Water Quality Remediation Plan
Dish Mill Brook Tributary

BURKE MOUNTAIN RESORT

East Burke, Vermont

Prepared for **Burke Mountain Resort**
East Burke, Vermont

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VHB PIONEER

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1.0 Introduction

This Water Quality Remediation Plan (WQRP) for Dish Mill Brook Tributary has been prepared by VHB Pioneer on behalf of Burke Mountain Resort (Burke). This voluntary plan was initiated by Burke in the context of the Act 250 Master Plan review and request Water Quality Certification to the Vermont Agency of Natural Resources (ANR).

Based on the most recent EPA-approved listing from 2008, Dish Mill Brook and its tributaries are considered to be meeting the State water quality standards and are not included on the 303(d) list of "surface waters in need of TMDL development". However, both Dish Mill Brook (from River Mile 0.0 to 1.3) and the unnamed Tributary originating from the mid-Burke area are included in the 2008 Vermont Part C list of "surface waters in need of further assessment" due to potential impacts to the aquatic life support use of these waters resulting from sedimentation. Therefore, in order to proactively address concerns in this area, Burke 2000 has prepared this Water Quality Remediation Plan, that identifies potential areas of concern, as well as establishes a blueprint for implementation of remedial measures and monitoring of water quality conditions, in order to address these concerns as future resort development moves forward in order to protect the water quality and maintain adequate aquatic habitat for fish and macroinvertebrates.

1.1 Background

Burke 2000, the holding company for Burke Mountain Resort (Burke) has prepared a master plan including conceptual future development plans.

The Vermont Department of Environmental Conservation (VTDEC) has previously collected aquatic biota samples from the Dish Mill Brook Tributary adjacent to the Burke Mountain Access Road (see Site Location Map, page 1 of Appendix 1). The

results of this sampling determined that aquatic biota were in fair condition in 2005, and in good condition 2006 It is Burke's intention to implement protective measures such that the Dish Mill Brook Tributary would reliably attain compliance with Vermont Water Quality Standards aquatic life support criteria, and therefore remain as waterbody in compliance with State water quality standards. This evaluation identifies specific measures which are recommended within the Dish Mill Brook Tributary watershed, some in concert with future development plans, which provide an opportunity for Burke to improve and maintain the water quality of the stream as it flows through the resort property. The primary focus is geared towards reduction of washoff sediment loading and reduction of peak stormwater flow rates from impervious surfaces, through the protective measures proposed in this plan, which would be implemented in concert with future development plans.

1.2 Water Quality Remediation Plan Overview

VHB Pioneer has prepared this WQRP for the Dish Mill Brook Tributary watershed. Field assessments of the Dish Mill Brook Tributary watershed indicate that unmanaged runoff and associated sedimentation from unpaved roads and impervious surfaces are areas where Burke can undertake protective measures to improve the water quality and aquatic habitat of Dish Mill Brook Tributary. Specific elements of this water quality remediation plan (WQRP) include:

- Assessing the existing channel conditions from a geomorphic perspective and assessing Burke's infrastructure with respect to outfalls, bridges, and culverts
- Identifying anthropogenic sediment sources
- Mapping the existing drainage system
- Developing plans targeted towards reduced sediment loads to channels and subsequent effectiveness monitoring

In order to address these elements, VHB Pioneer has completed the following work efforts:

- Rapid geomorphic assessments (RGA) and rapid habitat assessments (RHA) on select reaches, cross sections, pebble counts, and a bridge and culvert assessment (BCA) within the Dish Mill Brook Tributary watershed
- A watershed and subwatershed field delineation that has been mapped in a geographic information system (GIS)
- Sediment source identification
- A watershed hydrologic model that contains pre-development, existing, and proposed development conditions
- A washoff sediment loading model to quantify the amount of sediment contributed by each subwatershed

1.3 Water Quality Remediation Plan Components

The WQRP is based on several sources of data that include field observations, monitoring data, and modeled output.

1.3.1 Stream Survey and Reconnaissance

The VTDEC Phase II Stream Geomorphic Assessment (VTDEC 2003) was used as an overall guideline for conducting stream reconnaissance. VHB Pioneer conducted RGAs and RHAs along selected reaches during Summer 2007, as well as a BCA. The forms and methods for these assessments were developed by the VTDEC Rivers Management Section. The RGA and RHA allow for an overall assessment of the reach's geomorphic and habitat condition. One cross section per reach was surveyed and one pebble count per reach was conducted. The form developed by VTDEC for BCAs was used. Specific criteria on this form were used to prioritize a culvert's replacement priority rating.

1.3.2 Watershed Delineation and Stormwater Outfall Mapping

VHB Pioneer conducted field reconnaissance during November 2006 to delineate subwatersheds within the Dish Mill Brook Tributary watershed and to identify the existing stormwater outflows. Percent impervious area was also calculated using digital map data and aerial photographs.

1.3.3 Watershed Hydrologic Model

VHB Pioneer has developed a hydrologic model for the Dish Mill Brook Tributary watershed using HydroCAD® v 8.0. The model is based on the Natural Resource Conservation Service (NRCS) unit hydrograph method which incorporates land use conditions through the use of curve numbers and uses travel distances and lag times to route runoff. The subwatersheds in the model were derived directly from the above mentioned subwatershed delineation work. The HydroCAD model enables the simulation of pre-development and proposed development conditions. This allows for peak runoff to be evaluated based on specific changes to watershed conditions. In particular, the model provides a framework to evaluate potential effects on the flow regime based on different stormwater treatment practices and development scenarios.

1.3.4 Simple Method Model - Sediment

The Simple Method model (Scheuler, 1987) is a numerically based model that can be used to predict annual sediment loads. Average annual precipitation, land cover, percent impervious area and drainage area are key inputs into the model. The generated output yields sediment loads in pounds per acre per year (lb/ac/yr). All calculations are made in a Microsoft® Excel spreadsheet. The Simple Method also allows for the modeling of different treatment and development scenarios.

1.3.5 Biomonitoring Data

The VTDEC has sampled benthic macroinvertebrate populations on Dish Mill Brook Tributary 0.1 miles upstream of the confluence with the mainstem Dish Mill Brook.

The data collected from these samples provides information on species, richness, and density, as well as other biometric parameters used to assess a stream's biological health. In addition VTDEC has sampled Dish Mill Brook stations at varying times in the past.

During 2007, VHB Pioneer conducted aquatic biota sampling on the Dish Mill Tributary and two stations on Dish Mill Brook (RM 1.3 and RM 2.1)

2.0 Site Location and Identified Reach Characteristics

Burke Mountain Resort is located in East Burke, Vermont in the northeastern part of the state. The ski trails lie on the north slope of Burke Mountain (see Site Location map, page 1 of Appendix 1).

Dish Mill Brook Tributary is a high gradient stream that flows from approximately 2,350 feet in elevation to 1,080 feet at the confluence with Dish Mill Brook. In the higher terrain, elevation 2,350 to 1,650 feet, Dish Mill Brook Tributary flows through forest areas and ski trails. Below 1,650 feet, Dish Mill Brook Tributary flows adjacent to areas of typical mountain resort development including parking lots, condominiums, roads, and other commercial buildings. Dish Mill Brook Tributary has several branches but is described as one tributary with several reaches for the purpose of the RGA and RHA analyses (see the Bridge and Culvert Assessment and Stormwater Outfalls map in map pocket). The drainage area for the entire Dish Mill Brook Tributary watershed is 1.16 square miles.

The RGA and RHA surveyed six reaches within the Dish Mill Brook Tributary watershed: reaches A, B, C, D, E, and F. Reaches that flow near developed and developing areas were the focus of the assessment. All of the reaches are small high

gradient (SHG) streams, generally possess step-pool or cascade habitat, and are in confined valley settings.

Reach A is a tributary to Reach F and is located east of the Sherburne Base Lodge. The land use within the Reach A subwatershed is forest, roads, and some development. The confluence of Reach E and Reach B is the upstream extent of Reach A. Reach B is the easternmost tributary in the watershed; it flows in a westward direction and crosses Alpine Lane. The upstream extent of reach B is located at the confluence of Reaches C and D both of which cross the Mountain Road in the vicinity of the Mid-Burke Lodge. Land uses in Reaches B and C are ski trails, parking lots, roads, condominiums and forest. Reach E is located downstream of the Willoughby Quad Chair and has some ski trails within its watershed. This reach receives water from several small unnamed tributaries that were not surveyed. The Reach F survey stopped at the confluence of two unnamed tributaries just upslope of the Bunker Hill ski trail. The land use for the unsurveyed tributaries above Reach F is predominantly forest and ski trails as they are located on the western edge of the Burke's ski trail system.

The channels flow through areas dominated by forest composed of deciduous and coniferous species. Hemlock, spruce, and fir are the dominate tree species. Additional species observed include, hobble bush (*Viburnum alnifolium*), striped maple (*Acer pensylvanicum*), red maple (*Acer rubrum*) and birch (*Betula sp.*). The primary existing land uses in this area are ski trails, residential development and forest.

3.0 Hydrologic Modeling Analysis

3.1 HydroCAD® Model Development and Results

VHB Pioneer has completed hydrologic modeling analyses for Dish Mill Brook Tributary for pre-development, existing, and conceptual future development conditions. Modeling has been performed for the Dish Mill Brook Tributary watershed down to the confluence with Dish Mill Brook. The future development scenario is based on Stantec plans from July 19, 2007. The future development scenario includes potential residential and commercial developments that have stormwater runoff detention provided in stormwater basins. Subsequently, the hydrologic modeling for this area is based on the conceptual future development plan recognizing that final design and hydrologic calculations will provide a greater level of specificity than as described in this WQRP.

Under existing conditions, subwatersheds were delineated based on receiving streams and locations of stormwater discharge within the Dish Mill Brook Tributary watershed. Subwatershed summaries are presented in Appendix 2. Subwatersheds were delineated using available topographic mapping, field investigations, and development site plans. Subwatersheds for the future scenario encompass the development and the surrounding existing conditions subwatersheds were modified accordingly.

Two significant inputs to the HydroCAD® model are drainage area characteristics, which includes curve number (CN) runoff coefficient, and time of concentration (Tc). The CN values were determined from the existing land cover types and underlying soil drainage characteristics in the drainage areas using GIS. Land cover was determined using CAD plans from Stantec and soil drainage characteristics were determined using digital NRCS soil surveys. Residential land cover and commercial land cover were used to classify the proposed development under proposed conditions. Forest land cover was used to classify the proposed development area under pre-development conditions. Areas outside of proposed development were

classified according to the existing conditions land cover. Forest and ski trail land cover are prominent in the subwatersheds, with smaller amounts of open and impervious area. The most prominent soil type is Dixfield sandy loam. The majority of soils are classified as having hydrologic soil group C, indicating poorly drained soils. The Tc values were measured using the methods presented in Urban Hydrology for Small Watersheds (USDA 1986). The rain events modeled were over 24-hours and include the 1-, 2-, 10-, 25-, and 100-year storms, with rainfall depths determined using the Vermont Stormwater Management Manual (VTDEC 2002) and U.S. Weather Bureau Tech. Paper No. 40 (USDA 1961).

Hydrologic modeling results for the Dish Mill Brook Tributary watershed upstream of the confluence with Dish Mill Brook are provided in Table 1:

Table 1: Peak Discharges by Scenario for Range of Storm Events

Scenario	DA (mi^2)	1-yr storm (cfs)	2-yr storm (cfs)	10-yr storm (cfs)	25-yr storm (cfs)	100-yr storm (cfs)
Pre-Development	1.16	112	129	302	687	966
Existing	1.16	113	131	304	691	969
Post-Development	1.16	114	131	305	697	975

The hydrologic modeling results indicate that the post-build out scenario would result in a small increase (1-2 percent) in peak discharge at the downstream extent of Dish Mill Brook Tributary. Based on the sensitivity of the model and the potential error in the input data, the results indicate virtually no change between pre-development and post development conditions for the 1, 2 and 10 year storms. Existing conditions model results for the 10-year storm are provided in Appendix 2.

3.2 Simple Method Model Development and Results

All subwatersheds that drain to Dish Mill Brook were evaluated using the Simple Method model for calculating pollutant loading, including sediment. The 713 acre Dish Mill Brook Tributary watershed consists mainly of ski trails, open areas, and forest land covers (Impervious surfaces such as buildings, commercial, and residential, as well as paved and gravel roads and parking lots represent 34 acres or 4.8% of the watershed. Currently there are no existing stormwater treatment ponds.

Pollutant loads from eight land use classifications within the Dish Mill Brook Tributary watershed have been determined using the Simple Method (see calculations on page 2 of Appendix 1). This method is a widely used and accepted approach for the estimation of pollutant loads, within a given drainage area. The method provides a straightforward approach for the comparison of annual pollutant loading associated with various land uses, and incorporates treatment and management options. This method can be used to provide estimates of annual pollutant loads, from which decisions can be made with regard to treatment options and overall site plan design. This method takes into account several variables including average annual precipitation (PRISM, 2004), percent impervious land cover, mean pollutant concentration for a given land use type, contributing drainage area, and treatment removal rates. The tables on pages 3 through 8 of Appendix 1 provide a summary of pollutant load calculations associated with each drainage area under existing conditions.

The Simple method model yields results that indicate the wide range of sediment loading conditions within the Dish Mill Brook Tributary watershed. The range of sediment loading ranges from a low of 22 lb/ac/yr in subwatershed A46 to a high of 919 lb/ac/yr in subwatershed A08. While the overall average loading for the entire watershed is 42 lb/ac/yr suggests that sediment loading is relatively low, because it is an average, doesn't represent the magnitude of sediment washoff load from the

largest sediment producing subwatersheds. Of the eight subwatersheds that have the largest annual unitized sediment loads, VHB Pioneer has identified seven of them as critical subwatersheds (Table 2).

Table 2: Eight Largest Unitized Annual Sediment Loading Subwatersheds Within Dish Mill Brook Tributary

Sub-watershed	Unitized load (lb/ac/yr)	Largest Sediment Generating Land Use	Percent Impervious Area	Critical Subwatershed
A03	481	Transportation - gravel	45%	Yes
A08	919	Transportation - gravel	55%	Yes
A10	227	Transportation - gravel	18%	No
A13	270	Transportation - gravel	31%	Yes
A29	327	Transportation - gravel	30%	Yes
A30	549	Transportation - gravel	40%	Yes
A35	227	Transportation - paved	43%	Yes
A42	243	Transportation - paved	44%	Yes

Gravel roads and parking areas were identified as the largest producers of sediment within these subwatersheds. A total of 15.9 acres of these unpaved roads lies within the Dish Mill Brook Tributary watershed that currently generate an estimated 10,000 pounds of sediment per year.

4.0 Watershed Assessments and Biomonitoring

4.1 Stream Geomorphic Assessment

SGA data that were collected included a partial SGAas defined by the VTDEC for official Phase 2 Stream Geomorphic Assessment (SGA) projects. Nevertheless, VHB Pioneer used the SGA protocol as a general guideline to collect the data and to ensure the integrity of the data.

With rapid habitat assessments (RHA) and rapid geomorphic assessments (RGA) performed on six channel reaches, streams were assessed in terms of their overall condition. The RHA was conducted using the parameters that are appropriate for high gradient streams and the RGA was conducted using the parameters for confined streams, as the valley width was generally less than four times the bankfull width. Cross sections were surveyed and channel dimensions were determined. A level tape and measuring rod were used for these measurements. Pebble counts were also collected at each cross section location. The forms that were used were developed by the VTDEC from the "Vermont Stream Geomorphic Assessment Appendix A – Phase 2 Field Forms" (VTDEC 2003). Data from the original field forms are available upon request pending permission from Burke.

The quality assurance and quality control measures developed for the SGA and BCA (see Section 4.2) are provided on pages 9 through 12 of Appendix 1.

4.1.1 Rapid Habitat Assessment

With respect to the overall habitat condition, five out of six surveyed reaches had scores under 0.64, which suggests that the overall habitat condition is deemed as fair. Reach E was the exception in the survey and the data suggest that the reach is in overall good condition almost attaining reference condition.

Two habitat criteria that were further examined were sedimentation and bed composition. These parameters are important to consider in the context of future mountain project developments. Five of the six surveyed reaches were observed to have poor or fair embeddedness whereby at least 50 percent of gravel and larger size particles were surrounded by fine sediment. Only reach E was in reference condition, with 0 to 25 percent of the bed embedded with fine grain material (see Stream Geomorphic and Habitat Assessment map in map pocket). As for the sediment deposition parameter, half of the surveyed channels were observed as being in fair condition and the other half being in good condition as shown on the

above-referenced map. Reaches in good condition have some new increase in bar formation and have slight deposition in pools. Reaches in fair condition have moderate amounts of new deposition and have 30 to 50 percent of the channel bed affected.

In terms of the amount of channel alteration, five out of six of the reaches were assessed as good or reference, which suggests that the surveyed reaches had minimal straightening, berms, or streambank altering. Only Reach D was determined as fair, suggesting 20 to 80 percent of the reach had been channelized. The riffle/step frequency also had five out of six reaches being determined as good or reference conditions, with reach F being deemed as only in fair condition.

All surveyed streams were considered to have a fair condition for bank stability and bank vegetative protection. Slightly worse conditions were observed for vegetative zone width, with reach C and D considered poor on the left bank, and only reach D was observed as being in poor condition on the right bank. Table 3 provides a summary of RHA and RGA data collected on the six survey stream reaches.

Table 3: Summary of Rapid Habitat Assessment and Rapid Geomorphic Assessment Data

	Reach A	Reach B	Reach C	Reach D	Reach E	Reach F
Rapid Habitat Assessment						
Epifaunal Substrate	Good	Poor	Fair	Reference	Good	Good
Embeddedness	Fair	Poor	Poor	Fair	Reference	Fair
Velocity/Depth Patterns	Fair	Fair	Fair	Good	Reference	Fair
Sediment Deposition	Fair	Fair	Fair	Good	Good	Good
Channel Flow Status	Fair	Fair	Good	Good	Good	Good
Channel Alteration	Reference	Reference	Good	Fair	Reference	Reference
Riffle/Step Frequency	Good	Reference	Good	Good	Reference	Fair
Bank Stability (L)	Fair	Fair	Fair	Fair	Fair	Fair
Bank Stability (R)	Fair	Fair	Fair	Fair	Fair	Fair
Bank Vegetative Protection (L)	Fair	Fair	Fair	Fair	Fair	Fair

Table 3: Summary of Rapid Habitat Assessment and Rapid Geomorphic Assessment Data						
	Reach A	Reach B	Reach C	Reach D	Reach E	Reach F
Bank Vegetative Protection (R)	Fair	Fair	Fair	Fair	Fair	Fair
Riparian Vegetative Zone Width (L)	Fair	Fair	Poor	Poor	Fair	Fair
Riparian Vegetative Zone Width (R)	Fair	Fair	Fair	Poor	Fair	Fair
Habitat Condition Score	0.63	0.54	0.52	0.62	0.81	0.61
Rapid Geomorphic Assessment						
Channel Degradation	Poor	Poor	Poor	Poor	Good	Good
Channel Aggradation	Fair	Fair	Poor	Good	Reference	Poor
Widening Channel	Fair	Good	Fair	Fair	Reference	Good
Change in Planform	Good	Good	Good	Good	Good	Fair
Geomorphic Condition Score	0.40	0.48	0.39	0.50	0.75	0.45

4.1.2 Rapid Geomorphic Assessment

In a few locations the proximity of roads, ski trails, and homes reduces the width of the riparian buffer. Floodplain access is generally very limited resulting in channel incision. Some bank erosion was noted but the majority of the banks are stable. A significant amount of sedimentation resulting in elevated embeddedness (greater than 50 percent) was observed throughout the watershed. The increased sediment load has resulted in significant aggradation in much of the channel resulting in isolated avulsions and steep riffles as well as channel widening. The channel widening appears to be having a minimal effect on bank stability, but continued sedimentation may intensify this process.

The results for the RGA were mixed, with each reach receiving a fair, poor, and good score, with the exception of reach E, which did have the highest overall geomorphic condition score at 0.75, thereby placing it in good condition. The other five reaches had geomorphic condition scores between 0.35 and 0.64, classifying them in fair condition.

The Stream Geomorphic and Habitat Assessment map depict four of the six reaches as being in poor condition with respect to the channel degradation parameter (see map pocket). This condition is automatically obtained if multiple head cuts are present or if the incision ratio is greater than 2. Reference E and F were observed to be in good condition for this parameter.

Two reaches (C and F) were considered in poor condition when considering channel aggradation. This condition can occur when step-pool features are filled with sediment. These reaches can also have high width to depth ratios and can have experienced major changes to their hydrology. The aggradation is likely due to sand and gravel washoff from nearby roads.

Reaches B and F were observed as being in good condition in terms of channel widening, and reach E was in a reference condition in terms of widening as displayed on the Stream Geomorphic and Habitat Assessment map (see map pocket). These results suggest that bank erosion and scour are relatively low, and bar deposits are not overwhelming the channel. The three remaining reaches, A, C, and D were in fair condition, which suggests a somewhat higher width to depth ratio (between 30 and 40) and some mid-channel and/or diagonal bars are more abundant.

Finally, all the reaches except for F were in good condition for the channel planform parameter. Given the relative steepness of these streams, it is not unexpected that these channels have not made substantial lateral migrations. Reach F was in poor condition, specifically in terms of man-made constrictions significantly smaller than bankfull width, which in turn has caused extensive deposition and flow bifurcation.

4.1.3 Cross Sections and Pebble Counts

Cross Sections

Along each reach, a cross section was surveyed using best professional judgment to locate a site representative of the stream reach. Given the length of the reaches surveyed and the variability observed within a reach, each cross section is representative of the typical condition of the entire reach. The cross section data were used to determine channel dimensions such as width and depth as well as to determine ratios such as width to depth and entrenchment. Graphical presentations of the cross sections are shown on pages 13 and 14 of Appendix 1.

Table 4 provides a summary of the channel dimensions for each of the surveyed cross section within the reach. Low entrenchment values suggest that the channel has steep banks; higher entrenchment values suggest that peak flows have the ability to spread out onto a wider surface.

Table 4: Dish Mill Brook Tributary Channel Parameters

Reach	Bankfull Width (feet)	Mean Bankfull Depth (feet)	W/D	Entrenchment	Dominant Material
A	7.2	1.0	7.2	1.9	Coarse Gravel
B	14.3	0.7	20.4	1.3	Fine Gravel
C	9.5	0.9	9.5	2.0	Fine Gravel
D	6.6	0.8	7.3	2.0	Fine Gravel
E	8.0	1.1	6.1	1.6	Coarse Gravel
F	11.6	0.7	16.6	1.9	Fine Gravel

Pebble Counts

The pebble counts that were conducted grouped the particles into five categories; sand, fine gravel, coarse gravel, cobble, and boulder. The sampled data suggest Reaches A and E have a median grain size that is coarse gravel (see Figure 1). For reaches B, C, D and F, at least 50 percent of their sampled grains were less than 16mm, which is considered fine gravel. The level of fine material indicates that sediment is above levels that are considered healthy for aquatic life in reached B, C, D and F.

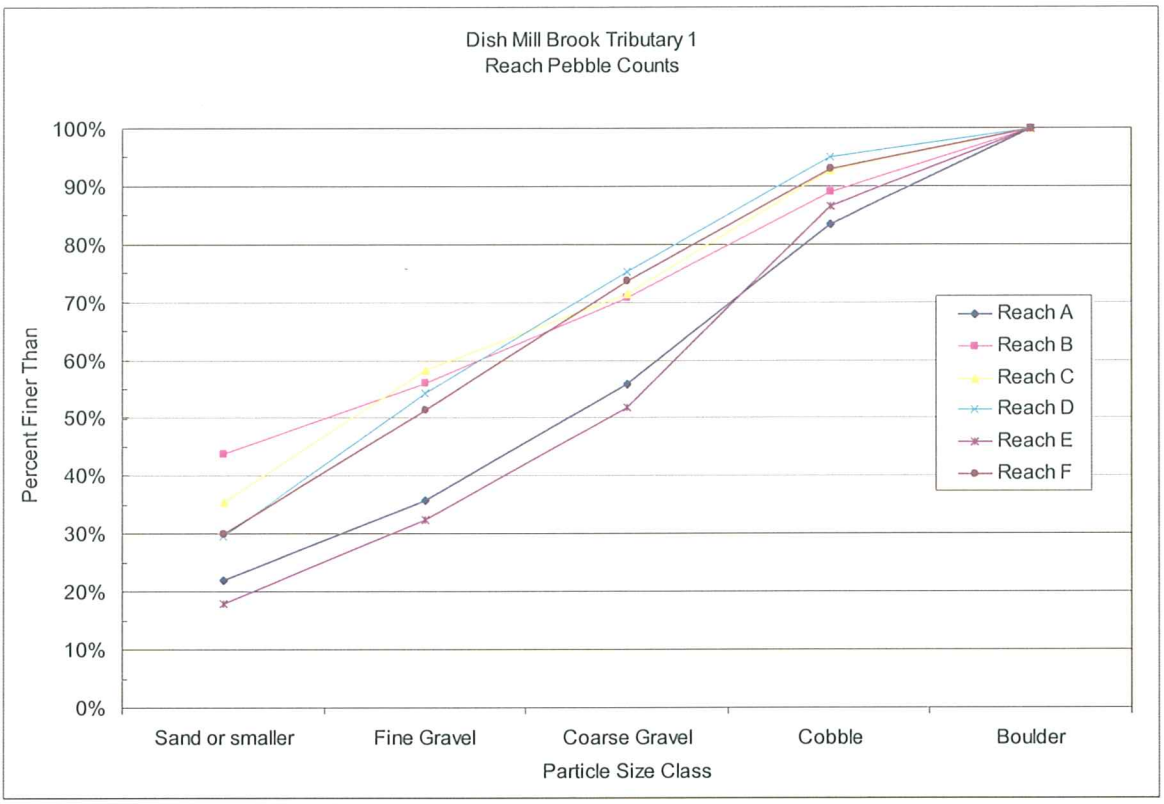

Figure 1. Particle size distribution for sampled reaches within the Dish Mill Brook Tributary.

4.2 Bridge and Culvert Assessment

VHB Pioneer conducted a BCA on twenty-five culverts and three bridges in May 2007. The locations of these structures are displayed on the Bridge and Culvert Assessment and Stormwater Outfalls map provided in the map pocket.

Bridges 01 and 02 appear to be constructed from logs and appear to be crossings for historic roads no longer in use. Both bridges have a structure span that is narrower than the channel width. Nevertheless, neither of these bridges, nor bridge 03 appears to be responsible for creating any problems with respect to water quality.

Based on the VTDEC BCA form, the criteria used to assess the culverts for replacement include the following parameters:

1. Upstream sediment obstruction
2. Two foot or greater outflow drop
3. Downstream banks substantially higher than upstream banks
4. High bank erosion on the downstream side

Culvert replacement was categorized as high if two or more of these conditions were observed.

The BCA identified five culverts that were obstructed on the upstream end by sediment. Five culverts were identified that had a two foot drop on the downstream end, and one with a six foot drop on the downstream end. Four culverts were identified as having downstream banks that were substantially higher than the upstream bank heights. Three culverts were observed as having high bank erosion (see Table 5).

Table 5: Bridge and Culvert Assessment Summary and Replacement Priority Ranking

Culvert ID	Geomorphic and Fish Data Passage Parameter					Culvert Replacement Priority
	Upstream Sediment Obstruction	2ft. or Greater Outflow Drop	Downstream Banks Substantially Higher Than Upstream Banks	High Downstream Bank Erosion	Burke Mtn. Owned?	
C-01	-----	-----	-----	-----	No	None
C-02	-----	-----	☑	-----	Yes	Low
C-03	☑	-----	-----	☑	No	High
C-04	☑	-----	-----	-----	Yes	Moderate
C-05	-----	-----	☑	-----	No	Low
C-06	-----	-----	-----	-----	Yes	None
C-07	-----	☑	-----	☑	Yes	High
C-08	☑	-----	-----	-----	No	Moderate
C-09	-----	-----	-----	-----	No	None
C-10	-----	-----	-----	-----	No	None
C-11	-----	-----	-----	-----	No	None
C-12	-----	-----	-----	-----	No	None
C-13	-----	-----	-----	-----	No	None
C-14	-----	-----	-----	-----	No	None

Table 5: Bridge and Culvert Assessment Summary and Replacement Priority Ranking						
Culvert ID	Geomorphic and Fish Data Passage Parameter					Culvert Replacement Priority
	Upstream Sediment Obstruction	2ft. or Greater Outflow Drop	Downstream Banks Substantially Higher Than Upstream Banks	High Downstream Bank Erosion	Burke Mtn. Owned?	
C-15	-----	-----	-----	-----	Yes	None
C-16	-----	☑	-----	-----	Yes	Moderate
C-17	-----	-----	-----	-----	Yes	None
C-18	-----	-----	-----	-----	Yes	None
C-19	-----	☑	☑	-----	Yes	High
C-20	☑	☑	-----	☑	Yes	High
C-21	-----	-----	-----	-----	Yes	None
C-22	-----	☑	-----	-----	Yes	Moderate
C-23	-----	-----	-----	-----	Yes	None
C-24	-----	-----	☑	-----	Yes	Low
C-25	-----	☑	-----	-----	Yes	Moderate

4.3 Subwatershed and Outfall Mapping

VHB Pioneer conducted field investigations of the property on November 9 and 10, 2006 in order to inventory stormwater outfalls and map their associated drainage areas. The outfall mapping process was similar to the method developed for mapping stormwater outfalls in stormwater impaired watersheds for VTDEC.

VHB Pioneer's assessment of the stormwater outfalls identified fourteen outfalls as critical due to erosion concerns (Table 6). Ten open channels and four closed pipes showed evidence of excessive sediment transport or erosion, one of which was plugged (see the Bridge and Culvert Assessment map in map pocket). Evidence of excessive sediment loading was noted by VHB Pioneer in the waterways at these sites, and can be observed in the photographs of these sites (pages 15 through 21 of Appendix 1). Seven outfalls were identified as draining areas with high impervious cover (see Table 6).

Table 6: Critical Outfalls			
Outfall	Associated Subwatershed(s)	Sediment and/or Erosion	> 25 % Impervious
OC-004	A49	X	X
OC-005	A49	X	X
OC-006	A49	X	X
OC-008	A29		X
OC-009	A31, A36	X	
OC-203	A08	X	
OC-208	A23	X	
OC-209	A23	X	
OC-210	A23	X	
OC-211	A23	X	
CP-001	A34	X	X
CP-002	A33		X
CP203	A10	X	X
CP-207	A15,A43	X Culvert Plugged	

The drainage pattern and impervious surfaces within the target watershed also play a critical role in understanding the movement of sediment through the target watershed. In order to better define and quantify high priority areas within the target watershed, VHB Pioneer delineated 51 subwatersheds and calculated their percent impervious cover.

The subwatershed delineation and percent impervious cover mapping illustrate some notable areas at Burke Mountain, primarily critical subwatersheds which were identified as having more than 25 percent impervious cover (Table 7).

Table 7: Critical Subwatersheds		
Subwatershed	**Total Area (Acres)**	**Percent Impervious**
A03	1.4	44.5
A08*	0.8	55.0
A13	1.5	31.3
A29*	0.7	29.6
A30	2.3	40.3
A32	0.9	38.1
A33*	1.1	31.9
A35	2.1	42.9
A42	1.2	43.7
A49*	0.9	33.5
*Subwatershed contains at least one critical outfall ^Duplicate photographs (see pages 15 through 21 of Appendix 1)		

In addition to the high percentage of impervious surface, these subwatersheds were also identified and photographed in the field as problem areas. The Bridge and Culvert Assessment and Stormwater Outfalls map in the map pocket displays critical watersheds. Photographs of four of these subwatersheds are on pages 22 and 23 of Appendix 1.

Subwatershed A03 is adjacent to Mountain Road, and subwatersheds A08, A13 and A42 are clustered around the Sherburne Base lodge upslope of Meadow Road. The remaining critical subwatersheds are clustered around the Mid-Burke lodge and parking lot. Four of the critical subwatersheds (A08, A29, A33 and A49) have a critical outfall located within their boundary.

4.4 VTDEC Biomonitoring Data

VTDEC has conducted biomonitoring sampling along Dish Mill Brook Tributary 0.1 miles upstream from the confluence with Dish Mill Brook in 1988, 2005, and 2006. VHB Pioneer also sampled this location in 2007. The 2006 sample met the VTDEC biocriteria for all eight biometrics and consequently the overall biologic community was listed as being in good condition (Table 8).

Table 8: Dish Mill Brook Tributary - River Mile 0.1 kick net sampling results

Year	Density[a]	Richness[b]	EPT[c]	PMA-O[d]	BI[e]	% Oligo.[f]	EPT/ EPT+C[g]	PPCS-FG[h]	Outcome
Class B2-3[1]	≥300	≥27	≥16	≥45	≤4.5	≤12	≥0.45	0.4	
1988	**200**	35.5	18	70.5	2.6	7.2	0.7	0.5	Fail
2005	**121.5**	28	**14.5**	76.6	2.7	1.6	1.0	0.7	Fail
2006	602.9	40	20	69.9	3.8	2.0	0.9	0.5	Pass
2007*	**138.5**	31.5	19.5	87.6	1.91	4.0	0.95	0.71	Fail

[1]VANR macroinvertebrate thresholds (2/12/02)
a) Density is the relative abundance of animals in a sample.
b) Richness is the number of species in a sample unit.
c) EPT is the number of species in the environmentally sensitive orders Ephemeroptera, Plecoptera, and Trichoptera.
d) Percent Model Affinity of Orders is a measure of order-level similarity to a model based on reference streams.
e) Hilsenoff Biotic Index is a measure of the macroinvertebrate assemblage tolerance toward organic enrichment
f) Percent Oligochaeta is a measure of the percentage of the community made up of this order
g) A measure of the ratio of the intolerant EPT orders to the generally tolerant Diptera family Chironomidae
h) Pinkham-Pearson Coefficient of Similarity – Functional Groups is a measure of functional feeding group similarity to a model based on reference streams.

Data collected by Steve Fiske of Vermont VTDEC
*Preliminary Data collect by C. Szal, finalization pending review by S. Fiske.

Bold denotes metric does not meet Class B2-3 Criteria

The 1988 samples did not meet the standard for density and the 2005 samples did not meet the standard for density or EPT. Failure to meet these standards resulted in the 1988 and 2005 sampling efforts classifying the overall aquatic macroinvertebrate community as being in fair condition. Subsequent sampling by VTDEC in 2006

determined that all eight criteria were met. As part of the 2006 sampling, it was noted that embeddedness in the channel was high and that sediment from gravel roads and parking lots appeared to be delivering sand to the channel.

Catherine Szal, Biologist, conducted kick net samples on October 1, 2007. Sampling was conducted on Dish Mill Brook stations 1.3 and 2.1 which both passed B2-3 criteria (See pages 27 through 29 of Attachment 1). The Dish Mill Brook Tributary station 0.1 kick net sample occurred upstream of the Mountain Road and below the confluence of Reach A and Reach F. The results from the latest sample round indicate that seven of eight metrics passed with only density failing to meet B2-3 criteria. This continues a trend of high variability with respect to densities for the Dish Mill Brook Tributary. .

5.0 Recommended Remediation Measures

5.1 Stream Geomorphic Assessment Reaches

5.1.1 Reach B

As mentioned, reach B was in poor condition for embeddedness and channel degradation. Critical outlets OC-208, OC-209, OC-210 and OC-211 lie in a series along a gravel road and all contribute directly to reach B, which provides supporting evidence for the reach having a poor embeddedness and channel degradation condition. Numerous sand and gravel deposits were observed in the channel, which also suggests that the road is a significant source of sediment. The stormwater runoff on gravel road should be routed so that gullies do not form on the road. This means that flow lengths must be limited and outlets should be treated to reduce the amount of sediment being supplied to the channel.

5.1.2 Reaches C and D

Together, Reaches C and D flow through six critical subwatersheds (A29, A30, A32, A33, A35, and A49) with impervious cover exceeding 25 percent. A great deal of the impervious area is from the Mid-Burke lodge parking lot and surrounding development. With the exception of Mountain Road, all other roads are gravel. The water quality impacts to these channels are generally believed to come from increased runoff from the untreated impervious areas and from sediment coming from unpaved roads.

The RGA suggests that the channels continue to adjust to the increased sediment loads and increased peak flows. The channels are being affected by side channel sediment deposits and have evidence of incision as well. The channels are likely to continue to be impacted until the sediment load and peak flows are reduced. Unpaved roads should be managed so that sediment generated from these roads is minimized and that the sediment that is generated is directed to areas that will not directly contribute to the channel. The proper placement of roadside ditches and water bars can significantly reduce sediment being directly contributed to Reaches C and D.

Reach C flows past the Mid-Burke Lodge on the eastern edge of the parking lot. The riparian zone in this area is minimal. Lacking a sufficient buffer, road-related sediment and untreated peak flows are directed towards this reach. The development of a planting plan to filter the runoff and sediment is recommended.

The potential for channel restoration exists on Reach D upstream of the confluence with Reach C. The riparian vegetation in this area is limited to mowed grass. Cobbles are located near the channel but serve no functional purpose as they are well outside the bankfull dimensions (Figure 2). The removal of the cobbles coupled

with a riparian planting plan would improve the structure and function of the channel.

Figure 2. Photograph of reach B looking downstream, upstream of a condominium development.

Proposed developments are located in the subwatersheds that contribute to Reaches C & D. Burke should develop best management practices (BMPs) to prevent increased levels of sediment and water being discharged due to construction related stormwater discharges.

5.1.3 Reach F

Critical subwatershed A08 and A13 contribute to the lower section of Reach F. The Sherburne Base lodge and its parking lot comprise much of the impervious area in these subwatersheds. Minimal buffers exist along a 200 foot stretch where the channel flows near some condominiums and a parking lot. As with reach C, a planting plan to increase the riparian buffer width is recommended.

5.2 High Priority Culverts

Upon inspection of these parameters in Table 5 (Section 4.2), culvert C-20 is checked for three parameters; culverts C-03, C-07, and C-19 are checked for two parameters. Burke should consider culverts C-03, C-07, C19 and C20 as high priority culverts to be replaced, adequately sized, and properly laid to grade during installation. (Photographs of each culvert are provided on pages 24 and 25 of Appendix 1).

Culverts with the next highest priority should be C-04 and C-08 due to sediment obstructing the flow of water at the inlet, and culverts C-16, C-22, and C-25 should also be considered for replacement due to having a two foot free fall drop. While culverts C-02, C05, and C-24 were identified as having downstream banks substantially higher than the upstream banks, these are considered low priority replacements.

Properly sized and placed culverts are designed to efficiently convey water and sediment without creating additional erosion, which is intended to improve water quality.

5.3 Stormwater Management

Existing stormwater management at Burke is minimal, as the existing impervious surfaces were constructed prior to the institution of operational phase stormwater management requirements by VTDEC. Existing impervious area associated with the mountain and adjacent land areas is managed for peak flow attenuation or pollutant

removal (primarily sediment). In some areas where there is an absence of proper management of stormwater runoff, extensive rills and gullies have formed, resulting in excessive outwash and accumulation of sediment (primarily fine grained material) in receiving waters.

Based on results from the sediment loading analysis, ten subwatersheds have been identified as predominant contributors of unmanaged runoff and washoff sediment load to receiving waters (Table 2). The two primary areas where a stormwater management system designed towards peak flow attenuation and sediment reduction would provide substantial benefits are the subwatersheds in and around the Sherburne Lodge (subwatershed A08, A13 and A42) and the Mid-Burke Lodge (subwatersheds A29, A30, A31, A32, A33, A35 and A49). The three watersheds associated with the Sherburne Lodge have a total area of 3.5 acres, 2.0 acres of which are impervious; the seven subwatersheds associated with the Mid-Burke lodge have a total area of 10.1 acres, 3.7 acres of which are impervious.

Where appropriate, management strategies may involve retrofitting existing developed areas with stormwater management systems, such as stone-lined swales and/or stormwater basins. In addition, both the Sherburne Lodge and Mid-Burke areas are slated for future re-development, which would result in conformance with applicable criteria of the Vermont Stormwater Management Manual (VSWMM) for water quality and quantity. The re-development of these areas with appropriate stormwater controls, and issuance of operational phase discharge permits from VTDEC with ongoing operation and maintenance requirements is a key aspect to addressing existing impacts due uncontrolled stormwater runoff in the watershed.

Specific assessment of proposed retrofit measures and future development proposals within the watershed should be made to ensure that the proposed hydrologic and sediment load targets, as described in Section 7.1, would be met.

5.3 On Mountain Improvements

The results from the Simple Method sediment analysis and field investigation indicate that the existing road system plays a large role in contributing sediment to channels. Field observations of the critical outfalls lead to a similar conclusion. As such, treatments idetnified in Table 9 are designed towards reducing sediment loads in Dish Mill Brook Tributary. These treatments were identified in 2007 and the table has been updated to include the current status.

Table 9: Critical Outfall Summary and Treatment

Outfall	Comment	Treatment Recommendation (2007)	Status (2009)
OC-004 OC-005 OC-006	Associated with dirt parking area nearby the maintenance building. Presently runoff from the parking lot is flowing directly into the nearby stream.	Interim treatment - Divert flow from entering the brook through the use of berms or swales and direct to the roadside ditches. Final treatment - Install SW detention BMP to temporarily detain flow and prevent sediment from reaching the stream.	Interim Treatment has been implemented. storage area and stream. Final Treatment – will be implemented as Mid-Burke is developed
OC-008	Associated with a gravel/paved parking area runoff draining to the stream untreated.	Direct runoff through a shallow ditch upslope of stream entry	Treatment pending
OC-009	Associated with a gravel/paved parking area with untreated runoff directly entering the stream	Interim treatment - Divert runoff from directly entering the stream through ditching. Final treatment - Install SW treatment BMP to detain flow and prevent sediment from reaching stream	Interim Treatment has been implemented In addition, concrete barriers have been installed to provide a 20' buffer between snow storage area and stream. Final Treatment – will be implemented as Mid-Burke is developed
OC-203	Associated with the condominium development with untreated runoff directly entering the stream. The outfall itself is eroding and adding to the sediment problem	Interim treatment - Stabilize the outfall with large stones and regrading. Final Treatment - Direct runoff away from the stream through the installation of parking lot drainage network and stormwater detention	Final Treatment – will be implemented as Mid-Burke is developed

Table 9: Critical Outfall Summary and Treatment			
Outfall	**Comment**	**Treatment Recommendation (2007)**	**Status (2009)**
OC-208 OC-209 OC-210 OC-211	Direct runoff occurs from a gravel road directly into the stream. Runoff is causing bank erosion	Regrade the road to drain into the drainage ditch on the opposite side of the road. Restore bank stability in eroded areas.	Treatment has been implemented. In addition, sediment has been removned from the drainage ditch.
CP-001	New culvert installations with invert and outlet. Channel upgrades needed.	Install culvert aprons at invert and outlet, regrade slope above outlet to match existing grade, restore the stream channel below the outlet. Plant vegetation	Apron installed, regrading channel and vegetation planting is still pending.
CP-002	New culvert installations with invert and outlet. Channel upgrades needed.	Install culvert aprons at invert and outlet, regrade slope above outlet to match existing grade, restore the stream channel below the outlet. Plant vegetation	Apron installed, regrading channel and vegetation planting is still pending.
CP-203 CP-207	Excess sediment buildup	Remove excess sediment. Monitor sediment accumulation and periodically remove buildup of sediment	Treatment has been implemented. In addition, the road was regarded to direct runoff to the open channel, regrading the channel and removal of excess sediment.

In addition to the outfall treatments listed in Table 9 above, the following activities were completed (location of improvements is shown on the attached map):

- During the summer of 2009 drainage improvements, including stone lining the lateral drainage ditch, removal of excess sediment buildup, and installation of new drainage culverts and plunge pools, on High meadow road, in the vicinity of subwatersheds A21, A22, A25.
- Sherburne Lodge Road was repaved for a 1000 foot stretch from the intersection of Mountain Road toward the lodge. Drainage improvements including lateral ditches and culverts were also installed.

6.0 Monitoring

VHB Pioneer has prepared a a water quality sampling program that would be implemented as specific phases of future Master Plan development are initiated. Current information gleaned from water quality sampling done in 2007 and earlier provides adequate baseline data. The monitoring effort proposed here would be implemented in concert with master plan development. Such a monitoring effort would record the stream response to protection efforts, and enable continued assessment of areas of concern within the watershed.

The monitoring that is presented in this report presents a recommended schedule for the first year of sampling. The monitoring plan can and should be modified annually based on monitoring results and site-specific developments

6.1 Water Quality Monitoring and Parameters

The water quality monitoring study would consist of the following components:

- Water chemistry
- Aquatic biota
- Sediment
- Cross sections
- Rainfall

VHB Pioneer recommends water quality monitoring at stations located throughout the Dish Mill Brook Tributary watershed (see Water Quality Monitoring Station Locations map on page 26 of Appendix 1). The 2008 monitoring schedule is summarized in Table 10.

Table 10: Water Quality Monitoring Schedule

Monitoring activity	Station*	Frequency
Water Chemistry (baseflow)	A1, B1, C1, C2, D1, E1, F1	One Summer (July – Aug.) One Fall (Sept. – Oct) 2 rounds annually
Water Chemistry (event-based)	A1, B1, C1, C2, D1, E1, F1	One Spring (April – May) One Summer (July – Aug.) One Fall (Sept. – Oct) 2 - 3 rounds annually
Sediment	A1, B1, C1, D1, E1, F1,	Once annually: (September – October)
Cross Sections	A1, B1, C1, C2, D1, D2, E1, F1, F2	Once annually: (September – October)
Rainfall	Mid-Burke Lodge	Continuous: March 31 – October 31
*The prefix is a reference to the reach on which the station lies.		

Each of the sampling stations is described below.

A1: Reach A Dish Mill Brook Tributary upstream of Dish Mill Brook confluence

B1: Reach B Dish Mill Brook Tributary upstream of Reach E

C1: Reach C Dish Mill Brook Tributary upstream of Reach D

C2: Reach C Dish Mill Brook Tributary upstream of the Mid-Burke Lodge Parking Lot

D1: Reach D Dish Mill Brook Tributary upstream of Reach C

D2: Reach D Dish Mill Brook Tributary above the Mid-Burke Lodge

E1: Reach E Dish Mill Brook Tributary upstream of Reach A

F1: Reach F Dish Mill Brook Tributary upstream of Reach A

F2: Reach F Dish Mill Brook Tributary on the western tributary above ski trails

6.1.1 Water Chemistry

Sampling is recommended to occur during baseflow and following significant rainfall events. Baseflow sampling would be conducted during a period when no rain or significant snowmelt event has been recorded for 24 to 48 hours prior to sampling. Event-based sampling would be conducted during rainfall (a rainfall

event resulting in 0.5 inches of rain in a 24 hour period) or snow melt events which generate runoff. Baseflow, storm or melt off event-flow (paremeters marked with an asterisk (*))and sediment sampling would occur at all the stations (see Table 10). Monitoring parameters for water chemistry sampling would include:

- pH (s.u.)*
- chloride (mg/L)
- total phosphorus (mg/L)
- total dissolved phosphorus (mg/L)
- alkalinity, as $CaCO_3$ (mg/L)
- turbidity (NTU)*
- total suspended solids (TSS) (mg/L)*
- conductivity (µmho)*
- temperature (°C)*

6.1.2 Aquatic Biota

Conducting annual aquatic biota sampling at station A1 using VTDEC protocols would provide a consistent and long term indication of the success achieved through the implementation of remedial measures to ensure reliable attainment of biocriteria established pursuant to the Vermont Water Quality Standards.

6.1.3 Sediment

Because sediment loading to the channels is an important concern, pebble counts are proposed at several water quality monitoring stations. The pebble counts provide information on size of channel bed and bar deposits and the degree to which bed material is embedded. The protocol calls for three rounds of 100 sampled particles be conducted at each monitoring site.

6.1.4 Cross Sections

The available data and observations of the reaches within the Dish Mill Brook Tributary watershed suggest that the channels are receiving elevated levels of sediment. Given the dynamic nature of mountain streams and that they are considered transport reaches, cross sections should be surveyed on an annual basis. One cross section at each of the water chemistry sampling stations would provide valuable information in terms of whether the channel is responding to the proposed remediation measures or not. The cross sections should be benchmarked and well identified in the field in order to ensure that surveys can take place on annual basis. Consequently, a channel slope measurement should be made at this location for hydraulic modeling purposes.

6.1.5 Rainfall

Burke should install an automatic rain gage that is not influenced by canopy cover. It should be located near the Mid-Burke lodge in the vicinity of 1,600 feet above sea level. A rain tipping bucket attached to a data logger should be installed that measures rainfall at 0.01 inch increments, which allows for determination of storm event, daily and monthly rainfall totals.

7.0 Action Plan

7.1 Proposed Hydrologic and Sediment Targets

The hydrologic and sediment targets are goals towards which Burke should be working. These goals can serve as benchmarks for the planning of future development.

7.1.1 Hydrologic Benchmark

The 2006 biomonitoring data for Dish Mill Brook Tributary suggest that the hydrologic regime is capable of supporting a healthy macroinvertebrate population. Several remediation measures have been recommended to reduce sediment to the channel network. As mentioned previously, all future developments will need to meet applicable criteria of the VSWMM. For the purposes of this remediation plan, the proposed hydrologic targets for future development are the peak flows in existing condition model in HydroCAD for the 2-year and 10-year storm events at the Dish Mill Brook Tributary confluence with the mainstem Dish Mill Brook. Such a target, coupled with sediment reduction measures should allow Dish Mill Brook Tributary at the biomonitoring station to maintain a healthy aquatic population.

7.1.2 Sediment Benchmark

Recommended sediment benchmarks, geared towards specific areas within the Dish Mill Brook Tributary watershed, are aimed at improving the water quality and overall habitat conditions. The critical subwatershed identification, coupled with the results, from the Simple method strongly suggest that the primary areas to focus on remediation for sediment reduction also lie within the subwatersheds where peak flow attenuation should occur.

Sediment benchmarks would be established, for the watershed as a whole and for subwatersheds where master plan development is proposed, as part of the implementation of the water quality remediation plan. Benchmarks would be met by the installation of stormwater BMPs as part of redevelopment or development requirement.

7.2 Proposed Water Quality Targets for Biocriteria

The biological condition of Dish Mill Brook Tributary has been previously assessed by VTDEC as described above. Future biomonitoring sampling efforts should be

conducted to track attainment of DEC Class B biocriteria, as presented in Table 8, over time.

7.3 Implementation for Remedial Measures

As described above, Burke has already utilized the results of field identification of impact areas by VHB Pioneer in 2006 to implement numerous small scale remediation actions within the watershed. However, the timing of implementation of larger scale water quality remediation measures will be tied to the timing of planning, design and permitting of future development projects at Burke. This approach must occur of necessity since much of the area within the Dish Mill Tributary watershed will be redeveloped as a result of the project.

7.4 Reporting

To provide a status report on the progress of plan implementation and monitoring results over time, it is proposed that an annual performance report be prepared for each year that activities are conducted pursuant to the plan). The annual report would be completed in May to cover the activities for the prior calendar year. The first Annual Report would be prepared in the year following initiation of the first phase of master plan related construction activities. The components of the annual report would include the following:

- Summary of monitoring data
- Implementation update of measures to be undertaken
- Update on the feasibility and details of specific measures
- Status report with respect to water quality targets
- Revisions to targets or target dates (if needed)

7.5 Conclusions

Burke has proactively entered into a water quality protection effort for the Dish Mill Brook Tributary watershed. Since 2006, a comprehensive assessment of the watershed has been completed, including water chemistry monitoring, stream geomorphic assessment, biomonitoring, and hydrologic and sediment modeling. In addition, several water quality improvement measures, summarized in section 5.4 above have already been implemented. This plan has identified the particular stressors impacting water quality within the Dish Mill Brook Tributary provides the framework for protection of the watershed before, during and after development.

The bulk of this protection effort, including water quality monitoring and development of specific stormwater BMPs will be initiated during the Master Plan Development Phases.

References

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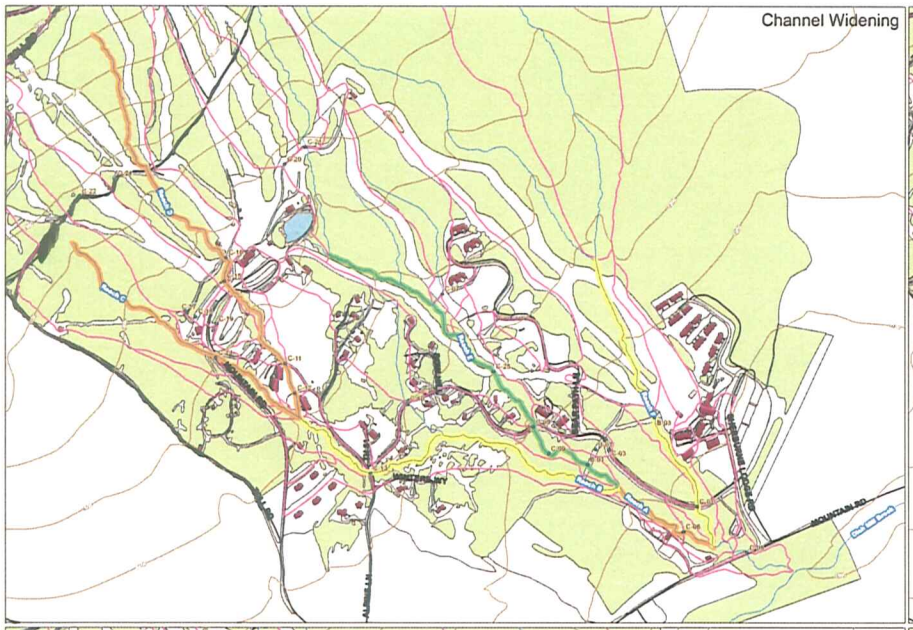
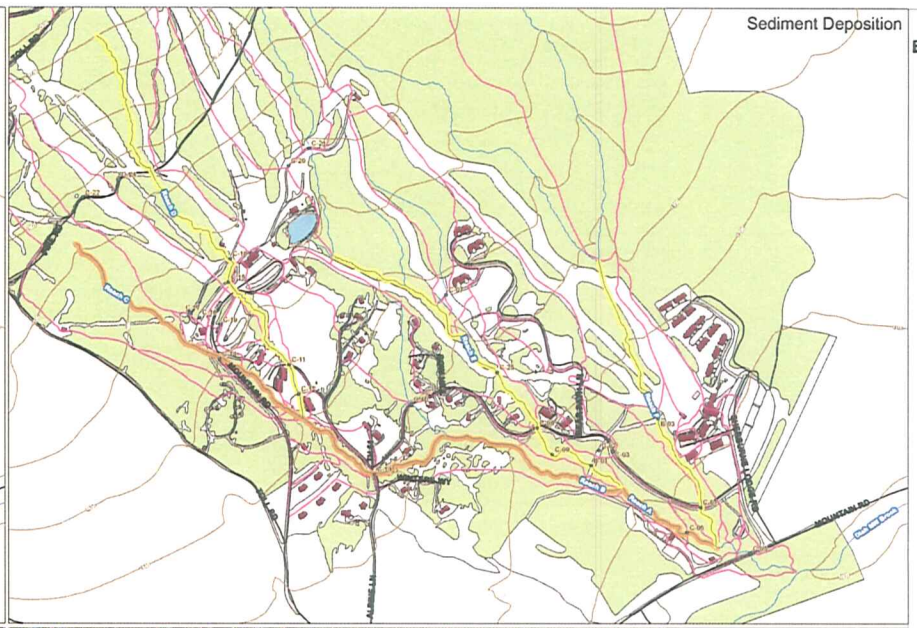
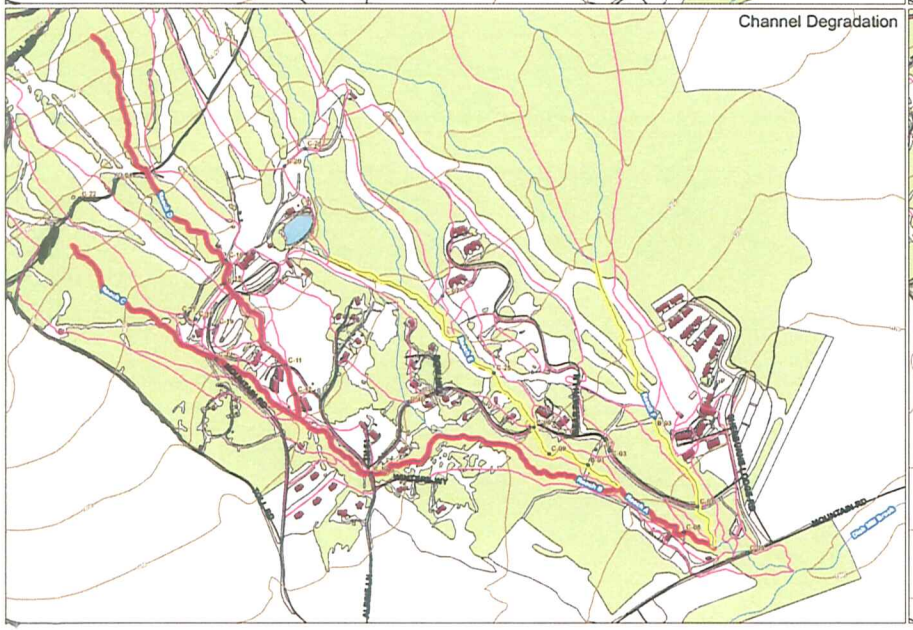
VTDEC 2002. The Vermont Stormwater Management Manual. Vermont Agency of Natural Resources. Waterbury, Vermont. March 2002.

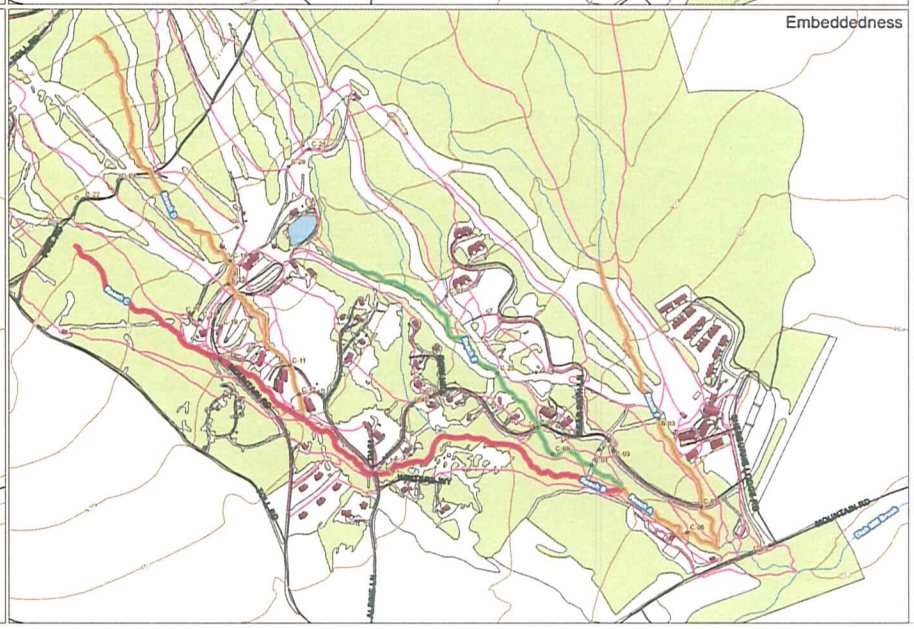
VTDEC 2003. Vermont Stream Geomorphic Assessment. Vermont Agency of Natural Resources. Waterbury, Vermont. April 2003.


Burke Mountain Resort
East Burke, Vermont
Dish Mill Brook Tributary 1 Watershed
Bridge and Culvert Assessment and
Stormwater Outfalls
October 15, 2009
Legend
Mid-Burke Base Area
Sherburne Lodge Base Area
Tributary 1
Gravel Parking Area - Stormwater run-off is being diverted from entering the stream through the installation/ upgrade of ditching. Also, concrete barriers have been installed to provide a buffer between the snow storage and the stream.
Maintenance Facility Parking Area - Stormwater run-off is being diverted from entering the brook (Reach C) through the use of berms or swales, and directing flow into roadside ditches.
Culvert (CP-002) - Culvert aprons have been installed at invert and culvert outlet.
Culvert (CP-001) - Culvert aprons have been installed at invert and culvert outlet.
High Meadow Road - Drainage improvements include; stone lining the lateral drainage ditch, removal of excessive sediment, and installation of new culverts and plunge pools.
High Meadow Road - The road has been regraded for stormwater run-off to enter a drainage ditch on the opposite side of the road. Drainage ditch has also been cleaned of excess sediment.
High Meadow Road - Excessive sediment has been removed from culvert outlets. Also, the road was regraded to direct run-off to an open channel.
Sherburne Lodge Road - A one thousand foot portion of the road from the intersection of Mountain Road toward toward the Sherburne Lodge was repaved. Drainage improvements such as lateral ditches and culverts were also installed.
PIONEER









Burke Mountain Resort East Burke, Vermont Stream Geomorphic and Habitat Assessment

October 15, 2009

Legend

- Culvert
- Reaches

Reaches Rating

- Poor (1-5)
- Fair (6-10)
- Good (11-15)
- Reference (16-20)
- Roads
- Dish Mill Brook Watershed

Land Cover

- BUILDING
- FOREST
- IMPERVIOUS
- OPEN, SKI TRAIL
- PARKING, ROAD
- WATER

0 500 1,000 Feet

Note: All ratings are on a scale of 20, with 20 being the best and 0 being the worst.

Sources: Background provided by NAIP Caledonia (2006); Roads provided by Vermont E911 (2006); Streams produced by Pioneer (2006).

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Prepared By: JAT

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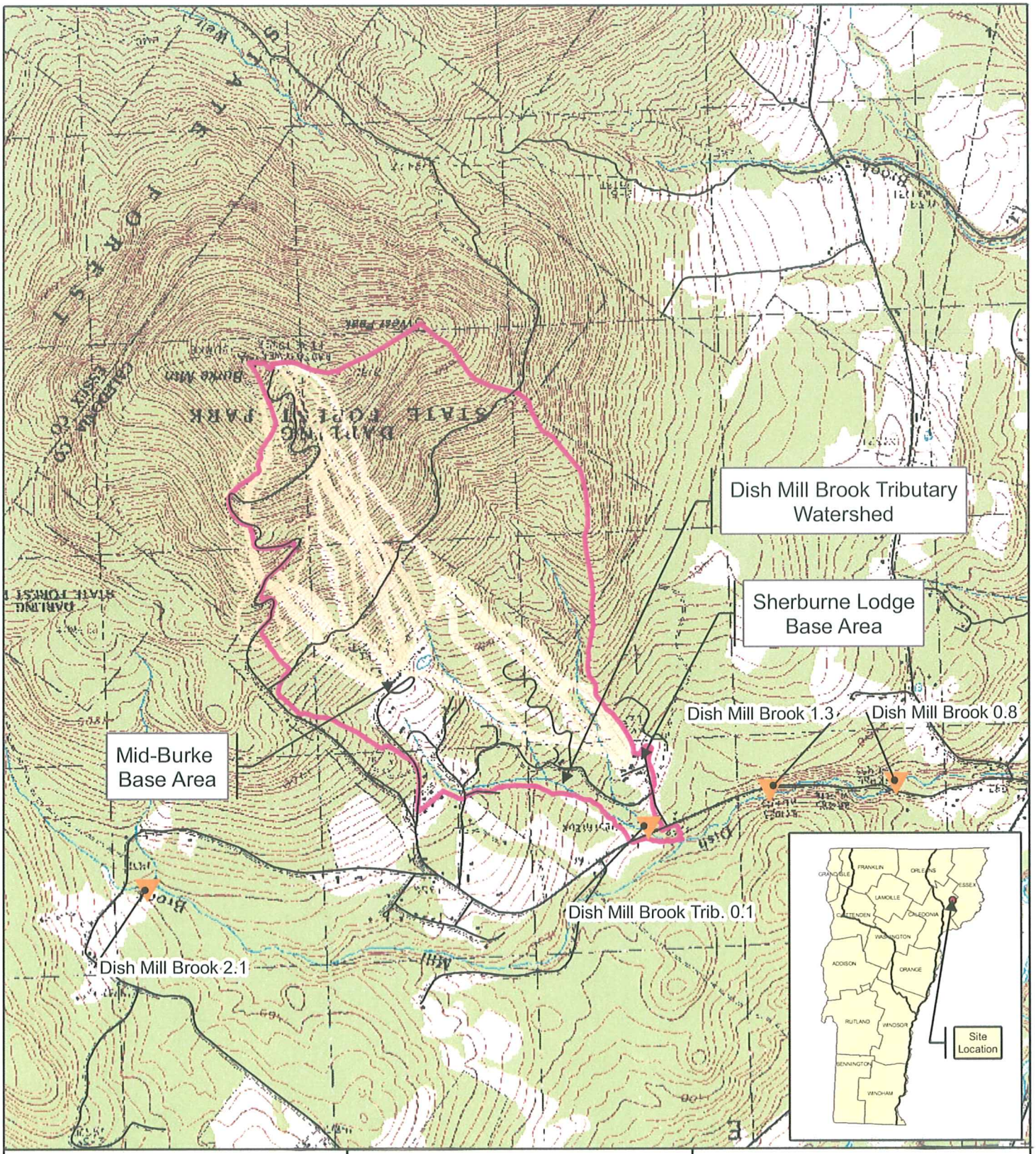

Legend

- Dish Mill Brook Tributary Watershed
- Biomonitoring Station
- Ski Trail

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Burke Mountain Resort
East Burke, VT
Site Location

October 15, 2009

2,000 1,000 0 2,000

Feet

Prepared by: JAT

Sources: USGS Topographic Maps 1316 and 1416 (1986 and 1988); Watershed mapped by Pioneer (2006).

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Burke Mountain Resort
East Burke, Vermont
Simple Method for Pollutant Loadings
Prepared by Pioneer Environmental Associates, LLC.
September 7, 2007

Annual Load = P * Pj * C * A * Rv * 0.226

Where:

P = Yearly rainfall depth
Pj = Fraction of rainfall events producing runoff (0.90)
C = Flow weighted mean concentration of pollutant
A = Area of contributing watershed
Rv = 0.05 + 0.009 * (site imperviousness) or accepted value
0.226 = Simple Method Coefficient

P = 42.4 (PRISM climatological data, downloaded from VCGI)
Pj = 0.9
Coefficient = 0.226

Table 1: Sediment Concentration Values

Land Use	TSS (mg/L)
Commercial	77
Forest	51
Open	51
Residential	70
Ski Trail	100
Transportation Gravel	374
Transportation Paved	142
Water	0

NYS DEC Draft Manual (2001)
EPA NURP Results for Forest/Rural Open (1993)
NYS DEC Draft Manual (2001)
Pioneer Judgement (2006)
Clinton & Vose - WQ Report (2003)
NYS SMDM (2001)
Pioneer Judgement (2006)
PRISM (2004)

Burke Mountain Resort
East Burke, Vermont
Simple Method for Pollutant Loadings
Prepared by Pioneer Environmental Associates, LLC.
October 16, 2009

Table 2: Subwatershed Areas (acres)

Land Use	Drainage Area										
	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11
COMMERCIAL	0.00	0.00	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FOREST	1.87	0.43	0.20	1.76	1.68	1.24	2.71	0.03	10.61	0.86	6.77
OPEN	0.24	0.01	0.55	0.37	1.57	0.14	0.41	0.00	3.90	0.58	0.53
RESIDENTIAL	0.00	0.00	0.00	0.00	0.57	0.00	0.00	0.25	1.31	0.00	0.00
SKI TRAIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.04
TRANSPORTATION GRAVEL	0.00	0.11	0.53	0.02	0.47	0.14	0.20	0.41	0.89	0.46	0.48
TRANSPORTATION PAVED	0.17	0.07	0.11	0.00	0.10	0.00	0.00	0.03	0.00	0.00	0.00
WATER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	2.28	0.62	1.42	2.17	4.40	1.53	3.32	0.78	16.71	1.90	7.81

Land Use	Drainage Area										
	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22
COMMERCIAL	0.00	0.32	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00
FOREST	2.72	0.02	5.42	2.25	0.28	0.52	0.28	0.20	0.26	0.03	0.03
OPEN	0.25	0.01	4.20	2.12	1.31	0.19	0.00	0.31	0.05	1.01	0.11
RESIDENTIAL	0.00	0.38	1.14	0.23	0.00	0.24	0.00	0.76	0.00	0.32	0.56
SKI TRAIL	0.00	0.27	1.80	1.51	0.00	0.04	4.50	0.37	0.00	0.00	0.00
TRANSPORTATION GRAVEL	0.24	0.36	1.01	0.57	0.20	0.25	0.00	0.23	0.01	0.32	0.09
TRANSPORTATION PAVED	0.00	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WATER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	3.21	1.51	13.57	6.67	1.79	1.25	4.85	1.87	0.32	1.69	0.79

Land Use	Drainage Area										
	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33
COMMERCIAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00
FOREST	2.45	0.03	3.86	0.16	2.19	0.98	0.07	0.47	0.59	0.16	0.32
OPEN	0.52	1.05	10.41	0.85	0.40	0.59	0.30	0.88	1.06	0.37	0.40
RESIDENTIAL	0.02	0.02	0.19	0.19	0.01	0.31	0.13	0.00	0.00	0.00	0.00
SKI TRAIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TRANSPORTATION GRAVEL	0.11	0.26	0.64	0.06	0.00	0.37	0.21	0.91	0.13	0.17	0.18
TRANSPORTATION PAVED	0.06	0.00	0.00	0.00	0.24	0.07	0.00	0.00	0.29	0.15	0.15
WATER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	3.17	1.36	15.10	1.26	2.84	2.32	0.71	2.27	2.12	0.85	1.06

Land Use	Drainage Area										
	A34	A35	A36	A37	A38	A39	A40	A41	A42	A43	A44
COMMERCIAL	0.02	0.34	0.29	0.00	0.02	0.00	0.09	0.00	0.08	0.00	0.00
FOREST	23.28	0.03	73.49	11.86	32.05	10.17	7.05	21.19	0.00	0.21	0.79
OPEN	1.91	0.74	1.47	0.48	0.02	0.00	4.22	2.69	0.54	0.18	0.51
RESIDENTIAL	0.00	0.00	0.00	0.00	0.00	0.38	1.57	1.00	0.00	0.46	0.02
SKI TRAIL	2.09	0.09	29.35	6.57	22.17	2.48	0.67	8.01	0.00	0.00	0.00
TRANSPORTATION GRAVEL	0.14	0.08	0.43	0.51	0.07	0.05	0.66	0.97	0.13	0.23	0.15
TRANSPORTATION PAVED	0.20	0.82	2.64	0.06	0.01	0.00	0.00	0.00	0.45	0.00	0.11
WATER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	27.63	2.11	107.68	19.47	54.35	13.08	14.27	33.87	1.19	1.07	1.58

Land Use	Drainage Area							Total
	A45	A46	A47	A48	A49	A50	A51	
COMMERCIAL	0.00	0.00	0.04	0.01	0.06	0.12	0.00	1.58
FOREST	0.92	194.53	90.74	2.51	0.18	10.95	4.93	536.30
OPEN	1.42	0.00	0.03	0.05	0.46	1.56	0.00	50.97
RESIDENTIAL	0.13	0.00	0.00	0.23	0.00	0.00	0.00	10.40
SKI TRAIL	0.00	0.04	17.71	0.87	0.00	10.28	15.56	124.50
TRANSPORTATION GRAVEL	0.67	0.00	0.06	0.22	0.24	0.87	0.29	15.82
TRANSPORTATION PAVED	0.06	0.00	0.00	0.00	0.00	0.00	0.03	5.99
WATER	0.00	0.00	0.00	0.00	0.00	0.96	0.00	0.96
Total	3.20	194.56	108.58	3.89	0.94	24.74	20.80	746.52

Burke Mountain Resort
East Burke, Vermont
Simple Method for Pollutant Loadings
Prepared by Pioneer Environmental Associates, LLC.
October 16, 2009

Table 3: Percent Imperviousness

Land Use	Drainage Area										
	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11
COMMERCIAL	0.00%	0.00%	2.94%	1.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
FOREST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
OPEN	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
RESIDENTIAL	0.00%	0.00%	0.00%	0.00%	2.89%	0.00%	0.00%	19.72%	1.27%	0.00%	0.00%
SKI TRAIL	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
TRANSPORTATION GRAVEL	0.00%	18.12%	37.02%	0.75%	10.75%	9.30%	6.14%	51.96%	5.32%	24.31%	6.21%
TRANSPORTATION PAVED	7.39%	10.84%	7.50%	0.00%	2.25%	0.00%	0.00%	3.84%	0.00%	0.00%	0.00%
WATER	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Subwatershed %	0.55%	4.46%	14.36%	0.02%	1.58%	0.87%	0.38%	33.40%	0.38%	5.91%	0.39%

Land Use	Drainage Area										
	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22
COMMERCIAL	0.00%	11.39%	0.00%	0.00%	0.00%	0.00%	1.58%	0.00%	0.00%	0.00%	0.00%
FOREST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
OPEN	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
RESIDENTIAL	0.00%	9.26%	2.41%	0.62%	0.00%	1.99%	0.00%	9.16%	0.00%	10.62%	9.84%
SKI TRAIL	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
TRANSPORTATION GRAVEL	7.59%	23.73%	7.46%	8.49%	11.06%	20.25%	0.01%	12.23%	2.40%	18.92%	11.71%
TRANSPORTATION PAVED	0.00%	10.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
WATER	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Subwatershed %	0.58%	11.47%	0.76%	0.74%	1.22%	4.48%	0.02%	5.20%	0.06%	5.63%	8.27%

Land Use	Drainage Area										
	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33
COMMERCIAL	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.12%	0.22%	0.00%	0.00%
FOREST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
OPEN	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
RESIDENTIAL	0.60%	1.53%	0.94%	1.99%	0.00%	6.38%	7.25%	0.00%	0.00%	0.00%	0.00%
SKI TRAIL	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
TRANSPORTATION GRAVEL	3.60%	19.34%	4.21%	4.71%	0.00%	16.02%	29.62%	40.27%	6.26%	20.54%	17.24%
TRANSPORTATION PAVED	1.89%	0.00%	0.00%	0.00%	8.29%	3.23%	0.00%	0.00%	13.71%	17.60%	14.67%
WATER	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Subwatershed %	0.17%	3.77%	0.19%	0.53%	0.69%	3.52%	10.10%	16.22%	2.28%	7.32%	5.12%

Land Use	Drainage Area										
	A34	A35	A36	A37	A38	A39	A40	A41	A42	A43	A44
COMMERCIAL	0.08%	8.72%	0.12%	0.00%	0.03%	0.00%	0.65%	0.00%	0.60%	0.00%	0.00%
FOREST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
OPEN	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
RESIDENTIAL	0.00%	0.00%	0.00%	0.00%	0.00%	0.09%	1.95%	0.57%	0.00%	15.38%	0.96%
SKI TRAIL	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
TRANSPORTATION GRAVEL	0.51%	3.78%	0.40%	2.63%	0.13%	0.36%	4.64%	2.86%	10.91%	21.08%	9.66%
TRANSPORTATION PAVED	0.72%	39.17%	2.46%	0.29%	0.02%	0.00%	0.00%	0.00%	37.61%	0.00%	7.15%
WATER	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Subwatershed %	0.01%	16.90%	0.06%	0.07%	0.00%	0.00%	0.43%	0.10%	15.37%	11.01%	1.45%

Land Use	Drainage Area							Total
	A45	A46	A47	A48	A49	A50	A51	
COMMERCIAL	0.00%	0.00%	0.02%	0.01%	1.51%	12.87%	0.00%	----
FOREST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	----
OPEN	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	----
RESIDENTIAL	4.03%	0.00%	0.00%	0.12%	0.00%	0.00%	0.00%	----
SKI TRAIL	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	----
TRANSPORTATION GRAVEL	20.89%	0.00%	0.03%	0.20%	6.22%	93.12%	1.15%	----
TRANSPORTATION PAVED	2.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	----
WATER	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	----
Subwatershed %	4.57%	0.00%	0.00%	0.02%	1.70%	3.34%	0.02%	----

Burke Mountain Resort
East Burke, Vermont
Simple Method for Pollutant Loadings
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October 16, 2009

Table 4: Runoff Coefficients

Land Use	Drainage Area										
	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11
COMMERCIAL	0.05	0.05	0.08	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05
FOREST	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
OPEN	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
RESIDENTIAL	0.05	0.05	0.05	0.05	0.08	0.05	0.05	0.23	0.06	0.05	0.05
SKI TRAIL	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
TRANSPORTATION GRAVEL	0.05	0.21	0.38	0.06	0.15	0.13	0.11	0.52	0.10	0.27	0.11
TRANSPORTATION PAVED	0.12	0.15	0.12	0.05	0.07	0.05	0.05	0.08	0.05	0.05	0.05
WATER	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Total	---	---	---	---	---	---	---	---	---	---	---

Land Use	Drainage Area										
	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22
COMMERCIAL	0.05	0.15	0.05	0.05	0.05	0.05	0.06	0.05	0.05	0.05	0.05
FOREST	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
OPEN	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
RESIDENTIAL	0.05	0.13	0.07	0.06	0.05	0.07	0.05	0.13	0.05	0.15	0.14
SKI TRAIL	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
TRANSPORTATION GRAVEL	0.12	0.26	0.12	0.13	0.15	0.23	0.05	0.16	0.07	0.22	0.16
TRANSPORTATION PAVED	0.05	0.15	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
WATER	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Total	---	---	---	---	---	---	---	---	---	---	---

Land Use	Drainage Area										
	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33
COMMERCIAL	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
FOREST	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
OPEN	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
RESIDENTIAL	0.06	0.06	0.06	0.07	0.05	0.11	0.12	0.05	0.05	0.05	0.05
SKI TRAIL	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
TRANSPORTATION GRAVEL	0.08	0.22	0.09	0.09	0.05	0.19	0.32	0.41	0.11	0.23	0.21
TRANSPORTATION PAVED	0.07	0.05	0.05	0.05	0.12	0.08	0.05	0.05	0.17	0.21	0.18
WATER	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Total	---	---	---	---	---	---	---	---	---	---	---

Land Use	Drainage Area										
	A34	A35	A36	A37	A38	A39	A40	A41	A42	A43	A44
COMMERCIAL	0.05	0.13	0.05	0.05	0.05	0.05	0.06	0.05	0.06	0.05	0.05
FOREST	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
OPEN	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
RESIDENTIAL	0.05	0.05	0.05	0.05	0.05	0.05	0.07	0.06	0.05	0.19	0.06
SKI TRAIL	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
TRANSPORTATION GRAVEL	0.05	0.08	0.05	0.07	0.05	0.05	0.09	0.08	0.15	0.24	0.14
TRANSPORTATION PAVED	0.06	0.40	0.07	0.05	0.05	0.05	0.05	0.05	0.39	0.05	0.11
WATER	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Total	---	---	---	---	---	---	---	---	---	---	---

Land Use	Drainage Area							Total
	A45	A46	A47	A48	A49	A50	A51	
COMMERCIAL	0.05	0.05	0.05	0.05	0.06	0.17	0.05	----
FOREST	0.05	0.05	0.05	0.05	0.05	0.05	0.05	----
OPEN	0.05	0.05	0.05	0.05	0.05	0.05	0.05	----
RESIDENTIAL	0.09	0.05	0.05	0.05	0.05	0.05	0.05	----
SKI TRAIL	0.05	0.05	0.05	0.05	0.05	0.05	0.05	----
TRANSPORTATION GRAVEL	0.24	0.05	0.05	0.05	0.11	0.89	0.06	----
TRANSPORTATION PAVED	0.07	0.05	0.05	0.05	0.05	0.05	0.05	----
WATER	0.05	0.05	0.05	0.05	0.05	0.05	0.05	----
Total	---	---	---	---	---	---	---	----

Burke Mountain Resort
East Burke, Vermont
Simple Method for Pollutant Loadings
Prepared by Pioneer Environmental Associates, LLC.
October 16, 2009

Table 5: Stormwater Treatment (%)

Land Use	Drainage Area										
	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11
COMMERCIAL	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
FOREST	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
OPEN	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
RESIDENTIAL	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SKI TRAIL	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
TRANSPORTATION GRAVEL	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
TRANSPORTATION PAVED	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
WATER	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total	---	---	---	---	---	---	---	---	---	---	---

Land Use	Drainage Area										
	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22
COMMERCIAL	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
FOREST	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
OPEN	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
RESIDENTIAL	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SKI TRAIL	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
TRANSPORTATION GRAVEL	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
TRANSPORTATION PAVED	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
WATER	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total	---	---	---	---	---	---	---	---	---	---	---

Land Use	Drainage Area										
	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33
COMMERCIAL	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
FOREST	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
OPEN	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
RESIDENTIAL	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SKI TRAIL	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
TRANSPORTATION GRAVEL	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
TRANSPORTATION PAVED	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
WATER	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total	---	---	---	---	---	---	---	---	---	---	---

Land Use	Drainage Area										
	A34	A35	A36	A37	A38	A39	A40	A41	A42	A43	A44
COMMERCIAL	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
FOREST	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
OPEN	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
RESIDENTIAL	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SKI TRAIL	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
TRANSPORTATION GRAVEL	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
TRANSPORTATION PAVED	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
WATER	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total	---	---	---	---	---	---	---	---	---	---	---

Land Use	Drainage Area							Total
	A45	A46	A47	A48	A49	A50	A51	
COMMERCIAL	0%	0%	0%	0%	0%	0%	0%	----
FOREST	0%	0%	0%	0%	0%	0%	0%	----
OPEN	0%	0%	0%	0%	0%	0%	0%	----
RESIDENTIAL	0%	0%	0%	0%	0%	0%	0%	----
SKI TRAIL	0%	0%	0%	0%	0%	0%	0%	----
TRANSPORTATION GRAVEL	0%	0%	0%	0%	0%	0%	0%	----
TRANSPORTATION PAVED	0%	0%	0%	0%	0%	0%	0%	----
WATER	0%	0%	0%	0%	0%	0%	0%	----
Total	---	---	---	---	---	---	---	----

Burke Mountain Resort
East Burke, Vermont
Simple Method for Pollutant Loadings
Prepared by Pioneer Environmental Associates, LLC.
October 16, 2009

Table 6: Subwatershed Annual Suspended Solids Load (pounds per year)

Land Use	Drainage Areas										
	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11
COMMERCIAL	0.0	0.0	2.1	0.9	0.0	0.0	0.0	0.2	0.0	0.0	0.0
FOREST	41.2	9.5	4.4	38.6	37.0	27.3	59.5	0.7	233.3	18.9	148.8
OPEN	5.2	0.2	12.0	8.2	34.5	3.2	9.0	0.0	85.9	12.7	11.6
RESIDENTIAL	0.0	0.0	0.0	0.0	26.2	0.0	0.0	34.1	48.6	0.0	0.0
SKI TRAIL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0	0.0	1.5
TRANSPORTATION GRAVEL	0.0	77.5	651.1	3.0	223.8	61.2	69.1	677.8	280.8	401.0	165.6
TRANSPORTATION PAVED	24.1	12.2	15.4	0.0	8.5	0.0	0.0	3.1	0.0	0.0	0.0
WATER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	70.5	99.5	685.0	50.6	330.0	91.6	137.6	718.4	648.6	432.7	327.5
Unitized (lbs/ac/yr)	30.9	159.7	481.4	23.4	75.1	60.1	41.5	919.5	38.8	227.5	41.9

Land Use	Drainage Areas										
	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22
COMMERCIAL	0.0	32.0	0.0	0.0	0.0	0.0	3.3	0.0	0.0	0.0	0.0
FOREST	59.8	0.4	119.2	49.4	6.1	11.5	6.1	4.5	5.6	0.6	0.8
OPEN	5.4	0.2	92.3	46.7	28.7	4.3	0.0	6.8	1.2	22.3	2.4
RESIDENTIAL	0.0	30.2	49.4	7.6	0.0	9.7	0.0	60.5	0.0	28.6	46.6
SKI TRAIL	0.0	11.6	77.7	65.2	0.1	1.8	193.9	16.0	0.0	0.0	0.0
TRANSPORTATION GRAVEL	93.1	304.0	382.6	230.8	95.3	189.4	0.1	118.1	1.8	226.6	46.7
TRANSPORTATION PAVED	0.0	28.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WATER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	158.4	407.2	721.2	399.6	130.3	216.7	203.2	205.8	8.6	278.1	96.5
Unitized (lbs/ac/yr)	49.3	270.3	53.1	59.9	72.9	173.6	41.9	110.1	27.0	165.0	121.4

Land Use	Drainage Areas										
	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33
COMMERCIAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.5	0.0	0.0
FOREST	53.9	0.7	85.0	3.4	48.3	21.5	1.5	10.4	12.9	3.5	7.0
OPEN	11.5	23.1	229.0	18.7	8.8	13.0	6.7	19.4	23.3	8.1	8.8
RESIDENTIAL	0.6	0.8	6.6	8.0	0.3	19.9	9.1	0.0	0.0	0.0	0.0
SKI TRAIL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0
TRANSPORTATION GRAVEL	30.3	190.6	180.6	17.6	0.0	232.7	215.5	1,215.6	45.4	132.4	120.5
TRANSPORTATION PAVED	4.9	0.0	0.0	0.0	35.9	7.2	0.0	0.0	61.6	38.3	34.5
WATER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	101.4	215.2	501.2	47.7	93.2	294.3	232.8	1,245.4	144.9	182.3	170.8
Unitized (lbs/ac/yr)	32.0	157.8	33.2	37.9	32.8	126.9	326.6	549.0	68.5	214.1	161.7

Land Use	Drainage Areas										
	A34	A35	A36	A37	A38	A39	A40	A41	A42	A43	A44
COMMERCIAL	0.7	29.1	9.7	0.0	0.6	0.0	3.5	0.0	2.9	0.0	0.0
FOREST	511.9	0.7	1,616.2	260.8	704.9	223.6	155.0	465.9	0.0	4.6	17.3
OPEN	41.9	16.2	32.3	10.5	0.5	0.0	92.8	59.3	11.8	3.9	11.2
RESIDENTIAL	0.0	0.0	0.0	0.0	0.0	11.6	63.9	33.4	0.0	52.0	0.5
SKI TRAIL	90.2	4.1	1,265.8	283.1	956.0	107.0	29.1	345.5	0.0	0.0	0.0
TRANSPORTATION GRAVEL	24.8	21.5	74.6	121.7	11.9	8.1	196.2	236.2	62.2	174.3	67.4
TRANSPORTATION PAVED	13.7	406.6	233.5	3.7	0.8	0.0	0.0	0.0	213.4	0.0	15.8
WATER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	683.3	478.1	3,232.0	679.8	1,674.7	350.3	540.4	1,140.3	290.2	234.8	112.2
Unitized (lbs/ac/yr)	24.7	227.1	30.0	34.9	30.8	26.8	37.9	33.7	243.3	219.5	71.1

Land Use	Drainage Areas							Total
	A45	A46	A47	A48	A49	A50	A51	
COMMERCIAL	0.0	0.0	1.4	0.4	2.5	13.3	0.0	103.96
FOREST	20.2	4,277.9	1,995.5	55.2	3.9	240.9	108.4	11,794.09
OPEN	31.3	0.0	0.6	1.0	10.1	34.2	0.0	1,120.84
RESIDENTIAL	6.7	0.0	0.0	7.0	0.0	0.0	0.0	561.98
SKI TRAIL	0.0	1.7	763.8	37.7	0.0	443.5	670.8	5,368.67
TRANSPORTATION GRAVEL	514.0	0.0	9.4	36.9	82.6	2,496.7	55.6	10,874.59
TRANSPORTATION PAVED	5.4	0.0	0.0	0.0	0.0	0.0	2.0	1,169.18
WATER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Total	577.6	4,279.6	2,770.6	138.2	99.1	3,228.6	836.8	30,993.31
Unitized (lbs/ac/yr)	180.3	22.0	25.5	35.5	105.9	130.5	40.2	41.5

Table 1: Simple Method: Annual Sediment Loads	
Land Cover	**Load (pounds/year)**
COMMERCIAL	104
FOREST	11,794
OPEN	1,121
RESIDENTIAL	562
SKI TRAIL	5,369
TRANSPORTATION GRAVEL	10,875
TRANSPORTATION PAVED	1,169
WATER	0
Total	**30,993**
Unitized (lbs/ac/yr)	**42**

Pioneer Environmental Associates, LLC.
Burke Mountain Resort
Stream Geomorphic Assessment
Field Collection Team and Training

Tom Shea and Alex Geller, both of Pioneer Environmental Associates, LLC. (Pioneer), conducted the field work. In 2005, Tom Shea attended a three day Vermont DEC River Management Division sponsored Phase 2 SGA training. He is currently a trained field team member for a Stream Geomorphic Assessment on White Creek and Mill Brook for a competitively awarded project administered by the Bennington County Conservation District. For that project he received another one day of training in the field with Shannon Pytlick of VTDEC River Management Division. Alex Geller was trained by Tom Shea for one day and conducted pebble counts and surveyed cross sections by himself on the second day.

Data Collection Review

The RHA and RGA were completed upon inspection of the entire reach. Upon returning from the field, forms were scanned into an Adobe Acrobat format (pdf). Form data were reviewed by William McDavitt, Senior Fluvial Geomorphologist of Pioneer. Subcomponent RHA and RGA scored were entered into a shapefile with column headers appropriate for each subcomponent. The beginning and end of each reach was noted on the field map and reviewed in the office by looking at an aerial photograph.

Cross section and pebble count data were entered into a Microsoft Excel spreadsheet. Cross section locations were checked and verified on the field map.

Burke/Stantec WQRP 2007
9/12/2007
Pioneer Environmental Associates, LLC.
SGA Phase II QA/QC Worksheet

Date:	9/12/2007
Stream Name:	Dish Mill Brook Tributary 1
Watershed:	Dish Mill Brook
QA Team Leader:	Zachary M. York
Organization:	Pioneer Environmental Associates, LLC.
Protocols Used:	VT DEC SGA Phase II Field Forms

Step	Method Used	Confidence Level	Data Collection/ Entry Date	Date Updated	Date of Local QA Team Review	Comments
Quality Assurance	VT DEC RMS sponsored Phase 2 SGA training - 10/4/05-10/7/05	High	N/A	N/A	N/A	Tom Shea attended SGA training; see narrative for details
Data Collection	VT DEC SGA Phase 2 Field Forms	High/Moderately High	7/12/2007 and 7/13/2007	N/A	N/A	Tom Shea (high confidence) Alex Geller (moderately high confidence)
Data Entry	MS Excel spreadsheets	High	7/16/2007	N/A	9/7/2007	No errors or omissions found
Quality Control	Review All Field Forms and Geodatabase for Omissions and/or Errors	High	N/A	N/A	9/7/2007	No errors or omissions found

Pioneer Environmental Associates, LLC.
Burke Mountain Resort
Bridge and Culvert Assessment
Field Collection Team and Training

Jesse Therrien and Eric Hebert of Pioneer Environmental Associates, LLC. (Pioneer) conducted the field work. Both field members received a 1/2 day training on Bridge and Culvert Assessments on May 17th from Tom Shea of Pioneer at Bolton Mountain Resort. The training reviewed all aspects of the BCA form for bridges and culverts.

Tom Shea is currently a trained field team member for a Stream Geomorphic Assessment on White Creek and Mill Brook for a competitively awarded project administered by the Bennington County Conservation District. For that project he received another one day of training in the field with Shannon Pytlick of Vermont DEC River Management Division. Jesse and Eric collected all data together in order to assure an overall consistency in their data collection.

Data Collection Review and Storage

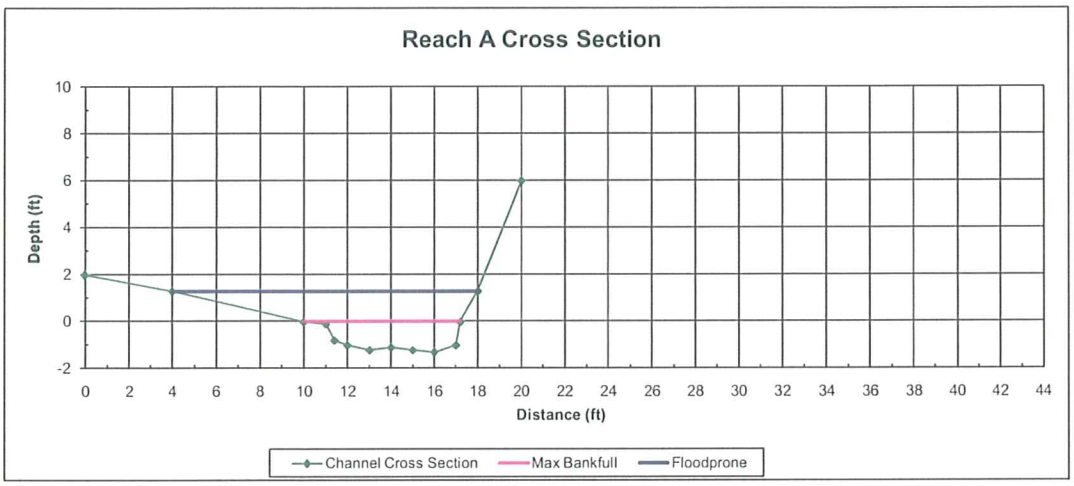
Zac York of Pioneer reviewed the BCA forms for errors and omissions. Upon returning from the field, forms were scanned into an Adobe Acrobat format. Pioneer has developed a Personal Geodatabase using ESRI's ArcMap 9.2. The personal geodatabase was developed with domains in a manner very similar to the Data Management System developed by the VTDEC. The location of each bridge and culvert was located using a GPS.

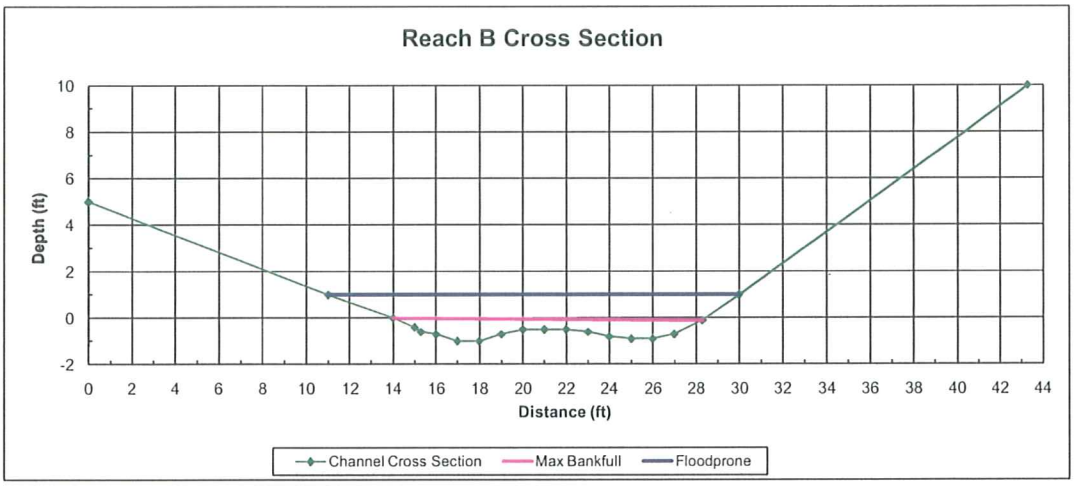
Burke/Stantec WQRP 2007
9/12/2007
Pioneer Environmental Associates, LLC.
Bridge and Culvert Assessment QA/QC Worksheet

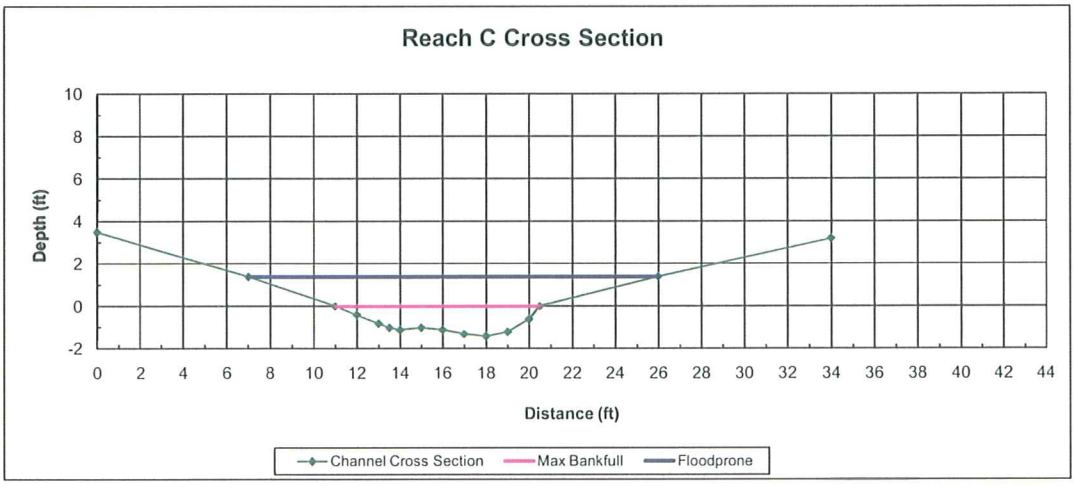
Date:	9/12/2007
Stream Name:	Dish Mill Brook Tributary 1
Watershed:	Dish Mill Brook
QA Team Leader:	Zachary M. York
Organization:	Pioneer Environmental Associates, LLC.
Protocols Used:	VT DEC Phase II BCA Field Forms

Step	Method Used	Confidence Level	Data Collection/ Entry Date	Date Updated	Date of Local QA Team Review	Comments
Quality Assurance	B&C Assessment training 5/17/07	High	N/A	N/A	N/A	See narrative for details
Data Collection	VT DEC SGA BCA Phase 2 Field Forms	High	5/29/2007	N/A	N/A	Data collected by Eric Hebert and Jesse Therrien (PEA)
Data Entry	Pioneer In-House Geodatabase	High	6/8/2007	N/A	9/5/2007	No errors or omissions found
Quality Control	Review Field Forms and Geodatabase for Omissions and/or Errors	High	N/A	N/A	9/5/2007	No errors or omissions found

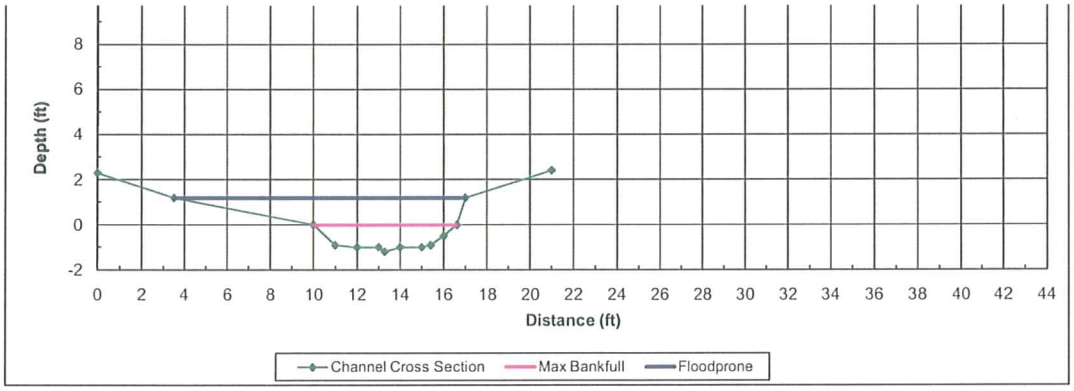
Burke Mountain Resort WQRP
Cross Sections

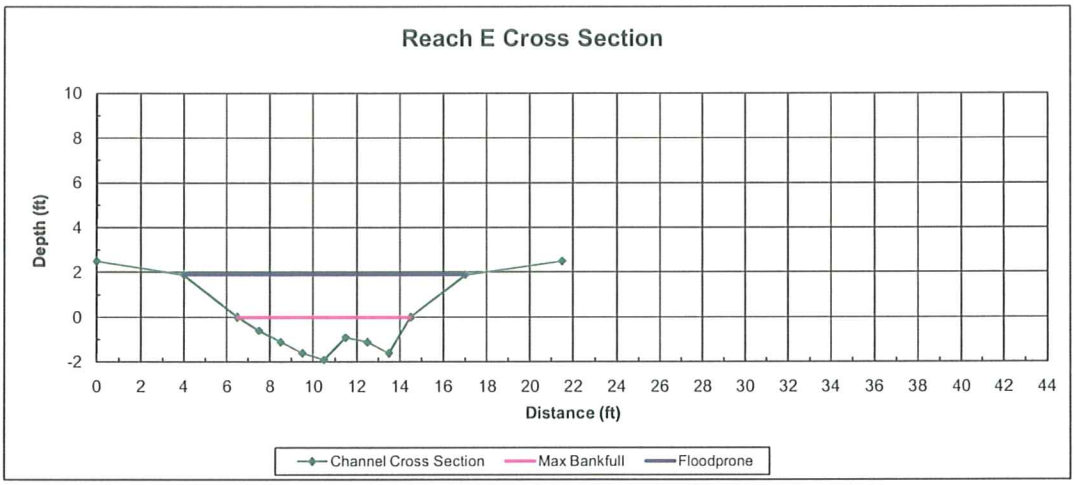


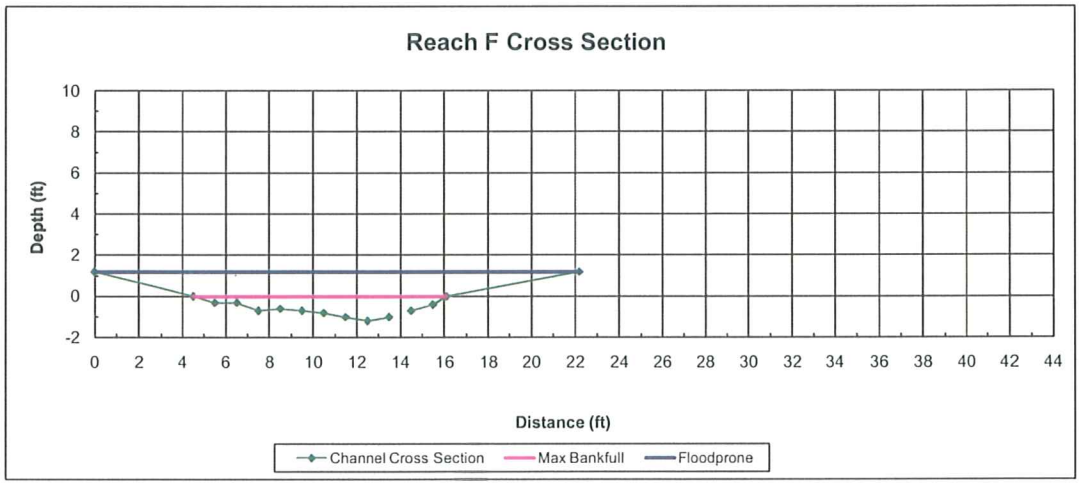




Burke Mountain Resort WQRP
Cross Sections







Photograph 1: OC-004. November 9, 2006

Photograph 2: OC-005. November 9, 2006

Photographs taken by Robert J. Stewart of Pioneer Environmental Associates, LLC.

Photograph 3: OC-006. November 9, 2006

Photograph 4: OC-008. November 9, 2006

Photographs taken by Robert J. Stewart of Pioneer Environmental Associates, LLC.

Photograph 5: OC-009. November 9, 2006

Photograph taken by Robert J. Stewart of Pioneer Environmental Associates, LLC.

Photograph 6: OC-203. November 9, 2006

Photograph taken by Jesse A. Therrien of Pioneer Environmental Associates, LLC.

Photograph 7: OC-208. November 9, 2006

Photograph 8: OC-209. November 9, 2006

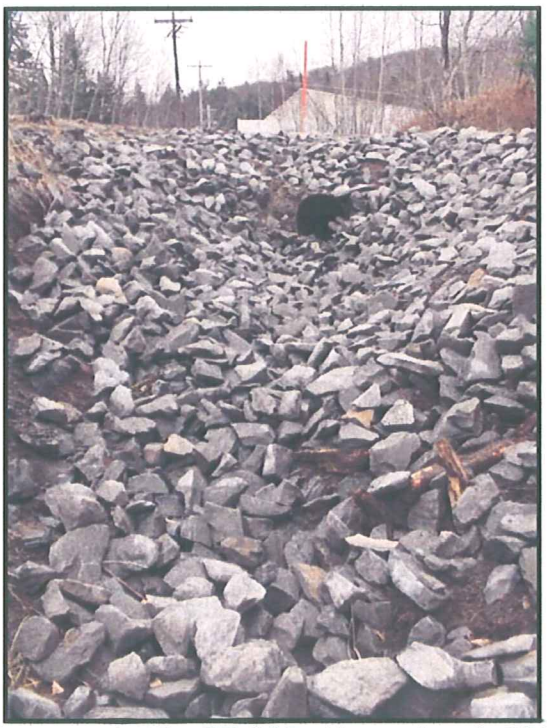
Photographs taken by Jesse A. Therrien of Pioneer Environmental Associates, LLC

Photograph 9: OC-210. November 9, 2006

Photograph 10: OC-211. November 9, 2006

Photographs taken by Jesse A. Therrien of Pioneer Environmental Associates, LLC.

Photograph 11: CP-001. November 9, 2006



Photograph 12: CP-002. November 9, 2006

Photographs taken by Rob J. Stewart of Pioneer Environmental Associates, LLC.

Photograph 13: CP-203. November 9, 2006

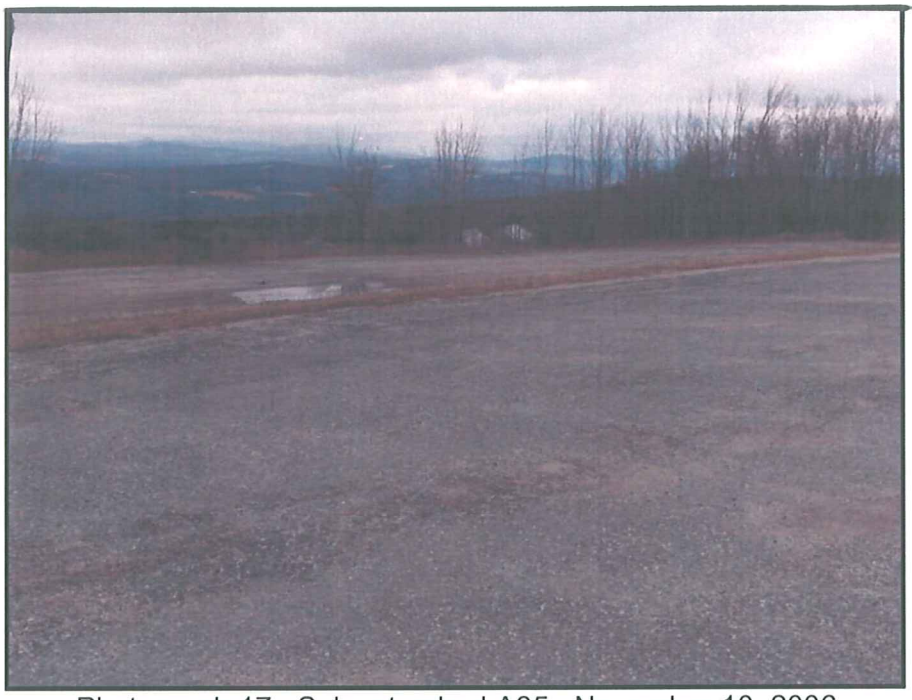
Photograph 14: CP-207. November 9, 2006

Photographs taken by Jesse A. Therrien of Pioneer Environmental Associates, LLC.

Photograph 15: Subwatershed A13. November 10, 2006

Photograph 16: Subwatershed A32. November 10, 2006

Photographs taken by Rob J. Stewart of Pioneer Environmental Associates, LLC.



Photograph 17: Subwatershed A35. November 10, 2006

Photograph 18: Subwatershed A42. November 9, 2006

Photographs taken by Rob J. Stewart of Pioneer Environmental Associates, LLC.

Photograph 1: C-03 (Inlet) – Excessive Sediment Obstruction

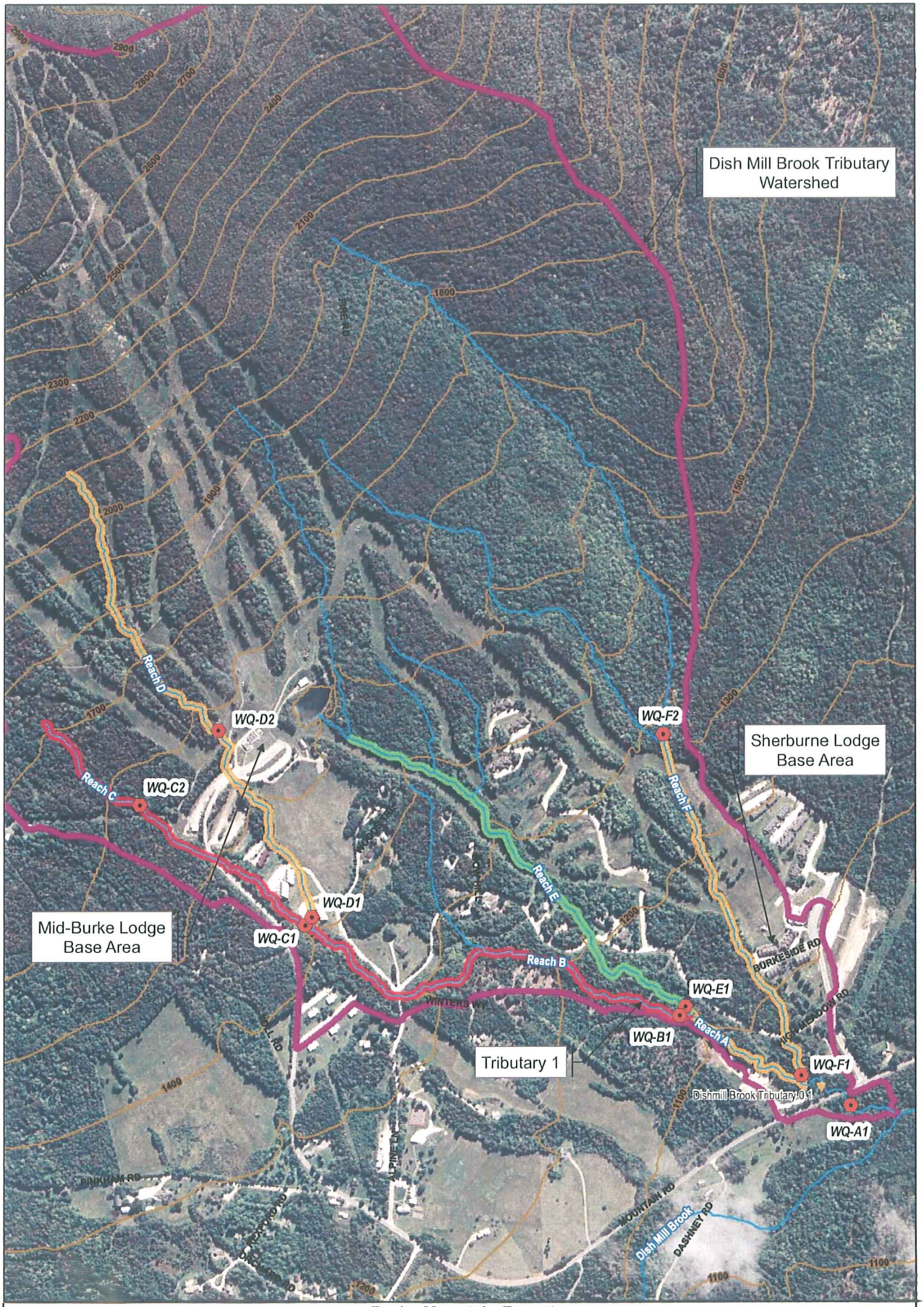
Photograph 2: C-07 (Outlet) – Six foot Outlet Drop

Photographs taken by Jesse A. Therrien of Pioneer Environmental Associates, LLC. on May 29, 2007

Photograph 3: C-19 (Outlet) – Two foot or Greater Outlet Drop

Photograph 4: C-20 (Outlet) – Two foot or Greater Outlet Drop

Photographs taken by Jesse A. Therrien of Pioneer Environmental Associates, LLC. on May 29, 2007



Legend

- Proposed WQ Monitoring Station
- Biomonitoring Station (DEC)
- Reaches
- Reach Rating
  - Poor (1-5)
  - Fair (6-10)
  - Good (11-15)
  - Reference (16-20)
- County Boundary
- Dish Mill Brook Tributary Watershed
- 100 ft. Contour

Burke Mountain Resort
East Burke, VT
Water Quality Monitoring Station Locations

October 15, 2009

600 300 0 600

Sources: Background: NAIP Photography (2003); Biomonitoring Stations data done by Vermont Agency of Natural Resources (2005); Watershed mapped by Pioneer (2006).

F:\57156.00\GIS\wq_mon_11x17.mxd

Prepared by: JAT

VHB PIONEER
7056 US Route 7, PO Box 120
North Pembroke, VT 05473
T 802 423 7788 F 802 423 7799

Project	Burke Mountain 0		
Station	Dish Mill Trib.		
Stream	Dish Mill Trib.	**Class**	Small, High Gradient, B2-3
Location	River Mile 0.1		
Sample Date	10/01/07	**Sampler**	Cathy Szal, Pioneer Environmental Associates, LLC

APPLICATION OF STATE OF VERMONT BIOCRITERIA (2/10/03)

Metric	Value	Metric Scoring Results Based on ANR Thresholds for SHG					
		Class B2-3		Class B1		Class A	
		Threshold	Outcome	Threshold	Outcome	Threshold	Outcome
Density	138.5	≥300	Fail	≥400	I+	≥500	I+
Richness	31.5	≥27	Pass	≥31	I+	≥35	Fail
EPT	19.5	≥16	Pass	≥19	I+	≥21	Fail
PMA-O	87.6	≥45	Pass	≥55	Pass	≥65	Pass
BI	1.91	≤4.50	Pass	≤3.50	Pass	≤3.00	Pass
%Oligo	4.0	≤12	Pass	≤5	I+	≤2	Fail
EPT/EPT+C	0.95	≥0.45	Pass	≥0.55	Pass	≥0.65	Pass
PPCS-F	0.71	≥0.40	Pass	≥0.45	Pass	≥0.50	Pass
Outcome		**Fails Class B2-3**					
Metrics not in compliance with Class B2-3 thresholds		Density					

B1 and A should be fai

Outcome Guidelines

1) Aquatic Life Use is "supported" when: a) five or more metrics are scored "*pass*" and no metrics are below the threshold value (I-).
2) Aquatic Life Use is "not supported" when one or more metrics are scored "*failed*".
3) In situations where neither items 1 or 2 are met, DEC will make an "indeterminate" finding and require further assessment. "Indeterminate" findings may be qualified by a *plus* or *minus* designation, indicating a tendency toward "support" or "non-support" status.

Scoring Guidelines - Wadeable Stream Category SHG

WQ Class	Score	Density	Richness	EPT	PMA-O	BI	% Oligo	EPT/ EPT+C	PPCS-F
A-1	Full Support	≥605	≥36	>22	≥70	≤2.70	≤1	≥0.67	≥0.55
	Threshold	≥500	≥35	≥21	≥65	≤3	≤2	≥0.65	≥0.5
	Non-Support	≤450	≤34	≤20	<60	≥3.30	≥3	≤0.63	≤0.45
B1	Full Support	≥450	≥32	≥20	≥60	≤3.35	≤3.5	≥0.57	≥0.50
	Threshold	≥400	≥31	≥19	≥55	≤3.5	≤5	≥0.55	≥0.45
	Non-Support	≤350	≤30	≤18	≤50	≥3.65	≥6.5	≤0.53	≤0.40
B2-3	Full Support	≥350	≥28	≥17	≥50	≤4.35	≤9.5	≥0.47	≥0.45
	Threshold	≥300	≥27	≥16	≥45	≤4.5	≤12	≥0.45	≥0.4
	Non-Support	≤250	≤26	≤15	≤40	≥4.65	≥14.5	≤0.43	≤0.35

Project	Burke Mountain 0		
Station	Dish Mill 1.3		
Stream	Dish Mill Brook	**Class**	Small, High Gradient, B2-3
Location	River Mile 1.3		
Sample Date	10/01/07	**Sampler**	Cathy Szal, Pioneer Environmental Associates, LLC

APPLICATION OF STATE OF VERMONT BIOCRITERIA (2/10/03)

Metric	Value	Metric Scoring Results Based on ANR Thresholds for SHG					
		Class B2-3		Class B1		Class A	
		Threshold	Outcome	Threshold	Outcome	Threshold	Outcome
Density	354.0	≥300	Pass	≥400	I+	≥500	I+
Richness	31.5	≥27	Pass	≥31	I+	≥35	Fail
EPT	20	≥16	Pass	≥19	Pass	≥21	Fail
PMA-O	66.4	≥45	Pass	≥55	Pass	≥65	I+
BI	1.90	≤4.50	Pass	≤3.50	Pass	≤3.00	Pass
%Oligo	1.4	≤12	Pass	≤5	Pass	≤2	I+
EPT/EPT+C	0.96	≥0.45	Pass	≥0.55	Pass	≥0.65	Pass
PPCS-F	0.47	≥0.40	Pass	≥0.45	I+	≥0.50	I-
Outcome		**Passes Class B2-3**					
Metrics not in compliance with Class B2-3 thresholds							

A should be fail

Outcome Guidelines

1) Aquatic Life Use is "supported" when: a) five or more metrics are scored "*pass*" and no metrics are below the threshold value (I-).
2) Aquatic Life Use is "not supported" when one or more metrics are scored "*failed*".
3) In situations where neither items 1 or 2 are met, DEC will make an "indeterminate" finding and require further assessment. "Indeterminate" findings may be qualified by a *plus* or *minus* designation, indicating a tendency toward "support" or "non-support" status.

Scoring Guidelines - Wadeable Stream Category SHG

WQ Class	Score	Density	Richness	EPT	PMA-O	BI	% Oligo	EPT/ EPT+C	PPCS-F
A-1	Full Support	≥605	≥36	>22	≥70	≤2.70	≤1	≥0.67	≥0.55
	Threshold	≥500	≥35	≥21	≥65	≤3	≤2	≥0.65	≥0.5
	Non-Support	≤450	≤34	≤20	<60	≥3.30	≥3	≤0.63	≤0.45
B1	Full Support	≥450	≥32	≥20	≥60	≤3.35	≤3.5	≥0.57	≥0.50
	Threshold	≥400	≥31	≥19	≥55	≤3.5	≤5	≥0.55	≥0.45
	Non-Support	≤350	≤30	≤18	≤50	≥3.65	≥6.5	≤0.53	≤0.40
B2-3	Full Support	≥350	≥28	≥17	≥50	≤4.35	≤9.5	≥0.47	≥0.45
	Threshold	≥300	≥27	≥16	≥45	≤4.5	≤12	≥0.45	≥0.4
	Non-Support	≤250	≤26	≤15	≤40	≥4.65	≥14.5	≤0.43	≤0.35

Project	Burke Mountain 0		
Station	Dish Mill 2.1		
Stream	Dish Mill Brook	**Class**	Small, High Gradient, B2-3
Location	River Mile 2.1		
Sample Date	10/01/07	**Sampler**	Cathy Szal, Pioneer Environmental Associates, LLC

APPLICATION OF STATE OF VERMONT BIOCRITERIA (2/10/03)

Metric	Value	Metric Scoring Results Based on ANR Thresholds for SHG					
		Class B2-3		Class B1		Class A	
		Threshold	Outcome	Threshold	Outcome	Threshold	Outcome
Density	370.0	≥300	Pass	≥400	I+	≥500	I+
Richness	36.5	≥27	Pass	≥31	Pass	≥35	Pass
EPT	24	≥16	Pass	≥19	Pass	≥21	Pass
PMA-O	67.7	≥45	Pass	≥55	Pass	≥65	I+
BI	2.98	≤4.50	Pass	≤3.50	Pass	≤3.00	I+
%Oligo	1.0	≤12	Pass	≤5	Pass	≤2	Pass
EPT/EPT+C	0.96	≥0.45	Pass	≥0.55	Pass	≥0.65	Pass
PPCS-F	0.52	≥0.40	Pass	≥0.45	Pass	≥0.50	I+
Outcome		**Passes Class B2-3**					
Metrics not in compliance with Class B2-3 thresholds							

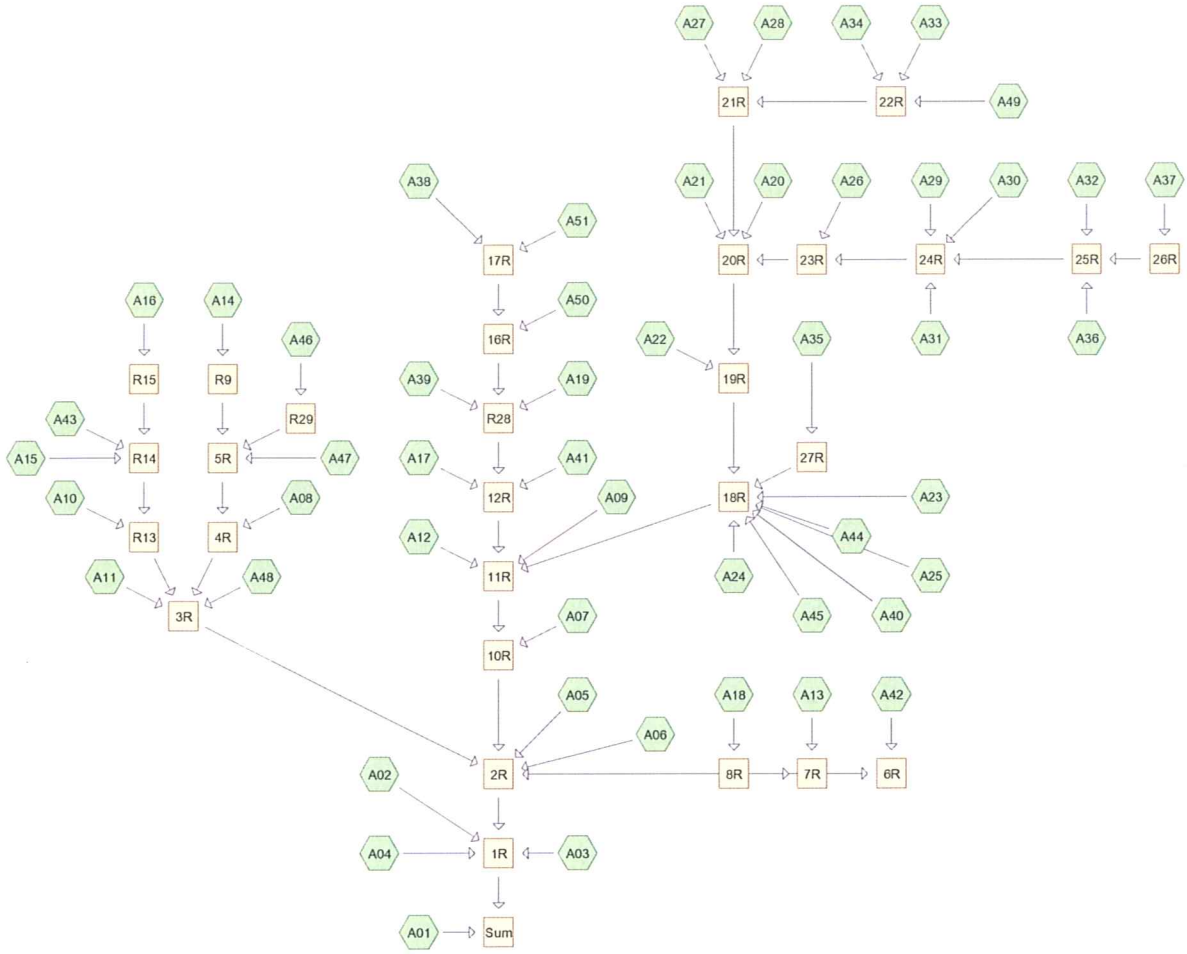
A should be fail

Outcome Guidelines

1) Aquatic Life Use is "supported" when: a) five or more metrics are scored "*pass*" and no metrics are below the threshold value (I-).
2) Aquatic Life Use is "not supported" when one or more metrics are scored "*failed*".
3) In situations where neither items 1 or 2 are met, DEC will make an "indeterminate" finding and require further assessment. "Indeterminate" findings may be qualified by a *plus* or *minus* designation, indicating a tendency toward "support" or "non-support" status.

Scoring Guidelines - Wadeable Stream Category SHG

WQ Class	Score	Density	Richness	EPT	PMA-O	BI	% Oligo	EPT/ EPT+C	PPCS-F
A-1	Full Support	≥605	≥36	>22	≥70	≤2.70	≤1	≥0.67	≥0.55
	Threshold	≥500	≥35	≥21	≥65	≤3	≤2	≥0.65	≥0.5
	Non-Support	≤450	≤34	≤20	<60	≥3.30	≥3	≤0.63	≤0.45
B1	Full Support	≥450	≥32	≥20	≥60	≤3.35	≤3.5	≥0.57	≥0.50
	Threshold	≥400	≥31	≥19	≥55	≤3.5	≤5	≥0.55	≥0.45
	Non-Support	≤350	≤30	≤18	≤50	≥3.65	≥6.5	≤0.53	≤0.40
B2-3	Full Support	≥350	≥28	≥17	≥50	≤4.35	≤9.5	≥0.47	≥0.45
	Threshold	≥300	≥27	≥16	≥45	≤4.5	≤12	≥0.45	≥0.4
	Non-Support	≤250	≤26	≤15	≤40	≥4.65	≥14.5	≤0.43	≤0.35



Subcat Reach Pond Link

Drainage Diagram for Dishmill Brook Tributary - Existing Conditions
Prepared by VHB Pioneer, Printed 10/16/2009
HydroCAD® 9.00 s/n 02116 © 2009 HydroCAD Software Solutions LLC

Summary for Subcatchment A01:

Runoff = 6.02 cfs @ 12.17 hrs, Volume= 0.451 af, Depth> 2.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
1.830	70	Woods, Good, HSG C
0.240	74	>75% Grass cover, Good, HSG C
0.170	98	Paved parking & roofs
0.040	77	Woods, Good, HSG D
2.280	73	Weighted Average
2.110		92.54% Pervious Area
0.170		7.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.7	150	0.0660	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
1.0	95	0.1050	1.62		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	340	0.0880	16.26	536.52	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
23.0	585	Total			

Summary for Subcatchment A02:

Runoff = 1.92 cfs @ 12.16 hrs, Volume= 0.145 af, Depth> 2.81"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.430	70	Woods, Good, HSG C
0.010	74	>75% Grass cover, Good, HSG C
0.030	98	Paved parking & roofs
0.150	98	Paved parking & roofs
0.620	78	Weighted Average
0.440		70.97% Pervious Area
0.180		29.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.7	150	0.0660	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
1.5	80	0.1250	0.88		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
0.1	70	0.0430	11.36	375.04	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
23.3	300	Total			

Summary for Subcatchment A03:

Runoff = 3.35 cfs @ 12.45 hrs, Volume= 0.408 af, Depth> 3.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.200	70	Woods, Good, HSG C
0.550	74	>75% Grass cover, Good, HSG C
0.630	98	Paved parking & roofs
0.040	94	Urban commercial, 85% imp, HSG C
1.420	85	Weighted Average
0.756		53.24% Pervious Area
0.664		46.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
37.8	150	0.0660	0.07		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.30"
9.6	690	0.0580	1.20		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
47.4	840	Total			

Summary for Subcatchment A04:

Runoff = 3.87 cfs @ 12.34 hrs, Volume= 0.396 af, Depth> 2.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
1.760	70	Woods, Good, HSG C
0.370	74	>75% Grass cover, Good, HSG C
0.020	94	Urban commercial, 85% imp, HSG C
0.020	98	Paved parking & roofs
2.170	71	Weighted Average
2.133		98.29% Pervious Area
0.037		1.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.6	150	0.0825	0.07		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.30"
1.9	105	0.1430	0.95		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
0.6	450	0.0560	12.97	428.00	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
37.1	705	Total			

Summary for Subcatchment A05:

Runoff = 16.23 cfs @ 12.07 hrs, Volume= 0.966 af, Depth> 2.64"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
1.680	70	Woods, Good, HSG C
1.570	74	>75% Grass cover, Good, HSG C
0.570	80	1/2 acre lots, 25% imp, HSG C
0.050	98	Paved parking & roofs
0.520	98	Paved parking & roofs
4.390	76	Weighted Average
3.678		83.77% Pervious Area
0.713		16.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	150	0.1330	0.23		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
1.1	160	0.1250	2.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.9	590	0.0500	3.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
14.9	900	Total			

Summary for Subcatchment A06:

Runoff = 5.02 cfs @ 12.08 hrs, Volume= 0.301 af, Depth> 2.38"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
1.240	70	Woods, Good, HSG C
0.140	74	>75% Grass cover, Good, HSG C
0.140	98	Paved parking & roofs
1.520	73	Weighted Average
1.380		90.79% Pervious Area
0.140		9.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.2	150	0.0830	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
1.8	240	0.1040	2.26		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	195	0.0770	15.21	501.87	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
15.2	585	Total			

Summary for Subcatchment A07:

Runoff = 5.48 cfs @ 12.43 hrs, Volume= 0.628 af, Depth> 2.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
2.710	70	Woods, Good, HSG C
0.410	74	>75% Grass cover, Good, HSG C
0.200	98	Paved parking & roofs
3.320	72	Weighted Average
3.120		93.98% Pervious Area
0.200		6.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
37.6	150	0.0670	0.07		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.30"
5.7	260	0.0910	0.75		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
0.6	550	0.0910	16.53	545.59	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
43.9	960	Total			

Summary for Subcatchment A08:

Runoff = 5.15 cfs @ 11.99 hrs, Volume= 0.266 af, Depth> 4.10"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.030	70	Woods, Good, HSG C
0.250	83	1/4 acre lots, 38% imp, HSG C
0.060	79	50-75% Grass cover, Fair, HSG C
0.440	98	Paved parking & roofs
0.780	91	Weighted Average
0.245		31.41% Pervious Area
0.535		68.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	95	0.1050	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
0.8	55	0.0250	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.6	200	0.0200	2.12		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
8.1	350	Total			

Summary for Subcatchment A09:

Runoff = 28.21 cfs @ 12.44 hrs, Volume= 3.276 af, Depth> 2.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
10.610	70	Woods, Good, HSG C
3.910	74	>75% Grass cover, Good, HSG C
0.890	98	Paved parking & roofs
1.310	80	1/2 acre lots, 25% imp, HSG C
16.720	73	Weighted Average
15.502		92.72% Pervious Area
1.218		7.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
37.4	150	0.0680	0.07		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.30"
5.9	330	0.1380	0.93		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
1.6	1,540	0.0840	15.88	524.19	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams

44.9	2,020	Total

Summary for Subcatchment A10:

Runoff = 6.21 cfs @ 12.14 hrs, Volume= 0.445 af, Depth> 2.81"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.860	70	Woods, Good, HSG C
0.580	74	>75% Grass cover, Good, HSG C
0.460	98	Paved parking & roofs
1.900	78	Weighted Average
1.440		75.79% Pervious Area
0.460		24.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.4	150	0.1000	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
2.2	205	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	510	0.0690	14.40	475.08	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
21.2	865	Total			

Summary for Subcatchment A11:

Runoff = 14.90 cfs @ 12.32 hrs, Volume= 1.483 af, Depth> 2.28"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
6.770	70	Woods, Good, HSG C
0.530	74	>75% Grass cover, Good, HSG C
0.040	79	50-75% Grass cover, Fair, HSG C
0.480	98	Paved parking & roofs
7.820	72	Weighted Average
7.340		93.86% Pervious Area
0.480		6.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.0	150	0.1000	0.08		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.30"
2.7	170	0.1750	1.05		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
1.1	1,115	0.0990	17.24	569.07	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
35.8	1,435	Total			

Summary for Subcatchment A12:

Runoff = 7.56 cfs @ 12.20 hrs, Volume= 0.611 af, Depth> 2.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
2.720	70	Woods, Good, HSG C
0.250	74	>75% Grass cover, Good, HSG C
0.240	98	Paved parking & roofs
3.210	72	Weighted Average
2.970		92.52% Pervious Area
0.240		7.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.8	150	0.2330	0.11		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.30"
2.3	120	0.1250	0.88		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
0.9	780	0.0770	15.21	501.87	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
26.0	1,050	Total			

Summary for Subcatchment A13:

Runoff = 8.13 cfs @ 12.05 hrs, Volume= 0.493 af, Depth> 3.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.320	94	Urban commercial, 85% imp, HSG C
0.010	74	>75% Grass cover, Good, HSG C
0.520	98	Paved parking & roofs
0.020	70	Woods, Good, HSG C
0.270	79	50-75% Grass cover, Fair, HSG C
0.380	80	1/2 acre lots, 25% imp, HSG C
1.520	89	Weighted Average
0.633		41.64% Pervious Area
0.887		58.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	150	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
2.6	300	0.0750	1.92		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.7	450	Total			

Summary for Subcatchment A14:

Runoff = 34.51 cfs @ 12.22 hrs, Volume= 2.872 af, Depth> 2.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
5.420	70	Woods, Good, HSG C
4.200	74	>75% Grass cover, Good, HSG C
1.140	80	1/2 acre lots, 25% imp, HSG C
1.800	79	50-75% Grass cover, Fair, HSG C
1.010	98	Paved parking & roofs
13.570	75	Weighted Average
12.275		90.46% Pervious Area
1.295		9.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.4	150	0.1330	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
10.6	1,265	0.1580	1.99		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	450	0.1110	18.26	602.57	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
27.4	1,865	Total			

Summary for Subcatchment A15:

Runoff = 19.06 cfs @ 12.17 hrs, Volume= 1.465 af, Depth> 2.63"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
2.250	70	Woods, Good, HSG C
2.120	74	>75% Grass cover, Good, HSG C
0.230	80	1/2 acre lots, 25% imp, HSG C
1.510	79	50-75% Grass cover, Fair, HSG C
0.570	98	Paved parking & roofs
6.680	76	Weighted Average
6.053		90.61% Pervious Area
0.628		9.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	150	0.0680	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
1.6	180	0.1390	1.86		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	1,100	0.1270	19.53	644.54	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
24.0	1,430	Total			

Summary for Subcatchment A16:

Runoff = 5.82 cfs @ 12.12 hrs, Volume= 0.393 af, Depth> 2.64"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.280	70	Woods, Good, HSG C
1.310	74	>75% Grass cover, Good, HSG C
0.200	98	Paved parking & roofs
1.790	76	Weighted Average
1.590		88.83% Pervious Area
0.200		11.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.6	150	0.1500	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
3.5	380	0.1320	1.82		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	170	0.1320	19.91	657.10	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
19.2	700	Total			

Summary for Subcatchment A17:

Runoff = 3.99 cfs @ 12.15 hrs, Volume= 0.291 af, Depth> 2.81"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.520	70	Woods, Good, HSG C
0.190	74	>75% Grass cover, Good, HSG C
0.250	98	Paved parking & roofs
0.240	80	1/2 acre lots, 25% imp, HSG C
0.040	79	50-75% Grass cover, Fair, HSG C
1.240	78	Weighted Average
0.930		75.00% Pervious Area
0.310		25.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.3	150	0.1170	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
4.5	450	0.1110	1.67		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
21.8	600	Total			

Summary for Subcatchment A18:

Runoff = 14.12 cfs @ 12.19 hrs, Volume= 1.133 af, Depth> 2.81"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.100	55	Woods, Good, HSG B
0.020	94	Urban commercial, 85% imp, HSG C
0.180	70	Woods, Good, HSG C
0.050	98	Paved parking & roofs
4.490	79	50-75% Grass cover, Fair, HSG C
4.840	78	Weighted Average
4.773		98.62% Pervious Area
0.067		1.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	150	0.2330	0.19		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
12.6	1,215	0.1030	1.60		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.7	1,365	Total			

Summary for Subcatchment A19:

Runoff = 6.39 cfs @ 12.15 hrs, Volume= 0.467 af, Depth> 3.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.200	70	Woods, Good, HSG C
0.310	74	>75% Grass cover, Good, HSG C
0.230	98	Paved parking & roofs
0.760	80	1/2 acre lots, 25% imp, HSG C
0.370	79	50-75% Grass cover, Fair, HSG C
1.870	80	Weighted Average
1.450		77.54% Pervious Area
0.420		22.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.4	150	0.1000	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
3.3	400	0.1630	2.02		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	180	0.1670	22.40	739.10	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
21.8	730	Total			

Summary for Subcatchment A20:

Runoff = 1.18 cfs @ 12.02 hrs, Volume= 0.059 af, Depth> 2.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.040	61	>75% Grass cover, Good, HSG B
0.010	98	Paved parking & roofs
0.160	70	Woods, Good, HSG C
0.090	77	Woods, Good, HSG D
0.010	80	>75% Grass cover, Good, HSG D
0.310	72	Weighted Average
0.300		96.77% Pervious Area
0.010		3.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	150	0.1670	0.25		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
0.0	70	0.1670	29.74	2,230.15	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=5.00' Z= 2.0 '/' Top.W=25.00' n= 0.040 Mountain streams
10.0	220	Total			

Summary for Subcatchment A21:

Runoff = 6.15 cfs @ 12.02 hrs, Volume= 0.312 af, Depth> 2.22"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.920	61	>75% Grass cover, Good, HSG B
0.300	70	1/2 acre lots, 25% imp, HSG B
0.260	98	Paved parking & roofs
0.030	77	Woods, Good, HSG D
0.100	80	>75% Grass cover, Good, HSG D
0.020	85	1/2 acre lots, 25% imp, HSG D
0.060	98	Paved parking & roofs
1.690	71	Weighted Average
1.290		76.33% Pervious Area
0.400		23.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	150	0.1670	0.25		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
0.2	270	0.1110	18.26	602.57	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
10.2	420	Total			

Summary for Subcatchment A22:

Runoff = 2.74 cfs @ 12.05 hrs, Volume= 0.151 af, Depth> 2.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.090	61	>75% Grass cover, Good, HSG B
0.030	55	Woods, Good, HSG B
0.560	70	1/2 acre lots, 25% imp, HSG B
0.090	98	Paved parking & roofs
0.020	80	>75% Grass cover, Good, HSG D
0.790	72	Weighted Average
0.560		70.89% Pervious Area
0.230		29.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	150	0.1000	0.20		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
0.6	215	0.1390	5.59		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
12.8	365	Total			

Summary for Subcatchment A23:

Runoff = 10.51 cfs @ 12.11 hrs, Volume= 0.696 af, Depth> 2.64"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.030	55	Woods, Good, HSG B
0.030	61	>75% Grass cover, Good, HSG B
0.090	98	Paved parking & roofs
0.760	70	Woods, Good, HSG C
0.170	74	>75% Grass cover, Good, HSG C
0.020	80	1/2 acre lots, 25% imp, HSG C
0.080	98	Paved parking & roofs
1.660	77	Woods, Good, HSG D
0.320	80	>75% Grass cover, Good, HSG D
0.010	98	Paved parking & roofs
3.170	76	Weighted Average
2.985		94.16% Pervious Area
0.185		5.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.4	150	0.1330	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
1.4	160	0.1560	1.97		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	675	0.0890	16.35	539.56	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
18.5	985	Total			

Summary for Subcatchment A24:

Runoff = 4.38 cfs @ 12.09 hrs, Volume= 0.270 af, Depth> 2.38"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.590	61	>75% Grass cover, Good, HSG B
0.090	98	Paved parking & roofs
0.030	70	Woods, Good, HSG C
0.460	74	>75% Grass cover, Good, HSG C
0.020	80	1/2 acre lots, 25% imp, HSG C
0.170	98	Paved parking & roofs
0.000	98	Paved parking & roofs
1.360	73	Weighted Average
1.095		80.51% Pervious Area
0.265		19.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	150	0.1000	0.20		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
3.9	380	0.1050	1.62		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.1	530	Total			

Summary for Subcatchment A25:

Runoff = 30.40 cfs @ 12.19 hrs, Volume= 2.371 af, Depth> 1.88"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.780	55	Woods, Good, HSG B
7.650	61	>75% Grass cover, Good, HSG B
0.050	70	1/2 acre lots, 25% imp, HSG B
0.360	98	Paved parking & roofs
3.080	70	Woods, Good, HSG C
2.770	74	>75% Grass cover, Good, HSG C
0.280	98	Paved parking & roofs
0.130	80	1/2 acre lots, 25% imp, HSG C
15.100	67	Weighted Average
14.415		95.46% Pervious Area
0.685		4.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	150	0.0666	0.17		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
9.2	1,110	0.1620	2.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	390	0.1030	17.59	580.45	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
24.0	1,650	Total			

Summary for Subcatchment A26:

Runoff = 2.29 cfs @ 12.11 hrs, Volume= 0.151 af, Depth> 1.51"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.160	55	Woods, Good, HSG B
0.850	61	>75% Grass cover, Good, HSG B
0.190	70	1/2 acre lots, 25% imp, HSG B
1.200	62	Weighted Average
1.152		96.04% Pervious Area
0.047		3.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.4	150	0.1330	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
1.0	110	0.1370	1.85		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	160	0.0940	22.31	1,673.17	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=5.00' Z= 2.0 '/' Top.W=25.00' n= 0.040 Mountain streams
17.5	420	Total			

Summary for Subcatchment A27:

Runoff = 6.76 cfs @ 12.21 hrs, Volume= 0.559 af, Depth> 2.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.010	61	>75% Grass cover, Good, HSG B
2.190	70	Woods, Good, HSG C
0.390	74	>75% Grass cover, Good, HSG C
0.240	98	Paved parking & roofs
2.830	73	Weighted Average
2.590		91.52% Pervious Area
0.240		8.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	150	0.1000	0.20		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
12.7	700	0.1360	0.92		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
2.1	590	0.1020	4.79		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
27.0	1,440	Total			

Summary for Subcatchment A28:

Runoff = 9.30 cfs @ 12.02 hrs, Volume= 0.477 af, Depth> 2.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.170	55	Woods, Good, HSG B
0.280	61	>75% Grass cover, Good, HSG B
0.310	70	1/2 acre lots, 25% imp, HSG B
0.340	98	Paved parking & roofs
0.810	70	Woods, Good, HSG C
0.310	74	>75% Grass cover, Good, HSG C
0.100	98	Paved parking & roofs
2.320	74	Weighted Average
1.803		77.69% Pervious Area
0.517		22.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	150	0.1670	0.25		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
0.2	30	0.1000	2.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	300	0.1000	23.01	1,725.74	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=5.00' Z= 2.0 '/' Top.W=25.00' n= 0.040 Mountain streams
10.4	480	Total			

Summary for Subcatchment A29:

Runoff = 2.54 cfs @ 12.12 hrs, Volume= 0.173 af, Depth> 2.64"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.070	55	Woods, Good, HSG B
0.300	61	>75% Grass cover, Good, HSG B
0.130	70	1/2 acre lots, 25% imp, HSG B
0.290	98	Paved parking & roofs
0.790	76	Weighted Average
0.468		59.18% Pervious Area
0.323		40.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.1	150	0.0330	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
0.5	150	0.1000	4.74		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
19.6	300	Total			

Summary for Subcatchment A30:

Runoff = 12.00 cfs @ 11.98 hrs, Volume= 0.550 af, Depth> 2.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.150	55	Woods, Good, HSG B
0.450	61	>75% Grass cover, Good, HSG B
0.420	98	Paved parking & roofs
0.320	70	Woods, Good, HSG C
0.430	74	>75% Grass cover, Good, HSG C
0.490	98	Paved parking & roofs
2.260	79	Weighted Average
1.350		59.73% Pervious Area
0.910		40.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	80	0.0200	1.12		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
4.0	70	0.0400	0.29		**Sheet Flow, SF - Ditch** n= 0.080 P2= 2.30"
1.4	320	0.0630	3.76		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.1	130	0.1150	24.68	1,850.65	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=5.00' Z= 2.0 '/' Top.W=25.00' n= 0.040 Mountain streams
6.7	600	Total			

Summary for Subcatchment A31:

Runoff = 6.69 cfs @ 12.08 hrs, Volume= 0.404 af, Depth> 2.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.150	55	Woods, Good, HSG B
0.790	61	>75% Grass cover, Good, HSG B
0.240	98	Paved parking & roofs
0.040	94	Urban commercial, 85% imp, HSG C
0.440	70	Woods, Good, HSG C
0.270	74	>75% Grass cover, Good, HSG C
0.180	98	Paved parking & roofs
2.110	72	Weighted Average
1.656		78.48% Pervious Area
0.454		21.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	40	0.0200	0.97		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
13.8	110	0.0400	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
0.6	100	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	500	0.1100	24.13	1,809.98	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=5.00' Z= 2.0 '/' Top.W=25.00' n= 0.040 Mountain streams
15.4	750	Total			

Summary for Subcatchment A32:

Runoff = 5.42 cfs @ 11.94 hrs, Volume= 0.227 af, Depth> 3.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.030	61	>75% Grass cover, Good, HSG B
0.010	98	Paved parking & roofs
0.160	70	Woods, Good, HSG C
0.340	74	>75% Grass cover, Good, HSG C
0.310	98	Paved roads w/curbs & sewers
0.850	82	Weighted Average
0.530		62.35% Pervious Area
0.320		37.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	150	0.0200	1.26		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.1	150	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.4	320	0.0310	12.81	960.85	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=5.00' Z= 2.0 '/' Top.W=25.00' n= 0.040 Mountain streams

3.5	620	Total

Summary for Subcatchment A33:

Runoff = 3.71 cfs @ 12.03 hrs, Volume= 0.194 af, Depth> 2.22"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.284	55	Woods, Good, HSG B
0.258	61	>75% Grass cover, Good, HSG B
0.153	98	Paved parking & roofs
0.204	70	Woods, Good, HSG C
0.050	74	>75% Grass cover, Good, HSG C
0.104	98	Paved parking & roofs
1.053	71	Weighted Average
0.796		75.59% Pervious Area
0.257		24.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	150	0.1660	0.25		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
1.1	150	0.1000	2.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	180	0.1110	24.24	1,818.18	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=5.00' Z= 2.0 '/' Top.W=25.00' n= 0.040 Mountain streams
11.2	480	Total			

Summary for Subcatchment A34:

Runoff = 50.00 cfs @ 12.33 hrs, Volume= 5.051 af, Depth> 2.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.020	55	Woods, Good, HSG B
0.030	61	>75% Grass cover, Good, HSG B
0.020	94	Urban commercial, 85% imp, HSG C
23.260	70	Woods, Good, HSG C
1.880	74	>75% Grass cover, Good, HSG C
2.090	79	50-75% Grass cover, Fair, HSG C
0.340	98	Paved parking & roofs
27.640	71	Weighted Average
27.283		98.71% Pervious Area
0.357		1.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.8	150	0.2330	0.11		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.30"
12.6	1,010	0.2870	1.34		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
1.0	1,620	0.1480	27.99	2,099.46	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=5.00' Z= 2.0 '/' Top.W=25.00' n= 0.040 Mountain streams
36.4	2,780	Total			

Summary for Subcatchment A35:

Runoff = 9.73 cfs @ 12.05 hrs, Volume= 0.559 af, Depth> 3.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.030	55	Woods, Good, HSG B
0.740	61	>75% Grass cover, Good, HSG B
0.900	98	Paved parking & roofs
0.090	69	50-75% Grass cover, Fair, HSG B
0.340	92	Urban commercial, 85% imp, HSG B
2.100	82	Weighted Average
0.911		43.38% Pervious Area
1.189		56.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	150	0.1000	0.20		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
1.1	190	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
13.3	340	Total			

Summary for Subcatchment A36:

Runoff = 179.70 cfs @ 12.47 hrs, Volume= 21.838 af, Depth> 2.43"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.010	92	Urban commercial, 85% imp, HSG B
0.020	55	Woods, Good, HSG B
0.600	69	50-75% Grass cover, Fair, HSG B
0.050	98	Paved parking & roofs
0.070	94	Urban commercial, 85% imp, HSG C
66.100	70	Woods, Good, HSG C
1.470	74	>75% Grass cover, Good, HSG C
27.840	79	50-75% Grass cover, Fair, HSG C
2.460	98	Paved parking & roofs
0.210	95	Urban commercial, 85% imp, HSG D
7.380	77	Woods, Good, HSG D
0.920	84	50-75% Grass cover, Fair, HSG D
0.570	98	Paved parking & roofs
107.700	74	Weighted Average
104.373		96.91% Pervious Area
3.327		3.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.6	150	0.1330	0.09		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.30"
18.0	2,800	0.2680	2.59		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.4	3,010	0.2330	35.12	2,634.23	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=5.00' Z= 2.0 '/' Top.W=25.00' n= 0.040 Mountain streams
48.0	5,960	Total			

Summary for Subcatchment A37:

Runoff = 31.40 cfs @ 12.18 hrs, Volume= 2.407 af, Depth> 2.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.040	98	Paved parking & roofs
11.860	70	Woods, Good, HSG C
0.480	74	>75% Grass cover, Good, HSG C
0.190	79	50-75% Grass cover, Fair, HSG C
0.530	98	Paved parking & roofs
13.100	71	Weighted Average
12.530		95.65% Pervious Area
0.570		4.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.8	150	0.3330	0.13		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.30"
2.6	210	0.2860	1.34		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
1.3	2,480	0.2060	33.03	2,476.91	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=5.00' Z= 2.0 '/' Top.W=25.00' n= 0.040 Mountain streams
23.7	2,840	Total			

Summary for Subcatchment A38:

Runoff = 99.09 cfs @ 12.40 hrs, Volume= 11.044 af, Depth> 2.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.020	94	Urban commercial, 85% imp, HSG C
28.580	70	Woods, Good, HSG C
0.020	74	>75% Grass cover, Good, HSG C
20.550	79	50-75% Grass cover, Fair, HSG C
0.080	98	Paved parking & roofs
3.470	77	Woods, Good, HSG D
1.620	84	50-75% Grass cover, Fair, HSG D
54.340	74	Weighted Average
54.243		99.82% Pervious Area
0.097		0.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.3	150	0.2000	0.10		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.30"
16.9	2,820	0.3100	2.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.1	1,780	0.2580	27.84	918.66	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
42.3	4,750	Total			

Summary for Subcatchment A39:

Runoff = 27.65 cfs @ 12.26 hrs, Volume= 2.486 af, Depth> 2.28"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
10.170	70	Woods, Good, HSG C
0.050	98	Paved parking & roofs
0.380	80	1/2 acre lots, 25% imp, HSG C
2.480	79	50-75% Grass cover, Fair, HSG C
13.080	72	Weighted Average
12.935		98.89% Pervious Area
0.145		1.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.3	150	0.2000	0.10		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.30"
5.2	340	0.1910	1.09		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
1.2	1,450	0.1380	20.36	671.87	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
30.7	1,940	Total			

Summary for Subcatchment A40:

Runoff = 43.10 cfs @ 12.10 hrs, Volume= 2.727 af, Depth> 2.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.050	92	Urban commercial, 85% imp, HSG B
0.540	55	Woods, Good, HSG B
1.390	61	>75% Grass cover, Good, HSG B
0.280	70	1/2 acre lots, 25% imp, HSG B
0.010	69	50-75% Grass cover, Fair, HSG B
0.320	98	Paved parking & roofs
0.040	94	Urban commercial, 85% imp, HSG C
6.510	70	Woods, Good, HSG C
2.830	74	>75% Grass cover, Good, HSG C
0.340	98	Paved parking & roofs
1.290	80	1/2 acre lots, 25% imp, HSG C
0.670	79	50-75% Grass cover, Fair, HSG C
14.270	72	Weighted Average
13.141		92.09% Pervious Area
1.129		7.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	150	0.2000	0.27		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
6.9	730	0.1230	1.75		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	950	0.1160	18.67	615.99	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
17.0	1,830	Total			

Summary for Subcatchment A41:

Runoff = 70.70 cfs @ 12.31 hrs, Volume= 6.903 af, Depth> 2.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
21.190	70	Woods, Good, HSG C
2.690	74	>75% Grass cover, Good, HSG C
0.970	98	Paved parking & roofs
1.000	80	1/2 acre lots, 25% imp, HSG C
8.010	79	50-75% Grass cover, Fair, HSG C
33.860	74	Weighted Average
32.640		96.40% Pervious Area
1.220		3.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.6	150	0.2670	0.12		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.30"
11.1	720	0.1880	1.08		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
2.2	2,610	0.1300	19.76	652.10	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
34.9	3,480	Total			

Summary for Subcatchment A42:

Runoff = 3.22 cfs @ 12.38 hrs, Volume= 0.366 af, Depth> 3.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.080	94	Urban commercial, 85% imp, HSG C
0.540	74	>75% Grass cover, Good, HSG C
0.580	98	Paved parking & roofs
1.200	87	Weighted Average
0.552		46.00% Pervious Area
0.648		54.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.8	150	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
8.6	110	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
3.9	675	0.0370	2.89		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
42.3	935	Total			

Summary for Subcatchment A43:

Runoff = 4.28 cfs @ 12.10 hrs, Volume= 0.278 af, Depth> 3.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.210	70	Woods, Good, HSG C
0.180	74	>75% Grass cover, Good, HSG C
0.460	80	1/2 acre lots, 25% imp, HSG C
0.230	98	Paved parking & roofs
1.080	81	Weighted Average
0.735		68.06% Pervious Area
0.345		31.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.4	150	0.1330	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
1.1	300	0.1000	4.74		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
17.5	450	Total			

Summary for Subcatchment A44:

Runoff = 5.27 cfs @ 12.11 hrs, Volume= 0.349 af, Depth> 2.64"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.770	70	Woods, Good, HSG C
0.510	74	>75% Grass cover, Good, HSG C
0.270	98	Paved parking & roofs
0.020	80	1/2 acre lots, 25% imp, HSG C
0.020	77	Woods, Good, HSG D
1.590	76	Weighted Average
1.315		82.70% Pervious Area
0.275		17.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.4	150	0.1330	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
1.5	160	0.1250	1.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	580	0.0950	16.89	557.45	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
18.5	890	Total			

Summary for Subcatchment A45:

Runoff = 13.30 cfs @ 12.07 hrs, Volume= 0.798 af, Depth> 3.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.280	70	Woods, Good, HSG C
1.360	74	>75% Grass cover, Good, HSG C
0.130	80	1/2 acre lots, 25% imp, HSG C
0.730	98	Paved parking & roofs
0.630	77	Woods, Good, HSG D
0.060	80	>75% Grass cover, Good, HSG D
3.190	80	Weighted Average
2.428		76.10% Pervious Area
0.763		23.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	150	0.1330	0.23		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
4.0	765	0.0460	3.22		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
14.9	915	Total			

Summary for Subcatchment A46:

Runoff = 213.77 cfs @ 12.76 hrs, Volume= 33.734 af, Depth> 2.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
2.930	55	Woods, Good, HSG B
186.970	70	Woods, Good, HSG C
0.040	79	50-75% Grass cover, Fair, HSG C
4.630	77	Woods, Good, HSG D
194.570	70	Weighted Average
194.570		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.2	150	0.1500	0.09		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.30"
39.1	3,470	0.3500	1.48		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
2.1	3,100	0.2100	25.12	828.81	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
68.4	6,720	Total			

Summary for Subcatchment A47:

Runoff = 150.61 cfs @ 12.54 hrs, Volume= 19.700 af, Depth> 2.18"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
90.740	70	Woods, Good, HSG C
0.030	74	>75% Grass cover, Good, HSG C
0.060	98	Paved parking & roofs
0.040	94	Urban commercial, 85% imp, HSG C
17.710	79	50-75% Grass cover, Fair, HSG C
108.580	71	Weighted Average
108.486		99.91% Pervious Area
0.094		0.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.8	150	0.3330	0.13		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.30"
29.3	2,040	0.2160	1.16		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
3.7	4,800	0.1580	21.79	718.91	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
52.8	6,990	Total			

Summary for Subcatchment A48:

Runoff = 13.23 cfs @ 12.08 hrs, Volume= 0.799 af, Depth> 2.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
2.510	70	Woods, Good, HSG C
0.050	74	>75% Grass cover, Good, HSG C
0.870	79	50-75% Grass cover, Fair, HSG C
0.220	98	Paved parking & roofs
0.010	91	Urban industrial, 72% imp, HSG C
0.230	80	1/2 acre lots, 25% imp, HSG C
3.890	74	Weighted Average
3.605		92.68% Pervious Area
0.285		7.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	150	0.1330	0.23		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
3.8	340	0.0880	1.48		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	640	0.0780	15.31	505.12	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
15.4	1,130	Total			

Summary for Subcatchment A49:

Runoff = 3.93 cfs @ 12.05 hrs, Volume= 0.226 af, Depth> 2.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.060	92	Urban commercial, 85% imp, HSG B
0.010	55	Woods, Good, HSG B
0.130	61	>75% Grass cover, Good, HSG B
0.200	98	Paved parking & roofs
0.160	70	Woods, Good, HSG C
0.330	74	>75% Grass cover, Good, HSG C
0.040	98	Paved parking & roofs
0.930	79	Weighted Average
0.639		68.71% Pervious Area
0.291		31.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	150	0.1000	0.20		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
1.2	140	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	240	0.1000	23.01	1,725.74	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=5.00' Z= 2.0 '/' Top.W=25.00' n= 0.040 Mountain streams
13.6	530	Total			

Summary for Subcatchment A50:

Runoff = 48.43 cfs @ 12.40 hrs, Volume= 5.389 af, Depth> 2.61"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
0.050	94	Urban commercial, 85% imp, HSG C
0.050	55	Woods, Good, HSG B
0.080	61	>75% Grass cover, Good, HSG B
1.410	69	50-75% Grass cover, Fair, HSG B
0.100	98	Paved parking & roofs
0.070	94	Urban commercial, 85% imp, HSG C
10.900	70	Woods, Good, HSG C
1.480	74	>75% Grass cover, Good, HSG C
0.770	98	Paved parking & roofs
8.880	79	50-75% Grass cover, Fair, HSG C
0.960	98	Paved parking & roofs
24.750	76	Weighted Average
22.818		92.19% Pervious Area
1.932		7.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.3	150	0.2000	0.10		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.30"
17.4	1,450	0.3100	1.39		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
0.6	780	0.1670	22.40	739.10	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
42.3	2,380	Total			

Summary for Subcatchment A51:

Runoff = 40.54 cfs @ 12.43 hrs, Volume= 4.680 af, Depth> 2.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=5.40"

Area (ac)	CN	Description
4.930	70	Woods, Good, HSG C
0.320	98	Paved parking & roofs
15.560	79	50-75% Grass cover, Fair, HSG C
20.810	77	Weighted Average
20.490		98.46% Pervious Area
0.320		1.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	150	0.3000	0.12		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.30"
23.5	2,380	0.4540	1.68		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
0.6	700	0.1430	20.73	683.93	**Trap/Vee/Rect Channel Flow,** Bot.W=5.00' D=3.00' Z= 2.0 '/' Top.W=17.00' n= 0.040 Mountain streams
44.7	3,230	Total			

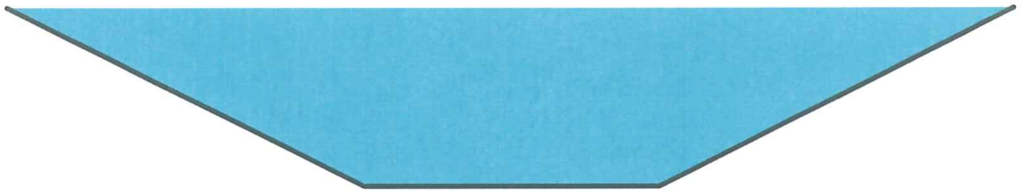
Summary for Reach 1R:

Inflow Area = 737.893 ac, 3.59% Impervious, Inflow Depth > 2.29" for 100-Yr event
Inflow = 968.42 cfs @ 12.57 hrs, Volume= 140.925 af
Outflow = 967.37 cfs @ 12.58 hrs, Volume= 140.838 af, Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 19.69 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 7.87 fps, Avg. Travel Time= 1.0 min

Peak Storage= 23,593 cf @ 12.57 hrs, Average Depth at Peak Storage= 3.95'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 583.26 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 480.0' Slope= 0.1040 '/'
Inlet Invert= 0.00', Outlet Invert= -49.92'



Summary for Reach 2R:

Inflow Area = 733.683 ac, 3.49% Impervious, Inflow Depth > 2.29" for 100-Yr event
Inflow = 963.15 cfs @ 12.55 hrs, Volume= 140.089 af
Outflow = 961.85 cfs @ 12.57 hrs, Volume= 139.975 af, Atten= 0%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.57 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 4.26 fps, Avg. Travel Time= 1.3 min

Peak Storage= 34,218 cf @ 12.56 hrs, Average Depth at Peak Storage= 6.99'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 255.78 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 340.0' Slope= 0.0200 '/'
Inlet Invert= 0.00', Outlet Invert= -6.80'

Summary for Reach 3R:

Inflow Area = 340.660 ac, 1.27% Impervious, Inflow Depth > 2.16" for 100-Yr event
Inflow = 376.44 cfs @ 12.68 hrs, Volume= 61.205 af
Outflow = 376.19 cfs @ 12.69 hrs, Volume= 61.163 af, Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 15.53 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 6.06 fps, Avg. Travel Time= 1.1 min

Peak Storage= 9,697 cf @ 12.69 hrs, Average Depth at Peak Storage= 2.45'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 571.93 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 400.0' Slope= 0.1000 '/'
Inlet Invert= 0.00', Outlet Invert= -40.00'

Summary for Reach 4R:

Inflow Area = 317.500 ac, 0.61% Impervious, Inflow Depth > 2.13" for 100-Yr event
Inflow = 358.31 cfs @ 12.69 hrs, Volume= 56.407 af
Outflow = 358.03 cfs @ 12.71 hrs, Volume= 56.357 af, Atten= 0%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 14.44 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 5.54 fps, Avg. Travel Time= 1.4 min

Peak Storage= 11,665 cf @ 12.70 hrs, Average Depth at Peak Storage= 2.49'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 527.30 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 470.0' Slope= 0.0850 '/'
Inlet Invert= 0.00', Outlet Invert= -39.95'

Summary for Reach 5R:

Inflow Area = 316.720 ac, 0.44% Impervious, Inflow Depth > 2.13" for 100-Yr event
Inflow = 358.43 cfs @ 12.67 hrs, Volume= 56.194 af
Outflow = 357.97 cfs @ 12.69 hrs, Volume= 56.141 af, Atten= 0%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 13.08 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 6.24 fps, Avg. Travel Time= 1.2 min

Peak Storage= 12,600 cf @ 12.68 hrs, Average Depth at Peak Storage= 2.66'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 461.11 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 460.0' Slope= 0.0650 '/'
Inlet Invert= 0.00', Outlet Invert= -29.90'

Summary for Reach 6R:

Inflow Area = 7.560 ac, 21.19% Impervious, Inflow Depth > 3.16" for 100-Yr event
Inflow = 21.48 cfs @ 12.17 hrs, Volume= 1.988 af
Outflow = 21.27 cfs @ 12.22 hrs, Volume= 1.983 af, Atten= 1%, Lag= 3.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.18 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 1.92 fps, Avg. Travel Time= 5.2 min

Peak Storage= 2,073 cf @ 12.19 hrs, Average Depth at Peak Storage= 0.73'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 124.81 cfs

4.00' x 2.00' deep channel, n= 0.030 Short grass
Side Slope Z-value= 1.0 '/' Top Width= 8.00'
Length= 600.0' Slope= 0.0330 '/'
Inlet Invert= 0.00', Outlet Invert= -19.80'

Summary for Reach 7R:

Inflow Area = 6.360 ac, 15.00% Impervious, Inflow Depth > 3.07" for 100-Yr event
Inflow = 19.47 cfs @ 12.12 hrs, Volume= 1.625 af
Outflow = 19.29 cfs @ 12.15 hrs, Volume= 1.623 af, Atten= 1%, Lag= 1.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.28 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 2.14 fps, Avg. Travel Time= 2.6 min

Peak Storage= 905 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.58'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 166.88 cfs

4.00' x 2.00' deep channel, n= 0.030 Short grass
Side Slope Z-value= 1.0 '/' Top Width= 8.00'
Length= 340.0' Slope= 0.0590 '/'
Inlet Invert= 0.00', Outlet Invert= -20.06'

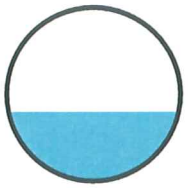
Summary for Reach 8R:

Inflow Area = 4.840 ac, 1.38% Impervious, Inflow Depth > 2.81" for 100-Yr event
Inflow = 14.12 cfs @ 12.19 hrs, Volume= 1.133 af
Outflow = 14.08 cfs @ 12.20 hrs, Volume= 1.132 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 12.15 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 4.70 fps, Avg. Travel Time= 0.7 min

Peak Storage= 233 cf @ 12.20 hrs, Average Depth at Peak Storage= 0.79'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 42.45 cfs

24.0" Round Pipe
n= 0.012 Steel, smooth
Length= 200.0' Slope= 0.0300 '/'
Inlet Invert= 0.00', Outlet Invert= -6.00'



Summary for Reach 10R:

Inflow Area = 379.553 ac, 4.97% Impervious, Inflow Depth > 2.39" for 100-Yr event
Inflow = 595.78 cfs @ 12.50 hrs, Volume= 75.712 af
Outflow = 595.25 cfs @ 12.50 hrs, Volume= 75.677 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 16.54 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 6.80 fps, Avg. Travel Time= 0.7 min

Peak Storage= 10,444 cf @ 12.50 hrs, Average Depth at Peak Storage= 3.18'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 530.39 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 290.0' Slope= 0.0860 '/'
Inlet Invert= 0.00', Outlet Invert= -24.94'

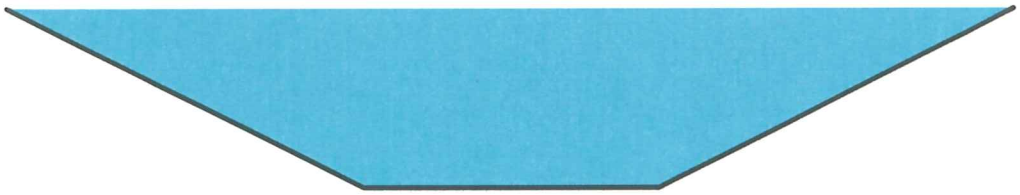
Summary for Reach 11R:

Inflow Area = 376.233 ac, 4.96% Impervious, Inflow Depth > 2.40" for 100-Yr event
Inflow = 592.05 cfs @ 12.47 hrs, Volume= 75.189 af
Outflow = 590.44 cfs @ 12.50 hrs, Volume= 75.084 af, Atten= 0%, Lag= 1.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 13.66 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 5.68 fps, Avg. Travel Time= 2.2 min

Peak Storage= 32,473 cf @ 12.48 hrs, Average Depth at Peak Storage= 3.61'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 416.37 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 750.0' Slope= 0.0530 '/'
Inlet Invert= 0.00', Outlet Invert= -39.75'



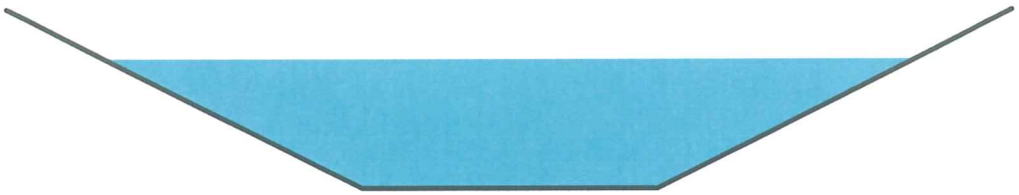
Summary for Reach 12R:

Inflow Area = 149.950 ac, 2.96% Impervious, Inflow Depth > 2.49" for 100-Yr event
Inflow = 269.54 cfs @ 12.43 hrs, Volume= 31.134 af
Outflow = 268.36 cfs @ 12.47 hrs, Volume= 31.068 af, Atten= 0%, Lag= 2.3 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 13.26 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 5.27 fps, Avg. Travel Time= 3.3 min

Peak Storage= 20,908 cf @ 12.45 hrs, Average Depth at Peak Storage= 2.17'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 521.06 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 1,030.0' Slope= 0.0830 '/'
Inlet Invert= 0.00', Outlet Invert= -85.49'



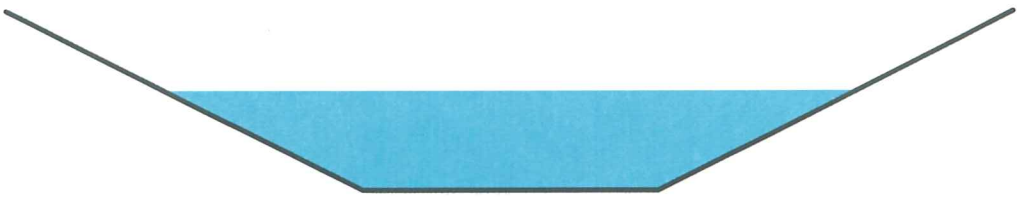
Summary for Reach 16R:

Inflow Area = 99.900 ac, 2.35% Impervious, Inflow Depth > 2.53" for 100-Yr event
Inflow = 187.08 cfs @ 12.43 hrs, Volume= 21.083 af
Outflow = 186.23 cfs @ 12.47 hrs, Volume= 21.037 af, Atten= 0%, Lag= 2.3 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 13.48 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 5.51 fps, Avg. Travel Time= 3.2 min

Peak Storage= 14,692 cf @ 12.45 hrs, Average Depth at Peak Storage= 1.66'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 610.66 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 1,060.0' Slope= 0.1140 '/'
Inlet Invert= 0.00', Outlet Invert= -120.84'



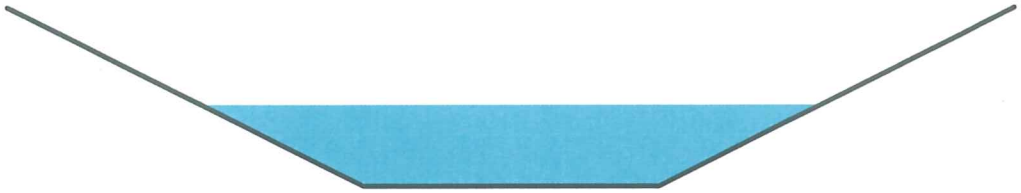
Summary for Reach 17R:

Inflow Area = 75.150 ac, 0.55% Impervious, Inflow Depth > 2.51" for 100-Yr event
Inflow = 139.52 cfs @ 12.41 hrs, Volume= 15.724 af
Outflow = 138.99 cfs @ 12.44 hrs, Volume= 15.694 af, Atten= 0%, Lag= 1.9 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 13.19 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 5.27 fps, Avg. Travel Time= 2.8 min

Peak Storage= 9,405 cf @ 12.42 hrs, Average Depth at Peak Storage= 1.37'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 664.53 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 890.0' Slope= 0.1350 '/'
Inlet Invert= 0.00', Outlet Invert= -120.15'



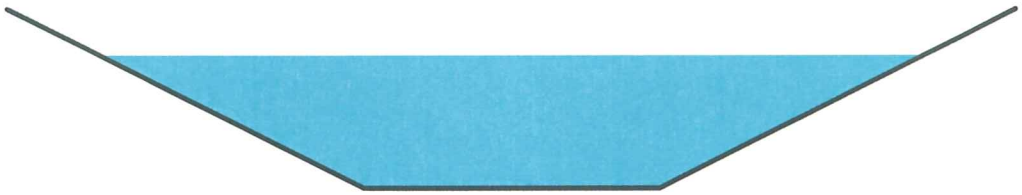
Summary for Reach 18R:

Inflow Area = 206.353 ac, 6.18% Impervious, Inflow Depth > 2.35" for 100-Yr event
Inflow = 292.80 cfs @ 12.39 hrs, Volume= 40.412 af
Outflow = 291.77 cfs @ 12.47 hrs, Volume= 40.233 af, Atten= 0%, Lag= 4.8 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 13.90 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 5.64 fps, Avg. Travel Time= 6.9 min

Peak Storage= 49,129 cf @ 12.43 hrs, Average Depth at Peak Storage= 2.22'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 539.56 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 2,340.0' Slope= 0.0890 '/'
Inlet Invert= 0.00', Outlet Invert= -208.26'



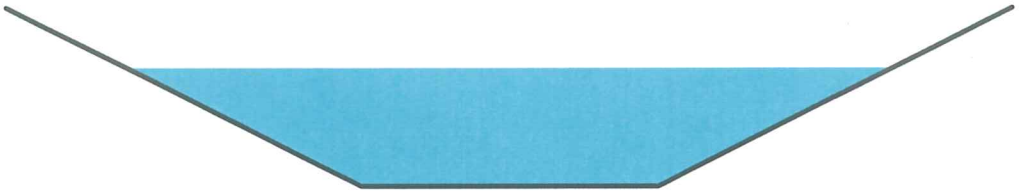
Summary for Reach 19R:

Inflow Area = 165.573 ac, 4.98% Impervious, Inflow Depth > 2.37" for 100-Yr event
Inflow = 254.04 cfs @ 12.45 hrs, Volume= 32.681 af
Outflow = 253.57 cfs @ 12.47 hrs, Volume= 32.647 af, Atten= 0%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 14.23 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 5.58 fps, Avg. Travel Time= 1.6 min

Peak Storage= 9,819 cf @ 12.46 hrs, Average Depth at Peak Storage= 1.99'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 586.06 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 550.0' Slope= 0.1050 '/'
Inlet Invert= 0.00', Outlet Invert= -57.75'



Summary for Reach 20R:

Inflow Area = 164.783 ac, 4.87% Impervious, Inflow Depth > 2.37" for 100-Yr event
Inflow = 253.82 cfs @ 12.44 hrs, Volume= 32.546 af
Outflow = 253.58 cfs @ 12.45 hrs, Volume= 32.530 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 13.61 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 5.34 fps, Avg. Travel Time= 0.8 min

Peak Storage= 4,700 cf @ 12.44 hrs, Average Depth at Peak Storage= 2.05'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 551.60 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 252.0' Slope= 0.0930 '/'
Inlet Invert= 0.00', Outlet Invert= -23.44'

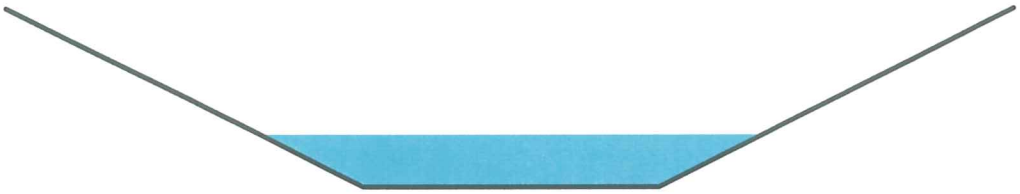
Summary for Reach 21R:

Inflow Area = 34.773 ac, 4.78% Impervious, Inflow Depth > 2.24" for 100-Yr event
Inflow = 58.78 cfs @ 12.33 hrs, Volume= 6.498 af
Outflow = 58.68 cfs @ 12.34 hrs, Volume= 6.494 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.97 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.67 fps, Avg. Travel Time= 0.9 min

Peak Storage= 1,179 cf @ 12.33 hrs, Average Depth at Peak Storage= 0.87'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 639.44 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 200.0' Slope= 0.1250 '/'
Inlet Invert= 0.00', Outlet Invert= -25.00'



Summary for Reach 22R:

Inflow Area = 29.623 ac, 3.06% Impervious, Inflow Depth > 2.22" for 100-Yr event
Inflow = 51.77 cfs @ 12.32 hrs, Volume= 5.471 af
Outflow = 51.53 cfs @ 12.35 hrs, Volume= 5.462 af, Atten= 0%, Lag= 1.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.93 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 3.22 fps, Avg. Travel Time= 2.5 min

Peak Storage= 2,835 cf @ 12.33 hrs, Average Depth at Peak Storage= 0.86'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 577.62 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 490.0' Slope= 0.1020 '/'
Inlet Invert= 0.00', Outlet Invert= -49.98'

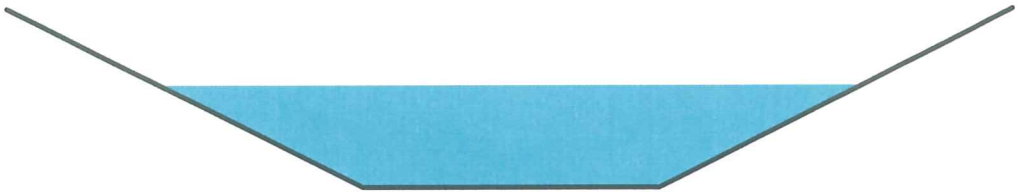
Summary for Reach 23R:

Inflow Area = 128.010 ac, 4.65% Impervious, Inflow Depth > 2.41" for 100-Yr event
Inflow = 199.57 cfs @ 12.46 hrs, Volume= 25.703 af
Outflow = 199.18 cfs @ 12.48 hrs, Volume= 25.681 af, Atten= 0%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 13.81 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 5.35 fps, Avg. Travel Time= 1.3 min

Peak Storage= 6,212 cf @ 12.47 hrs, Average Depth at Peak Storage= 1.71'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 615.99 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 430.0' Slope= 0.1160 '/'
Inlet Invert= 0.00', Outlet Invert= -49.88'



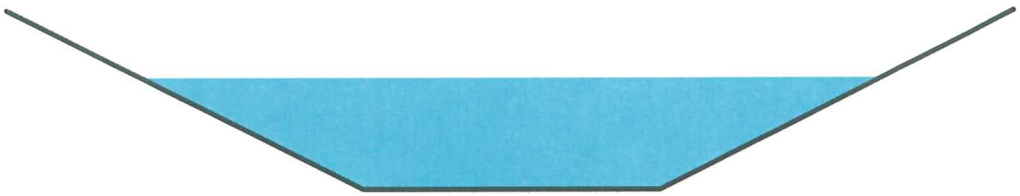
Summary for Reach 24R:

Inflow Area = 126.810 ac, 4.65% Impervious, Inflow Depth > 2.42" for 100-Yr event
Inflow = 199.16 cfs @ 12.45 hrs, Volume= 25.568 af
Outflow = 198.92 cfs @ 12.47 hrs, Volume= 25.551 af, Atten= 0%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 12.22 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 4.74 fps, Avg. Travel Time= 1.1 min

Peak Storage= 4,887 cf @ 12.46 hrs, Average Depth at Peak Storage= 1.87'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 521.06 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 300.0' Slope= 0.0830 '/'
Inlet Invert= 0.00', Outlet Invert= -24.90'



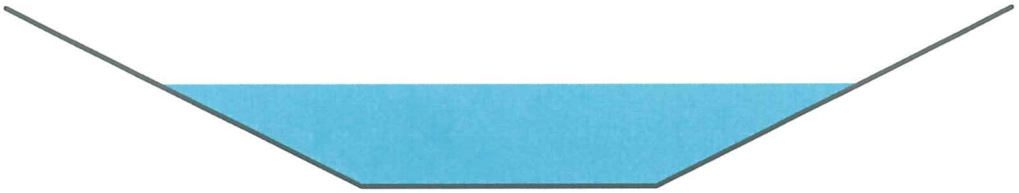
Summary for Reach 25R:

Inflow Area = 121.650 ac, 3.47% Impervious, Inflow Depth > 2.41" for 100-Yr event
Inflow = 196.05 cfs @ 12.44 hrs, Volume= 24.466 af
Outflow = 195.74 cfs @ 12.46 hrs, Volume= 24.442 af, Atten= 0%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 13.48 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 5.13 fps, Avg. Travel Time= 1.6 min

Peak Storage= 7,270 cf @ 12.45 hrs, Average Depth at Peak Storage= 1.72'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 599.85 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 500.0' Slope= 0.1100 '/'
Inlet Invert= 0.00', Outlet Invert= -55.00'



Summary for Reach 26R:

Inflow Area = 13.100 ac, 4.35% Impervious, Inflow Depth > 2.20" for 100-Yr event
Inflow = 31.40 cfs @ 12.18 hrs, Volume= 2.407 af
Outflow = 31.07 cfs @ 12.21 hrs, Volume= 2.402 af, Atten= 1%, Lag= 1.9 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.07 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.83 fps, Avg. Travel Time= 2.8 min

Peak Storage= 1,917 cf @ 12.19 hrs, Average Depth at Peak Storage= 0.91'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 318.44 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 310.0' Slope= 0.0310 '/'
Inlet Invert= 0.00', Outlet Invert= -9.61'

Summary for Reach 27R:

Inflow Area = 2.100 ac, 56.62% Impervious, Inflow Depth > 3.19" for 100-Yr event
Inflow = 9.73 cfs @ 12.05 hrs, Volume= 0.559 af
Outflow = 8.61 cfs @ 12.20 hrs, Volume= 0.553 af, Atten= 11%, Lag= 9.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.37 fps, Min. Travel Time= 5.6 min
Avg. Velocity = 1.62 fps, Avg. Travel Time= 18.5 min

Peak Storage= 2,910 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.29'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 647.07 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 1,800.0' Slope= 0.1280 '/'
Inlet Invert= 0.00', Outlet Invert= -230.40'

Summary for Reach R13:

Inflow Area = 11.450 ac, 14.26% Impervious, Inflow Depth > 2.70" for 100-Yr event
Inflow = 33.93 cfs @ 12.18 hrs, Volume= 2.576 af
Outflow = 33.30 cfs @ 12.24 hrs, Volume= 2.566 af, Atten= 2%, Lag= 3.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.91 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 2.18 fps, Avg. Travel Time= 6.5 min

Peak Storage= 4,139 cf @ 12.21 hrs, Average Depth at Peak Storage= 0.75'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 481.92 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 850.0' Slope= 0.0710 '/'
Inlet Invert= 0.00', Outlet Invert= -60.35'

Summary for Reach R14:

Inflow Area = 9.550 ac, 12.28% Impervious, Inflow Depth > 2.68" for 100-Yr event
Inflow = 28.34 cfs @ 12.17 hrs, Volume= 2.134 af
Outflow = 28.00 cfs @ 12.19 hrs, Volume= 2.131 af, Atten= 1%, Lag= 1.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.00 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 2.19 fps, Avg. Travel Time= 2.6 min

Peak Storage= 1,389 cf @ 12.18 hrs, Average Depth at Peak Storage= 0.64'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 533.51 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 345.0' Slope= 0.0870 '/'
Inlet Invert= 0.00', Outlet Invert= -30.02'

Summary for Reach R15:

Inflow Area = 1.790 ac, 11.17% Impervious, Inflow Depth > 2.64" for 100-Yr event
Inflow = 5.82 cfs @ 12.12 hrs, Volume= 0.393 af
Outflow = 5.66 cfs @ 12.20 hrs, Volume= 0.391 af, Atten= 3%, Lag= 4.8 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.82 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 1.24 fps, Avg. Travel Time= 8.5 min

Peak Storage= 944 cf @ 12.15 hrs, Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 481.95 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 635.0' Slope= 0.0710 '/'
Inlet Invert= 0.00', Outlet Invert= -45.09'

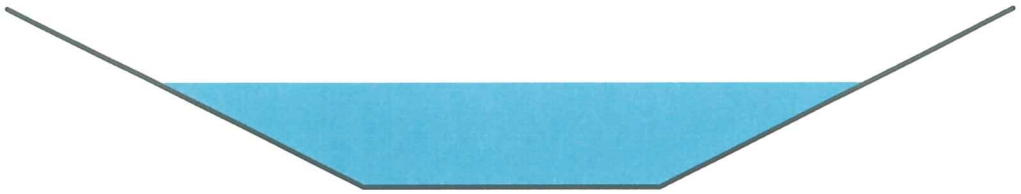
Summary for Reach R28:

Inflow Area = 114.850 ac, 2.54% Impervious, Inflow Depth > 2.51" for 100-Yr event
Inflow = 208.48 cfs @ 12.44 hrs, Volume= 23.990 af
Outflow = 207.49 cfs @ 12.48 hrs, Volume= 23.941 af, Atten= 0%, Lag= 2.2 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 13.89 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 5.40 fps, Avg. Travel Time= 3.2 min

Peak Storage= 15,597 cf @ 12.46 hrs, Average Depth at Peak Storage= 1.76'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 610.66 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 1,040.0' Slope= 0.1140 '/'
Inlet Invert= 0.00', Outlet Invert= -118.56'



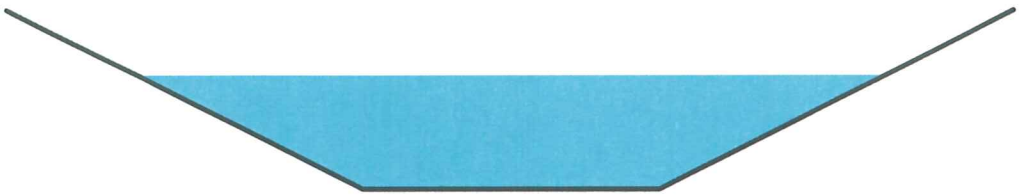
Summary for Reach R29:

Inflow Area = 194.570 ac, 0.00% Impervious, Inflow Depth > 2.08" for 100-Yr event
Inflow = 213.77 cfs @ 12.76 hrs, Volume= 33.734 af
Outflow = 213.49 cfs @ 12.81 hrs, Volume= 33.631 af, Atten= 0%, Lag= 3.4 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 12.73 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 6.41 fps, Avg. Travel Time= 3.6 min

Peak Storage= 23,003 cf @ 12.77 hrs, Average Depth at Peak Storage= 1.91'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 536.52 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 1,370.0' Slope= 0.0880 '/'
Inlet Invert= 0.00', Outlet Invert= -120.56'



Summary for Reach R9:

Inflow Area = 13.570 ac, 9.54% Impervious, Inflow Depth > 2.54" for 100-Yr event
Inflow = 34.51 cfs @ 12.22 hrs, Volume= 2.872 af
Outflow = 34.04 cfs @ 12.27 hrs, Volume= 2.863 af, Atten= 1%, Lag= 3.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.57 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 2.65 fps, Avg. Travel Time= 4.8 min

Peak Storage= 3,487 cf @ 12.24 hrs, Average Depth at Peak Storage= 0.71'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 545.59 cfs

5.00' x 3.00' deep channel, n= 0.040 Mountain streams
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 770.0' Slope= 0.0910 '/'
Inlet Invert= 0.00', Outlet Invert= -70.07'

Summary for Reach Sum:

Inflow Area = 740.173 ac, 3.60% Impervious, Inflow Depth > 2.29" for 100-Yr event
Inflow = 969.13 cfs @ 12.58 hrs, Volume= 141.288 af
Outflow = 969.13 cfs @ 12.58 hrs, Volume= 141.288 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs