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February 19, 2010

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

Re: Silver Lake Hydroelectric Project, FERC Project No. 11478
Operations Compliance Plan

Dear Secretary Bose:

The Silver Lake Hydroelectric Project (Project No. 11478) was issued an original FERC license on February 26, 2009. The Project is located on Sucker Brook in Addison County, Vermont and is owned and operated by Central Vermont Public Service Corporation (CVPS). A Water Quality Certification (WQC) was issued for the Project by the State of Vermont on December 5, 2008. The new license and associated water quality certification require CVPS to prepare several plans to meet the flow and reservoir management requirements stipulated in the license. CVPS has prepared one comprehensive Operations Compliance Plan to address several requirements in License Article 401 (A) and the associated Vermont WQC, including: Goshen Dam ramping plan, Silver Lake tailrace down ramping plan, Sucker Brook Diversion Dam bypass flow plan, Sugar Hill reservoir operating plan, smelt spawning protection operating protocol, and the monitoring plan for reservoir and flow management.

Attached for submittal is the Operations Compliance Plan for the Silver Lake Hydroelectric Project, which was approved by the Vermont Agency of Natural Resources (VANR) on February 18, 2010. The plan was developed in consultation with VANR, the Vermont Department of Fish and Wildlife (VDFW), and the United States Fish and Wildlife Service (USFWS). It should be noted that the USFWS deferred comment via email dated August 27, 2009. The VANR approval letter and correspondence record is contained in Appendix D of the final plan. Please contact me if you have any questions regarding this filing. Thank you.

Sincerely,

Jason George
Environmental Scientist

C: M. Scarzello, CVPS
B. Eliason, CVPS
B. Fitzgerald, VANR
R. Wentworth, VDFW
M. Grader, USFWS

Enclosure

SILVER LAKE HYDROELECTRIC PROJECT
FERC Project No. 11478

Operations Compliance Plan

Silver Lake Inlet

Central Vermont Public Service Corp.
77 Grove St.
Rutland, VT 05701

February 2010

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1.0 Introduction

The Silver Lake Hydroelectric Project (Project), located on Sucker Brook in Addison County, Vermont, was issued a new license by the Federal Energy Regulatory Commission (FERC) on February 26, 2009. The Project (FERC No. 11478) is owned and operated by Central Vermont Public Service Corporation (CVPS). The new license and associated water quality certificate (issued by the State of Vermont to CVPS on December 8, 2008) contain several items related to operations of the project and flow and water level management. The intent of this plan is to address the license requirements related to flow and water level management together in one comprehensive compliance plan.

1.1 Project Description

The Project consists of three major components: 1) Sugar Hill Reservoir and Goshen Dam, 2) Sucker Brook Diversion Dam, 3) and Silver Lake Development (Figure 1.1-1). Sugar Hill Reservoir and Silver Lake capture the annual spring runoff and release water from storage to provide year-round flow releases for power production. Water released from Sugar Hill Reservoir flows downstream to the Sucker Brook Diversion Dam, where water is diverted into Silver Lake. From Silver Lake water is brought to the powerhouse via a penstock. Flow is then released into a tailrace where it rejoins Sucker Brook, eventually flowing into Lake Dunmore.

Sugar Hill storage reservoir is created by Goshen Dam, which contains a 14-foot-wide intake structure with wooden trashracks and a concrete gate and a 232-foot-long, 4-foot-square concrete outlet structure equipped with two 6-inch-diameter, two 8-inch-diameter, and one 10-inch-diameter steel gate valves. Sugar Hill Reservoir has a normal full pool water surface elevation of 1,766 feet above mean sea level (msl) (datum is NVGD 29) and an intake structure invert elevation of 1,720 feet. The wooden trashracks have clear spacing of 3 inches.

Sucker Brook Diversion Dam, located at the confluence of Sucker Brook and Dutton Brook, consists of a 665-foot-long, 38-foot-high earth embankment section, and a 60-foot-long concrete spillway section which creates a 0.25-acre impoundment with a normal water surface elevation of 1,288 feet msl. There is a concrete intake structure equipped with a timber headgate and wooden trashracks leading to the 7,000-foot-long penstock, which supplies water to Silver Lake. The intake structure is located at the western end of the dam and consists of a single manually operated timber headgate, and wooden trashracks with 4-inch clear spacing.

Silver Lake has a normal surface elevation of 1,247.5 feet msl, and here, project-related structures include the Silver Lake Dam consisting of a 257-foot-long, 30-foot-high buttressed concrete with earthfill section, and a 18.5-foot-wide concrete section; an intake structure with steel trashracks; a 60-foot-long intake and outlet structure equipped with a slide gate; and a 5,200-foot-long penstock leading to the Silver Lake powerhouse. The intake structure at Silver Lake Dam contains two sets of trashracks; one at the submerged intake structure and one inside the outlet structure. The outer set of trashracks is composed of 3/8 inch thick steel bars with 1 ¾ inch spacing between bars. There is also a sluice way in the stoplog section of the dam which was constructed in 1998.

1.2 Current Operation

During the water quality certification study process in the 1990s, CVPS put into practice the operating rule curves for the Sugar Hill Reservoir and Silver Lake in accordance with the operating agreements that were ultimately made with the Vermont Agency of Natural Resources (VANR) for the water quality

certification issued in 2008. The operating plans limit the amount of winter drawdown both in timing and duration. The typical operating levels, such as the normal maximum pool level, are unchanged. Under normal operating conditions, the maximum full pool level is El. 1,766 feet for the Sugar Hill Reservoir, 5 feet below the reported spillway crest level. Except during the late winter drawdown, the reservoir is operated within a 5-foot band between El. 1,761 and 1,766. Outflows from the project are controlled by a series of valves with a maximum combined discharge capacity of approximately 70 cfs. A flow release of 70 cfs can lower the pond approximately 2 feet in a 24-hour period (assuming no inflow). Likewise, CVPS releases a minimum flow of 2.5 cubic feet per second (cfs) from Sugar Hill Reservoir to Sucker Brook. No minimum flows are currently released from Sucker Brook Diversion Dam or Silver Lake Dam; however plans are presented within to provide for the former.

When smelt are spawning in the spring, CVPS operates the project continuously to maintain spawning and incubation habitat in Sucker Brook downstream of the project tailrace.

Operation of the Silver Lake Project is scheduled on a weekly basis and is dependent on:

- The elevation of Silver Lake and Sugar Hill Reservoir in relation to their operating curves
- Anticipated precipitation
- System peak demand hours
- Time of day generation
- Smelt spawning status
- Facility scheduled maintenance

CVPS would like to formally correct the record regarding elevations at Sugar Hill Reservoir and Goshen Dam. The project structures were initially surveyed in 1995 and re-confirmed in 2009. The benchmark reference elevation is a brass pin located at the northern end of the spillway. CVPS surveyed this elevation as 1,772.37 feet, NGVD 29. The elevation of the spillway was also confirmed as 1,770.95 feet based upon the average elevation of six measurements across the length of the spillway. For operational practicality, the spillway elevation is rounded to 1,771.0 feet; therefore, 1,766.0 feet equals 50 feet local datum, as opposed to 1,765.5 feet as stated in the license. CVPS uses 1,766.0 feet as full pond, which is five feet below the emergency spillway crest. This is consistent with elevation markings on the chain which controls the outlet gate at the dam, and consistent with the intent of the Vermont water quality certification.

1.3 License Compliance Plan Overview

The FERC license dated February 26, 2009, requires CVPS to develop a Reservoir and Flow Management and Operations Plan to address the following issues:

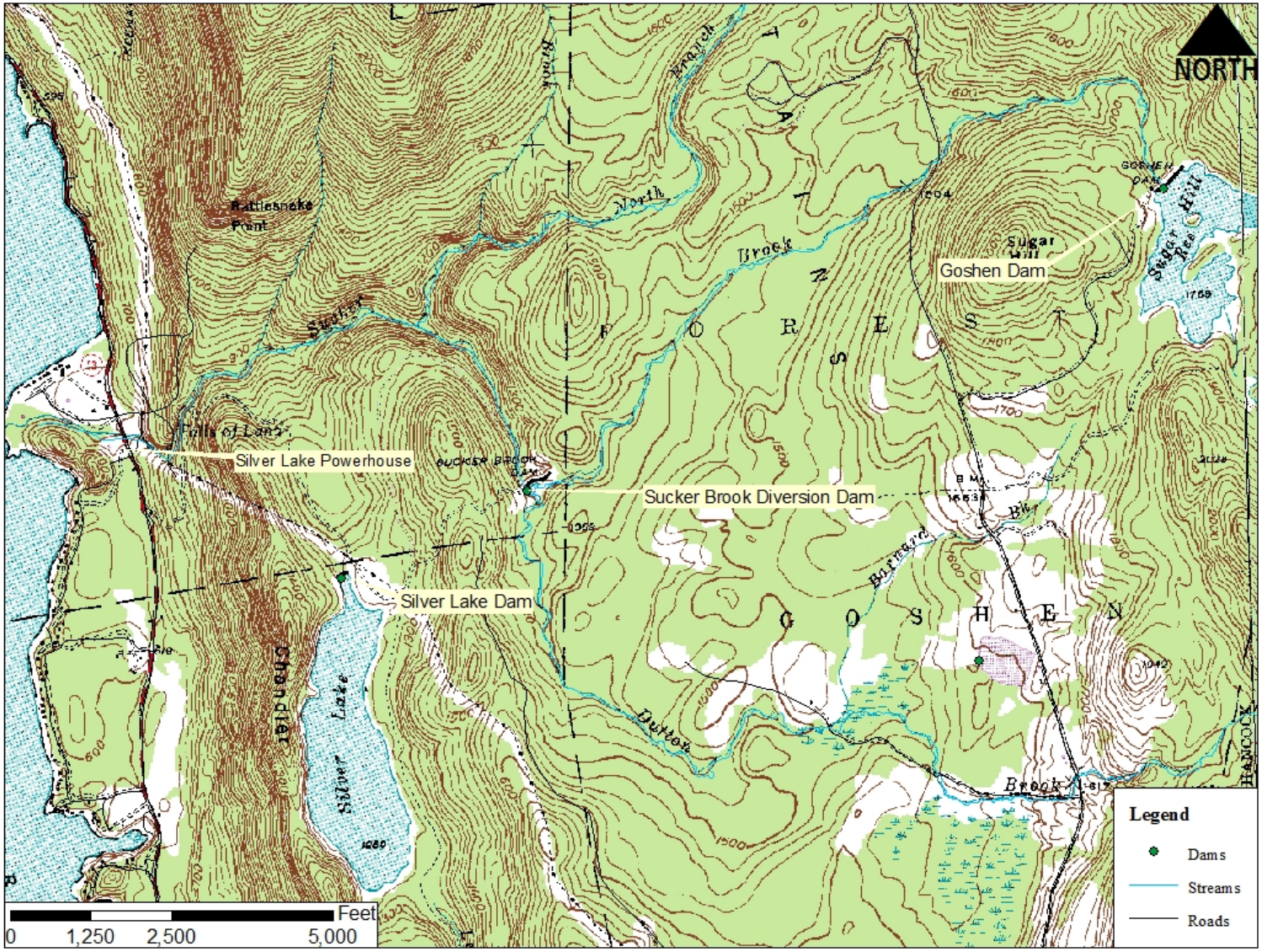
- Sugar Hill Reservoir water level management
- Minimum flow releases downstream of Goshen Dam
- Ramping of flow changes downstream of Goshen Dam
- Sucker Brook Diversion Dam water level elevations
- Minimum flow releases downstream of Sucker Brook Diversion Dam
- Silver Lake water level management
- Ramping of flow changes through the Silver Lake powerhouse
- Fish exclusion from the Silver Lake powerhouse tailrace
- Special operations for smelt spawning protection

Each issue is addressed in the following sections. The intent of this plan is to serve as a comprehensive compliance plan addressing CVPS's obligations related to operating the Project consistent with the flow and water level constraints contained in the FERC license.

Article 401 of the license requires the CVPS to file the plans required by the certification conditions for FERC approval, and document that measures required by the certification conditions have been completed.

It should be noted that according to the FERC license, prior to implementing the Sugar Hill Reservoir operating rule curve or the Silver Lake water level management criteria, Article 302 requires CVPS to file an operating plan for Commission approval that details how the project will be operated to achieve the required seasonal reservoir water surface elevations. In addition, Article 301 of the license requires that CVPS submit a report describing the effects of limiting reservoir drawdowns on local flooding and spillway adequacy of the project dams within 90 days of license issuance (by May 27, 2009). CVPS addressed these two issues by letter dated May 26, 2009 to FERC.

Figure 1.1-1: Silver Lake Hydroelectric Project.



2.0 Sugar Hill Reservoir

2.1 Description of Project Works

Sugar Hill storage reservoir is created by Goshen Dam, the most upstream portion of the Project. Goshen Dam contains a 14-foot-wide intake structure with wooden trashracks and a concrete gate and a 232-foot-long, 4-foot-square concrete outlet structure equipped with set of control valves located on the downstream face of the dam. Sugar Hill Reservoir has a surface area of 66.5 acres at the normal headpond elevation of 1,766 feet. In 1992, with the appropriate approvals, CVPS raised approximately 335 feet of the embankment to El. 1,777.0 to contain the probable maximum flood and provide the appropriate level of freeboard. The drainage area to the reservoir is 2.6 square miles.

The intake structure contains trashracks and a concrete gate structure, which can be raised and lowered manually by a hand operated chain hoist located on the top of the embankment. The gate can only be operated under very little differential head. Discharge from the outlet structure is regulated by a "nest" of five gate valves located in the outlet structure which include two 6-inch, two 8-inch, and one 10-inch diameter valves. The valves are all manually operated and have a discharge capacity of approximately 70 cfs at normal pond elevation. There is no leakage at the dam. A minimum flow release of at least 2.5 cfs is maintained continuously, and additional flows are provided as necessary to meet the reservoir's operating rule curve and to supply flows via Sucker Brook to Silver Lake which in turn feed the powerhouse turbine.

There is an emergency spillway at the northeast end of the dam that serves only to pass very high flows, with a crest elevation of 1,771 feet, five feet above normal high water. Downstream of the spillway are a series of low check dams constructed of earth and rock filled gabions which serve to dissipate energy and prevent erosion in the case of emergency high water situations.

2.2 License Requirements

Condition B of the Vermont Water Quality Certification requires that CVPS operate the Project in accordance with the minimum flow and reservoir level management schedules shown in Tables 2.2-1 and 2.2-2 below[1]. The minimum flows shall be released on a continuous basis and not interrupted.

Condition C of the Vermont Water Quality Certification requires CVPS to develop a ramping plan for the adjustment of the valve system at Goshen Dam in order to control the rate of change of downstream flows and protect downstream aquatic organisms. Condition H specifies that the valves at Goshen Dam shall be rated using field testing over the range of reservoir operating levels; the results and methodology used shall be included in the plan.

Lastly, Condition G of the Vermont Water Quality Certification requires CVPS to develop an operating plan for Sugar Hill Reservoir, indicating how the dam will be operated to conform to the goals of the operating rules described above. The following sections provide information on how the project will be managed to conform to the operating rule for water surface elevation and avoid related noncompliance with the conservation flow requirements.

[1] See note on elevations at Sugar Hill Reservoir in Section 1.2 of this plan.

Table 2.2-1: Sugar Hill Reservoir Operating Rule from May 1 through December 31.

Reservoir Level (feet msl)		Flow management
Elevation	**Relative**	
>1766.0	Above 0	Release at a rate as necessary to bring the reservoir down to 1766.0; maintain no less that 2.5 cfs at all times
1761.0 – 1766.0	0 to -5.0	Release no less than 2.5 cfs
1758.0 – 1761.0	-5.0 to -8.0	Fixed release of 2.5 cfs (storage dedicated to providing conservation flow)
1758.0	-8.0	Match inflow (maximum allowed drawdown)

Notes: Elevations used in this table were corrected for consistency with the CVPS 2009 field survey (NGVD 29) and based on historic operating datums. Based on a review of drawdown and flow release data, VANR may lower the 2.5 cfs conservation flow for this period if doing so would improve the overall flow regime for aquatic biota below Goshen Dam and below the diversion dam by reducing or eliminating the frequency and duration of drawdowns to elevation 1758.0 feet msl and the corresponding lower outflows from the reservoir. Any consideration of a lower conservation flow shall be done in consultation with the Department of Fish and Wildlife, the U.S. Fish and Wildlife Service, the U.S. Forest Service, and CVPS.

Table 2.2-2: Sugar Hill Reservoir Operating Rule from January 1 through April 30.

Reservoir Level (feet msl)		Flow management
Elevation	**Relative**	
>1761.0	Above -5.0	Maintain at no less than 2.5 cfs
1748.0 – 1761.0	-18.0 to -5.0	Maintain at no less than 2.5 cfs and manage drawdown in a manner that sufficient storage is available to accomplish this without dropping below elevation 1748.0 feet

Notes: Elevations used in this table were corrected for consistency with the CVPS 2009 field survey (NGVD 29) and based on historic operating datums. Winter drawdown begins on or about January 1 from the target elevation of 1766.0 feet msl (assuming that elevation can be attained from fall inflows while maintaining the 2.5 cfs conservation flow downstream), or after headpond ice formation, if later.

2.3 Operating Plan for Sugar Hill Reservoir

Sugar Hill Reservoir is operated as a seasonal storage reservoir in accordance with the rule curve for water surface elevation shown in Figure 2.3-1. There is a pond level sensor at Goshen Dam (Figure 2.3-2) which relays data to Silver Lake via telemetry and solar power; the elevation data is then transmitted to the Control Center in Rutland for incorporation into the SCADA system. The Control Center in Rutland and the operators are in daily contact to determine what adjustments are needed to comply with the rule curve. The Sugar Hill pond level is controlled by adjusting the valve nest openings (Figure 2.3-3). Operations personnel travel to the dam as needed to record the elevation and adjust the outlet valves to maintain the elevation in the operating range of the rule curve. Operators check the release at least twice per week and make adjustments, as needed. If the Control Center anticipates dramatic shifts in weather, then proactive changes can be made to the valve settings to allow for more storage, etc. Records are kept

to track changes to the valve openings. The discharge capacities of the valve openings are depicted in Table 2.3-1. This table is used to translate valve settings into discharge and the resulting value is stored in CVPS operational records. CVPS will perform field measurements to confirm and update the discharge data in Table 2.3-1, as described in Section 5 of this plan.

The gradual drawdown begins annually in January when ice cover is established, with maximum drawdown generally occurring by March. The reservoir begins to refill no later than early April, reaching normal pond by May 1. Typically, reservoir elevation does not change more than one foot in a week except immediately prior to spring run-off, when decreases of up to two feet per week occur, and during spring run-off, when an increase of up to 18 feet (from reservoir minimum elevation) is possible.

The dates depicted in the rule curve (Figure 2.3-1) were developed based on many years of historical operations data and include consideration of many factors such as: the timing of smelt spawning, available snow pack, and precipitation forecasts. The maximum winter drawdown is limited to 1,748 feet. During smelt spawning, enough water must be available in Sugar Hill Reservoir to account for contingencies in the event of little or no springtime precipitation. Available snowpack is also considered when determining the timing of reservoir refill. Additional details of project operation during smelt spawning are provided in Appendix C. Determining the expected refill date is part of CVPS's ongoing planning process. The lower limit of the rule curve corresponds with the latest observed smelt spawning.

2.4 Minimum Flow Release

CVPS maintains a continuous minimum flow of 2.5 cfs to Sucker Brook by manually adjusting the 6-inch pipe through the Goshen Dam outlet. Four turns on the first (older) 6-inch valve provides 2.5 cfs. Table 2.3-1 shows the discharge ratings of the outlet valves at Goshen Dam. The maximum combined discharge capacity of the valves is approximately 61 cfs when the reservoir is at 1,766 feet.

The required 2.5 cfs minimum flow is provided by adjusting the outlet valve openings to maintain the water surface at the crest of the 12-inch, 90 degree, V-notch weir. The V-notch weir is independent of reservoir elevation whereas the valve openings are not. Therefore, the valves are adjusted until the weir is full, thus verifying the 2.5 minimum flow. If the reservoir elevation is below full pond of 1,766, the CVPS operators fine –tune the opening of the valve, as necessary until the V-notch weir is full and then record that value in their records.

In October and November, 2008, CVPS calibrated and verified through flow metering that four (4) turns on the 6-inch valve provided the required minimum flow of 2.5 cfs. Flow measurements were collected within the streambed downstream of the discharge with the reservoir at 1765.9 feet (0.1 feet below typical full pond). A 12-inch V-notch weir (theoretical release of 2.5 cfs) was cut and shaped into the 6-foot high stop logs within the discharge house and the valve opened 4 turns. This filled the V-notch to its inside crest and flow was then metered downstream at two different locations. One site measured at 2.39 cfs and the other at 2.61 cfs; the two sites averaged 2.5 cfs. This allows the operator to confirm a consistent release of 2.5 cfs by visually checking the head of water through the V-notch.

During the summer, CVPS manages the reservoir in the five-foot range below full pool. If low inflows cause the pool to decline below elevation 1761.0 feet, the next three feet of storage are dedicated to maintaining a conservation flow of 2.5 cfs until the reservoir either declines to elevation 1758.0 feet or rises back to the normal summer range.

If low inflows result in declining water levels at Sugar Hill Reservoir such that the surface water elevation drops to 8 feet below normal (1,758 feet), CVPS will release reservoir inflows instead of the 2.5 cfs conservation flow, in accordance with Condition B of the Vermont Water Quality Certification. This will

be done by manually adjusting the outlet valves so the elevation remains constant until inflows to the reservoir increase. As described further in Section 3, under these low inflow scenarios, the quantification of discharge values below the minimum flow of 2.5 is required so the corresponding minimum flows can be provided below Sucker Brook Diversion Dam. CVPS proposes to install markings in 0.1 foot increments on the V-notch weir at the Goshen Dam outlet to allow for determination of the discharge when less than 2.5 cfs.

During winter operation, minimum flows are normally provided by keeping a 6-inch valve half open. This valve setting ensures at least 2.5 cfs minimum flow at the minimum reservoir elevation of 1,748 feet (see Table 2.3-1). Valve stems are maintained to prevent freezing; if ice is found on the V-notch weir, it is removed by the operators.

2.5 Ramping Plan

2.5.1 Current Conditions

CVPS operators currently use a ramping plan for the adjustment of the valve system at Goshen Dam to control the rate of change of downstream flows and protect downstream aquatic organisms. The maximum combined discharge capacity of the valves is approximately 65 cfs (Table 2.3-1).

CVPS operators work with the Control Center when planning the lowering and filling of Sugar Hill Reservoir. Under normal conditions, when winter drawdown begins in January, CVPS considers the current reservoir level, the ice formation conditions, and weather forecasts to determine flow releases. CVPS uses an iterative process when releasing water in accordance with the operating rules for both Sugar Hill Reservoir and Silver Lake. Adjustments are made to valve releases to ensure enough water is in storage throughout the winter months, until the refill process can begin in the spring. It benefits CVPS in terms of power production to draw down Sugar Hill Reservoir slowly throughout the winter so that all the available water is used at the Silver Lake station.

Weather forecasts and the current level of Silver Lake dictate the rate of adjustments to discharges from the Sugar Hill Reservoir under normal conditions; therefore, there is no set ramping rule that fits every scenario. CVPS will normally open valves iteratively whereby the operators and the Control Center are in close communication. The impoundment drawdown is normally achieved by releasing the minimum flow through the valves and then gradually up-ramping the release by opening one 6-inch valve either half way or fully. The Control Center will consult the reservoir operating rule curve, evaluate the results of the valve setting on the reservoir levels, consider weather forecasts and peak demand operating hours, and then communicate with the on-site operators for another change, if necessary. The Control Center may ask for an additional valve(s) to be opened either the next morning or later in the week, all the while considering the local weather forecasts. Each valve takes approximately 5 minutes to open fully by hand, resulting in a gradual increase in downstream flows. Similar down-ramping procedures are used by CVPS when refilling Sugar Hill Reservoir. The valves are iteratively adjusted to retain water in storage while adhering to the operating rule curves for water surface elevations and allowing for maximum power production.

During emergency situations (e.g., floods of August 2008), it may be necessary for CVPS to open all the outlet valves to lower the impoundment for safety reasons in anticipation of heavy rainfall. This is a rare occurrence. A flow release of 65 cfs can lower the pond level approximately 2 feet in a 24-hour period (assuming no inflow). In these cases, the existing discharge out of Goshen Dam is usually at an intermediate level. That is, CVPS may anticipate forecasted precipitation by proactively releasing water before a storm. If the precipitation amounts cause concern for reservoir elevation, CVPS will open additional valves.

2.5.2 Ramping Protocol

CVPS initially contended that their current mode of ramping operation is practical and can be continued without modification or further investigation in order to manage flow and water level constraints while still adequately protecting Sucker Brook habitat. However, in consultation with VANR in January and February, 2010 (see Appendix D) VANR stated that the rate of change of Goshen Dam discharges was still an issue. Therefore, CVPS agreed to develop a specific protocol for up- and down-ramping for flow releases at Goshen Dam.

Based on a comparative flow analysis at an unregulated USGS gage nearby (USGS No. 01142500 - Ayers Brook at Randolph, VT), VANR suggested a 4.0 cfsm/hour change in up-ramping and a 3.0 cfsm/hr change in down-ramping as typical maximum rates of change. VANR stated that comparative rates of change for Goshen Dam discharges were approximately 10 cfs/hour for up-ramping and 8 cfs/hour for down-ramping and offered these values as a suggested framework for the ramping protocol.

Up-Ramping:

CVPS operators will adjust the outflows at Goshen Dam at a maximum rate of change of approximately 10 cfs/hour. Table 2.5.2-1 presents the maximum allowable change in outflows in relation to any given valve setting. For example, if the valves are currently set to provide a discharge of 2.5 cfs and the operators are required to increase the flow releases from Goshen Dam, the maximum initial change allowable would be to open 1 6" value fully and the other 6" value half-way, resulting in an increase of 8.5 cfs. Going from minimum flow to opening both 6" valves would result in a flow increase of 12.1 cfs, which is higher than the acceptable hourly maximum rate of change. If additional flow releases are required after the initial change, the next valve change could occur one hour later, while still applying the rules of Table 2.5.2-1.

CVPS's up-ramping protocol will be applied when the elevation of Sugar Hill Reservoir is below 1,765 feet (one foot below full). When the water surface elevation of Sugar Hill Reservoir is at or above 1,765 feet, and precipitation is expected or occurring, CVPS operators need to react quickly in order to manage Sugar Hill Reservoir levels within the normal operating range. VANR recognized that in these circumstances, it is reasonable to forego the up-ramping requirement in order to manage the water levels in a safe manner.

Down-Ramping:

The maximum rate of change when adjusting flows in a decreasing manner at Goshen Dam will be approximately 8 cfs/hour. Table 2.5.2-1 highlights the maximum allowable change in outflows under any given valve setting.

For practical purposes, when adjusting outflows of the largest valve (10" diameter) for both up-ramping and down-ramping, the maximum rate of change is slightly above 10 cfs/hour. It was agreed during consultation with VANR that the ramping protocol could be based on the current operational procedures for adjusting outflows from the dam. Specifically, the operators adjust the outflows by setting the valves in a closed, half-open, or fully-open state. Staying within this rule, adjustments to the 10" valve from fully open to half open, or half open to closed, result in maximum hourly rates of change slightly above 10 cfs. For operational simplicity operators will continue with the half-open adjustments on the 10" valve.

Table 2.3-1: Discharge Capacities of Goshen Dam Outlet Valves.

Valve Opening	Discharge at Pond Elevation (cfs)				
	1,771 feet	**1,766 feet**	**1,761 feet**	**1,758 feet**	**1,748 feet**
6" valve half open	3.87	3.66	3.45	3.31	2.82
6" valve fully open	7.72	7.32	6.89	6.62	5.62
8" valve half open	6.87	6.52	6.14	5.90	5.02
8" valve fully open	13.73	13.01	12.25	11.76	10.00
10" valve half open	10.75	10.19	9.59	9.22	7.84
10" valve fully open	21.45	20.32	19.13	18.38	15.62
Total Discharge (all valves)	**64.34**	**60.97**	**57.40**	**55.15**	**46.87**

Note: Flow calculated based on flow through submerged tube equation (Design of Small Dams), where Q = C*A*(square root of (2*g*h). Discharge Coefficient used = 0.70.

Operators Notes:

First 6” valve: 14 turns to open (older seated valve)
New 6” valve: 19 turns to open (newer valve with finer threads)
2 – 8” valves: 18 1/2 turns to open
1 – 10” valve: 20 turns to open

3 turns necessary on the 8” valve before water flows
1 1/2 to 2 turns necessary on others
4 turns on first 6” valve at full pond (1,766 feet) provides minimum flow of 2.5 cfs (field verified).
To provide minimum flow at pond elevations less than full, open 6” valve until V-notch is full.

Figure 2.3-1: Sugar Hill Reservoir Operating Rule Curve for Water Surface Elevation (NGVD 29).

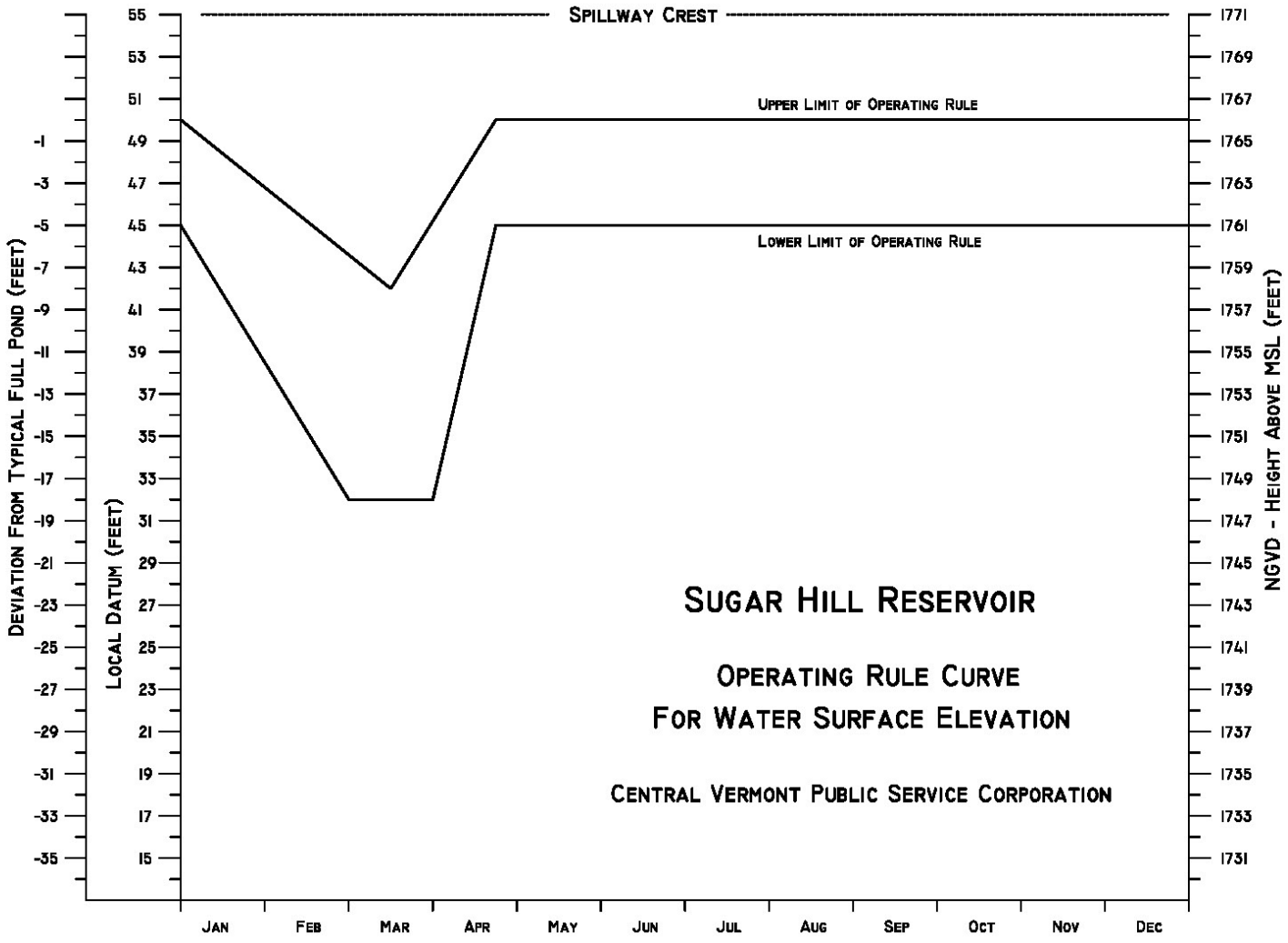


Table 2.5.2-1: Ramping Rates for Goshen Dam Discharges.

Up-Ramping												
		Change in Discharge (cfs) per Ramping Step										
	Valve Setting >>>	Min flow	1-6" (1/2)	1-6"	1-6" & 1-6" (1/2)	2-6"	2-6" & 1-8" (1/2)	2-6" & 1-8"	2-6", 1-8" & 1-8" (1/2)	2-6" & 2-8"	2-6", 2-8" & 10" (1/2)	2-6", 2-8" & 10"
Initial Setting	**Total Discharge (cfs)**	2.5	3.7	7.3	11.0	14.6	21.2	27.7	34.2	40.7	50.9	61.0
Min flow	2.5	0.0	1.2	4.8	8.5	12.1	18.7	25.2	31.7	38.2	48.4	58.5
1-6" (1/2)	3.7		0.0	3.7	7.3	11.0	17.5	24.0	30.5	37.0	47.2	57.3
1-6"	7.3			0.0	3.7	7.3	13.8	20.3	26.9	33.3	43.5	53.7
1-6" & 1-6" (1/2)	11.0				0.0	3.7	10.2	16.7	23.2	29.7	39.9	50.0
2-6"	14.6					0.0	6.5	13.0	19.5	26.0	36.2	46.3
2-6" & 1-8" (1/2)	21.2						0.0	6.5	13.0	19.5	29.7	39.8
2-6" & 1-8"	27.7							0.0	6.5	13.0	23.2	33.3
2-6", 1-8" & 1-8" (1/2)	34.2								0.0	6.5	16.7	26.8
2-6" & 2-8"	40.7									0.0	10.2	20.3
2-6", 2-8" & 10" (1/2)	50.9										0.0	10.1
2-6", 2-8" & 10"	61.0											0.0
Down-Ramping												
		Change in Discharge (cfs) per Ramping Step										
	Valve Setting >>>	2-6", 2-8" & 10"	2-6", 2-8" & 10" (1/2)	2-6" & 2-8"	2-6", 1-8" & 1-8" (1/2)	2-6" & 1-8"	2-6" & 1-8" (1/2)	2-6"	1-6" & 1-6" (1/2)	1-6"	1-6" (1/2)	Min flow
Initial Setting	**Total Discharge (cfs)**	61.0	50.9	40.7	34.2	27.7	21.2	14.6	11.0	7.3	3.7	2.5
2-6", 2-8" & 10"	61.0	0.0	-10.1	-20.3	-26.8	-33.3	-39.8	-46.3	-50.0	-53.7	-57.3	-58.5
2-6", 2-8" & 10" (1/2)	50.9		0.0	-10.2	-16.7	-23.2	-29.7	-36.2	-39.9	-43.5	-47.2	-48.4
2-6" & 2-8"	40.7			0.0	-6.5	-13.0	-19.5	-26.0	-29.7	-33.3	-37.0	-38.2
2-6", 1-8" & 1-8" (1/2)	34.2				0.0	-6.5	-13.0	-19.5	-23.2	-26.9	-30.5	-31.7
2-6" & 1-8"	27.7					0.0	-6.5	-13.0	-16.7	-20.3	-24.0	-25.2
2-6" & 1-8" (1/2)	21.2						0.0	-6.5	-10.2	-13.8	-17.5	-18.7
2-6"	14.6							0.0	-3.7	-7.3	-11.0	-12.1
1-6" & 1-6" (1/2)	11.0								0.0	-3.7	-7.3	-8.5
1-6"	7.3									0.0	-3.7	-4.8
1-6" (1/2)	3.7										0.0	-1.2
Min flow	2.5											0.0

Notes: The maximum hourly rate of change is ≦10 cfs/hr for up-ramping and ≅ 8 cfs/hr for down-ramping. Discharge estimates assume a water surface elevation of 1,766 feet. Discharge values will vary depending on the actual water surface elevation (see Table 2.3-1). To use the Table when making changes to the Goshen Dam outlet valves, first determine the initial valve setting. Read the Table across to determine maximum allowable hourly change in discharges. Shading indicates the maximum allowable hourly change in discharge that corresponds with initial valve setting. If additional changes are desired, wait one hour prior to the next change in valve settings.

Figure 2.3-2: Goshen Dam Pond Level Sensor and Relay.

Figure 2.3-3: Goshen Dam Outlet Valve Nest.

3.0 Sucker Brook Diversion Dam

3.1 Description of Project Works

The Sucker Brook Diversion Dam is located approximately 2.6 miles downstream of the Sugar Hill Reservoir. The dam consists of a 665-foot-long earthen section, and a 60-foot-long concrete spillway section that impounds a 0.25-acre reservoir. The normal headpond elevation is 1,288 feet, which is 18 feet below the crest of the emergency spillway section. There is no leakage at the Diversion Dam at normal operating levels (AIR No. 4, CVPS 1995).

The Diversion Dam has negligible storage capacity, and diverts water from Sucker Brook and Dutton Brook into a 7,000 foot long penstock that leads to Silver Lake. The intake structure can be controlled by a manually operated, 3 foot by 4 foot, timber headgate which is normally in the up position.

CVPS currently operates the Project to maintain the normal operating water level at the Sucker Brook Diversion Dam of 1,288 feet msl in accordance with Article 404. Inflows to Diversion Dam from Sucker Brook can be controlled from upstream by adjusting the discharge from Sugar Hill Reservoir. These inflows from Goshen Dam, along with natural runoff from Dutton Brook, merge at Diversion Dam and are conveyed to Silver Lake. The elevation behind Sucker Brook Diversion Dam increases as natural inflows from Dutton Brook increase, or in relation to releases from Goshen Dam.

3.2 License Requirements

The FERC license and associated WQC contain two specific requirements related to flow and water level management at Sucker Brook Diversion Dam. Article 404 of the license requires that CVPS maintain a normal water surface elevation of the pond created by the Diversion Dam. The VT WQC Conditions B and F require CVPS to develop a method to maintain minimum conservation flows of 2.5 cfs (or inflow, if less) below Sucker Brook Diversion Dam.

Specifically, Article 404 of the license states:

> *Sucker Brook Diversion Dam Pond. The licensee shall maintain a normal water surface pond elevation of 1,288 feet United States Geological Survey datum upstream of the Sucker Brook diversion dam. The pond elevation may be temporarily modified if required by operating emergencies beyond the control of the licensee, or for short periods upon mutual agreement between the licensee and the U.S. Fish and Wildlife Service (FWS) and Vermont Agency of Natural Resources (Vermont ANR). If the flow is so modified, the licensee shall notify the Commission, the FWS, and the Vermont ANR as soon as possible, but no later than 10 days after each such incident.*

Condition F of the Vermont WQC states:

> *The applicant shall develop a plan, including descriptions, hydraulic design calculations, an implementation schedule, and design drawings for the measures to be used to release the bypass flows at the Sucker Brook diversion dam. The plan shall be developed in consultation with the Department and the U.S. Fish and Wildlife Service and shall be subject to Department approval. Said approval may be conditional on field verification of the flow releases. The Department reserves the right of review and approval of any material changes made to the plan at any time.*

3.3 Minimum Flow Release

CVPS has developed a method to maintain minimum conservation flows of 2.5 cfs (or prorated inflow, if less) below Sucker Brook Diversion Dam by tapping the penstock leading to Silver Lake. Final design plans including hydraulic calculations for providing the minimum flow release at Diversion Dam are provided in Appendix A.

A sump with a simple fixed orifice (i.e., pipe and gate valve) located 1-foot above the bottom of the sump would be used to control the amount of water diverted for the minimum flow release. The sump would be located underneath the Diversion Dam outlet pipe near the downstream toe of the dam as shown in the drawings in Appendix A. The sump would be accessed though a manhole located directly above, that would allow for periodic cleaning of the sump in the event of sediment or debris accumulation. A V-notch weir at the outlet box is proposed to provide a means for visual observation and confirmation of minimum flow release through the penstock tap.

When inflows and water levels decline at Sugar Hill Reservoir and CVPS is releasing reservoir inflows instead of the 2.5 cfs conservation flow (e.g., during drought conditions when Sugar Hill Reservoir is eight feet below normal (1758 feet)), CVPS will estimate the flow at Diversion Dam by multiplying the Sugar Hill Reservoir release (estimated through the outlet V-notch discharge) by the watershed area proration (9.6:2.6) of four. CVPS proposes to install a staff gage on the V-notch weir at the Goshen Dam outlet to allow for calculation of the discharge when less than 2.5 cfs. Table 3.3-1 below was created to estimate discharge based on flow through the V-notch weir at Goshen Dam outlet. If the resulting estimate is less than 2.5 cfs at Diversion Dam, the conduit tap discharge will be adjusted by referencing a similar V-notch weir integral with the penstock tap at Sucker Brook Diversion Dam, as shown in Appendix A.

The initial designs were revised based on a telephone conference between CVPS and VANR on February 12, 2010. The two issues raised were: 1) turbulence at the outlet box may result in an inaccurate flow reading of the staff gage placed adjacent to the V-notch weir, and 2) turbidity of the discharges entering the channel from the 18" pipe while flushing the sand trap. VANR asked if CVPS could consider options to address these issues.

The designs were revised to add a baffle to the outlet box at the downstream end of the diversion pipe at Sucker Brook Diversion Dam. This will alleviate concerns related to turbulence of the discharge and allow for an accurate staff gage reading.

Regarding options for placement of the flushing flow, while the frequency of the flushing flows is not known yet, the sand trap will be checked regularly and flushed as needed. This may occur once or twice per week initially after installation. The flushing process normally takes less than five minutes to complete. CVPS investigated options including diverting the flow away from the outlet, and determined that the original location was the preferred option.

The channel at the outlet is not formed yet. It is expected that upon release of the minimum flows, a channel will establish through the forested area until it meets the existing channel, approximately 200 feet downstream. From a geomorphic perspective, the sediment provided to the diversion channel is needed for the natural channel formation process. Substrates from upstream are required for stream channel development. Without the coarser substrate material, the channel may not develop properly (e.g., incise), resulting in a poor channel condition.

The flows carrying the flushed sediment will be higher than the minimum flow and will therefore spill over the channel banks and should deposit sediment on the forested "floodplain." The flushing discharge location will also prevent long-term sediment build-up at the outlet from the continuous minimum flow discharges. In addition, the initial discharge flows into rip-rap, so some of the suspended sediment will get trapped there as well.

The flushing flows will be provided to the diversion channel, as initially intended. Any short-term effects on aquatic biota from turbid discharges are unavoidable in order to ensure that the minimum flow pipe is functioning properly and that the geomorphic condition of the new channel remains stable once it is developed.

The following is the approximate schedule for the process and the improvements to be implemented.

February 2010	Submit Final Plan to FERC
TBD, if necessary	Finalize Plan According to FERC Decision
Spring 2010	Determine and Address Regulatory Requirements
April 2010	Solicit Proposals from Contractors to Implement Improvements
May 2010	Review Contractor Proposals and Make Selection
Summer 2010	Begin Construction
Fall 2010	Complete Construction

Table 3.3-1: Look-Up Table for Sucker Brook Diversion Dam when Discharges are less than 2.5 cfs at Goshen Dam.

Sugar Hill Reservoir		Sucker Brook Diversion Dam
Head over V-notch weir	**Discharge (cfs)**	**Required Minimum Discharge (cfs)**
0.1	0.01	0.03
0.2	0.04	0.18
0.3	0.12	0.49
0.4	0.25	1.01
0.5	0.44	1.77
0.6	0.70	2.50
0.7	1.02	2.50
0.8	1.43	2.50
0.9	1.92	2.50
1.0	2.50	2.50

Note: Flows through the V-notch weir were calculated based on the equation: $Q = 2.5\tan(q/2)*H^{2.5}$, where $\tan(q/2) = 1$ for a 90-degree weir.

4.0 Silver Lake

4.1 Description of Project Works

Silver Lake is a seasonal storage reservoir and receives flow from the Sucker Brook Diversion Dam. Project-related structures include the Silver Lake Dam consisting of a 257-foot-long, 30-foot-high buttressed concrete with earthfill section and an 18.5-foot-wide concrete section; an intake structure with steel trashracks; a 60-foot-long intake and outlet structure equipped with a slide gate; and a 5,200-foot-long penstock leading to the Silver Lake powerhouse. The intake structure at Silver Lake Dam contains two sets of trashracks; one at the submerged intake structure and one inside the outlet structure. There is also a sluice way in the stoplog section of the dam which was constructed in 1998. Silver Lake at full pond has a surface area of approximately 110 acres. The non-overflow portion of the dam has a crest elevation of 1,259 feet.

Flows from Silver Lake are directed into a 5,200 foot long penstock to supply the powerhouse located 450 yards upstream of the confluence of Sucker Brook and Lake Dunmore. The project powerhouse contains one 2,200 kilowatt unit that generates at a net head of approximately 645 feet and uses a flow of approximately 60 cfs.

4.2 License Requirements

The FERC license and associated WQC contain specific requirements related to flow and water level management at Silver Lake. Specifically, the certification requires water levels at Silver Lake to be maintained between 1,245.5 and 1,247.5 feet msl from June 1 through November 30, with a maximum winter drawdown to elevation 1,239.5 feet msl between December 1 and May 31. From March 15 through May 31, the lake levels would be held stable or allowed to rise. Table 4.2-1 displays the water level management restrictions at Silver Lake as specified in the Vermont WQC Condition B.

Table 4.2-1: Silver Lake Water Level Management.

Season	Water Level Elevation
Summer/fall operating range (June - November)	1245.5 - 1247.5 feet msl
Winter/spring maximum drawdown (December - May)	Minimum: 1239.5 feet msl
March 15 - May 31 water level mgmt.	rising or stable

Additional license requirements for Silver Lake addressed in this section include:

- Ramping of flow changes through the Silver Lake powerhouse
- Fish exclusion from the Silver Lake tailrace
- Special operations for smelt spawning protection

Condition D of the Vermont WQC states:

> *Ramping plan at Station Tailrace. The applicant shall develop a down-ramping plan to govern reductions in the station discharge in order to prevent stranding and mortality to downstream aquatic organisms. The plan shall be developed in consultation with the Department, the Vermont Department of Fish and Wildlife, and the U.S. Fish and Wildlife Service and shall be subject to Department approval. The Department reserves the right of review and approval of any material changes made to the plan at any time.*

Condition J of the Vermont WQC states:

> *Fish Exclusion from Station Tailrace. The applicant shall continue to maintain a device at the lower end of the station tailrace to prevent fish from ascending the tailrace and becoming stranded. Any proposal to modify the design shall be subject to Department approval.*

Condition E of the Vermont WQC requires special operations during smelt spawning season in the spring and Condition L requires CVPS to provide VANR with a copy of the turbine rating curves, accurately depicting the flow/production relationship, for the record within one year of the issuance of the license (by February 26, 2010). The turbine rating curve for Silver Lake is contained in Appendix B.

4.3 Water Level Management

CVPS will operate Silver Lake to maintain surface water elevations in accordance with the new license. Under normal operating conditions, Silver Lake elevation will remain between 1,247.5 feet and 1,245.5 feet (NGVD 29) from June 1 through November 30. CVPS will then draw down the lake level to an elevation between 1,239.5 and 1,242.5 feet from December 1 through May 31, then refill the lake by June 1. The curve depicting the Silver Lake surface water operating rule is shown in Figure 4.3-1.

The outlet structure at the dam contains a slide gate which regulates flow into the penstock. The gate is electrically operated and capable of being controlled locally and closed from the CVPS Control Center in Rutland. There is also a three foot square low level waste gate that discharges excess flows downstream of the spillway. The pond level sensor (float gauge) at Silver Lake is tied into SCADA.

The Control Center in Rutland checks the reservoir elevation via SCADA and is in daily contact with operators to determine what adjustments are needed to comply with the rule curve. Typically, Silver Lake elevation does not change more than a couple of inches per day or more than one foot per week.

When determining the maximum drawdown level of Silver Lake, again the timing of the smelt run (early April) and the associated environmental conditions are considered. The lower limit of the rule curve (Figure 4.3-1) corresponds to start of smelt spawning. The initiation of smelt spawning is concurrent with increased run-off due to ice melt, and therefore increased flows available for reservoir storage. CVPS operates the Silver Lake turbine to keep levels below full pond; if full, operation at reduced capacity during nighttime in accordance with the smelt operations protocols is not possible. Additional details of the operations followed during smelt spawning are provided in Appendix C.

4.4 Ramping Plan for Silver Lake Powerhouse Tailrace

In accordance with Condition D of the Vermont WQC, CVPS is proposing to implement an incremental ramp down sequence when the Silver Lake unit is being brought off-line. The objective of this down-ramping plan is to govern reductions in the station discharge in order to prevent stranding and mortality to

downstream aquatic organisms. Specifically, the ramping plan will to allow for safe egress to fish from the 450-foot-long tailrace after shutdown.

When the project is shut down, water does not completely drain out of the tailrace due to recent deposition of bed material in Sucker Brook at the confluence with the tailrace. This hydraulic control allows several inches of water to remain in the tailrace channel when the Project is not operating. In addition, the fish exclusion device described in the next section prevents larger fish from entering the tailrace at any time. Therefore, the ramp-down sequence is designed to allow smaller fish to exit the tailrace channel by swimming downstream through the fish exclusion racks when the unit is shut down. The clear spacing on the fish exclusion racks is 1.5 inches.

A ramping study at the Silver Lake project was performed during the license application phase in November 1994. The study (AIR No. 5, CVPS 1995) evaluated the rate of habitat change in Sucker Brook related to Silver Lake project operation and was performed in consultation with the Vermont Department of Fish and Wildlife and the U.S. Fish and Wildlife Service. A down ramping proposal was included in the AIR No. 5, as submitted to the VT DEC and USFWS on January 20, 1995. CVPS proposes to ramp down the station in accordance with this proposal when transitioning to shut-down mode. On the rare occasion when there is an unforeseen shutdown, such as an emergency plant trip, the unit goes off-line in less than two minutes and there are no down ramping procedures that can be safely followed.

To minimize stranding potential, CVPS will change the existing shutdown mode (i.e., a reduction from full load flow of about 60 cfs to no flow in 2 minutes) to a three stage operation, with five minute intervals (i.e., reduction from full load to zero load over a fifteen minute period). This will be accomplished through programming a sequenced shutdown via the existing SCADA system.

Currently, the lowest level the turbine is capable of being run at is approximately half load (equal to about 800 kW). In the case of a manually initiated shutdown from full load, the operator will use the three stage sequence over fifteen minutes to achieve the same results. Upon initiation of shutdown, the operator will ramp down to 75% load and hold for 5 minutes, then decrease generation to the minimum capacity of 50% load (or about 800 kW) and hold for 5 minutes, then proceed to zero load. This will create a more gradual ramping scenario and reduce stranding potential.

4.5 Tailrace Fish Exclusion Device

CVPS shall continue to maintain a device at the lower end of the station tailrace to prevent fish from ascending the tailrace and becoming stranded. A vertical fish exclusion rack was constructed in the tailrace by CVPS in August 1992, to prevent fish from getting stranded when the unit goes off-line. This exclusion rack is currently in place and was inspected on April 20, 2009, as shown in Figure 4.5-1. The top of the rack was slightly below the water surface when the turbine was being run at 800 kW. At the time of inspection, the exclusion device was working effectively as evidenced by the observation of approximately 50 adult fish (sucker family) at the downstream end of the device. These fish were being blocked from moving into the tailrace during generation.

After the floods of August 2008, the channel morphology of Sucker Brook changed such that deposition at the confluence of the tailrace and Sucker Brook causes generation flows to backwater near the location of the fish exclusion device. CVPS operators will continue to monitor the effectiveness of this exclusion device. Per condition J of the Vermont WQC, any proposal to modify the design shall be submitted to VANR for approval.

4.6 Smelt Spawning

When annual smelt spawning begins in the spring, CVPS operates the Silver Lake turbine either in a reduced capacity or no generation at night to allow spawning rainbow smelt to lay eggs in the watered channel. During the daytime, the project is operated continuously to maintain spawning and incubation habitat in Sucker Brook downstream of the project tailrace. This mode of operation continues until physical observations are made regarding the hatching of the eggs and the juvenile smelt move out of the spawning area.

The smelt spawning report for 2009 (submitted to Vermont resource agencies in August) includes the revised operations and monitoring protocols in accordance with Condition E of the Vermont WQC. The revised protocol is appended to this plan in Appendix C.

Figure 4.3-1: Silver Lake Operating Rule Curve for Water Surface Elevation (NVGD 29).

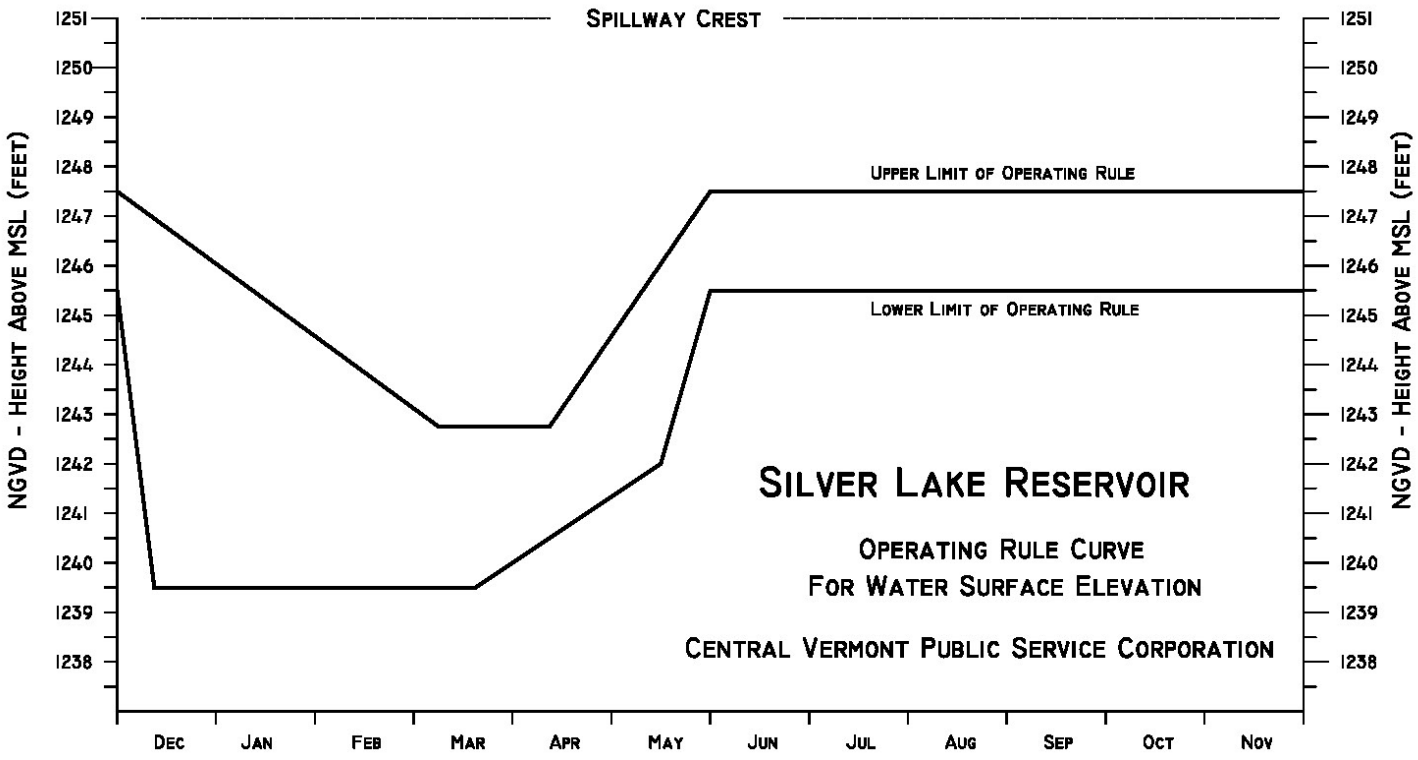


Figure 4.5-1: Silver Lake Tailrace Fish Exclusion Device.

Date of photo: April 20, 2009. Flow is from left to right.

5.0 Monitoring and Reporting

5.1 License Requirements

The Vermont WQC (Condition H) requires CVPS to develop a plan for continuous monitoring of flow releases at the project, both below the dams and below the station tailrace, and reservoir levels and inflows. License Article 402 specifies procedures for CVPS to follow if there is a deviation from reservoir water level or minimum flow requirements. Specifically, Condition H of the Vermont WQC states:

> *The applicant shall develop a plan for continuous monitoring of flow releases at the project, both below the dams and below the station tailrace, and reservoir levels and inflows. The valves at Goshen Dam shall be rated using field testing over the range of reservoir operating levels; the results and methodology used shall be included in the plan. The applicant shall maintain continuous records of flows and reservoir levels and provide such records on a regular basis as per specifications of the Department. The plan shall be developed in consultation with the Department and the U.S. Fish and Wildlife Service and shall be subject to Department approval. The Department reserves the right of review and approval of any material changes made to the plan at any time.*

License Article 402 states:

> *The licensee shall operate the project in accordance with the reservoir levels and minimum flow requirements required by condition B of the water quality certification (Appendix A). Reservoir levels and minimum flow requirements may be temporarily modified if required by operating emergencies beyond the control of the licensee, or for short periods upon agreement among the licensee, the Vermont Agency of Natural Resources (Vermont ANR) and the U.S. Fish and Wildlife Service (FWS). If the reservoir levels or any minimum flow is so modified, the licensee shall notify the Commission, the Vermont ANR, and the FWS as soon as possible, but no later than 10 days, after each such incident.*

In addition, Vermont WQC (Condition L) requires CVPS to provide a copy of the turbine rating curve, accurately depicting the flow/production relationship, for the record within one year of the issuance of the license.

5.2 Monitoring Plan

Impoundment elevation data is measured by water level sensors at Silver Lake and at Goshen Dam, and the readings are transmitted to the CVPS Control Center where hourly records of impoundment elevation are maintained. CVPS monitors project operational data such as real-time elevations and generation output through their SCADA system, which is maintained at their Control Center. The Project's rating curve (Appendix B) showing the discharge rates across the range of turbine output is used to determine flow releases at the Project.

Discharges through Goshen Dam are determined using the valve rating information described in Section 2.3 of this plan. The discharges listed for elevations 1,761 and 1,766 feet will be confirmed through field measurements in 2010, as described in Section 5.3 of this plan. Table 2.3-1 will be updated as necessary. Operators maintain daily logs on-site which are used to record outlet valve settings, as well as water level elevations, turbine output, and other operational notes. Records of Goshen Dam valve settings are also

relayed to the CVPS Control Center for continuous monitoring and storage in spreadsheets. This allows CVPS to maintain the required continuous flow in Sucker Brook below Goshen Dam.

The requirement to maintain records of reservoir inflows (per Condition H of the water quality certification) was discussed with VANR during the development of this plan. CVPS believes that the requirement of inflow recordkeeping is impractical and not necessary for CVPS to operate the project in compliance with the reservoir levels and minimum flow requirements contained in the license. At Sucker Brook Diversion Dam, the unregulated and ungaged Dutton Brook provides flow into the hydro system, supplementing the discharge from Goshen Dam; both of which are diverted into Silver Lake. CVPS noted the difficulty in quantifying inflows into Silver Lake. VANR agreed that as long as CVPS maintains good recordkeeping of Sugar Hill Reservoir and Silver Lake water levels as well as discharge records, then the requirement to maintain records of reservoir inflows was not necessary.

Upon request of VANR, CVPS agreed to perform visual checks on the minimum flow discharges at Goshen Dam and Sucker Brook Diversion Dam to verify that the V-notch weirs and associated staff gages show that sufficient flows are being provided to meet license requirements. CVPS operators will check and record the minimum flow discharges at Goshen Dam by visually inspecting the V-notch at the outlet structure and confirming that it is full during each site visit. CVPS operators will also check and record the discharges at Sucker Brook Diversion Dam when the site is visited to inspect/flush the sediment trap on the diversion device.

The practical measures described in this plan, such as continuous monitoring of reservoir water levels and visual monitoring of the Goshen Dam and Sucker Brook discharges, ensure that the license requirements related to minimum flows and water level management are being met.

5.3 Field Rating of Goshen Dam Discharges

Condition H of the Vermont water quality certification specifies that the valves at Goshen Dam shall be rated using field testing over the range of reservoir operating levels; the results and methodology used shall be included in this plan. In consultation with VANR, CVPS agreed to perform flow measurements of the five valves at Goshen Dam outlet when the reservoir is at elevations 1,766 and 1,761 feet in order to verify the discharge calculations presented in Table 2.3-1. Because CVPS avoids having the water surface elevation of Sugar Hill Reservoir at 1,771 feet due to safety concerns, a field rating is not feasible at this elevation. Also at elevations of 1,758 and 1,748 feet, it was agreed between CVPS and VANR that field rating was not necessary; however, after measuring flows under reservoir elevations of 1,761 and 1,766 feet, the discharge coefficients could be adjusted as necessary for the other reservoir elevations. VANR agreed that the flow measurements could occur during the summer field season, and that the valves can be rated independently due to safety concerns. CVPS will perform the field verification of flows at 1,761 and 1,766 feet in 2010 using standard streamflow measuring techniques in Sucker Brook below Goshen Dam. CVPS also agreed to re-measure the minimum flows below Goshen Dam when the V-notch weir is full to verify that 2.5 cfs is provided. This will be performed during the field rating of the outlet valves.

5.4 Reporting

CVPS will maintain continuous records of station output, impoundment water levels, Goshen Dam outlet valve settings, and discharges at Sucker Brook Diversion Dam and provide such records to agencies upon written request. An example of the spreadsheet used to maintain operational records is provided in Table 5.4-1. CVPS will allow inspection of the Project, including relevant records, upon reasonable notice by VANR, or other authorized agents to determine compliance with license and WQC requirements.

If CVPS determines that minimum flows or surface water elevations deviate from license requirements, then CVPS will self report to FERC, VANR, and USFWS within 10 days of the date the data becomes available regarding the incident in accordance with License Article 402. The report shall, to the extent possible, identify the cause, severity, and duration of the incident, and any observed or reported adverse environmental impacts resulting from the incident.

Table 5.4-1: Example Silver Lake Operations Spreadsheet.

Date/time	Sugar Hill Reservoir		Sucker Brook Diversion Dam	Silver Lake		
	Elevation (ft.)	Valve Setting	Discharge (cfs)	Elevation (ft.)	Turbine Output (kW)	Discharge (cfs)
7/1/2009 1:00	(SCADA)	(Manual Records)	(Manual Records)	(SCADA)	(SCADA)	(SCADA)
7/1/2009 2:00						
7/1/2009 3:00						
7/1/2009 4:00						
7/1/2009 5:00						
7/1/2009 6:00						
7/1/2009 7:00						
7/1/2009 8:00						
7/1/2009 9:00						
7/1/2009 10:00						
7/1/2009 11:00						
7/1/2009 12:00						

Notes: Sugar Hill Reservoir elevation, Silver Lake elevation, and Turbine Output are stored in SCADA. Manual records of Goshen Dam outlet valve settings and discharges at Sucker Brook Diversion Dam (once the diversion device is installed) are also maintained by CVPS but not stored in SCADA. Discharges are calculated based on Goshen Dam valve settings (Table 2.3-1), flow through the V-notch weir at Sucker Brook Diversion Dam, and the turbine rating curve (Appendix B), respectively. Once the PLC program is upgraded and tested in 2010, this table will be populated automatically to provide discharge below the station tailrace calculated from turbine rating curves.

6.0 Consultation

This plan was developed to comply with various conditions in the FERC license and Vermont water quality certification, many of which require consultation with the VANR and USFWS. Additionally, the content of this plan is subject to VANR approval.

A draft of this plan was provided to the VANR and USFWS on July 22, 2009. CVPS is required to submit to FERC documentation of its consultation with the VANR and USFWS. A copy of the correspondence is contained in Appendix D. The specific comments received are addressed below and were incorporated into the final Operations Compliance Plan. The USFWS deferred comment via email dated August 27, 2009. The revised Operations Compliance Plan was submitted to VANR and the Vermont Department of Fish and Wildlife on October 19, 2009 for review and approval.

Email comments were received from VANR on November 6, 18, and 20, 2009, which included a suggestion to ask FERC for another extension in order to resolve outstanding issues and gain VANR approval. On November 23, 2009, CVPS applied for another extension of time to file the final plan by February 21, 2010. FERC approved this request on January 12, 2010.

Two conference calls were subsequently held between CVPS and VANR on January 20 and February 12, 2010 in order to resolve outstanding issues related to the Plan in an attempt to gain VANR approval prior to FERC submittal. This Plan was revised in accordance with the consultation with VANR and re-submitted to VANR for approval on February 17, 2010. VANR responded on February 18, 2010 granting approval of the Operations Compliance Plan. A copy of the correspondence is contained in Appendix D.

6.1 Responsiveness Summary

VANR Comment 1:

Sugar Hill Reservoir Management
In Section 1.2, bottom of p. 2, the plan explains the difference between the local datum and sea level datum, and indicates that elevations are rounded to the closest whole foot throughout the plan. To avoid confusion between the license requirements and the operations plan, please use elevations out to the tenths place, 55.0 feet = 1765.5 feet msl. Please also indicate whether the elevation is NGVD 29 or NAVD 88.

CVPS Response:

CVPS has been using 1,766.0 feet as their normal fund pond elevation for Sugar Hill Reservoir and would like the record to reflect that this elevation is referenced to 50 feet local datum and 0 reference elevation. This is described further in the discussion on Page 2. The reference elevation is brass pin located at the northern end of the dam spillway. CVPS surveyed this elevation as 1772.37 in June 2009, which is based on NGVD 29, surveyed from a USGS disc on the Goshen Road.

VANR Comment 2:

Sugar Hill Reservoir Management

The description of the operation on p. 2 (#1) is not totally accurate. From January through April, the reservoir is to be maintained between elevation 1765.5 feet and the maximum drawdown level of 1747.5 feet. It is to be at elevation 1765.5 feet at the beginning of the period, assuming that does not conflict with the 2.5 cfs "guaranteed" minimum flow. If the reservoir is ice-covered, the winter drawdown can commence. Otherwise it is to be held at 1765.5 feet until the ice cover forms, again assuming that water does not need to be drawn from storage in order to maintain the 2.5 cfs minimum flow. The paragraph in Section 2.3 (p. 7) provides a more complete and accurate description.

CVPS Response:

The description of operations on page 2 has been revised for clarity. Normal full pond should be considered 1,766.0 feet.

VANR Comment 3:

Sugar Hill Reservoir Management
Figure 2.3-1, the reservoir rule curve, should show the upper limit curve going horizontal starting at the earliest expect refill date and the lower curve going horizontal on May 1. The Y axis also should be corrected by 0.5 foot as discussed above. In Section 2.3, please explain how decisions will be made in each individual winter as to what the maximum drawdown level will be.

CVPS Response:

Section 2.3 was revised to clarify Sugar Hill Reservoir drawdowns. The dates depicted in the rule curve (Figure 2.3-1) were developed based on many years of historical operations data. The operations protocols were refined based on many factors, including: the timing of smelt spawning, available snow pack, and precipitation forecasts. CVPS does not agree that the rule curve should be revised.

The earliest expected refill date is part of the ongoing planning process. During smelt spawning, enough water must be available in Sugar Hill Reservoir to account for contingencies in the event of little or no springtime precipitation. Available snowpack is also accounted for when determining the refill date.

Currently, the existing curve corresponds to the smelt operations protocol to allow for operator flexibility. The lower curve was left as is because the lower limit breaks at the last week in April to correspond with the latest observed smelt spawning. During this time smelt may still be spawning which forces CVPS to reduce flows earlier.

The maximum winter drawdown is limited to 1,748 feet. Limited snow pack, and a dry spring may dictate a higher minimum winter elevation. In summary, based on historical operations, CVPS's current proposed rule curve for operating Sugar Hill Reservoir is a practical approach which balances all these factors together.

VANR Comment 4:

Sugar Hill Reservoir Management
Regarding Table 2.3-1, is full pond considered to be at the spillway or at the normal maximum summer pool? Where it indicates that 2.5 cfs is provided by 4 turns on the 6-inch valve, is that referring to the old valve or the new one, as the stem threading apparently differs between the two? Based on the text in

Section 2.4, it is the *first*, or older, valve. It should be clarified in the table. Please explain in the plan how the hydraulic estimates of the flow capacities all of the valves were estimated. If I recall correctly, they are gate valves. Is the half-open setting equal to the midpoint between fully open and the number of turns at which discharge first started (e.g., for the 8-inch valve it would correspond to (3 + 18½)/2 = 10¾ turns)? Is it correct that the valves are only closed, fully opened, or half open? If that is correct, the new operating rules may require an ability to adjust outflows more precisely, in which case installation of a globe valve may be justified. The plan does not explain how the valve(s) will be set to discharge 2.5 cfs except at the full pool elevation.

CVPS Response:

Full pond is considered to be the normal maximum summer pool of 1,766.0 feet.

Four (4) turns on the 6-inch valve is referring to the older valve, which has a valve seat. The newer does not and has finer threads.

It is correct that the valves are gate valves. The valves can be opened or closed at any setting depending on how much water is needed. Generally, with the exception of the 4 turns on the 6-inch valve to provide 2.5 cfs, each valve is kept fully closed, fully opened, or half way, depending on flow and water level management.

Hydraulic estimates were calculated based on a flow through submerged tube calculation.

$$Q = (C)(A)(\text{square root of } 2(g)(h))$$

Where C = Coefficient of discharge, A = Area of opening (sq. ft.), g = gravitational constant of 32.2 fps, and h = head (ft.) from centerline of opening.

The required 2.5 cfs minimum flow is provided by adjusting the valve openings to keep water at the crest of the 12-inch, 90 degree, V-notch weir. The valves are adjusted until the weir is full, thus verifying the 2.5 min flow. If the outlet discharge pool is not full, operators will fine–tune the opening of the valve. The V-notch weir is independent of head. The most practical approach to ensure minimum flow is for the operators to make routine visual observations of flow discharge through the weir. CVPS does not agree that a globe valve is necessary to meet their flow and water management requirements.

The flow through the V-notch weir was calculated based on the equation:

$$Q=2.5\tan(q/2)*H\hat{}2.5$$

Where: tan(q/2) = 1 for 90-degree weir

As noted in the text, the minimum flow over the V-notch weir was field verified.

VANR Comment 5:

Sugar Hill Reservoir Management
In the second paragraph of Section 2.4, there is a reference to elevation 1765.9 feet as 0.1 foot below full pond. Is that correct, or was it 0.4 foot above the true full pond elevation of 1765.5 feet?

CVPS Response:

As previously discussed, full pool is 1766.0 feet.

VANR Comment 6:

Sugar Hill Reservoir Management
Section 2.4 should provide a better explanation of how the reservoir will be managed. During the summer (Table 2.2-1), normal operations will manage the reservoir in the five-foot range below full pool (1765.5 feet). If low inflows cause the pool to decline below elevation 1760.5 feet, the next three feet of storage are dedicated to maintaining a constant release of 2.5 cfs until the reservoir either declines to elevation 1757.5 feet or rises back to the normal summer range. Similarly, the winter operation as related to minimum flows should be described.

CVPS Response:

Section 2.4 was revised for clarity. Minimum flows are normally provided during winter operation by keeping one 6-inch valve half open. Valve stems are maintained to prevent freezing. If ice is found on the V-notch weir, it is removed by the operators.

VANR Comment 7:

Sugar Hill Reservoir Management
The plan does not address the Condition G requirement that "[t]he filing shall include performance expectations for the method and equipment to be used and a supporting calculation brief; this would include consideration of how frequently adjustments to the valve system must be made to meet the goals under different background conditions." One particular challenge will be trying to match inflows when the reservoir falls to elevation 1757.5 feet. Since the reservoir cannot be drawn down below that level, the releases must closely match inflow, which means frequent adjustments without having to correct by reducing outflows below inflows.

CVPS Response:

The discharge capacities of the outlet vales have been updated and are included in Table 2.3-1. Inflows are matched through monitoring of the impoundment water levels and careful coordination with the on-site operation personnel to make valve adjustments. The Control Center monitors reservoir elevation in real time to determine stability. Based on these observations, adjustments are made as needed to maintain inflow. Section 3.3 has been revised to describe how inflows will be provided below Sucker Brook Diversion Dam when Goshen Dam releases are less than 2.5 cfs.

VANR Comment 8:

Ramping Outflows from Sugar Hill Reservoir
Condition C of the water quality certification envisioned CVPS consulting with the Department of Fish and Wildlife in developing a ramping proposal below Goshen Dam. That consultation does not appear to have occurred. The only ramping restriction that is apparent in the description is that it takes five minutes to open (and presumably close) a valve. Assuming there is only one operator, the transition between 2.5

cfs (0.96 csm) and 70 cfs (26.9 csm, all valves open) would take about 28 minutes, or from 2.5 cfs to 25 cfs (one 6-inch valve at the minimum and one 10-inch valve fully open) would take 5 minutes. There is no substantiation of why this is an acceptable rate of change for downstream flows.

CVPS Response:

CVPS's substantiation of why their current ramp down procedure is an acceptable rate of change for downstream flows is provided in Section 2.5. The scenario presented in the comment above, where CVPS operators transition the Goshen Dam discharge from minimum flow to all valves fully opened, is unrealistic and has never occurred at the Project. The more likely scenario is that CVPS operators would open the second 6-inch and possibly an 8-inch valve and let things run. Based on daily weather and run-off conditions, the valve settings would then be iteratively adjusted over the next day or two if needed. The same procedures are followed for down ramping, i.e. the largest valves are closed first, progressing to the smaller ones.

Considering this is a remote, unmanned site, CVPS believes this mode of operations is practical and can be continued in order to manage flow and water level constraints while still protecting Sucker Brook habitat.

The Vermont Department of Fish and Wildlife has been provided a copy of this plan. Comments received will be included in Appendix D.

The Final Plan has been revised to reflect CVPS's commitment to implement both up- and down-ramping protocols, as described in Section 2.5.

VANR Comment 9:

Sucker Brook Diversion Dam
Condition F of the water quality certification requires CVPS to develop a plan for providing the minimum flow release in consultation with the Department and the U.S. Fish and Wildlife Service. The draft operations compliance plan provides a conceptual design and indicates that supporting documentation is forthcoming. Construction is proposed for summer 2010. Until complete, no minimum flow will be provided below the diversion dam. When 2.5 cfs or higher flows are being released from Sugar Hill Reservoir, 2.5 cfs will be released at the diversion dam. Otherwise, the flow at the diversion dam will be estimated by multiplying the Goshen Dam release by four and, if less than 2.5 cfs, "the conduit tap discharge will be adjusted accordingly." If I understand the latter correctly, that would mean that no flows will be diverted to Silver Lake under those conditions. It should be so stated for clarity.

CVPS Response:

Section 3.3 has been revised to clarify that when flows less than 2.5 cfs are being released from Sugar Hill Reservoir, the required flow at the diversion dam will be estimated by multiplying the Goshen Dam release by four and, if less than 2.5 cfs, the conduit tap discharge will be adjusted by setting the discharge according to the flow through the V-notch weir at Goshen Dam.

No flows will be diverted to Silver Lake under the above scenario unless inflows from Dutton Brook are in excess of the required flow per the calculation minus Goshen discharges.

The final design submittal will include rating tables.

VANR Comment 10:

Sucker Brook Diversion Dam
The plan indicates that the V-notch weir at Goshen Dam will be used to estimate the outflow. It is unclear how accurately flows through the V-notch can be estimated. As mentioned before, the method for estimating the valve discharges was not provided, except for the 2.5 cfs minimum. I would suggest installing a globe valve with a full capacity of 2.5 cfs and using its rating for lower flow instead of using the V-notch weir. That would avoid issues with access, winter icing, and the presence of significant approach velocities.

CVPS Response:

CVPS proposes to install markings in 0.1 foot increments on the V-notch weir at the Goshen Dam outlet to allow for calculation of the discharge when less than 2.5 cfs as described in Section 3.3. Similarly, a V-notch weir is proposed for use at the diversion dam. Design details are attached.

CVPS does not agree that a globe valve is necessary to meet flow and water management requirements.

VANR Comment 11:

Sucker Brook Diversion Dam
Regarding the conceptual design proposal for the minimum flow device, it will need to have the ability to pass all of inflows at certain times. So the hydraulics of the sump grate and its elevation relative to the downstream conduit invert are important. Preventing debris from accumulating on the grate or reaching the valve are also important considerations. Having a system that relies on periodic cleaning of the sump to work is problematic for a number of obvious reasons. One option to consider is eliminating the valve and instead using a stoplog structure at the discharge point. The stoplogs could initially be raised or lowered experimentally to establish the correct height for 2.5 cfs. That would avoid having a valve that may become plugged with debris.

The final design should be incorporated in the plan after approval.

CVPS Response:

Design details are provided in Section 3.3 and Appendix A of this plan. Given the penstock tap location, slope and distance to the discharge outlet, CVPS does not agree with the stoplog structure concept described. Such a structure would be impractically large, and prove difficult for maintenance and regulation of conservation flows. The penstock tap design incorporates an appropriately sized sand trap sump section adjacent to the valve and will be easily accessible for operator inspection and maintenance when needed. Flows through the penstock tap and V-notch weir at the discharge outlet will be visually observed by the operator as part of the routine checks made at Diversion Dam.

VANR Comment 12:

Silver Lake Water Level Management

As with Sugar Hill Reservoir, the plan should indicate how the maximum drawdown level will be determined each year as constrained by the need to refill to the summer level and to provide spring outflows that are consistent with the smelt management protocol. Section 4.3 suggests that the lake is drawn down to 1239.5 feet from December 1 through May 31. The rule curve (Figure 4.3-1) says the lake is drawn down to an elevation between 1239.5 and 1242.5 feet.

CVPS Response:

As with Sugar Hill Reservoir, the timing of the smelt run and the associated environmental conditions are important factors in determining the maximum drawdown level of Silver Lake. When determining the maximum drawdown level of Silver Lake, again the timing of the smelt run and the associated environmental conditions are considered. The lower limit of the rule curve corresponds to start of smelt spawning. The initiation of spawning is usually concurrent with increased run-off due to ice melt, and therefore increased flows available for reservoir storage. CVPS operates Silver Lake turbine to keep levels below full pond (if Silver Lake is full, the station can't run at a reduced capacity during nighttime). Section 4.3 was revised for clarity.

VANR Comment 13:

Tailrace Ramping Plan
Section 4.4 proposes a specific ramping protocol for testing purposes to insure that smaller fish that clear the fish rack (Section 4.5) have an opportunity to evacuate the tailrace as the water level drops. When the test is planned, Department of Fish and Wildlife staff should be notified so that they can observe. The final plan should reflect whatever ramping protocol is agreed upon with the Department of Fish and Wildlife. Although Condition D is not clear with respect to the extent of downstream impact to be covered by the ramping plan, Finding 80 clarifies that it relates to primarily to Sucker Brook and not the tailrace channel. Ramping was the subject of FERC Additional Information Request #5, and I believe that CVPS's current proposed ramping protocol is consistent with the proposal made at that time. When the protocol is tested, we would suggest monitoring both the brook downstream of the tailrace and the tailrace itself.

CVPS Response:

CVPS's current proposal for ramp down procedures is consistent with that described in FERC Additional Information Request #5. In responding to this request, CVPS examined the downstream channel. Quantitative field measurements of velocity, depth and wetted width were collected in the downstream channel across three transects. Based on the results of this study, CVPS proposed to implement the ramp down sequence described in Section 4.5 of this plan. Once the minimum flow device is installed at Sucker Brook Diversion Dam, at least 2.5 cfs will be provided to the portion of Sucker Brook that bypasses the powerhouse.

The Vermont Department of Fish and Wildlife has been provided a copy of this plan. Comments received will be included in Appendix D.

VANR Comment 14:

Smelt Spawning Protection Operating Protocol
Condition E of the water quality certification requires that the 1998 protocol be updated to incorporate certain revisions. The 2009 annual report (*Smelt Spawning protection Monitoring Protocol and 2009*

Results, CVPS, August 2009) discusses the revisions and appends a copy of the 1998 protocol. Please revise the protocol and append it to the operations compliance plan.

CVPS Response:

The revised operating protocol, extracted from the August 2009 Smelt Spawning Report, is included in Appendix C.

VANR Comment 15:

Monitoring Plan for Reservoir and Flow Management
Please include the text of Condition H in Section 5.1.

Again, the Goshen Dam valves need to rated for the range of water levels over which they are employed and for all the potential individual valve settings.

The reporting information must include the valve settings for Goshen Dam and the corresponding outflow estimate. All the information must be in a spreadsheet format that is easily interpreted relative to compliance. The Sugar Hill Reservoir data should include an estimate of hourly inflow based on the valve(s) discharge and the change in storage contents. Similarly, Silver Lake should include hourly inflow based on station generation and change in storage contents.

The spreadsheets should include plots of the actual water levels against the rule curves and include compliance checking functions.

I recommend that a monitoring report be filed with the Department after the first three months so that we have an opportunity to provide feedback.

CVPS Response:

The text of Condition H was added to Section 5.1.

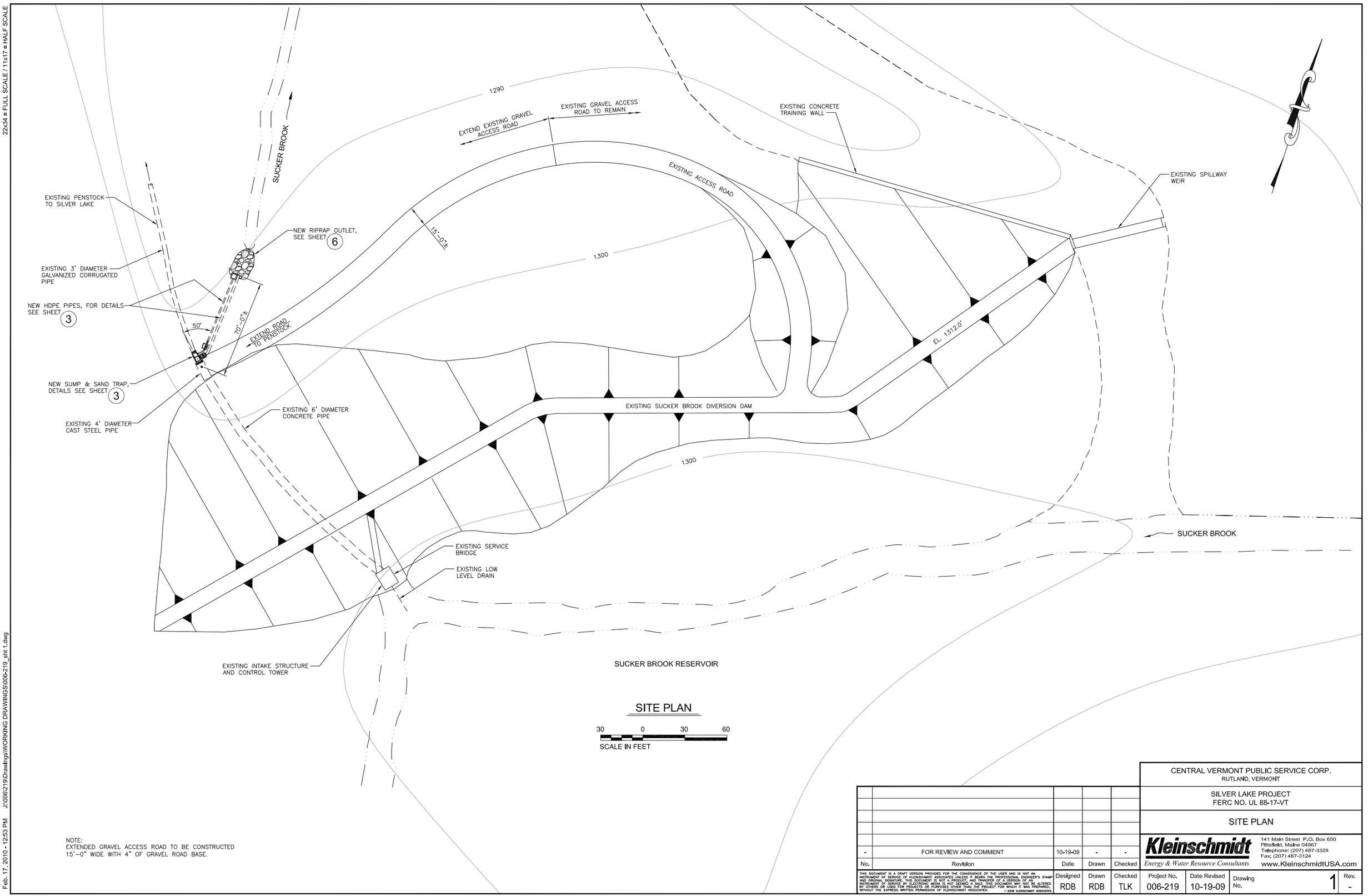
Table 2.3-1 provided in this plan provides discharge estimates of the outlet valves at Goshen Dam which correspond to various reservoir operating levels. As described in Section 5.3, CVPS agreed to perform flow measurements of the five valves at Goshen Dam when reservoir elevations are at elevations 1,766 and 1,761 feet in order to verify the calculations presented in Table 2.3-1.

CVPS utilizes a SCADA system for data storage. SCADA records include Sugar Hill Reservoir elevation, Silver Lake elevation, and turbine discharge. Discharges from Goshen Dam are recorded from operators' notes. Spreadsheets will be maintained by CVPS and provided to agencies upon request; an example is provided in Table 5.4-1.

As described in Section 5.2, CVPS and VANR agreed that as long as CVPS maintains good recordkeeping of Sugar Hill Reservoir and Silver Lake water levels as well as discharge records, then the requirement to maintain records of reservoir inflows was not necessary.

Appendix A: Penstock Tap Design for Minimum Flow below Sucker Brook Diversion Dam

22x34 = FULL SCALE / 11x17 = HALF SCALE



SITE PLAN

30 0 30 60

SCALE IN FEET

NOTE:
EXTENDED GRAVEL ACCESS ROAD TO BE CONSTRUCTED 15'-0" WIDE WITH 4" OF GRAVEL ROAD BASE.

No.	Revision	Date	Drawn	Checked
-	FOR REVIEW AND COMMENT	10-19-09	-	-

Designed	Drawn	Checked
RDB	RDB	TLK

CENTRAL VERMONT PUBLIC SERVICE CORP.
RUTLAND, VERMONT

SILVER LAKE PROJECT
FERC NO. UL 88-17-VT

SITE PLAN

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Project No.	Date Revised	Drawing No.	Rev.
006-219	10-19-09	1	-

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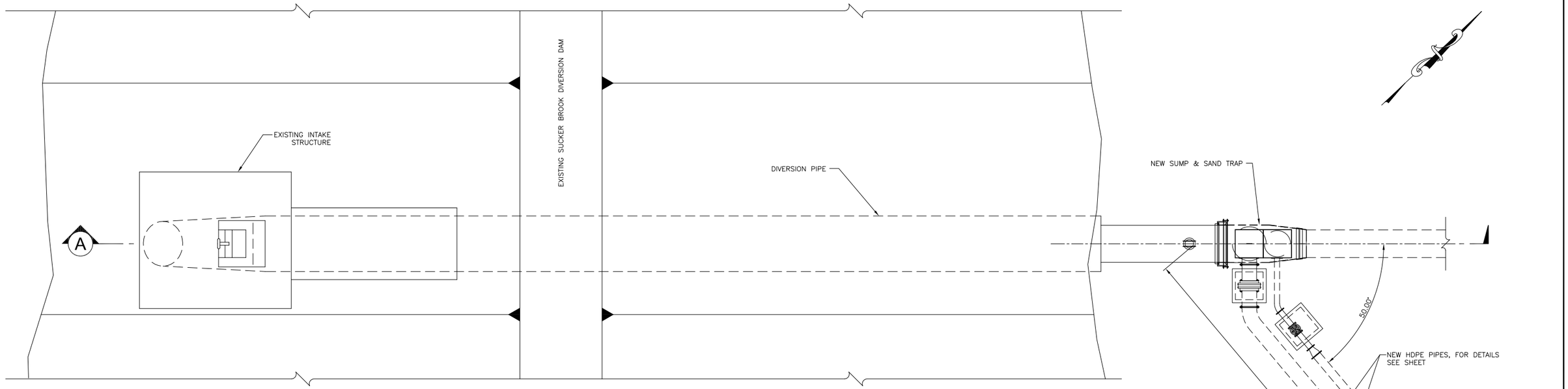
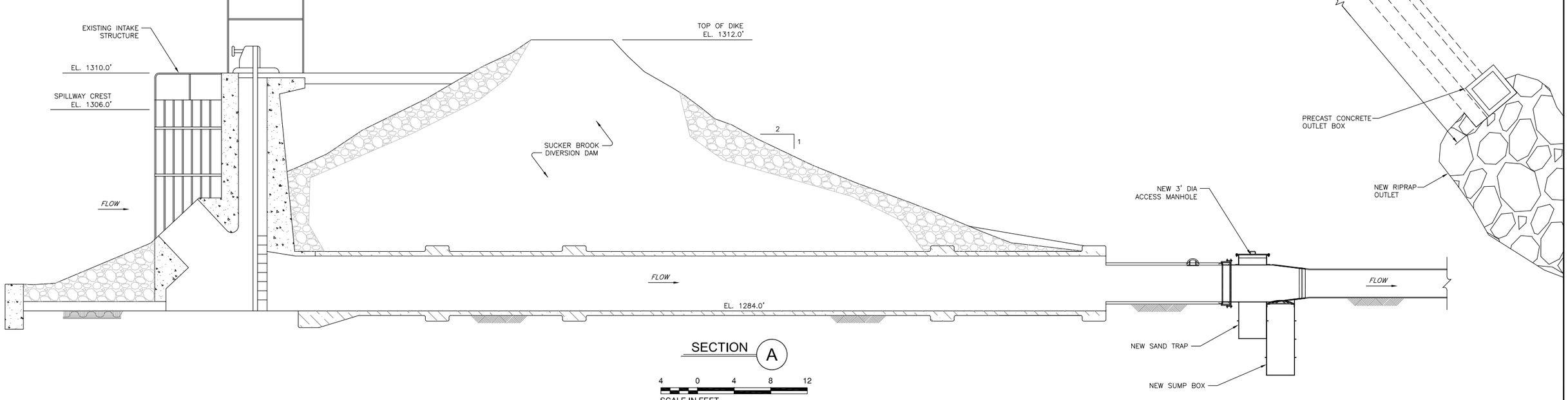


GENERAL PLAN

4 0 4 8 12

SCALE IN FEET



SECTION A

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SCALE IN FEET

No.	Revision	Date	Drawn	Checked
-	FOR REVIEW AND COMMENT	10-19-09	-	-

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Project No.	Date Revised	Drawing No.	Rev.
006-219	10-19-09	2	-

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SILVER LAKE PROJECT
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GENERAL PLAN AND SECTION

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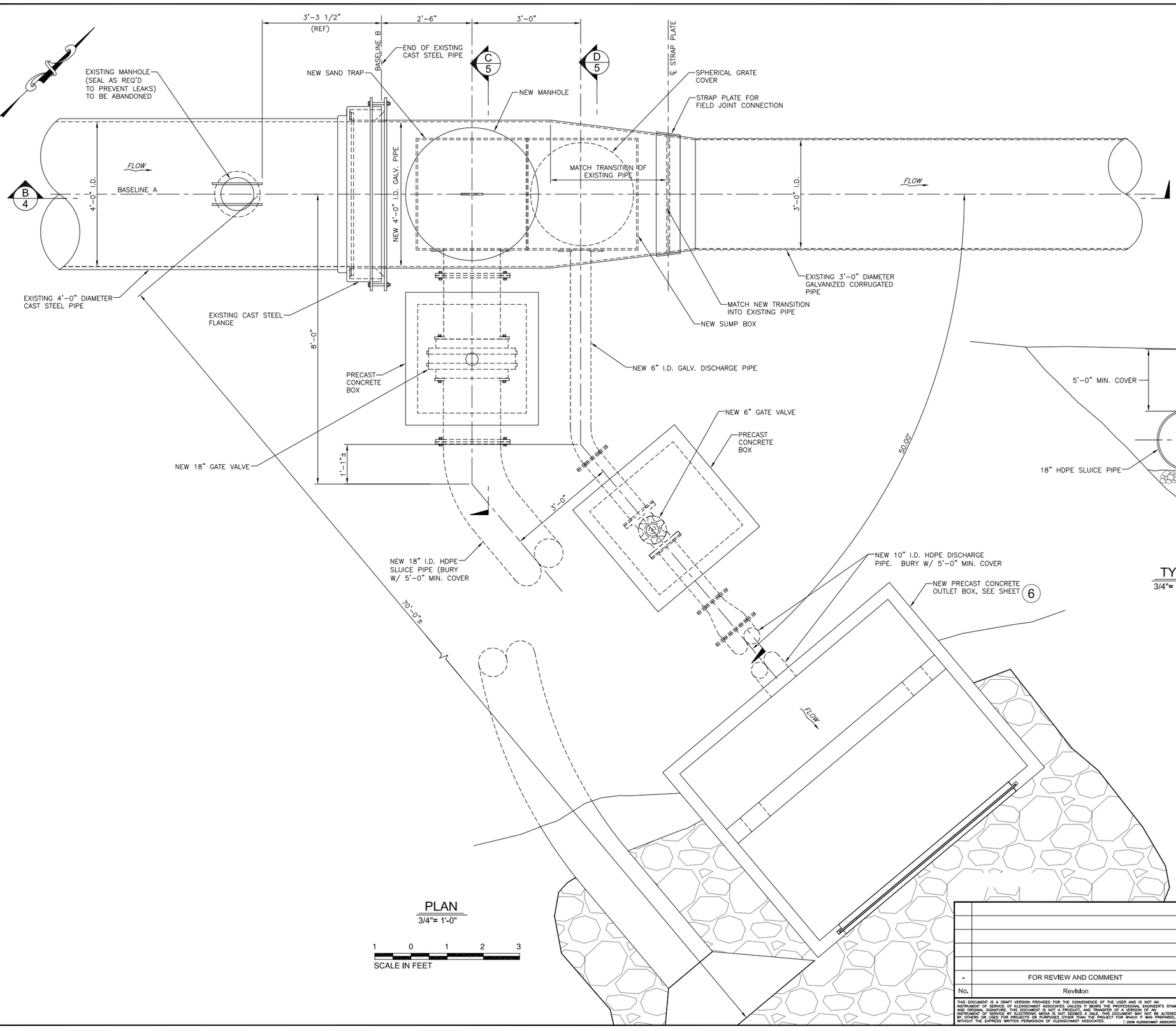
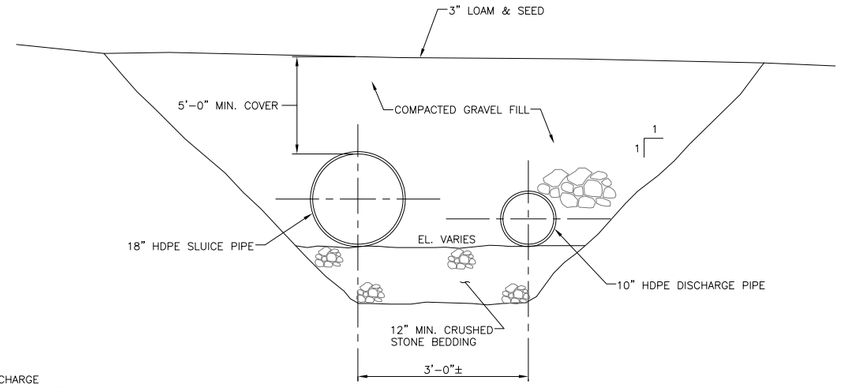


PLAN
3/4"= 1'-0"

1 0 1 2 3
SCALE IN FEET



TYPICAL PIPE TRENCH DETAIL
3/4"= 1'-0"

No.	Revision	Date	Drawn	Checked
-	FOR REVIEW AND COMMENT	10-19-09	-	-

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PLAN

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Project No.	Date Revised	Drawing No.	Rev.
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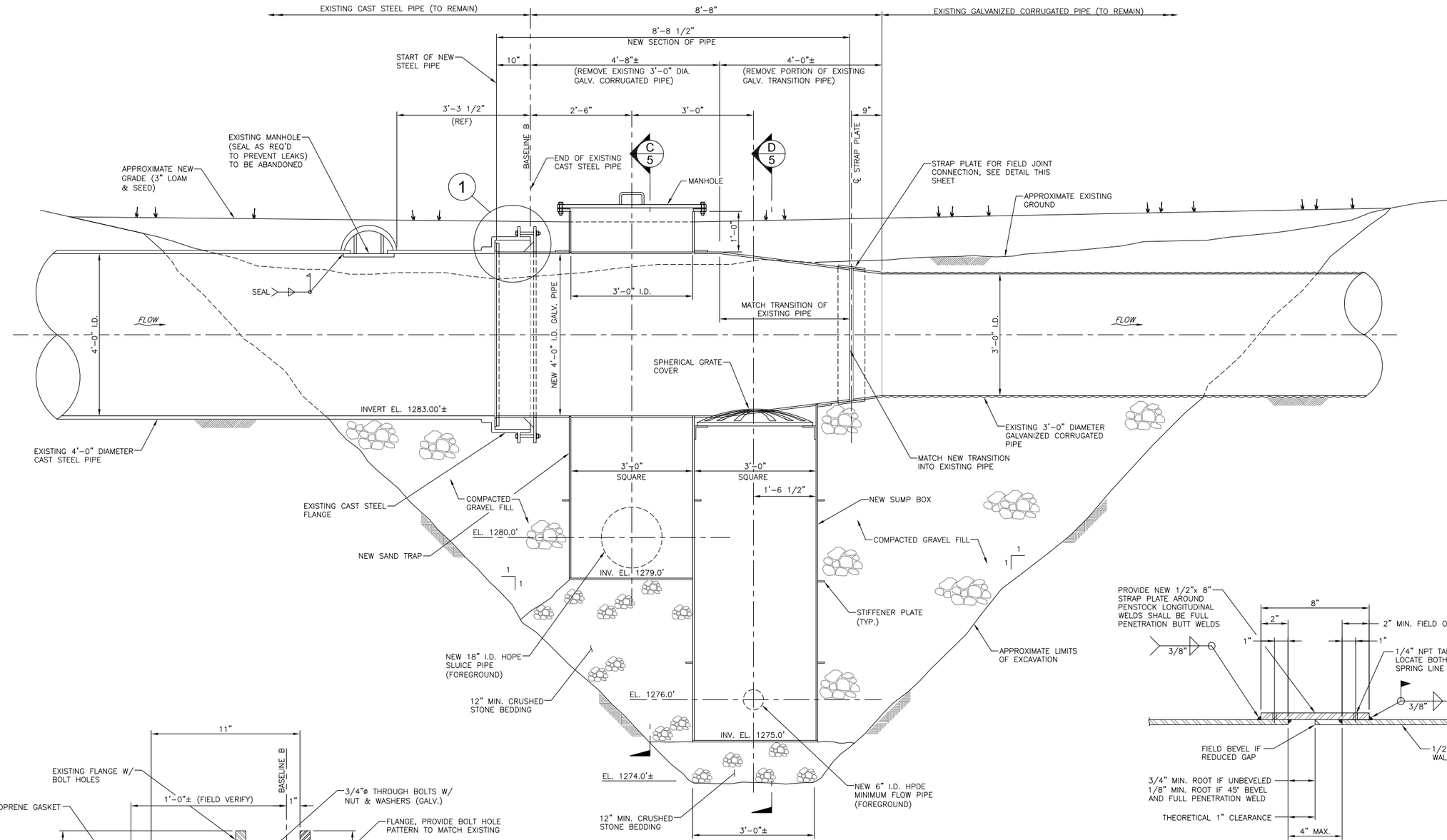

SECTION B / 3
3/4"= 1'-0"

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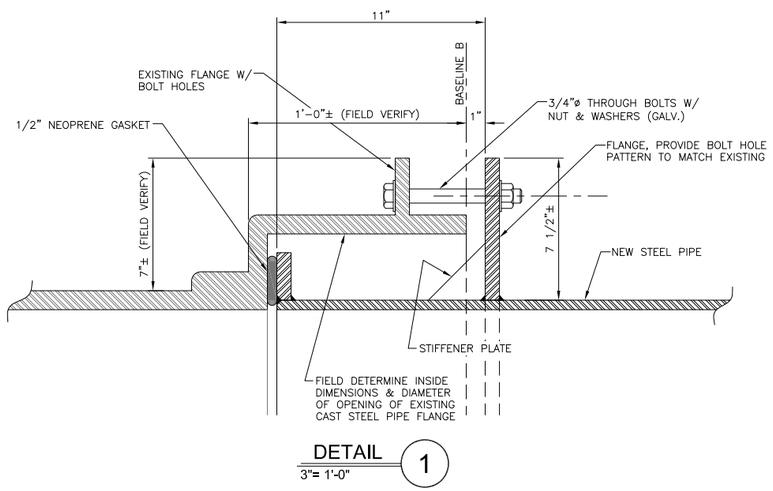
SCALE IN FEET



DETAIL 1
3"= 1'-0"

TYPICAL FIELD JOINT CONNECTION DETAIL
3"= 1'-0"

No.	Revision	Date	Drawn	Checked
-	FOR REVIEW AND COMMENT	10-19-09	-	-

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SECTIONS & DETAILS

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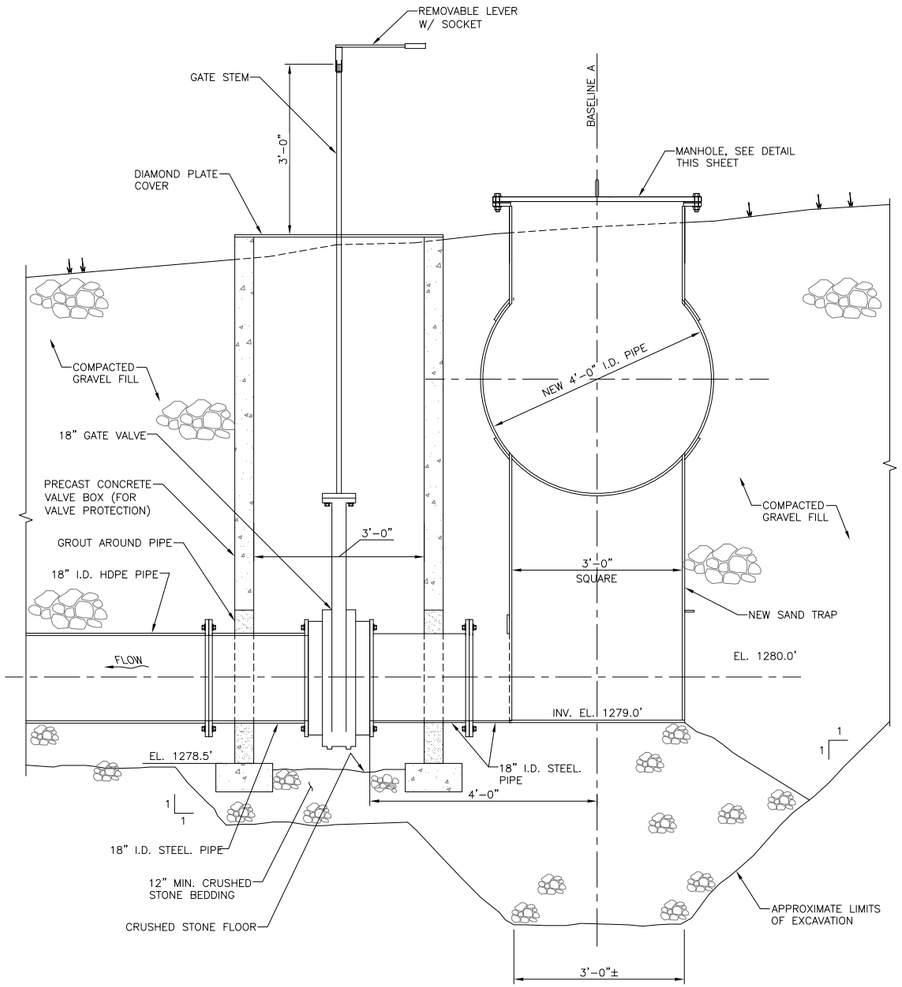

SECTION C 3
3/4"= 1'-0"

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SCALE IN FEET

HANDLE DETAIL
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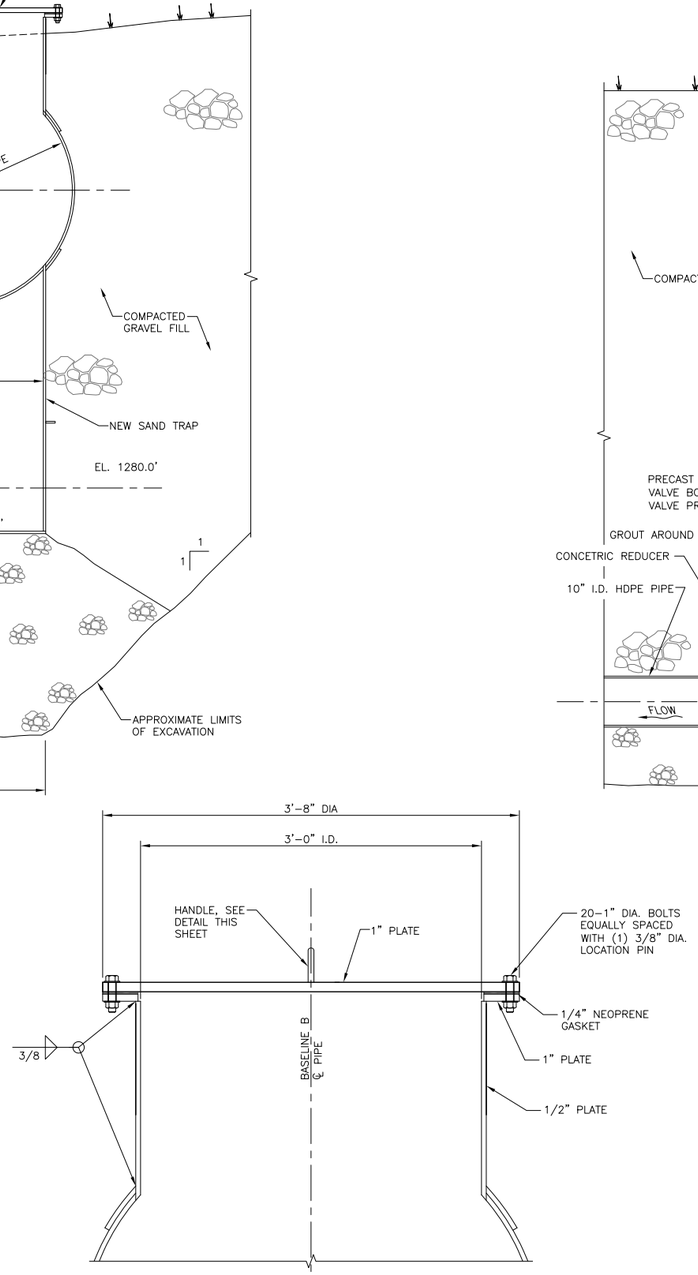

NEW MANHOLE DETAIL
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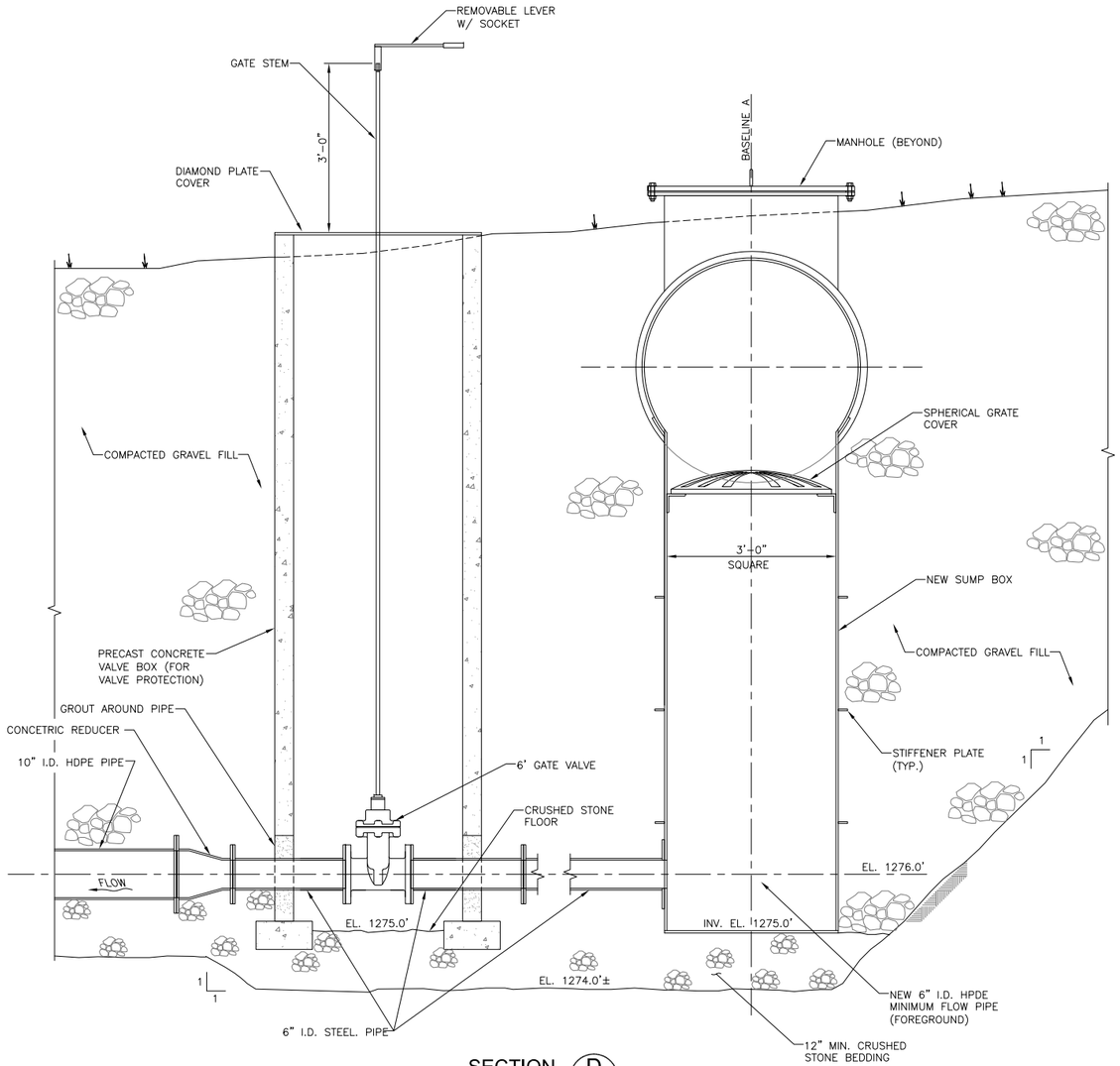

SECTION D 3
3/4"= 1'-0"

NOTES:

1. NEW GATE VALVE ASSEMBLIES TO BE INSTALLED ACCORDING TO AWWA C509 STANDARDS.
2. NEW HDPE PIPE TO BE INSTALLED ACCORDING TO AWWA C906 STANDARDS.
3. HDPE PIPE TO BE INSTALLED WITH A MINIMUM PIPE SLOPE OF NO LESS THAN 0.50%.
4. ALL STEEL PIPE JOINTS TO BE FLANGED & BOLTED AS SHOWN ON DRAWINGS.

No.	Revision	Date	Drawn	Checked
-	FOR REVIEW AND COMMENT	10-19-09	-	-

Designed	Drawn	Checked
RDB	TLT	TLK

Project No.	Date Revised	Drawing No.	Rev.
006-219	10-19-09	5	-

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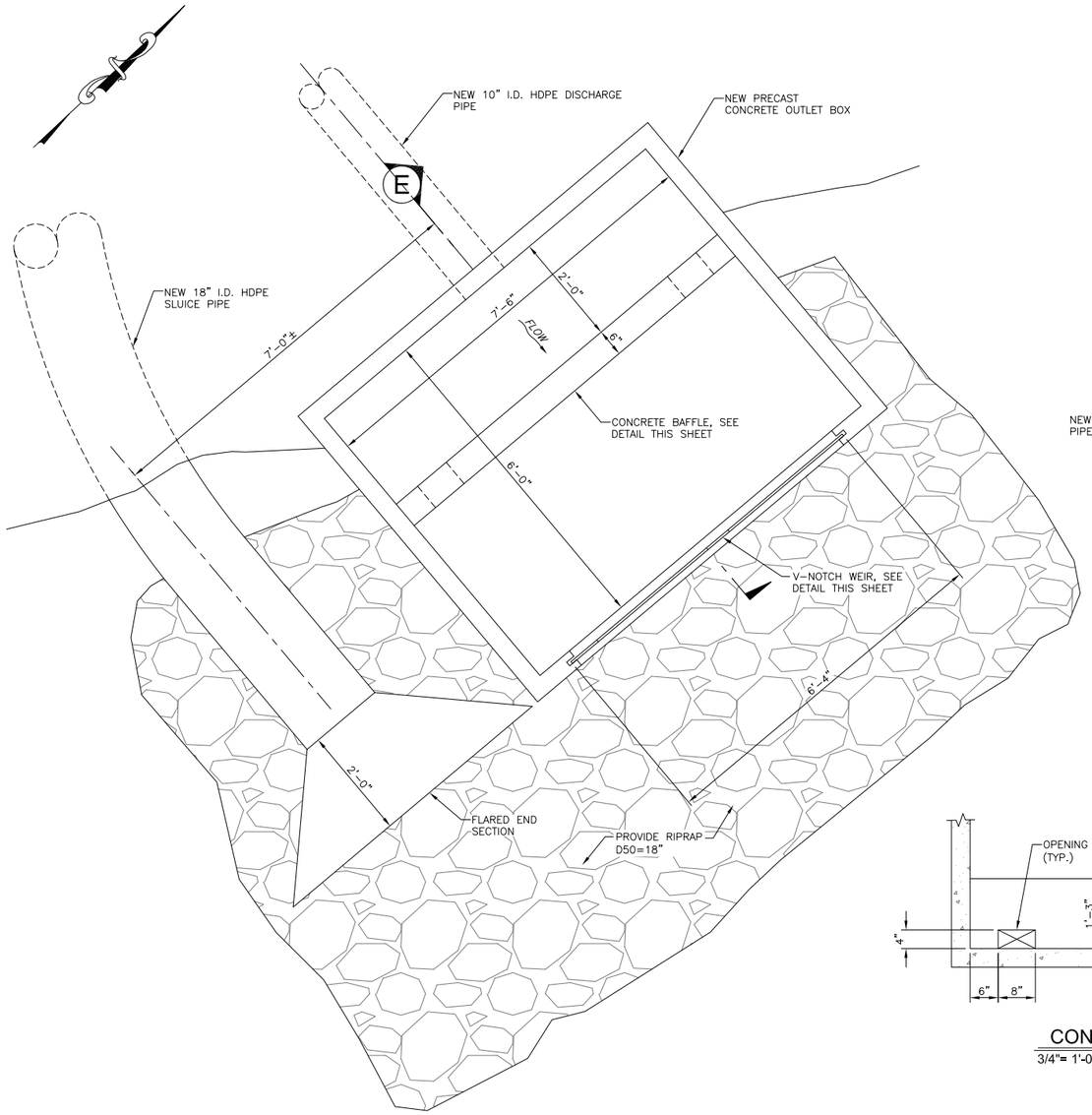

PLAN

3/4"= 1'-0"

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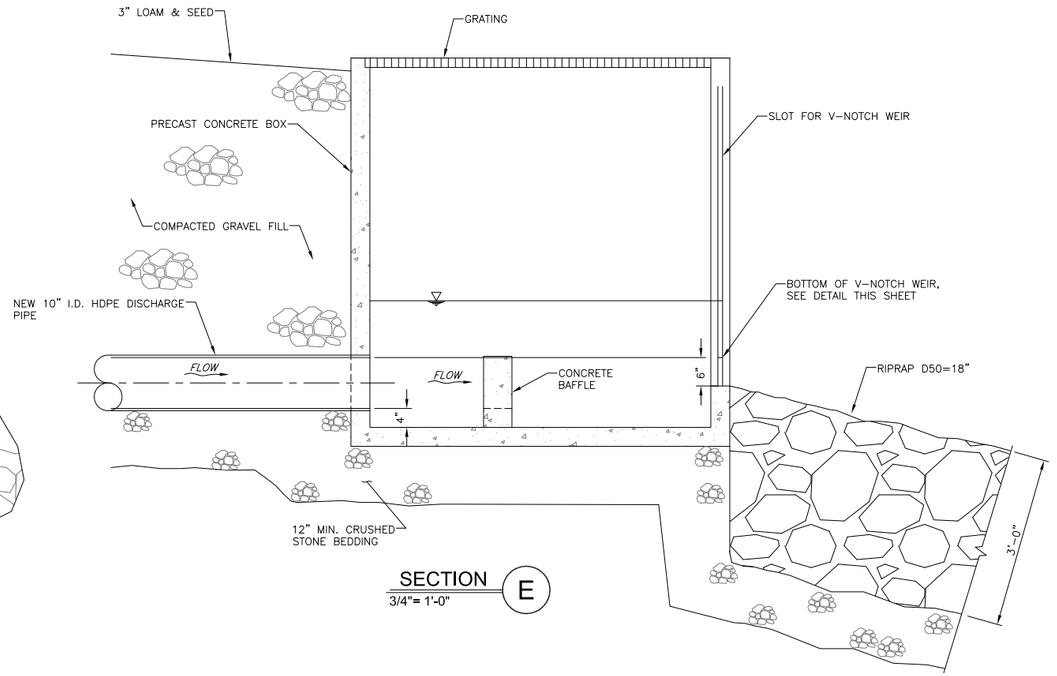
SCALE IN FEET



SECTION E

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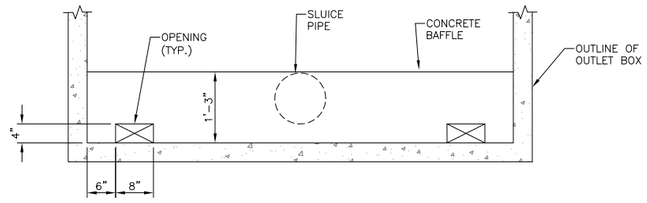

CONCRETE BAFFLE DETAIL

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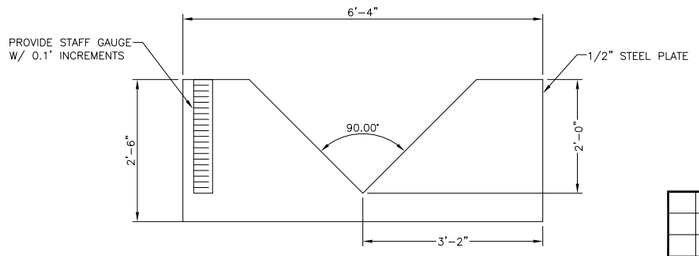


V-NOTCH WEIR DETAIL

3/4"= 1'-0"

90° V-Notch Weir Rating Table

Rating Table

Head (in)	Flow (cfs)	Head (in)	Flow (cfs)
0.0	**0.000**	11.0	**2.011**
0.5	**0.001**	11.5	**2.248**
1.0	**0.005**	12.0	**2.500**
1.5	**0.014**	12.5	**2.769**
2.0	**0.028**	13.0	**3.054**
2.5	**0.050**	13.5	**3.356**
3.0	**0.078**	14.0	**3.675**
3.5	**0.115**	14.5	**4.012**
4.0	**0.160**	15.0	**4.367**
4.5	**0.215**	15.5	**4.740**
5.0	**0.280**	16.0	**5.132**
5.5	**0.356**	16.5	**5.542**
6.0	**0.442**	17.0	**5.972**
6.5	**0.540**	17.5	**6.421**
7.0	**0.650**	18.0	**6.889**
7.5	**0.772**	18.5	**7.378**
8.0	**0.907**	19.0	**7.886**
8.5	**1.056**	19.5	**8.415**
9.0	**1.218**	20.0	**8.965**
9.5	**1.394**	20.5	**9.536**
10.0	**1.585**	21.0	**10.128**
10.5	**1.790**	21.5	**10.742**

No.	Revision	Date	Drawn	Checked
-	FOR REVIEW AND COMMENT	10-19-09	-	-

Designed	Drawn	Checked
RDB	TLT	TLK

Project No.	Date Revised	Drawing No.	Rev.
006-219	2-17-10	6	-

CENTRAL VERMONT PUBLIC SERVICE CORP.
RUTLAND, VERMONT

SILVER LAKE PROJECT
FERC NO. UL 88-17-VT

DISCHARGE BOX DETAILS

Kleinschmidt
Energy & Water Resource Consultants
141 Main Street P.O. Box 650
Pittsfield, Maine 04967
Telephone: (207) 487-3328
Fax: (207) 487-3124
www.KleinschmidtUSA.com

Feb. 17, 2010 - 12:55 PM J:\006\219\Drawings\WORKING DRAWINGS\006-219_sht 3.dwg

Kleinschmidt
Energy & Water Resource Consultants
141 Main St. P.O. Box 650
Pittsfield, Maine 04967
Telephone: (207) 487-3328
Fax: (207) 487-3124
www.KleinschmidtUSA.com

Project No.: 006.219

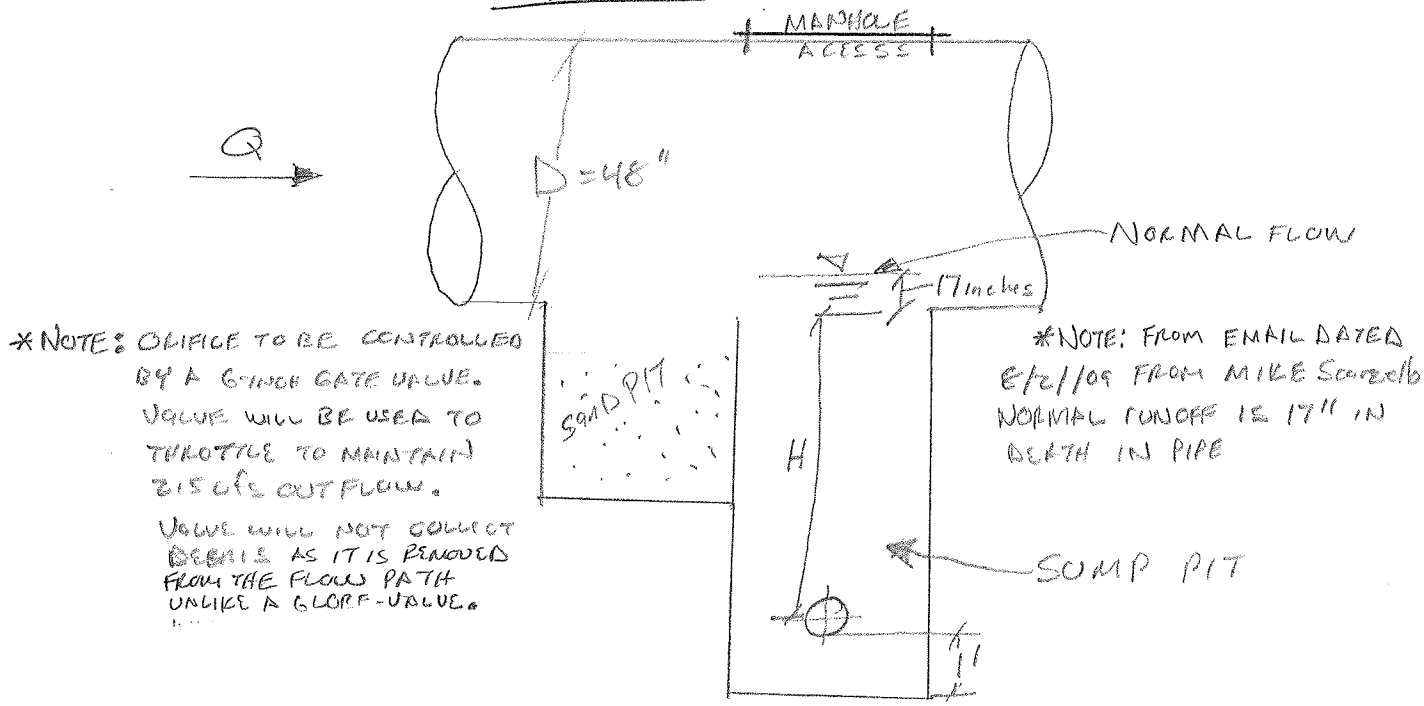
Project: CUPS - DIVERSION DAM

By: RDB Date: 10/15/09

Subject: MINIMUM FLOW DEVICE/STRUCTURE

Checked: JLS2 Date: 10/15/09

SKETCH



*NOTE: ORIFICE TO BE CONTROLLED BY A 6"INCH GATE VALVE. VALVE WILL BE USED TO THROTTLE TO MAINTAIN 2.5 cfs OUT FLOW.

VALVE WILL NOT COLLECT DEBRIS AS IT IS REMOVED FROM THE FLOW PATH UNLIKE A GLOBE-VALVE.

*NOTE: FROM EMAIL DATED 8/21/09 FROM MIKE SCANDELLA NORMAL RUNOFF IS 17" IN DEPTH IN PIPE

ORIFICE DEPTH FOR MINIMUM FLOW

ASSUMPTIONS: Orifice Diameter D = 6 in
Discharge Coefficient $C_d = 0.6$
Minimum Flow $Q = 2.5$ cfs

$$Q = C_d A \sqrt{2gH} \quad \therefore \quad H = \frac{Q^2}{(C_d^2)(A^2)(2g)}$$

$$H = \frac{2.5^2}{0.6^2 \times \left(\frac{\pi (.5)^2}{4}\right)^2 \times 2 \times 32.2} = 6.99 \text{ ft} \approx 7.0 \text{ ft} \leftarrow (\text{REQ'D SUMP DEPTH})$$

ORIFICE RATING TABLE

	H(ft)	Q(cfs)
FULL SUMP	7.0	2.5
NORMAL FLOW	8.42	2.74
FULL PIPE	11.0	3.18

← (FLOW TABLE)

*FLOW VARIES 0.6 cfs between full sump & full pipe.

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Project No.: 006.219

Project: CUPS - DIVERSION DAM

By: RDB Date: 10/15/09

Subject: MINIMUM FLOW DEVICE

Checked: JLSZ Date: 10/15/09

Outlet Pipe Sizing

Sediment Settleing Velocity ≈ 3 fps
Req'd minimum flow Q = 2.5 cfs

$$A = \frac{Q}{V} = \frac{2.5 \text{ cfs}}{3 \text{ fps}} = 0.83 \text{ sf}$$

$$A = \frac{\pi D^2}{4} \quad \therefore \quad D = \sqrt{\frac{0.83 \times 4}{\pi}} = 1.02 \text{ ft} \approx 12\text{-in } \phi \text{ PIPE}$$

* PIPE WILL BE SLOPED

USE D = 10-INCH ϕ ← (PIPE DIA)

MINIMUM PIPE SLOPE

- NEED TO MAINTAIN OPEN CHANNEL FLOW

PIPE Type = HDPE
Manning's "n" = 0.009 FROM HERSTAD, Hydraulic Engineerg pg 16.
MAX FLOW Q = 3.13 cfs
PIPE DIAMETER D = 10-in ϕ

USING Mannings EQ $Q = \frac{\alpha}{n} \frac{A^{5/3}}{Pw^{2/3}} S^{1/2}$ TO SOLVE FOR depth Y
$\alpha = 1.486$

SLOPE (%)	FLOW DEPTH (IN)	FLOW AREA (SF)	VELOCITY (FPS)
0.5	8.09	0.47	6.66
1.0	8.09	0.47	6.66
1.5	6.81	0.40	7.83
2.0	6.16	0.40	7.83

6.66 fps > 3 fps settleing velocity ∴ MIN PIPE SLOPE = 0.5% ← (SLO

* THIS WILL ENSURE THAT THE PIPE DOES NOT BECOME PRESSURIZED FLOW WILL BE OPEN CHANNEL GRAVITY FLOW IN 10-INCH PIPE

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www.KleinschmidtUSA.com

Project No.: 006.219

Project: CUPS - DIVERSION DAM

By: RDB Date: 02-18-2010

Subject: MINIMUM FLOW DEVICE

Checked: JLSZ Date: 02-18-2010

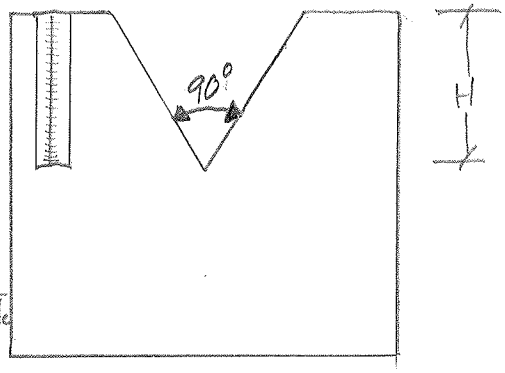
DISCHARGE WEIR DESIGN

USING TABLE 4-F pg 108 of Stevens Water Resource Book 3rd Edition Dated April 1978

FOR A V-NOTCH WEIR WITH A 90° opening

$$Q = (2.50)(H/12)^{5/2}$$

∴ H is depth in inches of flow THROUGH WEIR



* STAFF GAUGE IN 1/10 inch increments
* Weir height H to be H ≥ 15 inches
* WEIR TO BE MADE OF A SINGLE SURGICAL STEEL PLATE ½ thick

* FOR V-NOTCH RATING CURVE SEE ATTACHED SPREADSHEET.

Kleinschmidt
Energy & Water Resource Consultants

141 Main St P.O. Box 650
Pittsfield, Maine 04967
Tel: 207.487.3328
Fax: 207.487.3174

Page:
Project No: 006.210
By: RDB Date: 02-18-10
Checked: JLS2 Date: 02-18-10

Project: CVPS Diversion Dam
Subject: Minimum Flow Device

90° V-Notch Weir Rating Table

Rating Table			
Head (in)	**Flow (cfs)**	**Head (in)**	**Flow (cfs)**
0.0	**0.000**	11.0	**2.011**
0.5	**0.001**	11.5	**2.248**
1.0	**0.005**	12.0	**2.500**
1.5	**0.014**	12.5	**2.769**
2.0	**0.028**	13.0	**3.054**
2.5	**0.050**	13.5	**3.356**
3.0	**0.078**	14.0	**3.675**
3.5	**0.115**	14.5	**4.012**
4.0	**0.160**	15.0	**4.367**
4.5	**0.215**	15.5	**4.740**
5.0	**0.280**	16.0	**5.132**
5.5	**0.356**	16.5	**5.542**
6.0	**0.442**	17.0	**5.972**
6.5	**0.540**	17.5	**6.421**
7.0	**0.650**	18.0	**6.889**
7.5	**0.772**	18.5	**7.378**
8.0	**0.907**	19.0	**7.886**
8.5	**1.056**	19.5	**8.415**
9.0	**1.218**	20.0	**8.965**
9.5	**1.394**	20.5	**9.536**
10.0	**1.585**	21.0	**10.128**
10.5	**1.790**	21.5	**10.742**

Weir Discharge Equation

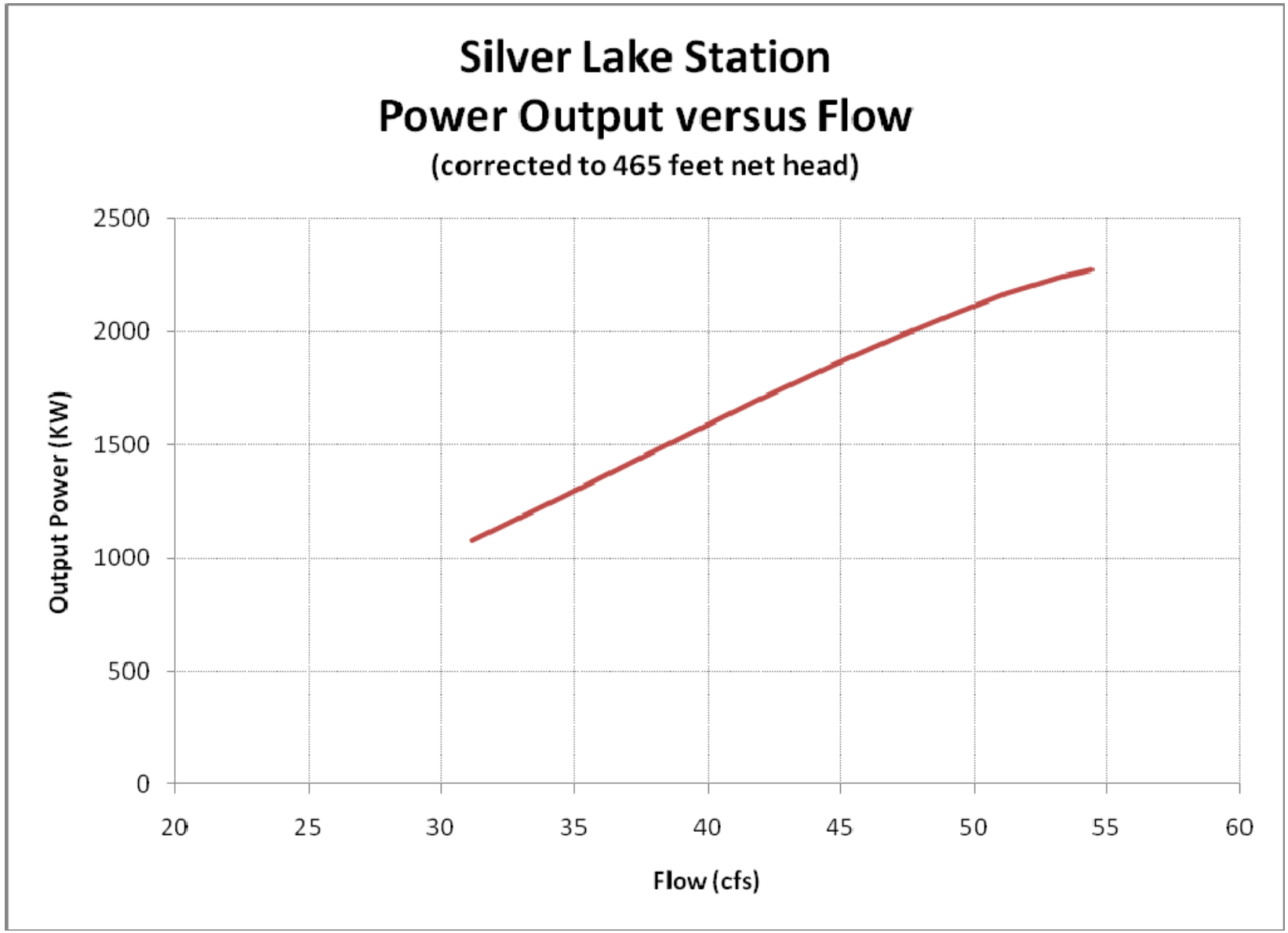
$$Q = 2.50 \times \left(\frac{H}{12}\right)^{\frac{5}{2}}$$

Where H (in inches)is the flow depth measured from the notch of the weir to the water surface

Note: 90° V-Notch Weir information from Table 4-F pg 108 of Stevens Water Resources Data Book 3rd Edition Dated April 1978

Appendix B: Turbine Rating Curve

Data Source: Response to Additional Information Request #10 Second Set (CVPS, 1996).


Silver Lake Station
Power Output versus Flow
(corrected to 465 feet net head)
Output Power (KW)
2500
2000
1500
1000
500
0
20
25
30
35
40
45
50
55
60
Flow (cfs)

Appendix C: Smelt Spawning Operations Protocol

Extracted from 2009 Smelt Report and edited for clarity.

The Lake Dunmore smelt population uses Sucker Brook for reproduction. An informal arrangement has been in place since 1965 between the Vermont Department of Fish and Wildlife (VDFW) and CVPS to release a minimum flow to provide adequate habitat for smelt spawning and incubation (CVPS, 1995: AIR No. 5). CVPS has historically been maintaining a constant discharge from the Project to maintain spawning and incubation habitat in Sucker Brook downstream of the project tailrace.

2.1 Operations Protocol

In 1998 CVPS, in conjunction with Multiple Resource Management, Inc. developed a proposed operating protocol to monitor smelt spawning in Sucker Brook downstream of the Silver Lake project. The protocol included a visual inspection process to define the beginning and end of the smelt spawning season and proposed an operating procedure to maximize the protection of rainbow smelt during spawning. Pursuant to the requirements in VT WQC condition E, the recommended protocols from the 1998 report are revised as follows:

a) On or before the 15th of March the staff gage is to be re-installed at the bridge abutment in the midst of the smelt spawning habitat and several coarse faced bricks put into the brook in backwater sites where spawning smelt congregate. In addition, a continuous water level and water temperature datalogger is to be installed in the principal smelt spawning area to collect data starting March 15 and ending when the hatch is complete.
b) Beginning March 15th, the monitoring bricks and other substrate are to be inspected daily to identify the commencement of spawning.
c) Once the first signs of smelt egg laying are observed, CVPS will transition to special operations to protect against egg desiccation due to changes in project generation. Starting no later than official sunset and ending no earlier than official sunrise CVPS will operate at reduced or no generation during smelt spawning and incubation period.
d) Reduce or shut down all generation before sunset on the second night of spawning. Read and record the staff gage the following morning before resuming generation.
e) Continue daily early morning monitoring of the staff gage to ensure that water level elevation from natural run-off is maintained.
f) Continue to perform daily early morning inspections to identify completion of incubation. When incubation is completed, generation may be altered to accommodate CVPS needs.
g) Maintain daily records for trend analysis.

2.2 Smelt Spawning Observations

A private road and bridge crosses Sucker Brook at the center of the smelt spawning area providing good access to the site. CVPS operators began daily monitoring of smelt spawning activities in Sucker Brook on March 15, 2009. Recorded observations include weather conditions, project operations, staff gage readings and status of the smelt spawning activities.

Paving bricks (coarse faced brick) are put in the river along the bank. The bricks and other substrate are monitored for smelt egg deposition every morning beginning on March 15. This effort requires simply walking to the bank to examine the brick and substrate for egg deposition. After egg deposition began, a new brick was placed in the river each day to monitor the intensity of egg laying each night; thus the end

of spawning activity could be determined. Specific cuts in the bank and large boulder eddies where the smelt congregated each night made for excellent brick placement. The eggs readily adhered to the bricks and were easily visible due to the contrast in color. After completion of spawning, incubation was followed and hatching determined complete when the eggs on the brick and other substrate are gone.

2.3 Water Level and Temperature Monitoring

The VT WQC requires the installation of water level and water temperature dataloggers in the principal smelt spawning area and continuous data collection starting March 15 and ending when the hatch is complete.

Continuous water level data (and water temperature data) will be recorded with a Level TROLL 500 pressure sensor manufactured by In-Situ, Inc. This model contains a vented cable which insures that atmospheric pressure is the reference pressure applied to the sensor, thereby eliminating the need for an external barometric pressure sensor. The logger will be placed in a temporary vertical stilling well affixed to the bridge abutment and synchronized to the depth markings on the staff gage. Annual monitoring efforts will commence on or before March 15th.

Appendix D: Agency Correspondence

VERMONT

Vermont Department of Environmental Conservation *Agency of Natural Resources*
Dam Safety and Hydrology Section
103 South Main Street [phone] 802-241-3758
Waterbury, VT 05671-0511 [fax] 802-244-4516
http://www.anr.state.vt.us/dec/fed/dss.htm

TRANSMITTED ELECTRONICALLY

August 13, 2009

Jason George, Environmental Scientist
Gomez and Sullivan Engineers, P.C.
55 North Stark Highway
Weare, NH 03281

RE: Silver Lake Hydroelectric Project – FERC No. 11478
Draft Operations Compliance Plan

Dear Mr. George:

On behalf of Central Vermont Public Service Corporation by letter dated July 22, 2009, you filed a draft operations compliance plan with the Department for the Silver Lake Hydroelectric Project. The plan is intended to address the provisions of several conditions of the Project water quality certification:

Condition C. Ramping plan at Goshen Dam
Condition D. Ramping plan at Station Tailrace
Condition E. Smelt Spawning Protection Operating Protocol
Condition F. Plan for method to maintain conservation flows below Sucker Brook diversion dam
Condition G. Operating plan for Sugar Hill Reservoir
Condition H. Monitoring Plan for Reservoir and Flow Management

The water level and flow management restrictions are contained in Condition B of the certification. Final plans are subject to Department approval before approval is sought from FERC under License Article 401(A). Herein the Department provides its comments.

Sugar Hill Reservoir Management

In Section 1.2, bottom of p. 2, the plan explains the difference between the local datum and sea level datum, and indicates that elevations are rounded to the closest whole foot throughout the plan. To avoid confusion between the license requirements and the operations plan, please use elevations out to the tenths place, 55.0 feet = 1765.5 feet msl. Please also indicate whether the elevation is NGVD 29 or NAVD 88.

The description of the operation on p. 2 (#1) is not totally accurate. From January through April, the reservoir is to be maintained between elevation 1765.5 feet and the maximum drawdown level of 1747.5 feet. It is to be at elevation 1765.5 feet at the beginning of the period, assuming that does not conflict with the 2.5 cfs "guaranteed" minimum flow. If the reservoir is ice-covered, the winter drawdown can commence. Otherwise it is to be held at 1765.5 feet until the ice cover forms, again assuming that water does not need to be drawn from storage in order to maintain the 2.5 cfs minimum flow. The paragraph in Section 2.3 (p. 7) provides a more complete and accurate description.

Figure 2.3-1, the reservoir rule curve, should show the upper limit curve going horizontal starting at the earliest expect refill date and the lower curve going horizontal on May 1. The Y axis also should be corrected by 0.5 foot as discussed above. In Section 2.3, please explain how decisions will be made in each individual winter as to what the maximum drawdown level will be.

Regarding Table 2.3-1, is full pond considered to be at the spillway or at the normal maximum summer pool? Where it indicates that 2.5 cfs is provided by 4 turns on the 6-inch valve, is that referring to the old valve or the new one, as the stem threading apparently differs between the two? Based on the text in Section 2.4, it is the *first*, or older, valve. It should be clarified in the table. Please explain in the plan how the hydraulic estimates of the flow capacities all of the valves were estimated. If I recall correctly, they are gate valves. Is the half-open setting equal to the midpoint between fully open and the number of turns at which discharge first started (e.g., for the 8-inch valve it would correspond to (3 + 18½)/2 = 10¾ turns)? Is it correct that the valves are only closed, fully opened, or half open? If that is correct, the new operating rules may require an ability to adjust outflows more precisely, in which case installation of a globe valve may be justified. The plan does not explain how the valve(s) will be set to discharge 2.5 cfs except at the full pool elevation.

In the second paragraph of Section 2.4, there is a reference to elevation 1765.9 feet as 0.1 foot below full pond. Is that correct, or was it 0.4 foot above the true full pond elevation of 1765.5 feet?

Section 2.4 should provide a better explanation of how the reservoir will be managed. During the summer (Table 2.2-1), normal operations will manage the reservoir in the five-foot range below full pool (1765.5 feet). If low inflows cause the pool to decline below elevation 1760.5 feet, the next three feet of storage are dedicated to maintaining a constant release of 2.5 cfs until the reservoir either declines to elevation 1757.5 feet or rises back to the normal summer range. Similarly, the winter operation as related to minimum flows should be described.

The plan does not address the Condition G requirement that "[t]he filing shall include performance expectations for the method and equipment to be used and a supporting calculation brief; this would include consideration of how frequently adjustments to the valve system must be made to meet the goals under different background conditions." One particular challenge will be trying to match inflows when the reservoir falls to elevation 1757.5 feet. Since the reservoir cannot be drawn down below that level, the releases must closely match inflow, which means frequent adjustments without having to correct by reducing outflows below inflows.

Ramping Outflows from Sugar Hill Reservoir

Condition C of the water quality certification envisioned CVPS consulting with the Department of Fish and Wildlife in developing a ramping proposal below Goshen Dam. That consultation does not appear to have occurred. The only ramping restriction that is apparent in the description is that it takes five minutes to open (and presumably close) a valve. Assuming there is only one operator, the transition between 2.5 cfs (0.96 csm) and 70 cfs (26.9 csm, all valves open) would take about 28 minutes, or from 2.5 cfs to 25 cfs (one 6-inch valve at the minimum and one 10-inch valve fully open) would take 5 minutes. There is no substantiation of why this is an acceptable rate of change for downstream flows.

Sucker Brook Diversion Dam

Condition F of the water quality certification requires CVPS to develop a plan for providing the minimum flow release in consultation with the Department and the U.S. Fish and Wildlife Service. The draft operations compliance plan provides a conceptual design and indicates that supporting documentation is forthcoming. Construction is proposed for summer 2010. Until complete, no minimum flow will be provided below the diversion dam. When 2.5 cfs or higher flows are being released from Sugar Hill Reservoir, 2.5 cfs will be released at the diversion dam. Otherwise, the flow at the diversion dam will be estimated by multiplying the Goshen Dam release by four and, if less than 2.5 cfs, "the conduit tap discharge will be adjusted accordingly." If

I understand the latter correctly, that would mean that no flows will be diverted to Silver Lake under those conditions. It should be so stated for clarity.

The plan indicates that the V-notch weir at Goshen Dam will be used to estimate the outflow. It is unclear how accurately flows through the V-notch can be estimated. As mentioned before, the method for estimating the valve discharges was not provided, except for the 2.5 cfs minimum. I would suggest installing a globe valve with a full capacity of 2.5 cfs and using its rating for lower flow instead of using the V-notch weir. That would avoid issues with access, winter icing, and the presence of significant approach velocities.

Regarding the conceptual design proposal for the minimum flow device, it will need to have the ability to pass all of inflows at certain times. So the hydraulics of the sump grate and its elevation relative to the downstream conduit invert are important. Preventing debris from accumulating on the grate or reaching the valve are also important considerations. Having a system that relies on periodic cleaning of the sump to work is problematic for a number of obvious reasons. One option to consider is eliminating the valve and instead using a stoplog structure at the discharge point. The stoplogs could initially be raised or lowered experimentally to establish the correct height for 2.5 cfs. That would avoid having a valve that may become plugged with debris.

The final design should be incorporated in the plan after approval.

Silver Lake Water Level Management

As with Sugar Hill Reservoir, the plan should indicate how the maximum drawdown level will be determined each year as constrained by the need to refill to the summer level and to provide spring outflows that are consistent with the smelt management protocol. Section 4.3 suggests that the lake is drawn down to 1239.5 feet from December 1 through May 31. The rule curve (Figure 4.3-1) says the lake is drawn down to an elevation between 1239.5 and 1242.5 feet.

Tailrace Ramping Plan

Section 4.4 proposes a specific ramping protocol for testing purposes to insure that smaller fish that clear the fish rack (Section 4.5) have an opportunity to evacuate the tailrace as the water level drops. When the test is planned, Department of Fish and Wildlife staff should be notified so that they can observe. The final plan should reflect whatever ramping protocol is agreed upon with the Department of Fish and Wildlife. Although Condition D is not clear with respect to the extent of downstream impact to be covered by the ramping plan, Finding 80 clarifies that it relates to primarily to Sucker Brook and not the tailrace channel. Ramping was the subject of FERC Additional Information Request #5, and I believe that CVPS's current proposed ramping protocol is consistent with the proposal made at that time. When the protocol is tested, we would suggest monitoring both the brook downstream of the tailrace and the tailrace itself.

Smelt Spawning Protection Operating Protocol

Condition E of the water quality certification requires that the 1998 protocol be updated to incorporate certain revisions. The 2009 annual report (*Smelt Spawning protection Monitoring Protocol and 2009 Results*, CVPS, August 2009) discusses the revisions and appends a copy of the 1998 protocol. Please revise the protocol and append it to the operations compliance plan.

Monitoring Plan for Reservoir and Flow Management

Please include the text of Condition H in Section 5.1.

Again, the Goshen Dam valves need to rated for the range of water levels over which they are employed and for all the potential individual valve settings.

The reporting information must include the valve settings for Goshen Dam and the corresponding outflow estimate. All the information must be in a spreadsheet format that is easily interpreted relative to compliance. The Sugar Hill Reservoir data should include an estimate of hourly inflow based on the valve(s) discharge and the change in storage contents. Similarly, Silver Lake should include hourly inflow based on station generation and change in storage contents.

The spreadsheets should include plots of the actual water levels against the rule curves and include compliance checking functions.

I recommend that a monitoring report be filed with the Department after the first three months so that we have an opportunity to provide feedback.

Please feel free to contact me if you should have questions.

Very truly yours,

Jeffrey R. Cueto, P.E.
Chief Hydrologist

c Peter LaFlamme, Director, Water Quality Division
Susan Warren, Water Quality Division
Chet Mackenzie, VT Fish and Wildlife Dept.
Gregory Smith, US Forest Service
Steve Roy, US Forest Service
Melissa Grader, USF&WS
Michael Scarzello, P.E., CVPS
Beth Eliason, CVPS

Jason George

From: Melissa_Grader@fws.gov
Sent: Thursday, August 27, 2009 12:59 PM
To: Jason George
Cc: 'Eliason, Beth'; 'Scarzello, Michael'; jeff.cueto@state.vt.us; rod.wentworth@state.vt.us
Subject: RE: Silver Lake Draft Operations Compliance Plan
Attachments: pic26418.gif

Yes Jason, we received the draft plan. Due to staffing limitations, we will not be able to review and provide comments on the Plan.

Thank you for soliciting our input.

Sincerely,
Melissa

~~~~~~

Melissa Grader, Fish and Wildlife Biologist
U.S. Fish and Wildlife Service/New England Field Office
c/o Connecticut River Coordinator's Office
103 East Plumtree Road
Sunderland, MA 01375
413-548-8002, ext. 124 (ph) 413-548-9622 (fax)
melissa_grader@fws.gov
www.fws.gov/northeast/newenglandfieldoffice

~~~~~~

"Jason George" <jgeorge@gomezandsullivan.com>

"Jason George"
<jgeorge@gomezandsullivan.com>

08/27/2009 10:02 AM

To<melissa_grader@fws.gov>

cc'"Scarzello, Michael"' <MScarze@cvps.com>,
'"Eliason, Beth"' <beliaso@cvps.com>

SubjectRE: Silver Lake Draft Operations Compliance Plan

Hi Melissa,

Can you please confirm that you received the Draft Operations Compliance Plan for the Silver Lake Hydroelectric Project (P-11478)?

We requested comments by August 21. CVPS has applied for an extension of time with FERC. Could you please let us know if you intend on providing comments? Thanks.

Jason George
Gomez and Sullivan Engineers, P.C.
55 North Stark Highway

Weare, NH 03281
603.529.4400

From: Jason George [mailto:jgeorge@gomezandsullivan.com]
Sent: Wednesday, July 22, 2009 2:58 PM
To: melissa_grader@fws.gov; 'Cueto, Jeff'
Cc: 'Scarzello, Michael'; 'Eliason, Beth'
Subject: Silver Lake Draft Operations Compliance Plan

Hi Jeff and Melissa,

Please find attached for your review the Draft Operations Compliance Plan for CVPS's Silver Lake Hydroelectric Project (Project No. 11478) in Vermont.

Hard copies were mailed to you today. Thanks.

Jason George
Gomez and Sullivan Engineers, P.C.
55 North Stark Highway
Weare, NH 03281
603.529.4400

GOMEZ AND SULLIVAN Engineers, P.C.

55 North Stark Highway
Weare, NH 03281
T - (603) 529-4400
F - (603) 529-4411

October 19, 2009

Jeffrey R. Cueto, P.E., Chief Hydrologist
Vermont Department of Environmental Conservation
Facilities Engineering Division, Laundry Bldg.
103 South Main Street
Waterbury, VT 05671-0511

Re: Silver Lake Hydroelectric Project, FERC Project No. 11478
Revised Operations Compliance Plan

Dear Mr. Cueto:

The Draft Operations Compliance Plan for the Silver Lake Hydroelectric Project (Project No. 11478) was initially sent to the Vermont Agency of Natural Resources (VANR) and the United States Fish and Wildlife Service (USFWS) for review on June 22, 2009. The Draft Operations Compliance Plan addressed several requirements in License Article 401(A) and the associated Vermont Water Quality Certification, including: Goshen Dam ramping plan, Silver Lake tailrace down ramping plan, Sucker Brook Diversion Dam bypass flow plan, Sugar Hill reservoir operating plan, and the monitoring plan for reservoir and flow management.

Central Vermont Public Service Corporation (CVPS) received comments on the draft plan from the VANR on August 13, 2009. On August 19, 2009, CVPS applied for a three-month extension of time to file the final plan with FERC. The extension was granted on August 31, 2009; the final plan is now due at FERC by November 23, 2009. In the VANR comment letter, it was noted that plan should be sent to the Vermont Department of Fish and Wildlife (VDFW) for review, specifically as it relates to the Goshen Dam ramping plan and the Silver Lake tailrace down ramping plan. Therefore, Rod Wentworth of the VDFW was sent a copy of the revised Operations Compliance Plan.

The Operations Compliance Plan has been revised to address the comments received from VANR and is attached for your review and approval. The components of this plan are subject to VANR approval prior to FERC filing. It is CVPS's intent to gain approval on the Operations Compliance Plan and file the final plan with FERC by November 23, 2009. Therefore, we are requesting that you provide any remaining comments on the revised plan by November 13, 2009. We were informed by the USFWS that they were not able to provide comments on the plan, however, a courtesy copy is being provided. Please contact me if you have any questions. Thank you.

Sincerely,

Jason George
Environmental Scientist

C: R. Wentworth, VDFW
M. Grader, USFWS
M. Scarzello, CVPS
B. Eliason, CVPS

Enclosure

Jason George

From: Cueto, Jeff [Jeff.Cueto@state.vt.us]
Sent: Friday, November 06, 2009 1:40 PM
To: Jason George
Cc: Melissa_Grader@fws.gov; Scarzello, Michael; Fitzgerald, Brian
Subject: Silver Lake Flow Management Plan

Jason – I read over the responses to my prior comments on the plan. CVPS disagrees with several of my recommendations. Given that, it is likely that we will need more time to work through things and be in a position to approve the plan before the November 23 FERC deadline. I suggest requesting a 60-day extension from FERC.

Concerning the datum issue, I note that my first comment was supposed to be 50.0 (not 55.0) feet = 1765.5 feet msl. The water quality certification footnote on p. 2 discussed this. The conditions of the certification are based on this relationship and not 50.0 feet = 1766.0 feet msl. I'd really like to understand this. Was the information CVPS gave us in 1998 incorrect (we were told the chain tag of 55 feet is at elevation 1770.5 feet) or was the chain moved up 0.5 foot? The dam crest apparently hasn't moved. If CVPS is essentially operating at levels that are half a foot higher, then the certification and perhaps the license need to be amended.

Jeff

><{{{˚> ***Jeffrey R. Cueto, P.E., Chief Hydrologist***
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><{{{˚> Dam Safety and Hydrology Section
><{{{˚> Facilities Engineering Division, Laundry Bldg.
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><{{{˚> jeff.cueto@state.vt.us

Jason George

From: Cueto, Jeff [Jeff.Cueto@state.vt.us]
Sent: Friday, November 20, 2009 2:39 PM
To: Jason George
Cc: 'Scarzello, Michael'; Wentworth, Rod; 'Eliason, Beth'; Fitzgerald, Brian; Melissa_Grader@fws.gov; Mackenzie, Chet
Subject: RE: Silver Lake

Jason – I'm going by memory as I don't have my review notes in front of me. The issues (and a few comments) are:

1. The Sugar Hill datum. The historical data used for the original review of the project and upon which the approved rule curve was based came from the headgate chain marks. The link marked 55' (1771) was found to actually be elevation 1770.5' msl based on the 1995 survey. So 50' local datum on the chain = 1765.5' msl. That was set as the maximum normal summer pool in the certification and license. So if CVPS wants 50' local datum to be the high summer pool, that is consistent with the record, and there is no change per se. The plan just needs to indicate that it equals 1765.5', and the other msl elevations need to be fixed in the plan, including the rule curve. Or you can just call the 1766.0 another local datum since it is off 0.5' from the msl values. Then you wouldn't have to modify the plan and remark the chain links. So, if I am correct, this is not a 0.5-foot change in pool management relative to what was permitted. That needs to be verified. (By the way, in my Comment #1 I meant "50.0 feet = 1765.5 feet msl" and not "55.0 feet = 1765.5 feet msl".
2. Regarding Comment #3, perhaps there is a difference in understanding what the rule curve is supposed to show. I'd expect the water level for SHR (Fig. 2.3-1) to fall between the two curves unless something exceptional happens, and "exceptional" may be a violation. That's why I thought it should go horizontal on May 1 instead of a week or so earlier. Not a big issue I suppose as long as it is consistent with the certification.
3. The valves are supposed to be field rated for all operational settings and reservoir levels per Condition H, as you mention in the second paragraph of Section 2.2. For low-flow, stable pond conditions, it is important to have a good rating on at least one valve and a means of estimating the inflow. Also, inflow records are required by the certification (Condition H).
4. Gate valves are not normally used for modulating flow. Usually their application is for either fully open or fully shut. I'm not sure whether use of a submerged tube formula is appropriate, and I'm not sure how you estimated the sectional area for half open. And, if you use other settings, I'm not sure you can assume a linear relationship between the stem travel and the sectional area. (Does your reference, *Design of Small Dams*, indicate that the method you used for estimating valve flow is appropriate?) One option is to install a flow meter on one of the 6-inch valves. On the bottom of p. 10, second line up, please change to "4 turns on first 6" valve…"
5. I don't recall having seen the v-notch weir, and I don't think we have any drawings for it. Weirs are normally installed in a manner that creates a stilling pool and minimal turbulence. If the weir is right below the valves, I'm surprised it is working well. The plan includes a rating table for the weir, discussed in Section 3.3. A staff gage with 0.1 ft graduations is to be installed to estimate flows less than 2.5 cfs. Gages normally use 0.01 ft graduations. So Table 3.3-1 is real coarse. It's insufficient for accurate estimates of SHR outflows and for setting minimum flow releases at the diversion dam.
6. SHR ramping. No specific protocol is proposed nor is any supporting documentation related to the issue provided. The historical data showed significant changes in outflow, which isn't surprising given the frequency of visits. Since there were no ramping studies for the licensing, the fact that there is no documented impact doesn't mean a whole lot.
7. The diversion dam minimum flow structure needs to be approved under Condition F. I had some reservations about the design, and I assume it hasn't changed. So I need to figure out whether it is approvable as proposed. The approval may be conditioned on initial field rating/testing and subsequent monitoring to determine whether it can be relied upon over the long term. Has the design changed at all from the first version I reviewed?
8. Section 3.3 uses a drainage area at Goshen Dam of 2.6 s.m., but Section 2.1 says 2.9 s.m. The certification uses 2.6 s.m.
9. Condition H requires inflow records at Silver Lake as well. Your Table 5.3-1 spreadsheet doesn't include all the required Condition H data for the three facilities.
10. My Comment 15 requested that the compliance spreadsheets include water level plots against the rule curves and compliance checking functions. You didn't respond.
11. On p. 1, you make citations to USGS datum in a few places. Technically, the USGS doesn't establish the vertical datum.

When I get my notes, I'll check to see if I missed anything.

Jeff

><{{{˚> ***Jeffrey R. Cueto, P.E., Chief Hydrologist***
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From: Jason George [mailto:jgeorge@gomezandsullivan.com]
Sent: Thursday, November 19, 2009 10:47 AM
To: Cueto, Jeff
Cc: 'Scarzello, Michael'; Wentworth, Rod; 'Eliason, Beth'; Fitzgerald, Brian; Melissa_Grader@fws.gov
Subject: RE: Silver Lake

Jeff,

CVPS is preparing an extension request to FERC for the Silver Lake Operations Compliance Plan, as you suggested. Before the request is submitted, CVPS would like to understand the specific issues that we still need to work through in order to gain approval on the plan.

We have your emails from 11/6/09 and 11/18/09 (below). From those correspondences we understand that your issues with the Revised Silver Lake Operations Compliance Plan, submitted to you and the VT DFW on October 19, 2009, include:

1. Datum used at Sugar Hill Reservoir
2. Goshen Dam Ramping Plan details

You've indicated that there are other issues that we may need to work through before the plan is approved by the Agency. CVPS requests that you identify those specific issues so that we can effectively resolve them.

Please copy Mike and Beth as CVPS prepares an extension request to FERC. Thank you.

Jason George
Gomez and Sullivan Engineers, P.C.

Please note my new contact information:

P.O. Box 2179
41 Liberty Hill Road - Building 1
Henniker, NH 03242
T - 603-428-4960
F - 603-428-3973

From: Cueto, Jeff [mailto:Jeff.Cueto@state.vt.us]
Sent: Wednesday, November 18, 2009 3:18 PM
To: Jason George

Cc: Scarzello, Michael; Wentworth, Rod
Subject: Silver Lake

Jason – I think it would be prudent to go ahead and ask for an extension of at least 30 days. Since I am out tomorrow and you are out Friday, I don't know how we are going to be able to pull things together for your FERC filing deadline of Monday. I did have some comments back from DFW that the ramping regime proposal at Goshen is vague. The data from AIR #6 showed some significant immediate changes in outflow. There is no information available on how the changes affect downstream stream stages and habitat.

If you get a 30- or 45-day extension, we can probably work through things before I leave the Agency.

Jeff

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Jason George

Subject: Silver Lake Operations Plan
Location: Teleconference

Start: Wed 1/20/2010 9:00 AM
End: Wed 1/20/2010 10:30 AM

Recurrence: (none)

Meeting Status: Accepted

Organizer: Scarzello, Michael

Brian - Attached is a summary of open items in the Silver Lake Operations Compliance Plan for discussion on Jan 20. Please advise is you need any of the refernced background info previously submitted to ANR. CV will tie parties together for the call, thanks mjs.

<<Silver Lake Ops Plan open items 1-2010.docx>>

Silver Lake Ops Plan open item...

Central Vermont Public Service
Silver Lake Operations Compliance Plan
Open Items Summary

January 7, 2010

For use in discussion with VANR, conference call scheduled for January 20 at 9 am.

Background

Central Vermont Public Service Corporation (CVPS) was issued an original FERC license for the Silver Lake Hydroelectric Project (Project No. 11478) on February 26, 2009. A Water Quality Certification (WQC) was issued for the Project by the State of Vermont on December 5, 2008 and is contained in the new FERC license as Appendix A. The new license and associated water quality certification contain several flow and reservoir management requirements for operation of the Project. To address these requirements, CVPS has prepared an operation compliance monitoring plan, which must first be approved by the Vermont Agency of Natural Resources (VANR) before submitting to FERC.

A Draft Operations Compliance Plan was developed by CVPS to describe how the Project will be operated to comply with several elements of the license, as listed below:

- Sugar Hill Reservoir water level management
- Minimum flow releases downstream of Goshen Dam
- Ramping of flow changes downstream of Goshen Dam
- Sucker Brook Diversion Dam water level elevation
- Minimum flow releases downstream of Sucker Brook Diversion Dam
- Silver Lake water level management
- Ramping of flow changes through the Silver Lake powerhouse
- Fish exclusion from the Silver Lake powerhouse tailrace

Consultation History

The Draft Operations Compliance Plan was initially sent to the VANR and the United States Fish and Wildlife Service (USFWS) for review on June 22, 2009. CVPS received comments on the draft plan from the VANR on August 13, 2009. On August 19, 2009, CVPS applied for a three-month extension of time to file the final plan with FERC by November 23, 2009. The extension was granted on August 31, 2009.

CVPS addressed the comments received and submitted a copy of the Revised Operations Compliance Plan to the VANR and Rod Wentworth of the VDFW for another review on October 19, 2009. The USFWS have been deferring to the State of Vermont and have not commented on the plan. It was CVPS's intent to gain approval on the Operations Compliance Plan and file the final plan with FERC by November 23, 2009. Email comments were received from Jeffrey Cueto of VANR on November 6, 18, and 20, 2009 with a suggestion to ask FERC for another

extension in order to resolve outstanding issues and gain VANR approval. On November 23, 2009, CVPS applied for another extension of time to file the final plan by February 21, 2010.

The purpose of this summary is to present the outstanding issues related to the Silver Lake Operations Compliance Plan. The outstanding issues, based on the email from J. Cueto on November 20, 2009 (CC: Michael Scarzello and Beth Eliason (CVPS), Rod Wentworth and Chet Mackenzie (VT DFW), Brian Fitzgerald, (VT DEC), and Melissa Grader (USFWS)), are summarized below.

Vertical Datum used at Sugar Hill Reservoir (Comment 1 in email)

There has been some confusion and an apparent discrepancy in the FERC license regarding water level elevations at Sugar Hill Reservoir. The certification and license refers to 1,765.5 feet msl, as the maximum normal summer pool elevation for Sugar Hill Reservoir and acknowledges this elevation is based on 50 feet local datum. There are also elevation tags on the headgate chain in the impoundment marked in one foot increments.

The normal full pool as referenced in the Vermont water quality certification is five feet below the emergency spillway elevation. The elevation of the emergency spillway was surveyed recently in November 2009 and it was determined to be at 1,770.95 feet. For practicality, this elevation can be considered 1,771.0 feet. The upper operating level of the reservoir is to be at least five feet below this level for safety considerations. CVPS has always been using this upper operating level (five feet below spillway crest, or 1,766.0 feet) as the full pool. The links on the gate chain are intended to be relative to the spillway crest.

CVPS has over the years relied too much on the gate chain markings. Based on the 1995 survey (as described in the letter to J. Cueto dated December 4, 1998), the chain tag elevations have apparently fallen out of calibration. CVPS's operational procedures have always referenced surface water elevations in relation to the spillway crest for dam safety consideration. That is, the maximum full pool (upper limit of the operating rule curve) is five feet down from the spillway crest at 1766 feet, and the corresponding normal summer operational zone varies between 1,766.0 feet and 1,761.0 feet, respectively.

Based on the recent survey data, CVPS is planning to install new brass disc on the gate mechanism as a benchmark elevation, and re-calibrate and chain link elevation tags in feet, msl. CVPS believes the revised plan describes this and has requested the record be corrected.

Field Rating of Goshen Dam Outflows (Comments 3, 4, and 5 in email)

Condition H of the WQC states "The valves at Goshen Dam shall be rated using field testing over the range of reservoir operating levels; the results and methodology used shall be included in the plan."

Table 2.3-1 in the revised plan presents calculated outflows from the Goshen Dam outlet valves. The minimum flow of 2.5 cfs was field verified. For lower flows when the elevation of the reservoir is at eight feet below full pool, CVPS must hold the reservoir elevation constant by

adjusting the outlet valves to match inflow. A staff gage on the V-notch weir was proposed as an aide in determining inflow/outflow under these low flow conditions.

As described in Section 2.4 of the revised plan, CVPS maintains a continuous minimum flow of 2.5 cfs to Sucker Brook by manually adjusting one of the 6-inch valves at the Goshen Dam outlet. This valve setting maintains the water surface at the crest of a 12-inch, 90 degree, V-notch weir cut into stoplogs before the discharge enters Sucker Brook. The minimum flow of 2.5 cfs provided through the V-notch weir was field verified as accurate in 2008.

With the exception of 4 turns on first 6" valve for minimum flows, CVPS operators use the valves to regulate outflows in manner that are either fully open, fully closed or half open. Although Condition H states that the valves at Goshen Dam shall be rated using field testing over the range of reservoir operating levels, CVPS believes that the discharge estimates presented in Table 2.3-1 are a valid and appropriate substitute for the field rating and can be used by CVPS to operate the project in compliance with the reservoir levels and minimum flow requirements contained in the license. CVPS is requesting that VANR accept the calculated discharge capacities of the outlet valves as presented in Table 2.3-1 in lieu of field testing over a range of reservoir operating levels.

Ramping Procedures for Goshen Dam Outflows (Comment 6 in email)

Condition C of the Vermont Water Quality Certification requires CVPS to develop a ramping plan for the adjustment of the valve system at Goshen Dam in order to control the rate of change of downstream flows and protect downstream aquatic organisms. CVPS described their ramping procedures in Section 2.5 of the revised plan; the current ramping procedure employed by CVPS is proposed for continuation.

CVPS and VANR seem to be at an impasse over this issue. CVPS's position is that the current ramping procedure in not causing and adverse impacts to aquatic resources. There were several site visits conducted by the resources agencies as part of the relicensing effort during which there was no documentation of impact. For additional information already provided, see Section 2.5 and Page 29 (Comment 8) in the responsiveness summary in the revised plan.

Regarding the historical data, the data set being referred to was provided in an AIR response (second set – February 1996) and shows daily outflows from Sugar Hill Reservoir.

Inflow Recordkeeping (Comments 3 and 9 in email)

Condition H of the WQC states "The applicant shall develop a plan for continuous monitoring of flow releases at the project, both below the dams and below the station tailrace, and reservoir levels and inflows."

CVPS intends to maintain records of flow releases and reservoir levels at the project as explained in Section 5 of the plan. However, CVPS is questioning the need for continuous monitoring of inflows to the reservoirs. The only scenario when CVPS needs to precisely know inflows in order to meet their flow and water level obligations contained in the license (Condition B of the

WQC) is under drought conditions, when Sugar Hill Reservoir is at its maximum drawdown level of 8 feet below full pool, or 1,758 feet. When the reservoir is at this level, CVPS is required to release outflows that match inflows into reservoir, as opposed to the 2.5 cfs minimum discharge otherwise required. Inflows are matched by holding the reservoir elevation constant and making adjustments to the outflow valves during this period. Inflows are then recorded as matching outflows for the day. This inflow value is needed because under these drought scenarios, additional adjustments are required at Sucker Brook Diversion Dam, where there is a requirement to release 2.5 cfs or inflow (Condition B of the WQC). Procedures for providing minimum flows below Diversion Dam are explained in Section 3.3 of the revised plan.

As described previously in the revised plan (Section 5.2 and responsiveness summary Page 33), CVPS believes that continuous monitoring of hourly reservoir inflows and changes in reservoir storage is an undue burden and not necessary for CVPS to operate the project in compliance with the reservoir levels and minimum flow requirements contained in the license. CVPS continuously monitors reservoir levels and Goshen Dam discharges in order to meet their license requirements.

Compliance Spreadsheets (Comment 10 in email)

VANR recommended requested developing compliance spreadsheets to include plotting water levels against the rule curves and compliance checking functions.

CVPS believes this is above the intent of the license and water quality certification which requires monitoring and recordkeeping.

Diversion Dam Minimum Flow Structure (Comment 7 in email)

CVPS addressed the concerns that VANR had on the initial design provided in the draft operation compliance report dated June 22, 2009. The final design plan for the fixed orifice release sent to VANR on October 19, 2009 should be reviewed. CVPS is looking forward to construction of the flow release device, and testing its performance next summer.

Jason George

From: Jason George [jgeorge@gomezandsullivan.com]
Sent: Tuesday, January 26, 2010 3:27 PM
To: 'Fitzgerald, Brian'
Cc: 'Scarzello, Michael'; 'Eliason, Beth'
Subject: Silver Lake Project Telecon Summary and Ramping Spreadsheets
Attachments: Telecon CVPS and VANR 1.20.10.docx; SL401MRM.pdf; Ayers Brook to Goshen Dam Flow Comparison.xlsx

Hi Brian,

Please find attached a summary of the conference call we had on January 20, 2010 with CVPS to discuss the Silver Lake Hydroelectric Project Operations Compliance Plan. Included is an Excel spreadsheet "*Ayers Brook to Goshen Dam Flow Comparison*" comparing Goshen Dam discharge to Ayers Brook discharge in 2009, and other various flow and ramping data –which is explained in the teleconference summary.

Also included is documentation of the flow measurements collected below Goshen Dam in 2008 to verify minimum flow of 2.5 cfs, as you requested.

Reminder that we agreed to have a follow-up conference call on Friday, February 12, 2010 from 9:00 AM-11:00 AM to discuss this issue. Please contact me if you need any additional information. Thanks.

Jason George
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TELECON

Date:	**January 20, 2010 9:00**
Call To:	**Brian Fitzgerald, VANR**
Call By:	**Mike Scarzello (CVPS), Beth Eliason (CVPS), and Jason George**
Re:	**Silver Lake Hydroelectric Project Operations Compliance Plan**
Distribution:	**Call participants**

This memo contains a summary of a telephone conference with the Vermont Agency of Natural Resources (VANR) regarding the Silver Lake Hydroelectric Project Operations Compliance Plan (Plan). A call was initiated to resolve outstanding issues related to the Plan in an attempt to gain VANR approval prior to FERC submittal on February 21, 2010.

VANR was briefed on the background related to the Plan development. The outstanding issues related to the Plan were highlighted in a summary distributed from CVPS to VANR on January 7, 2010. The discussion of these issues is summarized below.

Vertical Datum

VANR was agreeable to the requested clarification of the vertical elevations used at Sugar Hill Reservoir. It was explained the proposed elevations of 1,761 feet to 1,766 feet, msl are the normal summer operating level and were consistent with the assumptions of the 401 water quality certification. These elevations were relative to the emergency spillway crest, which was re-surveyed in 2009.

Field Rating of Goshen Dam Outlet Valves

VANR suggested they would still like to see field rating of the five valves at Goshen Dam when the reservoir is at elevations 1,766 and 1,761 feet in order to verify the calculations presented in Table 2.3-1 of the Plan. CVPS explained that they avoid having the elevation at 1,771 feet due to safety concerns, so a field rating is not feasible at this elevation. Also at elevations of 1,758 and 1,748 feet, it was agreed that field rating was not necessary; however, after measuring flows under 1,761 and 1,766 feet, the discharge coefficients could be adjusted if necessary for the other reservoir elevations. VANR agreed that the flow measurements could occur during the summer field season, and that the valves could be rated independently due to safety concerns. The methods should be added to the plan prior to approval. CVPS agreed to perform the field verification of flows at 1,761 and 1,766 feet this summer.

It was reiterated that the minimum flow of 2.5 cfs below Goshen was field verified through flow metering methods in 2008. VANR asked for the written documentation of the field effort. Attached is a letter report from Multiple Resource Management to CVPS.

Goshen Dam Ramping

It was explained to VANR that CVPS is proposing to continue their current mode of ramping at Goshen Dam. VANR was concerned about the rate of change and was looking for a quantitative discussion and guidelines for CVPS to use when making adjustments to outflows at Goshen Dam, such as a table to show that when flows are at X cfs, the maximum change allowed per day is Y. There can be provisions for emergency situations such as anticipated heavy precipitation, floods, etc.

The intent of the ramping protocol is to mimic the natural hydrograph. VANR suggested CVPS look at unregulated flows from the Ayers Brook USGS gage to determine natural rates of change. These can be compared to the actual and proposed ramping scenarios at Goshen Dam.

VANR mentioned that at Army Corps dam projects, the rate of change is 0.5 cubic feet per second per square mile of drainage (cfsm) per hour. The group agreed that CVPS would develop a spreadsheet showing ramping scenarios and submit to VANR as a basis for discussion.

Attached is the information requested in Excel format. The spreadsheet shows hourly and daily mean flow data from the 30.5 sq. mi. Ayers Brook USGS gage from May – September 2009 as well as daily data from 1999-2008. These data were obtained from the USGS and it should be noted that the 2009 data are provisional. The 2009 hourly data are compared to Goshen Dam discharge data (Figure 1). This figure shows that the magnitude of flow peaks in Ayers Brook in response to precipitation events were similar to the corresponding releases at Goshen Dam.

The associated rate of change in Ayers Brook flows (cfsm/day) and Goshen Dam were also calculated and again the comparison was done for 2009 data ("Goshen 2009" tab). In addition, the spreadsheet tab labeled "Goshen Valve Q Rate" shows the respective discharges of each valve setting and the rate of change as the valves are opened in sequence. Also included are precipitation data and Sugar Hill Reservoir elevation for May – Sept. 2009.

The 2009 data comparison shows that the rate of change in Goshen Dam discharges was higher compared to Ayers Brook in late May after over three inches of rain fell in the area, however the flow peaks were very similar. In this situation, the valves went from one 6" fully open to both 6" valves fully open and one 8" valve fully open. This change was necessary because the reservoir elevation was rising above the normal full pool elevation of 1,766 feet. A similar situation is presented in late July 2009 in response to over two inches of rainfall. It should also be noted that based on the last ten years of flow data from Ayers Brook, large changes in cfsm/day, although infrequent, can occur. The maximum daily change in cfsm during the last ten years at Ayers Brook was 13.28 in July 2007 (as shown in the worksheet "Ayers 99-08 Ranked").

Inflow Recordkeeping

VANR requested more time to think over the requirement in Condition H to maintain records of reservoir inflows. It was explained to VANR that when Sugar Hill Reservoir is drawn down to 8 feet blow full pool in the summer, that is then when information on inflows is required to manage minimum flow and water level obligations in the license. Table 3.3-1 in the plan was referenced and it was explained that staff gages were proposed for determining outflows at Goshen Dam under drought conditions; once these outflows are known, the appropriate outflow at the Sucker Brook diversion dam penstock tap can be provided.

It was recognized that CVPS was aware that inflow determination requires a calculation based on changes in reservoir storage. This calculation can be performed relatively simply at Sugar Hill Reservoir. However, CVPS mentioned that this project is not a typical riverine hydro project. Downstream at Sucker Brook diversion dam, the unregulated and ungaged Dutton Brook provides flow into the hydro system, supplementing the discharge from Goshen Dam; both of which are diverted into Silver Lake. CVPS noted the difficulty in quantifying inflows into Silver Lake.

Other Items

In terms of additional recordkeeping (spreadsheets with compliance checking functions), CVPS explained that alarm functions are built into the SCADA system to alert operators as limits of water level elevations are approached. A colored spreadsheet cell was presented as an example by VANR as a means to identify non-compliance.

VANR also mentioned that they would review the penstock tap designs with one of the state's engineers due to CVPS's intent to construct this improvement this summer.

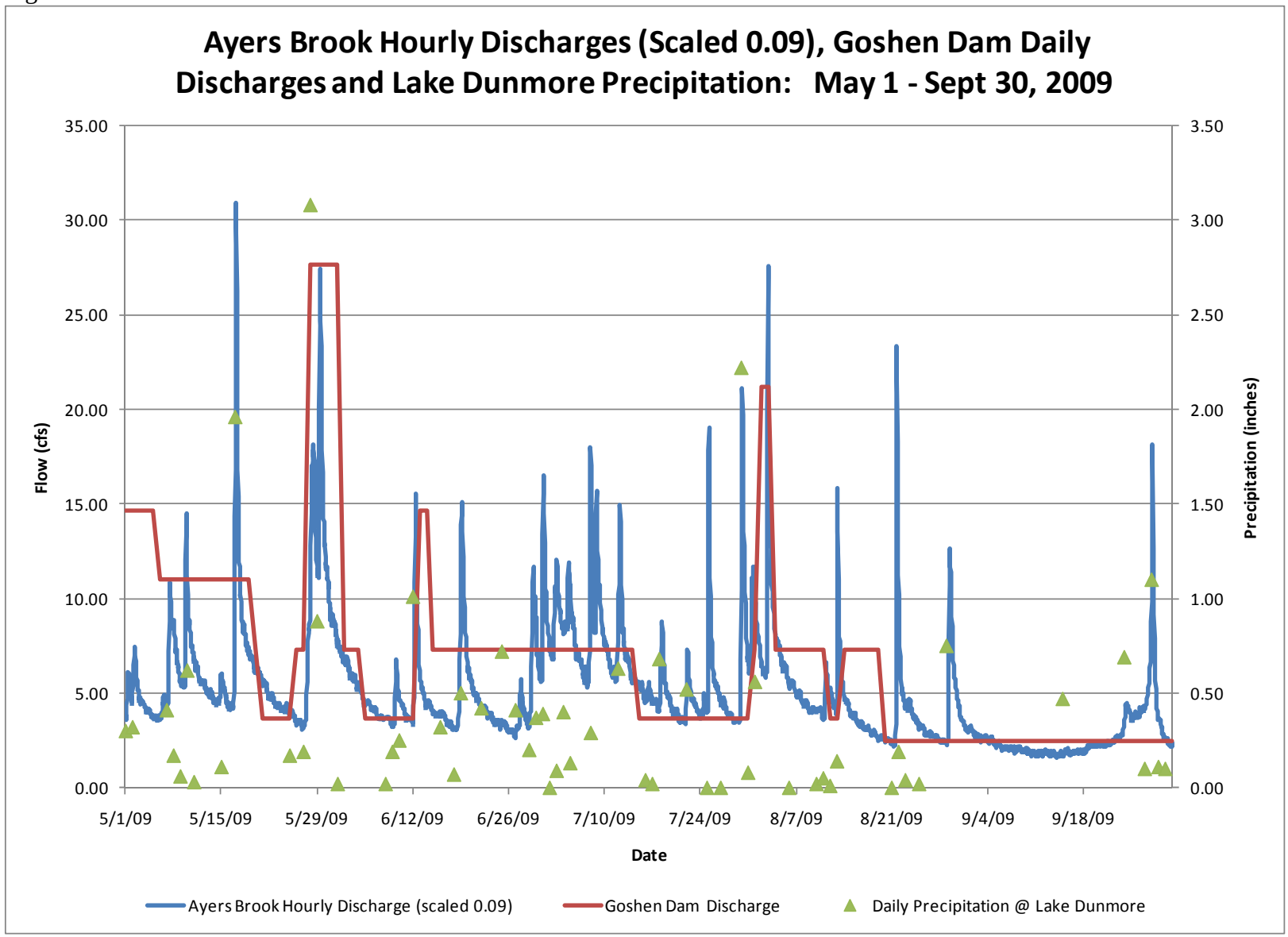
Summary

CVPS agreed to provide this summary and the attached info to VANR and another conference call was scheduled for February 12, 2010 at 9 am.

Attachments

1. Memo from MRM to CVPS dated November 17, 2008 describing the flow measurements collected below Goshen Dam in 2008 to verify minimum flow of 2.5 cfs.
2. Excel spreadsheet "*Ayers Brook to Goshen Dam Flow Comparison*" comparing Goshen Dam discharge to Ayers Brook discharge in 2009, and other various flow and ramping data.

Figure 1



Note: See "2009 Flow Comparison Chart" tab in the attached excel file.

Jason George

From: Jason George [jgeorge@gomezandsullivan.com]
Sent: Wednesday, February 17, 2010 3:30 PM
To: 'Fitzgerald, Brian'
Cc: 'Scarzello, Michael'; 'Eliason, Beth'
Subject: Silver Lake Operations Plan
Attachments: SL Operations Compliance Plan DRAFT FINAL Feb 2010_compressed.doc; Silver Lake 02-17-10.pdf; Telecon CVPS and VANR 2.12.10.docx

Hi Brian,

Attached for your review is a track change version of CVPS's Silver Lake Operations Compliance Plan. The plan has been revised according to our teleconference last week (summary also attached). A clean copy will be submittal with FERC upon your approval.

The Sucker Brook Diversion Dam minimum flow designs were also modified and included as a separate attachment in PDF.

Please let me know that you received this package and if you have any questions or concerns. I'll follow-up with you on Friday. Thanks a lot.

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TELECON

Date:	**February 12, 2010 9:00**
Call To:	**Brian Fitzgerald, VANR**
Call By:	**Mike Scarzello (CVPS), Beth Eliason (CVPS), and Jason George**
Re:	**Silver Lake Hydroelectric Project Operations Compliance Plan**

This memo contains a summary of a telephone conference with the Vermont Agency of Natural Resources (VANR) regarding the Silver Lake Hydroelectric Project Operations Compliance Plan (Plan). A follow-up call was held to discuss outstanding issues related to the Plan in an attempt to gain VANR approval prior to FERC submittal on February 21, 2010. The outstanding issues related to the Plan were initially discussed on a telephone call between CVPS and VANR on January 20, 2010. The follow-up discussion of these issues is summarized below.

CVPS confirmed that VANR was agreeable to the vertical elevations proposed in the Plan (1,761 feet to 1,766 feet, msl as the normal summer operating levels). These elevations are relative to the emergency spillway crest, which was re-surveyed in 2009, and are consistent with the assumptions of the 401 water quality certification.

CVPS reiterated their commitment to perform flow measurements to verify discharges from the five outlet valves at Goshen Dam when the reservoir is at elevations 1,766 and 1,761 feet. These measurements will be used to verify the discharge calculations presented in Table 2.3-1 of the Plan. The coefficients used in the discharge calculations for the other reservoir elevations will be extrapolated from the field measurements and adjusted as necessary. In addition to performing flow measurements of the valve discharges at Goshen Dam, VANR requested that the minimum flow over the V-Notch weir at Goshen Dam be field verified. CVPS agreed. The Plan will be revised to reflect this commitment.

<u>Goshen Dam Ramping</u>

Spreadsheet data showing discharges from the unregulated Ayers Brook USGS gage compared to discharges from Goshen Dam were reviewed as a basis for discussing the Goshen Dam ramping issue. VANR had reviewed the data provided on January 26 and stated that the rate of change of Goshen Dam discharges was still an issue. Based on the Ayers Brook data, a 4.0 cfsm/hour change in up-ramping and a 3.0 cfsm/hr change in down-ramping were suggested by VANR as typical maximum rates of change. VANR stated that comparative rates of change for Goshen Dam discharges (based on drainage area) were approximately 10 cfs/hour for up-ramping and 8 cfs/hour for down-ramping and offered these values as a suggested ramping protocol.

CVPS noted that on occasions when the elevation Sugar Hill Reservoir water level is already high (e.g., 1,765 feet) and precipitation is expected or occurring, CVPS operators need to react quickly in order to manage Sugar Hill Reservoir levels within the normal operating range. VANR recognized that in these circumstances, it may be reasonable to forego the up-ramping requirement in order to manage the water levels in a safe manner.

It was agreed that CVPS would develop a protocol for up- and down-ramping for the Plan in accordance with the discussions and submit to VANR for final review and approval.

VANR suggested that an adaptive management approach, where the ramping protocol could be tested and then evaluated, could be proposed by CVPS.

Inflow Recordkeeping

The requirement to maintain records of reservoir inflows was discussed. VANR stated that as long as CVPS maintains good recordkeeping of Sugar Hill Reservoir and Silver Lake water levels as well as discharge records, then the requirement to maintain records of reservoir inflows was not necessary. CVPS concurred.

Other Items

VANR raised the issue of verifying minimum flow discharges at Goshen Dam. VANR asked that CVPS add to the Plan a commitment for the operators to visually verify that flow through the V-notch weir is full, thereby confirming the 2.5 cfs minimum flow requirement. CVPS said the operators can do this and make note of it in their logs, and agreed to add this to the Plan.

VANR asked about monitoring flows and inspecting the V-notch weir discharge at Sucker Brook Diversion Dam once the minimum flow device is installed. CVPS confirmed that their Operators will check and record the discharges at Sucker Brook Diversion Dam. CVPS stated that the frequency of visual inspection will depend on how often the sediment trap on the device needs to be flushed.

VANR raised some questions on the design of the Sucker Brook Diversion Dam minimum flow device. Specifically, the 18" pipe designed to flush the sand trap was too close to the minimum flow pipe which could result in discharging short-term sediment laden water into Sucker Brook affecting aquatic biota. VANR asked if CVPS could consider options that would divert the flushing flow away from the channel. Potential options were discussed briefly and CVPS offered to investigate options for the final Plan.

VANR also questioned whether the stilling basin was sufficient to allow non-turbulent flows to pass through the V-notch weir at the diversion pipe. The concern was providing an accurate flow based on the reading of a staff gage adjacent to the V-Notch weir. CVPS offered to investigate options for the final Plan.

CVPS agreed to revise the Plan according to the teleconference discussions and submit a “track change” version to VANR for final review and approval.

VERMONT

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February 18, 2010

Michael J. Scarzello, P.E.
Central Vermont Public Service Corporation
77 Grove Street
Rutland, VT 05701

RE: Silver Lake Hydroelectric Project – FERC No. 11478
Operations Compliance Plan

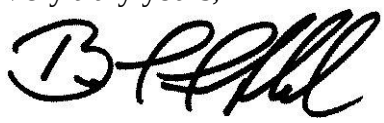
Dear Mr. Scarzello:

Gomez and Sullivan Engineers filed, on behalf of Central Vermont Public Service Corporation, a revised operations compliance plan for the Silver Lake Hydroelectric Project by e-mail on February 17, 2010. The plan addresses several conditions in the water quality certification issued on December 5, 2008, and is subject to Department approval under certification conditions C, D, F, G and H. We appreciate CVPS working with us and other agencies to revise earlier drafts of the plan and hereby grant the Department's approval.

As with any of these plans, operational experience after plan implementation may lead to further refinements. Please coordinate with us and obtain Department approval with respect to any future plan revisions.

Please feel free to contact me if you should have any questions.

Very truly yours,



Brian T. Fitzgerald
Streamflow Protection Coordinator

c: Rod Wentworth, VDFW
Chet MacKenzie, VDFW
Melissa Grader, USFWS
Jason George, Gomez & Sullivan