Village of Cooperstown Wastewater Treatment Facility Ultraviolet Disinfection Project

Final Report 07-04
January 2007

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VILLAGE OF COOPERSTOWN
WASTEWATER TREATMENT FACILITY
ULTRAVIOLET DISINFECTION PROJECT

FINAL REPORT

Prepared for the

NEW YORK STATE ENERGY RESEARCH AND DEVELOPMENT AUTHORITY

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NOTICE

ABSTRACT

The Village of Cooperstown Wastewater Treatment Facility (WWTF) is located off Linden Avenue in the Village of Cooperstown, Otsego County, New York. Constructed in 1968 and modified in 1990, the WWTF uses a fixed film process for nutrient removal and discharges treated effluent to the headwaters of the Susquehanna River. The WWTF operates under New York State Pollutant Discharge Elimination System (SPDES) Permit No. NY-002 3591 (included as Appendix A). The design flow for the WWTF is 0.52-mgd, but it currently has an interim SPDES flow limit of 0.75-mgd on a 12-month rolling average (12MRA) basis until further studies are done to determine the actual plant component capacities and potential upgrades.

Originally, gaseous chlorine was used for seasonal disinfection (May 16 thru September 15) as required in the facility's SPDES permit. However, when the New York State Department of Environmental Conservation (NYSDEC) renewed the SPDES permit in 1999, the effluent residual chlorine concentration allowed to be discharged to the Susquehanna River was lowered. Thus, a sodium bisulfite dechlorination system would be necessary to meet the new permit requirements. This would require a new, significantly larger, chlorine contact tank because the existing post aeration tank and outfall pipe could no longer be included in the contact time calculations. Additionally, it was determined that the existing post aeration structure was in desperate need of repair or replacement and was also undersized to handle future projected flows .

Therefore, considering the potential capital and operating costs associated with chemical disinfection, and desiring to eliminate the handling and environmental risks associated with such chemicals, the Village, with the concurrence of the NYSDEC, decided to consider ultraviolet (UV) disinfection as an alternative to the gaseous chlorine disinfection method. This report outlines the wastewater treatment plant components prior to UV addition its permit limits, its effluent quality, and its projected flows. It presents the detailed evaluation and comparison of UV disinfection vs. chlorine disinfection, including UV testing to determine effectiveness, compliance with permit limits, and modifications required for both systems, which were used to conclude that UV would be the best choice for disinfection at the WWTF. Final design, approvals, and construction components of the project are then discussed, and the report concludes with a performance evaluation of the newly installed UV disinfection system.

KEY WORDS

UV Transmittance: A measure of the amount of ultraviolet radiation that will pass through a given substance, such as wastewater, at a wavelength of 254 μm.

UV Intensity (I): The strength of UV radiation reaching a given particle. Directly related to the distance the light waves are from the source. Used in conjunction with time (t) to determine UV Dose (D); D=I x t).

Flocculation: The process of forming aggregates or flocs from finely divided particles into larger particles that can be readily removed by settling or filtering.

Fecal Coliform: A nonpathogenic bacteria organism known to cause a waterborne gastroenteritis disease.

Chlorine Residual: Measurement of the toxicity level of chlorine remaining in a wastewater effluent sample.

Total Suspended Solids (TSS): Measurement in mg/L, the amount of residue remaining on a filter paper after being dried at a specific temperature. Used routinely to assess the performance of a conventional wastewater treatment process.

ACKNOWLEDGEMENTS

Special mention for their significant involvement in this project is given to the Village of Cooperstown Wastewater Treatment Plant Operators, the Sewer Board and Finance Committee members; their consulting engineers, Lamont Engineers, P.C. and Tisdel Associates, and the UV System supplier and technical consultants, Koester Associates, Inc. and Trojan Technologies, Inc.

Also to be recognized are the construction contractors involved in the project, Pinnacle Construction, Inc., Diekow Electric, Inc. and Slack Chemical Company, Inc.

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SUMMARY

The Village of Cooperstown WWTF is a secondary fixed-film wastewater treatment facility that discharges into the headwaters of the Susquehanna River. The 0.52-mgd facility was constructed in 1968 and modified in 1989. Gaseous chlorine was the original means used to achieve disinfection of the treated effluent, but a SPDES permit modification was proposed by the NYS DEC in 1999 that would necessitate dechlorination to reduce the effluent chlorine residual to 0.37-mg/l. The existing chlorine contact tank was determined to be too small if dechlorination were to be installed and would therefore need to be replaced.

Concerned with the cost of the possible modifications associated with dechlorination and desiring to move away from the safety and environmental risks associated with chemical disinfection, the Village, with the approval and support of the NYS DEC, requested a deferment of the dechlorination requirement to investigate ultraviolet radiation (UV) as an alternative disinfection technology.

The investigation included effluent testing to ascertain the effectiveness of UV disinfection on the wastewater effluent, field observation of some existing UV systems in upstate New York, selecting the size and type of UV system, and determining facility modifications that would be required to accommodate a UV system. Field testing indicated that a proposed UV disinfection system could readily meet the effluent disinfection requirements of the modified SPDES permit and provide a good margin of safety. Flocculant addition facilities were also proposed as part of the UV system to improve effluent turbidity, and thus disinfection, on an as-needed basis.

Once the feasibility of UV disinfection was established, the advantages and disadvantages of chemical disinfection and UV disinfection were compared, and a 20-year net present worth (NPW) cost analysis was performed for both technologies. Then a grant for $123,820 from the NYS Energy Research and Development Authority (NYSERDA) was sought and successfully obtained. Applying the NYSERDA grant to the UV system cost, the 2002 estimated out-of-pocket NPW cost for UV disinfection was determined to be $335,700, whereas the estimated NPW cost for chemical disinfection was $316,700, a difference of $19,000.

Based on these findings, it was concluded that UV technology could be confidently applied at the Village of Cooperstown WWTF and would improve environmental and safety conditions for the operators, nearby residents, and the ecosystem. Although such improvements carried a substantially higher capital cost, the NYSERDA grant to the Village would help offset the capital cost difference and, with the tentative

acceptance of UV technology by the NYSDEC in a letter dated December 23, 2002, ultraviolet disinfection was formally selected for the Cooperstown WWTF.

Following this selection, preliminary design was started. In August 2003, additional field testing was done to determine the effectiveness of the addition of a flocculation chemical, and another wastewater treatment facility was visited to obtain design data and operators input for comparison of two similarly manufactured UV systems. In November 2003, final design was completed, and in September 2004 the construction of an open channel UV system using low pressure/high intensity horizontal lamps was substantially completed and tested. The new system was put into service for the 2005 disinfection season, and the old chlorination system was abandoned and removed. Initial data has shown that the system performs outstandingly in removal of germicidal bacteria, and the plant operators are very pleased with the systems ease of maintenance and the move away from chemical disinfection.

Section 1

PRE-UV CONDITIONS

WWTF OVERVIEW

The Village of Cooperstown WWTF treats both traditional wastewater from the Village collection system and process wastewater from the Village of Cooperstown Water Treatment Plant (WTP). Treated effluent from the WWTF is discharged to the Susquehanna River, a Class B (contact recreation/swimming) Stream. Dewatered solids are trucked to a landfill operated by the Montgomery Otsego Schoharie Solid Waste Management Authority in Montgomery County, New York.

A location plan for the Cooperstown WWTF is presented as Figure 1-1, and an overview of the pre- UV WWTF layout is presented in Figure 1-2.

Most of the unit processes at the Cooperstown WWTF were commissioned in 1968. That facility replaced an Imhoff Tank process that was constructed at the site during the 1930's. The process equipment at the WWTF prior to the new UV disinfection system is listed below:

<u>Liquid Stream Processes:</u>

- Mechanically-cleaned bar screen and manually-cleaned bypass bar screen (2);
- Parshall flume (2);
- Vortex-type grit removal system (2);
- Four (4) influent pumps, 1840-gpm peak pumping capacity (2);
- Primary clarifier, center feed, 50-ft diameter x 7-ft deep;
- Trickling filter w/rock media, 60-ft diameter x 5-ft deep;
- Three (3) rotating biological contactors (RBCs) (1);
- Two (2) final clarifiers (1), peripheral feed, 35-ft diameter x 9-ft deep;
- Gaseous chlorination (2) and concrete chlorine contact tank;
- 4000-gallon post aeration tank (1);
- 1180-feet of outfall pipe.

<u>Solids Handling Processes:</u>

- (2) digester recirculation pumps, 75-gpm capacity each (2);
- Anaerobic digester, 25,300-cf capacity w/ (2) draft tube mixers and waste gas flare;

- Plunger type digester/drying bed feed sludge pump, 75-gpm capacity [(2)];
- (6) covered sludge drying beds totaling 7,200-sf.

(1) Added in 1989

(2) Housed inside control building

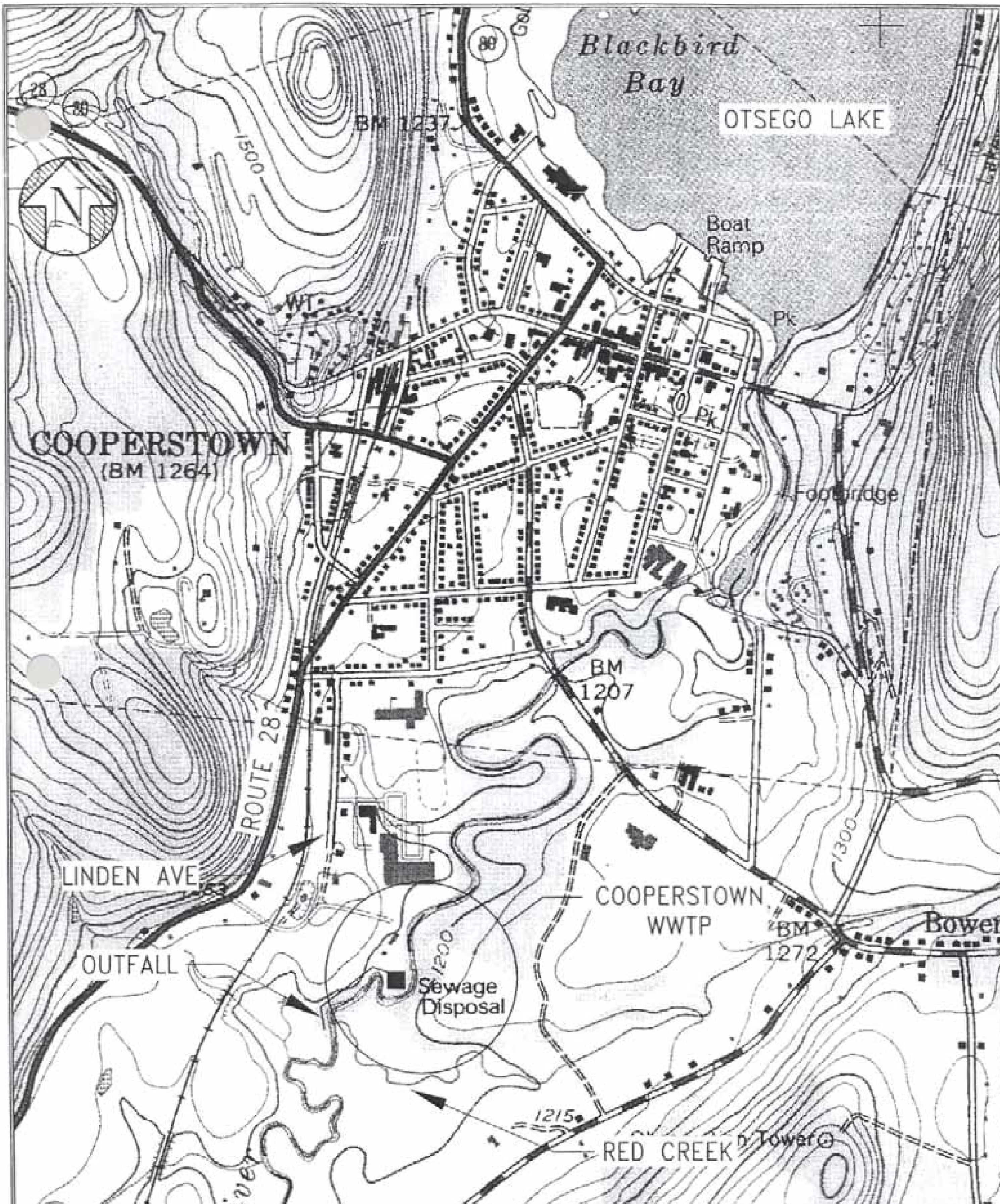
ORIGINAL DISINFECTION SYSTEM

A chlorine room within the control building housed a 400-lb/day automatic gas chlorinator, a 100-lb/day emergency manual chlorinator, and 1-ton chlorine gas cylinders. A monorail system facilitated moving the 1-ton cylinders from the delivery truck into the chlorine room.

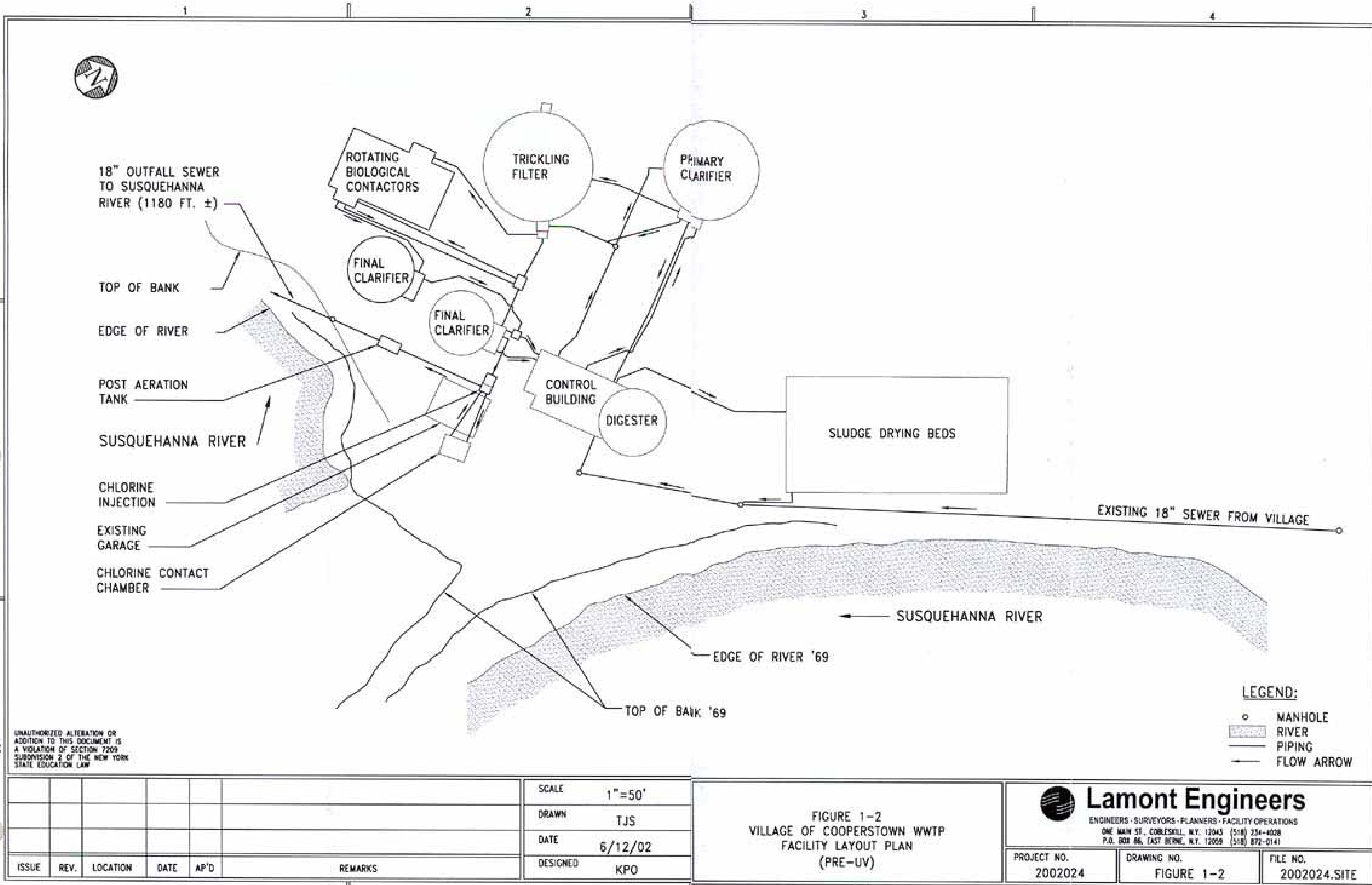
An automatic chlorinator used a flow signal from the Parshall flume to pace the chlorine dose. Thus, chlorine dosage was paced by influent flow. Chlorine solution was injected into the final effluent in a dedicated structure just downstream of the final clarifiers. The chlorinated effluent then flowed into the baffled concrete chlorine contact tank, passed through the concrete post aeration tank, and vitrified clay outfall pipe before finally discharging to the Susquehanna River, approximately 1180-feet downstream.

According to the Operation and Maintenance Manual for the WWTF, the disinfection system provided 17.1-minutes of contact time at a design peak hour flow of 2.3-mgd; 6.2-minutes were provided in the contact tank, and 10.9 minutes were provided in the outfall pipe. The contact tank was not newly constructed in 1968, but it was part of the Imhoff Tank system that formerly occupied the site. Visual inspection of this tank showed many small cracks and other signs of deterioration. The plant operator installed a sump pump in the contact tank to remove any settled solids that may have carried over from the final clarifiers.

The outfall pipe had deteriorated as well; a brick manhole located approximately 1000-feet upstream of the end of the pipe had partially collapsed, thus allowing much of the effluent to enter the river ahead of the intended discharge location. Further evidence of the outfall pipe condition appeared every spring when tree roots would plug the pipe, a condition that would worsen once the chlorine residual was removed from the effluent. The operator estimates that five man-days per month were required to keep the outfall pipe marginally serviceable.



DATE	PROJECT NO.	FIGURE 1-1 VILLAGE OF COOPERSTOWN WWTP SITE LOCATION MAP	Lamont Engineers ENGINEERS - SURVEYORS - PLANNERS - FACILITY OPERATIONS
6/12/02	2002024		
SCALE	DRAWN		
N.T.S.	TJS		


18" OUTFALL SEWER TO SUSQUEHANNA RIVER (1180 FT. ±)
TOP OF BANK
EDGE OF RIVER
POST AERATION TANK
SUSQUEHANNA RIVER
CHLORINE INJECTION
EXISTING GARAGE
CHLORINE CONTACT CHAMBER
ROTATING BIOLOGICAL CONTACTORS
TRICKLING FILTER
PRIMARY CLARIFIER
FINAL CLARIFIER
FINAL CLARIFIER
CONTROL BUILDING
DIGESTER
SLUDGE DRYING BEDS
EXISTING 18" SEWER FROM VILLAGE
SUSQUEHANNA RIVER
EDGE OF RIVER '69
TOP OF BANK '69
LEGEND:
MANHOLE
RIVER
PIPING
FLOW ARROW
UNAUTHORIZED ALTERATION OR ADDITION TO THIS DOCUMENT IS A VIOLATION OF SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW
ISSUE
REV.
LOCATION
DATE
AP'D
REMARKS
SCALE 1"=50'
DRAWN TJS
DATE 6/12/02
DESIGNED KPO
FIGURE 1-2
VILLAGE OF COOPERSTOWN WWTP
FACILITY LAYOUT PLAN
(PRE-UV)
Lamont Engineers
ENGINEERS · SURVEYORS · PLANNERS · FACILITY OPERATIONS
ONE MAIN ST., COBLESKILL, N.Y. 12043 (518) 234-4028
P.O. BOX 86, EAST BERNE, N.Y. 12059 (518) 872-0141
PROJECT NO. 2002024
DRAWING NO. FIGURE 1-2
FILE NO. 2002024.SITE

EXISTING ELECTRICAL SYSTEM

Electrical power is supplied to the plant by NYSEG and consists of a 208Y/120V, 3 phase, 4-wire underground service. The main fusible disconnect switch is rated for 400A. Power distribution to the treatment equipment is provided by a motor control center. An 85 kW diesel-fired generator and automatic transfer switch provide emergency power to selected treatment equipment within the plant. Power use data from NYSEG indicates the maximum plant demand is approximately 50 kVA (140A).

SPDES PERMIT AND REGULATORY COMPLIANCE

The SPDES permit (Appendix A) for the Village of Cooperstown WWTF became effective on February 1, 1999 and will remain in effect until February 1, 2009. Table 1-1, below, provides a summary of the SPDES permit requirements:

TABLE 1-1: SPDES PERMIT REQUIREMENTS

PARAMETER	EFFLUENT LIMITATION	
	May 16 to October 15	October 16 to May 15
Flow, 30 day mean	0.52-mgd	0.52-mgd
$CBOD_5$, 30 day mean	25 mg/l	25 mg/L and 108 lbs/day
$CBOD_5$, 7 day mean	--	40 mg/L and 173 lbs/day
UOD, 30 day mean	325 lbs/day	--
Suspended Solids, 30 day mean	30 mg/l and 130 lbs/day	30 mg/l and 130 lbs/day
Suspended Solids, 7 day mean	45 mg/l and 195 lbs/day	45 mg/l and 195 lbs/day
Coliform, Fecal, 30 day mean [(1)]	<200 CFU/100 ml	--
Coliform, Fecal, 7 day mean [(1)]	<400 CFU/100 ml	--
Chlorine Residual, daily maximum [(1)]	0.37 mg/l	--
PH, range	6.0 to 9.0 SU	6.0 to 9.0 SU
Settleable Solids, daily maximum	0.3 ml/l	0.3 ml/l
Ammonia, 30-day mean	10mg/l as NH_3	--
Dissolved Oxygen, daily minimum	7.0 mg/l	--
Stream Flow, daily minimum	11 cfs	11 cfs

[(1)] As noted previously, disinfection required only from May 16 to September 15

The permit includes interim and final limits for both effluent flow and chlorine residual. The permit also required the Village to submit an "approvable Engineering Report" by October 1, 2000. The report was to recommend an approach to meet the final effluent flow and residual chlorine limits of 0.520-mgd and 0.37 mg/l respectively and to propose a schedule for meeting those limits. The interim flow limit of 0.750-mgd (12 month rolling average) and chlorine residual limit of 2.0 mg/l (daily maximum) would be effective until the facility was ready to meet the final permit limits.

An Engineer's Report entitled "Abridged Sewer System Evaluation Survey, Village of Cooperstown" (dated June 1998, revised July 1999) was prepared by Lamont Engineers and submitted to the NYSDEC. This report presented the results of system-wide internal (TV) inspection, system-wide smoke testing, and extensive inflow and infiltration (I/I) flow isolation work and recommended the replacement or repair of essentially all of the existing gravity sewer pipe in the service area. Acting on the study recommendations, the Village of Cooperstown continues to pursue an aggressive I/I reduction program. Four construction projects have been completed to date: the first was completed in the summer of 1999, a second was completed in the spring of 2001, a third was completed in the summer of 2002, and the fourth was completed in the summer of 2004. Cooperstown is committed to reducing I/I flows even further through future I/I projects.

A second Engineering Report was submitted to the NYSDEC by Lamont Engineers on September 25, 2000. This report proposed that sodium bisulfite be injected at the post aeration basin for dechlorination and further proposed that a dechlorination system would be operating by December 31, 2001. Subsequent investigation revealed that if sodium bisulfite was added at the post aeration tank, the total chlorine contact time would be reduced to 6.2-minutes, and a new, larger tank would be required. The total project cost of complying with the chlorine residual limitation was then estimated to be $206,000. The aforementioned issues were discussed further at a meeting on January 24, 2002 among the Village Sewer Commission, NYSDEC, and Lamont Engineers. Also discussed was the desire of the Village to consider UV disinfection as an alternative to chlorination/dechlorination. In a follow-up letter to the NYSDEC dated February 5, 2002, the Village requested deferment of the chlorine residual limit for a period of six months to permit the subject UV engineering study to be completed.

WWTF FLOWS AND EFFLUENT QUALITY

Historical WWTF performance data from January 1997 to May 2002 was obtained and analyzed. The high 30-day average flow (ADF_{30}) during this period was 0.93-mgd, occurring in April 2000. The average day flow (ADF) during 2000 was 0.64-mgd. The peak hour flow (PHF) of 1.92-mgd and the maximum day flow (MDF) of 1.68-mgd both occurred on April 4, 2000. A copy of the influent chart from this date is presented in Appendix B.

The WWTF data presented in Appendix A shows that the effluent leaving the WWTF during this period was substantially better than required by the SPDES permit. Effluent BOD5 concentrations and mass values were generally below 10-mg/l and 50-lbs/day, respectively, with removal efficiencies above 90-percent.

TSS removal rates, while not as good as the BOD_5 removal rates, were also good; effluent TSS concentrations and mass values varied from 6-mg/l to 24-mg/l and 22-lbs/day to 155-lbs/day. Removal efficiencies for TSS were better than 77 %. At this time, it is thought high effluent TSS occurs when the stored sludge quantity becomes excessive and causes the digester supernatant quality to degrade. Although sludge storage and treatment is beyond the scope of this report, the subject will be addressed in detail in the forthcoming Cooperstown WWTF Capacity and Condition Assessment Report.

PROJECTED FLOW

Over the past 100 years, the resident population of the Village of Cooperstown has fluctuated between 2,000 and 3,000 persons, declining from a high of 2,909-persons in 1930 (Report on Sewerage and Sewage

Treatment, Stearns and Wheler Engineers, 1965) to 2,026-persons in 2000 (http://factfinder.census.gov, US Census Bureau). This population decline, concomitant with the gradual replacement of older water fixtures with newer low flow units as Village homes are remodeled, has undoubtedly reduced the wastewater flow to the Cooperstown WWTF. Influent flow to the WWTF is anticipated to decrease substantially in the near future as the aforementioned I/I abatement work continues. At the same time, however, increases in the popularity of Cooperstown as a tourism destination will bring some increased wastewater flow, particularly during the summer months. While the precise relationship between the possible flow increase and flow decrease is not clear, it is unlikely that future flows will exceed current flows.

Since the disinfection system must be sized to accommodate at least the current peak hour flow for the WWTF, or 1.92-mgd, any additional treatment capacity will provide a combination of capacity for growth and a factor of safety. A factor of safety of 10 percent should be applied as a minimum. Applying 10-percent, 20-percent and 30-percent growth factors to the current flows yields the future flow projections that are summarized in Table 1-2 below:

TABLE 1-2: CURRENT FLOW AND FUTURE FLOW PROJECTIONS

	ADF (2) (mgd)	**MDF (3) (mgd)**	**PHF (4) (mgd)**	**ADF_{30} (5) (mgd)**
1987 Design (1)	0.52	1.90	2.30	--
Current	0.64	1.68	1.92	0.93
+10%	0.70	1.85	2.11	1.02
+20%	0.77	2.02	2.30	1.12
+30%	0.83	2.18	2.50	1.21

(1) 1987 WWTF design flows are projections taken from ‘Operating Manual for Water Pollution Control Plant’, Stearns and Wheler Engineers, 1967
(2) ADF = Average Day Flow
(3) MDF = Maximum Day Flow
(4) PHF = Peak Hour Flow
(5) ADF_{30} = High 30-day Average Day Flow

According to the Table, the disinfection system would provide an adequate 10-percent factor of safety at a PHF of 2.11-mgd. Since the existing WWTF equipment is sized for a PHF of 2.3-mgd, the new disinfection system will also be sized to treat a PHF of 2.3-mgd. As illustrated in Table 1-2, the ADF will be 0.77-mgd, the MDF will be 2.02-mgd, and the ADF_{30} will be 1.12-mgd. This approach provides a conservative 20-percent growth and safety allowance for current flows.

Future WWTF expansion and/or improvement designs will also be based on the ADF of 0.77-mgd, the MDF of 2.02-mgd, the ADF30 of 1.12-mgd, and the PHF of 2.3-mgd.

Section 2

EVALUATION OF DISINFECTION TECHNOLOGIES

A disinfection system must consistently meet the required treatment objectives. Other criteria include operator safety, system reliability, environmental hazards, and of course cost. The applicability of UV disinfection to the Village of Cooperstown effluent was a matter of prime importance to this project; if UV disinfection was not suitable, then a chlorination and dechlorination system would be installed. If a UV system could be shown to be effective at the Cooperstown WWTF, however, the disinfection process would be selected, after considering the advantages, disadvantages and costs of each type of system.

The following sections present descriptions of each of the proposed disinfection technologies and an assessment as to the suitability of UV disinfection for Cooperstown.

UV DISINFECTION PROCESS DESCRIPTION

UV disinfection is a physical process in which microorganisms are subjected to UV radiation. In the UV process, it is radiation that inactivates the organisms. The two primary factors influencing UV inactivation are: (1) the amount (dose) of UV radiation reaching the microorganisms; and (2) the ability of each microorganism to absorb the dose. Unfortunately, it is not possible to directly measure the UV dose, so it must be estimated via mathematical modeling (the point source summation method) or via experimental results with an indicator organism (the bioassay method). The bioassay method, in which known dose-response data for the indicator organism are compared with data from the WWTF effluent, was selected for this project because it provides a measure of actual microbial response.

Regardless of the estimation method, UV dose is a function of the UV radiation intensity inside the UV system (the reactor) and the amount of time an organism spends inside the reactor. Factors influencing intensity may be broken into two categories: properties of the UV lamps and properties of the effluent. These factors are first summarized below and then discussed in detail:

UV Lamp and Reactor Properties:

- Lamp type (Low pressure lamps emit more of their energy at the 254-μm wavelength. UV is most effective at pathogen reduction at a wavelength of 253.7-μm);
- Lamp output (Low or high intensity lamps are available);
- Lamp operating hours (Lamp output decreases with age);
- Reactor Hydraulics (Mixed flow is important to ensure organism exposure to UV);
- Distance between lamps (Intensity decreases as distance from lamp increases);
- UV absorbance of quartz sleeve (Affects intensity reaching an organism);
- Lamp operating temperature (Higher lamp temps hasten scaling of quartz sleeves).

Effluent Quality:

- UV transmittance (UVT) of effluent (Affects intensity reaching an organism);
- Size and UV absorbance of other particles in effluent (Affects intensity of radiation reaching an organism);
- Fouling of UV lamp (Reduces intensity reaching an organism).

The intensity of radiation emitted by a UV lamp module decreases as the lamp ages and as foreign material fouls the quartz sleeve that houses the lamp. Additionally, radiation is absorbed by the quartz sleeve, by other particles in the water, and by the water itself, thus further reducing the intensity of the radiation reaching a specific particle. Therefore, in order to estimate the applied dose, one must first measure the UVT of the effluent for which UV disinfection is being considered.

Compliance with Applicable Standards

UV Transmittance

The Ten States' Standards indicate that UV disinfection should only be used on a high-quality effluent having TSS and BOD concentrations of not more than 30 mg/l and a UVT of at least 65-percent at a wavelength of 254 µm. Therefore, laboratory UVT testing was performed to investigate the compatibility of the Cooperstown WWTF effluent with the UV disinfection process. Two sampling events were conducted, one in April 2002 and one in June 2002, to ensure that the testing would be representative of peak TSS values at the WWTF. Each sampling event followed the protocol described below:

> Ten 1-liter effluent grab samples were taken from the secondary clarifier overflow box by the plant operator over a five-day period; five during low flow conditions and five during high flow conditions. The UVT testing of the samples was performed by the Village and by Trojan Technologies of London, Ontario, Canada. The TSS of each sample was recorded and then UVT at 254 µm was checked for both a raw sample portion and a filtered sample portion. The sample results from each battery of tests are summarized in Table 2-1 below and presented graphically as Figure 2-1.

TABLE 2-1: UVT TEST RESULTS

April 2002					June 2002				
Sample Date and Flowrate (1)	TSS_T (mg/l)	UVT-R_T (%)	UVT-F_T (%)	UVT-R_C (%)	Sample Date and Flowrate (1)	TSS_T (mg/l)	UVT-R_T (%)	UVT-F_T (%)	UVT-R_C (%)
4/8/02, 320k	2	77	78	76	6/17/02, 400k	8	71	74	66.1
4/8/02, 645k	3	81	82	82	6/17/02, 900k	16	71	75	66.3
4/9/02, 352k	2	75	76	74	6/18/02, 600k	12	67	71	64.1
4/9/02, 566k	4	78	79	79	6/18/02, 760k	21	69	75	59.2
4/10/02, 418k	4	77	78	71	6/19/02, 370k	10	67	71	60.8
4/10/02, 691k	2	72	73	77	6/19/02, 800k	27	66	72	57.5
4/11/02, 402k	3	71	72	70	6/20/02, 330k	13	66	70	--
4/11/02, 600k	4	74	75	73	6/20/02, 730k	24	67	73	--
4/12/02, 416k	2	71	72	69	6/21/02, 360k	11	66	70	--
4/12/02, 640k	5	75	75	74	6/21/02, 771k	22	68	74	--

(1) Flowrates are noted in 1000's of gallons per day
(2) "UVT-R" denotes raw effluent; "UVT-F" denotes filtered effluent
(3) Subscript "T" denotes analysis by Trojan Technologies; subscript "C" denotes analysis by Village of Cooperstown

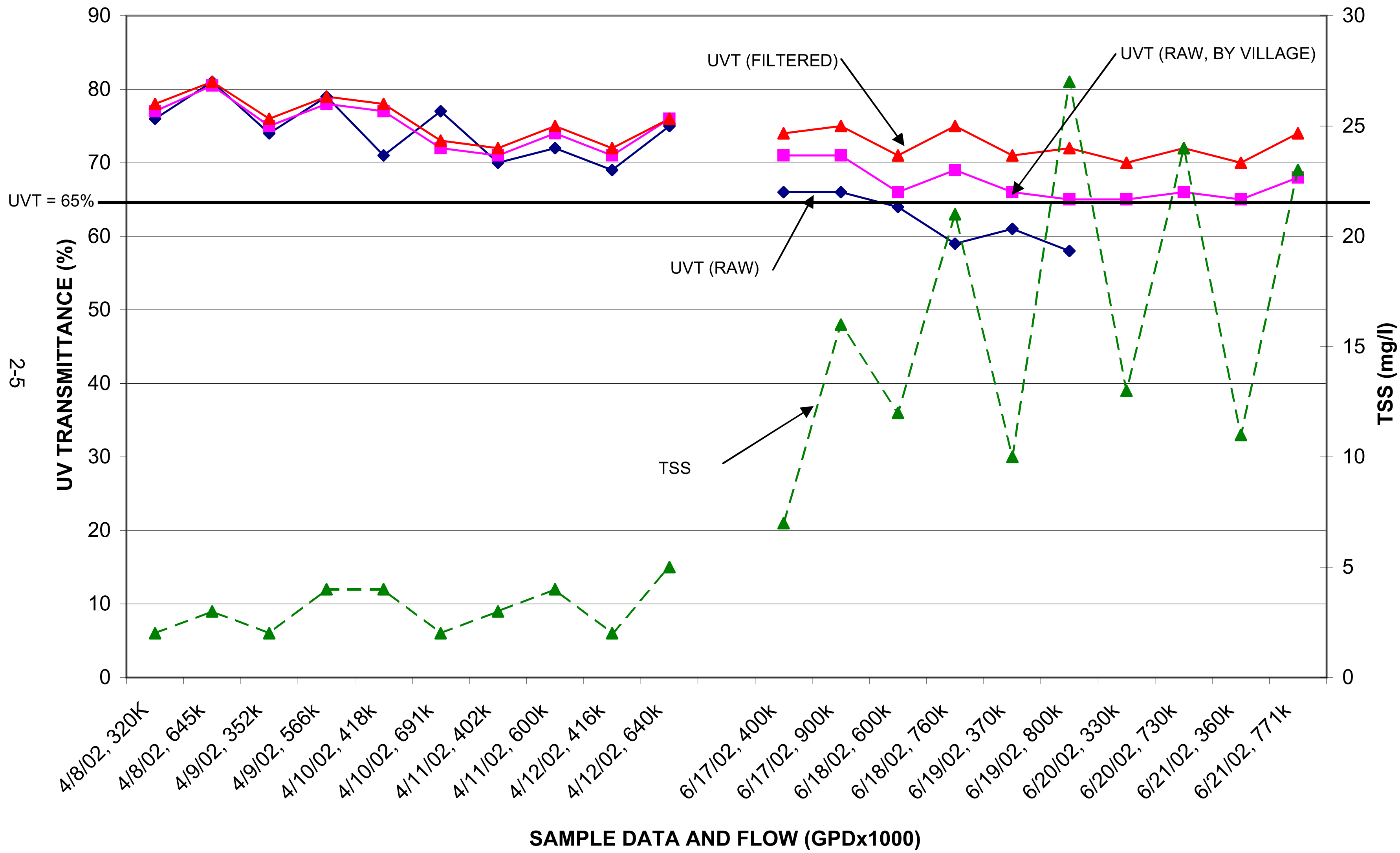
Testing by Trojan Technologies of the Cooperstown WWTF effluent showed a minimum raw UVT of 66-percent at the maximum indicated TSS of 27-mg/l thus it is within the UVT guidelines set forth in the Ten States' Standards. Since the UVT for the filtered and unfiltered samples are quite similar for the April battery of tests, one can infer that the transmittance of the effluent is a property of the Cooperstown WWTF effluent and is not significantly affected by particles within the water. In June however, the filtered UVT was up to 6-percent higher than that of the raw UVT; this is indicative of UV radiation being absorbed by large particles in the wastewater. Furthermore, these results suggest that enhancing the secondary effluent quality would also improve disinfection.

Results obtained by the Village for raw effluent were similar to Trojan Technologies’ results for the April sampling event but somewhat lower for the June sampling event, reaching a minimum UVT of 58-percent. The apparent discrepancy between the two sets of UVT results led the Village to conduct a third sampling event with chemical addition as described below.

A copy of the UVT testing procedure and data is presented in Appendix C.

FIGURE 2-1: VILLAGE OF COOPERSTOWN EFFLUENT UV TRANSMITTANCE

SECONDARY EFFLUENT



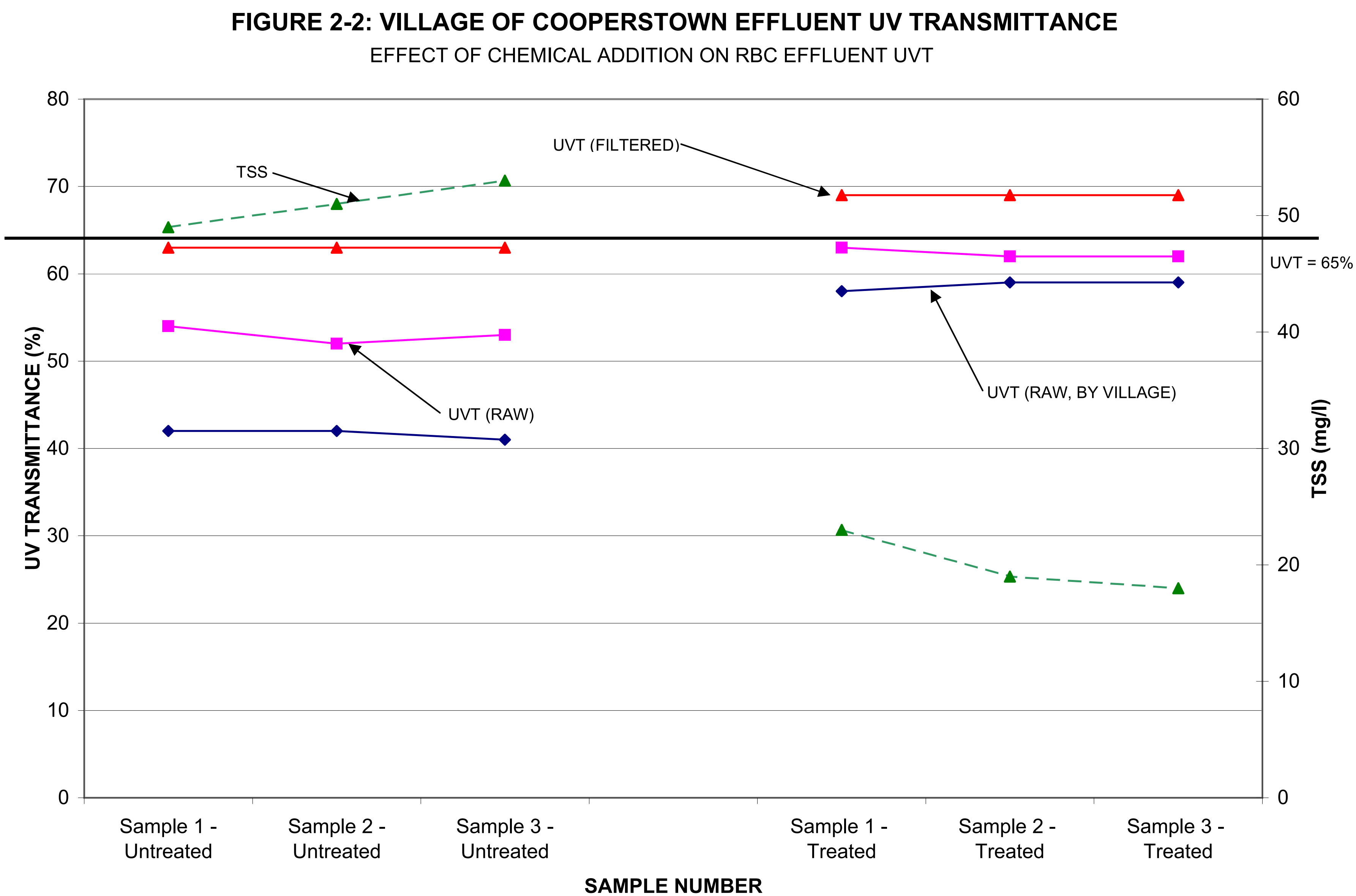
Chemical Addition and UV Transmittance

With the assistance of the Slack Chemical Company, the Village of Cooperstown conducted benchtop chemical addition testing to determine what improvement, if any, could be obtained in the effluent clarity from the addition of chemical coagulation and flocculation agents. Samples of the influent to the final clarifiers were taken at the RBC effluent structure. Chemical agents were added to four 1.0-liter samples as follows: (1) Praestol 189, a proprietary flocculant, at a concentration of 50-mg/l; (2) poly -aluminum chloride (PAC) at a concentration of 40-mg/l; (3) ferric chloride at a concentration of 40-mg/l; and (4) a control sample with no chemical added. Each sample was agitated, settled, and visually inspected. Of the four samples, the PAC and ferric chloride samples both showed a dramatic improvement in clarity, suggesting that chemical addition could improve the removal efficiency of the final clarifier(s). Photos of the stirring apparatus and each sample appear in Appendix D.

Based on the positive visual results obtained with PAC and ferric chloride, additional testing was performed to quantify the potential improvement in UVT. Ferric chloride is a hazardous chemical and as such would require containment facilities and special handling precautions, whereas PAC is considered to be non-hazardous. Therefore, PAC was selected for use in the additional testing. As before, a Slack Chemical representative prepared six samples of RBC effluent at a PAC concentration of 40-mg/l. Six identical samples were collected and left untreated. The samples were divided equally; three of each type were tested by the Village and three of each type by Trojan Technologies. The results of this testing appear below in Table 2-2 and in Figure 2-2.

TABLE 2-2: UVT TESTING WITH PAC ADDITION

Sample [1]	Untreated				Treated w/ 40-mg/l PAC			
	TSS_T (mg/l)	UVT-R_T (%)	UVT-F_T (%)	UVT-R_C (%)	TSS_T (mg/l)	UVT-R_T (%)	UVT-F_T (%)	UVT-R_C (%)
Sample 1	49	54	63	42.5	23	63	69	56.5
Sample 2	51	52	63	42.5	19	62	69	57.8
Sample 3	53	53	63	41.5	18	62	69	57.2



R:\2002024\EXCEL\UVT Testing

LAMONT ENGINEERS

(1) All samples taken 8/13/02 at a flow rate of 720,000-gpd
(2) "UVT-R" denotes raw effluent; "UVT-F" denotes filtered effluent
(3) Subscript "T" denotes analysis by Trojan Technologies; subscript "C" denotes analysis by Village of Cooperstown

It is unlikely that the sedimentation time during the jar testing precisely mimics the retention time and hydraulics of the secondary clarifiers, thus the exact results of full-scale PAC addition may differ from these bench-top results. It is evident, however, that PAC addition at the RBC effluent box has the potential to dramatically reduce TSS concentration and to significantly improve UVT.

UV Radiation Dose

The Ten States' Standards suggest that the minimum design dose of UV radiation should be 30,000-μW s/cm^2 to ensure adequate deactivation of microorganisms in effluent having maximum BOD and TSS concentrations of 30 mg/L. Regardless of the actual design dose to be used, the dose must be calculated after adjustments for maximum lamp fouling and lamp output reduction after one year (8760-hours) of continuous operation. The required dose is specific to each effluent and therefore must be experimentally determined through the bioassay method (collimated beam testing) for each proposed UV installation. The test subjects the effluent to a range of UV radiation doses of known intensity in a collimated beam apparatus. The fecal coliform concentration of the effluent is measured before and after each dose and plotted on a chart. The resulting graph is known as the dose-response curve, which is used to size the UV equipment. In order to obtain dose-response data specific to the Cooperstown WWTF, samples of effluent were again collected and sent to Trojan Technologies for collimated beam testing. These samples were used to develop a dose-response curve for the proposed Cooperstown UV installation. The procedure and results for the collimated beam testing is presented in Appendix C, a summary of these results is presented in Table 2-3 below, and the dose response curve is illustrated in Figure 2-3:

TABLE 2-3: COLLIMATED BEAM TEST RESULTS

Dose (μW s/cm^2)	Fecal Coliform (CFU/100-ml)
0	110,000
10,000	1,400
20,000	300
40,000	90
60,000	57
80,000	41
100,000	47

Interpolating Figure 2-3 indicates that the proposed UV design dose of 53,500 μW s/cm^2 will meet the Cooperstown permitted maximum fecal concentration of 200-CFU/100-ml with a factor of safety of almost 3.0.

For full-size flow through UV systems, the time element of the dose is controlled by the flow rate through the reactor. The flow rate at a wastewater treatment plant without equalization, such as the Cooperstown WWTF, may fluctuate substantially during the day. Therefore, the UV reactor will deliver the design dose at the peak hour flow to ensure adequate inactivation through the entire flow range.

Design Criteria

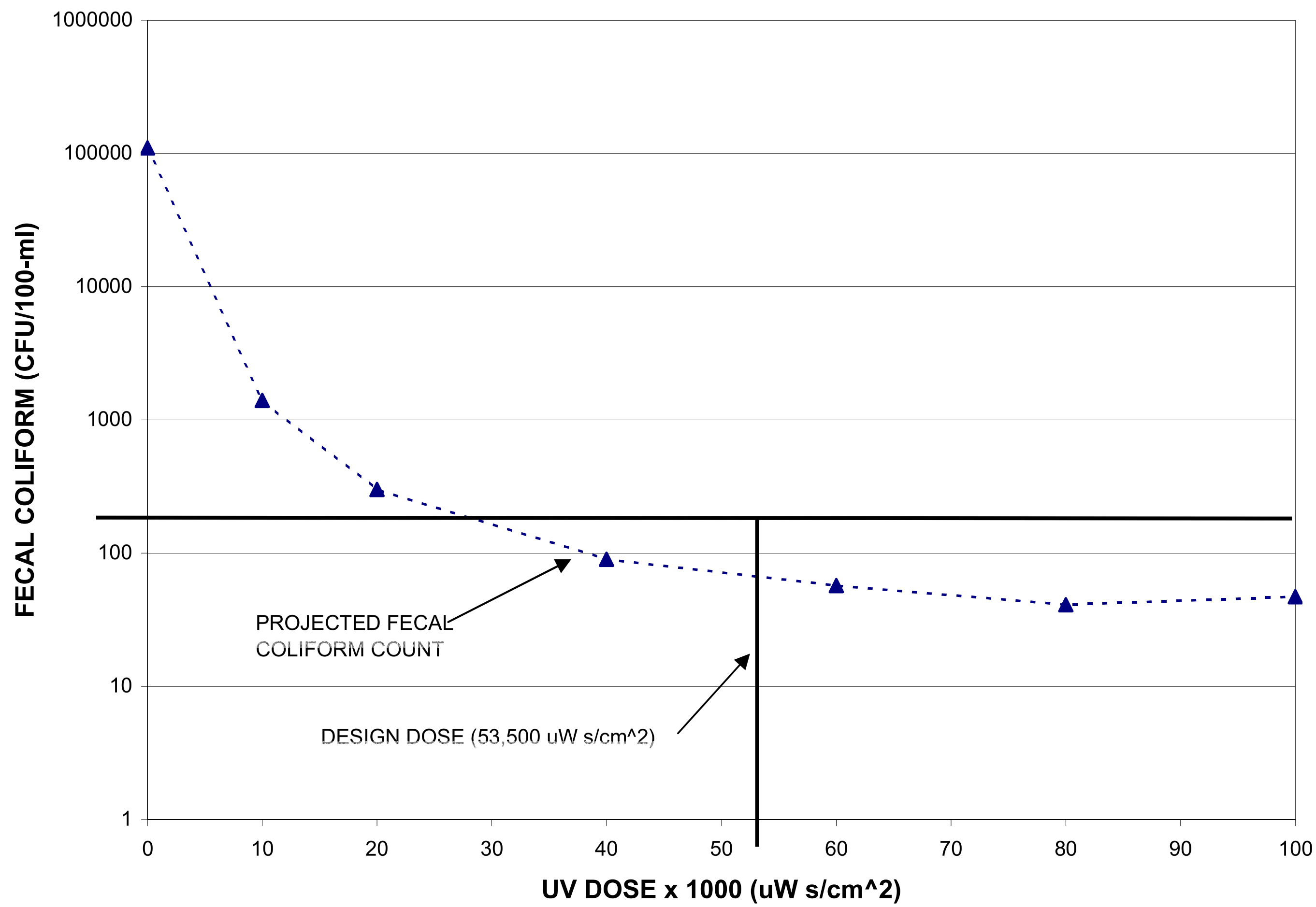
Table 2-4, below, identifies proposed design criteria developed during this project for a UV disinfection system at the Village of Cooperstown WWTF.

TABLE 2-4: PROPOSED UV DESIGN CRITERIA

	Required/Suggested	Cooperstown
UVT, minimum	65-percent	65-percent
Mean Particle Size Distribution	--	57.8-microns
TSS, maximum	30-mg/l	27-mg/l
BOD, maximum	30-mg/l	11-mg/l
Dose	30,000-μW s/cm^2	53,500-μW s/cm^2
Peak Hour Flow Rate, maximum	--	2.3-mgd

FIGURE 5-3: Village of Cooperstown Dose Response Curve

June 28, 2002, 65% UVT, 20-mg/l TSS



Other UV Installations

During this project, representatives of the Village of Cooperstown and Lamont Engineers visited four nearby WWTFs that use UV disinfection:

- Grand Gorge WWTF (Trojan UV 4000 medium pressure self cleaning)
- Pine Hill WWTF (Trojan PTP low pressure manual cleaning)
- Village of Hobart WWTF (Atlantic Megatron low pressure automatic cleaning)
- Lehighton, Pa. WWTF (Wedeco TAK low pressure self cleaning)

Each of the plant operators interviewed expressed overall satisfaction with the UV systems at their facilities and offered suggestions for Cooperstown based on their experiences.

Additionally, a telephone call was placed to the Ellenville WWTF to discuss their long-term experiences with a UV system operating on trickling filter effluent. The Ellenville WWTF treatment train is quite similar to the Village of Cooperstown WWTF with one notable exception: the Ellenville WWTF has clarification between the trickling filter and the RBCs, where Cooperstown does not. Overall, the Ellenville operator is quite pleased with the performance of the UV system, since the effluent fecal coliform concentration is consistently less than 5-CFU/100-ml; he does strongly recommend a self-cleaning system. The suggestions from the other operators, the observations made during the tours, and the specific concerns of the Cooperstown staff would be incorporated into the UV disinfection system as described below.

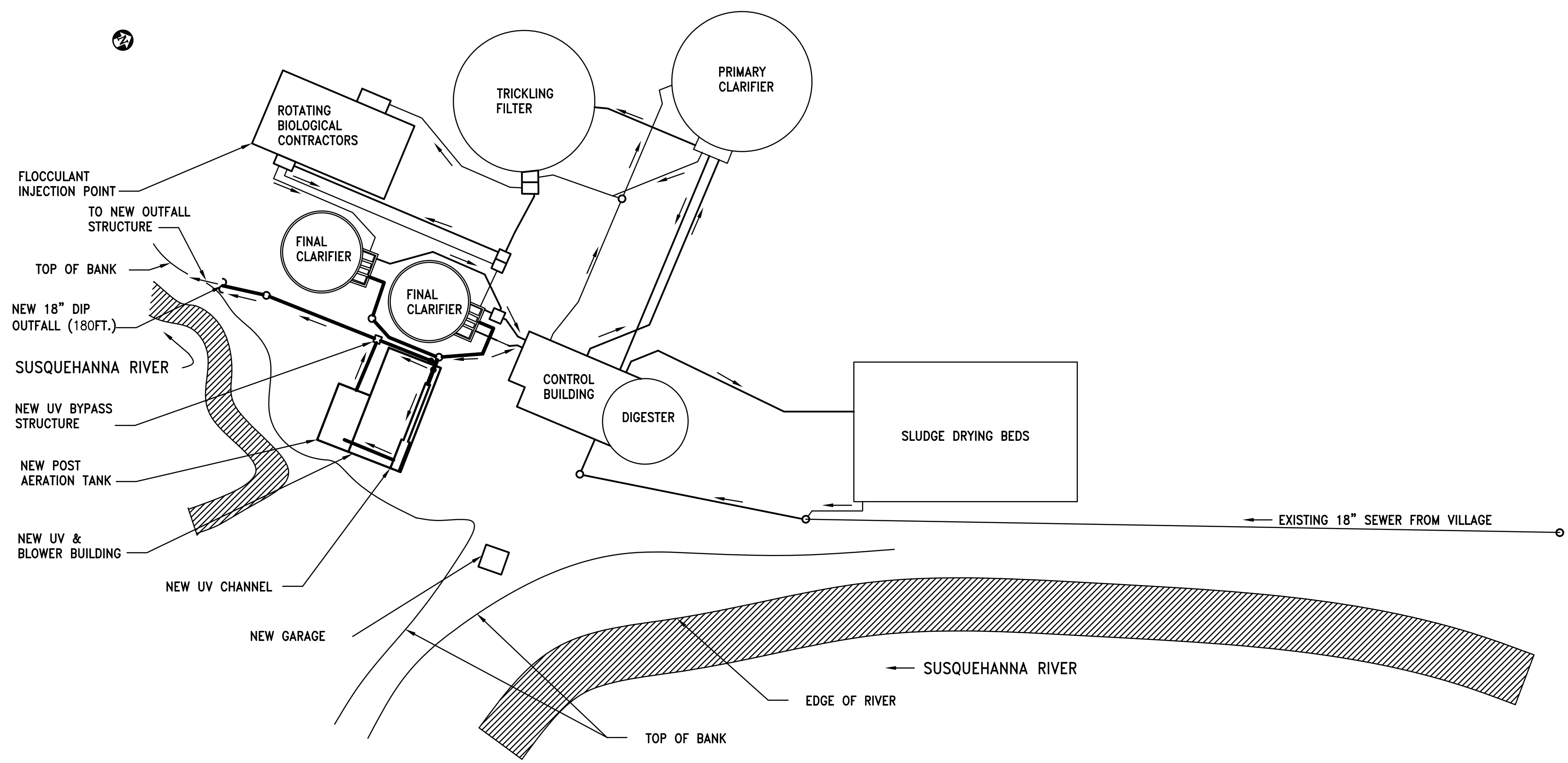
Features of UV Disinfection System

The proposed UV system for the Village of Cooperstown WWTF would incorporate the following features:

- Self-cleaning lamps. The system includes a hydraulic and/or chemical wiping assembly that automatically cleans the quartz bulb housings when intensity has been reduced. Food grade hydraulic oil will be specified for the hydraulic system.
- Low pressure, high intensity lamps. Low-pressure lamps operate at a lower temperature, which reduces scale build-up on the quartz housings. Low-pressure systems can also restart immediately after a power loss, whereas medium pressure systems must cool for up to 20-minutes prior to restarting. Furthermore, high intensity lamps produce a higher radiation output with a smaller lamp surface area, thus reducing the footprint of the system.
- Open channel installation. Installing the UV reactor in an open concrete channel permits easier access for inspection and maintenance.
- Variable power output. Lamp power is varied automatically in response to wastewater flow changes as measured through the existing WWTF influent flow meter.
- Stand-by lamp modules. Modern UV systems have additional lamp modules built-in as stand-by units. If a lamp or ballast fails on the duty module, the system will automatically switchover to the redundant module(s).
- Automatic system alarm tied into the plants automatic dialer.
- Connection to emergency generator for continuous operation upon power outages.

The system would be enclosed in a pre-engineered wood building with lighting and potable water. The design layout is shown in Figure 2-4.

Manufacturer's data and cost information for the proposed UV disinfection system is presented in Appendix E.



ISSUE	REV.	LOCATION	DATE	AP'D	REMARKS

SCALE	N.T.S.
DRAWN	TJS/NER
DATE	6/10/02
DESIGNED	KPO

FIGURE 2 – 4
NEW UV DISINFECTION FACILITY
SITE PLAN

Lamont Engineers
ENGINEERS · SURVEYORS · PLANNERS · FACILITY OPERATIONS
ONE MAIN ST., COBLESKILL, N.Y. 12043 (518) 234-4028
P.O. BOX 86, EAST BERNE, N.Y. 12059 (518) 872-0141

PROJECT NO.	DRAWING NO.	FILE NO.
2002024	FIGURE 2-4	2002024SITE2

Electrical Improvements

The existing electrical service has the capacity to serve the new UV system equipment, which will add approximately 14 kVA (40A) of load to the service. However, the existing electrical distribution equipment lacks circuit breaker space for providing circuits to the new equipment. To accommodate the new equipment, a new panelboard will be installed and will be provided with spare circuit breaker space to accommodate future upgrades. The existing emergency generator has sufficient capacity to provide emergency power to the new UV system equipment.

CHLORINATION/DECHLORINATION PROCESS DESCRIPTION

Chlorination is a chemical process in which microorganisms are subjected to an oxidizing compound. The oxidizer alters the genetic material (DNA) comprised in the microorganisms such that they can no longer reproduce. This alteration process, also known as inactivation, depends upon three fundamental criteria: (1) the strength of the oxidizer to which the microorganisms are exposed; (2) the duration of exposure; and (3) the sensitivity of the organism. There are varieties of chemical oxidizers that are used for disinfection purposes. Historically, gaseous chlorine has been widely used due primarily to its low cost and ease of handling. Recent years have brought a heightened awareness of the risks associated with gaseous chlorine, most notably the safety hazards to plant staff and surrounding homes in the event of a chlorine leak. As communities such as Cooperstown move to eliminate these hazards, alternative disinfectants such as liquid sodium hypochlorite are gaining popularity because although they are still considered hazardous chemicals, the risk is more readily contained within the WWTF. For this reason a 12.5-percent solution of sodium hypochlorite will be considered during the chlorination evaluation for the Village of Cooperstown WWTF.

When an oxidizer such as sodium hypochlorite (NaOCl) is mixed with WWTF effluent, it disassociates into free available chlorine and initiates several chemical reactions. Most of the free chlorine is used up during the biochemical inactivation of the microorganisms. Some chlorine reacts with organic carbon and ammonia-nitrogen in the effluent forming trihalomethanes (THMs) and chloramines, respectively. THMs are a harmful byproduct of chlorination, whereas chloramines are a weak but stable disinfectant. The remaining chlorine, termed residual chlorine, exits the WWTP with the effluent and adds a toxin to the receiving waterbody.

Many WWTFs, including the Cooperstown WWTF, are now subject to effluent chlorine limits to protect the receiving waterbody. Therefore, all discussion of chlorination in this report will also include chemical dechlorination. Sulfite salts solutions such as sodium bisulfite or sodium metabisulfite, which react quickly with chlorine compounds, are typically used to effect the dechlorination. Excess sulfites consume dissolved oxygen (DO) from the effluent, possibly requiring additional DO to be added.

Compliance with Applicable Standards

The Recommended Standards for Wastewater Facilities ("Ten States' Standards") offer considerable guidance for the design of chlorination and dechlorination systems at WWTFs. A baseline chlorine dose of 10-mg/l is suggested for trickling filter effluent, and this dose must be maintained for at least 15 minutes during peak hour flow. Furthermore, dechlorination with sodium bisulfite (as previously proposed) requires a theoretical dose of 1.46-mg/l plus an additional 10-percent to neutralize 1.0-mg/l of chlorine. The dechlorination reaction takes place almost immediately, but 30 seconds of contact time is required at peak hour flow.

As noted in the chlorination/dechlorination Engineering Report (Lamont Engineers, September 2000) the Cooperstown WWTF has maintained a chlorine residual of between 0.5-mg/l and 2.0-mg/l with an average chlorine dose of 4.2-mg/l and a maximum chlorine dose of just 4.6-mg/l. Therefore, the proposed sodium hypochlorite feed system will be sized to provide 4.6-mg/l of available chlorine at the peak hour flow of 2.3-mgd.

The residual chlorine in the effluent has not exceeded 1.9-mg/l but could reach as high as 2.0-mg/l. With a chlorine residual limit of 0.37-mg/l, the dechlorination equipment must be able to remove at least 1.6-mg/l of residual chlorine (2.0-mg/l – 0.4-mg/l) to ensure adequate dechlorination under all conditions. To be cautious, however, the proposed sodium bisulfite feed system will be sized to remove up to 2.0 mg/l of residual chlorine, i.e., to provide 3.2-mg/l (2.0-mg/l x 1.46 x 1.1) at the peak hour flow of 2.3-mgd.

Design Criteria

Table 2-5 below identifies the proposed design criteria developed during this project for a chlorination/dechlorination disinfection system at the Village of Cooperstown WWTF.

TABLE 2-5: PROPOSED CHLOR/DECHLOR DESIGN CRITERIA

	Required/Suggested	**Cooperstown**
Chlorine dose	10-mg/l	4.6-mg/l
Sodium bisulfite dose	110% x 1.46mg/l per mg/l Cl_2	3.1-mg/l
Chlorine contact time (@ PHF)	15-minutes	15.5-minutes
Dechlor contact time (@ PHF)	30-seconds	45-seconds
Peak hour flow rate	--	2.3-mgd

Features of Chlorination/Dechlorination System

Sodium hypochlorite and sodium bisulfite containers would be located in the existing chlorine room in separate containment vessels. Deliveries would be made through the existing double doors of the chlorine room. Chemical usage at the projected ADF of 0.8-mgd is estimated to be as follows:

- 12.5% NaOCl: 0.8-mgd x 4.2-mg/l x 8.34 / (10-lbs/gal x 0.125) = 23-gpd
- 38% $NaHSO_3$: 0.8-mgd x 3.2-mg/l x 8.34 / (11.34-lbs/gal x 0.38) = 5-gpd

Allowing for a 30-day storage of each chemical would require a 750-gallon nominal sodium hypochlorite capacity and space for three 55-gallon drums of sodium bisulfite. New chemical storage tankage would be located in the existing chlorine room. Separate chemical containment would be provided.

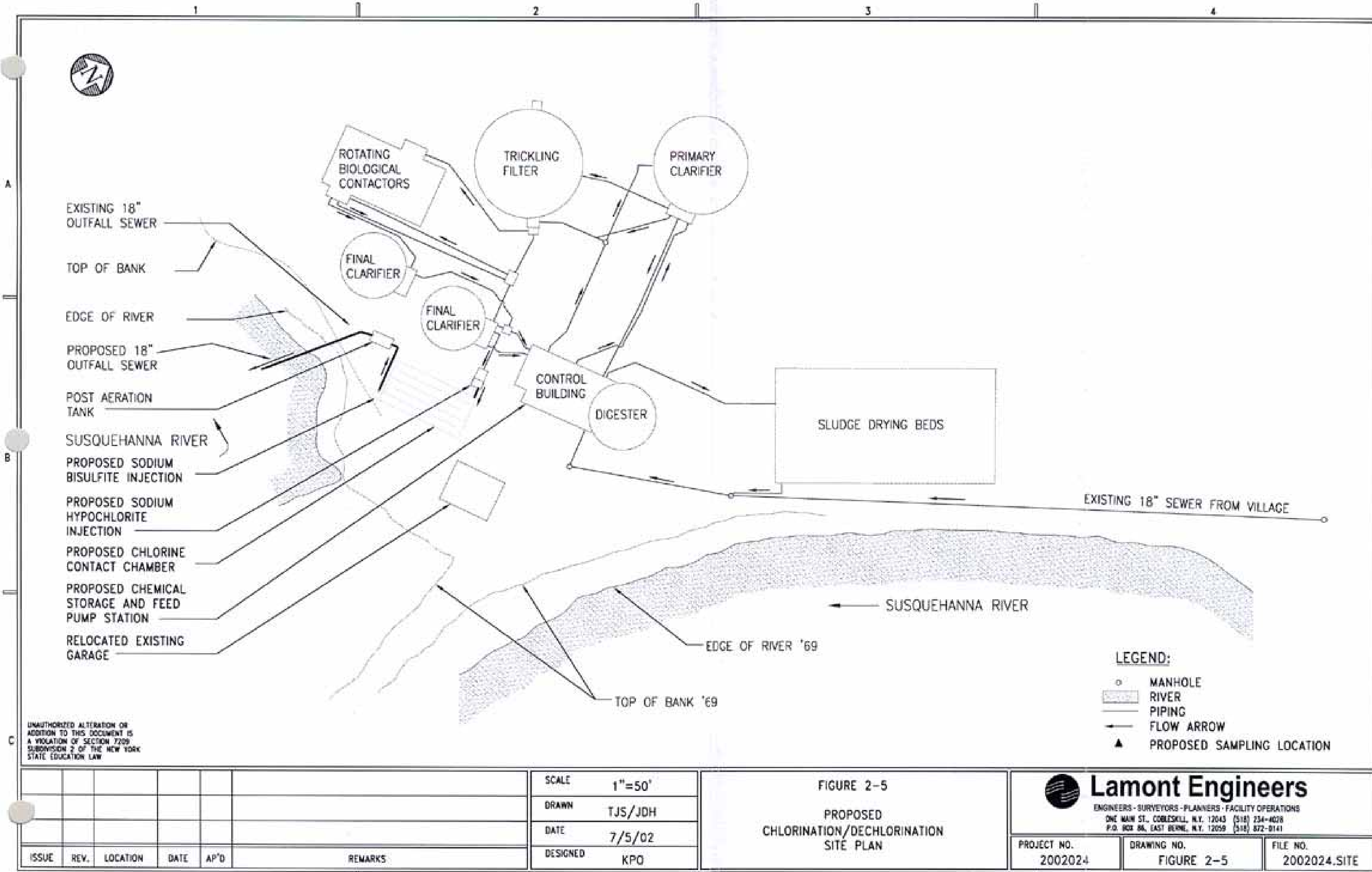
Two flow-paced chemical dosing pumps would be provided for each chemical, one as a duty unit and one as a redundant unit. These pumps would also be located in the chlorine room. The sodium hypochlorite pumps would be rated at 3.0-gph and the sodium bisulfite pumps would be rated at 0.6-gph. Each pump would have a 30:1 turndown ratio to accommodate low effluent flows and would be fitted with appropriate pressure reducing, backpressure, and priming valves. The pumps would draw suction directly from the chemical storage containers; no day tanks would be provided. When a tank is empty, the operator would transfer the pump suction to the next tank. The pump outputs would be flow paced based on the analog 4-20-mA signal from the influent Parshall flume and the comparative signals of a new Stranco disinfection controller.

The current chlorine injection location would remain, but a new 25,000-gallon nominal capacity concrete chlorine contact tank would be constructed at the current location of the existing garage, which must be relocated. The contact tank would have integral baffles, an effluent weir, and two in-floor sumps to facilitate draining and cleaning. Sodium bisulfite would be injected at the effluent weir to ensure thorough mixing. A 400-gallon bisulfite contact tank would be constructed at the outlet of the chlorine contact tank.

Dechlorinated effluent would flow out of the bisulfite contact tank, through approximately 30-feet of PVC piping and into the existing post aeration tank where the DO levels would be increased to at least 7.0-mg/L. The existing 18-inch gravity outfall pipe would conduct the final effluent out of the WWTF and into the Susquehanna River at the existing outfall location. The bulk of the existing outfall pipe would be retained and repaired or replaced during a future WWTF upgrade project. The combined volumes of the bisulfite tank, the post aeration tank, and the effluent piping would provide over 45 seconds of contact time at the PHF of 2.3-mgd.

A site plan depicting the proposed chlorination/dechlorination disinfection system appears as Figure 2-5.

Manufacturer's information on the Stranco controller, typical chemical metering pumps, and chemical storage tanks appears in Appendix F.


EXISTING 18" OUTFALL SEWER
TOP OF BANK
EDGE OF RIVER
PROPOSED 18" OUTFALL SEWER
POST AERATION TANK
SUSQUEHANNA RIVER
PROPOSED SODIUM BISULFITE INJECTION
PROPOSED SODIUM HYPOCHLORITE INJECTION
PROPOSED CHLORINE CONTACT CHAMBER
PROPOSED CHEMICAL STORAGE AND FEED PUMP STATION
RELOCATED EXISTING GARAGE
ROTATING BIOLOGICAL CONTACTORS
TRICKLING FILTER
PRIMARY CLARIFIER
FINAL CLARIFIER
FINAL CLARIFIER
CONTROL BUILDING
DIGESTER
SLUDGE DRYING BEDS
EXISTING 18" SEWER FROM VILLAGE
SUSQUEHANNA RIVER
EDGE OF RIVER '69
TOP OF BANK '69
LEGEND:
MANHOLE
RIVER
PIPING
FLOW ARROW
PROPOSED SAMPLING LOCATION
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ISSUE
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REMARKS
SCALE 1"=50'
DRAWN TJS/JDH
DATE 7/5/02
DESIGNED KPO
FIGURE 2-5
PROPOSED CHLORINATION/DECHLORINATION SITE PLAN
Lamont Engineers
ENGINEERS · SURVEYORS · PLANNERS · FACILITY OPERATIONS
ONE MAIN ST., COBLESKILL, N.Y. 12043 (518) 234-4028
P.O. BOX 86, EAST BERNE, N.Y. 12059 (518) 872-0141
PROJECT NO. 2002024
DRAWING NO. FIGURE 2-5
FILE NO. 2002024.SITE

Electrical Improvements

The existing electrical service has the capacity to serve the new chlorination/dechlorination equipment, which will add an almost negligible load to the service. However, the existing electrical distribution equipment lacks circuit breaker space for providing circuits to the new equipment. To accommodate the new equipment, a new panelboard would be installed and would be provided with spare circuit breaker space to accommodate future upgrades. The existing emergency generator has sufficient capacity to provide emergency power to the new chlorination/dechlorination system equipment.

Section 3

COMPARISON OF DISINFECTION TECHNOLOGIES

ADVANTAGES AND DISADVANTAGES COMPARISON

The advantages and disadvantages of chlorination/dechlorination and UV radiation, excluding capital and O&M costs, are summarized in Table 3-1 below.

TABLE 3-1: ADVANTAGES AND DISADVANTAGES COMPARISON

CHLORINATION/DECHLORINATION	
Advantages	**Disadvantages**
Lower power usage than UV	Safety hazard for staff and residents
Process is simpler in design than UV systems	Environmental risk in case of spill/leak
More historical WWTF installations than UV	Chemical overdosing is possible
Direct measurement of residual is possible	UFC [(1)] requires gas scrubbing/containment
Clarity of the effluent not as vital to effectiveness	Does not inactivate cryptosporidium
	NaOCl decomposes over time
	Chemical handling is required
	Forms hazardous byproducts (THMs)
UV RADIATION	
Advantages	**Disadvantages**
Inactivates cryptosporidium	Slightly Higher power requirements
Negligible chemicals required	Not possible to measure UV dose directly
Non-toxic to receiving stream	System troubleshooting more complex
Cannot be overdosed	Does not inactivate protozoan cysts
	Reduced effectiveness in turbid water

[(1)] UFC = Uniform Fire Code

NET PRESENT WORTH COST COMPARISON (2002)

A 2002 net present worth comparison is presented in Table 3-2 below.

2002 Capital and O&M cost estimates for the UV Disinfection System and the Chlorination/Dechlorination System are included in Appendix G.

TABLE 3-2: NET PRESENT WORTH COST COMPARISON (2002)

Item	Estimated Capital Cost [(1)]	Yearly Operating and Maintenance Cost	Net Present Worth [(2)]
UV Disinfection	$221,000	$10,000	$335,700
Chlorination/Dechlorination Disinfection	$202,000	$10,000	$316,700

[(1)] Capital costs are Village "out-of-pocket" costs after grant funds are applied
[(2)] Net Present Worth calculated based on 20 years, 6% interest, (P/A = 11.47)

UV SYSTEMS ENERGY USE COMPARISON

UV disinfection systems are split into two categories, low pressure and medium pressure lamp. Low pressure lamps are further subdivided into conventional mercury and amalgam lamps. Amalgam lamps are also referred to as low pressure, high intensity lamps. A comparison of these three types of lamps is shown in Table 3-3. As medium pressure lamps are very high power consumers and require a large foot print for installation, they were not selected for Cooperstown. Systems using low pressure conventional lamps do not have power turn down capability or automatic cleaning systems, and they are sensitive to temperature changes.

TABLE 3-3: UV LAMP COMPARISON

	Conventional Low Pressure Lamps	Amalgam Low Pressure Lamps	Medium Pressure Lamps
UV emission spectrum	Narrow band	Narrow band	Broad band
UV-C wavelength	254nm	254nm	200nm – 280 nm
Percent of electrical power input converted into UV-C light	40%	30%	15%
UV lamp power	0.5 W/cm	2 W/cm	100 W/cm
UV-C radiation flux	0.2 W/cm	0.6 W/cm	15 W/cm
UV lamp surface temperature	40°C	100°C	600-900°C
Influence of ambient temperature	Large	Lower	Negligible
Electrical input power range	5 – 50 W	50 – 300 W	1 – 30 KW

A comparison of power cost for a low pressure conventional system to a low pressure amalgam (high intensity) system with variable output ballast and automatic cleaning feature, as installed in Cooperstown, based on average day flow and peak hour flow is summarized below.

Low Pressure Conventional @ Average Day Flow of 1.1 MGD requires a 2.8 kW power draw

Low Pressure Conventional @ Peak Hour Flow of 2.3 MGD requires a 5.95 kW power draw

Low Pressure Amalgam @ Average Day Flow of 1.1 MGD requires a 3.6 kW power draw

Low Pressure Amalgam @ Peak Hour Flow of 2.3 MGD requires a 8.0 kW power draw

For the conventional system without the turn down capability, the power draw has to be designed to maintain a minimum power draw of 5.95kw for all flow ranges in order to provide adequate disinfection for peak flows. For the Amalgam system with variable power ballast, the system can be designed to accommodate incremental power draws based on 3.6 kW average and vary incrementally to accommodate higher flows. Therefore, based on Cooperstown's seasonal disinfection operating period from May 16 through October 15, which yields approximately 3,600 hours, and using a cost of $0.08/kW results in a power cost comparison for these systems as follows:

Low Pressure Conventional (LPC)	3,600 hrs. x 5.95 kW x $0.08/kW=	$1,714 per year
Low Pressure High Iintensity (LPHI)	3,600 hrs. x 3.6 kW x $0.08/kW=	$1,038 per year

Total Savings for LPHI vs LPC = $676/year.

This cost will also increase due to longer bulb life and less labor for cleaning maintenance associated with the LPHI system.

The preliminary UV system design was developed using information on the UV3000+ disinfection system manufactured by Trojan Technologies Inc. Similar variable power, self-cleaning systems are commercially available from other sources such as the TEK system manufactured by PCI Wedeco. Final selection of a supplier would be made based on the established qualifications of that supplier and on the bid price of the equipment.

Section 4

FINAL DESIGN AND CONSTRUCTION

Based on the positive results of the UV transmittance testing and the demonstrated ability of chemical addition to improve the UV transmittance of the Cooperstown WWTF effluent, UV disinfection was determined to be a viable alternative to chlorination with dechlorination for this facility, but the safety and environmental benefits of the UV system come with a higher price tag than the more traditional chlorination system.

With UV being formally approved for this installation by the NYSDEC, the Village decided that UV technology will best meet its needs and visions of the future. Available funding, which the Village received through a NYSERDA grant program, played a key role the decision-making process because the NYSERDA grant reduced the capital cost difference between UV and chlorination.

Once UV was selected as the disinfection method, the following actions were taken:

- Conduct a full-scale test of PAC injection to verify its effect on UV transmittance and to determine an optimal dosage. Coordinate this test with the ongoing phosphorus sampling
- Prepare Village Pre-Purchase Bidding Documents for the UV equipment, and contact additional system manufacturers for competitive bidding
- Prepare final design documents (drawings and specifications) for approval and competitive bidding of the construction and installation of the proposed UV facilities
- Bid, award, and construct the new UV disinfection system facilities

These tasks are described in further detail as follows:

In August 2003, full-scale testing using PAC was performed. Samples were collected and sent to Trojan Technologies, Wedeco, and the Village test labs for UVT evaluation. Two samples were taken on each day throughout the week of August 21-24, 2003 to represent low flow and high flow conditions. The results of these tests are shown below in Table 4-1 and are tabulated in Figure 4-1. Trojan and the Village compared untreated (un-filtered) samples to treated (filtered) samples, but Wedeco only tested treated samples. TSS testing was also obtained, and the average results are shown. A few observations in this data are:

- Higher flows did not have any significant effect on UVT
- UVT was effective on all TSS conditions
- The Village results don't show PAC having any significant effect on UVT, although their unfiltered data was obtained a week later due to a sampling error during the week of 8/21.

Based on this testing, it was concluded that a PAC chemical addition system should still be included in the final design of the UV facilities. However, simple, manually operated pumps, tubing, appropriate valving, and small drums of stored chemical would be incorporated into the project to save cost.

Also, in August, a UV system in Lehighton, PA., by Wedeco and similar to the Trojan design, was toured for a comparison to the Trojan UV system and for additional operators' comments. At this point it was determined that in order for the project to advance at a more rapid pace, and for a better design-base, an equipment pre-purchase bid for the UV equipment would be procured by the Village. In September 2003, two bids were received. Wedeco's bid was $94,600, Trojan's was $79,400, and Trojan was awarded the contract.

Design proceeded based on the Trojan UV system with final design being completed in November 2003. In January 2004, design approval was obtained from the NYSDEC. The construction project was then bid and awarded in February 2004, and in April 2004 a notice to proceed was issued. The construction project consisted of a 1,250 square foot pre-engineered building with cast-in-place concrete channel for the UV equipment. Bypass valves and piping was included to allow the new facility to be bypassed during the non-disinfection season and for maintenance of the UV equipment. Also included in the project were a chemical injection system, a post aeration tank and blowers, four new raw sewage pumps, and a new plant outfall. The total project construction cost, including the pre-purchased UV equipment, was $565,845. Figure 4-2 shows the new building exterior, Figure 4-3 shows the new UV equipment and the open channel arrangement, and Figure 4-4 shows the actual UV equipment components and arrangement. The UV equipment was tested and started up in early October 2004, and the new facility was fully completed by the end of that month. The system went fully on line in May 2005. Several articles on the Cooperstown UV system have been published, and power point presentations have been made. An open house and ribbon-cutting ceremony was held on October 19, 2005. In attendance were representatives from NYSERDA, NYSDEC, Otsego County, The Village, it's operators and consultants, Senator James Seward and several other wastewater plant operators from surrounding communities. Some of the highlights of this event are displayed in Figure 4-5.

TABLE 4-1: UVT TEST RESULTS (2003)

Sample Date and Flowrate	UVT-FT(%)	UVT-FW(%)	UVT-FC(%)	UVT-RT(%)	UVT-RC(%)	TSSAVG(mg/l)
8/21/2002, 0.36mgd	71	66	63	68		9
8/21/2003, 0.81mgd	75	70.5	66	71		7.75
8/22/2003, 0.58mgd	70	66.1	58	67		8.25
8/22/2003, 0.90mgd	72	65.6	60	67		13
8/23/2002, 0.40mgd	71	66.7	65	68		8.5
8/23/2003, 0.72mgd	73	70.2	67	70		8
8/24/2003, 0.62mgd	72	68.5	67	69		6.25
8/24/2003, 0.72mgd	75	70.7	69	72		8
8/24/2003, 0.32mgd	74	69.3	68	71		4.5
8/24/2003, 0.63mgd	73	66.7	65	71		8
8/28/2003, 0.36mgd					65	
8/28/2003, 0.67mgd					66	
8/29/2003, 0.37mgd					65	
8/29/2003, 0.67mgd					68	
8.30/2003, 0.71mgd					62	
8.30.2003, 0.68mgd					67	
8/31/2003, 0.48mgd					65	
8/31/2003, 0.60mgd					65	
9/1/2003, 0.56mgd					64	
9/1/2003, 0.72mgd					66	

(1) Flow rates are noted in 1000's of gallons per day
(2) "UVT-R" denotes raw effluent; "UVT-F" denotes filtered effluent
(3) Subscript "T" denotes analysis by Trojan Technologies; subscript "C" denotes analysis by Village of Cooperstown

2004024\Excel\UVT Test Results (2003)

FIGURE 4-1: TABULATION OF UV TRANSMITTANCE RESULTS

EFFLUENT UV TRANSMITTANCE (2003 TEST RESULTS)

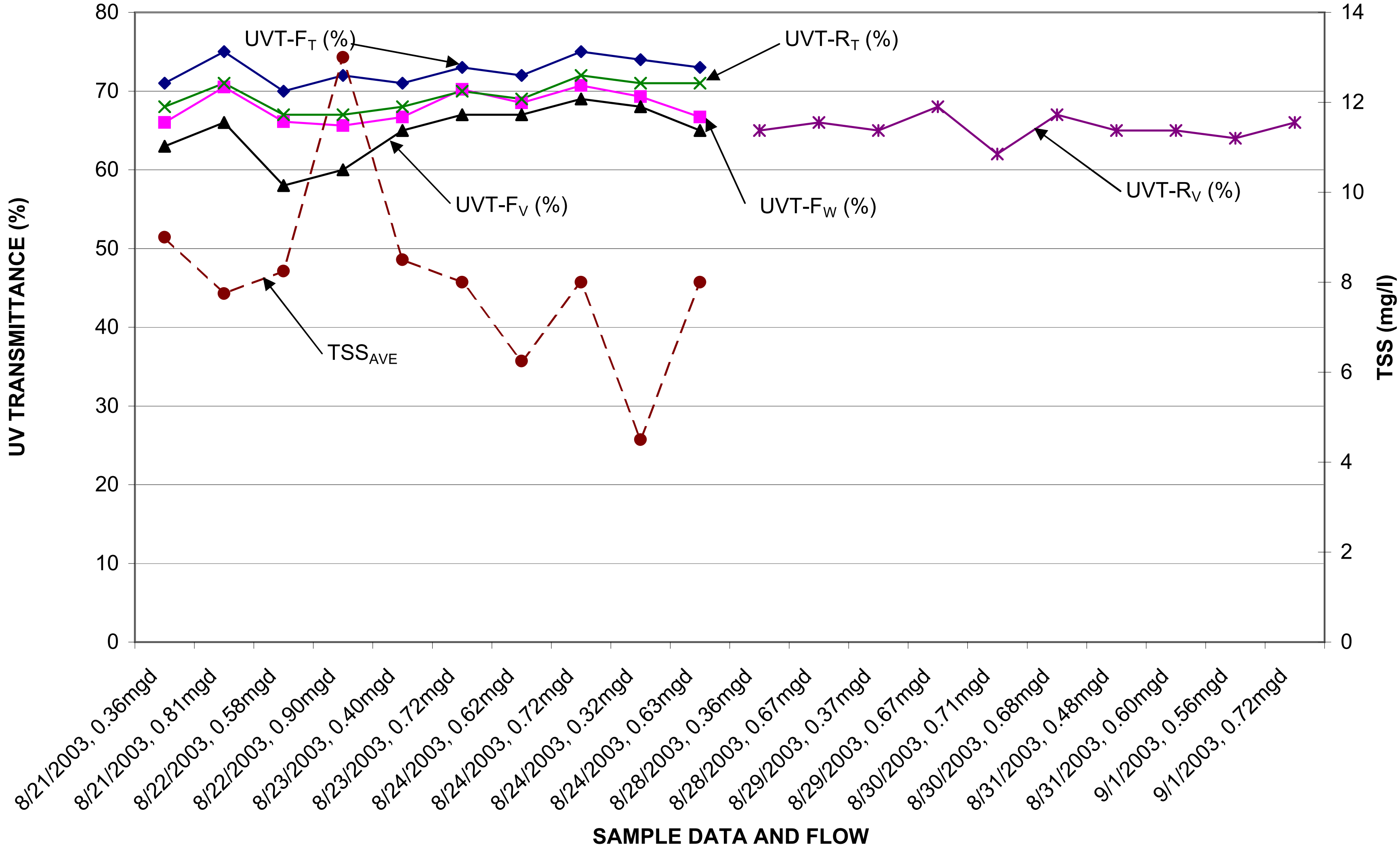
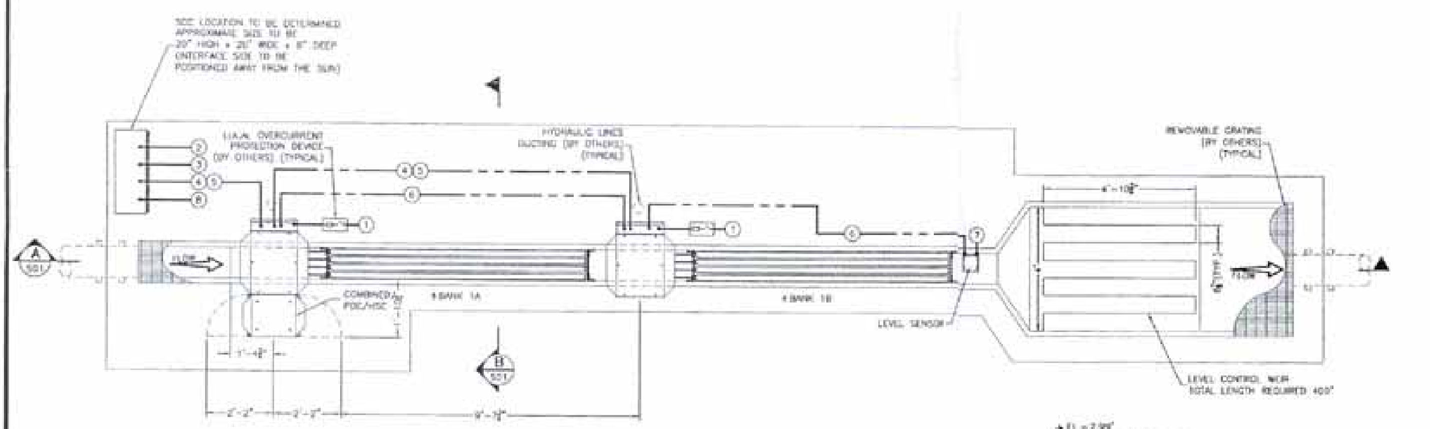
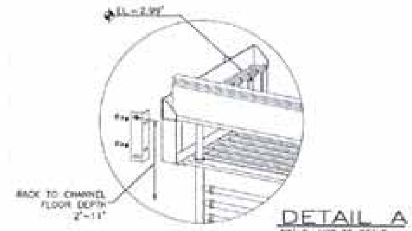


Figure 4-2 New UV and Blower Building

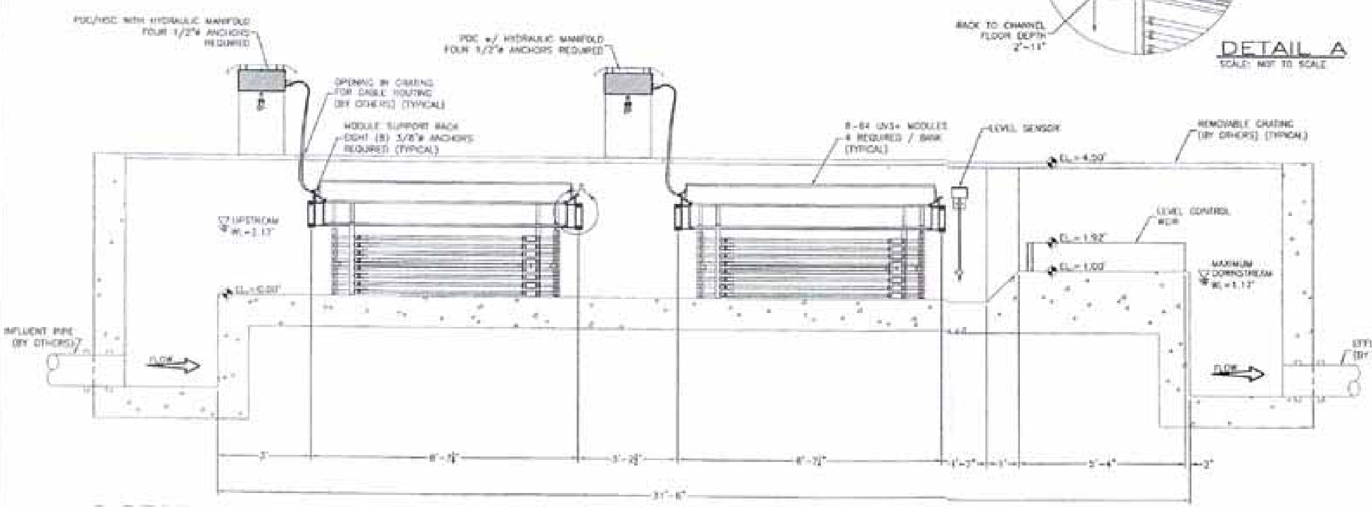
Figure 4-3 New Trojan UV 3000 Plus System



PLAN VIEW
SCALE AS SHOWN



DETAIL A
SCALE: NOT TO SCALE

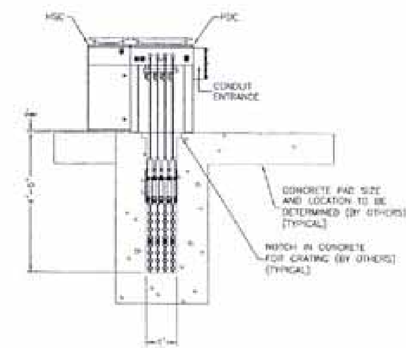


A SECTION
SCALE AS SHOWN
NOTE: SCC NOT SHOWN FOR CLARITY

TROJAN UV3000 PLUS
EQUIPMENT INTERCONNECTIONS

No.	DESCRIPTION	FROM	TO
1	POWER DISTRIBUTION CENTER (PDC)/HYDRAULIC SYSTEMS CENTRE (HSC) POWER SUPPLY 480Y/277V, 3 PHASE, 4 WIRE + GROUND 10.7 kVA/PDC POWER DRAW 17.8 AMPS MAXIMUM CURRENT/PHASE	DISTRIBUTION PANEL (DP) (BY OTHERS) (NOT SHOWN)	PDC
2	SYSTEM CONTROL CENTER (SCC) POWER SUPPLY 120V, 1 PHASE, 2 WIRE + GROUND, 10 AMPS	DP (BY OTHERS) (NOT SHOWN)	SCC
3	FLOW METER 4-20 mA, DC ANALOG INPUT (BY OTHERS)	FLOW METER PANEL (NOT SHOWN)	SCC
4	GROUND LINK 14 AWG TYPE TWH STRANDED	SCC	PDC (DAISY CHAINED)
5	SERIAL COMMUNICATION LINK (RS485) 1 SHIELDED TWISTED PAIR (24 AWG)	SCC	PDC (DAISY CHAINED)
6	LOW WATER LEVEL DETECTION 2-14 AWG TYPE TWH STRANDED	LEVEL SENSOR	PDC (DAISY CHAINED)
7	LEVEL SENSOR POWER SUPPLY 120V, 1 PHASE, 2 WIRE + GROUND, 5 AMPS	DP (NOT SHOWN) (BY OTHERS)	LEVEL SENSOR
8	TELEPHONE LINE (SUPPLY BY OTHERS)	LOCAL SUPPLY (NOT SHOWN)	SCC

NOTES:
- DO NOT SLOPE CHANNEL FLOOR.
- CHANNEL WIDTH & DEPTH MUST BE KEPT WITHIN A TOLERANCE OF + OR - ⅛".
- ANCHOR BOLTS ARE NOT SUPPLIED BY TROJAN TECHNOLOGIES INC.
- SYSTEM CONDUIT, WIRING, DISTRIBUTION PANELS & INTERCONNECTIONS BY OTHERS.
- ELECTRICAL REQUIREMENTS SHOWN ARE TO SUPPLY TROJAN UV EQUIPMENT ONLY. ELECTRICAL INRUSH FACTOR TO BE ADDED AS PER LOCAL CODE.
- REMOVABLE GRATING SECTIONS SHALL BE EASILY REMOVED BY ONE PERSON. MAXIMUM WEIGHT OF THE SECTIONS SHALL BE IN ACCORDANCE WITH REQUIREMENTS OF THE APPLICABLE JURISDICTION.
- CONTRACTOR TO REVIEW ALL TROJAN TECHNOLOGIES INC. INSTALLATION INSTRUCTIONS PRIOR TO EQUIPMENT INSTALLATION.
- USE TROJAN SUPPLIED HYDRAULIC HOSE KIT FOR PDC/HSC TO PDC CONNECTION.



B SECTION
SCALE AS SHOWN
NOTE: SCC AND GRATING NOT SHOWN FOR CLARITY

FIGURE 4-4

DESIGN CRITERIA		
	PEAK FLOW	2.30 MGD
	U.V. TRANSMISSION AT 253.7 nm	65%
	SUSPENDED SOLIDS	30 mg / l
	DISINFECTION STANDARD	200 FC / 100ml

CONFIDENTIALITY NOTICE
The information contained in this drawing is owned by Trojan Technologies Inc. Unauthorized copying or other reproduction is strictly prohibited.

Trojan Technologies Inc.

DESCRIPTION: LAYOUT, UV3+ COOPERSTOWN NY		QUOTE NO. LTB1395B
DRAWN BY: SMC/LZ	DATE: 03NO13	PROJECT NO. 510305
CHECKED BY: SAH	DATE: 03NO13	
APPROVED BY: WJG	DATE: 03NO13	DWG NO. S01 REV. B
SCALE (11x17): 1/4"=1'-0"	LOG NUMBER: N/A	

Figure 4-5 Open House Event October 19, 2005

Section 5

PERFORMANCE EVALUATION

The new UV disinfection system successfully completed its first year of operation in 2005. A tabulation of the 2005 wastewater data is shown on Table 5-1. This data shows the system is working extremely well for removal of fecal coliform and is well below the permitted limit of 200 MPN/100-mL with an average removal efficiency of 99.8%. The system is capable of maintaining the designed UVT or around 65% with a setting of approximately 58%, which is 64% of full power (only one bank running), and without the addition of a chemical floculation agent. This is also, in part, due to the very good secondary effluent TSS of 7.2 mg/L average. TSS removal, again very high, in lbs/day has been calculated and is shown in the bottom row of the table. The data also confirms that the calculated design UV dose of 53.5 mW-s/cm^2 is appropriate for this system.

For Cooperstown, the UV system dose algorithm is based on the following design parameters.

Flow = Design Peak – 2.3 MGD
UVT = 65%
Effluent TSS = 30 mg/l
Required Dose = 66,123 uwsec/cm^2 (includes adjustment for end of lamp life and fowling)

The system paces the delivered dose based on flow. The other parameters are fixed in the algorithm. Therefore, regardless of the actual water quality, the UV system is paced using the fixed basis of design values. While this may not totally optimize the energy input to the system, it is a reasonable common design approach for this sized facility. Larger systems sometimes pace UV dose via flow and UVT that requires an expensive UVT monitor, which was not felt to be cost effective for this size facility. Some systems allow for manual adjustment by inputting TSS values, but this creates some risk. If the actual TSS level rises above the manual set point, disinfection may be compromised. The same applies for manually inputting UVT values. This manual approach requires a much higher level of surveillance, and thus, higher labor cost.

As actual average daily flows at Cooperstown are often below the minimum turndown capability of the UV lamps, this system will not operate any lower than its minimum input power allowed when flows are below this average. This could be interpreted as "overdisinfecting" and may seem electrically inefficient. However, it is

TABLE 5-1 - VILLAGE OF COOPERSTOWN WWTP
UV DATA - 2005 SEASON

Date		5/5/05	5/19/05	6/2/05	6/9/05	7/7/05	7/14/05	7/28/05	8/4/05	8/11/05	9/2/05	AVERAGE
Time		1345	1315	1235	1245	1315	1200	1250	1300	1220	1245	
F.coliform	*MPN/100 mL*											
to UV		13000	31000	8800	20000			70000		34000	72000	35542.9
from UV		60							60	40	90	63.3333
TSS	*mg/L*											
influent		112	106	206	118	140	139	na	154	170	146	143
final effluent		6	8	10	5	6	5	5	9	8	10	7.2
UV Intensity	*mW/cm2*	7.6	6.6	6.5	7.4	7.2	5.6	6.4	7.1	6.3	6.2	6.69
UV Transmittance	*%*											
measured		74	69	66	66	63	63	61	62	63	62	64.9
inserted		65	60	60	60	55	55	55	55	55	55	57.5
Bank(s)		B	B	B	A	A	A	B	A	B*	B	
% Full power							60	64	68	64	64	64
DOSE	*mW-s/cm2*	58.1	60.6	55.7	55.3	53.6	na	55.4	50.1	54.5	59.1	55.8222
		DOSE set 50								DOSE set 55		
FLOW												
chart	*mgd*	0.71	0.56	0.65	0.73	0.76	0.97	0.63	0.79	0.65	0.41	0.686
Contact time	*seconds*	*7.65*	9.06	8.59	7.76	7.37	11.25	8.71	7.1	8.62	9.45	8.25667
Estimated TSS												
Removal	lb./day	626	471	1,060	686	834	1,081	NA	953	876	450	775
2002024\Excel\UV 2005 Data												

a common design for smaller facilities such as Cooperstown with a high peak flow as compared to those facilities with average flow. The inclusion of end of lamp life and lamp fouling adjustments also adds conservatism to the delivered dose. In summary, in the context of this facility, the UV system has been optimized for a balance of capital and operating cost.

Using some of the data from Table 5-1, Trojan Technologies was asked to give an evaluation of the UV systems' power input as it relates to mass of solids treated. That is (electrical energy input) per (mass of solids treated) = kW/[effluent flow) x (TSS removed)]. Figure 5-1 shows this comparison. This graph indicates as TSS removal increases, power per pound of TSS removed decreases. Therefore, based on the amount of TSS removed for this facility it can be derived that the UV system is operating in the low end of the kW required per pound of TSS removed, thus making it very energy efficient in relation to TSS removed and again showing how important the TSS at the UV influent is to the energy performance of the system. In addition, a review of the past and current monthly electrical bills indicates that only approximately 1,400 additional kwh were directly attributed to the 2005 UV disinfection season (four months = 350kwh/month).

Figure 5-1 Village of Cooperstown

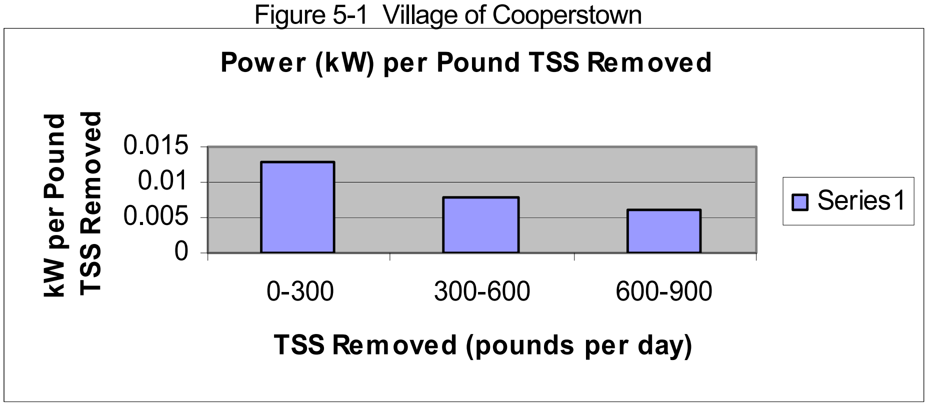


Table 5-2 includes UV operating data for the 2006 disinfection season. This data indicates excellent F. coliform removal and also shows a good linear correlation between UV dose and influent flow as designed. It can be noted that very low effluent TSS results in high UV transmittance measurements. The table also concludes why the system is designed for peak flows as shown by the results obtained on 8/3/06.

TABLE 5-2 - VILLAGE OF COOPERSTOWN WWTP

UV DATA - 2006 SEASON

Date		5/04/06	5/11/06	6/8/06	6/15/06	7/6/06	8/13/06	8/3/06	8/10/06	9/7/06	9/14/06
Time		12:20	11:45	12:20	12:05	12:10	12:05	12:50	11:35	11:55	11:40
F.coliform	*MPN/100 mL*										
to UV				6000	6000	4000	12000	7500	12900	39000	32000
from UV		10	>10	<10	<10	<10	<10	<10	20	<10	<10
TSS	*mg/L*										
final effluent		5	<5	<3	<5	9	14	<5	6	6	9
UV Transmittance	*%*										
measured			69	70	71	72	66	69	76	72	69
inserted		55	55	55	55	55	55	55	55	55	55
Bank(s)		A	B	B	AB	AB	AB	AB	A	A	B
% Full power	BANK A	64			72	60	80	60	76	72	
	BANK B		64	72	60	92	60	76			72
UV Intensity	*mW/cm2*				6.5	8.3	7.6	7.1	7.208	7.4	7.3
	BANK A	6.98			6.85	5.29	9.84	5.22	8.2	7.36	
	BANK B		6.21	7.7	5.35	11.29	5.26	8.21			7.32
DOSE	*mW-s/cm2*	61.37	58.42	56.27	98.56	82.79	88.53	99.82	59.44	59.75	59.12
	DOSE SET:	55	55	55	55	55	55	55	55	55	55
kW Power											
FLOW											
chart	*mgd*	*0.632*	0.59	0.729	0.675	1.075	0.891	13.57	0.757	0.674	0.687

2002024\Excel\UV 2005 Data - Table 5-2

The systems automatic cleaning system has operated well, and off-season system decommissioning has been performed with no problems encountered. The PAC addition system has yet to be used but is ready in case high TSS are encountered. Overall, the system has been easy to operate and environmentally safe. Based on the research, findings, and conclusions of this report, along with the successful implementation of the design and construction of the project, the Village of Cooperstown and its plant operators will continue to see many more successful disinfection seasons with only periodic bulb replacement, channel cleaning, minor component maintenance required, and no more handling of hazardous chemicals.

APPENDIX A

Current SPDES Permit
For Cooperstown WWTF

91-20-5 (F/97)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

State Pollutant Discharge Elimination System (SPDES)

NOTICE / RENEWAL APPLICATION / PERMIT

JUL 25 2003

REGION 7 HEADQUARTERS

Please read **ALL** instructions on the back before completing this application form. Please **TYPE** or **PRINT** clearly in ink.

PART 1 - NOTICE 04/28/2003

Permittee Contact Name, Title, Address

COOPERSTOWN (V)
MAYOR
22 MAIN ST
COOPERSTOWN NY 13326

RECEIVED JUL - 1 2003 VILLAGE CLERK COOPERSTOWN, NY

Facility and SPDES Permit Information

Name: COOPERSTOWN (V) SEWAGE TREATMENT
Ind. Code: 4952 County: OTSEGO
DEC No.: 4-3650-00004/00001
SPDES No.: NY 002 3591
Expiration Date: 02/01/2004
Application Due By: 08/05/2003

Are these name(s) & address(es) correct? if not, please write corrections above.

The State Pollutant Discharge Elimination System Permit for the facility referenced above expires on the date indicated. You are required by law to file a complete renewal application **at least 180 days prior to expiration of your current permit. Note the "Application Due By" date above.**

CAUTION: This short application form and attached questionnaire are the only forms acceptable for permit renewal. Sign Part 2 below and mail only this form and the completed questionnaire using the enclosed envelope. *Effective April 1, 1994 the Department no longer assesses SPDES application fees.*

If there are changes to your discharge, or to operations affecting the discharge, then in addition to this renewal application, you must also submit a separate permit modification application to the Regional Permit Administrator for the DEC region in which the facility is located, as required by your current permit. See the reverse side of this page for instructions on filing a modification request.

PART 2 - RENEWAL APPLICATION

CERTIFICATION: I hereby affirm that under penalty of perjury that the information provided on this form and all attachments submitted herewith is true to the best of my knowledge and belief. False statements made herein are punishable as a Class A misdemeanor pursuant to section 210.45 of the Penal Law.

RECEIVED NYSDEC ENVIRONMENTAL PERMITS 03 JUL 30 AM 10:43

Carol Waller, Mayor

Name of person signing application (see instructions on back) Title

Carol Waller 7/23/03

Signature Date

PART 3 - PERMIT (Below this line - Official Use Only)

Effective Date: 02, 01, 04 Expiration Date: 02, 01, 09

William R. Adriance

Permit Administrator

Address: NYSDEC - Division of Environmental Permits
Bureau of Environmental Analysis
625 Broadway, Albany, NY 12233-1750

William R. Adriance 9/10/03

Signature Date

This permit together with the previous valid permit for this facility issued 9 / 17 / 98 and subsequent modifications constitute authorization to discharge wastewater in accordance with all terms, conditions and limitations specified in the previously issued valid permit, modifications thereof or issued as part of this permit, including any special or general conditions attached hereto. Nothing in this permit shall be deemed to waive the Department's authority to initiate a modification of this permit on the grounds specified in 6NYCRR §621.14, 6NYCRR §754.4 or 6NYCRR §757.1 existing at the time this permit is issued or which arise thereafter.

Attachments: General Conditions dated 11 / 90

91-20-5a (7/99)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Please enter the numbers from your current permit:	DEC Number: 4 - 3650 - 00084 / 00001
	SPDES Number: NY ~~4-3650~~ 0023591

SPDES RENEWAL APPLICATION
QUESTIONNAIRE

THIS PAGE MUST BE COMPLETED AND RETURNED WITH YOUR COMPLETED APPLICATION

Please **TYPE** or **PRINT** neatly using adequate pressure to make ALL copies legible. Keep the GOLD copy for your records.

1. Has the SPDES permit for your facility been modified in the past 5 years ☐ YES ☒ NO

2. Dischargers who use, manufacture, store, handle or discharge toxic or hazardous pollutants are subject to Industrial Best Management Practices (BMP) plan requirements for toxic or hazardous substances. A BMP plan prevents or minimizes the potential for release of pollutants to receiving waters from such ancillary industrial activities, including material storage areas; plant site runoff; in-plant transfer; process and material storage areas; loading and unloading operations, and sludge and waste disposal areas.

   Does your facility conduct ancillary activities as described above, which are not covered by BMP requirements in your current permit? ☐ YES ☒ NO

Please indicate which of the following best describes the situation at your facility:

☐ None of the concerns on the "Self Evaluation List" seem to apply to my facility at this time and I will not be applying for a modification of the SPDES permit in the foreseeable future.

☐ Yes, some of the items on the "Self Evaluation List" have led me to believe my permit needs to be modified. I already have a complete modification application pending with the Department.

☐ Yes, some of the items on the "Self Evaluation List" have led me to believe that the SPDES permit for this facility may need to be Modified. I have requested the appropriate forms by phone OR I have completed and attached the "Request For SPDES Application Forms" (included in this renewal package) to allow me to submit a permittee-initiated Modification application.

☒ The items on the "Self Evaluation List" have left me unable to conclude whether my permit needs to be modified at this time. I am reporting the following general concerns about my permit:

We are in the process of imstalling ultraviolet treatment to replace chlorine use by May, 2004.

DISTRIBUTION: Regional Water Engineer
Central Office (BWP)
Regional Permit Administrator
Applicant

New York State Department of Environmental Conservation
Division of Environmental Permits, 4th Floor
625 Broadway, Albany, New York 12233-1750
Phone: (518) 402-9167 • **FAX:** (518) 402-9168
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

September 10, 2003

MAYOR
COOPERSTOWN (V)
22 MAIN ST
COOPERSTOWN, NY 13326

FACILITY INFORMATION

COOPERSTOWN (V) SEWAGE
TREATMENT PLANT
LOCATION: COOPERSTOWN (V)
COUNTY: OTSEGO
DEC NO: 4-3650-00004-00001
SPDES NO: NY 002 3591

Dear SPDES Permittee:

Enclosed please find a validated NOTICE/RENEWAL APPLICATION/PERMIT form renewing your State Pollutant Discharge Elimination System (SPDES) permit for the referenced facility. This validated form, together with the previously issued permit (see issuance date of this permit in Part 3 of the NOTICE/RENEWAL APPLICATION/PERMIT form), and any subsequent permit modifications constitute authorization to discharge wastewater in accordance with all terms, conditions and limitations specified therein.

The instructions and other information that you received with the NOTICE/RENEWAL APPLICATION/PERMIT package fully described procedures for renewal and modification of your SPDES permit under the Environmental Benefit Permit Strategy (EBPS). As a reminder, SPDES permits are renewed at a central location in Albany in order to make the process more efficient. All other concerns with your permit such as applications for permit modifications, permit transfers to a new owner, name changes, and other questions should be directed to the Regional Permit Administrator at the following address:

NYSDEC REGION 4 SUB OFFICE
65561 State Highway 10, Suite 1
Stamford, NY 12167-9503
(607) 652-7741

If you have already filed an application for modification of your permit, it will be processed separately through our regional office. If you have questions concerning this permit renewal, please contact Lynn Kaplan at (518) 402-9165.

Sincerely,

William R. Adriance

Chief Permit Administrator

Enclosure
cc: RPA
RWE
BWP

New York State Department of Environmental Conservation
Division of Environmental Permits, Region 4
65561 State Highway 10, Suite 1, Stamford, New York 12167-9503
Phone: (607) 652-7741 • **FAX:** (607) 652-2342
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

January 24, 2002

cc - Brian
Dennis
John
office

The Honorable Wendell Tripp, Mayor
The Village of Cooperstown
22 Main Street
Cooperstown, NY I3326

RE: SPDES Permit # NY- 002 3591
Cooperstown STP
Cooperstown (V), Otsego County

Dear Mayor Tripp:

The SPDES discharge permit for this facility is hereby modified to allow for the following changes:

For the Period 01/24/02 to 3/31/02 the minimum daily flow of the Susquehanna River may be lowered to no less than 9.0 cubic feet per second. When the minimum daily flow of the Susquehanna River is dropped below 11.0 cubic feet per second, the effluent limitation for Ultimate Oxygen Demand (UOD) will be set at 260 pounds / day.

The Village of Cooperstown shall conduct additional monitoring to determine the UOD effluent load during each 30-day period when flows in the Susquehanna River are below the normal permitted minimum daily flow of 11.0 cfs. These monitoring reports shall be submitted to the Department as per the existing SPDES permit.

The Village of Cooperstown shall provide the results of efforts to confirm whether the flow measuring technique employed at the Mill Street Dam provides sufficient accuracy, to this office by 2/8/02.

This permit change is effective 1/24/02. Please attach this letter to your SPDES permit. This modification is based upon your request to the Department regarding the drop in lake levels for Otsego Lake from the lack of rainfall. The above modification allows the flexibility to reduce the outflow from the lake, to maintain minimum flows in the Susquehanna River, while assuring that maximum permitted effluent loading versus receiving water assimilative capacity is not exceeded. If you have any questions please feel free to contact either Peter Jackson of our Division of Water (518-357-3282) or myself (607 652-7741 or 518-357-2069).

Sincerely,

John Feltman
Deputy Regional Permit Administrator
Region 4

cc: R4DOW - P. Jackson
BWFD - R. Hannaford
NYSDOH - Oneonta
USEPA Region II
SRBC

Post-it® Fax Note 7671	Date 1/24	# of pages ▶ 1
To T. Peters	From John Feltman	
Co./Dept.	Co.	
Phone #	Phone #	
Fax #	Fax #	

New York State Department of Environmental Conservation
Division of Environmental Permits, Region 4
65561 State Highway 10, Suite 1, Stamford, New York 12167-9503
Phone: (607) 652-7741 • FAX: (607) 652-2342
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

November 26, 2001

Sewer Plant

The Honorable Wendell Tripp, Mayor
The Village of Cooperstown
22 Main Street
Cooperstown, NY 13326

RE: SPDES Permit # NY- 002 3591
Cooperstown STP
Cooperstown (V), Otsego County

Dear Mayor Tripp:

The SPDES discharge permit for this facility is hereby modified to allow for the following changes:

For the Period 11/26/01 to 1/19/02 the minimum daily flow of the Susquehanna River may be lowered to no less than 9.0 cubic feet per second. When the minimum daily flow of the Susquehanna River is dropped below 11.0 cubic feet per second, the effluent limitation for Ultimate Oxygen Demand (UOD) will be set at 260 pounds / day.

The Village of Cooperstown shall conduct additional monitoring to determine the UOD effluent load during each 30-day period when flows in the Susquehanna River are below the normal permitted minimum daily flow of 11.0 cfs. These monitoring reports shall be submitted to the Department as per the existing SPDES permit.

The Village of Cooperstown should confirm whether the flow measuring technique employed at the Mill Street Dam provides sufficient accuracy or further adjustment is needed. The USGS Troy office provides this field evaluation service which is acceptable to this Department.

This permit change is effective 11/26/01. Please attach this letter to your SPDES permit. This modification is based upon your request to the Department regarding the drop in lake levels for Otsego Lake from the lack of rainfall. The above modification allows the flexibility to reduce the outflow from the lake, to maintain minimum flows in the Susquehanna River, while assuring that maximum permitted effluent loading versus receiving water assimilative capacity is not exceeded. If you have any questions please feel free to contact either Peter Jackson of our Division of Water (518-357-3282) or myself (607 652-7741 or 518-357-2069).

Sincerely,

John Feltman
Deputy Regional Permit Administrator
Region 4

cc: R4DOW - P. Jackson
BWFD - R. Hannaford
NYSDOH - Oneonta
USEPA Region II
SRBC

New York State Department of Environmental Conservation
Office of Environmental Quality, Region 4
1150 North Westcott Road, Schenectady, New York 12306-2014
Phone: (518) 357-2045 • **FAX:** (518) 357-2398
Website: www.dec.state.ny.us

John P. Cahill
Commissioner

November 29, 1999

Mr. Henry Green, Chief Operator
Village of Cooperstown
22 Main Street
Cooperstown, NY I3326

Re: SPDES Permit # NY002-3591
Cooperstown STP
Cooperstown (V), Otsego County

Dear Mr. Green:

Mr. Canker recently filed a "Report of Noncompliance Event" for four flow exceedences in October. Thank him for me but it is not currently necessary as of October 1, 1999, the effective date of (permit) modification or "EDM."

This newly modified permit allows you a twelve months rolling average (12MRA) of 750,000 gallons per day under the compliance schedule found on page number 6. This language is located on page 4 of 8 in your new permit under note number (5). This measure temporarily prevents chargeable violations for flow exceedences (i. e., those above 0.52 MGD, but within the 12 MRA) in view of Cooperstown's acceptance of the modified permit and all of its conditions.

More important, note that an Engineering Report is due on October 1, 2000. Enclosed is a copy of the permit for your personal reference. I believe you already have the General Conditions, Part II referenced therein.

If any clarification or additional information is required, please feel free to contact me at (518) 357-2382.

Very truly yours,

Peter F. Jackson
Environmental Engineer I
Region IV

Attachment: 9/3/99 permit transmittal w/ SPDES
cc: Dr. Peters

PFJ/ml-COOPrpt

① KAK ② File

New York State Department of Environmental Conservation
Division of Environmental Permits, Region 4
1150 North Westcott Road, Schenectady, New York 12306-2014
Phone: (518) 357-2069 • **FAX:** (518) 357-2460
Website: www.dec.state.ny.us

John P. Cahill
Commissioner

September 3, 1999

RECEIVED
SEP 8 1999

Wendell Tripp, Mayor
Village of Cooperstown
22 Main Street
Cooperstown, NY 13326

RE: DEC #4-3650-00004/00001
SPDES #NY-0023591
Cooperstown WTP
Otsego (T), Otsego County

Dear Mr. Tripp:

Enclosed is your modified SPDES Permit which is effective beginning October 1, 1999, and will expire on February 1, 2004. The permit is modified in response to your letter dated July 17, 1998, regarding in-stream monitoring location, and associated minimum release requirements.

Please read all permit conditions carefully. All permit documents must be available upon request by Department staff as well as distributed to and understood by your personnel responsible for proper operation of the facility and compliance with the discharge limits. Any violation of these permit conditions constitutes a violation of the Environmental Conservation Law.

If you have any questions regarding this permit, you may contact the Division of Environmental Permits at the above address. Please refer to the above referenced numbers when you are corresponding with this office or when you are applying to renew or modify this permit.

Any questions regarding your <u>annual</u> pollutant discharge elimination fee should be directed to the Regulatory Fee Determination Unit at 1-800-225-2566.

Sincerely,

John H. Feltman
Environmental Analyst 2
Division of Environmental Permits

Enclosure
CC: Div. of Water, Region 4
Robert Hannaford, Div. of Water, Albany - 3505
Department of Health
Regulatory Fee Unit
File

91-20-2 (1/89)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

State Pollutant Discharge Elimination System (SPDES)
DISCHARGE PERMIT
Special Conditions (Part I)

Industrial Code: 4952
Discharge Class (CL): 05
Toxic Class (TX): N
Major Drainage Basin: 06
Sub Drainage Basin: 01
Water Index Number: SR
Compact Area: SRBC

SPDES Number: NY - 0023591
DEC Number: 4-3650-00004/00001
Effective Date (EDP): 02/01/99
Expiration Date (ExDP): 02/01/04
Modification Date(s): 10/01/99
Attachment(s): General Conditions (Part II) Date: 11/90

This SPDES permit is issued in compliance with Title 8 of Article 17 of the Environmental Conservation Law of New York State and in compliance with the Clean Water Act as amended, (33 U.S.C. Section 1251 et. seq.)(hereafter referred to as "the Act").

PERMITTEE NAME AND ADDRESS Attention: Wendell Tripp, Mayor

Name: Village of Cooperstown
Street: 22 Main Street
City: Cooperstown State: NY Zip Code: 13326
is authorized to discharge from the facility described below:

FACILITY NAME AND ADDRESS

Name: Village of Cooperstown Wastewater Treatment Facility
Location (C,T,V): Cooperstown (V) County: Otsego
Facility Address: 22 Main Street
City: Cooperstown State: NY Zip Code: 13326
NYTM - E: 505.5 NYTM - N: 4 725.8
From Outfall No.: 001 at Latitude: 42° 40′ 09" & Longitude: 74° 56′ 02"
into receiving waters known as: Susquehanna River Class: B
and; (list other Outfalls, Receiving Waters & Water Classifications)

in accordance with the effluent limitations, monitoring requirements and other conditions set forth in Special Conditions (Part I) and General Conditions (Part II) of this permit.

DISCHARGE MONITORING REPORT (DMR) MAILING ADDRESS

Mailing Name: Village of Cooperstown
Street: 22 Main Street
City: Cooperstown State: NY Zip Code: 13326
Responsible Official or Agent: Wendell Tripp, Mayor Phone: (607)547-2411

This permit and the authorization to discharge shall expire on midnight of the expiration date shown and the permittee shall not discharge after the expiration date unless this permit has been renewed, or extended pursuant to law. To be authorized to discharge beyond the expiration date, the permittee shall apply for a permit renewal no less than 180 days prior to the expiration date shown above.

DISTRIBUTION: D. Lis, DOW, Region 4
R. Hannaford, BWFD
DOH
Regulatory Fee Unit
File

(DEPUTY)
Permit Administrator: John H. Feltman
Address: 1150 North Westcott Road, Schenectady, NY 12306
Signature: [signature] Date: 9/3/99

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning EDM and lasting until February 1, 1999 the discharges from the permitted facility shall be limited and monitored by the permittee as specified below:

LIMITATIONS APPLY: [ ] All Year [X] Seasonal from May 16 to October 15.

Outfall Number 001

EFFLUENT LIMITATIONS

[x] Flow	30 day arithmetic mean	0.52	[x] MGD[5] [ ] GPD		
[x] CBOD, 5 - Day	30 day arithmetic mean	25	mg/l and		lbs/day[1]
[ ] BOD, 5 - Day	7 day arithmetic mean		mg/l and		lbs/day
[x] UOD[2]	30 day arithmetic mean		mg/l and	325	lbs/day
[x] Solids, Suspended	30 day arithmetic mean	30	mg/l and	130	lbs/day[1]
[x] Solids, Suspended	7 day arithmetic mean	45	mg/l and	195	lbs/day

[x] Effluent disinfection required: [ ] All Year [X] Seasonal from May 16 to September 15

[x] Coliform, Fecal	30 day geometric mean shall not exceed 200/100 ml[3]	
[x] Coliform, Fecal	7 day geometric mean shall not exceed 400/100 ml[3]	
[x] Chlorine, Total Residual	Daily Maximum[3]	0.37 mg/l[6]
[x] pH	Range	6.0-9.0 SU
[x] Solids, Settleable	Daily Maximum	0.3 ml/l
[x] Ammonia	Daily Maximum	10 mg/l as NH_3
[x] Dissolved Oxygen	Daily Minimum	7.0 mg/l
[x] Stream Flow	Daily Minimum	11.0 CFS[4]
[ ]		
[ ]		
[ ]		

MONITORING REQUIREMENTS

Parameter	Frequency	Sample Type	Sample Location Influent	Sample Location Effluent
[x] Flow, [x] MGD [ ] GPD	Continuous	Recorder	X	
[x] CBOD, 5 - Day, mg/l	2/month	6-hr. comp.	X	X
[x] Solids, Suspended, mg/l	2/month	6-hr. comp.	X	X
[x] Coliform, Fecal, No./100 ml[3]	2/month	Grab		X
[x] Nitrogen, TKN (as N), mg/l	2/month	6-hr. comp.		X
[x] Ammonia (as NH_3), mg/l	2/month	6-hr. Comp.		X
[x] pH, SU (standard units)	1/day	Grab		X
[x] Solids, Settleable, ml/l	1/day	Grab	X	X
[x] Chlorine, Total Residual, mg/l[3]	1/day	Grab		X
[ ] Phosphorus, Total (as P), mg/l				
[x] Temperature, Deg. F	1/day	Grab		X
[ ]				
[x] Dissolved Oxygen, mg/l	1/day	Grab		X
[x] Receiving Stream Flow			Mill St.Dam[4]	
[ ]				

NOTES: See Page 4 of 8

91-20-2b (1/89)

SPDES No.: NY 002 3592

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning EDM and lasting until February 1, 1999

the discharges from the permitted facility shall be limited and monitored by the permittee as specified below:

LIMITATIONS APPLY: [ ] All Year [X] Seasonal from October 16 to May 15.

Outfall Number 001

EFFLUENT LIMITATIONS

[x] Flow	30 day arithmetic mean	0.52	[x] MGD(5) [ ] GPD
[x] CBOD, 5 - Day	30 day arithmetic mean	25 mg/l and 108	lbs/day(1)
[x] CBOD, 5 - Day	7 day arithmetic mean	40 mg/l and 173	lbs/day
[ ] UOD(2)		mg/l and	lbs/day
[x] Solids, Suspended	30 day arithmetic mean	30 mg/l and 130	lbs/day(1)
[x] Solids, Suspended	7 day arithmetic mean	45 mg/l and 195	lbs/day

[ ] Effluent disinfection required: [ ] All Year [ ] Seasonal from ______ to ______

[ ] Coliform, Fecal	30 day geometric mean shall not exceed 200/100 ml(3)	
[ ] Coliform, Fecal	7 day geometric mean shall not exceed 400/100 ml(3)	
[ ] Chlorine, Total Residual	Daily Maximum(3)	mg/l
[x] pH	Range	6.0-9.0 SU
[x] Solids, Settleable	Daily Maximum	0.3 ml/l
[ ]		mg/l as
[x] Stream Flow	Daily Minimum	11.0 CFS(4)
[ ]		
[ ]		
[ ]		
[ ]		

MONITORING REQUIREMENTS

Parameter	Frequency	Sample Type	Sample Location Influent	Sample Location Effluent
[x] Flow, [x] MGD [ ] GPD	Continuous	Recorder	X	
[x] CBOD, 5 - Day, mg/l	2/month	6-hr. comp.	X	X
[x] Solids, Suspended, mg/l	2/month	6-hr. comp.	X	X
[ ] Coliform, Fecal, No./100 ml(3)				
[ ] Nitrogen, TKN (as N), mg/l				
[ ] Ammonia (as NH_3), mg/l				
[x] pH, SU (standard units)	1/day	Grab		X
[x] Solids, Settleable, ml/l	1/day	Grab	X	X
[ ] Chlorine, Total Residual, mg/l(3)				
[ ] Phosphorus, Total (as P), mg/l				
[x] Temperature, Deg. F	1/day	Grab		X
[x] Receiving Stream Flow			Mill St.Dam(4)	
[ ]				
[ ]				
[ ]				

NOTES: See Page 4 of 8

Effluent Limitations and Monitoring Requirements (con't)

The following notes apply all year:

(1) The effluent value shall not exceed 20% of influent values.

(2) Ultimate oxygen demand shall be computed as follows:
$UOD = 1\frac{1}{2} \times CBOD_5 + 4\frac{1}{2} \times TKN$ (Total Kjeldahl Nitrogen)

(3) Monitoring of these parameters is only required during the period when disinfection is required.

(4) The flow of the Susquehanna River shall be regulated to maintain a minimum daily flow of 11.0 cubic feet per second. Flow is to be determined daily by the use of a rectangular weir in the Mill St. Dam from May 1 through October 31 and once per week from November 1 through April 30; a minimum flow of 10.0 cubic feet per second shall be maintained through the weir.

Four times annually during periods of low flow between June through September stream measurements will be made at the outfall to confirm a minimum of 1-cubic foot per second increment between the Dam and the outfall.

(5) Compliance with this effluent limitation is to be achieved in accordance with the compliance schedule contained on page 6 of this permit. During the interim period, the flow shall not exceed a 12 month rolling average (12 MRA) of 0.75 MGD.

(6) Compliance with the effluent limitation for total residual chlorine is to be achieved in accordance with the compliance schedule contained on page 6 of this permit. During the interim period, the daily maximum discharge shall not exceed 2.0 mg/l.

Flow Management

a) Complete an annual sewer system inspection and maintenance program.

b) Prepare an annual report for the period January 1 to December 31 that describes the permittee's sewer inspection and maintenance activities for the period and an assessment of the sewer inspection and maintenance program's effectiveness. The report shall be submitted with the first DMR submission following the close of the report period.

SCHEDULE OF COMPLIANCE

a) The permittee shall comply with the following schedule.

Action Code	Outfall Number(s)	Compliance Action	Due Date
53599	001	The permittee shall commence a study to determine the means, methods, and implementation schedule necessary to achieve compliance with the effluent limitations for flow and total residual chlorine. The results of this study shall be presented in an approvable Engineering Report. The Report shall be submitted to the offices listed on the monitoring and reporting page of this permit. Upon approval of the Engineering Report, the implementation schedules will become the enforceable compliance schedules.	EDM + 12 months

b) The permittee shall submit a written notice of compliance or non-compliance with each of the above schedule dates no later than 14 days following each elapsed date, unless conditions require more immediate notice under terms of the General Conditions (Part II), Section 5. All such compliance or non-compliance notification shall be sent to the locations listed under the section of this permit entitled RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS. Each notice of non-compliance shall include the following information:

1. A short description of the non-compliance;
2. A description of any actions taken or proposed by the permittee to comply with the elapsed schedule requirements without further delay and to limit environmental impact associated with the non-compliance;
3. A description or any factors which tend to explain or mitigate the non-compliance; and
4. An estimate of the date the permittee will comply with the elapsed schedule requirement and an assessment of the probability that the permittee will meet the next scheduled requirement on time.

c) The permittee shall submit copies of any document required by the above schedule of compliance to NYSDEC Regional Water Engineer at the location listed under the section of this permit entitled RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS, unless otherwise specified in this permit or in writing by the Department.

DISCHARGE NOTIFICATION REQUIREMENTS

a) Within ninety days after the effective date of this permit modification, the permittee shall install and maintain identification signs at all outfalls to surface waters listed in this permit. The sign(s) shall be conspicuous, legible and in as close proximity to the point of discharge as is reasonably possible while ensuring the maximum visibility from the surface water and shore. The signs shall be installed in a manner that poses minimal hazard to navigation, bathing or other water related activities. If the public has access to the water from the land in the vicinity of the outfall, an identical sign shall be posted to be visible from the direction approaching the surface water.

The signs shall have **minimum** dimensions of eighteen inches by twenty four inches (18" x 24") and shall have white letters on a green background and contain the following information:

N.Y.S. PERMITTED DISCHARGE POINT

SPDES PERMIT No.: NY__________

OUTFALL No. :____

For information about this permitted discharge contact:

Permittee Name: __________________________________

Permittee Contact: __________________________________

Permittee Phone: ( ) - ### - ####

OR:

NYSDEC Division of Water Regional Office Address :

NYSDEC Division of Water Regional Office Phone: ( ) - ### -####

b) If, upon the effective date of this modification, the permittee has installed signs that include the information required by § 17-0815-a(2)(a), but do not meet the specifications listed above, the permittee may continue to use the existing signs for a period of up to five years, after which the signs shall comply with the specifications listed above.

c) The permittee shall periodically inspect the outfall identification signs in order to insure that they are maintained, are still visible and contain information that is current and factually correct.

d) Within ninety days after the effective date of this permit modification, the permittee shall provide for public review at a repository accessible to the public, copies of the Discharge Monitoring Reports (DMRs) as required by the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of this permit. This repository shall be open to the public at a minimum of normal daytime business hours. The repository may be at the business office repository of the permittee or at an off-premises location of its choice (such location shall be the village, town, city or county clerk's office, the local library or other location as approved by the Department). In accordance with the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of your permit, each DMR shall be maintained on record for a period of three years.

RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS

a) The permittee shall also refer to the General Conditions (Part II) of this permit for additional information concerning monitoring and reporting requirements and conditions.

b) The monitoring information required by this permit shall be summarized, signed and retained for a period of three years from the date of the sampling for subsequent inspection by the Department or its designated agent. **Also;**

[X] (if box is checked) monitoring information required by this permit shall be summarized and reported by submitting completed and signed Discharge Monitoring Report (DMR) forms for each 1 month reporting period to the locations specified below. Blank forms are available at the Department's Albany office listed below. The first reporting period begins on the effective date of this permit and the reports will be due no later than the 28th day of the month following the end of each reporting period.

Send the **original** (top sheet) of each DMR page to:

Department of Environmental Conservation
Division of Water
Bureau of Watershed Compliance Programs
50 Wolf Road
Albany, New York 12233-3506

Phone: (518) 457-3790

Send the **first copy** (second sheet) of each DMR page to:

Department of Environmental Conservation
Regional Water Engineer
Region 4
1150 N. Westcott Road
Schenectady, NY 12306-2014

c) A monthly "Wastewater Facility Operation Report..." (form 92-15-7) shall be submitted (if box is checked) to the [X] Regional Water Engineer and/or [ ] County Health Department or Environmental Control Agency listed above.

d) **Noncompliance** with the provisions of this permit shall be reported to the Department as prescribed in the attached General Conditions (Part II).

e) Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

f) If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR Part 136 or as specified in this permit, the results of this monitoring shall be included in the calculations and recording on the Discharge Monitoring Reports.

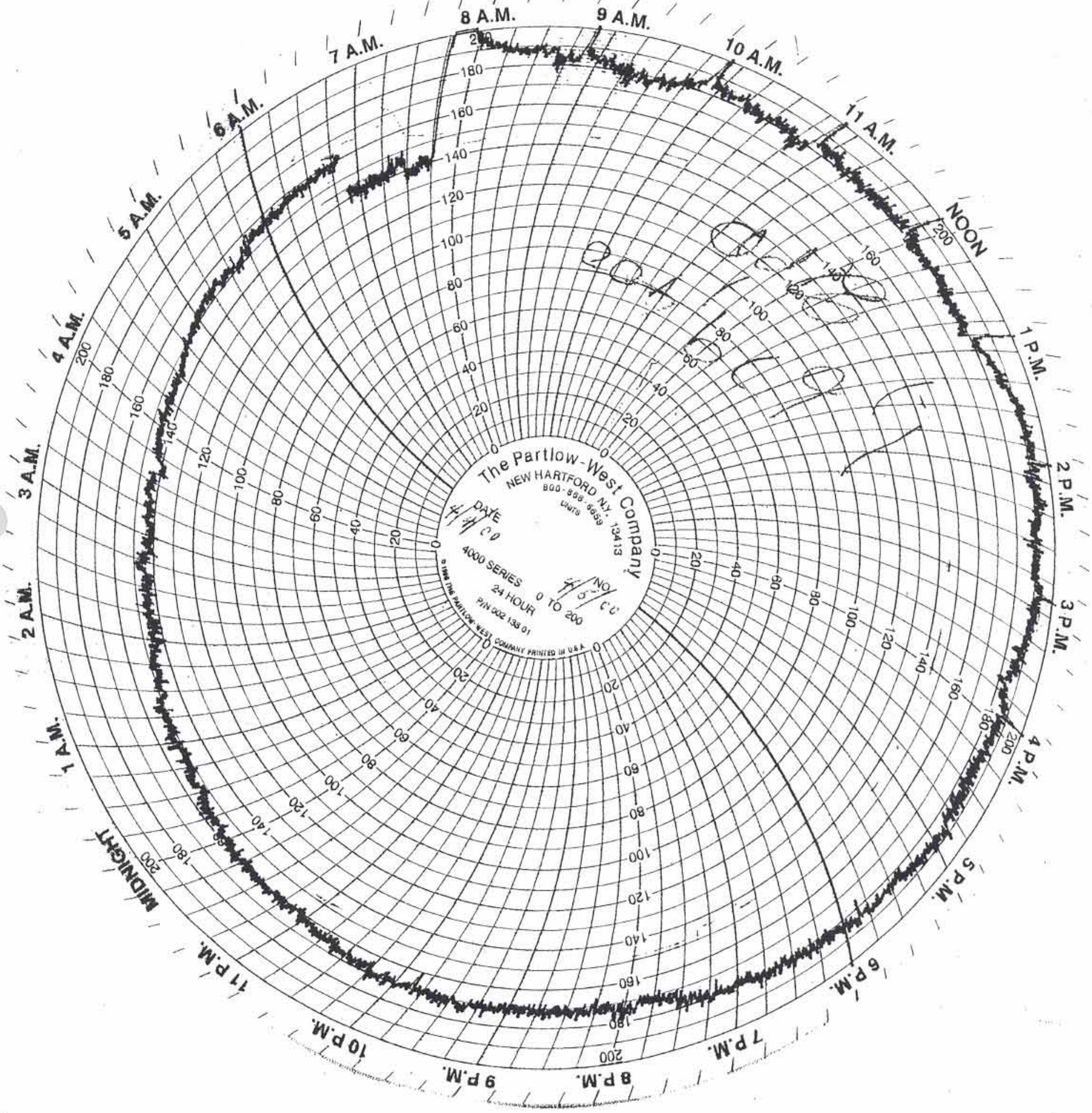
g) Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in this permit.

h) Unless otherwise specified, all information recorded on the Discharge Monitoring Report shall be based upon measurements and sampling carried out during the most recently completed reporting period.

i) Any laboratory test or sample analysis required by this permit for which the State Commissioner of Health issues certificates of approval pursuant to section five hundred two of the Public Health Law shall be conducted by a laboratory which has been issued a certificate of approval. Inquiries regarding laboratory certification should be sent to the Environmental Laboratory Accreditation Program, New York State Health Department Center for Laboratories and Research, Division of Environmental Sciences, The Nelson A. Rockefeller State Plaza, Albany, New York 12201.

APPENDIX B

Influent Flow Chart
For Cooperstown WWTF
Dated April 4, 2000
And WWTF Data from
January 1997 to May 2002


The Partlow-West Company
NEW HARTFORD N.Y. 13413
800-866-5659
UNITS
DATE
4000 SERIES
24 HOUR
0 TO 200
P/N 002 135 01
NO
THE PARTLOW-WEST COMPANY PRINTED IN U.S.A.
MIDNIGHT
1 A.M.
2 A.M.
3 A.M.
4 A.M.
5 A.M.
6 A.M.
7 A.M.
8 A.M.
9 A.M.
10 A.M.
11 A.M.
NOON
1 P.M.
2 P.M.
3 P.M.
4 P.M.
5 P.M.
6 P.M.
7 P.M.
8 P.M.
9 P.M.
10 P.M.
11 P.M.

VILLAGE OF COOPERSTOWN WASTEWATER TREATMENT FACILITY DATA
1997 TO 2002

PERIOD	ADF_{30} (MGD)	MDF (MGD)	MIN TEMP - RAW, (°C)	MAX TEMP - EFFL, (°C)	INFLUENT BOD_5 (mg/l)	INFLUENT BOD_5 (#/day)	EFFLUENT BOD_5 (mg/l)	EFFLUENT BOD_5 (#/day)	BOD_5 REMOVAL (%)	INFLUENT TSS (mg/l)	INFLUENT TSS (#/day)	EFFLUENT TSS (mg/l)	EFFLUENT TSS (#/day)	TSS REMOVAL (%)	EFFLUENT DO MIN.	EFFLUENT NH_3 (mg/l)	EFFUENT TKN (mg/l)	EFFLUENT UOD (mg/l)
Jan-97	0.63	0.81	7.0	8.0	99.00	520.00	8.00	42.00	91.9%	98.00	--	--	--	--				
Feb-97	0.63	1.10	5.0	7.0	123.00	648.00	7.00	37.00	94.3%	92.00	485.00	8.00	42.00	91.3%				
Mar-97	0.71	0.94	6.0	6.0	87.00	516.00	6.00	36.00	93.0%	63.00	373.00	--	36.00	90.3%				
Apr-97	0.81	1.12	6.0	9.0	92.00	618.00	6.00	40.00	93.5%	68.00	457.00	--	47.00	89.7%				
May-97	0.69	0.84	9.0	13.0	106.00	614.00	7.00	41.00	93.3%	85.00	492.00	--	75.00	84.8%				
Jun-97	0.62	0.66	12.0	19.0	149.00	766.00	8.00	41.00	94.6%	119.00	612.00	8.00	93.00	84.8%				
Jul-97	0.58	0.63	16.0	21.0	159.00	769.00	5.00	24.00	96.9%	126.00	609.00	--	53.00	91.3%				
Aug-97	0.57	0.63	19.0	22.0	174.00	833.00	4.00	19.00	97.7%	121.00	579.00	--	48.00	91.7%				
Sep-97	0.50	0.60	18.0	21.0	176.00	729.00	3.00	12.00	98.4%	120.00	497.00	--	--	--				
Oct-97	0.44	0.49	16.0	19.0	188.00	693.00	6.00	22.00	96.8%	129.00	476.00	6.00	22.00	95.4%				
Nov-97	0.43	0.53	12.0	15.0	142.00	515.00	7.00	25.00	95.1%	110.00	399.00	14.00	51.00	87.2%				
Dec-97	0.46	0.54	8.0	10.0	151.00	573.00	11.00	42.00	92.7%	71.00	270.00	16.00	61.00	77.4%				
Average	0.59	--	11.2	14.2	137.00	650.00	7.00	32.00	94.9%	100.00	477.00	10.00	53.00	88.4%				
Maximum	0.81	1.12	19.0	22.0	188.00	833.00	11.00	42.00	98.4%	129.00	612.00	16.00	93.00	95.4%				
Minimum	0.43	--	5.0	6.0	87.00	515.00	3.00	12.00	91.9%	63.00	270.00	6.00	22.00	77.4%				
Permit Limit	**0.65**						**30.00**	**163.00**				**30.00**	**163.00**	**65.0%**				
Jan-98	0.65	1.07	7.0	9.0	81.00	473.00	8.00	43.00	90.9%	66.00	356.00	10.00	54.00	84.8%				
Feb-98	0.52	0.69	7.0	9.0	103.00	445.00	6.00	26.00	94.2%	92.00	398.00	--	30.00	92.5%				
Mar-98	0.77	1.17	7.0	10.0	95.00	608.00	6.00	38.00	93.8%	68.00	435.00	--	45.00	89.7%				
Apr-98	0.74	1.31	8.0	12.0	122.00	755.00	5.00	31.00	95.9%	87.00	538.00	--	56.00	89.6%				
May-98	0.68	0.80	12.0	17.0	125.00	707.00	9.00	51.00	92.8%	103.00	582.00	--	96.00	83.5%				
Jun-98	0.78	1.08	10.0	19.0	167.00	1079.00	6.00	39.00	96.4%	137.00	886.00	24.00	155.00	82.5%				
Jul-98	0.70	0.90	18.0	21.0	131.00	811.82	6.40	40.39	95.0%	96.00	593.19	8.50	53.54	91.0%				
Aug-98	0.65	0.77	19.0	22.0	156.00	836.72	3.00	15.84	98.1%	105.00	551.65	--	26.24	95.2%				
Sep-98	0.55	0.65	19.0	21.0	134.00	616.61	3.00	13.59	97.8%	105.00	482.51	7.00	29.88	93.8%				
Oct-98	0.52	0.60	16.0	19.0	161.19	702.97	6.52	--	--	112.13	489.03	12.11	52.81	89.2%				
Nov-98	0.44	0.50	12.0	18.0	158.00	616.09	7.49	29.21	95.3%	95.03	370.57	13.00	--	--				
Dec-98	0.42	0.51	10.0	15.0	150.00	519.50	8.50	29.50	94.3%	131.69	456.00	17.00	59.00	87.1%				
Average	0.62	--	12.1	16.0	132.00	681.00	6.00	32.00	94.9%	100.00	511.00	13.00	60.00	89.0%				
Maximum	0.78	1.31	19.0	22.0	167.00	1079.00	9.00	51.00	98.1%	137.00	886.00	24.00	155.00	95.2%				
Minimum	0.42	--	7.0	9.0	81.00	445.00	3.00	13.59	90.9%	66.00	356.00	7.00	26.24	82.5%				
Permit Limit	**0.65**						**30.00**	**163.00**				**30.00**	**163.00**	**65.0%**				
Jan-99	0.54	1.31	8.0	9.0	116.42	490.47	8.14	34.30	93.0%	89.32	376.12	12.80	54.17	85.6%				
Feb-99	0.58	0.79	8.0	9.0	121.40	570.25	5.51	25.92	95.5%	95.59	448.99	8.00	37.57	91.6%				
Mar-99	0.62	0.77	7.0	9.0	122.64	--	7.00	36.38	--	95.97	498.84	--	--	--				
Apr-99	0.65	0.80	8.0	12.0	123.64	--	--	--	--	--	--	--	--	--				
May-99	0.57	0.69	12.0	17.0	158.49	800.56	3.61	18.24	97.7%	136.76	691.02	--	--	--				
Jun-99	0.55	0.68	14.0	21.0	175.45	807.29	6.00	27.62	96.6%	123.50	568.25	13.50	62.14	89.1%				
Jul-99	0.62	0.71	17.0	23.0	145.73	--	5.51	--	--	122.38	--	--	--	--				
Aug-99	0.59	0.69	19.0	22.0	219.89	1212.61	4.95	24.41	98.0%	160.82	879.56	6.98	38.20	95.7%				
Sep-99	0.53	0.66	19.0	23.0	266.79	1165.39	4.00	--	--	137.50	600.64	7.50	--	--				
Oct-99	0.48	0.57	15.0	18.0	184.59	799.62	7.48	31.62	96.0%	106.01	447.74	14.30	61.25	86.3%				
Nov-99	0.41	0.55	12.0	17.0	163.72	539.69	4.65	--	--	121.00	398.86	9.50	32.34	91.9%				
Dec-99	0.43	0.47	9.0	13.0	118.45	465.66	7.05	27.74	94.0%	83.59	328.63	10.97	43.13	86.9%				
Average	0.55	--	12.3	16.1	160.00	761.00	6.00	28.00	95.8%	116.00	524.00	10.00	47.00	89.6%				
Maximum	0.65	1.31	19.0	23.0	266.79	1212.61	8.14	36.38	98.0%	160.82	879.56	14.30	62.14	95.7%				
Minimum	0.41	--	7.0	9.0	116.42	465.66	3.61	18.24	93.0%	83.59	328.63	6.98	32.34	85.6%				
Permit Limit	**0.65**						**30.00**	**163.00**				**30.00**	**163.00**	**65.0%**				

VILLAGE OF COOPERSTOWN WASTEWATER TREATMENT FACILITY DATA

1997 TO 2002

PERIOD	ADF_{30} (MGD)	MDF (MGD)	MIN TEMP - RAW, (°C)	MAX TEMP - EFFL, (°C)	INFLUENT BOD_5 (mg/l)	INFLUENT BOD_5 (#/day)	EFFLUENT BOD_5 (mg/l)	EFFLUENT BOD_5 (#/day)	BOD_5 REMOVAL (%)	INFLUENT TSS (mg/l)	INFLUENT TSS (#/day)	EFFLUENT TSS (mg/l)	EFFLUENT TSS (#/day)	TSS REMOVAL (%)	EFFLUENT DO MIN.	EFFLUENT NH_3 (mg/l)	EFFUENT TKN (mg/l)	EFFLUENT UOD (mg/l)
Jan-00	0.52	0.70	8.0	11.0	131.09	649.79	8.83	43.78	93.3%	86.24	--	--	54.52	--				
Feb-00	0.63	1.54	6.0	9.0	119.00	463.34	6.99	27.24	94.1%	119.02	463.41	6.90	27.24	94.1%				
Mar-00	0.83	1.13	7.0	9.0	85.50	561.91	4.00	26.28	95.3%	69.73	458.24	--	33.26	92.7%				
Apr-00	0.93	1.68	8.0	11.0	57.19	426.12	3.00	22.35	94.8%	57.59	429.09	--	40.72	90.5%				
May-00	0.89	1.26	11.0	15.0	84.62	693.16	6.81	55.84	91.9%	65.27	534.69	11.70	95.32	82.2%				
Jun-00	0.79	0.86	14.0	18.0	107.43	771.55	6.01	43.19	94.4%	102.05	732.90	--	86.13	88.2%				
Jul-00	0.64	0.78	17.0	21.0	139.18	705.41	3.00	15.20	97.8%	165.74	840.04	12.50	63.72	92.4%				
Aug-00	0.62	0.77	17.0	22.0	158.27	867.37	5.03	--	--	136.05	745.61	--	65.81	91.2%				
Sep-00	0.52	0.61	16.0	20.0	209.64	--	5.03	--	--	151.03	--	--	--	--				
Oct-00	0.48	0.58	14.0	17.0	190.69	771.16	6.48	26.23	96.6%	136.58	552.37	--	--	--				
Nov-00	0.39	0.45	10.0	13.0	171.00	554.84	8.49	--	--	128.53	--	--	47.04	--				
Dec-00	0.43	0.77	6.0	9.0	184.46	570.29	7.00	21.64	96.2%	116.83	361.20	--	--	--				
Average	0.64	--	11.2	14.6	137.00	640.00	6.00	31.00	94.9%	111.00	569.00	10.00	57.00	90.2%				
Maximum	0.93	1.68	17.0	22.0	209.64	867.37	8.83	55.84	97.8%	165.74	840.04	12.50	95.32	94.1%				
Minimum	0.39	--	6.0	9.0	57.19	426.12	3.00	15.20	91.9%	57.59	361.20	6.90	27.24	82.2%				
Permit Limit	**0.65**						**30.00**	**163.00**				**30.00**	**163.00**	**65.0%**				
Jan-01	0.43	0.53	6.0	8.0	151.63	565.46	6.05	--	--	101.89	379.98	--	26.50	93.0%				
Feb-01	0.49	0.68	5.0	7.0	128.59	583.27	6.13	27.82	95.2%	109.26	495.61	6.00	--	--				
Mar-01	0.48	0.63	5.0	7.0	147.07	565.78	5.00	19.23	96.6%	109.36	420.69	6.00	23.08	94.5%				
Apr-01	0.82	1.45	5.0	9.0	108.52	577.44	5.52	29.38	94.9%	105.04	558.94	--	56.49	89.9%				
May-01	0.56	0.64	9.0	14.0	133.03	597.74	4.50	20.22	96.6%	118.02	530.31	--	38.18	92.8%				
Jun-01	0.58	0.62	13.0	18.0	130.29	621.91	5.51	26.31	95.8%	106.91	510.32	--	--	--				
Jul-01	0.52	0.59	15.0	20.0	187.89	848.23	3.53	15.93	98.1%	192.19	867.66	10.93	49.38	94.3%				
Aug-01	0.50	0.71	17.0	22.0	--	1063.80	4.96	42.57	96.0%	186.05	797.74	6.96	29.86	96.3%				
Sep-01	0.42	0.48	17.0	21.0	216.95	794.97	5.43	19.90	97.5%	183.29	671.62	--	34.91	94.8%				
Oct-01	0.37	0.44	15.0	19.0	196.52	638.46	8.49	27.60	95.7%	127.49	414.21	12.49	40.59	90.2%				
Nov-01	0.33	0.38	12.0	16.0	196.06	561.43	7.00	20.04	96.4%	183.98	526.84	--	41.52	92.1%				
Dec-01	0.32	0.43	9.0	13.0	104.84	258.38	6.47	15.94	93.8%	158.01	389.41	--	25.96	93.3%				
Average	0.49	--	10.7	14.5	155.00	640.00	6.00	24.00	96.1%	140.00	547.00	8.00	37.00	93.1%				
Maximum	0.82	1.45	17.0	22.0	216.95	1063.80	8.49	42.57	98.1%	192.19	867.66	12.49	56.49	96.3%				
Minimum	0.32	--	5.0	7.0	104.84	258.38	3.53	15.93	93.8%	101.89	379.98	6.00	23.08	89.9%				
Permit Limit	**0.65**						**30.00**	**163.00**				**30.00**	**163.00**	**65.0%**				
Jan-02	0.36	0.50	7.0	9.0	185.20	592.58	9.51	30.43	94.9%	122.05	390.55	10.00	32.00	91.8%	--	--	--	--
Feb-02	0.49	0.63	6.0	8.0	133.20	538.68	5.92	23.96	95.6%	114.95	464.87	8.90	34.22	92.6%	--	--	--	--
Mar-02	0.50	0.91	7.00	8.00	155.54	605.89	5.00	19.47	96.8%	132.81	517.35	6.49	25.26	95.1%	--	--	--	--
Apr-02	0.53	0.61	7.00	13.0	95.90	454.03	6.08	28.80	93.7%	83.12	393.54	7.08	33.54	91.5%	--	--	--	--
May-02	0.64	0.94	10.0	15.0	145.00	703.00	6.00	27.00	96.2%	120.00	586.00	13.00	73.00	87.5%	7.9	1.96	7.62	129
Jun-02	0.62	0.89	13.0	19.0	148.00	815.00	10.00	52.00	93.6%	157.00	864.00	29.00	158.00	81.7%	7.7	5.25	7.58	230
Jul-02	0.54	0.63	17.0	22.0	138.00	623.00	11.00	52.00	91.7%	192.00	868.00	15.00	67.00	92.3%	7.1	2.95	5.2	183
Aug-02	0.48	0.56	19.0	22.0	169.00	675.00	4.00	16.00	97.6%	157.00	624.00	11.00	44.00	92.9%	7.1	4.24	8.15	152
Sep-02	0.43	0.61	18.0	21.0	204.00	714.00	6.00	21.00	97.1%	160.00	558.00	10.00	35.00	93.7%	7.1	1.13	4.7	101
Oct-02	0.48	0.69	14.0	20.0	108.00	504.00	8.00	38.00	92.5%	177.00	821.00	20.00	92.00	88.8%	7	1.67	5.08	117
Nov-02	0.53	0.70	11.0	14.0	138.00	591.00	6.00	26.00	95.6%	119.00	512.00	14.00	58.00	88.7%	--	--	--	--
Dec-02	0.52	0.74	8.0	10.0	124.00	535.00	9.00	37.00	93.1%	112.00	483.00	14.00	55.00	88.6%	--	--	--	--
Average	0.51	--	11.4	15.1	145.00	613.00	7.00	31.00	94.8%	137.00	590.00	13.00	59.00	90.4%				
Maximum	0.64	0.94	19.0	22.0	204.00	815.00	11.00	52.00	97.6%	192.00	868.00	29.00	158.00	95.1%				
Minimum	0.36	--	6.0	8.0	95.90	454.03	4.00	16.00	91.7%	83.12	390.55	6.49	25.26	81.7%				
Permit Limit	**0.65**						**30.00**	**163.00**				**30.00**	**163.00**	**65.0%**				

APPENDIX C

UV Transmittance Testing
& Collimated Beam Testing
Procedures
Results of April 2002 Event
Results of June 2002 Event
Results of August 2002 Event

FAX TRANSMISSION

Koester Associates, Inc.

From: Peter J. Radosta, P.E.

Phone	(315)697-3800
Fax	(315)697-3888
E-Fax	(425)977-7994
Mobile	(315)391-0086
E-mail	radosta@msn.com
Address	Suite 7, Madison Blvd. Canastota, NY 13032

Date: March 13, 2002

This fax contains (2) pages, including this page.

Name: Keith O'Hara

Subj: UV Sampling

Please review the below procedure for sampling:

Grab samples are taken at various times during the day in order to determine the range in final effluent quality. The most representative samples taken over a one week period are often those at high and low flow times. At a minimum, samples should be taken at high and low flow times and should be tested for TSS and UV Transmittance.

VERIFY W/ KOESTER

Date to be Collected: Mon. to Fri. Collect 2 grab samples per day (one sample at peak flow and one at low flow), as described below.

Date to be Sent: As soon as possible after the last day of sampling

Please collect in clean plastic bottles with no preservatives added:

1. At PEAK FLOW - 500 mL *Grab Sample* of the *Plant Effluent* **before** the UV lamps.

2. At LOW FLOW - 500 mL *Grab Sample* of the *Plant Effluent* **before** the UV lamps.

Store all the samples in a refrigerator during the one week sample period.

Koester Associates, Inc.

FAX TRANSMISSION
PAGE 2

Label Instructions:

- Must contain name & telephone/fax number(s) of contact person(s) for reports.
- Sample location, date, time, flow rate and weather conditions.

Packaging & Shipping Instructions:

- Samples should be placed in a sturdy box
- **Ice is not necessary!** ← ?
- Ship overnight delivery to: Sampling Laboratory
  Trojan Technologies, Inc.
  3020 Gore Rd.
  London, Ontario
  Canada N5V 4T7
  Tel : (519)457-3400
  Fax : (519)457-3030

Canadian Customs Form: WATER SAMPLE for analysis. Declared value - $1.00.

If you have any questions please do not hesitate to call.

Thank you.

Trojan Technologies Inc.
World Leader in UV Disinfection Systems

COLLIMATED BEAM TEST SAMPLING INSTRUCTIONS

To: Keith O'Hara
From: Lamont Engineers
E-mail:
Date: 6/5/02
Re: **Cooperstown, NY**

The collimated beam test helps determine the UV dose necessary to disinfect wastewater effluent to legislated permit levels or lower for a specified target microorganism. **Take the collimated beam sample on a Mon., Tues., or Wed. to ensure suitable shipping transit time and proper sample analysis.**

Collimated Beam Test Sampling Instructions:

1. The collimated beam test requires **UNDISINFECTED** effluent.
2. Using plastic bottles, collect three 1 liter/quart grab samples of final effluent before chlorine contact chamber. Label all three sample bottles: "Collimated Beam Sample".
3. Using a plastic bottle, collect one 0.5 liter/quart grab sample of final effluent before chlorine contact chamber. Add 0.5 mL of chlorine bleach to the sample to prevent any changes to particle size while in transit. Label sample bottle: "PSA – preserved with bleach".
4. Include plant process info, flow rate, weather conditions, required disinfection limits and date/time during sampling.

Shipping Instructions:

1. Collect **and** ship samples on the same day.
2. Sample bottles should be packed in an **ice cube-filled** (or ice pack) sturdy cooler. **NO** dry ice.
3. The cooler lid should be taped and sealed to avoid leaks.
4. Include plant name, phone/fax number and plant contact.
5. Ship **overnight delivery** to: John Faber, Trojan Technologies Inc.
3020 Gore Road
London, Ontario, Canada, N5V 4T7
Tel. 519 457-3400, Fax. 519 457-3030

IMPORTANT - Sample Description/Shipment Information:

Label shipping document as: **"WATER SAMPLE FOR ANALYSIS"**.
Total Declared Value = $15.00
Please inform us of the courier TRACKING NUMBER after shipping cooler.
Contact John Faber(X2389) or Karen Dargatz(X2231) if you have any questions.

Trojan Technologies Inc.

World Leader in UV Disinfection Systems

FAX

Number of pages including coversheet: 2

To: Pete Radosta of KOESTER ASSOCIATES
Fax: 015
CC:
From: Todd Bartlett
E-mail: tbartlett@trojanuv.com
Date: August 27, 2002
Re: Cooperstown, NY

☐ **Urgent** ☒ **For Your Information** ☐ **Please Comment**

Pete,

I have attached the results of the latest round of sample testing at Cooperstown. Note that the three (3) samples at the bottom were taken after PAC. The PAC seemed to make a difference. The UVT went up and the TSS went down... both good things!

I am sending these results to you only because I figured you would want to discuss the results with the engineer/plant personnel.

If you have any questions, please do not hesitate to call.

Cheers,

Todd

Todd Bartlett

Trojan

TROJAN TECHNOLOGIES INC.
3020 Gore Road
London, Ontario
N5V 4T7 CANADA
Telephone: (519) 457-3400
Facsimile: (519) 457-3030

WATER ANALYSIS REPORT

To: Jennifer Muller

Project Name: Cooperstown, NY

Sample #: S02-995 to S02-1000

Sample Source: Village of Cooperstown WWTP

Process: RBC

Date sample taken: August 13, 2002

Date sample analysed: August 20, 2002

Parameters Analysed: UV Transmittance-whole sample, UV Transmittance - filtered, Total Suspended Solids

Sample Treatment: No Additives

SAMPLE NO.	SAMPLE DESCRIPTION	%T	%T FILTERED	TSS (PPM)
S02-995	#1 - Untreated RBC Effluent - 720,000 gpd August 13, 2002	54	63	49
S02-996	#2 - Untreated RBC Effluent - 720,000 gpd August 13, 2002	52	63	61
S02-997	#3 - Untreated RBC Effluent - 720,000 gpd August 13, 2002	53	63	53
S02-998	#1 - Treated 40mg/L PAC - Effluent - 720,000 gpd August 13, 2002	63	69	23
S02-999	#2 - Treated 40 mg/L PAC - Effluent - 720,000 gpd August 13, 2002	62	69	19
S02-1000	#3 - Treated 40mg/L PAC - Effluent - 720,000 gpd August 13, 2002	62	69	18

Comments:

Certified by J. Fuller,
Team Leader, Analytical Services

Trojan

TROJAN TECHNOLOGIES INC.
3020 Gore Road
London, Ontario
N5V 4T7 CANADA
Telephone: (519) 457-3400
Facsimile: (519) 457-3030

WATER ANALYSIS REPORT

To: Todd Bartlett

Project Name: Cooperstown, NY

Rep: Koester Associates, Inc.

Sample #: S02-369 to S02-378

Engineer: Lamont Engineers

Sample Source: Cooperstown WWTP

Process: Trickling Filter/Rotating Biological Contactor

Parameters Analyzed: UV Transmittance-whole sample, UV Transmittance - filtered, TSS, UV Dose Response (Collimated Beam)

Date sample taken: April 8-12, 2002

Sample Treatment: No Additives

Date sample analysed: April 17, 2002

Disinfection Limits: 200 Fecal Coliform/100mL

SAMPLE NO.	SAMPLE DESCRIPTION	%T	%T FILTERED	TSS (PPM)
S02-369	Final Clarifier - Flow@320000gpd April 08, 2002	77	78	2
S02-370	Final Clarifier - Flow@646000gpd April 08, 2002	81	82	3
S02-371	Final Clarifier - Flow@352000gpd April 09, 2002	75	76	2
S02-372	Final Clarifier - Flow@886000gpd April 09, 2002	78	79	4
S02-373	Final Clarifier - Flow@418000gpd April 10, 2002	77	78	4
S02-374	Final Clarifier - Flow@691000gpd April 10, 2002	72	73	2
S02-375	Final Clarifier - Flow@402000gpd April 11, 2002	71	72	3
S02-376	Final Clarifier - Flow@880000gpd April 11, 2002	74	75	4
S02-377	Final Clarifier - Flow@416000gpd April 12, 2002	71	72	2
S02-378	Final Clarifier - Flow@840000gpd April 12, 2002	75	75	5

Comments:

Certified by K. Dargatz
Technologist, Analytical Services

Trojan

TROJAN TECHNOLOGIES INC.
3020 Gore Road
London, Ontario
N6V 4T7 CANADA
Telephone: (519) 457-3400
Facsimile: (519) 457-3030

WATER ANALYSIS REPORT

To: Todd Bartlett

Rep: Koester Associates, Inc.

Engineer: Lamont Engineers

Project Name: Cooperstown, NY

Sample #: S02-757 to S02-766

Sample Source: Cooperstown WWTP

Process: Trickling Filter/Rotating Biological Contactor

Date sample taken: June 17-25, 2002

Date sample analysed: June 27, 2002

Disinfection Limits: 200 Fecal Coliform/100mL

Parameters Analyzed: UV Transmittance-whole sample, UV Transmittance - filtered, TSS, UV Dose Response (Collimated Beam)

Sample Treatment: No Additives

SAMPLE NO.	SAMPLE DESCRIPTION	%T	%T FILTERED	TSS (PPM)	MEAN PARTICLE SIZE (MICRONS)	%PARTICLES >31MICRONS
S02-757	Collimated Beam Sample - final clarifier June 25, 2002	65	69	20	57.8	62.1
S02-758	PSA Sample June 25, 2002	-	-	-	47.3	53.5
S02-759	Final Clarifier Effluent, flow @ 400000gpd June 17, 2002	71	74	8	-	-
S02-760	Final Clarifier Effluent, flow @ 900000gpd June 17, 2002	71	75	16	-	-
S02-761	Final Clarifier Effluent, flow @ 600000gpd June 18, 2002	67	71	12	-	-
S02-762	Final Clarifier Effluent, flow @ 760000gpd June 18, 2002	69	75	21	-	-
S02-763	Final Clarifier Effluent, flow @ 370000gpd June 19, 2002	67	71	10	-	-
S02-764	Final Clarifier Effluent, flow @ 800000gpd June 19, 2002	66	72	27	-	-
S02-765	Final Clarifier Effluent, flow @ 330000gpd June 20, 2002	66	70	13	-	-
S02-766	Final Clarifier Effluent, flow @ 730000gpd June 20, 2002	67	73	24	-	-

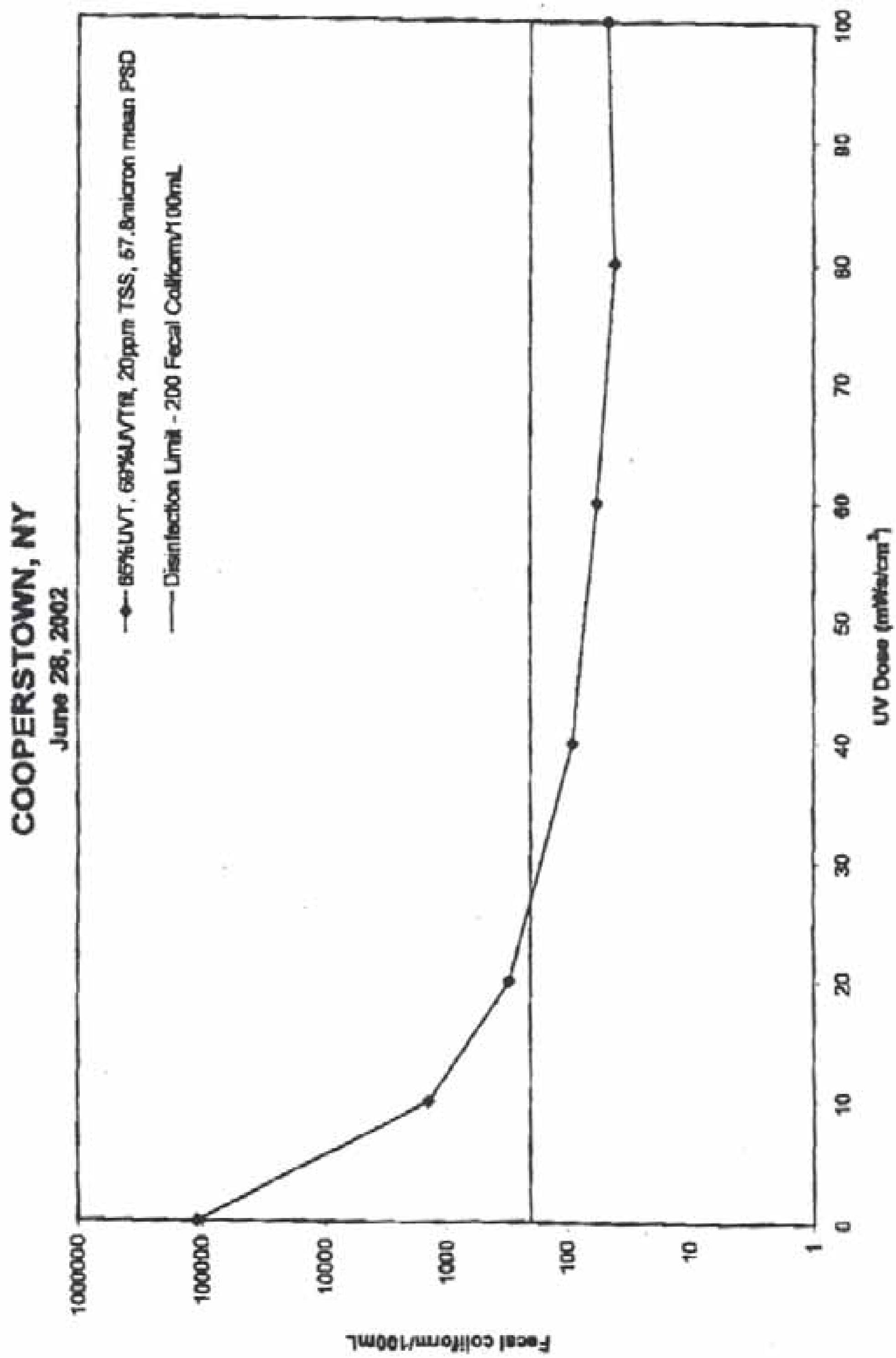
S02-767	Final Clarifier Effluent, flow @ 360000gpd June 21, 2002	66	70	11	-	-
S02-768	Final Clarifier Effluent, flow @ 771000gpd June 21, 2002	68	74	22	-	-

Collimated Beam Results

Dose (mWs/cm²)	Fecal Coliform/100mL
0	110000
10	1400
20	300
40	90
60	57
80	41
100	47

Comments:

Certified by J. Faber,
Team Leader, Analytical Services


COOPERSTOWN, NY
June 28, 2002
85%UVT, 69%UVTf, 20ppm TSS, 57.8micron mean PSD
Disinfection Limit - 200 Fecal Coliform/100mL
Fecal coliform/100mL
1000000
100000
10000
1000
100
10
1
0
10
20
30
40
50
60
70
80
90
100
UV Dose (mWs/cm²)

APPENDIX D

Chemical Addition Testing Photos
Stirring Apparatus
Sample 1: Control Sample
Sample 2: Praestol 189
Sample 3: Poly-Aluminum Chloride
Sample 4: Ferric Chloride

Stirring Apparatus

Samples, left to right: Control sample, Praestol, PAC and Ferric chloride

Control Sample – No Chemical

Praestol 189

PAC

Ferric Chloride

APPENDIX E

UV Manufacturer's Literature
& Cost Data

FAX TRANSMISSION

Koester Associates, Inc.

From: Peter J. Radosta, P.E.

Date: July 25, 2002

Phone (315)697-3800
Fax (315)697-3888
Mobile (315)727-2534
E-mail peter@koesterassociates.com
Address Suite 7, Madison Blvd.
Canastota, NY 13032

This fax contains (9) pages, including this page.

Name: Keith O'Hara
Company: Lamont Engineers
[fax:]

Subj: Cooperstown WWTP

Keith,

Please see attached and call me if you have any questions on the analysis. Based on the collimated beam testing and the nature of fixed film effluent, Trojan suggests that the UV dose be increased as described.

Please give me a call if you have any questions or require more information.

Pete

Trojan Technologies Inc.

World Leader in UV Disinfection Systems

FAX

Number of pages including coversheet: 5

To: Pete Radosta of KOESTER ASSOCIATES

Fax: 015

CC:

From: Todd Bartlett

E-mail: tbartlett@trojanuv.com

Date: July 12, 2002

Re: Cooperstown, NY

☐ Urgent ☒ For Your Information ☐ Please Comment

Pete,

I have attached the revised UV3000Plus™ quote for Cooperstown, NY. The UV system configuration has changed from one (1) bank to two (2) banks. This will allow for some mixing of the effluent between the banks. I have based this design on a UVT of 65% (was 55% previously – testing showed 65% is reasonable) and the bioassay dose that this system will provide is 53,500 $\mu Ws/cm^2$. From the collimated beam testing that was done, this dose will provide for disinfection to 200 fecal coliforms/100 ml, based on a 30 day geometric mean.

I will be out of the office next week on holidays. If you have any questions, contact Jen.

Cheers,

Todd

Todd Bartlett

Trojan Technologies Inc.

UV3000Plus PROPOSAL

July 12, 2002

KOESTER ASSOCIATES, INC.
R. R. 5, Box 620
Suite 7, Madison Blvd., Canastota, NY 13032
USA

Attention: Peter Radosta
Reference: Cooperstown, NY
Quote No: LTB1395A

In response to your request, we are pleased to provide the following **Trojan System UV3000Plus™** proposal for the **Cooperstown** project. Since Trojan introduced the open channel approach to disinfection in 1982, many municipalities have selected ultraviolet as the preferred method for pathogen destruction at their facilities.

The **Trojan System UV3000Plus™** utilizes low pressure high intensity lamp technology that reduces the total number of lamps required, compared to conventional low pressure lamp systems. All of Trojan's UV systems are modular in design, with each system customized in response to the effluent criteria. The lamps are oriented in a horizontal configuration parallel to the flow and incorporate a fully automated mechanical/chemical cleaning system that eliminates the need for manual sleeve wiping. In addition, the **Trojan System UV3000Plus™** utilizes a variable output power supply so that power draw is optimized based on continuous effluent monitoring.

Please review carefully our design criteria for peak flow rate, total suspended solids, disinfection limit, and UV transmittance to ensure that the criteria used match actual project parameters. When detailed project design commences, please contact our office for a review of all design parameters, including dimensions and equipment requirements. In addition, Trojan is able to provide analytical services to quantify effluent quality and confirm design criteria.

Trojan's price for the attached design is **$140,000 (in US$)**. This quoted price includes the equipment as described, freight to site and start-up by qualified personnel. This quote **excludes** any taxes that may be applicable. The above information is to be used for budget estimates and is valid for 90 days from this day.

Please do not hesitate to call us if you have any questions or would like additional information. Thank you for the opportunity to quote the **Trojan System UV3000Plus™** on this project.

With best regards,
Trojan Technologies Inc.

Todd Bartlett
Encl.

DESIGN CRITERIA

Current Peak Design Flow:	**2.5 US_MGD**
UV Transmission:	**65 %, minimum**
Total Suspended Solids:	**30 mg/l** (30 Day Average; grab samples)
Max Average Particle Size	**30 microns**
Disinfection Limit:	**200 fecal coliform** per 100 ml, based on a 30 day Geometric Mean of consecutive daily grab samples

DESIGN SUMMARY

Based on the above design criteria, the Trojan System UV3000Plus™ proposed consists of:

Number of Channels:	1
Total Number of Banks:	2
Number of Modules per Bank:	4
Number of Lamps per Module:	8
Total Number of UV Lamps:	64
Number of Power Distribution Centers:	2
Number of System Control Centers:	1
Number of Level Controllers:	1
Type of Level Controller:	**Weighted Gate**
Automatic Mechanical/Chemical Cleaning:	**Yes**

EFFLUENT CHANNEL DIMENSIONS

L =	Minimum length required for flow equalization:	30 ft
W =	Channel width based on number of UV modules:	12 in
D =	Maximum depth required for UV Module access:	84 in

Dimensions are given for reference only. Consult Trojan Technologies for overall system detailed dimensions.

ELECTRICAL REQUIREMENTS

1. The UV System Control Center requires an electrical service of one (1) 120 Volts, 1 phase, 2 wire (plus ground), 10 Amps.
2. Each Power Distribution Center requires and electrical service of one (1) 277/480 Volts, 3 phase, 4 wire (plus ground), 8.2 kVA.
3. The Hydraulic Systems Center requires an electrical service of one (1) 120 Volts, 1 phase, 2 wire (plus ground), 30 Amps.
4. The low water level sensor requires an electrical service of one (1) 120 volts, 1 phase, 2 wire (plus ground), 5 Amps.

NOTES

1. UV Disinfection Equipment specification is available upon request.
2. If there are site-specific hydraulic constrains that must be applied, please consult the manufacturer's representative to ensure compatibility with the proposed system.
3. Standard spare parts and safety equipment are included with this proposal.
4. The weighted controller (automatic level controller) is not designed to handle periods of no flow.
5. Electrical disconnects required as per local state code are not included in this proposal.
6. Trojan Technologies Inc. warrantees all components of the system (excluding UV lamps) against faulty workmanship and materials for a period of 12 months from date of start-up or 18 months after shipment, which ever occurs first

OPERATING COSTS FOR TROJAN SYSTEM UV3000Plus™

Design Criteria

Average Flow:	0.87 US_MGD
Yearly Usage:	8760 hours
UV Transmission:	65 %, minimum

Power Requirements

Total Power Draw:	16 kW
Average Power Draw:	3.6 kW
Annual Operating Hours:	8750 hours
Cost per kW Hour:	$0.08
Annual Power Cost:	***$2,520***

Replacement Lamp Costs

Number of lamps replaced per year:	11
Price per lamp:	$200
Annual Lamp Replacement Cost:	***$2,111***

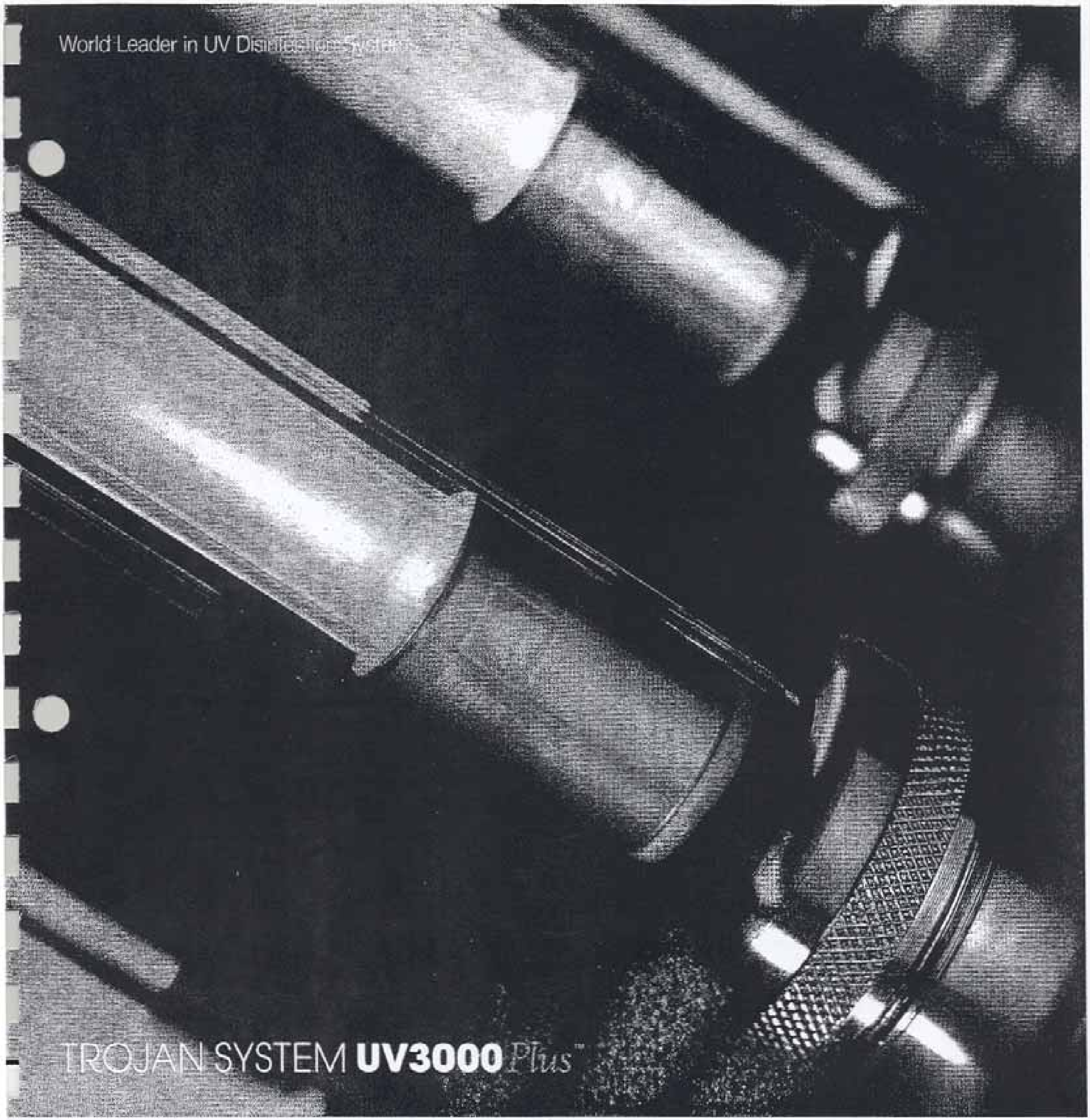
Total Annual Operation and Maintenance Costs are: $4,631

Over time, the quartz sleeves that house the UV lamps become fouled as charged particles adhere to the surface of the sleeve. These sleeves need to be cleaned and several cleaning options are available.

Cleaning Requirements	Additional Annual Costs
1. Mechanical/chemical cleaning	None
2. Mechanical cleaning	Chemical Cleaning Cost: labor and chemicals
3. Manual cleaning	Chemical Cleaning Cost: labor and chemicals

NOTES

1. O&M costs are based on system flow-pacing using a 4-20 mA signal from a flow meter (supplied by others).
2. All costing has been based on the system operating at the average flow conditions.
3. All power requirements are based solely on the UV lamps.



Trojan Technologies Inc.

Trojan System UV3000*Plus*™

Revolutionary UV technology for disinfecting water and wastewater

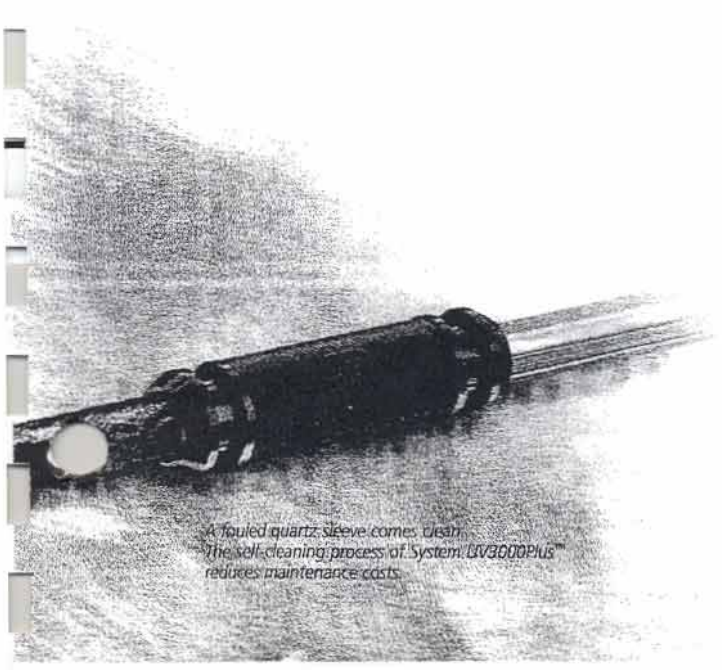
Trojan System UV3000*Plus*™ is designed for treatment plants where sleeve fouling rates, maintenance and electricity costs are significant considerations. Suitable for large plants, System UV3000*Plus*™ offers powerful new features that will cut capital and operational costs and make treating wastewater safer than ever.

Thousands of municipalities and industries throughout the world have discovered that disinfecting wastewater with ultraviolet light (UV) is safer, more environmentally sound and less costly than using chlorine. In fact, more than 2,000 municipal wastewater treatment plants around the world now use Trojan Technologies' UV disinfection systems and the number continues to grow at a remarkable pace.

The Trojan System UV3000*Plus*™ is a new generation of UV disinfection equipment that builds on the exceptional performance of the well-established Trojan System UV3000™ and UV4000™.

The UV3000*Plus*™ includes features like automated cleaning and variable output electronic ballasts that, before now, were only available on the larger System UV4000™.

With the arrival of UV3000*Plus*™, many more treatment plants can now benefit from Trojan's proven UV disinfection technology.



A fouled quartz sleeve comes clean. The self-cleaning process of System UV3000Plus™ reduces maintenance costs.

System UV3000*Plus*™ takes UV disinfection to the leading edge...and beyond.

New low-pressure, high-intensity lamp technology increases UV output, reduces the number of lamps required and diminishes space requirements.

In addition, Trojan's proprietary chemical and mechanical self-cleaning technology decreases maintenance costs. The cleaning process occurs without disrupting the disinfection process.

Variable power output electronic ballasts conserve energy by matching UV output to changes in effluent quality and flow rates.

Custom engineered systems; simple to install, trouble-free to operate.

The compact, modular design of the Trojan System UV3000*Plus*™ permits Trojan engineers to customize each system to meet specific project requirements.

Installed in an open channel, System UV3000*Plus*™ UV lamps are mounted horizontally and parallel to the flow. This design optimizes hydraulics, inducing turbulence and dispersion, and ensures that wastewater is properly exposed to the UV output for the required duration. Gravity flow carries wastewater to the UV units in their channels, eliminating the need for pressurized vessels, piping and pumps. This open-channel architecture keeps Trojan's wastewater treatment systems running smoothly at the lowest cost.

A fully submersible 316 stainless steel frame holds the lamps and quartz sleeves in the effluent channel. All cables running between the ballasts and the lamps are enclosed and protected from the effluent and UV radiation within the waterproof module frame.

How does UV disinfection work?

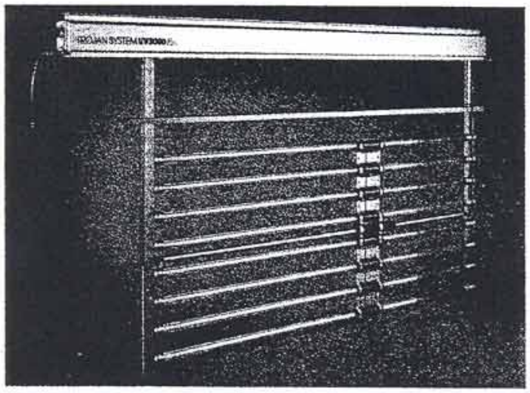
Ultraviolet light disinfects wastewater by altering the genetic (DNA) material in cells so that bacteria, viruses and other microorganisms can no longer reproduce. The UV light is produced by germicidal lamps submerged in an open channel. As wastewater flows past the UV lamps, microorganisms are exposed to a lethal dose of UV energy. The UV dose is a product of UV light intensity and exposure time.

KEY FEATURES OF TROJAN SYSTEM UV3000*PLUS*™

- Environmentally safe – no chlorine required, no disinfection by-products created
- Excellent disinfection results
- New low-pressure, high-intensity lamps can treat lower quality wastewater
- Significantly fewer lamps needed – installation costs and space requirements reduced
- Variable output ballasts allow UV output to be tailored to meet wastewater conditions
- Optional automatic mechanical and chemical self-cleaning cuts labor costs
- Low maintenance
- Comprehensive warranty

Trojan System UV3000*Plus*™

The new generation of Trojan UV technology



New low pressure, high-intensity lamps save space, reduce costs and treat lower quality wastewater.

Trojan's new lamps have a significantly higher total UV output intensity than existing low-pressure lamps. They produce stable output in a wide range of water yet maintain the high energy efficiency of traditional low-pressure lamps. Pre-heated to start at all temperatures and to extend lamp life, the lamps have a 58" (147 cm) effective arc length. They are assembled in modules of two, four, six or eight lamps of equal length.

The lamps are also sealed inside heavy-duty quartz sleeves with multiple seals. Trojan's patented sealing system maintains a watertight barrier around the internal wiring while individually isolating each lamp and the module frame. Their high-intensity output allows the UV3000*Plus*™ lamps to be used to treat lower quality wastewater such as primary effluents, combined sewer overflows (CSO), and storm water.

Variable power output electronic ballasts provide exceptional disinfection control and energy savings.

The UV3000*Plus*™ incorporates variable output electronic ballasts, a feature previously available only on the larger System UV4000™.

With System UV3000*Plus*™, the UV output of the lamps can be varied as effluent quality or flow rates change. Consequently, the system uses only the energy it needs. Matching lamp output to current wastewater conditions allows users to conserve energy, prolong lamp life and save money.

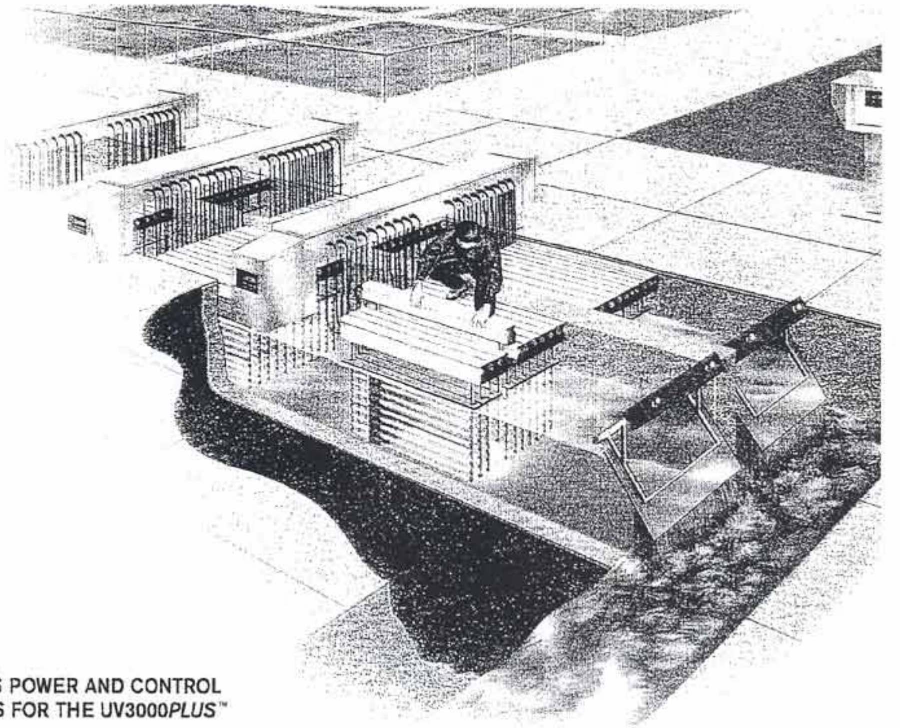
For greater convenience, this process can be automated by Trojan's On-line UV Transmission Monitor.™ As wastewater quality, flow rate, or both change, this feature automatically adjusts lamp output to maintain the disinfection standard. This feature further extends the life of the lamps, which reduces plant maintenance and operating costs.

In addition, System UV3000*Plus*™ can be programmed to turn off banks of UV lamps if the flow rate drops below a certain level. Lead and lag banks are automatically switched to equalize lamp operating time. Pennstocks may be operated by the system to open and close channels to follow flow variations. This flexibility conserves power and prolongs lamp life.

Trojan's variable output electronic ballast is mounted within a NEMA 6(IP65) rated waterproof enclosure within the module frame, eliminating the need for large ballast panels and reducing space requirements.

At the heart of the System UV3000 *Plus*™ are low-pressure, high-intensity UV lamps that dramatically reduce the number of lamps required. With fewer lamps, System UV3000 *Plus*™ can be installed in compact spaces, which lowers installation costs. Also, fewer lamps means lower lamp replacement costs and reduced maintenance expenses.

*Trojan's mechanical **and** chemical self-cleaning process takes place automatically while System UV3000Plus™ is in operation.*



The Trojan UV models usually fit easily into existing effluent channels or chlorine-contact chambers. All equipment is designed for outdoor operation; users do not need to construct new buildings.

Automated self-cleaning technology cuts maintenance costs significantly.

Sooner or later, effluents will coat the quartz sleeves that house the UV lamps, reducing their effectiveness. Cleaning lamp modules by hand carries a cost, so Trojan engineers designed an automatic self-cleaning system used effectively in more than 120 System UV4000™ installations globally. And this same well-proven technology is available as a time and money-saving option with the System UV3000*Plus*™.

Remaining in their operating position, the modules are thoroughly cleaned by a sleek wiper system that combines both mechanical and chemical cleaning. By incorporating a small quantity of chemical cleaning solution in addition to mechanical cleaning, Trojan's patented wiper system removes deposits on the quartz sleeves much more effectively than mechanical cleaning alone can do. It's convenient, it's safe, it's cost-effective, and, because it has few moving parts, it's easily maintained.

Not only can users cut labor costs, they can clean large systems efficiently in minutes without shutting down or bypassing lamp modules. Disinfection continues during cleaning. And users no longer need to hoist equipment into chemical cleaning tanks. In the past, certain treatment plants couldn't use low pressure UV disinfection because the wastewater would foul the lamps too quickly. That's no longer a problem. With System UV3000*Plus*™, virtually any plant can now take advantage of the economic, environmental and safety benefits of UV disinfection.

TROJAN'S POWER AND CONTROL SYSTEMS FOR THE UV3000*PLUS*™

Power Distribution Center

Constructed of heavy gauge 304 stainless steel, the Power Distribution Center (PDC) enclosure is mounted across the channel. The PDC consists of a service entrance and a bus bar power distribution system. The service entrance provides service power to the bus bar. Power is relayed from a bus bar system to individual UV modules through stainless steel receptacles. All UV modules are individually ground-fault and overload protected for safety.

System Control Center

The System Control Center monitors and controls all UV functions. Using the Trojan On-line GUI System™ (GUI: Graphical User Interface) software, the UV system can be controlled locally, remotely or both. The Trojan On-line RMI System™ (RMI: Remote Monitoring Interface) allows Trojan's service technicians to monitor important UV parameters.

Alarms and UV Detection Systems

The Trojan System UV3000*Plus*™ alarms warn immediately if a problem occurs. Trojan can also program the control software to generate unique alarms for individual applications. A UV detection probe monitors quartz sleeve fouling, variations in the UV absorbing qualities of the effluent, and UV lamp output.

On-line UV Transmission Monitor™ (UVT)

Trojan's UVT automatically monitors the UV transmissivity of wastewater. An LCD display screen shows how the UV transmission characteristics have changed over a 60-minute or 24-hour period.

UV Intensity Sensor

System UV3000*Plus*™ features a UV intensity sensor with an automated self-cleaning system. The sensor continually monitors the UV output of the lamps to ensure that specified UV dose levels are met.

Automatic Level Controller

The Automatic Level controller (ALC) keeps the effluent depth in the channel at the optimum level.

APPENDIX F

*Manufacturer's Literature for
Dosing Pumps, Dosing Controller
& Chemical Storage Tanks*

Cooperstown WWTP

Item #: **Dulcotest**

7 Sensor Holder, Submersible, CPVC, (CL) Assy

Part Number:	Qty:	Unit Price:	Total Price:
7500005	1	$287.00	**$287.00**

Item #: **Dulcotest**

7 Sheilded Signal Cable, 2-Wire for mA Sensors and Signal Converters

Part Number:	Qty:	Unit Price:	Total Price:
7740215	100	$1.00	**$100.00**

Grand Total: $4,163.00

gamma/ L
Solenoid Diaphragm Dosing Pumps

Document download ▼

The control electronics are fitted with two microprocessors which allow us to create control solutions tailored to the requirements of each individual customer.

- Capacity range 0.74 - 32 l/h, 16 - 2 bar
- Continuous stroke length adjustment from 0 - 100%
- Material options: PP, PVC, Acrylic/PVC, PTFE, stainless steel
- Patented coarse/fine bleeding on PP, PVC and Acrylic/PVC versions
- Self-bleeding liquid end version in PP and Acrylic/PVC
- Digitally accurate stroking rate via keypad and large LCD display
- Select feed rate display in strokes/min. or l/h
- Programmable pressure levels
- Dosing monitor input, adjustable error stroke counter
- External control via voltage free contact with optional increase/decrease pulse function
- Optional external control via standard signal 0/4 - 20 mA
- Two level float switch connector
- Profibus-Conector PROFI® BUS
- HV liquid end for hughly viscous media
- Low Voltage 12-24 V DC, 24 V AC/DC Option
- 14 day timer option

The gamma/ L is the world's first **calibrateable** pump of its performance class. Instead of calculating the metered quantity based on the set stroke length and stroke rate it is now possible to display the metered quantity directly in l/h. The large illuminated **LC display** ensures all displayed variables are easy to read.
The pump features an input for a **two-stage float-type** level switch with an early warning function for the purpose of monitoring the supply of chemicals. A **flow monitor** can be connected for the purpose of registering each individual stroke. Error messages are transferred via an optional relay.

The metering capacity can be set manually based on the stroke length and stroke rate. In addition to that the pump can be controlled by potential free contacts e.g. coming from a watermeter or a DULCOMETER® measurement and control unit.

With the option **analogue activation** the stroke rate can be controlled via 0/4-20 mA signal. In addition, it is also possible to arbitrarily allocate the stroke rate to the input signal thus enabling an inversely proportional characteristic and adaptation of the pump to the control signal. This makes it possible to use the gamma/ L as a **metering pump** with integrated proportional controller thus representing an extremely favourably priced alternative to conventional systems.

In all operating modes the pump can be switched on and off via a floating permanent contact with the **pause function**.

Detailed Specifications For Part #TC3581IX

300 Gallon Crosslinked Polyethylene Vertical Bulk Storage Tank

IX series is designed to handle contents that have a maximum specific gravity o at 73 degrees F. Our crosslinked tanks have excellent environmental stress cra impact resistance.

- Excellent chemical resistance.
- Translucent for visible content level.
- Molded in calibrations.
- Excellent cold temperature impact resistance.
- ASTM-D-1998-91 specifications compliance available.

Diameter: **35 Inches**
Height: **81 Inches**
Capacity: **300 Gallons**
Manway: **16 Inches**
FOB: **TCIPF,Tn**

FOB Codes: N=New York, T=Texas, I=Illinois, C=California, F=Florida, P=Pennsylvania, Tn=Tennesse

Email: sales@chemtainer.com

228 Spring Avenue ,Troy NY 12180
Tel 518-273-8048 Fax 518-270-0014

Jem Enterprises

Fax

To: MR Dick Green

To:	Henry Lamont P.E.	**From:**	Jim Dwyer
Fax:	518-234-4613	**Pages:**	7
Phone:	518-234-4028	**Date:**	September 20, 2000
Re:	Cooperstown WWTP	**CC:**	M Mooney

☐ **Urgent** ☐ **For Review** ☐ **Please Comment** ☐ **Please Reply** ☐ **Please Recycle**

Dear Henry:

When doing this from your notes I had to come up with a way to span the vast difference between low usage to high usage and still deliver material without constant adjustment to the stroke function. Although a ProMinent pump has a turn down rate of 1800 : 1 if a system is automated the operator is not standing by the pump to adjust the stroke knob during low and high flows. To overcome this problem what we did was put two pumps on line with internal 4-20 monitoring where pump 1 runs when the signal is from 4- 20 mA and the second pump only come on when the signal is from 9 –20 mA. This is standard on the Gamma L pumps and is something that can be programmed in the field. I was trying to reach you by phone the last few days to explain this but was unable to make contact. Due to the volume on hypochloride that is used I enclosed the price for a 132 gal tank and for the lesser volume bisulfite I proposed a 66 gal tank to give the operators some time to refill the tanks before they run out or the alarm is set off.

From you figures I can not tell but from so experience I think that the plant is over feeding CL2, I have worked up a price for a controller which would reduce the amount of CL2 added and lessens or eliminate

the use of the Bisulfite. This system many not be for the system right now but could be looked at in the future to reduce the cost of the chemical addition. Any questions feel free to contact me

Very Truly Yours

Jim Dwyer

Cooperstown WWTP

Item #: Chlorine - gamma/L Metering Pump

1 - The gamma/L is a microprocessor-based solenoid-driven diaphragm-type programmable metering pump.
- Output displayed in either gph or L/h.
- Manual stroke length adjustment from 0% to 100%, displayed in 1% increments.
- Adjustable stroke frequency control from 0 to 180 spm.
- Direct calibration and built-in warning.
- Accumulative stroke counter.
- Totalized output in gallons or Liters.
- External pulse contact 1:1.
- Three LED lights indicate operational status.
- Fiberglass-reinforced PPE plastic housing with a NEMA 4X enclosure rating.
- CE approved.

Flow: 4.12 GPH / 4 LPH
Pressure: 58 PSIG / 4 BAR
Liquid End Material: Acrylic with PVC valves & Viton O-rings
Options Included: , Viton Seals (PP, PC, NP), Auto-degassing liq end (NP except 1000, 0232), 1/4" x 3/16" Tube Fittings, Standard Version With Logo, 100-230 V, 50/60 Hz, N. American Plug, 115 V, Fault Annunciating Relay, Drops Out, Manual + External 1:1 With Analog Control, No Access Code, Standard Flow Monitor, Standard Pause/Float

Part Number:	Qty:	Unit Price:	Total Price:
GALa 0420NPB900UD102000	3	$1,012.00	$3,036.00

Grand Total: $7,444.00

Item #: Chlorine - Accessory Kit

2 FV/IV/Tubing 1/2" x 3/8", NP1, NP3, NE1, NP6, NS3, PCB, NPB

Part Number:	Qty:	Unit Price:	Total Price:
7809402	2	$0.00	$0.00

Item #: Chlorine - Float Switch

4 15 ft, PVC, two-stage, w/ ceramic weight

Part Number:	Qty:	Unit Price:	Total Price:
7142038	1	$98.00	$98.00

Item #: Chlorine - Mounting Bracket

5 Wall Mount PPE, for gamma/Concept, w/screws

Part Number:	Qty:	Unit Price:	Total Price:
810164	2	$53.00	$106.00

Cooperstown WWTP

Item #: Chlorine - Spare Parts Kit

6 BT4A 0220 NPB, BT5A 0420, Auto-Degassing

Part Number:	Qty:	Unit Price:	Total Price:
1001671	2	$125.00	**$250.00**

Item #: Chlorine - Multi-Function Valve

7 PVDF, 145 psig (10 bar) - size I

Part Number:	Qty:	Unit Price:	Total Price:
791715	3	$92.00	**$276.00**

Item #: Bisulfite - gamma/L Metering Pump

8 - The gamma/L is a microprocessor-based solenoid-driven diaphragm-type programmable metering pump.
- Output displayed in either gph or L/h.
- Manual stroke length adjustment from 0% to 100%, displayed in 1% increments.
- Adjustable stroke frequency control from 0 to 180 spm.
- Direct calibration and built-in warning.
- Accumulative stroke counter.
- Totalized output in gallons or Liters.
- External pulse contact 1:1.
- Three LED lights indicate operational status.
- Fiberglass-reinforced PPE plastic housing with a NEMA 4X enclosure rating.
- CE approved.

Flow: 00.55 GPH / 17.5 LPH
Pressure: 253 PSIG / 17.5 BAR
Liquid End Material: Acrylic with PVC valves & Viton O-rings
Options Included: , Viton Seals (PP, PC, NP), Bleed valve, w/o valve springs (PP, PC except 0232), 1/4" x 3/16" Tube Fittings, Standard Version With Logo, 100-230 V, 50/60 Hz, N. American Plug, 115 V, Fault Annunciating Relay, Drops Out, Manual + External 1:1 With Analog Control, No Access Code, Standard Flow Monitor, Standard Pause/Float

Part Number:	Qty:	Unit Price:	Total Price:
GALa 1602NPB200UD102000	3	$773.00	**$2,319.00**

Item #: Bisulfite - Accessory Kit

9 FV/IV/Tubing 1/4" x 3/16", NP1, NP3, NS3, ES3, NE1, NP6, PCB, NPB

Part Number:	Qty:	Unit Price:	Total Price:
7809401	3	$0.00	**$0.00**

Item #: Bisulfite - Chemical Tank

10 66 gal. (250 liter), PE

Part Number:	Qty:	Unit Price:	Total Price:
791996	1	$241.00	**$241.00**

Cooperstown WWTP

Item #: **Bisulfite - Float Switch**

11 15 ft, PVC, two-stage, w/ ceramic weight

Part Number:	Qty:	Unit Price:	Total Price:
7142038	1	$98.00	**$98.00**

Item #: **Bisulfite - Mounting Bracket**

12 Wall Mount PPE, for gamma/Concept, w/screws

Part Number:	Qty:	Unit Price:	Total Price:
810164	2	$53.00	**$106.00**

Item #: **Bisulfite - Multi-Function Valve**

13 PVDF, 232 psig (16 bar) - size I

Part Number:	Qty:	Unit Price:	Total Price:
792011	3	$92.00	**$276.00**

Item #: **Bisulfite - Spare Parts Kit**

14 BT4A 1602 PCB/NPB

Part Number:	Qty:	Unit Price:	Total Price:
1001723	2	$96.00	**$192.00**

Item #: **Chlorine - Chemical Tank**

15 132 gal. (500 liter), PE

Part Number:	Qty:	Unit Price:	Total Price:
791997	1	$446.00	**$446.00**

Grand Total: $7,444.00

OPTimal

Cooperstown WWTP

Item #: D1C Controller

1 - The D1C is a microprocessor-based single variable process monitor and controller.
- An illuminated LCD displays measured and correcting variables, status information and fault conditions.
- Menu driven programming for calibration, set point limits, alarms and outputs, allows for easy startup and operation.
- Features include time-based sensor monitoring and protected access code to prevent unauthorized changes. Non-volatile memory retains all settings and calibrations.
- Other selected options are listed below.

Version: Wall Mount
Process Variable: Chlorine (Free or Total Chlorine or Bromine, depending on sensor)
Voltage: 100 V, 50/60 Hz100 V, 50/60 Hz
Options Included: , With Terminal for 4-20 MA Signal (From Transducer), Manual Temperature Setting P, L, H, or A, Feed Forward Control via 0/4-20 mA Signal, NC Pause Contact (stops chemical feed when opened), Analog (0/4-20 mA) Output of Measured Value for Recording, General Fault Alarm Relay, PID Control, English

Part Number:	Qty:	Unit Price:	Total Price:
D1Ca W3C14111A020E	1	$2,212.00	**$2,212.00**

Item #: Dulcotest

2 Total Chlorine Sensor CTE 1-mA, 0.1 - 10 ppm (for D1C,D2C)

Part Number:	Qty:	Unit Price:	Total Price:
740684	1	$1,400.00	**$1,400.00**

Item #: Dulcometer

3 Power Cord, 6 ft, 115V plug for WS and D1C

Part Number:	Qty:	Unit Price:	Total Price:
741203	1	$6.00	**$6.00**

Item #: Dulcotest

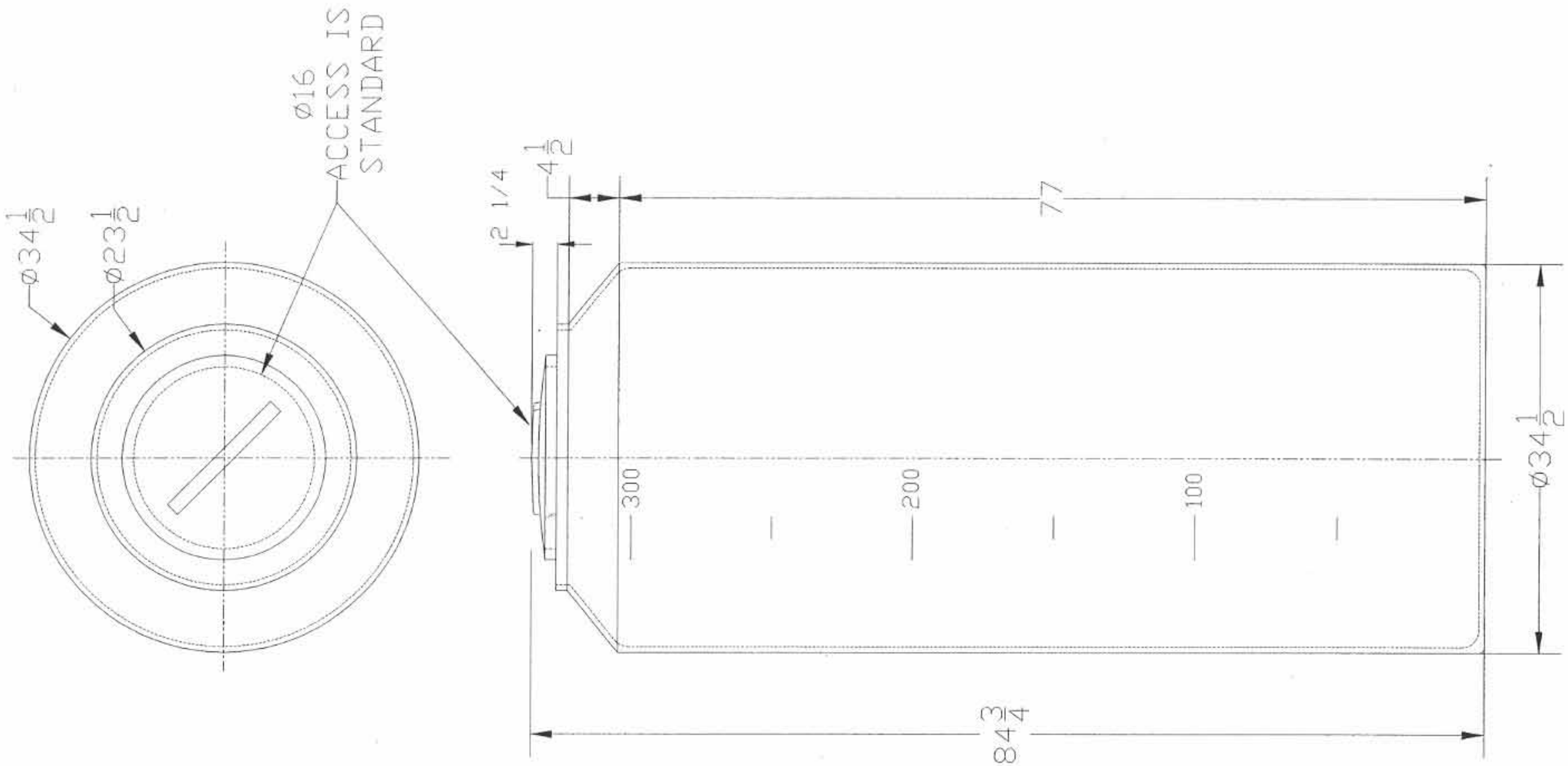
4 Electrolyte for CLE Free Chlorine Sensors, 100 mL → ELECTROLYTE FOR TOTAL CHLORINE - SAME COST

Part Number:	Qty:	Unit Price:	Total Price:
506270	1	$43.00	**$43.00**

Item #: Dulcotest

5 Spare Membrane Cap for CLE, CDE, OZE Sensors

Part Number:	Qty:	Unit Price:	Total Price:
790488	1	$135.00	**$135.00**



Rev. 0	Date 04/16/01	File Name IX3581-5
CHEM-TAINER Industries Inc. 361 Neptune Ave. W. Babylon, NY 11704 (631) 661-8300 Fax: (631) 661-8209	Date 04/16/01 / Drawn By: EJS	Mold Location CA / Cust. Rep.
TITLE 300 GAL. CROSSLINKED POLYETHYLENE VERTICAL BULK STORAGE TANK		
Part # TC3581IX	Dwg. # C-3581-25	

ALL DIMENSIONS SHOWN ARE OUTSIDE PART DIMENSIONS IN INCHES,
AND VARY BY THE STANDARD ROTATIONAL MOLDING TOLERANCE OF ±2%.

APPENDIX G

2002 Capital and O&M Cost Estimates For UV Disinfection And Chlorination/Dechlorination

Lamont, VanDeValk, Buckman & Whitbeck, P.C.
82 Main Street, P.O. Box 86
East Berne, N.Y. 12059
518-872-0141

ESTIMATE FORM A Date: October 2002
Village of Cooperstown WWTP By: KPO Ckd: HL
Job # 2002024
SUBJECT: Prelim. Capital Cost Estimate for Chlor/Dechlor System

ITEM	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE				TOTAL EXTENDED COST	SECTION TOTAL
				LABOR	MAT'L	EQUIP.COST	TOTAL UNIT COST		
1	**Chlorination System**								
	Remove existing gas chlorine system	ls	1	$ 1,000	$ 500	-	$ 1,500	$ 1,500	
	Sodium hypo metering pumps	ea	2	$ 2,000	$ 3,700	-	$ 5,700	$ 11,400	
	Chemical tankage	ea	3	$ 500	$ 500	-	$ 1,000	$ 3,000	
	Provide 30-day supply of sodium hypochlorite	gal	750	-	$ 2	-	$ 2	$ 1,500	
	Construct spill containment area	ls	1	$ 1,500	$ 1,000	-	$ 2,500	$ 2,500	$ 19,900
2	**Dechlorination System**								
	Sodium bisulfite metering pumps	ea	2	$ 2,000	$ 3,700	-	$ 5,700	$ 11,400	
	Provide spill containment pallet	ea	1	-	$ 1,000	-	$ 1,000	$ 1,000	
	Provide 30-day supply of sodium bisulfite	drum	3	-	$ 150	-	$ 150	$ 450	$ 12,850
3	**Chlorine Contact Tank and Piping***								
	18-inch interconnecting piping	lf	75	$ 25	$ 20	$ 5	$ 50	$ 3,750	
	Demolish and remove existing tank	ls	1	$ 1,500	-	$ 500	$ 2,000	$ 2,000	
	Relocate existing garage	ls	1	$ 3,000	$ 3,000	-	$ 6,000	$ 6,000	
	Chemical piping	ls	1	$ 1,000	$ 500	$ 500	$ 2,000	$ 2,000	
	Excavate/backfill for new contact tank	cy	700	$ 6	-	$ 4	$ 10	$ 7,000	
	Handrails, sumps and gates	ls	1	$ 2,500	$ 2,000	$ 500	$ 5,000	$ 5,000	
	Concrete contact tank	cy	130	$ 225	$ 200	$ 25	$ 450	$ 58,500	$ 84,250
	** = Preliminary design: 25,000-gallons*								
4	**Controls**								
	Dosing controller for chlor/dechlor pumps	ls	1	$ 7,000	$ 8,400	-	$ 15,400	$ 15,400	$ 15,400
								Subtotal Construction Costs	$ 132,400
								Contingencies (20%)	$ 26,480
								Insurance and Bonding (10%)	$ 13,240
								TOTAL CONSTRUCTION COSTS	$ 173,000
								Engineering Fees and other Administrative Costs (17%)	$ 29,000
								TOTAL CAPITAL COSTS	$ 202,000

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ESTIMATE FORM A Date: October 2002
Village of Cooperstown WWTP By: KPO Ckd: HL
Job # 2002024
SUBJECT: Prelim. Capital Cost Estimate for UV System

ITEM	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE				TOTAL EXTENDED COST	TOTALS	NYSERDA GRANT	VILLAGE OUT-OF-POCKET COSTS
				LABOR	MAT'L	EQUIP.COST	TOTAL UNIT COST				
1	**UV System**										
	Trojan UV3000+, 64 lamps in 2 banks	ls	1	$ 20,000	-	$ 140,000	$ 160,000	$ 160,000			
	New wood building (20' x 30') w/ tank	sf	600	$ 25	$ 25	-	$ 50	$ 30,000			
	Electrical installation plus building lights	ls	1	$ 17,000	$ 8,000	-	$ 25,000	$ 25,000	$ 215,000	$ (119,200)	$ 95,800
2	**Chemical Feed System**										
	PAC chemical metering pumps w/ accessories	ea	2	$ 500	$ 500	$ 1,500	$ 2,500	$ 5,000			
	Spill containment area	ea	1	$ 1,000	$ 1,000	-	$ 2,000	$ 2,000			
	Install chemical piping	ls	1	$ 700	$ 300	-	$ 1,000	$ 1,000			
	2000-gallon chemical storage tank(s)	ls	1	$ 2,500	$ 1,000	$ 3,500	$ 7,000	$ 7,000			
	Provide first fill of PAC	gal	2500	-	$ 0.24	-	$ 0.24	$ 600	$ 15,600	$ -	$ 15,600
3	**Post Aeration System and Piping**										
	18-inch interconnecting piping	lf	75	$ 25	$ 20	$ 5	$ 50	$ 3,750			
	Demolish and remove existing tank	ls	1	$ 1,500	-	$ 500	$ 2,000	$ 2,000			
	Aerator, grating and handrails	ls	1	$ 2,000	$ 3,000	$ 500	$ 5,500	$ 5,500			
	New concrete aeration tank	ls	1	$ 4,000	$ 4,000	$ 25	$ 8,025	$ 8,025	$ 19,275	$ -	$ 19,275
								Subtotal Construction Costs	$ 249,875	$ (119,200)	$ 130,675
								Contingencies (10%) ****	$ 24,988	$ -	$ 24,988
								Insurance and Bonding (10%) *	$ 10,988	$ -	$ 10,988
								TOTAL CONSTRUCTION COSTS	$ 285,850	$ -	$ 166,650
								Engineering Fees and other Administrative Costs (17%) *****	$ 48,595	$ -	$ 48,595
								Grant Administration Costs **	$ 25,098	$ (4,620)	$ 4,940
								Previously Expended Funds ***	$ 13,400	$ -	$ 13,400
								TOTAL CAPITAL COSTS	$ 372,943	$ (123,820)	$ 233,585
								VILLAGE CASH COST (LESS PREVIOUSLY EXPENDED FUNDS)			$ 221,000

NOTES;

* NOT applied to prepurchased equipment ($140,000)
** From spreadsheet of T. Peters, 12/29/02
*** UV Study and Survey by Lamont Engineers
**** Source of contingency funds to be determined by project team PRIOR TO construction
***** Cost assumes on-site help from Village forces for construction observation

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518-872-0141

ESTIMATE FORM A Date: October 2002
Village of Cooperstown WWTP By: KPO Ckd: HL
Job # 2002024
SUBJECT: Prelim. O&M Cost Estimate for UV System

ITEM	ITEM DESCRIPTION	OPERATING DAYS PER YEAR	OPERATING HOURS PER DAY	ELECTRICAL COST ($/kWh)	POWER CONSUMPTION (HP)	ANNUAL COST ($/YEAR)	SECTION TOTAL
1	**Electrical Power Costs**						
	UV System (Average power consumption = 3.6 kW)	123	24	$ 0.15	4.8	$ 1,585	
	Aerator	123	24	$ 0.15	0.0	$ -	
	Chemical feed pumps	123	24	$ 0.15	0.5	$ 165	$ 1,751
2	**Maintenance Allowance**						
	Misc. spare parts	-	-	-	-	$ 1,000	
	Lamp replacement (11 lamps per year @ $200/lamp)	-	-	-	-	$ 2,200	$ 3,200
3	**Building Lighting**					$ 600	$ 600
4	**Labor for Operation and Maintenance Activities**						
	Daily checks @ $25/hr	123	0.5	-	-	$ 1,538	
	Lamp replacement labor @ $25/hr	11	2	-	-	$ 550	
	Seasonal startup/shutdown @ $25/hr	2	8	-	-	$ 400	
	Quartz sleeve cleaning @ $25/hr	5	8	-	-	$ 1,000	$ 3,488
5	**Chemical Usage**						$ -
						Total Annual O&M Cost	$ 9,038
						USE	***$ 10,000***

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ESTIMATE FORM A Date: October 2002
Village of Cooperstown WWTP By: KPO Ckd: HL
Job # 2002024
SUBJECT: Prelim. O&M Cost Estimate for Chlor/Dechlor System

ITEM	ITEM DESCRIPTION	OPERATING DAYS PER YEAR	OPERATING AMOUNT PER DAY	ELECTRICAL COST ($/kWh)	POWER CONSUMPTION (HP)	ANNUAL COST ($/YEAR)	SECTION TOTAL
1	**Electrical Power Costs**						
	Aerator	123	24	$ 0.15	0.0	$ -	
	Chemical feed pumps	123	24	$ 0.15	1.0	$ 330	$ 330
2	**Maintenance Allowance**						
	Misc. spare parts	-	-	-	-	$ 2,000	$ 2,000
3	**Labor for Operation and Maintenance Activities**						
	Daily checks @ $25/hr	123	0.5	-	-	$ 1,538	
	Pump rebuild labor @ $25/hr	1	4	-	-	$ 100	
	Basin cleaning @ $25/hr	5	8			$ 1,000	
	Seasonal startup/shutdown @ $25/hr	5	8	-	-	$ 1,000	$ 3,638
4	**Chemical Usage**						
	12.5% Sodium hypochlorite @ $1/gallon	123	23			$ 2,829	
	38% Sodium bisulfite @ $1.40/gallon	123	5			$ 861	$ 3,690
						Total Annual O&M Cost	$ 9,658
						USE	***$ 10,000***

For information on other
NYSERDA reports, contact:

New York State Energy Research
and Development Authority
17 Columbia Circle
Albany, New York 12203-6399

toll free: 1 (866) NYSERDA
local: (518) 862-1090
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www.nyserda.org

Village of Cooperstown Wastewater Treatment facility Ultraviolet Disinfection Project

Final Report 07-04

State of New York
Eliot Spitzer, Governor