VPDES PERMIT FACT SHEET

This document gives pertinent information concerning the reissuance of the Virginia Pollutant Discharge Elimination System (VPDES) permit listed below. This permit is being processed as a Major, Municipal permit. The effluent limitations contained in this permit will maintain the Water Quality Standards of 9VAC25-260 et seq. The discharge results from the operation of a publically owned wastewater treatment plant serving an approximate population of 25,000. This permit action consists of reissuing and updating the permit to reflect current policy and guidance, including revisions in the bacterial and zinc limitations in the permit.

1. Facility Name: Totopotomoy Wastewater Treatment Plant

   Facility Location: 9015 Pole Green Park Lane
   Mechanicsville, Virginia
   See **Attachment 1** – Studley topographic map, #126A

   Facility Mailing Address: P. O. Box 470
   Hanover, Virginia 23069

2. Permit No. VA0089915 Expiration Date: August 27, 2012

3. SIC Code: 4952 – Sewerage Systems

4. Owner: County of Hanover
   Owner Contact: Name: Matthew Ellinghaus
   Title: Assistant Chief of Operations and Maintenance
   Hanover County Public Utilities
   Telephone: 804/365-6701
   Email: mbellinghaus@hanovercounty.gov

5. Application Complete Date: May 16, 2012

   Permit Drafted By: Ray Jenkins Date: July 6, 2012
   Permit Reviewed By: Jaime Bauer Date: July 12, 2012
   Curt Linderman Date: July 19, 2012
   Kyle Winter Date: July 20, 2012
   Allan Brockenbrough Date: July 17, 2012

   Public Comment Period Dates: *TBD* to *TBD*

6. Receiving Stream Name: Pamunkey River at river mile 8-PMK054.89
   River Basin: York River
   River Subbasin: NA
   Section: 1
   Class: II
   Special Standards: aa

1-Day, 30 Year low flow:	24 MGD
1-Day, 10-Year low flow:	32 MGD
7-Day, 10-Year low flow:	36 MGD
30-Day, 10-Year low flow:	42 MGD
30-Day, 5-Year low flow:	54 MGD

Harmonic Mean: 199 MGD

Tidal: Yes
On 303(d) list: Yes

See **Attachment 2** – Flow Frequency Determination / 303(d) Status memorandum and ambient stream data.

7. Operator License Requirements: A Class I operator is required. The Sewage Collection and Treatment (SCAT) Regulations, 9 VAC 25-790 et seq., recommend the minimum daily hours that the treatment works should be manned by a licensed operator or other operating staff.

8. Reliability Class: The permittee is required to maintain Class I reliability for this facility. Reliability is a measure of the ability of a component or system to perform its designated function without failure or interruption of service. The reliability classification is based on the water quality and public health consequences of a component or system failure.

9. Permit Characterization:

( ) Private ( ) Federal ( ) State (**X**) POTW ( ) PVOTW

( ) Possible Interstate Effect ( ) Interim Limits in Other Document (attach to Fact Sheet)

10. Description of Wastewater Treatment System

Outfall Number	Discharge Sources	Treatment	Design Flow
001	Residential, commercial, and industrial connections	Influent screening, activated sludge (BNR mode), secondary clarification, UV disinfection, and post aeration. Sludge is dewatered, digested, and disposed at landfill.	Current design flow of 7 MGD. The permit also includes an effluent tier for a design flow of 10 MGD.

See process flow schematic in **Attachment 3**.

The treatment plant received interim Certificates to Operate (CTOs) for the initial plant (5 MGD design) dated April 1, 2004 and June 18, 2004, and a final CTO dated September 14, 2004. Discharge commenced in April 2004. A CTO dated October 18, 2010 was issued for expansion to 7 MGD. See **Attachment 4** for these CTOs.

11. Sewage Sludge Use or Disposal: Dewatered sludge is disposed at landfill.

12. Site Inspection: See **Attachment 5**: Technical inspection by Mike Dare on November 19, 2010.

13. Materials Storage: The septage receiving area is contained with a drain and pump station that return spillage to the headworks of the treatment plant. Solids handling facilities including the truck loading area are in a building. Chemical storage for alum, polymer, sodium hydroxide, sodium hypochlorite, and sodium aluminate is under roof with containment; drainage from the unloading area is returned to the headworks of the treatment plant.

14. Ambient Water Quality Information:

    Ambient stream data are in Attachment 2. Attachment 2 also includes information regarding 303(d) and TMDL determinations. The ambient data were collected at the Route 360 bridge over the Pamunkey River, approximately two miles above the discharge point (DEQ monitoring station 8-PMK056.87).

    See item 26 below for a discussion of Total Maximum Daily Loads (TMDLs).

    The effluent from the Totopotomoy WWTP is discharged to the river via a diffuser. A mixing analysis was conducted using CORMIX version 3.1 (report date of April 1998) which established that complete mixing occurs (i.e., 100% mix) at discharges of 10 MGD and less. A drawing of the diffuser structure and a summary of the mixing report are in **Attachment 6**. The Stream Sanitation Analysis dated June 2, 1997 is also included in Attachment 6.

15. Antidegradation Review and Comments:

    The State Water Control Board's Water Quality Standards include an antidegradation policy (9 VAC 25-260-30). All state surface waters are provided one of three levels of antidegradation protection. For Tier 1 or existing use protection, existing uses of the water body and the water quality to protect those uses must be maintained. Tier 2 water bodies have water quality that is better than the water quality standards. Significant lowering of the water quality of Tier 2 waters is not allowed without an evaluation of the economic and social impacts. Tier 3 water bodies are exceptional waters and are so designated by regulatory amendment. The antidegradation policy prohibits new or expanded discharges into exceptional waters.

    The antidegradation review begins with a tier determination. The Pamunkey River at the discharge point is not impaired for any measurable Aquatic Life Use criteria. The receiving stream is therefore, considered a Tier 2 waterbody.

16. Effluent Screening and Limitation Development:

    Effluent data are presented in **Attachment 7**. Sections A.12 (page 6 of Form 2A) and B.6 (page 8) provide information on mostly conventional pollutants. Also included in Attachment 7 are spreadsheets for effluent pH and temperature. These pH and temperature data provide input values for effluent evaluation (see below).

    Attachment 8 summarizes the water quality criteria data that were submitted and the screening of those data for further evaluation.

    Attachment 9 presents an evaluation of the data that were screened in Attachment 8. Included in Attachment 9 are the MSTRANTI printout and STATS.exe analyses. The input information for

MSTRANTI is as follows:

a. Stream flows and temperature, pH, and hardness are from Attachment 2.

b. The mix percentages are 100% from Attachment 6.

c. An effluent hardness concentration of 76.8 mg/L is the average of the hardness data reported in Attachment 8.

d. The effluent temperature of 23.6 °C is the 90th percentile of effluent temperatures reported for the 2011 calendar year which are tabulated in Attachment 7.

e. The effluent pH values – 90th percentile of maximum values of 7.65 and 10th percentile of 7.2 – are from the period of May 2009 through April 2012. These data are tabulated in Attachment 7.

STATS evaluations are presented at 10 MGD only. As the input data are the same for 7 and 10 MGD, if limitations are not indicated at 10 MGD, then limitations will not be indicated at 7 MGD.

Reported data (see Attachment 8) are also evaluated in regard to the need for limitations to protect the water quality standards for human health. Screening in regard to the need for human health based limitations follows. Only evaluations at 10 MGD are presented. As the input data are the same for 7 and 10 MGD, if limitations are not indicated at 10 MGD, then limitations will not be indicated at 7 MGD.

Pollutant	**Maximum Reported Value (µg/L)**	**Human Health WLA at 10 MGD "All Other Surface Waters" (µg/L)**	**Limitation Needed?**
Dissolved Nickel	1.26	2,900	No
Dissolved Zinc	37.5	17,000	No
Dissolved Copper and Chloride were also detected. There is a human health standard for public water supply (PWS) for these parameters. This facility does not discharge to waters designated PWS. The following is therefore, for information only.			
Dissolved Copper	1.62	830 PWS	Not applicable
Chloride	47,000	160,000 PWS	Not applicable

Basis for Limitations – 7 MGD:

Part I.A.1 – 7 MGD					
PARAMETER	BASIS	DISCHARGE LIMITS			
		Monthly Average	Weekly Average	Minimum	Maximum
001 Flow	NA	NL – monitoring only	NA	NA	NL
002 pH	1, 6	NA	NA	6.0 SU	9.0 SU
004 TSS	2	10 [(a)] mg/L 260 [(a)] kg/day	15 mg/L 400 [(a)] kg/d	NA	NA
007 DO	2	NA	NA	6.5 mg/L	NA
012 Total Phosphorus	7	2.0 mg/L	NA	NA	NA
068 TKN	2	3.0 mg/L 79 kg/day	4.5 mg/L 120 [(a)] kg/day	NA	NA
159 $cBOD_5$	2	10 [(a)] mg/L 260 [(a)] kg/day	15 mg/L 400 [(a)] kg/d	NA	NA
846 *E. coli* [(b)]	1, 3	126 N/100 mL	NA	NA	NA
792 Total Nitrogen – Calendar Year Average	4	8.0 mg/L	NA	NA	NA
794 Total Phosphorus – Calendar Year Average	4	2.0 mg/L	NA	NA	NA
805 Total Nitrogen – Calendar Year-to-Date	4	NL	NA	NA	NA
806 Total Phosphorus – Calendar Year-to-Date	4	NL	NA	NA	NA

Basis:
1. Water Quality-based Limits
2. Best Engineering Judgment – Agency guidance regarding effluent development for receiving streams that cannot be modeled. Also see the June 2, 1997 memorandum in Attachment 6. Regarding the D.O. limitation, the limitation is further based on action taken by the State Water Control Board – see comment below.
3. TMDL – also see item 26 of this fact sheet
4. Regulation for Nutrient Enriched Waters and Discharges within the Chesapeake Bay Watershed (9 VAC 25-40-70)
5. Sewage Collection and Treatment Regulations (9 VAC 25-790-750)
6. Federal Secondary Treatment Standards (40 CFR 133.102)
7. Best Engineering Judgment / Policy for Nutrient Enriched Waters

(a) This limitation is expressed in two significant figures.
(b) Geometric mean. This *E. coli* limitation became effective during the term of the 2007 permit in accordance with successful completion of a bacterial monitoring program

required by the 2007 permit (Part I.B in the 2007 permit).

Additional Comments on Selected Parameters:

Ammonia

The need for ammonia limitations was evaluated – see Attachment 9. The monthly and weekly average limitations from Attachment 9 would be 3.58 mg/L and 4.31 mg/L, respectively. Forty percent to 60% of TKN is typically ammonia. Assuming the highest possible percentage of ammonia, the TKN limitations in the above table represent monthly and weekly average ammonia concentrations of 1.8 mg/l and 2.7 mg/L, respectively, which are less (i.e., more stringent) than the limitations from Attachment 9 cited above. The TKN limitations are therefore, protective in regard to ammonia toxicity.

Dissolved Oxygen (D.O.)

The stream modeling memorandum in Attachment 6 indicates an effluent DO limitation of 5.0 mg/L. The initial issuance of this permit in 1999 was controversial, resulting in a public hearing. At its March 11, 1999 meeting, the State Water Control Board approved issuance of the permit with a D.O. limitation of 6.5 mg/L to meet the antidegradation policy in the mixing zone.

Total Nitrogen and Total Phosphorus

Total Nitrogen and Total Phosphorus annual average limitations of 8.0 mg/L and 2.0 mg/L, respectively, are the concentrations that were approved by the Certificate to Construct (CTC) dated October 1, 2008 for the 7 MGD expansion – see **Attachment 10**. The nutrient wasteload allocations in the Chesapeake Bay TMDL are 182,734 pounds per year of total nitrogen and 12,182 pounds per year total phosphorus. There is an interim, total phosphorus allocation of 21,319 pounds per year through 2015 under the General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Dischargers and Nutrient Trading in the Chesapeake Watershed in Virginia. At 7 MGD, 8.0 mg/L total nitrogen calculates to 170,548 pounds per year, which is within the allocation. At 2.0 mg/L, total phosphorus calculates to an annual loading of 42,637 pounds, which exceeds the allocation. Although the total phosphorus concentration of 2.0 at design flow does not represent compliance with the allocation, compliance with the allocation is required by the General VPDES Watershed Permit. The annual average concentrations reported for 2011 were 6.96 mg/L total nitrogen and 0.25 mg/L total phosphorus. The Office of VPDES Permits concurred with this approach in an email dated May 10, 2012.

Basis for Limitations – 10 MGD:

Part I.A.1 – 10 MGD					
PARAMETER	BASIS	DISCHARGE LIMITS			
		Monthly Average	Weekly Average	Minimum	Maximum
001 Flow	NA	NL – monitoring only	NA	NA	NL
002 pH	1, 6	NA	NA	6.0 SU	9.0 SU
004 TSS	2	10 [(a)] mg/L 380 [(a)] kg/day	15 mg/L 570 [(a)] kg/d	NA	NA
007 DO	2	NA	NA	6.5 mg/L	NA
068 TKN	2	3.0 mg/L 110 [(a)] kg/day	4.5 mg/L 170 [(a)] kg/day	NA	NA
159 $cBOD_5$	2	10 [(a)] mg/L 260 [(a)] kg/day	15 mg/L 400 [(a)] kg/d	NA	NA
846 *E. coli* [(b)]	1, 3	126 N/100 mL	NA	NA	NA
792 Total Nitrogen – Calendar Year Average	4	6.0 mg/L	NA	NA	NA
794 Total Phosphorus – Calendar Year Average	4	0.4 mg/L	NA	NA	NA
805 Total Nitrogen – Calendar Year-to-Date	4	NL	NA	NA	NA
806 Total Phosphorus – Calendar Year-to-Date	4	NL	NA	NA	NA

Basis:
1. Water Quality-based Limits
2. Best Engineering Judgment – Agency guidance regarding effluent development for receiving streams that cannot be modeled. Also see the June 2, 1997 memorandum in Attachment 6. Regarding the D.O. limitation, the limitation is further based on action taken by the State Water Control Board – see comment below.
3. TMDL – also see item 26 of this fact sheet
4. Regulation for Nutrient Enriched Waters and Discharges within the Chesapeake Bay Watershed (9 VAC 25-40-70)
5. Sewage Collection and Treatment Regulations (9 VAC 25-790-750)
6. Federal Secondary Treatment Standards (40 CFR 133.102)

(a) This limitation is expressed in two significant figures.

(b) Geometric mean. This *E. coli* limitation became effective during the term of the 2007 permit in accordance with successful completion of a bacterial monitoring program required by the 2007 permit (Part I.B in the 2007 permit).

Additional Comments on Selected Parameters:

Ammonia

The need for ammonia limitations was evaluated – see Attachment 9. The monthly and weekly average limitations from Attachment 9 would be 2.67 mg/L and 3.21 mg/L, respectively. Forty percent to 60% of TKN is typically ammonia. Assuming the highest possible percentage of ammonia, the TKN limitations in the above table represent monthly and weekly average ammonia concentrations of 1.8 mg/l and 2.7 mg/L, respectively, which are less (i.e., more stringent) than the limitations from Attachment 9 cited above. The TKN limitations are therefore, protective in regard to ammonia toxicity.

Dissolved Oxygen

The stream modeling memorandum in Attachment 6 indicates an effluent DO limitation of 5.0 mg/L. The initial issuance of this permit in 1999 was controversial, resulting in public hearing. At its March 11, 1999 meeting, the State Water Control Board approved issuance of the permit with a DO limitation of 6.5 mg/L to meet the antidegradation policy in the mixing zone.

Total Nitrogen and Total Phosphorus

Total Nitrogen and Total Phosphorus annual average limitations of 6.0 mg/L and 0.4 mg/L, respectively, are the concentrations that were used to establish the nutrient allocations; that is, these concentrations at 10 MGD produce the yearly allocation amounts (total phosphorus in year 2016). The nutrient wasteload allocations in the Chesapeake Bay TMDL are 182,734 pounds per year of total nitrogen and 12,182 pounds per year total phosphorus. There is an interim, total phosphorus allocation of 21,319 pounds per year through 2015 under the General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Dischargers and Nutrient Trading in the Chesapeake Watershed in Virginia. Even if the facility is expanded to 10 MGD prior to January 1, 2016, the Regulation for Nutrient Enriched Waters and Dischargers within the Chesapeake Bay Watershed (9 VAC 25-40) requires that the upgrade meet the final allocations. The permittee may choose to seek relief from the 6.0 mg/l TN and 0.4 mg/l TP limitations should additional wasteload allocation be acquired for the Totopotomoy WWTP.

17. Basis for Sludge Use & Disposal Requirements: Not applicable, as this facility does not land apply sludge.

18. Antibacksliding Statement: A total phosphorus monthly average limitation of 2.0 mg/L has been removed from the 7 MGD effective January 1, 2012 and the 10 MGD tiers and replaced with appropriate yearly average limitations. Total recoverable zinc limitations have also been removed from the 10 MGD tier because analysis now shows that a limitation is not needed – see Attachment 9.

    Removal of the 2.0 mg/L monthly average phosphorus limitations is not considered backsliding in accordance with Guidance Memo 07-2008, Amendment 2 because: a) the facility's nutrient limitations are regulated by the permittee's Watershed GP (VAN030051); and b) the limitations are technology-based, so backsliding is permissible.

The zinc limitations can be removed because the limitations never became effective. Guidance Memorandum No. 00-2011 (page 37) states that permit limitations that have not become effective are not subject to the antibacksliding restrictions. The subject zinc limitations do not become effective until issuance of a Certificate to Operate for the 10 MGD facility.

19. Compliance Schedule: None

20. Other Requirements and Special Conditions

[Part I.B in the 2007 permit – Bacterial Effluent Limitations and Monitoring Requirements – has been deleted. Part I.B required a bacterial study in regard to moving from fecal coliform to *E coli* limitations. Testing in September and October 2007 showed *E. coli* counts ranging from <1 to 5 count per 100 mL, indicating that *E. coli* were effectively controlled by the existing UV disinfection process. The permittee has been reporting *E. coli* on the DMR since November 2007.]

a. Special Condition I.C.1 – 95% Capacity Reopener

Required by VPDES Permit Regulation, 9 VAC 25-31-200 B.4 for all POTW and PVOTW permits.

This special condition is the same as Special Condition I.C.1 in the 2007 permit.

b. Special Condition I.C.2 – Indirect Discharges

Rationale: Required by VPDES Permit Regulation, 9 VAC 25-31-200.B.1 and B.2 for POTWs and PVOTWs that receive waste from someone other than the owner of the treatment works.

This special condition is the same as Special Condition I.C.2 in the 2007 permit.

c. Special Condition I.C.3 – Operation and Maintenance (O&M) Manual Requirement

Rationale: Required by Code of Virginia §62.1-44.19; Sewage Collection and Treatment Regulations, 9 VAC 25-790; and VPDES Permit Regulation 9 VAC 25-31-190.E.

Special Condition I.C.3 in the 2007 also addresses the O&M Manual requirement. The language in the proposed permit however, has been significantly revised. The most significant revision is that it is no longer required that manuals be submitted to DEQ for staff review and approval, unless requested by DEQ staff.

d. Part I.C.4 – CTC, CTO Requirement

Rationale: Required by Code of Virginia § 62.1-44.19; Sewage Collection and Treatment Regulations, 9 VAC 25-790. 9 VAC 25-40-70 A authorizes DEQ to include technology-based annual concentration limits in the permits of facilities that have installed nutrient control equipment, whether by new construction, expansion or upgrade.

Special Condition I.C.4 in the 2007 also addresses the CTC/CTO requirement. The language in the proposed permit however, has been revised.

e. Special Condition I.C.5 – Licensed Operator Requirement

Rationale: The VPDES Permit Regulation, 9 VAC 25-31-200.C and the Code of Virginia § 54.1-2300 et seq., Rules and Regulations for Waterworks and Wastewater Works Operators and Onsite Sewage System Professionals (18 VAC 160-20-10 et seq.) require licensure of operators.

Special Condition I.C.5 in the 2007 also addresses the licensed operator requirement. The language in the proposed permit however, has been updated to reflect the new name of the licensing board.

f. Special Condition I.C.6 – Reliability Class

Rationale: Required by Sewage Collection and Treatment Regulations, 9 VAC 25-790 for all municipal facilities.

This special condition is the same as Special Condition I.C.6 in the 2007 permit.

[Special Condition I.C.7 – Water Quality Criteria Reopener – in the 2007 has been deleted. This special condition is typically used when the permit requires monitoring for a parameter with no limitations in Part I.A of the permit. There is no such parameter in the proposed permit.]

g. Special Condition I.C.7 – Sludge Reopener

Rationale: Required by VPDES Permit Regulation, 9 VAC 25-31-220.C for all permits issued to treatment works treating domestic sewage.

This special condition is the same as Special Condition I.C.8 in the 2007 permit.

h. Special Condition I.C.8 – Compliance Reporting

Rationale: Authorized by VPDES Permit Regulation, 9 VAC 25-31-190.J.4 and 220.I. This condition is necessary when pollutants are monitored by the permittee and a maximum level of quantification and/or a specific analytical method is required in order to assess compliance with a permit limit or to compare effluent quality with a numeric criterion. The condition also establishes protocols for calculation of reported values.

Special Condition I.C.9 in the 2007 permit addresses compliance reporting. The language in the proposed permit has been significantly revised. The Quantification Levels (QLs) given for $cBOD_5$, TSS, TKN and TRC are standard Agency prescribed QLs used to identify the quantifiable concentration of a particular pollutant in an effluent (Guidance Memo 10-2003). The $cBOD_5$ QL of 2 mg/L is being included for consistency with recently adopted VPDES General Permit regulations and is necessary to ensure compliance with the permit limitations.

i. Special Condition I.C.9 – Sludge Use and Disposal

Rationale: VPDES Permit Regulation, 9 VAC 25-31-100.P; 220.B.2; and 420 through 720, and 40 CFR Part 503 require all treatment works treating domestic sewage to submit information on sludge use and disposal practices and to meet specified standards for sludge use and disposal.

This special condition is the same as Special Condition I.C.11 in the 2007 permit except that reference to the Department of Health has been removed.

j. Special Condition I.C.10 – In-stream Macroinvertebrate Monitoring

Rationale: Code of Virginia § 62.1-44.21 authorizes the Board to request information needed to determine the impact of a discharge on State waters.

The benthic monitoring program initially stipulated the collection of river bottom samples by dredge. The initial four years of monitoring (pursuant to the 1999 permit) was not useful because few benthic organisms were found in the upstream and downstream sediment samples. In response to that, the 2007 permit required (in Special Condition I.C.10) that the permittee establish an action plan, to include input from DEQ staff, to establish an acceptable sampling protocol. The effort to establish a protocol is ongoing. DEQ staff has worked with the County on a sampling method to collect macroinvertebrates from woody debris and other appropriate substrates. DEQ staff is developing a written protocol for that sampling. Also, at present, reference sources (i.e., an assessment tool) do not exist for evaluation of the collected data. DEQ staff is also working to identify an assessment tool for freshwater tidal rivers.

The draft permit proposes that macroinvertebrate monitoring resume once a written protocol and assessment tool are developed. The frequency of monitoring was recommended by the PRO benthic monitoring staff. At this time, cursory visual observation of the receiving stream suggests comparable conditions to other similar streams.

k. Special Condition I.C.11 – Material Storage and Handling

Rationale: 9 VAC 25-31-50A prohibits the discharge of any wastes into State waters unless authorized by permit. Code of Virginia §62.1-44.16 and §62.1-44.17 authorize the Board to regulate the discharge of industrial waste or other waste.

This is the same as Special Condition 13 in the 2007 permit except that the phrase “and consistent with Best Management Practices“ has been added in accordance with the VPDES permit manual (revised August 25, 2011).

[Special Condition I.C.12 in the 2007 permit has been deleted. This same language was included in Special Condition I.C.14.a in the 2007 permit. It is included in Special Condition I.C.12.a in the proposed permit.]

l. Special Condition I.C.12 – Re-openers

Rationale: Section 303(d) of the Clean Water Act requires that total maximum daily loads (TMDLs) be developed for streams listed as impaired. This special condition is to allow the permit to be reopened if necessary to bring it into compliance with any applicable TMDL approved for the receiving stream. The re-opener recognizes that, according to section 402(o)(1) of the Clean Water Act, limits and/or conditions may be either more or less stringent than those contained in this permit. Specifically, they can be relaxed if they are the result of a TMDL, basin plan, or other wasteload allocation prepared under section 303 of the Act. 9 VAC 25-40-70.A authorizes DEQ to include technology-based annual concentration limits in the permits of facilities that have installed nutrient control equipment, whether by new construction, expansion or upgrade. 9 VAC 25-31-390.A authorizes DEQ to modify VPDES permits to promulgate amended water quality standards.

This special condition is the same as Special Condition I.C.14 in the 2007 permit.

m. Special Condition I.C.13 – Nutrient Reporting Calculations

Rationale: § 62.1-44.19:13 of the Code of Virginia defines how annual nutrient loads are to be calculated; this is carried forward in 9 VAC 25-820-70. As annual concentrations (as opposed to loads) are limited in the individual permit, this special condition is intended to reconcile the reporting calculations between the permit programs, as the permittee is collecting a single set of samples for the purpose of ascertaining compliance with two permits.

This special condition is essentially the same as Special Condition I.C.15 in the 2007 permit – some typographical errors have been corrected and some language has been added.

n. Special Condition I.C.14 – Environmental Excellence Program

Rationale: 9 VAC 25-40-70.B authorizes DEQ to approve an alternate compliance method to the technology-based effluent concentration limitations as required by subsection A of this section. Such alternate compliance method shall be incorporated into the permit of an Exemplary Environmental Enterprise (E3) facility or an Extraordinary Environmental Enterprise (E4) facility to allow the suspension of applicable technology-based effluent concentration limitations during the period the E3 or E4 facility has a fully implemented environmental management system that includes operation of installed nutrient removal technologies at the treatment efficiency levels for which they were designed.

This is the same as Special Condition I.C.17 in the 2007 permit.

o. Special Condition I.C.15 – Closure Plan

Rationale: Code of Virginia § 62.1-44.19 of the State Water Control Law. This condition establishes the requirement to submit a closure plan for the wastewater treatment facility

if the treatment facility is being replaced or is expected to close.

This is a new special condition in the proposed permit.

p. Part I.C – Whole Effluent Toxicity (WET) Testing

Rationale: VPDES Permit Regulation, 9 VAC 25-31-210 and 220.I, requires monitoring in the permit to provide for and assure compliance with all applicable requirements of the State Water Control Law and the Clean Water Act.

Part I.F in the 2007 permit addresses WET testing. The reference to the 5 MGD tier has been removed, the language has been slightly revised, and the endpoint for the 7 MGD has increased from 11% to 12% (which is a more stringent endpoint). This value increased because of a slight decrease in the 7Q10 stream flow as determined for the 2012 reissuance.

See **Attachment 11** for additional information regarding WET testing. WETLIM10 spreadsheets are included for both the 7 and 10 MGD tiers. STATS analysis is only shown for 10 MGD. As the input data are the same for 7 and 10 MGD, if limitations are not indicated at 10 MGD, then limitations will not be indicated at 7 MGD.

The reporting schedule begins with the report due by December 31, 2013. The report for 2012 was received on June 11, 2012.

q. Part I.D – Pretreatment Program

Rationale: VPDES Permit Regulation, 9 VAC 25-31-730 through 900, and 40 CFR Part 403 require certain existing and new sources of pollution to meet specified regulations.

Part I.E of the 2007 permit also addressed pretreatment and required a survey of all Industrial Users. Part I.D in the proposed 2012 permit addresses the implementation of a pretreatment program. This change was prompted by the diversion of wastewater from a Categorical Industrial User to the Totopotomoy WWTP on April 5, 2010. Hanover's proposed pretreatment program was submitted for review and approval on July 3, 2012. The first sentence in Part I.D of the draft 2012 permit has been written to reflect the fact that the submitted program is under review. Also, the requirement that the County's Enforcement Response Plan (ERP) be reviewed and updated within 90 days of the effective date of the permit was not included in the draft 2012 permit because review of the ERP is part of the overall program review and approval.

21. Part II, Conditions Applicable to All VPDES Permits:

Section 9 VAC 25-31-190 of the VPDES Permit Regulation requires that all VPDES contain or specifically cite the conditions listed.

22. Changes to the 2007 permit:

Permit Reference	Description of Change	Rationale	Date of Change
Cover page	Boilerplate verbiage revised	Per August 25, 2011 VPDES Permit Manual, Section MN-1.	July 2012
	Permit term shortened so that the expiration date is the last day of a month.	Staff decision October 25, 2011	
5 MGD tier	5 MGD tier deleted (Part I.A.1 in 2007 permit)	WWTP has expanded to 7 MGD	July 2012
Part I.A.1 7 MGD tier (I.A.2 in the 2007 permit addressed the 7 MGD tier)	In the line immediately preceding the limitations table, "by the permittee" has been deleted.	PRO staff decision February 28, 2012	July 2012
	Total Phosphorus: Monthly average of 2.0 mg/L applicable through 12-31-2012; then replaced with yearly average.	Monthly average limitation is needed to avoid backsliding until yearly average becomes effective.	
	Bacterial limitation expressed as *E. coli* instead of fecal coliform.	2007 permit provided for transition from fecal to *E. coli*. This is not a new limitation.	
	Added Total Nitrogen and Total Phosphorus annual average limitations and year-to-date reporting.	Guidance Memorandum 07-2008, Amendment 2	
	Total Phosphorus sampling frequency changed from once per month to once per week.	Consistent with Part I.E of the Nutrient General Permit and with VPDES Permit Manual (August 25, 2011; Section MN-2, page 2)	
	Revised/rearranged footnotes	Revised for clarity	
	Added footnote 3	Defines the period of time that the 2.0 mg/L monthly average TP limitation is applicable	
	Added footnote 4,	Definition of TN	
	Added footnote 5	Directs permittee to instructions for calculating averages	

Permit Reference	Description of Change	Rationale	Date of Change
	Added footnote 6	Yearly averages are for calendar year, so limitations become effective January 1st of the year following the year in which the limitation is triggered.	
	Added 85% removal requirement for BOD5 and TSS	Part of definition of secondary treatment	
	Added location of effluent sample collection	PRO staff decision on April 24, 2012	
Part I.A.2 10 MGD tier (I.A.3 in the 2007 permit addressed the 10 MGD tier)	Same as above for 7 MGD tier, except that 2.0 mg/L TP monthly average limitation (and corresponding footnote for the 7 MGD tier) completely removed.	Replaced by yearly average limitation.	July 2012
	Total Recoverable Zinc limitations deleted	Evaluation of data indicates that zinc limitations are no longer needed – see Attachment 9	
Part I.B	Part I.B in the 2007 permit required a bacterial study to transition from a fecal coliform limitation to an *E. coli* limitation. The study was completed and the *E. coli* limitation became effective. This language has been removed in the 2012 draft permit. Therefore, the lettering in subsequent parts of the permit has been revised.		July 2012
Part I.B – Special Conditions (I.C in the 2007 permit addressed special conditions)	See item 20 in fact sheet for more detail: ● Special Conditions 1, 2, and 6 are the same as in the 2007 permit. ● Special Conditions 12 and 16 in the 2007 permit were deleted. ● The numbering of the following conditions changed with no revisions to text: Condition 8 in the 2007 permit is now 7, 14 is now 12, and 17 is now 14. ● The following Special Conditions have been revised: 3, 4, 5, 8 (#9 in the 2007 permit), 9 (previously #11), 10, 11 (previously #13), 13 (previously #15), and 16 (previously #7). ● Special Condition 15 is a new condition in the proposed permit.		July 2012

Permit Reference	Description of Change	Rationale	Date of Change
Part I.C – WET Testing (I.F in the 2007 permit addressed WET testing)	Part I.C in the proposed permit is the WET testing program. The proposed Part I.C is essentially the same as Part I.F in the 2007 permit. Reference to the 5 MGD tier has been removed. The endpoint for the 7 MGD facility has increased from ≥11% to ≥12%.	The endpoint increased from ≥11% to ≥12% due a decrease in stream flow. See Attachments 2 and 11.	July 2012
Part I.D – Pretreatment (I.E in the 2007 permit addressed pretreatment)	The 2007 permit does not contain a Part I.D. Language updated	Updated language reflects GM 10-2003 and regional practice.	July 2012
Parts I.G and I.H in 2007 permit	These sections in the 2007 permit that addressed land application of sewage sludge were removed.	Sludge disposed at landfill. Application for permit renewal did not include land application.	
Part II.A.4	Item 4 added to Part II.A.	Reflects change in laboratory accreditation requirements, as reflected in the August 25, 2011 VPDES Permit Manual, Section MN-1.	July 2012

23. Variances/Alternate Limits or Conditions: None

24. Public Notice Information required by 9VAC25-31-280.B:

Comment period: Start Date: End Date: 11:59 p.m.

Publication dates: and in the *Richmond Times-Dispatch*

All pertinent information is on file and may be inspected or copied by contacting Ray Jenkins at:

Virginia Department of Environmental Quality (DEQ)
Piedmont Regional Office
4949-A Cox Road
Glen Allen, Virginia 23060-6296
Telephone Number 804/527-5037
Facsimile Number 804/527-5106

Email ray.jenkins@deq.virginia.gov

DEQ accepts comments and requests for public hearing by e-mail, fax or postal mail. All comments and requests must be in writing and be received by DEQ during the comment period. Submittals must include the names, mailing addresses and telephone numbers of the commenter/requester and of all persons represented by the commenter/requester. A request for public hearing must also include: 1) The reason why a public hearing is requested. 2) A brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requester, including how and to what extent such interest would be directly and adversely affected by the permit. 3) Specific references, where possible, to terms and conditions of the permit with suggested revisions. A public hearing may be held, including another comment period, if public response is significant, based on individual requests for a public hearing, and there are substantial, disputed issues relevant to the permit. The public may review the draft permit and application at the DEQ office named above by appointment or may request copies of the documents from the contact person listed above.

25. Additional Comments:

a. Special Standards:

9VAC25-260-530 of the Virginia Water Quality Standards assigns both Special Standards a and aa to Section 1 of the York River Basin. Special Standard a addresses shellfish waters. The receiving stream at the point of discharge does not contain a saline habitat suitable for shellfish; therefore this Special Standard does not apply to this facility.

Special Standard aa is a site-specific dissolved oxygen standard for the tidal Mattaponi and Pamunkey Rivers. The dissolved oxygen limitation in the permit of 6.5 mg/L instantaneous minimum protects this special standard.

b. Previous Board Action:

In response to public comment, the State Water Control Board at its March 11, 1999 meeting directed the staff to issue the 1999 permit incorporating the following:

(1) Annual benthic monitoring in the receiving stream. This requirement has continued with the 2007 permit and the proposed 2012 permit. The details of this monitoring are currently being reexamined.
(2) An instantaneous minimum dissolved oxygen limitation of 6.5 mg/L. This limitation was maintained in the 2007 permit and is included in the proposed 2012 permit.
(3) A monthly average total suspended solids limitation of 10 mg/L. This limitation was maintained in the 2007 permit and is included in the proposed 2012 permit.

Following issuance of the permit in 1999, a lawsuit was filed against the Virginia State Water Control Board, the Virginia Department of Environmental Quality, and Hanover County claiming that the permit must be set aside because the Board did not make proper findings regarding the dissolved oxygen levels in the river, because the Board did not find that existing recreational uses of the river such as swimming, fishing, and canoeing and nature observation would be protected, and because the Board did not find that the use of the river

by anadromous fish would be protected. The petitioners further asserted that the record contained no substantial evidence that would support such findings. The Circuit Court of the City of Richmond ruled that the petitioners lacked standing under the relevant factors for standing and the case was dismissed on April 3, 2001. That ruling was appealed to the Court of Appeals of Virginia. The appeal was upheld on its merits and returned to the Circuit Court, which ruled in favor of the Board.

c. Public Comment: *No comments were received*.

d. Annual permit fee payments are up-to-date (last payment deposited on September 6, 2011).

e. The discharge is in conformance with the existing planning documents for the area.

f. This discharge is not controversial and is currently meeting the required effluent limitations.

g. The Virginia Department of Health reviewed the permit application and had no objections to the reissuance of the permit.

h. This permittee is not currently enrolled in the eDMR program. The permit was notified in the permit renewal notification (email dated May 31, 2011) that use of eDMR would eventually be necessary. The PRO Compliance Auditor contacted the permittee by email on July 5, 2012.

i. This permittee does not participate in the Virginia Environmental Excellence Program (VEEP).

j. The Environmental Protection Agency has reviewed the draft permit and had no comments or objections regarding the draft permit.

k. Hanover County government officials and the Richmond Regional Planning District Commission were notified of the intended reissuance of this permit by copy of the public notice on *TBD*.

l. DEQ staff coordinated the proposed reissuance of this permit with the Virginia Department of Conservation and Recreation (DCR) staff in regard to impact on threatened and endangered species. The Green floater, Eastern lampmussel, and the Yellow lampmussel have been historically documented in the Pamunkey River. To minimize impacts, DCR recommended the use of UV or ozone for disinfection and utilization of new disinfection technologies when available. The Totopotomoy WWTP utilizes UV disinfection.

m. In regard to storm water runoff from the plant site, the permittee submitted a No Exposure Certification. The Certification was approved on July 19, 2012, with an expiration date of July 19, 2014.

n. Reduced monitoring has not been considered because the expanded treatment plant (7 MGD) has not been in operation for three years – see August 25, 2011 VPDES Permit Manual, Section MN-2, A.5.b.(3).

26. 303(d) Listed Segments/Total Maximum Daily Load (TMDL)

During the 2010 305(b)/303(d) Integrated Water Quality Assessment, the Pamunkey River was assessed overall as a Category 5D water ("The Water Quality Standard is not attained where TMDLs for a pollutant(s) have been developed but one or more pollutants are still causing impairment requiring additional TMDL development.") The applicable fact sheets are included in Attachment 2. The Recreation Use is impaired due to E. coli exceedances, the Aquatic Life Use is impaired due to EPA's overlisting of the river for nutrients in 1998, and the Fish Consumption Use is impaired due to VDH advisories for PCBs and mercury. The Wildlife Use was fully supporting.

The Recreation Use was mistakenly assessed as Category 4A ("Water is impaired or threatened for one or more designated uses but does not require a TMDL because the TMDL for specific pollutant(s) is complete and US EPA approved') during the 2010 305(b)/303(d) cycle; the draft 2012 report corrects the error and considers the Recreation Use to be Category 5A ("A water quality standard is not attained. The water is impaired or threatened for one or more designated uses by a pollutant(s) and requires a TMDL (303d list)."). The Totopotomoy WWTP was not addressed in the downstream Pamunkey River Basin Bacterial TMDL, therefore the bacterial impairment could not be considered a nested impairment, as it was in the 2010 assessment. The TMDL was therefore, modified on *TBD* to establish a bacterial allocation for the Totopotomoy WWTP. The draft 2012 fact sheets are also included in Attachment 2.

This facility discharges directly to the Pamunkey River in the Chesapeake Bay watershed in the Upper Pamunkey River segment (segment number PMKTF). The receiving stream has been addressed in the Chesapeake Bay TMDL, approved by EPA on December 29, 2010. The TMDL addresses dissolved oxygen (DO), chlorophyll a, and submerged aquatic vegetation (SAV) impairments in the main stem Chesapeake Bay and its tidal tributaries by establishing non-point source load allocations (LAs) and point-source waste load allocations (WLAs) for Total Nitrogen (TN), Total Phosphorus (TP) and Total Suspended Solids (TSS) to meet applicable Virginia Water Quality Standards contained in 9VAC25-260-185. This facility is considered a Significant Chesapeake Bay wastewater discharge and has been assigned a TN WLA of 182,734 pounds per year, a TP WLA of 12,182 pounds per year, and a TSS WLA of 913,668 pounds per year.

Implementation of the Chesapeake Bay TDML is currently accomplished in accordance with the Commonwealth of Virginia's Phase I Watershed Implementation Plan (WIP), approved by EPA on December 29, 2010. The approved WIP recognizes that the TMDL nutrient WLAs for Significant Chesapeake Bay wastewater dischargers are set in two regulations: 1) the Water Quality Management Planning Regulation (9VAC25-720); and 2) the "General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed of Virginia" (9VAC25-820). The WIP further outlines that since TSS discharges from wastewater facilities represent an insignificant portion of the Bay's total sediment load, they may be considered in the aggregate. The WIP also states that wastewater discharges with technology-based TSS limits are considered consistent with the TMDL. The TSS limitations in the permit are more stringent than the applicable technology-based limitations (i.e., secondary standards) and therefore, the discharge is in conformance with the TMDL.

40 CFR 122.44(d)(1)(vii)(B) requires permits to be written with effluent limits necessary to meet

water quality standards and to be consistent with the assumptions and requirements of applicable WLAs. DEQ has provided coverage under the VPDES Nutrient General Permit (GP) for this facility under permit VAN030051. The requirements of the Nutrient GP currently in effect for this facility are consistent with the Chesapeake Bay TMDL. This individual permit includes TSS limitations of 10 mg/L monthly average that are also consistent with the Chesapeake Bay TMDL and WIP. In addition, the individual permit has limits of 10 mg/L $cBOD_5$ monthly average, 3.0 mg/L TKN monthly average, and 6.5 mg/L DO minimum which provide protection of instream D.O. concentrations to at least 5.0 mg/L. However, implementation of the full Chesapeake Bay WIP, including GP reductions combined with actions proposed in other source sectors, is expected to adequately address ambient conditions such that the proposed effluent limits of this individual permit are consistent with the Chesapeake Bay TMDL, and will not cause an impairment or observed violation of the standards for DO, chlorophyll a, or SAV as required by 9VAC25-260-185.

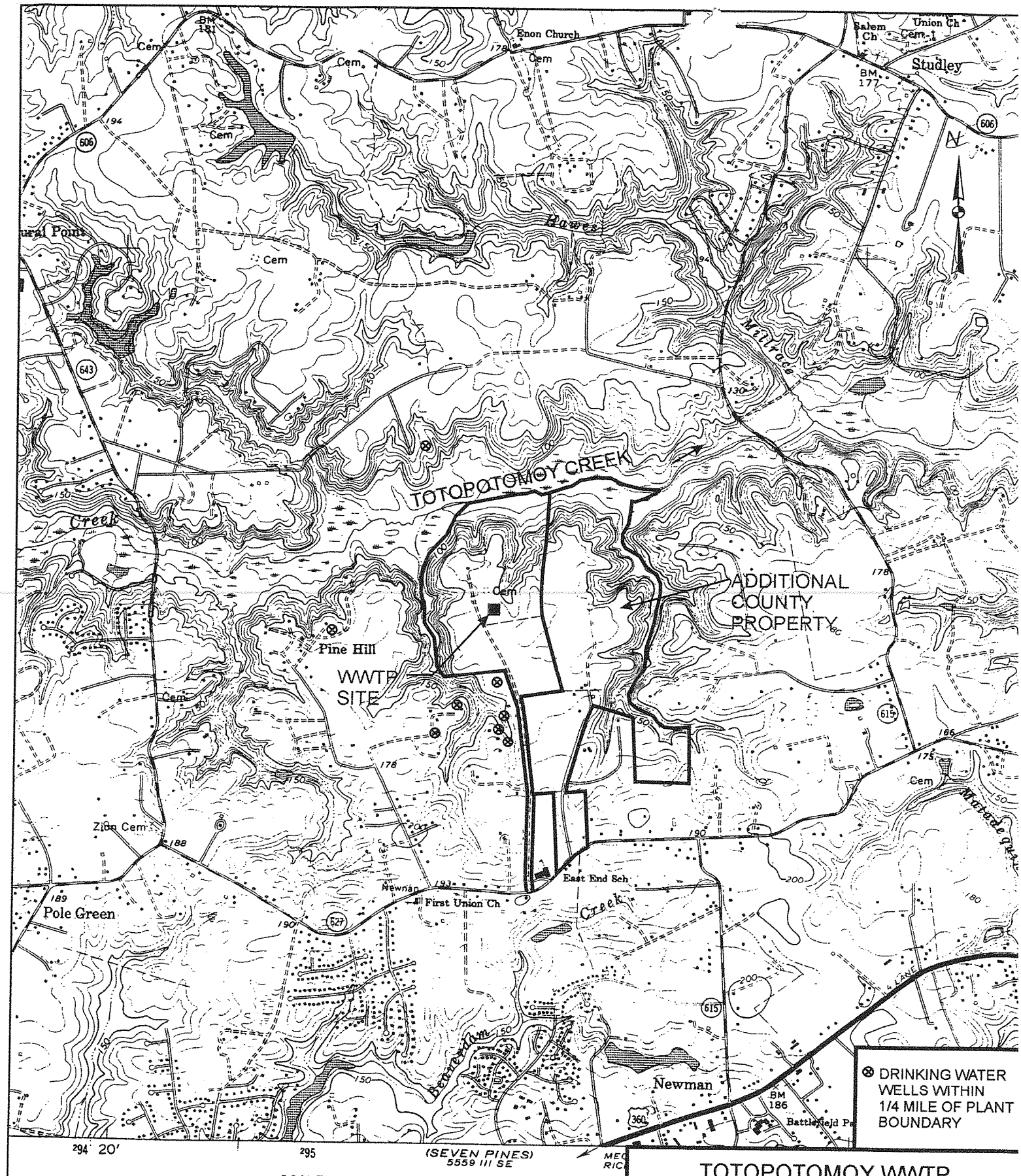
The Totopotomoy discharge will not contribute to the TMDL impairments. *E. coli* is limited to levels that protect the water quality standard. Effluent monitoring indicated that dissolved mercury and PCBs were not detected at acceptable quantification levels. Total Nitrogen, Total Phosphorus, and Total Suspended Solids are addressed in the discussion above.

27. Attachments:

Attachment 1 – Location Maps
Attachment 2 – Flow Frequency and 303(d) Determinations
Attachment 3 – Schematic of Treatment Plant
Attachment 4 – Certificates to Operate for 5 and 7 MGD Facilities
Attachment 5 – Technical Inspection Report
Attachment 6 – Drawing of Effluent Diffuser Structure and Mixing Analysis
Attachment 7 – Effluent Data
Attachment 8 – Water Quality Criteria Data and Screening
Attachment 9 – MSTRANTI and STATS Analyses
Attachment 10 – Certificate to Construct for 7 MGD Facility
Attachment 11 – Whole Effluent Toxicity (WET) Analysis

Attachment 1

Location Maps



SCALE 1:24 000

1 ½ 0

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

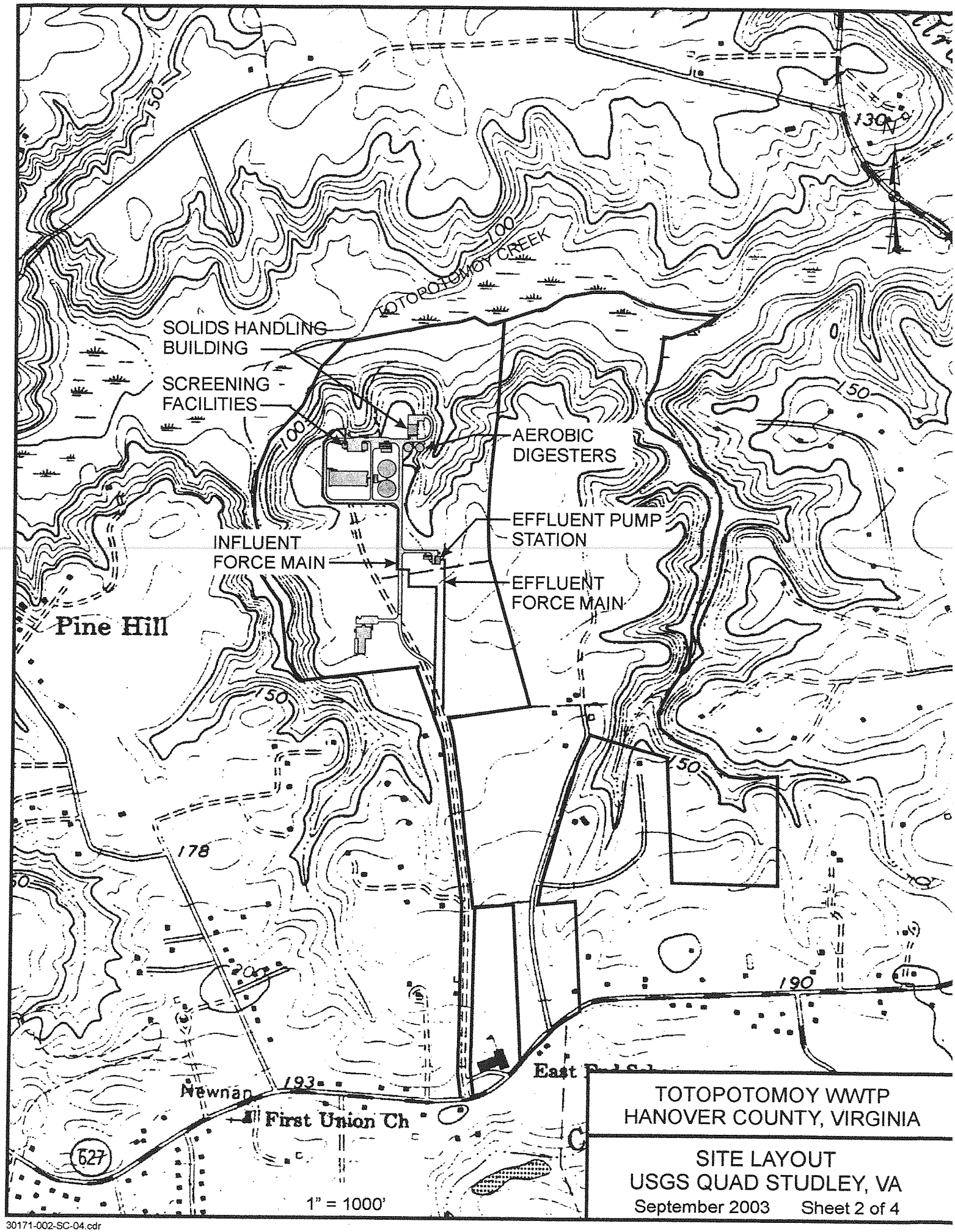
CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

TOTOPOTOMOY WWTP
HANOVER COUNTY, VIRGINIA

LOCATION MAP WWTP SITE
USGS QUAD STUDLEY, VA

September 2003 Sheet 1 of 4

30171-002-SC-01.cdr

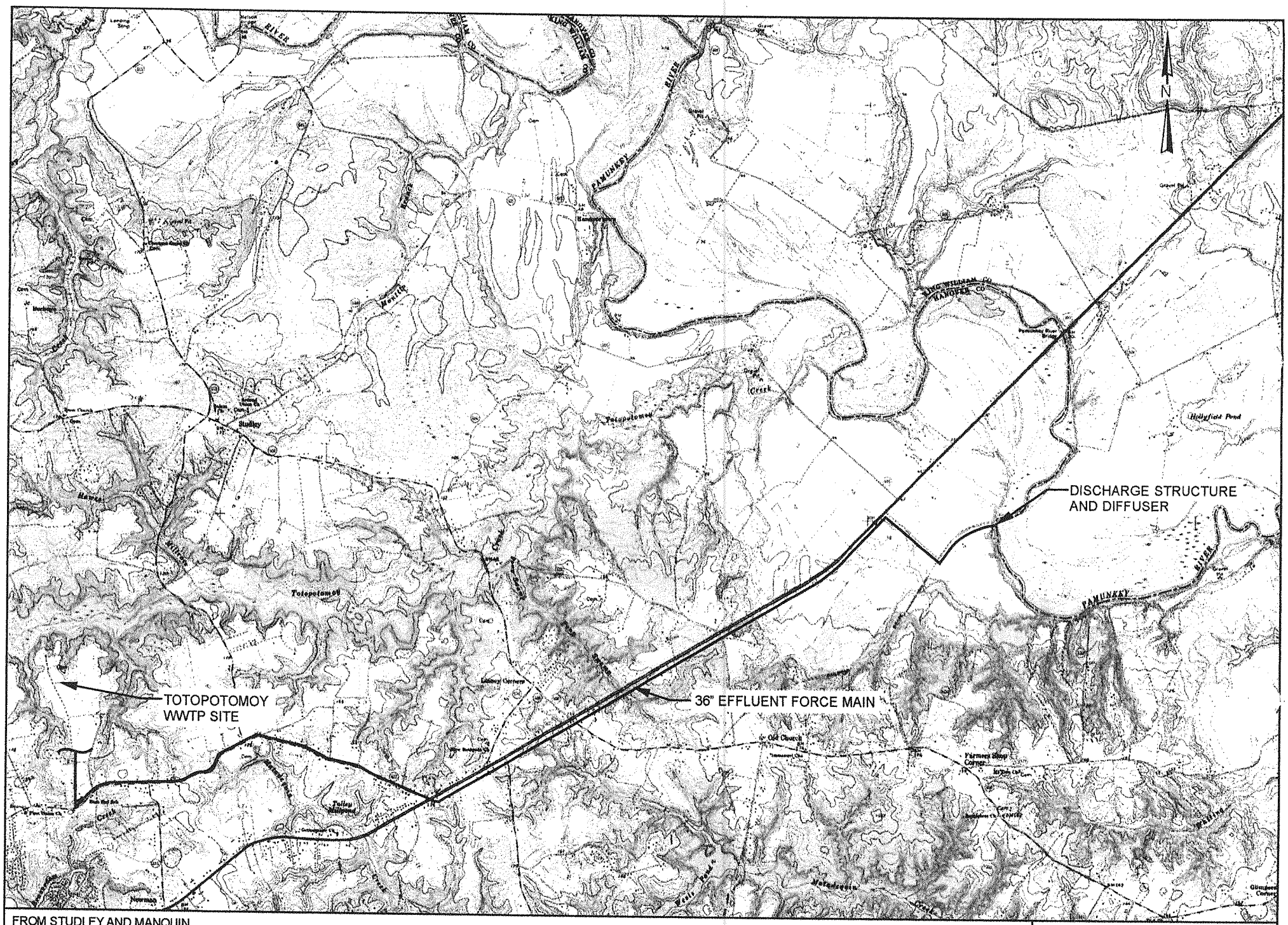


TOTOPOTOMOY WWTP
HANOVER COUNTY, VIRGINIA

SITE LAYOUT
USGS QUAD STUDLEY, VA

September 2003 Sheet 2 of 4

30171-002-SC-04.cdr

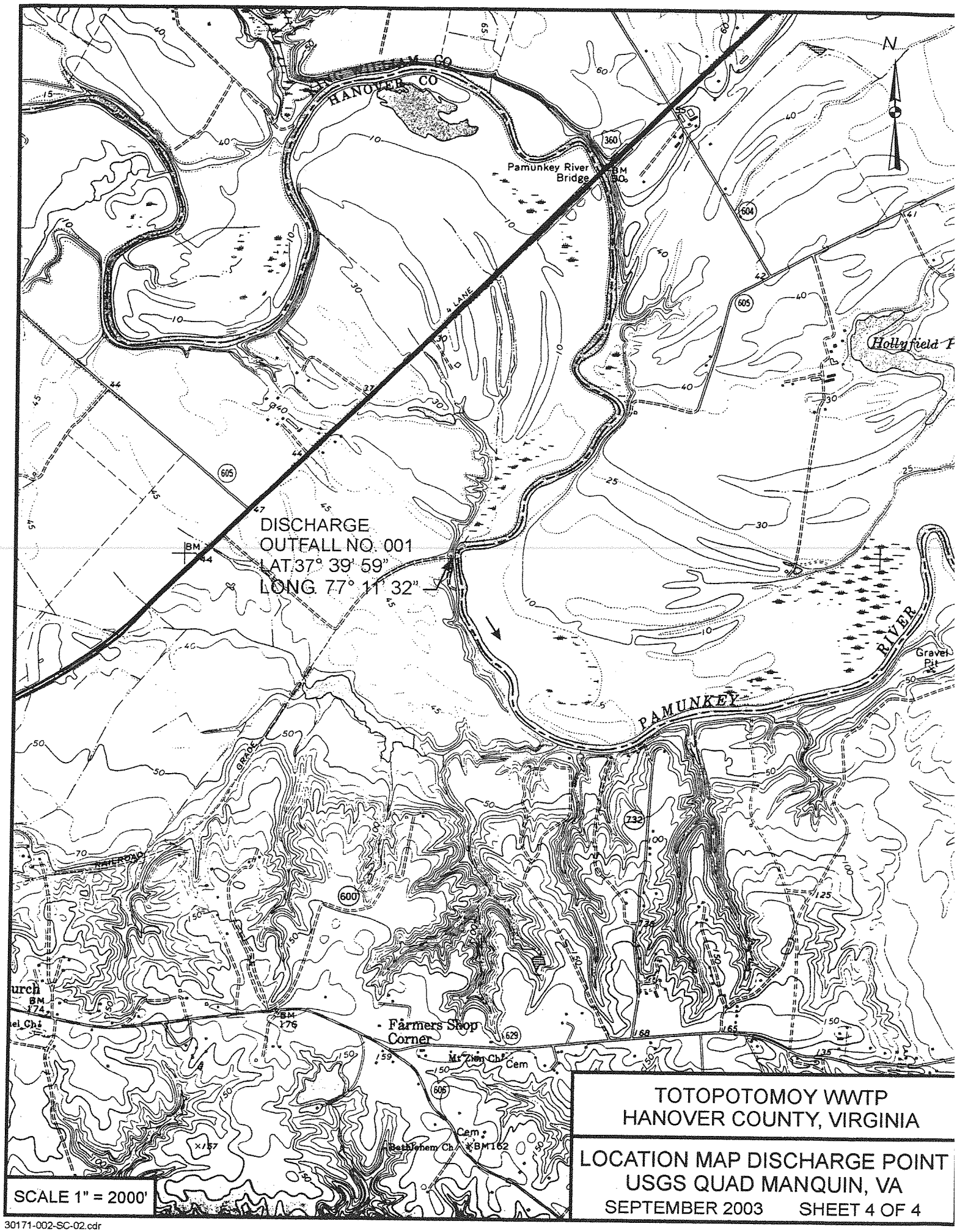


FROM STUDLEY AND MANQUIN
USGS QUAD MAPS

1 ½ 0 1
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 .5 0 3000 1 KILOMETER
CONTOUR INTEVERAL 10 FEET

TOTOPOTOMOY WWTP
HANOVER COUNTY, VIRGINIA

LOCATION MAP
EFFLUENT FORCE MAIN



TOTOPOTOMOY WWTP
HANOVER COUNTY, VIRGINIA

LOCATION MAP DISCHARGE POINT
USGS QUAD MANQUIN, VA
SEPTEMBER 2003 SHEET 4 OF 4

30171-002-SC-02.cdr

Attachment 2

Flow Frequency and 303(d) Determinations

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office
4949-A Cox Road Glen Allen, Virginia 23060

SUBJECT: Flow Frequency Determination / 303(d) Status
Totopotomoy WWTP – VA0089915

TO: Ray Jenkins

FROM: Jennifer Palmore, P.G.

DATE: April 17, 2012
REVISED: May 21, 2012

COPIES: File

Hanover County's Totopotomoy Wastewater Treatment Plant (WWTP) discharges to the Pamunkey River near Manquin, VA. The outfall is located at rivermile 8-PMK054.89. Stream information has been requested for use in developing effluent limitations for the VPDES permit.

The Pamunkey River is tidal at the discharge point. Flow frequencies cannot be determined for tidally affected streams; however, the freshwater inflow into the river has been requested.

The analysis utilizes two continuous record stream gauges: Pamunkey River near Hanover (#01673000) which has been operated since 1941 by the USGS and Totopotomoy Creek near Studley (#01673550) which has been operated since 1978 by the DEQ. The freshwater inflow at the tidal limit was determined by drainage area proportion from the Pamunkey gauge. The flow from the intervening drainage area between the tidal limit and the discharge was calculated by drainage area proportion using the Totopotomoy gauge. The flows were then added. Note: The Pamunkey River is regulated by releases from the Lake Anna dam; therefore only flows after 1972 were used. The flow frequencies are presented below.

Pamunkey River near Hanover, VA (#01673000)
Drainage Area: 1,081 mi^2
Statistical period: 1972-2003
High flow months: December – May

1Q30 = 34 cfs	High Flow 1Q10 = 117 cfs
1Q10 = 46 cfs	High Flow 7Q10 = 134 cfs
7Q10 = 52 cfs	High Flow 30Q10 = 200 cfs
30Q10 = 59 cfs	HM = 285 cfs
30Q5 = 75 cfs	

Pamunkey River at tidal limit
Drainage Area: 1,168 mi^2

1Q30 = 37 cfs	High Flow 1Q10 = 126 cfs
1Q10 = 50 cfs	High Flow 7Q10 = 145 cfs
7Q10 = 56 cfs	High Flow 30Q10 = 216 cfs
30Q10 = 64 cfs	HM = 308 cfs
30Q5 = 81 cfs	

Totopotomoy Creek near Studley, VA (#01673550):

Drainage Area: 26.2 mi^2

Statistical period: 1978-2003

High flow months: January – May

1Q30 = 0.06 cfs	High Flow 1Q10 = 4.2 cfs
1Q10 = 0.24 cfs	High Flow 7Q10 = 5.6 cfs
7Q10 = 0.39 cfs	High Flow 30Q10 = 8.8 cfs
30Q10 = 0.85 cfs	HM = undetermined
30Q5 = 1.8 cfs	

Flow contributed by intervening drainage area:

Drainage Area: 40.5 mi^2

1Q30 = 0.06 cfs	High Flow 1Q10 = 4.5 cfs
1Q10 = 0.26 cfs	High Flow 7Q10 = 6.1 cfs
7Q10 = 0.42 cfs	High Flow 30Q10 = 9.5 cfs
30Q10 = 0.92 cfs	HM = undetermined
30Q5 = 1.9 cfs	

Pamunkey River at discharge point:

Drainage Area: 1,208 mi^2

1Q30 = 37 cfs (24 MGD)	High Flow 1Q10 = 131 cfs (84 MGD)
1Q10 = 50 cfs (32 MGD)	High Flow 7Q10 = 151 cfs (98 MGD)
7Q10 = 56 cfs (36 MGD)	High Flow 30Q10 = 226 cfs (146 MGD)
30Q10 = 65 cfs (42 MGD)	HM = 308 cfs (199 MGD)
30Q5 = 83 cfs (54 MGD)	

This analysis does not address any withdrawals, discharges, or springs lying between the gauge and the discharge point. The high flow months are January through May.

The Water Quality Standards designate the discharge location as tidal freshwater, therefore the Aquatic Life toxics criteria for freshwater should be used.

During the 2010 305(b)/303(d) Integrated Water Quality Assessment, the Pamunkey River was assessed as a Category 5D water ("The Water Quality Standard is not attained where TMDLs for a pollutant(s) have been developed but one or more pollutants are still causing impairment requiring additional TMDL development.") The applicable fact sheets are attached. The Recreation Use is impaired due to E. coli exceedances, the Aquatic Life Use is impaired due to EPA's overlisting of the river for nutrients in 1998, and the Fish Consumption Use is impaired due to VDH advisories for PCBs and mercury. The Wildlife Use was fully supporting.

Please note that the Recreation Use was mistakenly assessed as Category 4A during the 2010 305(b)/303(d) cycle; the draft 2012 report corrects the error and considers the Recreation Use to be Category 5A. The Totopotomoy WWTP was not addressed in the downstream Pamunkey River Basin Bacterial TMDL, therefore the bacterial impairment cannot be considered a nested impairment, as it was in the 2010 assessment, and must be addressed through either a TMDL modification or a new TMDL. The draft 2012 fact sheets are included.

The facility was included in the Chesapeake Bay TMDL, which addressed dissolved oxygen, chlorophyll a, and SAV impairments in the mainstem Bay and its tidal tributaries. The TMDL was approved by the EPA on 12/29/2010. The Totopotomoy WWTP is considered a significant discharger and received individual wasteload allocations of 182,734 lbs/year of total nitrogen, 12,182 lbs/year of total phosphorus, and 913,668 lbs/year of total suspended solids (TSS). The nutrient allocations are administered through the Nutrient Watershed General Permit. The TSS allocations are considered aggregated loads and facilities with technology-based TSS limits are considered to be in conformance with the TMDL.

As the receiving stream is not impaired for any measurable Aquatic Life Use criteria, the river should be considered a Tier 2 waterbody.

Water quality data from DEQ monitoring station 8-PMK056.87 is attached. The station is located on the Pamunkey River at the Route 360 bridge and is approximately 2 miles upstream of the discharge.

If you have any questions concerning this analysis, please let me know.

2010 Fact Sheets for 303(d) Waters

RIVER BASIN: York River Basin

HYDROLOGIC UNIT: 02080106

STREAM NAME: **Pamunkey River**

TMDL ID: **F13E-01-BAC**

2010 IMPAIRED AREA ID: CB-PMKTF

ASSESSMENT CATEGORY: 4A

TMDL DUE DATE: 2020

IMPAIRED SIZE: 0.3049 - Sq. Mi.

Watershed: VAP-F13E

INITIAL LISTING: 2008

UPSTREAM LIMIT: Tidal limit

DOWNSTREAM LIMIT: Pampatike Landing

From the tidal limit at Totopotomoy Creek to Pampatike Landing

CLEAN WATER ACT GOAL AND USE SUPPORT:

Recreation Use - Not Supporting

IMPAIRMENT: E. coli

The Pamunkey River from Pampatike Landing to Macon Creek was initially listed on the 1998 303(d) list as impaired of the Recreation Use goal because of fecal coliform exceedances at Pampatike Landing (Route 654). EPA also identified the station on their list of "Waters Identified to Virginia for Consideration During Development of the Next Listing Cycle." This inclusion was probably in error as the segment was already 303(d) listed.

During the 2006 cycle, the bacteria standard changed to E. coli and the segment had acceptable exceedance rates: 1/19 at 8-PMK048.80 and 0/12 at 8-PMK039.74 and the segment was delisted. However, although the segment had been delisted, it was included in the Pamunkey Basin TMDL which was approved by the EPA on 8/2/2006.

During the 2008 cycle, the Pamunkey River again failed the Recreation Use and expanded upstream to the tidal limit based on E. coli exceedances at 8-PMK048.80 and 8-PMK056.87. Station 8-PMK039.74 had an acceptable exceedance rate (0/21). The exceedance rates during the 2010 cycle are below. The segment upstream of the original impairment will be considered a nested (Category 4A) water.

8-PMK056.87 - 5/32
8-PMK048.80 - 5/37
8-PMK039.74 - 0/21

IMPAIRMENT SOURCE: Point Sources, Nonpoint Sources

Allocations were given to both point and nonpoint sources in the watershed.

RECOMMENDATION: Nested

2010 Fact Sheets for 303(d) Waters

RIVER BASIN: York River Basin **HYDROLOGIC UNIT:** 02080106

STREAM NAME: **Pamunkey River**

TMDL ID: **PMKTF-BNUT-BAY** **2010 IMPAIRED AREA ID:** CB-PMKTF

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2010

IMPAIRED SIZE: - Sq. Mi. **Watershed:** VAP-F13E

INITIAL LISTING: 1998

UPSTREAM LIMIT: Extent of tide at Totopotomoy Creek

DOWNSTREAM LIMIT: Tidal freshwater/Oligohaline boundary

The tidal freshwater Pamunkey River mainstem.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Aquatic Life Use - Not Supporting, Open Water Subuse - Insufficient Information

IMPAIRMENT: Nutrients/Eutrophication Biological Indicators

The tidal Pamunkey River was initially listed on the 1998 303(d) list as fully supporting but threatened of the aquatic life use goal because a 1995 special study showed river subject to 33% exceedance rate of daily mean DO standard during warm weather conditions May through October. The estuarine Pamunkey River is considered fully allocated relative to dissolved oxygen. New discharges cannot result in further DO depression.

The Chesapeake Bay and its tidal tributaries were added by the EPA to the 1998 303(d) list. EPA listed the impairment as dissolved oxygen exceedances caused by nutrient overenrichment. This listing included the entire mainstem estuarine Pamunkey River.

During the 2006 cycle, the new Chesapeake Bay water quality standards were adopted. The tidal freshwater Pamunkey segment failed the default CB 30-day open water summer dissolved oxygen criteria of 5.5 mg/L. Water quality standards specific for the Pamunkey and Mattaponi Rivers were adopted after the close of the assessment period and the new criteria were first used in the 2008 cycle. The specific criteria recognize that dissolved oxygen is naturally depressed in the rivers due to their extensive marsh systems. During the 2010 cycle, the Pamunkey Tidal Freshwater segment is in attainment of both the site-specific 30-day open water summer DO criteria and the 30-day Rest of Year DO criteria.

The Shallow Water Use is fully supporting the SAV acreage and Water Clarity criteria.

Although the Pamunkey Tidal Freshwater segment is in attainment of every Chesapeake Bay criteria which was measured, there is insufficient information to assess the Migratory Spawning Use or the other Open Water Use's dissolved oxygen frequency criteria, therefore the mainstem must remain impaired due to EPA's overlisting.

The tributaries to the segment are considered Category 3B.

IMPAIRMENT SOURCE: Nonpoint Source, Point Source

Tidal marshes contribute to organic loading resulting in DO depressions and full allocation judgment.

RECOMMENDATION: Continue Monitoring

2010 Fact Sheets for 303(d) Waters

RIVER BASIN: York River Basin **HYDROLOGIC UNIT:** 02080106

STREAM NAME: **Pamunkey River**

TMDL ID: **F13R-13-HG** **2010 IMPAIRED AREA ID:** VAP-F13R-13

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2018

IMPAIRED SIZE: 72 - Stream Miles **Watershed:** VAP-F13R

INITIAL LISTING: 2006

UPSTREAM LIMIT: Nelson Bridge Road (Route 615)

DOWNSTREAM LIMIT: Mouth at the York River

The Pamunkey River from Nelson Bridge Road (Route 15) downstream approximately 72 miles to the mouth at the York River.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Fish Consumption Use - Not Supporting

IMPAIRMENT: Mercury

On 9/30/2004, VDH issued a fish consumption advisory from Nelson Bridge Road to Jacks Creek near Liberty Hall. The advisory recommends that no one eat more than 2 meals per month of blue catfish because of mercury contamination in the fish tissue.

This condemnation was expanded on 10/7/2009 and now extends downstream to the mouth at the York River.

The advisory is based on mercury fish tissue exceedances at DEQ monitoring stations 8-PMK056.87, 8-PMK032.00, and 8-PMK006.36.

IMPAIRMENT SOURCE: Unknown, Atmospheric deposition

The source of the mercury is considered unknown, although atmospheric deposition is suspected.

RECOMMENDATION: Problem Characterization

2010 Fact Sheets for 303(d) Waters

RIVER BASIN: York River Basin

HYDROLOGIC UNIT: 02080106

STREAM NAME: **Pamunkey River**

TMDL ID: **F13R-13-PCB**

2010 IMPAIRED AREA ID: VAP-F13R-13

ASSESSMENT CATEGORY: 5A

TMDL DUE DATE: 2022

IMPAIRED SIZE: 72 - Stream Miles

Watershed: VAP-F13R

INITIAL LISTING: 2010

UPSTREAM LIMIT: Nelson Bridge Road (Route 615)

DOWNSTREAM LIMIT: Mouth at the York River

The Pamunkey River from Nelson Bridge Road (Route 15) downstream approximately 72 miles to the mouth at the York River.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Fish Consumption Use - Not Supporting

IMPAIRMENT: PCBs

On 10/7/2009, VDH issued a fish consumption advisory from Nelson Bridge Road to the mouth at West Point. The advisory recommends that no one eat more than 2 meals per month of gizzard shad because of PCB contamination in the fish tissue.

The advisory is based on PCB fish tissue exceedances at DEQ monitoring stations 8-PMK056.87, 8-PMK032.00, and 8-PMK006.36.

IMPAIRMENT SOURCE: Unknown

The source of the PCB is considered unknown.

RECOMMENDATION: Problem Characterization

2012 Fact Sheets for 303(d) Waters

RIVER BASIN: York River Basin

HYDROLOGIC UNIT: 02080106

STREAM NAME: **Pamunkey River**

TMDL ID: **F13E-01-BAC**

2012 IMPAIRED AREA ID: CB-PMKTF

ASSESSMENT CATEGORY: 5A

TMDL DUE DATE: 2020

IMPAIRED SIZE: 0.3049 - Sq. Mi.

Watershed: VAP-F13E

INITIAL LISTING: 2008

UPSTREAM LIMIT: Tidal limit

DOWNSTREAM LIMIT: Pampatike Landing

From the tidal limit at Totopotomoy Creek to Pampatike Landing

CLEAN WATER ACT GOAL AND USE SUPPORT:

Recreation Use - Not Supporting

IMPAIRMENT: E. coli

The Pamunkey River from Pampatike Landing to Macon Creek was initially listed on the 1998 303(d) list as impaired of the Recreation Use goal because of fecal coliform exceedances at Pampatike Landing (Route 654). EPA also identified the station on their list of "Waters Identified to Virginia for Consideration During Development of the Next Listing Cycle." This inclusion was probably in error as the segment was already 303(d) listed.

During the 2006 cycle, the bacteria standard changed to E. coli and the segment had acceptable violation rates: 1/19 at 8-PMK048.80 and 0/12 at 8-PMK039.74 and the segment was delisted. However, although the segment had been delisted, it was included in the Pamunkey Basin TMDL which was approved by the EPA on 8/2/2006.

During the 2008 cycle, the Pamunkey River again failed the Recreation Use and expanded upstream to the tidal limit based on E. coli exceedances at 8-PMK048.80 and 8-PMK056.87. Station 8-PMK039.74 had an acceptable violation rate (0/21).

8-PMK056.87 - 8/32
8-PMK048.80 - 6/27

IMPAIRMENT SOURCE: Point Sources, Nonpoint Sources

Allocations were given to both point and nonpoint sources in the watershed.

RECOMMENDATION: Problem Characterization

2012 Fact Sheets for 303(d) Waters

RIVER BASIN: York River Basin **HYDROLOGIC UNIT:** 02080106

STREAM NAME: **Pamunkey River**

TMDL ID: **PMKTF-BNUT-BAY** **2012 IMPAIRED AREA ID:** CB-PMKTF

ASSESSMENT CATEGORY: 4A **TMDL DUE DATE:** 2010

IMPAIRED SIZE: - Sq. Mi. **Watershed:** VAP-F13E

INITIAL LISTING: 1998

UPSTREAM LIMIT: Extent of tide at Totopotomoy Creek

DOWNSTREAM LIMIT: Tidal freshwater/Oligohaline boundary

The tidal freshwater Pamunkey River mainstem.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Aquatic Life Use - Not Supporting, Open Water Subuse - Insufficient Information

IMPAIRMENT: Nutrients/Eutrophication Biological Indicators

The tidal Pamunkey River was initially listed on the 1998 303(d) list as fully supporting but threatened of the Aquatic Life Use goal because a 1995 special study showed river subject to 33% violation rate of daily mean DO standard during warm weather conditions May through October. The estuarine Pamunkey River is considered fully allocated relative to dissolved oxygen. New discharges cannot result in further DO depression.

The Chesapeake Bay and its tidal tributaries were added by the EPA to the 1998 303(d) list. EPA listed the impairment as dissolved oxygen exceedances caused by nutrient overenrichment. This listing included the entire mainstem estuarine Pamunkey River.

During the 2006 cycle, the new Chesapeake Bay water quality standards were adopted. The tidal freshwater Pamunkey segment failed the default CB 30-day open water summer dissolved oxygen criteria of 5.5 mg/L. Water quality standards specific for the Pamunkey and Mattaponi Rivers were adopted and the new criteria were used in the 2008 cycle. The specific criteria recognize that dissolved oxygen is naturally depressed in the rivers due to their extensive marsh systems. The Pamunkey Tidal Freshwater segment is in attainment of both the site-specific 30-day open water summer DO criteria and the 30-day Rest of Year DO criteria. The Shallow Water Use is fully supporting the SAV acreage criteria.

Although the Pamunkey Tidal Freshwater segment was in attainment of every Chesapeake Bay criteria which were measured, there was insufficient information to assess the Migratory Spawning Use or the other Open Water Use's dissolved oxygen frequency criteria, therefore the mainstem must remain impaired due to EPA's overlisting.

The Chesapeake Bay TMDL was approved by the EPA on 12/31/2010, therefore the Pamunkey is a Cat 4A water. The tributaries will be considered Category 2C.

IMPAIRMENT SOURCE: Nonpoint Source, Point Source

Tidal marshes contribute to organic loading resulting in DO depressions and full allocation judgment.

RECOMMENDATION: Implementation

2012 Fact Sheets for 303(d) Waters

RIVER BASIN: York River Basin **HYDROLOGIC UNIT:** 02080106

STREAM NAME: **Pamunkey River**

TMDL ID: **F13R-13-HG** **2012 IMPAIRED AREA ID:** VAP-F13R-13

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2018

IMPAIRED SIZE: 72 - Stream Miles **Watershed:** VAP-F13R

INITIAL LISTING: 2006

UPSTREAM LIMIT: Nelson Bridge Road (Route 615)

DOWNSTREAM LIMIT: Mouth at the York River

The Pamunkey River from Nelson Bridge Road (Route 15) downstream approximately 72 miles to the mouth at the York River.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Fish Consumption Use - Not Supporting

IMPAIRMENT: Mercury

On 9/30/2004, VDH issued a fish consumption advisory from Nelson Bridge Road to Jacks Creek near Liberty Hall. The advisory recommends that no one eat more than 2 meals per month of blue catfish because of mercury contamination in the fish tissue.

This condemnation was expanded on 10/7/2009 and now extends downstream to the mouth at the York River.

The advisory is based on mercury fish tissue exceedances at DEQ monitoring stations 8-PMK056.87, 8-PMK032.00, and 8-PMK006.36.

IMPAIRMENT SOURCE: Unknown, Atmospheric deposition

The source of the mercury is considered unknown, although atmospheric deposition is suspected.

RECOMMENDATION: Problem Characterization

2012 Fact Sheets for 303(d) Waters

RIVER BASIN: York River Basin **HYDROLOGIC UNIT:** 02080106

STREAM NAME: **Pamunkey River**

TMDL ID: **F13R-13-PCB** **2012 IMPAIRED AREA ID:** VAP-F13R-13

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2022

IMPAIRED SIZE: 72 - Stream Miles **Watershed:** VAP-F13R

INITIAL LISTING: 2010

UPSTREAM LIMIT: Nelson Bridge Road (Route 615)

DOWNSTREAM LIMIT: Mouth at the York River

The Pamunkey River from Nelson Bridge Road (Route 15) downstream approximately 72 miles to the mouth at the York River.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Fish Consumption Use - Not Supporting

IMPAIRMENT: PCBs

On 10/7/2009, VDH issued a fish consumption advisory from Nelson Bridge Road to the mouth at West Point. The advisory recommends that no one eat more than 2 meals per month of gizzard shad because of PCB contamination in the fish tissue.

The advisory is based on PCB fish tissue exceedances at DEQ monitoring stations 8-PMK056.87, 8-PMK032.00, and 8-PMK006.36.

IMPAIRMENT SOURCE: Unknown

The source of the PCB is considered unknown.

RECOMMENDATION: Problem Characterization

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Salinity
8-PMK056.87	7/2/1968	S	0.3	29.44	7		8	
8-PMK056.87	8/27/1968	S	0.3	26.67	7.2		4.5	
8-PMK056.87	9/13/1968	S	0.3	22.22	7.8		8	
8-PMK056.87	2/5/1970	S	0.3	4.44	6.7		12.79	
8-PMK056.87	3/19/1970	S	0.3	5.56	6.7		12.59	
8-PMK056.87	4/14/1970	S	0.3	12.22	6.7		9.6	
8-PMK056.87	5/7/1970	S	0.3	16.11	7.5		8.3	
8-PMK056.87	5/31/1970	S	0.3	21.11	7.7		8.8	
8-PMK056.87	7/11/1970	S	0.3		6.5		5.8	
8-PMK056.87	9/2/1970	S	0.3	25.56	7		7	
8-PMK056.87	10/29/1970	S	0.3	15	6.7		7.2	
8-PMK056.87	11/22/1970	S	0.3	7.22	6.8		9.2	
8-PMK056.87	5/6/1971	S	0.3	17.22	7		9	
8-PMK056.87	6/1/1971	S	0.3	16.67	6.7		7.8	
8-PMK056.87	7/11/1971	S	0.3	27.22	7.3		6.5	
8-PMK056.87	8/30/1971	S	0.3	24.44			6.4	
8-PMK056.87	9/2/1971	S	0.3	22.78	6.3		6.2	
8-PMK056.87	11/10/1971	S	0.3	8.89	6.2		11	
8-PMK056.87	4/3/1972	S	0.3	9.44	6.8		11	
8-PMK056.87	8/18/1972	S	0.3	23.89	6.7		7	
8-PMK056.87	8/31/1972	S	0.3	24.44	7		7.6	
8-PMK056.87	10/31/1972	S	0.3	12.22	6.5		8	
8-PMK056.87	12/11/1972	S	0.3	8.33	6.7		11	
8-PMK056.87	2/16/1973	S	0.3	2.22	6.6		12.79	
8-PMK056.87	4/17/1973	S	0.3	12.22	6.8		9.6	
8-PMK056.87	5/28/1973	S	0.3	18.89	6.9		8.4	
8-PMK056.87	6/19/1973	S	0.3	22.22	6.7		6.2	
8-PMK056.87	7/30/1973	S	0.3	27.78	7.6		7.8	
8-PMK056.87	8/19/1973	S	0.3	26.11	7		8.2	
8-PMK056.87	9/17/1973	S	0.3	23.33	7		8	
8-PMK056.87	10/12/1973	S	0.3	18.89	6.9		7.8	
8-PMK056.87	11/14/1973	S	0.3	8.89	7		11.19	
8-PMK056.87	12/3/1973	S	0.3	6.11	6.8			
8-PMK056.87	1/17/1974	S	0.3	5.56	6.5		10	
8-PMK056.87	2/20/1974	S	0.3	5.56	6.9		11.59	
8-PMK056.87	3/4/1974	S	0.3	10	7.2		11.39	
8-PMK056.87	4/16/1974	S	0.3		6.5		7.6	
8-PMK056.87	5/13/1974	S	0.3	18.89	7		8.2	
8-PMK056.87	6/12/1974	S	0.3	24.44	7		6.2	
8-PMK056.87	7/15/1974	S	0.3	26.67	7.5		9	
8-PMK056.87	8/11/1974	S	0.3	23.89	7		7	
8-PMK056.87	9/20/1974	S	0.3	22.22	7		7.5	
8-PMK056.87	1/6/1975	S	0.3	2.22	7		12	
8-PMK056.87	2/10/1975	S	0.3	4.44	7		12	
8-PMK056.87	3/20/1975	S	0.3	10	6.5		9	
8-PMK056.87	4/2/1975	S	0.3	12.22	7		9.2	
8-PMK056.87	5/6/1975	S	0.3	16.67	7		9	
8-PMK056.87	6/5/1975	S	0.3	22.22	6.9		7.4	
8-PMK056.87	7/15/1975	S	0.3	22.22	6.4		5.6	
8-PMK056.87	7/30/1975	S	0.3	25.56	6.9		6.6	
8-PMK056.87	8/28/1975	S	0.3	25.56	7		6.6	
8-PMK056.87	9/9/1975	S	0.3	23.33	7.2		6.8	
8-PMK056.87	10/17/1975	S	0.3	17.78	6.8		7.8	
8-PMK056.87	11/13/1975	S	0.3	14.44	7		8.6	
8-PMK056.87	12/3/1975	S	0.3	8.89	7		11	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Salinity
8-PMK056.87	1/14/1976	S	0.3	4.44	6.5		12.19	
8-PMK056.87	2/20/1976	S	0.3	11.11	7		10.19	
8-PMK056.87	4/15/1976	S	0.3	15.56	7.5		10	
8-PMK056.87	5/10/1976	S	0.3	17.78	7		8	
8-PMK056.87	6/2/1976	S	0.3	21.11	6.8		6.6	
8-PMK056.87	7/6/1976	S	0.3	23.89	7.1		7.7	
8-PMK056.87	8/18/1976	S	0.3	23.33	7.3		6.8	
8-PMK056.87	9/15/1976	S	0.3	21.11	7.5		7.6	
8-PMK056.87	10/11/1976	S	0.3	17.22	7		7.8	
8-PMK056.87	12/13/1976	S	0.3	6.67	7.4		11.19	
8-PMK056.87	2/28/1977	S	0.3	10.5	7.5		9.5	
8-PMK056.87	4/6/1977	S	0.3	14	8.5		8.2	
8-PMK056.87	5/12/1977	S	0.3	19	7.5		8.6	
8-PMK056.87	6/8/1977	S	0.3	26	7.5		9	
8-PMK056.87	8/17/1977	S	0.3	30	6.6		5	
8-PMK056.87	10/28/1977	S	0.3	17	6.5		7	
8-PMK056.87	11/15/1977	S	0.3	1.4	6.8		8.8	
8-PMK056.87	12/14/1977	S	0.3	0.4	7		13.39	
8-PMK056.87	1/10/1978	S	0.3	0	7.5		13.39	
8-PMK056.87	3/9/1978	S	0.3	6	6.9		10.59	
8-PMK056.87	4/13/1978	S	0.3	21	7.5		8.4	
8-PMK056.87	5/10/1978	S	0.3	16	6.7		8.2	
8-PMK056.87	6/1/1978	S	0.3	24	6.5		6.4	
8-PMK056.87	6/6/1978	S	0.3	24	6.5		6.4	
8-PMK056.87	7/26/1978	S	0.3	28.5	7.5		6.6	
8-PMK056.87	8/7/1978	S	0.3	27	6.7		6	
8-PMK056.87	10/11/1978	S	0.3	15	7.5		8.3	
8-PMK056.87	10/11/1978	S	0.3	15	7.5		8.3	
8-PMK056.87	11/20/1978	S	0.3	12	7.3		9.2	
8-PMK056.87	11/20/1978	S	0.3	12	7.3		9.2	
8-PMK056.87	12/13/1978	S	0.3	6	7		11.2	
8-PMK056.87	1/8/1979	S	0.3	4	6.5		11.6	
8-PMK056.87	3/22/1979	S	0.3		7.5		9.8	
8-PMK056.87	4/24/1979	S	0.3	20	6.5		6	
8-PMK056.87	6/14/1979	S	0.3	21	6.3		7.9	
8-PMK056.87	8/8/1979	S	0.3	30	7.6		8.6	
8-PMK056.87	9/20/1979	S	0.3	18	6.9		7.8	
8-PMK056.87	10/16/1979	S	0.3	13	6.4		9.3	
8-PMK056.87	11/14/1979	S	0.3	9.5	6.8		9.3	
8-PMK056.87	12/11/1979	S	0.3	5.5	6.9		12	
8-PMK056.87	1/29/1980	S	0.3	4	7.2		11.4	
8-PMK056.87	2/27/1980	S	0.3	5.5	7		11.6	
8-PMK056.87	3/17/1980	S	0.3	7	6.5		11.3	
8-PMK056.87	4/15/1980	S	0.3					
8-PMK056.87	5/12/1980	S	0.3	17	6.7		8.4	
8-PMK056.87	6/16/1980	S	0.3	24	7		7	
8-PMK056.87	7/10/1980	S	0.3	28	6.9		6.7	
8-PMK056.87	7/13/1980	S	0.3	27	7.5		5.8	
8-PMK056.87	7/15/1980	S	0.3	26.5	7.3		6.3	
8-PMK056.87	8/4/1980	S	0.3	29.5	7.1		5.8	
8-PMK056.87	9/8/1980	S	0.3	26	7		6.1	
8-PMK056.87	10/14/1980	S	0.3	14	7.2		9.4	
8-PMK056.87	11/24/1980	S	0.3	4.5	6.8		11.8	
8-PMK056.87	12/16/1980	S	0.3	5	6.7		12	
8-PMK056.87	2/17/1981	S	0.3	4	6.5		11.4	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Salinity
8-PMK056.87	3/18/1981	S	0.3	8	6.7		10.2	
8-PMK056.87	4/16/1981	S	0.3	18	7.5		8.4	
8-PMK056.87	5/12/1981	S	0.3	17.5	6.3		7	
8-PMK056.87	6/15/1981	S	0.3	28	7.1		5	
8-PMK056.87	7/14/1981	S	0.3	29.5	7		6.5	
8-PMK056.87	8/12/1981	S	0.3	26	6.5		5.7	
8-PMK056.87	9/10/1981	S	0.3	23.5	7.2		6.4	
8-PMK056.87	11/19/1981	S	0.3		7.5		11	
8-PMK056.87	12/8/1981	S	0.3	5	7		12.8	
8-PMK056.87	2/9/1982	S	0.3	4	6.5		9.4	
8-PMK056.87	3/24/1982	S	0.3	9.5	6		7.5	
8-PMK056.87	4/28/1982	S	0.3	16	6.8		6.5	
8-PMK056.87	6/29/1982	S	0.3	26	6.6		6.4	
8-PMK056.87	7/28/1982	S	0.3	28	6.5		4.8	
8-PMK056.87	8/18/1982	S	0.3	24.5	6.3		5.8	
8-PMK056.87	10/19/1982	S	0.3	12	6.3		7.9	
8-PMK056.87	11/17/1982	S	0.3	8.5	6.5		12.4	
8-PMK056.87	12/16/1982	S	0.3	5.49	6.5		12.6	
8-PMK056.87	1/27/1983	S	0.3	4	6		12.7	
8-PMK056.87	3/15/1983	S	0.3	9.49	6.5		10	
8-PMK056.87	4/19/1983	S	0.3	11	6.2		9	
8-PMK056.87	5/19/1983	S	0.3	16	6.3		8.8	
8-PMK056.87	6/21/1983	S	0.3	24	6.7		6.4	
8-PMK056.87	7/12/1983	S	0.3	25.5	6.5		6.7	
8-PMK056.87	11/15/1983	S	0.3	7	6.5		10.7	
8-PMK056.87	12/8/1983	S	0.3	6	7.5		10	
8-PMK056.87	2/5/1984	S	0.3	7	7.2		11.3	
8-PMK056.87	2/7/1984	S	0.3	2.5	6.5		12	
8-PMK056.87	4/26/1984	S	0.3	13			8.8	
8-PMK056.87	6/4/1984	S	0.3	19.5	5.7		7.9	
8-PMK056.87	7/3/1984	S	0.3	26	6.51		8.5	
8-PMK056.87	8/13/1984	S	0.3	24.5	6.5		6.4	
8-PMK056.87	9/5/1984	S	0.3	23	6.17		6.8	
8-PMK056.87	10/10/1984	S	0.3	16	6.76		8.3	
8-PMK056.87	1/7/1985	S	0.3	6.1	5.4		13.7	
8-PMK056.87	2/20/1985	S	0.3	4	5.8		12.2	
8-PMK056.87	3/6/1985	S	0.3	10	5.7		10.2	
8-PMK056.87	4/3/1985	S	0.3	13.3	6.7		8.9	
8-PMK056.87	5/7/1985	S	0.3	20.5	7		8	
8-PMK056.87	6/17/1985	S	0.3	24	7.1		7.4	
8-PMK056.87	7/9/1985	S	0.3	26.5	7.1		6.9	
8-PMK056.87	8/27/1985	S	0.3	23	6.2		6.1	
8-PMK056.87	9/24/1985	S	0.3	20	7.3		7.2	
8-PMK056.87	10/22/1985	S	0.3	16.5	6.2		8.1	
8-PMK056.87	12/2/1985	S	0.3	12	7.6		9.5	
8-PMK056.87	1/7/1986	S	0.3	3	6.4		13	
8-PMK056.87	2/5/1986	S	0.3	6	6.7		11.7	
8-PMK056.87	3/4/1986	S	0.3	5	6.7		11.9	
8-PMK056.87	4/2/1986	S	0.3	17	6.6		8.7	
8-PMK056.87	5/6/1986	S	0.3	18.5	7.15		7.9	
8-PMK056.87	6/11/1986	S	0.3	25	7.26		6.1	
8-PMK056.87	7/1/1986	S	0.3	26	7.8		5.9	
8-PMK056.87	8/12/1986	S	0.3	25.5	7.42		5.9	
8-PMK056.87	9/11/1986	S	0.3	21	7.55		7.8	
8-PMK056.87	10/15/1986	S	0.3	17.5	5.67		7.6	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Salinity
8-PMK056.87	11/6/1986	S	0.3	13	7.21		8.4	
8-PMK056.87	12/8/1986	S	0.3	5	7.7		11.4	
8-PMK056.87	1/15/1987	S	0.3	5.5	7.3		11.4	
8-PMK056.87	2/9/1987	S	0.3	4	7.84		11.6	
8-PMK056.87	3/9/1987	S	0.3	9.5	8.01		10.4	
8-PMK056.87	4/22/1987	S	0.3	15.3	6.77		7	
8-PMK056.87	5/14/1987	S	0.3	19	7.35		8	
8-PMK056.87	6/18/1987	S	0.3	26	6.79		5.7	
8-PMK056.87	6/18/1987	S	0.3	26	6.79		5.7	
8-PMK056.87	7/23/1987	S	0.3	28.9	7.66		5.9	
8-PMK056.87	8/13/1987	S	0.3	27.1	6.91		4.6	
8-PMK056.87	9/17/1987	S	0.3	24	7.28		7.2	
8-PMK056.87	10/6/1987	S	0.3	14	7.57		9.7	
8-PMK056.87	11/19/1987	S	0.3	10.5	8.06		10.2	
8-PMK056.87	12/21/1987	S	0.3	6	8.25		11.4	
8-PMK056.87	1/6/1988	S	0.3	2	8.39		11.8	
8-PMK056.87	2/24/1988	B	1	5.9	7.5		12.3	
8-PMK056.87	3/14/1988	S	0.3	9.3	7.64		10.1	
8-PMK056.87	4/13/1988	S	0.3				9.6	
8-PMK056.87	5/4/1988	S	0.3	14.9	7.23		8.5	
8-PMK056.87	6/22/1988	S	0.3	26.5	7.1		6.3	
8-PMK056.87	7/11/1988	S	0.3	27	7.21		6.4	
8-PMK056.87	8/4/1988	S	0.3	26.5	7.2		6.2	
8-PMK056.87	9/8/1988	S	0.3	19.9	6.97		7.7	
8-PMK056.87	10/24/1988	S	0.3	13.5	7.56		8	
8-PMK056.87	10/24/1988	S	0.3	13.5	7.56		8	
8-PMK056.87	10/24/1988	S	0.3	13.5	7.56		8	
8-PMK056.87	11/21/1988	S	0.3	6.5	7.03		11.2	
8-PMK056.87	4/11/1989	S	0.3	10.6	7.93		10.3	
8-PMK056.87	5/4/1989	S	0.3	14.6	6.85		7.6	
8-PMK056.87	5/10/1989	S	0.3	14.6	6.85		7.6	
8-PMK056.87	6/12/1989	S	0.3	23.7	7.15		7.2	
8-PMK056.87	7/10/1989	S	0.3	25.1	6.86		6.4	
8-PMK056.87	8/31/1989	S	0.3	25.4	6.98		6.6	
8-PMK056.87	9/14/1989	S	0.3	25.4	6.91		6.5	
8-PMK056.87	10/10/1989	S	0.3	13.1	7.64		9.6	
8-PMK056.87	11/15/1989	S	0.3	14.5	7.15		10.3	
8-PMK056.87	11/15/1989	S	0.3	14.5	7.15		10.3	
8-PMK056.87	12/14/1989	S	0.3	1.5	7.26		4.2	
8-PMK056.87	1/10/1990	S	0.3	5.1	7.09		12.8	
8-PMK056.87	3/7/1990	S	0.3	7.6	7.99		12.5	
8-PMK056.87	4/12/1990	S	0.3	11.7	7.78		10	
8-PMK056.87	5/15/1990	S	0.3	19	6.97		8.3	
8-PMK056.87	6/12/1990	S	0.3	23.4	7.12		7.1	
8-PMK056.87	7/17/1990	S	0.3	26.2	7.28		6.4	
8-PMK056.87	8/14/1990	B	1	26.02	6.61	6.8		
8-PMK056.87	8/14/1990	S	0.3			6.8		
8-PMK056.87	9/17/1990	S	0.3	22.1	6.98	7.15	7.1	
8-PMK056.87	10/15/1990	S	0.3	22.73	6.73	5.6		
8-PMK056.87	11/28/1990	S	0.3	11.5	7.05	9.89	9.9	
8-PMK056.87	12/17/1990	S	0.09	6.4	7.12	12.32	12.3	
8-PMK056.87	3/13/1991	S	0.09	7.64	7.14	11.71	11.7	
8-PMK056.87	4/10/1991	S	0.09	20.33	6.91	7.51	7.5	
8-PMK056.87	5/8/1991	S	0.09	20.77	6.82	7.28	7.3	
8-PMK056.87	6/10/1991	S	0.3	23.05	6.97		7.56	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Salinity
8-PMK056.87	7/1/1991	S	0.3	28.6	6.55	5.55		
8-PMK056.87	8/5/1991	S	0.3	27.25	6.28	5.83		
8-PMK056.87	9/4/1991	S	0.3	24.52	6.86	7.4		
8-PMK056.87	9/30/1991	S	0.3	18.34	7.17	8.01		
8-PMK056.87	12/3/1991	S	0.3	12.07	6.74	8.98		
8-PMK056.87	1/6/1992	S	0.3	7.71	6.25	11.07		
8-PMK056.87	2/18/1992	S	0.3	6.88	6.5	12.44		
8-PMK056.87	3/4/1992	S	0.3	10.01	6.23	10.7		
8-PMK056.87	4/13/1992	S	0.3	18.02	6.34	7.95		
8-PMK056.87	5/11/1992	S	0.3	16.15	6.02	8.57		
8-PMK056.87	6/10/1992	S	0.3	22.57	6.68	6.61		
8-PMK056.87	7/7/1992	S	0.3	24.43	6.29	6.02		
8-PMK056.87	8/17/1992	S	0.3	20.93	5.85	7.37		
8-PMK056.87	9/2/1992	S	0.3	23.61	6.74	6.76		
8-PMK056.87	10/1/1992	S	0.3	16.61	6.7	8.34		
8-PMK056.87	11/3/1992	S	0.3	14.23	6.45	10.68		
8-PMK056.87	12/2/1992	S	0.3	7.52	6.8	11.28		
8-PMK056.87	1/5/1993	S	0.3	8.92	6.42	10.71		
8-PMK056.87	2/1/1993	S	0.3	4.62	6.57	12.49		
8-PMK056.87	3/3/1993	S	0.3	5.84	6.38	12.18		
8-PMK056.87	4/5/1993	S	0.3	12.09	6.36	9.87		
8-PMK056.87	5/4/1993	S	0.3	18.89	6.37	8.12		
8-PMK056.87	6/1/1993	S	0.3	21.79	6.32	7.39		
8-PMK056.87	7/12/1993	S	0.3	29.42	6.53	5.6		
8-PMK056.87	8/9/1993	S	0.3	24.11	6.53	7.07		
8-PMK056.87	9/1/1993	S	0.3	27.83	6.71	5.83		
8-PMK056.87	10/7/1993	S	0.3	16.55	7.06	8.86		
8-PMK056.87	11/2/1993	S	0.3	10.04	6.63	9.71		
8-PMK056.87	12/20/1993	S	0.3	5.38	6.73	11.91		
8-PMK056.87	8/30/1995	S	1	25.48	6.35	6.5		
8-PMK056.87	9/1/1995	S	1	26.33	6.89	6.42		
8-PMK056.87	9/13/1995	S	2	22.99	7.07	6.95		
8-PMK056.87	9/20/1995	S	2	20.64	6.86	6.3		
8-PMK056.87	9/27/1995	S	2	18.24	6.98	7.56		
8-PMK056.87	10/4/1995	S	2	19.18	6.97	7.65		
8-PMK056.87	9/11/1996	S	1	24.44	6.22	3.93		
8-PMK056.87	7/8/1997	S	0.3	25.49	6.92	5.97		
8-PMK056.87	8/11/1997	S	0.3	24.24	6.96	7.57		
8-PMK056.87	9/30/1997	S	0.3	19.3	6.89	6.82		0
8-PMK056.87	10/20/1997	S	0.3	13.68	6.74	6.76		
8-PMK056.87	11/6/1997	S	0.3	10.13	6.79	8.1		
8-PMK056.87	12/1/1997	S	0.3	9.38	6.7	10.01		
8-PMK056.87	1/5/1998	S	0.3	4.83	6.62	12.22		
8-PMK056.87	2/4/1998	S	0.3	5.76	6.31	11.26		
8-PMK056.87	3/11/1998	S	0.3	9.2	6.09	9.45		
8-PMK056.87	4/8/1998	S	0.3	12.92	6.28	9.04		
8-PMK056.87	5/6/1998	S	0.3	18.23	6.56	8.35		
8-PMK056.87	6/3/1998	S	0.3	24.15	6.52	6.81		
8-PMK056.87	7/7/1998	S	0.3	26	6.44	6.88		
8-PMK056.87	8/24/1998	S	0.3	25.8	6.7	5.98		
8-PMK056.87	9/21/1998	S	0.3	25.5	6.71	5.6		
8-PMK056.87	10/19/1998	S	0.3	15.6	6.32	8.55		
8-PMK056.87	11/23/1998	S	0.3	8.42	6.54	11.12		
8-PMK056.87	12/16/1998	S	0.3	6.14	6.67	10.94		0.1
8-PMK056.87	1/14/1999	S	0.3	4.03	6.41	10.21		

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Salinity
8-PMK056.87	2/8/1999	S	0.3	6.35	6.62	9.98		
8-PMK056.87	3/8/1999	S	0.3	6.34	6.54	11.73		
8-PMK056.87	4/12/1999	S	0.3	15.89	6.72	6.45		
8-PMK056.87	5/24/1999	S	0.3	23.04	6.59	6.2		
8-PMK056.87	6/16/1999	S	0.3	23.92	6.55	6.45		
8-PMK056.87	7/22/1999	S	0.3	28.54	6.85	5.25		0.1
8-PMK056.87	8/17/1999	S	0.3	27.07	6.83	5.12		0.1
8-PMK056.87	9/15/1999	S	0.3	22.37	6.8	6.3		0
8-PMK056.87	10/7/1999	S	0.3	16.24	6.45	6.19		0.1
8-PMK056.87	11/4/1999	S	0.3	11.73	6.53	6.05		0
8-PMK056.87	2/16/2000	S	0.3	5.84	7.14	13.31		0
8-PMK056.87	3/15/2000	S	0.3	12.32	6.56	10.31		0
8-PMK056.87	4/25/2000	S	0.3	15.15	6.59	8.63		0
8-PMK056.87	5/25/2000	S	0.3	20.52	6.87	7.32		0
8-PMK056.87	6/6/2000	S	0.3	20.85	6.72	6.89		
8-PMK056.87	7/17/2000	S	0.3	23.86	6.6	5.83		0.1
8-PMK056.87	8/15/2000	S	0.3	24.06	6.27	7.7		0
8-PMK056.87	9/27/2000	S	0.3	16.64	6.64	7.27		0
8-PMK056.87	10/19/2000	S	0.3	15.8	6.64	7.1		0.1
8-PMK056.87	11/2/2000	S	0.3	10.47	7.06	8.71		0.1
8-PMK056.87	12/6/2000	S	0.3	1.44	6.83	10.97		0
8-PMK056.87	1/3/2001	S	0.3	0.01	6.63	14.7		0
8-PMK056.87	2/15/2001	S	0.3	7.93	6.79	11.32		0
8-PMK056.87	3/27/2001	S	0.3	9.95	6.63	10.25		0
8-PMK056.87	4/19/2001	S	0.3	13.04	6.47	8.04		0
8-PMK056.87	5/22/2001	S	0.3	18.39	6.75	7.55		0.08
8-PMK056.87	7/18/2001	S	0.3	25.81	6.76	7.19		0
8-PMK056.87	9/20/2001	S	0.3	19.8	6.84	7.32		
8-PMK056.87	11/28/2001	S	0.3	12.39	6.66	8.54		0.1
8-PMK056.87	1/9/2002	S	0.3	0.74	6.23	13.94		0
8-PMK056.87	3/28/2002	S	0.3	12.14	6.89	8.94		0
8-PMK056.87	5/20/2002	S	0.3	18.33	6.74	7.3		0
8-PMK056.87	8/21/2002	S	0.3	28.48	7.11	5.14		0
8-PMK056.87	10/24/2002	S	0.3	13.8	6.94	8.57		0
8-PMK056.87	12/9/2002	S	0.3	0.99	6.99	14.48		0
8-PMK056.87	2/20/2003	S	0.3	2.98	6.88	13.61		0
8-PMK056.87	4/24/2003	S	0.3	14.82	6.66	9.05		0
8-PMK056.87	6/18/2003	S	0.3	21.08	6.55	6.64		0
8-PMK056.87	8/28/2003	S	0.3	26.28	6.75	6.03		0
8-PMK056.87	10/23/2003	S	0.3	13.93	6.64	8.23		0
8-PMK056.87	12/29/2003	S	0.3	5.58	6.76	11.62		0
8-PMK056.87	2/24/2004	S	0.3	7.16	6.48	11.28		0
8-PMK056.87	4/21/2004	S	0.3	20.46	6.79	7.42		0
8-PMK056.87	6/9/2004	S	0.3	23.44	6.84	6.88		0
8-PMK056.87	7/22/2004	S	0.3	26.38	6.69	6.18		
8-PMK056.87	8/30/2004	S	0.3	25.47	6.99	0.69		0
8-PMK056.87	11/22/2004	S	0.3	13.37	6.33	9.32		0
8-PMK056.87	1/18/2005	S	0.3	5.18	6.37	12.23		0
8-PMK056.87	3/30/2005	S	0.3	11.22	7.07	10.16		0
8-PMK056.87	5/25/2005	S	0.3	16.89	6.91	7.55		0
8-PMK056.87	6/29/2005	S	0.3	26.57	7.01	6.04		0
8-PMK056.87	9/29/2005	S	0.3	21.99	7.42	6.31		
8-PMK056.87	11/2/2005	S	0.3	11.17	7.45	7.27		0
8-PMK056.87	1/19/2006	S	0.3	7.35	7.35	11.55		0
8-PMK056.87	3/27/2006	S	0.3	9.7	7	11.5		0

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Salinity
8-PMK056.87	5/22/2006	S	0.3	20	7.2	7.6		0
8-PMK056.87	7/11/2006	S	0.3	25.5	7	3.3		0
8-PMK056.87	9/5/2006	S	0.3	21	6.9	6.7		0
8-PMK056.87	11/13/2006	S	0.3	13	6.2	8.9		0
8-PMK056.87	2/27/2007	S	0.3	5.4	6.3	11.5		0
8-PMK056.87	4/23/2007	S	0.3	16	6.9	8.9		0
8-PMK056.87	5/2/2007	S	0.3	20.3	6.8	7.7		
8-PMK056.87	6/27/2007	S	0.3	26.4	6.5	6.1		0
8-PMK056.87	8/28/2007	S	0.3	26.3	7.2	5.5		0
8-PMK056.87	10/25/2007	S	0.3	18	6.8	6		
8-PMK056.87	11/29/2007	S	0.3	8.3	6.7	9.8		
8-PMK056.87	12/4/2007	S	0.3	5.8	6.7	11.4		0
8-PMK056.87	2/13/2008	S	0.3	4.8	6.2	12.3		
8-PMK056.87	4/1/2008	S	0.3	14.5	6.3	9.1		0
8-PMK056.87	6/11/2008	S	0.3	28.4	6.4	5.5		0
8-PMK056.87	7/18/2008	S	0.3	26.9	6.6	6		
8-PMK056.87	8/5/2008	S	0.3	27.7	7.1	5.9		0
8-PMK056.87	10/9/2008	S	0.3	17.6	6.7	8.7		0
8-PMK056.87	12/10/2008	S	0.3	5.7	7	12.1		
8-PMK056.87	1/6/2009	S	0.3	6	6.2	11.2		0
8-PMK056.87	3/23/2009	S	0.3	9.8	7.2	8.5		0
8-PMK056.87	5/5/2009	S	0.3	18.5	7.1	6.8		0
8-PMK056.87	6/24/2009	S	0.3	25.1	6.8	6.5		
8-PMK056.87	7/6/2009	S	0.3	23.5	7	5.2		0
8-PMK056.87	9/14/2009	S	0.3	21.5	6.8	6.7		
8-PMK056.87	11/2/2009	S	0.3	13.8	6.4	7.6		
8-PMK056.87	4/1/2010	S	0.3	13.5	5.6	6.7		
8-PMK056.87	4/30/2010	S	0.3	16.5	6.6	8.6		
8-PMK056.87	6/16/2010	S	0.3	27.1	7	6.6		
8-PMK056.87	8/16/2010	S	0.3	26.3	6.6	6.8		
8-PMK056.87	11/23/2010	S	0.3	10.1	6.4	9.9		
8-PMK056.87	1/10/2011	S	0.3	0.5	6.9	13.9		
8-PMK056.87	2/2/2011	S	0.3	5.5	6.4	13.2		
8-PMK056.87	3/24/2011	S	0.3	14.3	6.6	8.2		
8-PMK056.87	4/13/2011	S	0.3	17.7	6.8	8		
8-PMK056.87	5/31/2011	S	0.3	26.6	6.8	5.6		
8-PMK056.87	6/21/2011	B	0.9	24.7	7.3	7.1		0
8-PMK056.87	6/22/2011	S	0.3	24.8	7.2	6.1		0
8-PMK056.87	7/18/2011	S	0.3	26.7	7.1	5.5		0
8-PMK056.87	8/2/2011	S	0.3	29.2	7.2	5		0
8-PMK056.87	9/12/2011	S	0.3	22.8	6.1	2.9		0
8-PMK056.87	10/5/2011	S	0.3	16.3	6.4	9		
8-PMK056.87	11/29/2011	S	0.3	12	6.6	9.6		
8-PMK056.87	12/21/2011	S	0.3	8.54	6.75	11.43		
8-PMK056.87	1/30/2012	S	0.3	7.35	7.18	11.04		
8-PMK056.87	2/13/2012	S	0.3	6.7	7.02	10.31		
8-PMK056.87	2/15/2012	S	0.3	6.2	7.08	12.38		
8-PMK056.87	3/19/2012	S	0.3	16.03	7.1	9.07		
8-PMK056.87	4/16/2012	S	0.3	17.94	7.11	7.7		
90th Percentile				**26.4**	**7.5**			
10th Percentile				**5.4**	**6.3**			

					00900	
					HARDNESS, TOTAL (MG/L AS CACO3)	
Sta Id	Collection Date Time	Depth Desc	Depth	Container Id Desc	Value	Com Code
8-PMK056.87	11/21/1988 12:05	S	0.3	R	26	
8-PMK056.87	03/13/1989 12:20	S	0.3	R	18	
8-PMK056.87	04/11/1989 13:30	S	0.3	R	20	
8-PMK056.87	05/04/1989 12:05	S	0.3	R	14	
8-PMK056.87	07/10/1989 13:30	S	0.3	R	20	
8-PMK056.87	08/31/1989 12:40	S	0.3	R	34	
8-PMK056.87	09/14/1989 15:40	S	0.3	R	36	
8-PMK056.87	10/10/1989 14:50	S	0.3	R	28	
8-PMK056.87	11/15/1989 11:20	S	0.3	R	22	
8-PMK056.87	12/14/1989 14:15	S	0.3	R	22	
8-PMK056.87	01/10/1990 14:30	S	0.3	R	16	
8-PMK056.87	03/07/1990 14:10	S	0.3	R	26	
8-PMK056.87	04/12/1990 14:00	S	0.3	R	28	
8-PMK056.87	05/15/1990 14:45	S	0.3	R	46	
8-PMK056.87	06/12/1990 14:20	S	0.3	R	26	
8-PMK056.87	07/17/1990 15:00	S	0.3	R	30	
8-PMK056.87	09/17/1990 13:15	S	0.3	R	42	
8-PMK056.87	10/15/1990 13:55	S	0.3	R	48	
8-PMK056.87	11/28/1990 13:00	S	0.3	R	30	
8-PMK056.87	12/17/1990 13:40	S	0.09	R	32	
8-PMK056.87	01/15/1991 15:20	S	0.3	R	6	
8-PMK056.87	02/05/1991 13:00	S	0.3	R	30	
8-PMK056.87	03/13/1991 13:21	S	0.09	R	42	
8-PMK056.87	04/10/1991 16:15	S	0.09	R	40	
8-PMK056.87	05/08/1991 11:33	S	0.09	R	50	
8-PMK056.87	07/01/1991 14:40	S	0.3	R	42	
8-PMK056.87	08/05/1991 12:15	S	0.3	R	56	
8-PMK056.87	09/04/1991 13:05	S	0.3	R	52	
8-PMK056.87	12/03/1991 13:09	S	0.3	R	34	
8-PMK056.87	01/06/1992 13:10	S	0.3	R	26	
8-PMK056.87	02/18/1992 12:00	S	0.3	R	42	
8-PMK056.87	03/04/1992 12:50	S	0.3	R	26	
8-PMK056.87	04/13/1992 14:15	S	0.3	R	38	
8-PMK056.87	05/11/1992 10:40	S	0.3	R	26	
8-PMK056.87	06/10/1992 11:50	S	0.3	R	32	
8-PMK056.87	07/07/1992 12:11	S	0.3	R	68	
8-PMK056.87	08/17/1992 11:58	S	0.3	R	26	
8-PMK056.87	09/02/1992 12:51	S	0.3	R	44	
8-PMK056.87	10/01/1992 13:17	S	0.3	R	44	
8-PMK056.87	11/03/1992 12:30	S	0.3	R	36	
8-PMK056.87	12/02/1992 12:50	S	0.3	R	30	
8-PMK056.87	01/05/1993 13:12	S	0.3	R	29	
8-PMK056.87	02/01/1993 11:47	S	0.3	R	26	
8-PMK056.87	03/03/1993 13:34	S	0.3	R	32	
8-PMK056.87	04/05/1993 11:55	S	0.3	R	22	
8-PMK056.87	05/04/1993 10:40	S	0.3	R	26	
8-PMK056.87	06/01/1993 12:50	S	0.3	R	26	
8-PMK056.87	07/12/1993 12:35	S	0.3	R	38	
8-PMK056.87	08/09/1993 11:44	S	0.3	R	32	
8-PMK056.87	09/01/1993 12:55	S	0.3	R	48	
8-PMK056.87	10/07/1993 13:47	S	0.3	R	40	

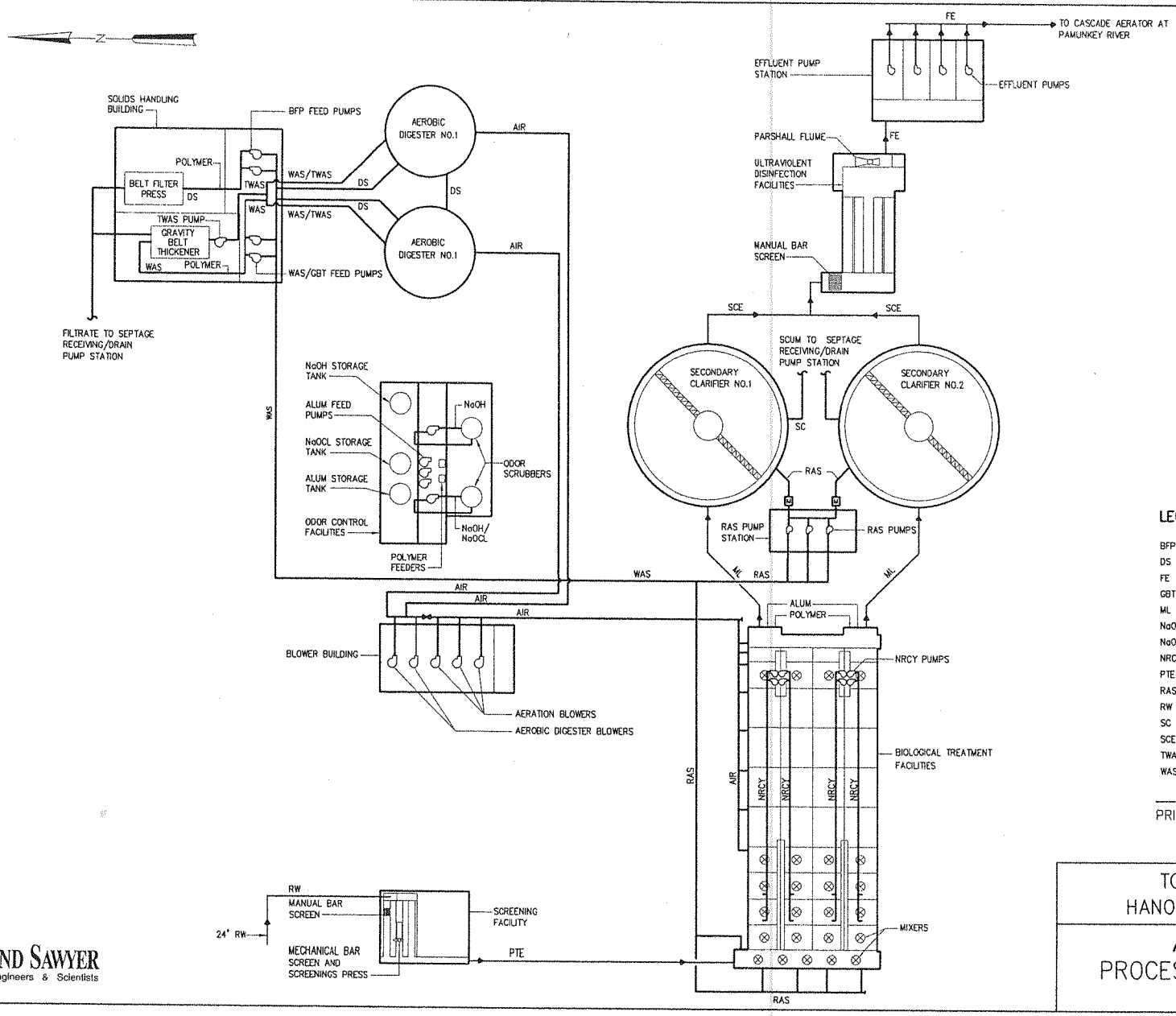
					00900	
					HARDNESS, TOTAL (MG/L AS CACO3)	
Sta Id	Collection Date Time	Depth Desc	Depth	Container Id Desc	Value	Com Code
8-PMK056.87	11/02/1993 11:33	S	0.3	R	42	
8-PMK056.87	12/20/1993 14:11	S	0.3	R	32	
8-PMK056.87	07/08/1997 10:30	S	0.3	R	33.4	
8-PMK056.87	08/11/1997 06:45	S	0.3	R	39.6	
8-PMK056.87	09/30/1997 10:33	S	0.3	R	43.5	
8-PMK056.87	10/20/1997 11:46	S	0.3	R	20.9	
8-PMK056.87	11/06/1997 11:35	S	0.3	R	31.9	
8-PMK056.87	12/01/1997 14:02	S	0.3	R	20.2	
8-PMK056.87	01/05/1998 11:44	S	0.3	R	22.9	
8-PMK056.87	02/04/1998 09:40	S	0.3	R	16.7	
8-PMK056.87	03/11/1998 11:15	S	0.3	R	8.9	
8-PMK056.87	04/08/1998 09:50	S	0.3	R	15.5	
8-PMK056.87	05/06/1998 11:10	S	0.3	R	18.3	
8-PMK056.87	06/03/1998 11:40	S	0.3	R	15.8	
8-PMK056.87	07/07/1998 11:35	S	0.3	R	27	
8-PMK056.87	08/24/1998 10:20	S	0.3	R	34.5	
8-PMK056.87	09/21/1998 11:35	S	0.3	R	46.7	
8-PMK056.87	10/19/1998 10:45	S	0.3	R	66	
8-PMK056.87	11/23/1998 10:50	S	0.3	R	78	
8-PMK056.87	12/16/1998 10:05	S	0.3	R	33	
8-PMK056.87	01/14/1999 11:40	S	0.3	R	32	
8-PMK056.87	02/08/1999 10:20	S	0.3	R	40	
8-PMK056.87	03/08/1999 10:00	S	0.3	R	28	
8-PMK056.87	04/12/1999 10:15	S	0.3	R	26	
8-PMK056.87	05/24/1999 16:00	S	0.3	R	56	
8-PMK056.87	06/16/1999 11:00	S	0.3	R	48.4	
8-PMK056.87	08/17/1999 10:35	S	0.3	R	48.8	
8-PMK056.87	09/15/1999 10:45	S	0.3	R	33.4	
8-PMK056.87	10/07/1999 11:10	S	0.3	R	24.4	
8-PMK056.87	12/28/1999 10:00	S	0.3	R	26	
8-PMK056.87	02/16/2000 10:30	S	0.3	R	27.4	
8-PMK056.87	03/15/2000 12:00	S	0.3	R	24	
8-PMK056.87	04/25/2000 10:30	S	0.3	R	16	
8-PMK056.87	05/25/2000 11:30	S	0.3	R	25	
8-PMK056.87	06/06/2000 10:00	S	0.3	R	31	
8-PMK056.87	07/17/2000 10:50	S	0.3	R	24	
8-PMK056.87	08/15/2000 10:30	S	0.3	R	35.2	
8-PMK056.87	09/27/2000 10:10	S	0.3	R	28	
8-PMK056.87	10/19/2000 10:05	S	0.3	R	48	
8-PMK056.87	11/02/2000 10:10	S	0.3	R	40.6	
8-PMK056.87	12/06/2000 09:40	S	0.3	R	32.4	
8-PMK056.87	01/03/2001 10:55	S	0.3	R	40.9	
8-PMK056.87	02/15/2001 11:33	S	0.3	R	28.3	
8-PMK056.87	03/27/2001 12:30	S	0.3	R	30.7	
8-PMK056.87	04/19/2001 11:00	S	0.3	R	15.5	
8-PMK056.87	05/22/2001 10:55	S	0.3	R	33.3	
8-PMK056.87	07/18/2001 12:00	S	0.3	R	47.8	
8-PMK056.87	09/20/2001 13:37	S	0.3	R	78.7	
8-PMK056.87	11/28/2001 11:50	S	0.3	R	31.1	
8-PMK056.87	01/09/2002 11:25	S	0.3	R	23.4	
8-PMK056.87	03/28/2002 11:20	S	0.3	R	15.7	

					00900	
					HARDNESS, TOTAL (MG/L AS CACO3)	
Sta Id	Collection Date Time	Depth Desc	Depth	Container Id Desc	Value	Com Code
8-PMK056.87	05/20/2002 13:45	S	0.3	R	34.9	
8-PMK056.87	08/21/2002 11:10	S	0.3	R	83.7	
8-PMK056.87	10/24/2002 11:00	S	0.3	R	48.4	
8-PMK056.87	12/09/2002 11:40	S	0.3	R	33.9	
8-PMK056.87	02/20/2003 11:40	S	0.3	R	20.4	
8-PMK056.87	04/24/2003 11:10	S	0.3	R	26.9	
8-PMK056.87	06/18/2003 11:10	S	0.3	R	24.6	
8-PMK056.87	08/28/2003 11:45	S	0.3	R	43.6	
8-PMK056.87	10/23/2003 11:55	S	0.3	R	26.1	
8-PMK056.87	12/29/2003 13:35	S	0.3	R	32	
8-PMK056.87	02/24/2004 14:25	S	0.3	R	24.2	
8-PMK056.87	04/21/2004 13:30	S	0.3	R	21.7	
8-PMK056.87	06/09/2004 11:25	S	0.3	R	30	
8-PMK056.87	07/22/2004 10:45	S	0.3	R	35	
8-PMK056.87	08/30/2004 11:45	S	0.3	R	41.6	
8-PMK056.87	11/22/2004 13:30	S	0.3	R	26	
8-PMK056.87	01/18/2005 12:50	S	0.3	R	14	
8-PMK056.87	03/30/2005 12:00	S	0.3	R	20	
8-PMK056.87	05/25/2005 11:25	S	0.3	R	32	
8-PMK056.87	06/29/2005 10:30	S	0.3	R	44	
8-PMK056.87	09/29/2005 11:20	S	0.3	R	68	
8-PMK056.87	11/02/2005 11:00	S	0.3	R	56	
8-PMK056.87	01/19/2006 14:40	S	0.3	R	26	
8-PMK056.87	03/27/2006 13:50	S	0.3	R	36	
8-PMK056.87	05/22/2006 14:30	S	0.3	R	32	
8-PMK056.87	07/11/2006 12:30	S	0.3	R	34	
8-PMK056.87	09/05/2006 14:10	S	0.3	R	24	
8-PMK056.87	11/13/2006 14:00	S	0.3	R	18	
Average					**33**	

Attachment 3

Schematic of Treatment Plant

Figure 1-2



LEGEND

BFP	BELT FILTER PRESS
DS	DIGESTED SLUDGE
FE	FINAL EFFLUENT
GBT	GRAVITY BELT THICKENER
ML	MIXED LIQUOR
NaOCL	SODIUM HYPOCHLORITE
NaOH	SODIUM HYDROXIDE
NRCY	NITRIFIED RECYCLE
PTE	PRELIMINARY TREATMENT EFFLUENT
RAS	RETURN ACTIVATED SLUDGE
RW	RAW WASTEWATER
SC	SCUM
SCE	SECONDARY CLARIFIER EFFLUENT
TWAS	THICKENED WASTE ACTIVATED SLUDGE
WAS	WASTE ACTIVATED SLUDGE

PRIMARY FLOW PATH

TOTOPOTOMOY WWTP
HANOVER COUNTY, VIRGINIA

Attachment 3
PROCESS FLOW SCHEMATIC

HAZEN AND SAWYER
Environmental Engineers & Scientists

03/15/04 1:20pm FILE= H:\2732-2\O&M\Figure 1-2 by PLAWANSON XREF FILE = NONE

Attachment 4

Certificates to Operate for 5 and 7 MGD Facilities

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

CERTIFICATE TO OPERATE
(Interim)

EFFECTIVE DATE: April 1, 2004

FACILITY NAME: Totopotomoy Wastewater Treatment Plant

OWNER: County of Hanover

NUMBER: 4-085-18796

DESCRIPTION OF FACILITY SYSTEM: The project consists of the construction of a five million-gallon per day wastewater treatment works utilizing biological nutrient removal technology. The headworks consist of mechanical screening. Post treatment consists of ultraviolet disinfection and cascade reaeration at the discharge. Waste sludge is aerobically digested and dewatered by belt press.

CERTIFICATION OF COMPLETION: By letter, March 31, 2004, the design engineer, Hazen and Sawyer, certified the facility has been substantially completed in accordance with the approved plans.

AUTHORIZATION TO OPERATE: The owner is authorized to operate these facilities in accordance with the Sewage Collection and Treatment Regulations with the conditions that within 90 days the owner shall:

1. complete the remaining treatment works construction, principally the sludge dewatering facilities;
2. install the railing, grating,, stairs, and other safety equipment;
3. grade and seed the grounds
4. not exceed 2.5 million gallons per day average flow

ISSUED BY:

Raymond R Barrows Jr

Raymond R. Barrows, Jr., P.E.
Area Engineer
Office of Wastewater Engineering
Virginia Department of Environmental Quality

April 1, 2004
Date

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

CERTIFICATE TO OPERATE
(Interim)

EFFECTIVE DATE: June 18, 2004

FACILITY NAME: Totopotomoy Wastewater Treatment Plant

OWNER: County of Hanover

NUMBER: 4-085-18796

DESCRIPTION OF FACILITY SYSTEM: The project consists of the construction of a five million-gallon per day wastewater treatment works utilizing biological nutrient removal technology. The headworks consist of mechanical screening. Post treatment consists of ultraviolet disinfection and cascade reaeration at the discharge. Waste sludge is aerobically digested and dewatered by belt press.

CERTIFICATION OF COMPLETION: By letter, March 31, 2004, the design engineer, Hazen and Sawyer, certified the facility has been substantially completed in accordance with the approved plans.

AUTHORIZATION TO OPERATE: The owner is authorized to operate these facilities in accordance with the Sewage Collection and Treatment Regulations with the conditions that within 90 days the owner shall:

1. complete the remaining treatment works construction, principally the sludge dewatering facilities;
2. install the railing, grating,, stairs, and other safety equipment;
3. grade and seed the grounds
4. not exceed 2.5 million gallons per day average flow

ISSUED BY:

Raymond R. Barrows

Raymond R. Barrows, Jr., P.E.
Area Engineer
Office of Wastewater Engineering
Virginia Department of Environmental Quality

June 18, 2004
Date

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

CERTIFICATE TO OPERATE

EFFECTIVE DATE:	September 14. 2004
FACILITY NAME:	Totopotomoy Wastewater Treatment Plant
OWNER:	County of Hanover
DESCRIPTION OF FACILITY SYSTEM:	The facility consists of the construction of a five million gallon per day wastewater treatment works, utilizing biological nutrient removal technology. The headworks consist of mechanical screening. Post treatment consists of ultraviolet disinfection and cascade aeration at the discharge. The facility is designed to meet discharge limits of CBOD: 5 mg/l, TSS: 10 mg/l, and Total Nitrogen:8 mg/l . .
CERTIFICATE OF COMPLETION:	By letters of September 1and 9, 2004, the design engineer, Hazen and Sawyer, certified the outfall system and liquid treatment, respectively, have been completed, substantially in accordance with the approved plans.
AUTHORIZATION TO OPERATE:	The owner is authorized to operate these facilities in accordance with the Sewage Collection and Treatment Regulations.
LOG NUMBER:	19813
ISSUED BY:	

Raymond R Barrows Jr.

Raymond R. Barrows, Jr., P.E.
Area Engineer
Office of Wastewater engineering
Virginia Department of Environmental Quality

September 14, 2004

Date

Department of Environmental Quality
APPLICATION for CERTIFICATE TO OPERATE
Under the Sewage Collection and Treatment Regulations 9 VAC 25-790
and/or the Water Reclamation and Reuse Regulation 9 VAC 25-740

See instructions. Submit 1 copy of this form and any attachments. Form will expand as you enter information.

Project Title: (as it appears on plans) Totopotomoy Wastewater Treatment Plant 7 MGD Expansion P.E. Seal Date on Cover: February 5, 2009 Specifications Title and Date: Totopotomoy Wastewater Treatment Plant 7 MGD Expansion, February 2009	
Location of Project: 9015 Pole Green Park Ln, Mechanicsville, VA 23116	County/City: Hanover County
Receiving Wastewater Collection System(s): N/A; plant discharges to the Pamunkey River	
Receiving Sewage Treatment Plant(s): project is located at the Totopotomoy WWTP	
PROJECT OWNER: Hanover County	**RESPONSIBLE ENGINEER**
Owner Contact Name: Dave Van Gelder	Name: Matthew Fishman
Title: Chief of Operations and Maintenance	Company Name: Hazen and Sawyer
Address: P.O. Box 470, Hanover, VA 23069	Address: 4011 Westchase Boulevard, Raleigh, NC 27607
Phone: 804-365-6235	Phone: 919-833-7152
Email: dfvangelder@co.hanover.va.us	Email: mfishman@hazenandsawyer.com
Owner Signature and Date:	

PTL NUMBER FROM CERTIFICATE TO CONSTRUCT: 24158

Attach Copy of the original Certificate to Construct if issued prior to November 9, 2008. If applicable, provide verification of compliance with any conditions in the Certificate to Construct.

Design Flow: (a) average daily flow (MGD): 7.0 (b) peak flow (MGD): 12.5

For sewage treatment plant, water reclamation or satellite reclamation projects, provide the VPDES/VPA Permit Number: VA0089915

Is a new Discharge Monitoring Report (DMR) or other monthly monitoring report required? Yes ☒ No ☐

For Pump Stations, Sewage Treatment Plants, and Reclamation Systems, check Reliability Class: I ☒ II ☐ III ☐ NA ☐

.....

Two options are provided for the Statement of Completion, depending on whether the project is being authorized under the Sewage Collection and Treatment Regulations, the Water Reclamation and Reuse Regulations, or BOTH. Please check the appropriate box and then provide signature and seal below as indicated.

☒ *The following statement of completion for issuance of a Certificate to Operate under the Sewage Collection and Treatment Regulations must be signed and sealed by the responsible engineer.* (DEQ will not conduct a confirming inspection.)

"The construction of the project has been completed in accordance with the referenced plans and specifications or revised only in accordance with 9 VAC 25-790-180.B, and inspections have been performed to make this statement in accordance with Section 9 VAC 25-790-180.C.1 of the Sewage Collection and Treatment Regulations."

COMMONWEALTH OF VIRGINIA
MATTHEW A. FISHMAN
44003
4/6/2010
PROFESSIONAL ENGINEER

Licensed Engineer's Signature and original seal (signed and dated)

☐ *The following statement of completion for issuance of a Certificate to Operate under the Water Reclamation and Reuse Regulation must be signed and sealed by the responsible engineer.* (DEQ will not conduct a confirming inspection.)

"The construction of the project has been completed in accordance with the referenced plans and specifications or revised only in accordance with 9 VAC 25-740-120-B.2.b. and inspections have been performed to make this statement in accordance with Section 9 VAC 25-40-120.B.3.a. of the Water Reclamation and Reuse Regulations."

Licensed Engineer's Signature and original seal (signed and dated)

For DEQ use only:

In accordance with *Code of Virginia* 1950, as amended, Title 62.1, Section 62.1-44.19, this form, signed by the appropriate DEQ representative, serves as the **Certificate to Operate** for the referenced project.

Curtis J. Linderman		10/18/10	25045
Name	Signature	Date	CTO PTL Number

Department of Environmental Quality Authorized Representative

An Operation and Maintenance Manual must be submitted to the DEQ Regional Office in accordance with 9 VAC 25-790 for sewage treatment plants, 9 VAC 25-740 for water reclamation systems and satellite reclamation systems and VPDES or VPA permit requirements.

For pump stations, an Operation and Maintenance Manual must be maintained for the facility in accordance with 9 VAC 25-790, but is NOT to be submitted to DEQ. The pump station must be operated and maintained in accordance with that manual.

Attachment 5

Technical Inspection Report

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Wastewater Facility Inspection Report

Revised 08/2001

Facility Name:	Totopotomoy WWTP	**Facility No.:**	VA0089915
~~City~~/County:	Hanover County	**Inspection Agency:**	DEQ/PRO
Inspection Date:	November 19, 2010	**Date Form Completed:**	November 24, 2010
Inspector:	Mike Dare	**Time Spent:**	12 hrs. w/ travel & report
Reviewed By:	_____	**Unannounced Insp.?**	Yes
		FY-Scheduled Insp.?	Yes

Present at Inspection: Perry Greene, Utility Superintendent

TYPE OF FACILITY:

Domestic		Industrial	
[ ] Federal	[X] Major	[ ] Major	[ ] Primary
[x] Non-Federal	[ ] Minor	[ ] Minor	[ ] Secondary

Population Served: Population served extends from the Hanover Co. Airpark, south to Route 360.

Number of Connections: Flow not treated at the Totopotomoy WWTP is pumped to the Henrico Co. WRF.

TYPE OF INSPECTION:

[x] Routine — Date of last inspection: March 18 and 20, 2009

[ ] Compliance — Agency: DEQ/PRO

[ ] Reinspection

EFFLUENT MONITORING:

Date: September 2010 CBOD: 0.4 mg/L TSS: 1.6 mg/L Flow: 2.0 MGD

See also DMR files

CHANGES AND/OR CONSTRUCTION

DATA VERIFIED IN PREFACE	[x] Updated	[ ] No changes
Has there been any new construction?	[x] Yes*	[ ] No **Upgrade to 7 MGD**
If yes, were plans and specifications approved?	[ ] Yes	[ ] No* [ ] N/A
DEQ approval date:	N/A	

(A) PLANT OPERATION AND MAINTENANCE

1. Class and number of licensed operators: ***Class I – 3 (one current Operator vacancy)***

2. Hours per day plant is staffed: ***14 hours/day; Superintendent is on-call 24/7***

3. Describe adequacy of staffing: [x] Good [ ] Average [ ] Poor*

4. Does the plant have an established program for training personnel? [x] Yes [ ] No

5. Describe the adequacy of the training program: [x] Good [ ] Average [ ] Poor*

6. Are preventive maintenance tasks scheduled? [x] Yes [ ] No*

7. Describe the adequacy of maintenance: [x] Good [ ] Average [ ] Poor*

8. Does the plant experience any organic/hydraulic overloading? [ ] Yes* [x] No
   If yes, identify cause and impact on plant:

9. Any bypassing since last inspection? [ ] Yes* [x] No

10. Is the on-site electric generator operational? [x] Yes* [ ] No* [ ] N/A

11. Is the STP alarm system operational? [x] Yes [ ] No * [ ] N/A

12. How often is the standby generator exercised? [x] Weekly [ ] Monthly [ ] Other:
    Power Transfer Switch? [x] Weekly [ ] Monthly [ ] Other:
    Alarm System? [ ] Weekly [ ] Monthly [x] Other: ***Daily***

13. When were the cross connection control devices last tested on the potable water service? ***Each of the five units was last certified in September of 2010***

14. Is sludge disposed in accordance with the approved sludge disposal plan? [x] Yes [ ] No* [ ] N/A

15. Is septage received by the facility? [ ] Yes [x] No
    Is septage loading controlled? [ ] Yes [ ] No * [x] N/A
    Are records maintained? [ ] Yes [ ] No* [x] N/A

16. Overall appearance of facility: [x] Good [ ] Average [ ] Poor*

Comments: #5 Training includes OJT in-house promotion training, DEQ classes, VA Tech Short Course. #6 Maintenance tasks are scheduled through a computer based work order system. Routine preventive maintenance, such as lubrication, and repairs are performed by the County maintenance staff and plant personnel. #11 Alarm signals page Operators and signal the SCADA Control System. The County Noise Ordinance does not allow audible alarms at this site due to its proximity to an elementary school, County Park and residences. #14 Sludge is disposed of at the Shoosmith landfill.

(B) PLANT RECORDS

1. Which of the following records does the plant maintain?

Operational Logs for each unit process	[x] Yes	[ ] No*	[ ] N/A
Instrument maintenance and calibration	[x] Yes	[ ] No*	[ ] N/A
Mechanical equipment maintenance	[x] Yes	[ ] No*	[ ] N/A
Industrial waste contribution **(Municipal Facilities)**	[ ] Yes	[ ] No*	[x] N/A

2. What does the operational log contain?

Visual Observations	[x] Yes	[ ] No	[ ] N/A
Flow Measurement	[x] Yes	[ ] No	[ ] N/A
Laboratory Results	[x] Yes	[ ] No	[ ] N/A
Process Adjustments	[x] Yes	[ ] No*	[ ] N/A
Control Calculations	[x] Yes	[ ] No	[ ] N/A
Other:	***Note: Logs are also maintained in the database.***		

3. What do the mechanical equipment records contain:

As built plans and specs?	[x] Yes	[ ] No*	[ ] N/A
Spare parts inventory?	[x] Yes	[ ] No*	[ ] N/A
Manufacturers instructions?	[x] Yes	[ ] No*	[ ] N/A
Equipment/parts suppliers?	[x] Yes	[ ] No*	[ ] N/A
Lubrication schedules?	[x] Yes	[ ] No*	[ ] N/A
Other:	None		
Comments:	None		

4. What do the industrial waste contribution records contain: ***(Applicable to municipal facilities only)***

Waste characteristics?	[x] Yes	[ ] No*	[ ] N/A
Locations and discharge types?	[x] Yes	[ ] No*	[ ] N/A
Impact on plant?	[x] Yes	[ ] No*	[ ] N/A
Other:	***No industry in service area.***		
Comments:			

5. Are the following records maintained at the plant:

Equipment maintenance records	[x] Yes	[ ] No*	[ ] N/A
Operational Log	[x] Yes	[ ] No*	[ ] N/A
Industrial contributor records	[ ] Yes	[ ] No*	[x] N/A
Instrumentation records	[x] Yes	[ ] No*	[ ] N/A
Sampling and testing records	[x] Yes	[ ] No*	[ ] N/A

6. Are records maintained at a different location? [ ] Yes [x] No
   Where are the records maintained? ***All are available on site.***

7. Were the records reviewed during the inspection? [ ] Yes [x] No

8. Are the records adequate and the O & M Manual current? [x*] Yes [ ] No* [ ] N/A
   O&M Manual date written: *3/04; revised 4/05, 6/10*
   Date DEQ approved O&M: *most recent approval 9/29/10*

9. Are the records maintained for required 3-year period? [x] Yes [ ] No*

Comments: #1 - A single operational log is kept for the entire plant. Log includes notes for various treatment units, observations, equipment adjustment & control tests. Logs are also maintained in the plant database.
#2 - Lab records are separate from operational log.

(C) SAMPLING

1.	Are sampling locations capable of providing representative samples?	[x] Yes	[ ] No*	[ ] N/A
2.	Do sample types correspond to those required by the permit?	[x] Yes	[ ] No*	[ ] N/A
3.	Do sampling frequencies correspond to those required by the permit?	[x] Yes	[ ] No*	[ ] N/A
4.	Are composite samples collected in proportion to flow?	[x] Yes	[ ] No*	[ ] N/A
5.	Are composite samples refrigerated during collection?	[x] Yes	[ ] No*	[ ] N/A
6.	Does plant maintain required records of sampling?	[x] Yes	[ ] No*	[ ] N/A
7.	Does plant run operational control tests?	[x] Yes	[ ] No*	[ ] N/A

Comments:

(D) TESTING

1. Who performs the testing?

[x] Plant/Lab – ***Field Parameters, CBOD, TSS, TP, E. coli,***
[ ] Central Lab
[x] Commercial Lab - Name: ***J.R. Reed & Associates: NO_3-NO_2, TKN, Toxicity.***

If plant performs any testing, complete 2-4.

2.	What method is used for chlorine analysis?	***N/A - UV disinfection***		
3.	Is sufficient equipment available to perform required tests?	[x] Yes	[ ] No*	[ ] N/A
4.	Does testing equipment appear to be clean and/or operable?	[x] Yes	[ ] No*	[ ] N/A

Comments: Please see enclosed DEQ *Laboratory Inspection Report*.

(E) FOR INDUSTRIAL FACILITIES W/ TECHNOLOGY BASED LIMITS N/A

1. Is the production process as described in the permit application? (If no, describe changes in comments)

   [ ] Yes [ ] No* [x] N/A

2. Do products and production rates correspond to the permit application? (If no, list differences in comments section)

   [ ] Yes [ ] No* [x] N/A

3. Has the State been notified of the changes and their impact on plant effluent?

   [ ] Yes [ ] No* [x] N/A

Comments: None

FOLLOW UP TO COMPLIANCE & GENERAL RECOMMENDATIONS FROM THE PREVIOUS DEQ INSPECTION:

Compliance Recommendations/Request for Corrective Action:

None

General Recommendations/Observations:

None

INSPECTION REPORT SUMMARY

Compliance Recommendations/Request for Corrective Action:

1. **There are no compliance recommendations at this time.**

General Recommendations/Observations:

1. **There are no general recommendations at this time.**

Comments:

It is apparent that the Hanover County staff takes pride in this impeccably maintained, state of the art facility. Unique features include remote equipment monitoring and operation via a laptop computer. Additional safety and security is afforded by strategically located cameras that are also remotely accessible. Odors are virtually eliminated by an odor scrubber system. The Operational and Laboratory staff members are efficient in their duties yet always very helpful to DEQ personnel.

Air from the screening facility, the septage receiving /plant drain pump station, biological treatment unit and the solids handling building is drawn through the odor scrubber system. (Photo from previous insp.)

Items evaluated during this inspection include (check all that apply):

[x] Yes	[ ] No		Operational Units
[x] Yes	[ ] No		O & M Manual
[ ] Yes	[x] No		Maintenance Records
[ ] Yes	[ ] No	[x] N/A	Pathogen Reduction & Vector Attraction Reduction
[x] Yes	[ ] No	[ ] N/A	Sludge Disposal Plan
[ ] Yes	[ ] No	[x] N/A	Groundwater Monitoring Plan
[ ] Yes	[ ] No	[x] N/A	Storm Water Pollution Prevention Plan
[x] Yes	[ ] No	[ ] N/A	Permit Special Conditions
[ ] Yes	[x] No	[ ] N/A	Permit Water Quality Chemical Monitoring
[x] Yes	[ ] No	[ ] N/A	Laboratory Records

UNIT PROCESS: Sewage Pumping

1. Name of station: ***Shelton Pointe Pump Station***
2. Location (if not at STP): ***At power lines off the end of Shelton Pointe Dr. Access is via Sentry Station Rd.***
3. Following equipment operable:

a. All pumps? (2)	[x] Yes	[ ] No*	
b. Ventilation?	[x] Yes	[ ] No*	[ ] N/A
c. Control system?	[x] Yes	[ ] No*	[ ] N/A
d. Sump pump?	[ ] Yes	[ ] No*	[x] N/A
e. Seal water system?	[ ] Yes	[ ] No*	[x] N/A

4. Reliability considerations:

a. Class	[x] I	[ ] II	[ ] III
b. Alarm system operable?	[x] Yes	[ ] No	[ ] N/A
c. Alarm conditions monitored:			
1. high water level:	[x] Yes	[ ] No*	[ ] N/A
2. high liquid level in dry well:	[ ] Yes	[ ] No*	[x] N/A
3. main electric power:	[x] Yes	[ ] No*	[ ] N/A
4. auxiliary electric power:	[x] Yes	[ ] No*	[ ] N/A
5. failure of pump motors to start:	[x] Yes	[ ] No*	[ ] N/A
6. test function: can manually test	[x] Yes	[ ] No*	
7. other:	***PLC failure***		
d. Backup for alarm system operational?	[x] Yes	[ ] No*	[ ] N/A
e. Alarm signal reported to (identify):			
f. Continuous operability provisions:			
1. Generator hook up?	[ ] Yes	[x] No	
2. Two sources of electricity?	[x] Yes	[ ] No	
3. Portable pump?	[ ] Yes	[x] No	
4. 1 day storage?	[ ] Yes	[x] No	
5. other:	***Generator on site***		

5. Does station have bypass? [ ] Yes* [x] No

a. Evidence of bypass use?	[ ] Yes*	[ ] No	[x] N/A
b. Can bypass be disinfected?	[ ] Yes	[ ] No*	[x] N/A
c. Can bypass be measured?	[ ] Yes	[ ] No*	[x] N/A

6. How often is station checked? ***Monitored continuously by SCADA***
7. General condition: [x] Good [ ] Fair [ ] Poor*

Comments: Facility is operated by the Maintenance Department. This is one of two stations that pump to the Totopotomoy WWTP. Flow is diverted as required to the Henrico Co. WRF. Toured this facility with Mr. Tennant Frost, Utility Supervisor.

Shelton Pointe Pump Station. Manholes on the two incoming gravity sewers are in the foreground.

UNIT PROCESS: Sewage Pumping

1. Name of station: ***Septage Receiving / Plant Drain Pump Station***
2. Location (if not at STP): ***N/A***
3. Following equipment operable:
   - a. All pumps? [x] Yes [ ] No*
   - b. Ventilation? [x] Yes [ ] No* [ ] N/A
   - c. Control system? [x] Yes [ ] No* [ ] N/A
   - d. Sump pump? [ ] Yes [ ] No* [x] N/A
   - e. Seal water system? [ ] Yes [ ] No* [x] N/A

4. Reliability considerations:
   - a. Class [x] I [ ] II [ ] III
   - b. Alarm system operable? [x] Yes [ ] No [ ] N/A
   - c. Alarm conditions monitored:
     1. high water level: [x] Yes [ ] No* [ ] N/A
     2. high liquid level in dry well: [ ] Yes [ ] No* [x] N/A
     3. main electric power: ***(for plant)*** [x] Yes [ ] No* [ ] N/A
     4. auxiliary electric power: ***(plant gen.)*** [x] Yes [ ] No* [ ] N/A
     5. failure of pump motors to start: [x] Yes [ ] No* [ ] N/A
     6. test function: [x] Yes [ ] No*
     7. other: ***Motor Moisture detection alarm***
   - d. Backup for alarm system operational? [x] Yes [ ] No* [ ] N/A
   - e. Alarm signal reported to (identify): ***SCADA***
   - f. Continuous operability provisions:
     1. Generator hook up? [ ] Yes [x] No
     2. Two sources of electricity? [x] Yes [ ] No ***on-site generator***
     3. Portable pump? [ ] Yes [x] No
     4. 1 day storage? [ ] Yes [x] No
     5. other: N/A

5. Does station have bypass? [ ] Yes* [x] No
   - a. Evidence of bypass use? [ ] Yes* [ ] No [x] N/A
   - b. Can bypass be disinfected? [ ] Yes [ ] No* [x] N/A
   - c. Can bypass be measured? [ ] Yes [ ] No* [x] N/A
6. How often is station checked? ***Monitored continuously by SCADA***
7. General condition: [x] Good [ ] Fair [ ] Poor*

Comments: This pump station is set up to accept drainage from all process units at the plant. The pump station is equipped with 2 submersible pumps. Air is pulled from the wetwell through the odor scrubber system. Debris from sewer line cleaning is deposited in a container that dewaters and drains to the pump station. Septage is currently not being received.

Septage Receiving / Plant Drain Pump Station

UNIT PROCESS: Screening/Comminution

1. Number of units: Manual: *1* Mechanical: *1*

   Number of units in operation: Manual: *0* Mechanical: *1*

2. Bypass channel provided? [x] Yes [ ] No

   Bypass channel in use? [ ] Yes [x] No [ ] N/A

3. Area adequately ventilated? [x] Yes [ ] No*

4. Alarm system for equipment failure or overloads? [x] Yes [ ] No [ ] N/A ***High level alarm***

   If present, is the alarm system operational? [x] Yes ? [ ] No * [ ] N/A

5. Proper flow-distribution between units? [x] Yes [ ] No * [ ] N/A

6. How often are units checked and cleaned? ***The steps move up every 13 minutes***

7. Cycle of operation: ***Timer activated, with back-up float switch control***

8. Volume of screenings removed: ***~ 8 to 9 cubic yards/3 months***

9. General condition: [x] Good [ ] Fair [ ] Poor*

Comments: This facility consists of one Step Screen and one bypass channel with a coarse bar rack. Each channel is designed for a flow of 7 MGD. The steps of the screen move up like an escalator, at a rate of approximately 4 steps every 13 minutes. Screenings are carried by the ledges of the steps up to the compactor, where the screenings are dewatered and dropped through a chute to the dumpster contained within the building below.

Screenings are limed daily to reduce odors.

Screening system

UNIT PROCESS: Activated Sludge Aeration

1. Number of units: *4*
   Number of units in operation: *2*

2. Mode of operation: ***5 Stage BNR***

3. Proper flow distribution between units? [ ] Yes [ ] No* [x] N/A

4. Foam control operational? [x] Yes [ ] No* [ ] N/A

5. Scum control operational? [ ] Yes [ ] No* [x] N/A

6. Evidence of the following problems:
   a. Dead spots? [ ] Yes* [x] No
   b. Excessive foam? [ ] Yes* [x] No
   c. Poor aeration? [ ] Yes* [x] No
   d. Excessive aeration? [ ] Yes* [x] No
   e. Excessive scum? [ ] Yes* [x] No
   f. Aeration equipment malfunction? [ ] Yes* [x] No
   g. Other:

7. Mixed liquor characteristics (as available)

pH:	*6.9 SU 11/18/10*	MLSS:	*1870 mg/L combined flow @ reaeration channel 11/18/10*
DO:	*2.75 mg/L 11/18/10*	SDI:	*N/A*
SVI:		Color:	*Brown*
Odor:	*earthy*	Settleability:	*250 ml/L 11/18/10*
		Other:	*OUR 9 Av. 11/18/10*

8. Return/waste sludge:
   a. return rate: ***2.6 MGD***; recycle rate: ***up to 5 MGD***
   b. waste rate: ***.130 MGD***
   c. frequency of wasting: ***Daily***

9. Aeration system control: [ ] Time Clock [ ] Manual [x] Continuous
   [ ] Other

10. Effluent control devices working properly ***(oxidation ditches)***? [ ] Yes [ ] No [x] N/A

11. General condition: [x] Good [ ] Fair [ ] Poor *

UNIT PROCESS: Activated Sludge Aeration

1. Number of units: *4*
   Number of units in operation: *2*

2. Mode of operation: ***5 Stage BNR***

3. Proper flow distribution between units? [ ] Yes [ ] No* [x] N/A

4. Foam control operational? [x] Yes [ ] No* [ ] N/A

5. Scum control operational? [ ] Yes [ ] No* [x] N/A

6. Evidence of the following problems:
   a. Dead spots? [ ] Yes* [x] No
   b. Excessive foam? [ ] Yes* [x] No
   c. Poor aeration? [ ] Yes* [x] No
   d. Excessive aeration? [ ] Yes* [x] No
   e. Excessive scum? [ ] Yes* [x] No
   f. Aeration equipment malfunction? [ ] Yes* [x] No
   g. Other:

Comments: Sodium Hypochlorite can be added to the RAS for filamentous control.

5-stage BNR Activated Sludge System

Activated Sludge

UNIT PROCESS: Sedimentation

[ ] Primary [x] Secondary [ ] Tertiary

1. Number of units: *2*
   In operation: *1*

2. Proper flow-distribution between units? [ ] Yes [ ] No* [x] N/A

3. Signs of short-circuiting and/or overloads? [ ] Yes* [x] No

4. Effluent weirs level? [x] Yes [ ] No* [ ] N/A
   Clean? [x] Yes [ ] No* ***Automatic weir brush system***

5. Scum collection system working properly? [x] Yes [ ] No* [ ] N/A

6. Sludge-collection system working properly? [x] Yes [ ] No* [ ] N/A

7. Influent, effluent baffle systems working properly? [x] Yes [ ] No* [ ] N/A

8. Chemical addition? [x] Yes [ ] No
   Chemicals: **Alum** can be added if required for phosphorus control. **Polymer** can also be added.

9. Effluent characteristics: *Clear*

10. General condition: [x] Good [ ] Fair [ ] Poor*

Comments:

The sludge blanket is maintained at near zero inches to prevent the denitrification of solids.

Clarifier

UNIT PROCESS: Sludge Pumping
(Nitrogen Recycle Pumps (NRCY))

1. Number of Pumps: *8 (4 submersible, 4 verticle turbine)*
   Number of pumps in operation: *4*

2. Type of sludge pumped: [ ] Primary [ ] Secondary [ ] Return Activated
   [ ] Combination [x] Other: ***Recycle Activated Sludge***

3. Type of pump: [ ] Plunger [ ] Diaphragm [ ] Screwlift
   [ ] Centrifugal [ ] Progressing cavity [x] Other: ***Vertical Turbine***

4. Mode of operation: [ ] Manual [x] Automatic [ ] Other:

5. Sludge volume pumped: ***Up to 5 MGD***

6. Alarm system for equipment failures or overloads operational? [x] Yes [ ] No* [ ] N/A

7. General condition: [x] Good [ ] Fair [ ] Poor*

Comments: None

UNIT PROCESS: Sludge Pumping (RAS)

1. Number of Pumps: *3*
   Number of pumps in operation: *1*

2. Type of sludge pumped: [ ] Primary [ ] Secondary [x] Return Activated [ ] Combination [ ] Other:

3. Type of pump: [ ] Plunger [ ] Diaphragm [ ] Screwlift [x] Centrifugal[ ] Progressing cavity [ ] Other:

4. Mode of operation: [ ] Manual [x] Automatic [ ] Other:

5. Sludge volume pumped: ***2.6 MGD***

6. Alarm system for equipment failures or overloads operational? [x] Yes [ ] No* [ ] N/A

7. General condition: [x] Good [ ] Fair [ ] Poor*

Comments: None

UNIT PROCESS: Sludge Pumping (WAS to Digesters or GBT)

1. Number of Pumps: *2*
   Number of pumps in operation: *1*

2. Type of sludge pumped: [ ] Primary [ ] Secondary [ ] Return Activated [ ] Combination [x] Other: WAS

3. Type of pump: [ ] Plunger [ ] Diaphragm [ ] Screwlift [x] Centrifugal[ ] Progressing cavity [ ] Other:

4. Mode of operation: [ ] Manual [x] Automatic [ ] Other:

5. Sludge volume pumped: ***.130 MGD***

6. Alarm system for equipment failures or overloads operational? [x] Yes [ ] No* [ ] N/A

7. General condition: [x] Good [ ] Fair [ ] Poor*

Comments: None

UNIT PROCESS: Gravity Thickening
(Gravity Belt Thickener)

1. Number of units: *1*

   Number of units in operation: *1*

2. Types of sludge(s) fed to the thickener: [ ] Primary [x] WAS [ ] Combination

   [ ] Other:

3. Solids concentration in the influent sludge: ***approx. 0.35*** %

   Solids concentration in thickened sludge: ***4.7*** % (10/15/10)

4. Sludge feeding: [ ] Continuous [x] Intermittent

5. Signs of short-circuiting and/or overloads? [ ] Yes* [x] No [ ] N/A

6. Effluent weirs level? [ ] Yes [x] No * [ ] N/A

7. Sludge collection system work properly? [ ] Yes [x] No * [ ] N/A

8. Influent, effluent baffle systems work properly? [ ] Yes [x] No * [ ] N/A

9. Chemical addition? [x] Yes [ ] No * [ ] N/A

   Identify chemical/dose: ***Polymer; dose not obtained.***

10. General condition: [x] Good [ ] Fair [ ] Poor*

Comments: None

Gravity Belt Thickener

UNIT PROCESS: Sludge Pumping

(GBT to Digester)

1. Number of Pumps: *1*

   Number of pumps in operation: *1*

2. Type of sludge pumped: [ ] Primary [ ] Secondary [ ] Return Activated

   [ ] Combination [X] Other: ***Thickened WAS***

3. Type of pump: [ ] Plunger [ ] Diaphragm [ ] Screwlift

   [ ]Centrifugal [x] Progressing cavity [ ] Other:

4. Mode of operation: [x] Manual [ ] Automatic [ ] Other:

5. Sludge volume pumped: ***Rated at 200 gpm***

6. Alarm system for equipment failures or overloads operational? [x] Yes [ ] No* [ ] N/A

7. General condition: [x] Good [ ] Fair [ ] Poor*

Comments: None

UNIT PROCESS: Aerobic Digestion

1. Number of units: *2*

   Number of units in operation: *1*

2. Type of sludge treated: [ ] Primary [x] WAS [ ] Other:

3. Frequency of sludge application to digesters: ***as wasted***

4. Supernatant return rate:

5. pH adjustment provided? [x] Yes [ ] No

   Utilized: [ ] Yes [ ] No [ ] N/A ***can add sodium aluminate***

6. Tank contents well-mixed and relatively free of odors? [x] Yes [ ] No*

7. If diffused aeration is used, do diffusers require frequent cleaning? [ ] Yes [x] No [ ] N/A

8. Location of supernatant return: [ ] Head [ ] Primary [x] Other ***Plant Drain Pump Station***

9. Process control testing:

   a. percent volatile solids: [x] Yes 30 % [ ] No *Avg for November 2010*

   b. pH: [x] Yes 7.7 SU [ ] No *11/18/10*

   c. alkalinity: [ ] Yes ---- mg/L [ ] No

   d. dissolved oxygen: [x] Yes 0 .0 mg/L [ ] No *11/18/10*

10. Foaming problem present? [ ] Yes * [x] No

11. Signs of short-circuiting or overloads? [ ] Yes * [x] No

12. General condition: [x] Good [ ] Fair [ ] Poor*

UNIT PROCESS: Aerobic Digestion

Comments: None

Digester

UNIT PROCESS: Sludge Pumping

(Digester to Belt Filter Press)

1. Number of Pumps: *2*

   Number of pumps in operation: *1*

2. Type of sludge pumped: [ ] Primary [ ] Secondary [ ] Return Activated [ ] Combination

   [x] Other: ***WAS***

3. Type of pump: [ ] Plunger [ ] Diaphragm [ ] Screwlift

   [ ] Centrifugal [x] Progressing cavity [ ] Other:

4. Mode of operation: [ ] Manual [x] Automatic [ ] Other:

5. Sludge volume pumped: ***Rated at 200 gpm***

6. Alarm system for equipment failures or overloads operational? [x] Yes [ ] No* [ ] N/A

7. General condition: [x] Good [ ] Fair [ ] Poor*

Comments: None

UNIT PROCESS: Pressure Filtration (Sludge)

(Belt Press)

1. Number of units: *1*

   Number In operation: *1*

2. Percent solids in influent sludge: ***approx. 1.7*** *%*

3. Percent solids in discharge cake: ***typically 16%***

4. Filter run time: ***6 hours/day***

5. Amount cake produced: ***3 to 4 loads/week, 10 to 14 tons/load.***

6. Conditioning chemicals used: [x] Yes [ ] No

   Type and Dose: ***Polymer***

7. Sludge pumping: **cake to dumpster** [ ] Manual [x] Automatic

8. Recirculating system included on acid wash: [ ] Yes [ ] No [x] N/A

9. Signs of overloads? [ ] Yes * [x] No

10. General condition: [x] Good [ ] Fair [ ] Poor*

Comments: None

Belt Filter Press

UNIT PROCESS: Ultraviolet (UV) Disinfection

1.	Number of UV lamps/assemblies:	***Each of 4 channels has 5 Modules in series, 40 lights per module.***
	Number in operation:	***3 modules in ea. of 2 channels.***
2.	Type of UV system and design dosage:	***Low Pressure Mercury Vapor***
3.	Proper flow distribution between units?	[x] Yes [ ] No* [ ] N/A
4.	Method of UV intensity monitoring?	***Photocells – 1 per module***
5.	Adequate ventilation of ballast control boxes?	[x] Yes [ ] No* [ ] N/A
6.	Indication of on/off status of all lamps provided?	[x] Yes [ ] No*
7.	Lamps assemblies easily removed for maintenance?	[x] Yes [ ] No*
8.	Records of lamp operating hours & replacement dates provided:	[x] Yes [ ] No*
9.	Routine cleaning system provide	[x] Yes [ ] No* ***Air scrub system/acid tank***
	Operated properly?	[x] Yes [ ] No*
	Frequency of routine cleaning:	***Once per month or as required based on UV intensity***
10.	Lamp energy control system operating properly?	[x] Yes [ ] No*
11.	Date of last system overhaul:	
	a. UV unit completely drained	[x] Yes [ ] No*
	b. all surfaces cleaned	[x] Yes [ ] No*
	c. UV transmissibility checked	[x] Yes [ ] No*
	d. output of selected lamps checked	[x] Yes [ ] No*
	e. output of tested lamps	
	f. total operating hours, oldest lamp/assembly	Channel 1: 7339 hrs.; channel 2: 4750 hrs.
	g. number of spare lamps and ballasts available:	lamps: 50 ballasts: 15 ***Does not include lamps/ballasts in channels not in use***
12.	UV protective eyeglasses provided:	[x] Yes [ ] No*
13.	General condition:	[x] Good [ ] Fair [ ] Poor*

Comments: Two of four channels is in use. Each channel is designed to treat a maximum 3.33 MGD. The UV system is under cover.

UV system effluent discharges to the Parshall flume.

UV System Controls

Post UV system sampling by M. Dare at 1210 hrs:

pH 6.90 SU

DO 8.5 mg/L

Temp 18.2 deg C

UNIT PROCESS: Flow Measurement

[ ] Influent [ ] Intermediate [x] Effluent

1. Type measuring device: ***24" Parshall Flume with Ultrasonic Sensor***

2. Present reading: ***2.12 MGD at 1207 hours***

3. Bypass channel? [ ] Yes [x] No
   Metered? [ ] Yes [ ] No* [x] N/A

4. Return flows discharged upstream from meter? [ ] Yes [x] No
   If Yes, identify: *N/A*

5. Device operating properly? [x] Yes [ ] No*

6. Date of last calibration: ***July 27, 2010***

7. Evidence of following problems:
   a. Obstructions? [ ] Yes* [x] No
   b. Grease? [ ] Yes* [x] No

8. General condition: [x] Good [ ] Fair [ ] Poor*

Comments: Calibration check using ruler and conversion table performed daily

UNIT PROCESS: Sewage Pumping

1. Name of station: ***Effluent Pump Station and Force Main***
2. Location (if not at STP): ***N/A***
3. Following equipment operable:

a. All pumps?	(4)	[x] Yes	[ ] No*	
b. Ventilation?		[x] Yes	[ ] No*	[ ] N/A
c. Control system?		[x] Yes	[ ] No*	[ ] N/A
d. Sump pump?		[ ] Yes	[ ] No*	[x] N/A
e. Seal water system?		[ ] Yes	[ ] No*	[x] N/A

4. Reliability considerations:

a. Class	[x] I	[ ] II	[ ] III
b. Alarm system operable?	[x] Yes	[ ] No	[ ] N/A
c. Alarm conditions monitored:			
1. high water level:	[x] Yes	[ ] No*	[ ] N/A
2. high liquid level in dry well:	[ ] Yes	[ ] No*	[x] N/A
3. main electric power:	[x] Yes	[ ] No*	[ ] N/A
4. auxiliary electric power:	[x] Yes	[ ] No*	[ ] N/A
5. failure of pump motors to start:	[x] Yes	[ ] No*	[ ] N/A
6. test function:	[x] Yes	[ ] No*	
7. other:	***VFD Fault, Motor Thermal Overload, Low Water Levels***		
d. Backup for alarm system operational?	[x] Yes	[ ] No*	[ ] N/A
e. Alarm signal reported to (identify):	***SCADA***		
f. Continuous operability provisions:			
1. Generator hook up?	[ ] Yes	[x] No	
2. Two sources of electricity?	[x] Yes	[ ] No	***on-site generator***
3. Portable pump?	[ ] Yes	[x] No	
4. 1 day storage?	[ ] Yes	[x] No	
5. other:	N/A		

5. Does station have bypass?	[ ] Yes*	[x] No	
a. Evidence of bypass use?	[ ] Yes*	[ ] No	[x] N/A
b. Can bypass be disinfected?	[ ] Yes	[ ] No*	[x] N/A
c. Can bypass be measured?	[ ] Yes	[ ] No*	[x] N/A

6. How often is station checked? ***Monitored continuously by SCADA***

7. General condition: [x] Good [ ] Fair [ ] Poor*

Comments: There are 4 pumps: two pumps have a capacity of 2.5 MGD each, the other two - 7.5 MGD each. Effluent is pumped to the Pamunkey River via a 36" force main. One lower capacity pump is run most of the time.

UNIT PROCESS: Post Aeration (cascading steps)

1. Number of units: *2*

   Number of units in operation: *1*

2. Proper flow-distribution between units? [ ] Yes [ ] No* [x] N/A

3. Evidence of following problems:

   a. Dead spots? [ ] Yes* [ ] No

   b. Excessive foam? [ ] Yes* [ ] No

   c. Poor aeration? [ ] Yes* [ ] No

   d. Mechanical equipment failure? [ ] Yes* [ ] No [ ] N/A

4. How is the aerator controlled? [ ] Time clock [ ] Manual [ ] Continuous

   [ ] Other _____ [x] N/A

5. What is the current operating schedule? ***Continuous***

6. Step weirs level? [x] Yes [ ] No* [ ] N/A

7. Effluent D.O. level: ***See comments***

8. General condition: [ ] Good [ ] Fair [ ] Poor*

Comments: Post aeration and receiving stream are remotely located and were not viewed. The plant discharge is submerged. The receiving stream is the Pamunkey River.

cc: [x] Owner

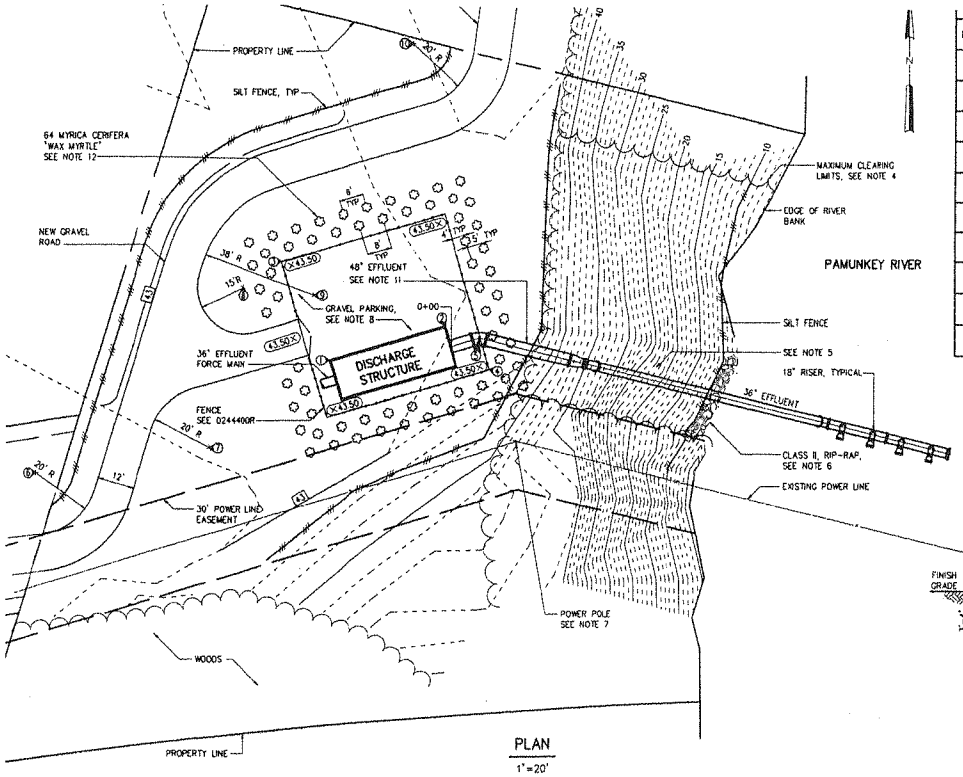
[x] DEQ - OWPP, attn: S. Stell

[x] DEQ - File

[x] EPA Region III

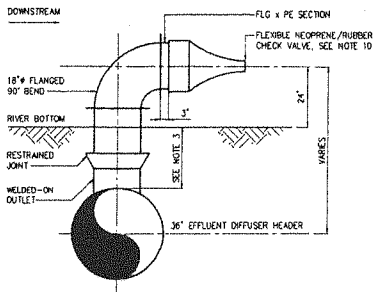
Attachment 6

Drawing of Effluent Diffuser Structure and Mixing Analysis

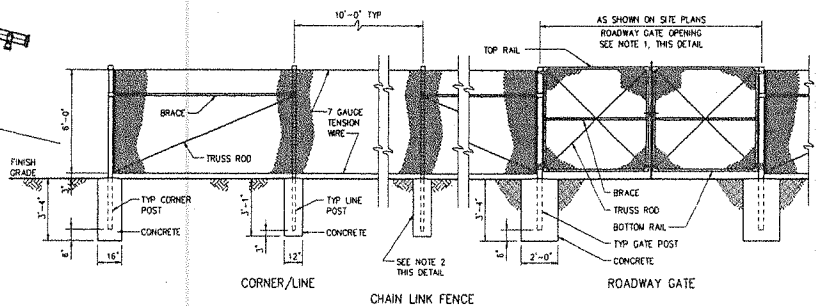


PLAN
1"=20'

NUMBER	DESCRIPTION	NORTH	EAST
1	NORTH WEST CORNER DISCHARGE STRUCTURE	3769044.23	11861438.91
2	NORTH EAST CORNER DISCHARGE STRUCTURE	3769055.40	11861476.80
3	NORTH WEST CORNER FENCE	3769076.11	11861423.26
4	SOUTH EAST CORNER FENCE	3769040.97	11861491.48
5	CENTER LINE 30' BEND 48" EFFLUENT	3769051.44	11861488.09
6	CENTER POINT OF CURVE NEW GRAVEL ROAD	3769007.72	11861343.08
7	CENTER POINT OF CURVE NEW GRAVEL ROAD AND ACCESS	3769015.53	11861399.91
8	CENTER POINT OF CURVE NEW GRAVEL ROAD AND ACCESS	3769067.75	11861410.81
9	CENTER POINT OF CURVE NEW GRAVEL ROAD	3769065.13	11861434.08
10	CENTER POINT OF CURVE NEW GRAVEL ROAD	3769147.55	11861466.09



DIFFUSER RISER AND PORT DETAIL 1 / S1
1/2"=1'-0"



CORNER/LINE CHAIN LINK FENCE ROADWAY GATE

0244400R

NOTES: 1 PROVIDE LATCHING DEVICES TO HOLD GATES IN OPEN POSITION.
2 IF ROCK IS ENCOUNTERED WHEN SETTING POSTS, DRILL HOLES 4 INCHES LARGER IN DIAMETER THAN POSTS AND BACKFILL TO GRADE WITH CLASS "B" CONCRETE.

1 THE VIRGINIA MARINE RESOURCES COMMISSION PROVIDED PROHIBITS CONSTRUCTION OF THE EFFLUENT DIFFUSER PIPING FROM FEBRUARY 15 THROUGH JUNE 30 OF ANY YEAR.

2 ELEVATION OF DIFFUSER PORTS SHALL BE SET TO MAINTAIN A CENTERLINE ELEVATION 24" ABOVE THE RIVER BOTTOM. ELEVATION WILL VARY BETWEEN PORTS.

3 PROVIDE A MINIMUM OF 2' OF COVER OVER DIFFUSER HEADER. CONTRACTOR SHALL VERIFY RIVER BOTTOM ELEVATION AND SUBMIT FINAL PIPING ARRANGEMENT FOR REVIEW BY ENGINEER.

4 CONTRACTOR SHALL SUBMIT CONSTRUCTION PLAN DETAILING MEANS AND METHODS OF CONSTRUCTION PRIOR TO ANY LAND DISTURBING ACTIVITY. ADDITIONAL EROSION CONTROL MEASURES MAY BE REQUIRED BASED ON THE CONTRACTOR'S CONSTRUCTION PLAN, AND SHALL BE INSTALLED AND MAINTAINED AS DIRECTED BY THE ENGINEER. DRAWINGS DO NOT SHOW COFFERCELL OR EXCAVATION RETAINAGE CONSTRUCTION TO FACI INSTALLATION OF EFFLUENT PIPIN IF CONTRACTOR'S PROPOSED CONST N REQUIRES COFFERCELL OR EXCAVA AGE. STRUCTURAL INTEGRITY OF PROPOSED SYSTEM SHALL BE RESPONSIBILITY OF CONTRACTOR. CONTRACTOR SHALL PROVIDE STRUCTURAL CALCULATIONS AND DETAILED DRAWINGS OF PROPOSED RETAINAGE SYSTEM. DRAWINGS AND CALCULATIONS SHALL BE SEALED BY A PROFESSIONAL ENGINEER CURRENTLY REGISTERED IN THE COMMONWEALTH OF VIRGINIA

5 WHERE DISTURBED BY CONSTRUCTION ACTIVITIES (ABOVE ELEVATION 10.0), THE SLOPE SHALL BE STABILIZED WITH A CELLULAR CONFINEMENT SYSTEM, MODEL GW40 AS MANUFACTURED BY PRESTO, GEOLOCK PC801 AS MANUFACTURED BY NATIONAL SEAL COMPANY, ENVIROGRID AS MANUFACTURED BY AGH INDUSTRIES, OR EQUAL. SEED SLOPE PER SEEDING SCHEDULE, INCLUDING 30#/ACRE OF SERICEA LESPEDEZA.

6 WHERE DISTURBED BY CONSTRUCTION ACTIVITIES (BELOW ELEVATION 10.0 TO BOTTOM OF RIVER), THE SLOPE SHALL BE STABILIZED WITH CLASS II RIP-RAP 24" THICK. BEDDING SHALL BE GEOTEXTILE INSTALLED AS PER VDOT SPECIFICATION SECTION 414.03(a)

7 CONTRACTOR SHALL PROTECT POWER POLE DURING EXCAVATION. BM EL 42.52, SPIKE IN POWER POLE JP20.

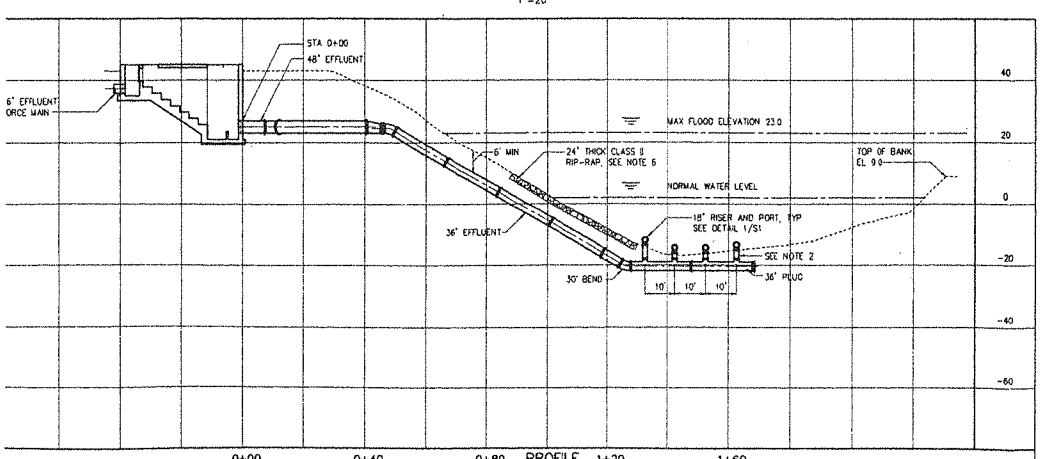
8 THE ENTIRE AREA WITHIN THE FENCE LINE AND EXTENDING TWO (2) FEET BEYOND THE FENCE LINE IN ALL DIRECTIONS SHALL BE PAVED WITH A 6" THICK LAYER OF GRAVEL OVER FILTER FABRIC.

9 ALL EFFLUENT PIPING SHOWN ON THIS DRAWING SHALL BE RESTRAINED JOINT DUCTILE IRON PIPE UNLESS OTHERWISE NOTED.

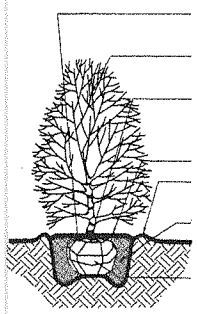
10 CHECK VALVE SHALL BE "TIDEFLEX" AS MANUFACTURED BY RED VALVE CO., INC. OR EQUAL. CHECK VALVES SHALL BE THE SLIP-ON TYPE AND SHALL BE PROVIDED WITH STAINLESS STEEL MOUNTING CLAMP AND HARDWARE.

11 SEE DRAWING S2 FOR ADDITIONAL PIPING IN THIS AREA.

12 PLANTS SHALL BE 4' TO 6' IN HE INSTALLED. ALL PLANT MATERIA RANTEED DURING INSTALLATION AND UNTIL ECT ACCEPTANCE. ANY PLANT MATERIA ES, IS DAMAGED OR DISEASED, OR IS UNHE AND IN UNSIGHTLY CONDITION, OR OTHER CAUSES DUE TO CONTRACTOR'S NEGLIGENCE SHALL BE REPLACED IMMEDIATELY AT THE CONTRACTOR'S EXPENSE.



PROFILE
1"=20'



TOP OF BURLAP BALL SHALL BE AT LEAST 1 1/2" ABOVE THE FINISHED GRADE.

PRUNE SHRUBS AT OWNER'S DIRECTION. PRUNE ALL SHRUBS TO ACHIEVE A UNIFORM MASS.

REMOVE ANY CONTAINER THAT MAY BE AROUND ROOTS. IF PLANT IS IN BURLAP, LEAVE BURLAP IN PLACE WHEN PLANT IS INSTALLED.

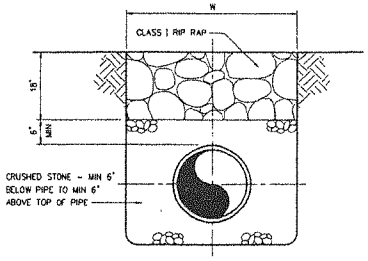
3" MULCH

BUILD 4-6" CONTINUOUS SAUCER AROUND THE TREE PIT TO HOLD THE WATER.

FILL MATERIAL TO CONSIST OF 1/3 NATIVE SOIL FROM HOLE DUG FOR PLANT. SEE SPEC'S FOR BACKFILL MIXTURE.

ROOTBALLS GREATER THAN 2' IN DIAMETER SHALL SIT ON MOUND OF UNDISTURBED SOIL TO PREVENT SETTLING. ROOTBALLS LESS THAN 2' MAY SIT ON COMPACTED SOIL. DIAMETER OF HOLE FOR BALLS 2' & GREATER SHALL BE 2' LARGER THAN DIAMETER OF BALL. DIAMETER OF HOLE FOR BALLS UP TO 2' SHALL BE TWICE THE BALL DIAMETER.

SHRUB PLANTING
NOT TO SCALE



DIFFUSER HEADER BEDDING

DESIGNED H & S	TIMMONS	HAZEN AND SAWYER	COUNTY OF HANOVER VIRGINIA	DISCHARGE STRUCTURE	THE SCALE BAR SHOWN BELOW	DATE FEBRUARY 2000
DRAWN H & S						H & S JOB 2732

Mixing Analysis

The Totopotomoy WWTP discharges to the Pamunkey River through a diffuser located on the bottom of the river. The diffuser extends one third of the way across the river and consists of fourteen 6-inch ports spaced 6 feet apart. The ports are located approximately 1 foot off the river bottom.

Hydraulic modeling results were submitted by the permittee to establish the extent of mixing in the Pamunkey River which is tidal at the outfall location. Version 3.1 of the CORMIX model was run with input parameters based on a field survey and results from the Virginia Institute of Marine Science's hydrodynamic model of the York River based on the HEM-3D model.

The results of the CORMIX modeling indicate that a significant amount of tidal mixing occurs in the Pamunkey River. However the CORMIX modeling was limited to a single ebb tide condition and did not reflect the impact of a continuous discharge over numerous tidal cycles. The results of the modeling were accurate enough to establish that the diffuser provides sufficient mixing to establish a complete mix with the freshwater flow in the Pamunkey River under 7Q10 and 1Q10 conditions. Establishing a complete mix with the freshwater inflow and not accounting for tidally induced mixing is a conservative approach consistent with permitting actions for other similarly situated dischargers in the upper James River estuary.

Totopotomoy Wastewater Treatment Plant

Hanover County, Virginia

APR 1998
PRO

VPDES PERMIT APPLICATION - SUPPLEMENTAL INFORMATION

April 15, 1998

BACKGROUND

The Hanover County Virginia Department of Public Utilities submitted a VPDES permit application to the Virginia Department of Environmental Quality for review in April 1997. Subsequently, additional effluent characterization and mixing analyses were provided to DEQ by Hazen and Sawyer. On August 25, 1997, DEQ notified Hanover County that additional information was needed in order to accurately characterize the receiving stream and that the VPDES permit application was considered incomplete until the discharge point could be field surveyed and an accurate mixing analysis submitted for DEQ's review. DEQ also enclosed a VPDES Sewage Sludge Permit Application Form to be completed based on the information currently available about proposed methodologies of sludge management for the new Totopotomoy Wastewater Treatment Plant. The enclosed information addresses both the mixing characteristics at the proposed discharge location and the Sewage Sludge Permit Application.

MIXING ANALYSIS MODEL

A mixing zone analysis has been performed with field verified data for the Totopotomoy Wastewater Treatment Plant proposed effluent discharge point on the Pamunkey River downstream of the Highway 360 Bridge. This analysis uses the Cornell Mixing Zone Expert System (CORMIX) model for both the 5 mgd and the 10 mgd plant design condition at the critical stream flow condition. The location of the discharge point has modified from the original permit application to a point at coordinates latitude 37°39'27", longitude 77° 11'09", approximately two river miles downstream of the Highway 360 Bridge crossing of the Pamunkey River. See attached drawing. River characteristics

were determined at the proposed discharge point by field surveying river cross-sections and by utilization of modeling data provided by the Virginia Institute of Marine Sciences (VIMS).

Field Survey

The proposed discharge point was field surveyed at the location as shown on the attached drawings. The river cross-section indicates a trapezoidal-shaped river channel with a center depth of 10.09 feet. On the date of the survey, it was observed that a change in water depth of 0.78 feet occurred in a two hour period after slack tide. The proposed discharge point was observed to be clearly tidal with flow reversal. During the field survey, velocity measurements were made with a portable velocity meter and ranged from 0.4 to 1.1 fps (12.2 to 33.5 cm/s) depending upon depth. Readings were taken at an undetermined period after slack tide.

On November 21, 1997, a site inspection was performed for the Totopotomoy plant discharge and was attended by Mr. Allan Brockenbrough, II of DEQ, Mr. Bennett Rugnauth of VDH, Mr. Steve Herzog of Hanover County, Mr. Brad Botwick and Mrs. Ashley Neville of Gray and Pape, Mr. Brian Bortell of Timmons, and Mr. Ron Taylor of Hazen and Sawyer. Three potential discharge locations were inspected: one immediately at the bridge (site #1), one downstream on the easternmost border of the Town of Newcastle archaeological site (site #2), and one approximately 3000 feet further downstream outside the Newcastle area and adjacent to the confluence of the Pamunkey River and an unnamed tributary (site #3). Based upon field survey, modeling results, and water quality issues, Hanover County has selected the further downstream site (site #3) as the proposed discharge location.

VIMS Model Runs

VPDES permitting for discharge of effluent into a receiving stream requires determination of dilution or instream waste concentration (IWC) under critical

conditions. In a non-tidal river, the 1-day minimum flow occurring every 10 years (1Q10) is taken as the critical flow for acute toxicity considerations and the 7-day minimum flow in every 10 years (7Q10) for chronic toxicity considerations. In tidally influenced rivers, the minimum flow critical condition may be augmented by the tidal flux. The tidal flux may be determined by site-specific measurements taken during low flow periods or, as in this case, by hydrodynamic modeling. The Virginia Institute of Marine Sciences (VIMS) has developed a hydrodynamic model for the York River basin. This model, known as HEM-3D (Three - Dimensional Hydrodynamic Eutrophication Model), was applied to the York River basin including the Pamunkey and Mattaponi Rivers under the direction of Dr. Albert Kuo of VIMS to determine the tidal effect under critical conditions. The model simulation input conditions were:

- Mean tidal range at the York River mouth
- Upstream freshwater discharges in:

  Pamunkey River = 64 cfs (41.37 mgd) 1Q10 condition

  Mattaponi River = 15 cfs (9.70 mgd).

The model provides predicted current velocities at different depths over four typical tidal cycles (see Appendix A for detailed model results).

The modeling results indicate that the tidal influence at the proposed discharge location is significant under the summer critical river flow conditions. The tides are regular semi-dural tides. Relatively strong currents are observed during both flood and ebb periods. It is interesting to note that the current velocities are quite constant during most of the time of the flood or ebb periods. There is a relatively short transition period from maximum ebb velocity to maximum flood velocity of about one hour for the current to change directions and reach maximum velocity in the opposite direction. Results for the maximum velocity at middle depth during flood and ebb periods are as follows:

- Maximum flood velocity at middle depth = 25.4 cm/s
- Maximum ebb velocity at middle depth = 25.0 cm/s

The critical mean tidal current velocity was calculated based on depth average and the time average of the net velocities during the critical one hour flow directional transition period around the slack tide point. The critical mean velocity, cross-sectional area of the river, and critical flowrate are as follows:

- Critical mean tidal current velocity = 11.9 cm/s
- Cross-sectional area below mean sea level = 139 m^2
- Critical stream flow rate = 16.5 m^3/s (381 mgd)

The critical stream flow rate due to the tidally induced flow is far in excess of the 7Q10 stream flow condition normally considered critical. This indicates that initial mixing dilution should be improved by the tidal influence at the point of discharge.

CORMIX Model Results

A mixing zone analysis was performed using the Cornell Mixing Zone Expert System, CORMIX version 3.10, subsystem CORMIX2. The model simulation was run for both the 5 mgd and the 10 mgd plant design discharge conditions at the critical mean tidal current velocity of 11.9 cm/s. Other input data are as follows:

- Average water depth = 2.0 m
- River width at mean sea level = 69.5 m
- Discharge diffuser configuration:
  - diffuser diameter = 30"
  - port diameter = 6"
  - diffuser length = 23.8 m
  - port spacing = 6 ft (1.83 m)

number of ports = 14

port orientation = discharge elbow directed downstream, 0.3 m from river bottom to centerline

The results of model analysis are presented in full in Appendix B. The summarized results of the mixing analysis are indicated in the following table:

CORMIX RESULTS	Plant Flow @ 5 mgd	Plant Flow @ 10 mgd
Initial Instream Dilution Ratio	29.1	18.1
Inital Dilution Distance Downstream from Diffuser	11.9 m	11.9 m
Laterally Fully Mixed Distance Downstream from Diffuser	190.6 m	133.1 m
Fully Mixed Dilution Ratio	76.6	38.8
Fully Mixed Distance Downstream from Diffuser	2,114 m	4,513 m
Instream Waste Concentration (IWC)	0.013	0.026

VPDES PERMIT IMPLICATIONS

The Pamunkey River at the point of discharge is not modellable by conventional means due to the tidal influence upon the river. DEQ has recommended that, in such cases, VPDES permit limits should be set at "self-sustaining" levels. "Self-sustaining" is defined by DEQ as an effluent that causes virtually no degradation to the river water quality. Traditionally, "self-sustaining" limits have been in the range of BOD_5 = 10 mg/l, TSS = 10 mg/l, and TKN = 3 mg/l. Based on the CORMIX modeling results and the tidal flux induced mixing that occurs, it appears that effluent discharge permit limits

in this range are clearly "self-sustaining" for this reach of the Pamunkey River.

Metals and Toxicity Testing

Limited data is available concerning potential influent wastewater characteristics at the Totpotomoy Wastewater Treatment Plant making it difficult to predict metals concentrations in the plant effluent. Previous estimates indicate that dissolved metals should be monitored and evaluated for reasonable potential for permit limit requirements based on instream waste concentrations.

The discharge should also be monitored for bioassay characteristics using the chronic test procedure at 1.3% effluent concentration for the 5 mgd permit for the first year. If the first year's test results indicate there to be no reasonable potential for instream impact, then continued monitoring should be reduced in frequency. If a reasonable assurance evaluation of the data indicates no potential toxicity is present, biomonitoring should be curtailed unless a major process change occurs.

VPDES Sewage Sludge Permit Application

DEQ has notified Hanover County that the VPDES Permit Regulation now requires that a VPDES Sewage Sludge permit application be filed as part of the VPDES permit application for the new discharge. This sludge permit application serves to provide information regarding the use or disposal of sewage sludge generated by the proposed treatment plant. While the amount of information available is limited at this time, the permit application will serve as the basis for the sludge management plan for the new facility. The draft VPDES permit will likely include conditional approval of the sludge management plan and require that it be updated and approved prior to implementing specific sludge uses or disposal practices. The application has been filled out to the extent possible and is attached to this document in Appendix C.

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office

4949-A Cox Road, Glen Allen, VA 23060-6296 804/527-5020

SUBJECT: Results of Stream Sanitation Analysis and Effluent Limit Recommendations
Totopotomoy Wastewater Treatment Plant - Hanover County
Discharge to Pamunkey River

TO: Curt Linderman

FROM: Jon van Soestbergen

DATE: June 2, 1997

COPIES: Allan Brockenbrough, File

A stream sanitation analysis for the proposed Totopotomoy wastewater treatment plant (WWTP) discharge to the Pamunkey River was received April 28, 1997. A flow frequency analysis by Paul Herman dated May 6, 1997 for the Pamunkey River at the discharge location was also received. The proposed discharge will be to the Pamunkey River at river mile 8-PMK054.89 (latitude/longitude 37°39'59"/077°14'32") in watershed VAP-F13E. The Pamunkey River is tidally influenced at the proposed discharge location. The application for VPDES permit submitted by the County indicates an initial design flow of 5 MGD, with future expansion to 10 MGD. Fresh water inflow (background 7Q10) at the point of discharge is 65.2 cfs (42.1 MGD).

Seasonal dissolved oxygen (DO) violations in the tidally influenced reaches of the Pamunkey River are well documented (DEQ Memoranda, October 1, 1990, March 19, 1996). The violations are considered to be the result of natural conditions caused by extensive marshlands that border the tidal Pamunkey River. Although the frequency of violations has been insufficient in the past to consider the river impaired for 305(b) assessment purposes, the assimilative capacity of the river with respect to DO is considered to be fully allocated.

Because the river reach to which the proposed WWTP will discharge is considered fully allocated, a best professional judgment (BPJ) approach to establishing VPDES permit limits to maintain DO concentrations in the Pamunkey River is recommended. This approach is supported by DEQ's Water Permits Support Division (M.D. Phillips, e-mail communication, March 17, 1997). The basis for the BPJ approach is A.J. Anthony's Swamp Limits memorandum (A.J. Anthony, 1987), which recommends the following effluent limits, regardless of discharge flow:

$cBOD_5$:	10 mg/l
TSS:	10 mg/l
TKN:	3 mg/l
Cl_2:	0.011 mg/l

A DO limit of 5.0 mg/l is recommended to reflect projected background conditions in the Pamunkey River.

If you have any questions or need additional information, let me know.

References

* Alling, Mark, "Tidal Pamunkey River Dissolved Oxygen Study, Performed June 1 - October 31, 1997", DEQ Memorandum to Curt Linderman, March 19, 1996.
* Alling, Mark, "Dissolved Oxygen Standard Violations on the Pamunkey River Near the Proposed New Kent County STP", DEQ Memorandum to Allan Brockenbrough, October 1, 1990.
* Phillips, M.D., "Discharge to Pamunkey River", DEQ Internal E-mail to Allan Brockenbrough, March 17, 1997.
* Anthony, A.J., "Advisory Notification of Effluent Limits for Swamp and Marsh Waters", DEQ Memorandum to Larry Lawson, March 9, 1987.

Attachment 7

Effluent Data

FACILITY NAME AND PERMIT NUMBER:
Totopotomoy Wastewater Treatment Plant - VA0089915

Form Approved 1/14/99
OMB Number 2040-0086

A.11. Description of Treatment.

a. What levels of treatment are provided? Check all that apply.

____ Primary ✓ Secondary
✓ Advanced ____ Other. Describe: Biological Nutrient Removal

b. Indicate the following removal rates (as applicable):

Design BOD_5 removal or Design $CBOD_5$ removal	99 (actual)	%
Design SS removal	99 (actual)	%
Design P removal	99 (actual)	%
Design N removal	96 (actual)	%
Other ____	____	%

c. What type of disinfection is used for the effluent from this outfall? If disinfection varies by season, please describe.

Ultra-violet light disinfection

If disinfection is by chlorination, is dechlorination used for this outfall? ____ Yes ____ No

d. Does the treatment plant have post aeration? ✓ Yes ____ No

A.12. Effluent Testing Information. All Applicants that discharge to waters of the US must provide effluent testing data for the following parameters. Provide the indicated effluent testing required by the permitting authority for each outfall through which effluent is discharged. Do not include information on combined sewer overflows in this section. All information reported must be based on data collected through analysis conducted using 40 CFR Part 136 methods. In addition, this data must comply with QA/QC requirements of 40 CFR Part 136 and other appropriate QA/QC requirements for standard methods for analytes not addressed by 40 CFR Part 136. At a minimum, effluent testing data must be based on at least three samples and must be no more than four and one-half years apart.

Outfall number: 001

PARAMETER	MAXIMUM DAILY VALUE		AVERAGE DAILY VALUE		
	Value	Units	Value	Units	Number of Samples
pH (Minimum)	6.84	s.u.			
pH (Maximum)	7.38	s.u.			
Flow Rate	4.98	MGD	2.43	MGD	365
Temperature (Winter)	20.3	C	16.3	C	90
Temperature (Summer)	25.3	C	23	C	90

* For pH please report a minimum and a maximum daily value

POLLUTANT		MAXIMUM DAILY DISCHARGE		AVERAGE DAILY DISCHARGE			ANALYTICAL METHOD	ML / MDL
		Conc.	Units	Conc.	Units	Number of Samples		
CONVENTIONAL AND NONCONVENTIONAL COMPOUNDS.								
BIOCHEMICAL OXYGEN	BOD-5							
DEMAND (Report one)	CBOD-5	3.2	MG/L	3.2	MG/L	365	S.M 5210B	2.0 mg/l
~~FECAL COLIFORM~~ - (E. coli)		199	N/CML	8.8	MG/L	365	S.M 9223D	1.0 cfu/100ml
TOTAL SUSPENDED SOLIDS (TSS)		6.6	MG/L	3.2	MG/L	52	S.M 2540D,A	1.0 mg/l

END OF PART A.
REFER TO THE APPLICATION OVERVIEW TO DETERMINE WHICH OTHER PARTS OF FORM 2A YOU MUST COMPLETE

c If the answer to B.5.b is "Yes," briefly describe, including new maximum daily inflow rate (if applicable).

_____

d. Provide dates imposed by any compliance schedule or any actual dates of completion for the implementation steps listed below, as applicable. For improvements planned independently of local, State, or Federal agencies, indicate planned or actual completion dates, as applicable. Indicate dates as accurately as possible.

Implementation Stage	Schedule MM / DD / YYYY	Actual Completion MM / DD / YYYY
– Begin construction	___/___/_____	___/___/_____
– End construction	___/___/_____	___/___/_____
– Begin discharge	___/___/_____	___/___/_____
– Attain operational level	___/___/_____	___/___/_____

e. Have appropriate permits/clearances concerning other Federal/State requirements been obtained? ____Yes ____No

Describe briefly: _____

B.6. EFFLUENT TESTING DATA (GREATER THAN 0.1 MGD ONLY).

Applicants that discharge to waters of the US must provide effluent testing data for the following parameters. Provide the indicated effluent testing required by the permitting authority for each outfall through which effluent is discharged. Do not include information on combined sewer overflows in this section. All information reported must be based on data collected through analysis conducted using 40 CFR Part 136 methods. In addition, this data must comply with QA/QC requirements of 40 CFR Part 136 and other appropriate QA/QC requirements for standard methods for analytes not addressed by 40 CFR Part 136. At a minimum, effluent testing data must be based on at least three pollutant scans and must be no more than four and one-half years old.

Outfall Number: 001

POLLUTANT	MAXIMUM DAILY DISCHARGE		AVERAGE DAILY DISCHARGE			ANALYTICAL METHOD	ML / MDL
	Conc.	Units	Conc.	Units	Number of Samples		
CONVENTIONAL AND NONCONVENTIONAL COMPOUNDS.							
AMMONIA (as N)	<0.20	mg/l	<0.20	mg/l	3	EPA 350.1	0.20 mg/l
CHLORINE (TOTAL RESIDUAL, TRC)	<0.1	mg/l	<0.1	mg/l	3	Hach 8167	0.1 mg/l
DISSOLVED OXYGEN	13.36	mg/l	8.9	mg/l	1095	S.M 4500-O G	0.1 mg/l
TOTAL KJELDAHL NITROGEN (TKN)	6.8	mg/l	1.5	mg/l	1095	S.M 4500NH3F	0.050 mg/l
NITRATE PLUS NITRITE NITROGEN	7.3	mg/l	6.26	mg/l	156	EPA 351.2	0.05 mg/l
OIL and GREASE	<5.0	mg/l	<5.0	mg/l	3	EPA 1664A	5.0 mg/l
PHOSPHORUS (Total)	1.6	mg/l	0.3	mg/l	156	SM 4500-P B.5	0.1 mg/l
TOTAL DISSOLVED SOLIDS (TDS)	436	mg/l	391	mg/l	3	SM2540C	1.0 mg/l
OTHER							

END OF PART B.
REFER TO THE APPLICATION OVERVIEW TO DETERMINE WHICH OTHER PARTS OF FORM 2A YOU MUST COMPLETE

Effluent pH (Standard Units) from DMRs		
Month	**Minimum pH**	**Maximum pH**
2009 May	6.2	7.2
June	7	7.4
July	6.8	7.3
August	6.8	7.4
September	7	7.5
October	7.2	7.5
November	6.9	7.4
December	6.7	7.2
2010 January	6.6	6.9
February	6.5	6.8
March	6.4	6.7
April	6.3	7.2
May	6.7	7.3
June	6.7	7.2
July	7	7.5
August	7.1	7.7
September	7.3	7.6
October	7.1	7.4
November	6.7	7.3
December	6.5	7.2
2011 January	6.6	7.5
February	7.2	7.6
March	7.1	7.8
April	7.2	7.5
May	6.9	7.9
June	7	8.4
July	6.9	7.6
August	6.8	7.5
September	6.9	7.4
October	7	7.5
November	7.1	7.5
December	6.8	7.4
2012 January	6.8	7.3
February	6.9	7.4
March	7	7.6
April	7.2	7.6
P_{90}		7.65
P_{10}		7.2

Effluent Temperature from Data Provided by Permittee		
2011 Month	**Day**	**Effluent Temperature, °C**
January	1 Sat	13.7
	2 Sun	14.3
	3 Mon	14.3
	4 Tue	14.3
	5 Wed	14.3
	6 Thu	14.3
	7 Fri	14.1
	8 Sat	14
	9 Sun	13
	10 Mon	14
	11 Tue	13.7
	12 Wed	13.6
	13 Thu	13.1
	14 Fri	13.2
	15 Sat	13.1
	16 Sun	13
	17 Mon	13.3
	18 Tue	13.5
	19 Wed	13.4
	20 Thu	13.4
	21 Fri	13.3
	22 Sat	11.8
	23 Sun	12
	24 Mon	13.2
	25 Tue	12.4
	26 Wed	13.1
	27 Thu	
	28 Fri	12.7
	29 Sat	12.6
	30 Sun	12.8
	31 Mon	13
February	1 Tue	
	2 Wed	13.1
	3 Thu	13
	4 Fri	12.9
	5 Sat	12.8
	6 Sun	12.9
	7 Mon	13.1
	8 Tue	13
	9 Wed	12.5
	10 Thu	12.8
	11 Fri	12.7
	12 Sat	12.4
	13 Sun	12.5
	14 Mon	13
	15 Tue	12.5
	16 Wed	12.6
	17 Thu	12.8
	18 Fri	12.8
	19 Sat	12.9
	20 Sun	13.2
	21 Mon	12.9

2011 Month	Day	Effluent Temperature, °C
	22 Tue	12.7
	23 Wed	13.3
	24 Thu	13.1
	25 Fri	13.3
	26 Sat	
	27 Sun	13.5
	28 Mon	13.6
March	1 Tue	13.6
	2 Wed	13.5
	3 Thu	13.4
	4 Fri	13.4
	5 Sat	13.3
	6 Sun	13.4
	7 Mon	13.7
	8 Tue	13.6
	9 Wed	13.6
	10 Thu	13.8
	11 Fri	13.1
	12 Sat	13.2
	13 Sun	13.2
	14 Mon	14.1
	15 Tue	13.8
	16 Wed	13.7
	17 Thu	13.6
	18 Fri	13.9
	19 Sat	14.2
	20 Sun	14
	21 Mon	14.8
	22 Tue	14.3
	23 Wed	14.5
	24 Thu	
	25 Fri	14.6
	26 Sat	13.9
	27 Sun	14.2
	28 Mon	14.7
	29 Tue	14.4
	30 Wed	14.3
	31 Thu	14.3
April	1 Fri	14.2
	2 Sat	14.1
	3 Sun	14.2
	4 Mon	14.6
	5 Tue	14.4
	6 Wed	14.5
	7 Thu	14.6
	8 Fri	14.9
	9 Sat	14.8
	10 Sun	14.7
	11 Mon	15.3
	12 Tue	15.2
	13 Wed	15
	14 Thu	14.9
	15 Fri	15.1
	16 Sat	15
	17 Sun	15.2

2011 Month	Day	Effluent Temperature, °C
	18 Mon	15.4
	19 Tue	15.3
	20 Wed	15.5
	21 Thu	15.6
	22 Fri	17.7
	23 Sat	15.6
	24 Sun	15.9
	25 Mon	16.9
	26 Tue	17.1
	27 Wed	18.1
	28 Thu	18.3
	29 Fri	17
	30 Sat	16.5
May	1 Sun	16.7
	2 Mon	17
	3 Tue	17.3
	4 Wed	16.9
	5 Thu	16.9
	6 Fri	17.2
	7 Sat	16.9
	8 Sun	17.7
	9 Mon	17.3
	10 Tue	17.6
	11 Wed	17.3
	12 Thu	17.4
	13 Fri	17.4
	14 Sat	17.4
	15 Sun	17.4
	16 Mon	17.9
	17 Tue	18.3
	18 Wed	18
	19 Thu	17.9
	20 Fri	18.7
	21 Sat	18
	22 Sun	18.2
	23 Mon	18.5
	24 Tue	18.6
	25 Wed	18.7
	26 Thu	18.6
	27 Fri	18.8
	28 Sat	18.8
	29 Sun	18.8
	30 Mon	20.8
	31 Tue	19.6
June	1 Wed	19.7
	2 Thu	19.6
	3 Fri	19.8
	4 Sat	19.9
	5 Sun	19.9
	6 Mon	20.2
	7 Tue	20.1
	8 Wed	20.2
	9 Thu	20.4
	10 Fri	20.2
	11 Sat	20.6

2011 Month	Day	Effluent Temperature, °C
	12 Sun	21.1
	13 Mon	20.9
	14 Tue	20.8
	15 Wed	20.7
	16 Thu	20.7
	17 Fri	21.3
	18 Sat	21.2
	19 Sun	21.3
	20 Mon	21.1
	21 Tue	23.8
	22 Wed	21.1
	23 Thu	21.1
	24 Fri	21.7
	25 Sat	21.7
	26 Sun	21.8
	27 Mon	21.6
	28 Tue	24.5
	29 Wed	21.2
	30 Thu	21.4
July	1 Fri	21.5
	2 Sat	22.1
	3 Sun	23.3
	4 Mon	21.6
	5 Tue	22.1
	6 Wed	
	7 Thu	
	8 Fri	
	9 Sat	
	10 Sun	
	11 Mon	
	12 Tue	
	13 Wed	
	14 Thu	
	15 Fri	
	16 Sat	
	17 Sun	
	18 Mon	
	19 Tue	25.3
	20 Wed	22.4
	21 Thu	22.5
	22 Fri	22.7
	23 Sat	22.8
	24 Sun	22.7
	25 Mon	23.1
	26 Tue	23
	27 Wed	23
	28 Thu	23
	29 Fri	23.2
	30 Sat	23.3
	31 Sun	23.4
August	1 Mon	24
	2 Tue	23.5
	3 Wed	24.1
	4 Thu	24.5
	5 Fri	23.5

2011 Month	Day	Effluent Temperature, °C
	6 Sat	23.6
	7 Sun	24
	8 Mon	25
	9 Tue	24.5
	10 Wed	23.9
	11 Thu	24
	12 Fri	23.9
	13 Sat	23.8
	14 Sun	23.8
	15 Mon	24.6
	16 Tue	24.5
	17 Wed	23.6
	18 Thu	23.8
	19 Fri	23.8
	20 Sat	23.7
	21 Sun	24.4
	22 Mon	24.3
	23 Tue	24.3
	24 Wed	23.7
	25 Thu	23.6
	26 Fri	23.6
	27 Sat	23.6
	28 Sun	23.6
	29 Mon	23.6
	30 Tue	23.9
	31 Wed	23.6
September	1 Thu	23.9
	2 Fri	24
	3 Sat	24
	4 Sun	25
	5 Mon	24.1
	6 Tue	24.2
	7 Wed	23.6
	8 Thu	23.4
	9 Fri	23.6
	10 Sat	23.6
	11 Sun	23.6
	12 Mon	23.8
	13 Tue	23.7
	14 Wed	23.8
	15 Thu	23.5
	16 Fri	23.4
	17 Sat	23.3
	18 Sun	23.2
	19 Mon	
	20 Tue	23.2
	21 Wed	22.9
	22 Thu	23.3
	23 Fri	23.1
	24 Sat	22.9
	25 Sun	22.9
	26 Mon	23.1
	27 Tue	23
	28 Wed	22.9
	29 Thu	23.2
	30 Fri	23.1

2011 Month	Day	Effluent Temperature, °C
October	1 Sat	22.7
	2 Sun	22.7
	3 Mon	22.6
	4 Tue	22.4
	5 Wed	22.2
	6 Thu	22
	7 Fri	22.2
	8 Sat	22
	9 Sun	21.9
	10 Mon	21.7
	11 Tue	22.1
	12 Wed	22.1
	13 Thu	22.3
	14 Fri	22.1
	15 Sat	21.8
	16 Sun	21.7
	17 Mon	21.7
	18 Tue	21.7
	19 Wed	21.5
	20 Thu	21.6
	21 Fri	21.5
	22 Sat	21.1
	23 Sun	21.1
	24 Mon	21.3
	25 Tue	21.2
	26 Wed	21.2
	27 Thu	20.8
	28 Fri	20.2
	29 Sat	20.4
	30 Sun	20.3
	31 Mon	20.4
November	1 Tue	20.3
	2 Wed	20
	3 Thu	19.8
	4 Fri	19.9
	5 Sat	19
	6 Sun	19
	7 Mon	19.4
	8 Tue	19.3
	9 Wed	19.3
	10 Thu	18.9
	11 Fri	18.2
	12 Sat	18.1
	13 Sun	18.1
	14 Mon	18.8
	15 Tue	19
	16 Wed	18.7
	17 Thu	18.9
	18 Fri	18.7
	19 Sat	18.4
	20 Sun	18.5
	21 Mon	18.6
	22 Tue	18.6
	23 Wed	18.7
	24 Thu	18.6

2011 Month	Day	Effluent Temperature, °C
	25 Fri	18.1
	26 Sat	18.3
	27 Sun	18.2
	28 Mon	18.6
	29 Tue	18.5
	30 Wed	18
December	1 Thu	16.7
	2 Fri	17.9
	3 Sat	18.3
	4 Sun	18.1
	5 Mon	17
	6 Tue	17.3
	7 Wed	17.8
	8 Thu	17.4
	9 Fri	17
	10 Sat	17
	11 Sun	17.3
	12 Mon	
	13 Tue	17.1
	14 Wed	16.8
	15 Thu	16.2
	16 Fri	17
	17 Sat	16.8
	18 Sun	16.8
	19 Mon	16.6
	20 Tue	16.2
	21 Wed	16.5
	22 Thu	16.6
	23 Fri	16.7
	24 Sat	16.5
	25 Sun	16.5
	26 Mon	16.5
	27 Tue	15.7
	28 Wed	16.3
	29 Thu	
	30 Fri	11
	31 Sat	15.5
	Minimum	**11**
	Maximum	**25.3**
	Average	**18.4**
	P_{90}	**23.6**

Attachment 8

Water Quality Criteria Data and Screening

Attachment 8

Water Quality Criteria Monitoring
Totopotomoy Wastewater Treatment Plant

The concentrations that are shaded are detected values that were evaluated in regard to the need to establish water quality based effluent limitations (see Attachment 9).

Effluent limitations that protect the water quality standards for *E. coli* are established in Part I.A of the permit.

Although ammonia was not detected at a quantification level of 200 µg/L, the reported effluent concentrations are the result of the treatment provided as ammonia is characteristically present in domestic wastewater. Consequently, the need for ammonia limitations in Part I.A of the permit is determined using an assumed ammonia concentration. See Attachment 9.

Hardness is not a pollutant per se; an effluent hardness concentration is needed to calculate applicable water quality standards for the metals.

All other pollutants are considered absent for the purpose of this evaluation.

CHEMICAL	REQUIRED QUANTIFICATION LEVEL, µg/L	REPORTED, µg/L		
		4-13 2011	6-22-2011	11-16-2011
METALS				
Antimony, dissolved	1.4	<20	<0.50	<1.0
Arsenic, dissolved	1.0	<20	<1.0	<1.0
Cadmium, dissolved	0.30	<0.1	<0.05	<0.05
Chromium III, dissolved (1)	3.6	<5.0	<1.0	<1.0
Chromium VI, dissolved (1)	1.6	<5.0	<1.0	<1.0
Copper, dissolved	0.50	1.1	1.62	1.43
Lead, dissolved	0.50	<1.0	<0.10	<0.10
Mercury, dissolved	1.0	<0.20	<0.10	<0.10
Nickel, dissolved	0.94	<2.0	1.25	1.26
Selenium, dissolved	2.0 (2)	<2.0	<0.50	
Selenium, total recoverable	2.0		<0.50	<0.50
Silver, dissolved	0.20	<0.10	<0.05	<0.10

CHEMICAL	REQUIRED QUANTIFICATION LEVEL, µg/L	REPORTED, µg/L		
		4-13 2011	6-22-2011	11-16-2011
Thallium, dissolved	(1)	<0.10	<0.10	<0.10
Zinc, dissolved	3.6	36.7	36.0	37.5
		6-6-2012: 32.3 6-7-2012: 32.9 6-8-2012: 32.3 6-11-2012: 30.2		6-12-2012: 27.8 6-13-2012: 32.7 6-14-2012: 30.2
PESTICIDES/PCB'S				
Aldrin	0.05		<0.05	
Chlordane	0.2		<0.20	
Chlorpyrifos (synonym = Dursban)	(1)		<0.10	
DDD	0.1	<0.05	<0.05	
DDE	0.1	<0.05	<0.05	
DDT	0.1		<0.05	
Demeton	(1)		<0.10	
Diazinon	(1)		<0.10	
Dieldrin	0.1	<0.05	<0.05	
Alpha-Endosulfan	0.1		<0.05	
Beta-Endosulfan	0.1		<0.05	
Endosulfan Sulfate	0.1		<0.05	
Endrin	0.1		<0.05	
Endrin Aldehyde	(1)	<0.05	<0.05	
Guthion	(1)		<0.10	
Heptachlor	0.05		<0.05	
Heptachlor Epoxide	(1)	<0.05	<0.05	
Hexachlorocyclohexane Alpha-BHC	(1)	<0.05	<0.05	
Hexachlorocyclohexane Beta-BHC	(1)	<0.05	<0.05	
Hexachlorocyclohexane Gamma-BHC or Lindane	(1)		<0.05	
Kepone	(1)	<0.10	<0.10	
Malathion	(1)		<0.10	
Methoxychlor	(1)		<0.05	
Mirex	(1)		<0.05	
Parathion	(1)		<0.10	

CHEMICAL	REQUIRED QUANTIFICATION LEVEL, µg/L	REPORTED, µg/L		
		4-13 2011	6-22-2011	11-16-2011
PCB Total	7.0	<7.00	<7.00	
Toxaphene	5.0		<5.00	
BASE NEUTRAL EXTRACTABLES				
Acenaphthene	10.0	<10.0	<10.0	<10.0
Anthracene	10.0	<10.0	<10.0	<10.0
Benzidine	(1)	<10.0	<10.0	<10.0
Benzo (a) anthracene	10.0	<10.0	<10.0	<10.0
Benzo (b) fluoranthene	10.0	<10.0	<10.0	<10.0
Benzo (k) fluoranthene	10.0	<10.0	<10.0	<10.0
Benzo (a) pyrene	10.0	<10.0	<10.0	<10.0
Bis 2-Chloroethyl Ether	(1)	<10.0	<10.0	<10.0
Bis 2-Chloroisopropyl Ether	(1)	<10.0	<10.0	<10.0
Bis-2-ethylhexyl phthalate	10.0	<10.0	<10.0	<10.0
Butyl benzyl phthalate	10.0	<10.0	<10.0	<10.0
2-Chloronaphthalene	(1)	<10.0	<10.0	<10.0
Chrysene	10.0	<10.0	<10.0	<10.0
Dibenz(a,h)anthracene	20.0	<10.0	<10.0	<10.0
Dibutyl phthalate (synonym = Di-n-Butyl Phthalate)	10.0	<10.0	<10.0	<10.0
1,2-Dichlorobenzene	10.0	<10.0	<10.0	<10.0
1,3-Dichlorobenzene	10.0	<10.0	<10.0	<10.0
1,4-Dichlorobenzene	10.0	<10.0	<10.0	<10.0
3,3-Dichlorobenzidine	(1)	<10.0	<10.0	<10.0
Diethyl phthalate	10.0	<10.0	<10.0	<10.0
Dimethyl phthalate	(1)	<10.0	<10.0	<10.0
2,4-Dinitrotoluene	10.0	<10.0	<10.0	<10.0
1,2-Diphenylhydrazine	(1)	<10.0	<10.0	<10.0
Fluoranthene	10.0	<10.0	<10.0	<10.0
Fluorene	10.0	<10.0	<10.0	<10.0
Hexachlorobenzene	(1)	<10.0	<10.0	<10.0

CHEMICAL	REQUIRED QUANTIFICATION LEVEL, µg/L	REPORTED, µg/L		
		4-13 2011	6-22-2011	11-16-2011
Hexachlorobutadiene	(1)	<10.0	<10.0	<10.0
Hexachlorocyclopentadiene	(1)	<10.0	<10.0	<10.0
Hexachloroethane	(1)	<10.0	<10.0	<10.0
Indeno(1,2,3-cd)pyrene	20.0	<10.0	<10.0	<10.0
Isophorone	10.0	<10.0	<10.0	<10.0
Nitrobenzene	10.0	<10.0	<10.0	<10.0
N-Nitrosodimethylamine	(1)	<10.0	<10.0	<10.0
N-Nitrosodi-n-propylamine	(1)	<10.0	<10.0	<10.0
N-Nitrosodiphenylamine	(1)	<10.0	<10.0	<10.0
Pyrene	10.0	<10.0	<10.0	<10.0
1,2,4-Trichlorobenzene	10.0	<10.0	<10.0	<10.0
VOLATILES				
Acrolein	(1)	<0.50	<0.50	<0.50
Acrylonitrile	(1)	<10.0	<10.0	<10.0
Benzene	10.0	<10.0	<10.0	<10.0
Bromoform	10.0	<10.0	<10.0	<10.0
Carbon Tetrachloride	10.0	<10.0	<10.0	<10.0
Chlorobenzene (synonym = monochlorobenzene)	50.0	<10.0	<10.0	<10.0
Chlorodibromomethane	10.0	<10.0	<10.0	<10.0
Chloroform	10.0	<10.0	<10.0	<10.0
Dichloromethane (synonym = methylene chloride)	20.0	<10.0	<10.0	<10.0
Dichlorobromomethane	10.0	<10.0	<10.0	<10.0
1,2-Dichloroethane	10.0	<10.0	<10.0	<10.0
1,1-Dichloroethylene	10.0	<10.0	<10.0	<10.0
1,2-trans-dichloroethylene	(1)	<10.0	<10.0	<10.0
1,2-Dichloropropane	(1)	<10.0	<10.0	<10.0
1,3-Dichloropropene	(1)	<20.0	<20.0	<20.0
Ethylbenzene	10.0	<10.0	<10.0	<10.0
Methyl Bromide	(1)	<10.0	<10.0	<10.0

CHEMICAL	REQUIRED QUANTIFICATION LEVEL, µg/L	REPORTED, µg/L		
		4-13 2011	6-22-2011	11-16-2011
1,1,2,2-Tetrachloroethane	(1)	<10.0	<10.0	<10.0
Tetrachloroethylene	10.0	<10.0	<10.0	<10.0
Toluene	10.0	<10.0	<10.0	<10.0
1,1,2-Trichloroethane	(1)	<10.0	<10.0	<10.0
Trichloroethylene	10.0	<10.0	<10.0	<10.0
Vinyl Chloride	10.0	<10.0	<10.0	<10.0
ACID EXTRACTABLES				
2-Chlorophenol	10.0	<10.0	<10.0	<10.0
2,4 Dichlorophenol	10.0	<10.0	<10.0	<10.0
2,4 Dimethylphenol	10.0	<10.0	<10.0	<10.0
2,4-Dinitrophenol	(1)	<10.0	<10.0	<10.0
2-Methyl-4,6-Dinitrophenol	(1)	<10.0	<10.0	<10.0
Nonylphenol	(1)		<10.0	
Pentachlorophenol	50.0	<10.0	<10.0	<10.0
Phenol	10.0	<10.0	<10.0	<10.0
2,4,6-Trichlorophenol	10.0	<10.0	<10.0	<10.0
MISCELLANEOUS				
Ammonia as NH_3-N	200		<200	
		4-12-2012: <100		4-9-2012: <100
Chlorides	(1)		47,000	
Chlorine, Total Residual	100	3 samples reported in Form 2A – all <100		
Cyanide, Free	10.0	<10 total	<10 free	<10 free
E. coli / *Enterococcus* (N/CML)	(1)	365 samples reported in Form 2A – 8.8 average; 199 maximum		
Hydrogen Sulfide	(1)	<100 (sulfide)	<100 (sulfide)	
Tributyltin (ng/L)	(1)		<30	
Hardness (mg/L as $CaCO_3$)	(1)	78.4	72.7	79.3

(1) The QL is at the discretion of the permittee.
(2) The dissolved selenium water quality standard applies to salt water only. The permittee provided dissolved data, so that data is reported here in addition to the total recoverable data. All selenium data is less than the DEQ maximum QL.

Attachment 9

MSTRANTI and STATS Analyses

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Totopotomoy WWTP – 7 MGD Permit No.: VA0089915

Receiving Stream: Pamunkey River Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information

Mean Hardness (as CaCO3) =	33	mg/L
90% Temperature (Annual) =	26.4	deg C
90% Temperature (Wet season) =		deg C
90% Maximum pH =	7.5	SU
10% Maximum pH =	6.3	SU
Tier Designation (1 or 2) =	2	
Public Water Supply (PWS) Y/N? =	n	
Trout Present Y/N? =	n	
Early Life Stages Present Y/N? =	y	

Stream Flows

1Q10 (Annual) =	32	MGD
7Q10 (Annual) =	36	MGD
30Q10 (Annual) =	42	MGD
1Q10 (Wet season) =		MGD
30Q10 (Wet season) =		MGD
30Q5 =	54	MGD
Harmonic Mean =	199	MGD

Mixing Information

Annual - 1Q10 Mix =	100	%
- 7Q10 Mix =	100	%
- 30Q10 Mix =	100	%
Wet Season - 1Q10 Mix =	100	%
- 30Q10 Mix =	100	%

Effluent Information

Mean Hardness (as CaCO3) =	76.8	mg/L
90% Temp (Annual) =	23.6	deg C
90% Temp (Wet season) =		deg C
90% Maximum pH =	7.65	SU
10% Maximum pH =	7.2	SU
Discharge Flow =	7	MGD

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Acenapthene	0	--	--	na	9.9E+02	--	--	na	8.6E+03	--	--	na	9.9E+01	--	--	na	8.6E+02	--	--	na	**8.6E+02**
Acrolein	0	--	--	na	9.3E+00	--	--	na	8.1E+01	--	--	na	9.3E-01	--	--	na	8.1E+00	--	--	na	**8.1E+00**
Acrylonitrile[C]	0	--	--	na	2.5E+00	--	--	na	7.4E+01	--	--	na	2.5E-01	--	--	na	7.4E+00	--	--	na	**7.4E+00**
Aldrin [C]	0	3.0E+00	--	na	5.0E-04	1.7E+01	--	na	1.5E-02	7.5E-01	--	na	5.0E-05	4.2E+00	--	na	1.5E-03	**4.2E+00**	--	na	**1.5E-03**
Ammonia-N (mg/l) (Yearly)	0	1.92E+01	2.05E+00	na	--	1.07E+02	1.43E+01	na	--	4.80E+00	5.12E-01	na	--	2.67E+01	3.58E+00	na	--	**2.67E+01**	**3.58E+00**	na	--
Ammonia-N (mg/l) (High Flow)	0	1.57E+01	3.78E+00	na	--	1.57E+01	3.78E+00	na	--	3.93E+00	9.44E-01	na	--	3.93E+00	9.44E-01	na	--	**3.93E+00**	**9.44E-01**	na	--
Anthracene	0	--	--	na	4.0E+04	--	--	na	3.5E+05	--	--	na	4.0E+03	--	--	na	3.5E+04	--	--	na	**3.5E+04**
Antimony	0	--	--	na	6.4E+02	--	--	na	5.6E+03	--	--	na	6.4E+01	--	--	na	5.6E+02	--	--	na	**5.6E+02**
Arsenic	0	3.4E+02	1.5E+02	na	--	1.9E+03	9.2E+02	na	--	8.5E+01	3.8E+01	na	--	4.7E+02	2.3E+02	na	--	**4.7E+02**	**2.3E+02**	na	--
Barium	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Benzene [C]	0	--	--	na	5.1E+02	--	--	na	1.5E+04	--	--	na	5.1E+01	--	--	na	1.5E+03	--	--	na	**1.5E+03**
Benzidine[C]	0	--	--	na	2.0E-03	--	--	na	5.9E-02	--	--	na	2.0E-04	--	--	na	5.9E-03	--	--	na	**5.9E-03**
Benzo (a) anthracene [C]	0	--	--	na	1.8E-01	--	--	na	5.3E+00	--	--	na	1.8E-02	--	--	na	5.3E-01	--	--	na	**5.3E-01**
Benzo (b) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	5.3E+00	--	--	na	1.8E-02	--	--	na	5.3E-01	--	--	na	**5.3E-01**
Benzo (k) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	5.3E+00	--	--	na	1.8E-02	--	--	na	5.3E-01	--	--	na	**5.3E-01**
Benzo (a) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	5.3E+00	--	--	na	1.8E-02	--	--	na	5.3E-01	--	--	na	**5.3E-01**
Bis2-Chloroethyl Ether[C]	0	--	--	na	5.3E+00	--	--	na	1.6E+02	--	--	na	5.3E-01	--	--	na	1.6E+01	--	--	na	**1.6E+01**
Bis2-Chloroisopropyl Ether	0	--	--	na	6.5E+04	--	--	na	5.7E+05	--	--	na	6.5E+03	--	--	na	5.7E+04	--	--	na	**5.7E+04**
Bis 2-Ethylhexyl Phthalate [C]	0	--	--	na	2.2E+01	--	--	na	6.5E+02	--	--	na	2.2E+00	--	--	na	6.5E+01	--	--	na	**6.5E+01**
Bromoform [C]	0	--	--	na	1.4E+03	--	--	na	4.1E+04	--	--	na	1.4E+02	--	--	na	4.1E+03	--	--	na	**4.1E+03**
Butylbenzylphthalate	0	--	--	na	1.9E+03	--	--	na	1.7E+04	--	--	na	1.9E+02	--	--	na	1.7E+03	--	--	na	**1.7E+03**
Cadmium	0	1.4E+00	5.5E-01	na	--	8.0E+00	3.4E+00	na	--	3.6E-01	1.4E-01	na	--	2.0E+00	8.5E-01	na	--	**2.0E+00**	**8.5E-01**	na	--
Carbon Tetrachloride [C]	0	--	--	na	1.6E+01	--	--	na	4.7E+02	--	--	na	1.6E+00	--	--	na	4.7E+01	--	--	na	**4.7E+01**
Chlordane [C]	0	2.4E+00	4.3E-03	na	8.1E-03	1.3E+01	2.6E-02	na	2.4E-01	6.0E-01	1.1E-03	na	8.1E-04	3.3E+00	6.6E-03	na	2.4E-02	**3.3E+00**	**6.6E-03**	na	**2.4E-02**
Chloride	0	8.6E+05	2.3E+05	na	--	4.8E+06	1.4E+06	na	--	2.2E+05	5.8E+04	na	--	1.2E+06	3.5E+05	na	--	**1.2E+06**	**3.5E+05**	na	--
TRC	0	1.9E+01	1.1E+01	na	--	1.1E+02	6.8E+01	na	--	4.8E+00	2.8E+00	na	--	2.6E+01	1.7E+01	na	--	**2.6E+01**	**1.7E+01**	na	--
Chlorobenzene	0	--	--	na	1.6E+03	--	--	na	1.4E+04	--	--	na	1.6E+02	--	--	na	1.4E+03	--	--	na	**1.4E+03**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Chlorodibromomethane[C]	0	--	--	na	1.3E+02	--	--	na	3.8E+03	--	--	na	1.3E+01	--	--	na	3.8E+02	--	--	na	**3.8E+02**
Chloroform	0	--	--	na	1.1E+04	--	--	na	9.6E+04	--	--	na	1.1E+03	--	--	na	9.6E+03	--	--	na	**9.6E+03**
2-Chloronaphthalene	0	--	--	na	1.6E+03	--	--	na	1.4E+04	--	--	na	1.6E+02	--	--	na	1.4E+03	--	--	na	**1.4E+03**
2-Chlorophenol	0	--	--	na	1.5E+02	--	--	na	1.3E+03	--	--	na	1.5E+01	--	--	na	1.3E+02	--	--	na	**1.3E+02**
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	4.6E-01	2.5E-01	na	--	2.1E-02	1.0E-02	na	--	1.2E-01	6.3E-02	na	--	**1.2E-01**	**6.3E-02**	na	--
Chromium III	0	2.7E+02	3.5E+01	na	--	1.5E+03	2.2E+02	na	--	6.8E+01	8.8E+00	na	--	3.8E+02	5.4E+01	na	--	**3.8E+02**	**5.4E+01**	na	--
Chromium VI	0	1.6E+01	1.1E+01	na	--	8.9E+01	6.8E+01	na	--	4.0E+00	2.8E+00	na	--	2.2E+01	1.7E+01	na	--	**2.2E+01**	**1.7E+01**	na	--
Chromium, Total	0	--	--	1.0E+02	--	--	--	na	--	--	--	1.0E+01	--	--	--	8.7E+01	--	--	--	na	--
Chrysene[C]	0	--	--	na	1.8E-02	--	--	na	5.3E-01	--	--	na	1.8E-03	--	--	na	5.3E-02	--	--	na	**5.3E-02**
Copper	0	5.8E+00	4.1E+00	na	--	3.2E+01	2.5E+01	na	--	1.4E+00	1.0E+00	na	--	8.1E+00	6.3E+00	na	--	**8.1E+00**	**6.3E+00**	na	--
Cyanide, Free	0	2.2E+01	5.2E+00	na	1.6E+04	1.2E+02	3.2E+01	na	1.4E+05	5.5E+00	1.3E+00	na	1.6E+03	3.1E+01	8.0E+00	na	1.4E+04	**3.1E+01**	**8.0E+00**	na	**1.4E+04**
DDD[C]	0	--	--	na	3.1E-03	--	--	na	9.1E-02	--	--	na	3.1E-04	--	--	na	9.1E-03	--	--	na	**9.1E-03**
DDE[C]	0	--	--	na	2.2E-03	--	--	na	6.5E-02	--	--	na	2.2E-04	--	--	na	6.5E-03	--	--	na	**6.5E-03**
DDT[C]	0	1.1E+00	1.0E-03	na	2.2E-03	6.1E+00	6.1E-03	na	6.5E-02	2.8E-01	2.5E-04	na	2.2E-04	1.5E+00	1.5E-03	na	6.5E-03	**1.5E+00**	**1.5E-03**	na	**6.5E-03**
Demeton	0	--	1.0E-01	na	--	--	6.1E-01	na	--	--	2.5E-02	na	--	--	1.5E-01	na	--	--	**1.5E-01**	na	--
Diazinon	0	1.7E-01	1.7E-01	na	--	9.5E-01	1.0E+00	na	--	4.3E-02	4.3E-02	na	--	2.4E-01	2.6E-01	na	--	**2.4E-01**	**2.6E-01**	na	--
Dibenz(a,h)anthracene[C]	0	--	--	na	1.8E-01	--	--	na	5.3E+00	--	--	na	1.8E-02	--	--	na	5.3E-01	--	--	na	**5.3E-01**
1,2-Dichlorobenzene	0	--	--	na	1.3E+03	--	--	na	1.1E+04	--	--	na	1.3E+02	--	--	na	1.1E+03	--	--	na	**1.1E+03**
1,3-Dichlorobenzene	0	--	--	na	9.6E+02	--	--	na	8.4E+03	--	--	na	9.6E+01	--	--	na	8.4E+02	--	--	na	**8.4E+02**
1,4-Dichlorobenzene	0	--	--	na	1.9E+02	--	--	na	1.7E+03	--	--	na	1.9E+01	--	--	na	1.7E+02	--	--	na	**1.7E+02**
3,3-Dichlorobenzidine[C]	0	--	--	na	2.8E-01	--	--	na	8.2E+00	--	--	na	2.8E-02	--	--	na	8.2E-01	--	--	na	**8.2E-01**
Dichlorobromomethane[C]	0	--	--	na	1.7E+02	--	--	na	5.0E+03	--	--	na	1.7E+01	--	--	na	5.0E+02	--	--	na	**5.0E+02**
1,2-Dichloroethane[C]	0	--	--	na	3.7E+02	--	--	na	1.1E+04	--	--	na	3.7E+01	--	--	na	1.1E+03	--	--	na	**1.1E+03**
1,1-Dichloroethylene	0	--	--	na	7.1E+03	--	--	na	6.2E+04	--	--	na	7.1E+02	--	--	na	6.2E+03	--	--	na	**6.2E+03**
1,2-trans-dichloroethylene	0	--	--	na	1.0E+04	--	--	na	8.7E+04	--	--	na	1.0E+03	--	--	na	8.7E+03	--	--	na	**8.7E+03**
2,4-Dichlorophenol	0	--	--	na	2.9E+02	--	--	na	2.5E+03	--	--	na	2.9E+01	--	--	na	2.5E+02	--	--	na	**2.5E+02**
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
1,2-Dichloropropane[C]	0	--	--	na	1.5E+02	--	--	na	4.4E+03	--	--	na	1.5E+01	--	--	na	4.4E+02	--	--	na	**4.4E+02**
1,3-Dichloropropene[C]	0	--	--	na	2.1E+02	--	--	na	6.2E+03	--	--	na	2.1E+01	--	--	na	6.2E+02	--	--	na	**6.2E+02**
Dieldrin[C]	0	2.4E-01	5.6E-02	na	5.4E-04	1.3E+00	3.4E-01	na	1.6E-02	6.0E-02	1.4E-02	na	5.4E-05	3.3E-01	8.6E-02	na	1.6E-03	**3.3E-01**	**8.6E-02**	na	**1.6E-03**
Diethyl Phthalate	0	--	--	na	4.4E+04	--	--	na	3.8E+05	--	--	na	4.4E+03	--	--	na	3.8E+04	--	--	na	**3.8E+04**
2,4-Dimethylphenol	0	--	--	na	8.5E+02	--	--	na	7.4E+03	--	--	na	8.5E+01	--	--	na	7.4E+02	--	--	na	**7.4E+02**
Dimethyl Phthalate	0	--	--	na	1.1E+06	--	--	na	9.6E+06	--	--	na	1.1E+05	--	--	na	9.6E+05	--	--	na	**9.6E+05**
Di-n-Butyl Phthalate	0	--	--	na	4.5E+03	--	--	na	3.9E+04	--	--	na	4.5E+02	--	--	na	3.9E+03	--	--	na	**3.9E+03**
2,4 Dinitrophenol	0	--	--	na	5.3E+03	--	--	na	4.6E+04	--	--	na	5.3E+02	--	--	na	4.6E+03	--	--	na	**4.6E+03**
2-Methyl-4,6-Dinitrophenol	0	--	--	na	2.8E+02	--	--	na	2.4E+03	--	--	na	2.8E+01	--	--	na	2.4E+02	--	--	na	**2.4E+02**
2,4-Dinitrotoluene[C]	0	--	--	na	3.4E+01	--	--	na	1.0E+03	--	--	na	3.4E+00	--	--	na	1.0E+02	--	--	na	**1.0E+02**
Dioxin 2,3,7,8-tetrachlorodibenzo-p-dioxin	0	--	--	na	5.1E-08	--	--	na	4.4E-07	--	--	na	5.1E-09	--	--	na	4.4E-08	--	--	na	**4.4E-08**
1,2-Diphenylhydrazine[C]	0	--	--	na	2.0E+00	--	--	na	5.9E+01	--	--	na	2.0E-01	--	--	na	5.9E+00	--	--	na	**5.9E+00**
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	1.2E+00	3.4E-01	na	7.8E+02	5.5E-02	1.4E-02	na	8.9E+00	3.1E-01	8.6E-02	na	7.8E+01	**3.1E-01**	**8.6E-02**	na	**7.8E+01**
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	1.2E+00	3.4E-01	na	7.8E+02	5.5E-02	1.4E-02	na	8.9E+00	3.1E-01	8.6E-02	na	7.8E+01	**3.1E-01**	**8.6E-02**	na	**7.8E+01**
Alpha + Beta Endosulfan	0	2.2E-01	5.6E-02	--	--	1.2E+00	3.4E-01	--	--	5.5E-02	1.4E-02	--	--	3.1E-01	8.6E-02	--	--	**3.1E-01**	**8.6E-02**	--	--
Endosulfan Sulfate	0	--	--	na	8.9E+01	--	--	na	7.8E+02	--	--	na	8.9E+00	--	--	na	7.8E+01	--	--	na	**7.8E+01**
Endrin	0	8.6E-02	3.6E-02	na	6.0E-02	4.8E-01	2.2E-01	na	5.2E-01	2.2E-02	9.0E-03	na	6.0E-03	1.2E-01	5.5E-02	na	5.2E-02	**1.2E-01**	**5.5E-02**	na	**5.2E-02**
Endrin Aldehyde	0	--	--	na	3.0E-01	--	--	na	2.6E+00	--	--	na	3.0E-02	--	--	na	2.6E-01	--	--	na	**2.6E-01**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Ethylbenzene	0	--	--	na	2.1E+03	--	--	na	1.8E+04	--	--	na	2.1E+02	--	--	na	1.8E+03	--	--	na	**1.8E+03**
Fluoranthene	0	--	--	na	1.4E+02	--	--	na	1.2E+03	--	--	na	1.4E+01	--	--	na	1.2E+02	--	--	na	**1.2E+02**
Fluorene	0	--	--	na	5.3E+03	--	--	na	4.6E+04	--	--	na	5.3E+02	--	--	na	4.6E+03	--	--	na	**4.6E+03**
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Guthion	0	--	1.0E-02	na	--	--	6.1E-02	na	--	--	2.5E-03	na	--	--	1.5E-02	na	--	--	**1.5E-02**	na	--
Heptachlor [C]	0	5.2E-01	3.8E-03	na	7.9E-04	2.9E+00	2.3E-02	na	2.3E-02	1.3E-01	9.5E-04	na	7.9E-05	7.2E-01	5.8E-03	na	2.3E-03	**7.2E-01**	**5.8E-03**	na	**2.3E-03**
Heptachlor Epoxide[C]	0	5.2E-01	3.8E-03	na	3.9E-04	2.9E+00	2.3E-02	na	1.1E-02	1.3E-01	9.5E-04	na	3.9E-05	7.2E-01	5.8E-03	na	1.1E-03	**7.2E-01**	**5.8E-03**	na	**1.1E-03**
Hexachlorobenzene[C]	0	--	--	na	2.9E-03	--	--	na	8.5E-02	--	--	na	2.9E-04	--	--	na	8.5E-03	--	--	na	**8.5E-03**
Hexachlorobutadiene[C]	0	--	--	na	1.8E+02	--	--	na	5.3E+03	--	--	na	1.8E+01	--	--	na	5.3E+02	--	--	na	**5.3E+02**
Hexachlorocyclohexane Alpha-BHC[C]	0	--	--	na	4.9E-02	--	--	na	1.4E+00	--	--	na	4.9E-03	--	--	na	1.4E-01	--	--	na	**1.4E-01**
Hexachlorocyclohexane Beta-BHC[C]	0	--	--	na	1.7E-01	--	--	na	5.0E+00	--	--	na	1.7E-02	--	--	na	5.0E-01	--	--	na	**5.0E-01**
Hexachlorocyclohexane Gamma-BHC[C] (Lindane)	0	9.5E-01	na	na	1.8E+00	5.3E+00	--	na	5.3E+01	2.4E-01	--	na	1.8E-01	1.3E+00	--	na	5.3E+00	**1.3E+00**	--	na	**5.3E+00**
Hexachlorocyclopentadiene	0	--	--	na	1.1E+03	--	--	na	9.6E+03	--	--	na	1.1E+02	--	--	na	9.6E+02	--	--	na	**9.6E+02**
Hexachloroethane[C]	0	--	--	na	3.3E+01	--	--	na	9.7E+02	--	--	na	3.3E+00	--	--	na	9.7E+01	--	--	na	**9.7E+01**
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	1.2E+01	na	--	--	5.0E-01	na	--	--	3.1E+00	na	--	--	**3.1E+00**	na	--
Indeno (1,2,3-cd) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	5.3E+00	--	--	na	1.8E-02	--	--	na	5.3E-01	--	--	na	**5.3E-01**
Iron	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Isophorone[C]	0	--	--	na	9.6E+03	--	--	na	2.8E+05	--	--	na	9.6E+02	--	--	na	2.8E+04	--	--	na	**2.8E+04**
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	**0.0E+00**	na	--
Lead	0	3.8E+01	4.2E+00	na	--	2.1E+02	2.6E+01	na	--	9.5E+00	1.1E+00	na	--	5.3E+01	6.5E+00	na	--	**5.3E+01**	**6.5E+00**	na	--
Malathion	0	--	1.0E-01	na	--	--	6.1E-01	na	--	--	2.5E-02	na	--	--	1.5E-01	na	--	--	**1.5E-01**	na	--
Manganese	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Mercury	0	1.4E+00	7.7E-01	--	--	7.8E+00	4.7E+00	--	--	3.5E-01	1.9E-01	--	--	2.0E+00	1.2E+00	--	--	**2.0E+00**	**1.2E+00**	--	--
Methyl Bromide	0	--	--	na	1.5E+03	--	--	na	1.3E+04	--	--	na	1.5E+02	--	--	na	1.3E+03	--	--	na	**1.3E+03**
Methylene Chloride [C]	0	--	--	na	5.9E+03	--	--	na	1.7E+05	--	--	na	5.9E+02	--	--	na	1.7E+04	--	--	na	**1.7E+04**
Methoxychlor	0	--	3.0E-02	na	--	--	1.8E-01	na	--	--	7.5E-03	na	--	--	4.6E-02	na	--	--	**4.6E-02**	na	--
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	**0.0E+00**	na	--
Nickel	0	8.6E+01	9.4E+00	na	4.6E+03	4.8E+02	5.8E+01	na	4.0E+04	2.1E+01	2.3E+00	na	4.6E+02	1.2E+02	1.4E+01	na	4.0E+03	**1.2E+02**	**1.4E+01**	na	**4.0E+03**
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Nitrobenzene	0	--	--	na	6.9E+02	--	--	na	6.0E+03	--	--	na	6.9E+01	--	--	na	6.0E+02	--	--	na	**6.0E+02**
N-Nitrosodimethylamine[C]	0	--	--	na	3.0E+01	--	--	na	8.8E+02	--	--	na	3.0E+00	--	--	na	8.8E+01	--	--	na	**8.8E+01**
N-Nitrosodiphenylamine[C]	0	--	--	na	6.0E+01	--	--	na	1.8E+03	--	--	na	6.0E+00	--	--	na	1.8E+02	--	--	na	**1.8E+02**
N-Nitrosodi-n-propylamine[C]	0	--	--	na	5.1E+00	--	--	na	1.5E+02	--	--	na	5.1E-01	--	--	na	1.5E+01	--	--	na	**1.5E+01**
Nonylphenol	0	2.8E+01	6.6E+00	--	--	1.6E+02	4.1E+01	na	--	7.0E+00	1.7E+00	--	--	3.9E+01	1.0E+01	--	--	**3.9E+01**	**1.0E+01**	na	--
Parathion	0	6.5E-02	1.3E-02	na	--	3.6E-01	8.0E-02	na	--	1.6E-02	3.3E-03	na	--	9.1E-02	2.0E-02	na	--	**9.1E-02**	**2.0E-02**	na	--
PCB Total[C]	0	--	1.4E-02	na	6.4E-04	--	8.6E-02	na	1.9E-02	--	3.5E-03	na	6.4E-05	--	2.2E-02	na	1.9E-03	--	**2.2E-02**	na	**1.9E-03**
Pentachlorophenol [C]	0	4.7E+00	3.5E+00	na	3.0E+01	2.6E+01	2.2E+01	na	8.8E+02	1.2E+00	8.9E-01	na	3.0E+00	6.5E+00	5.4E+00	na	8.8E+01	**6.5E+00**	**5.4E+00**	na	**8.8E+01**
Phenol	0	--	--	na	8.6E+05	--	--	na	7.5E+06	--	--	na	8.6E+04	--	--	na	7.5E+05	--	--	na	**7.5E+05**
Pyrene	0	--	--	na	4.0E+03	--	--	na	3.5E+04	--	--	na	4.0E+02	--	--	na	3.5E+03	--	--	na	**3.5E+03**
Radionuclides	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Gross Alpha Activity (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Beta and Photon Activity (mrem/yr)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Radium 226 + 228 (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Uranium (ug/l)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Selenium, Total Recoverable	0	2.0E+01	5.0E+00	na	4.2E+03	1.1E+02	3.1E+01	na	3.7E+04	5.0E+00	1.3E+00	na	4.2E+02	2.8E+01	7.7E+00	na	3.7E+03	**2.8E+01**	**7.7E+00**	**na**	**3.7E+03**
Silver	0	7.4E-01	--	na	--	4.1E+00	--	na	--	1.9E-01	--	na	--	1.0E+00	--	na	--	**1.0E+00**	**--**	**na**	**--**
Sulfate	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
1,1,2,2-Tetrachloroethane[C]	0	--	--	na	4.0E+01	--	--	na	1.2E+03	--	--	na	4.0E+00	--	--	na	1.2E+02	**--**	**--**	**na**	**1.2E+02**
Tetrachloroethylene[C]	0	--	--	na	3.3E+01	--	--	na	9.7E+02	--	--	na	3.3E+00	--	--	na	9.7E+01	**--**	**--**	**na**	**9.7E+01**
Thallium	0	--	--	na	4.7E-01	--	--	na	4.1E+00	--	--	na	4.7E-02	--	--	na	4.1E-01	**--**	**--**	**na**	**4.1E-01**
Toluene	0	--	--	na	6.0E+03	--	--	na	5.2E+04	--	--	na	6.0E+02	--	--	na	5.2E+03	**--**	**--**	**na**	**5.2E+03**
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Toxaphene [C]	0	7.3E-01	2.0E-04	na	2.8E-03	4.1E+00	1.2E-03	na	8.2E-02	1.8E-01	5.0E-05	na	2.8E-04	1.0E+00	3.1E-04	na	8.2E-03	**1.0E+00**	**3.1E-04**	**na**	**8.2E-03**
Tributyltin	0	4.6E-01	7.2E-02	na	--	2.6E+00	4.4E-01	na	--	1.2E-01	1.8E-02	na	--	6.4E-01	1.1E-01	na	--	**6.4E-01**	**1.1E-01**	**na**	**--**
1,2,4-Trichlorobenzene	0	--	--	na	7.0E+01	--	--	na	6.1E+02	--	--	na	7.0E+00	--	--	na	6.1E+01	**--**	**--**	**na**	**6.1E+01**
1,1,2-Trichloroethane[C]	0	--	--	na	1.6E+02	--	--	na	4.7E+03	--	--	na	1.6E+01	--	--	na	4.7E+02	**--**	**--**	**na**	**4.7E+02**
Trichloroethylene [C]	0	--	--	na	3.0E+02	--	--	na	8.8E+03	--	--	na	3.0E+01	--	--	na	8.8E+02	**--**	**--**	**na**	**8.8E+02**
2,4,6-Trichlorophenol [C]	0	--	--	na	2.4E+01	--	--	na	7.1E+02	--	--	na	2.4E+00	--	--	na	7.1E+01	**--**	**--**	**na**	**7.1E+01**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Vinyl Chloride[C]	0	--	--	na	2.4E+01	--	--	na	7.1E+02	--	--	na	2.4E+00	--	--	na	7.1E+01	**--**	**--**	**na**	**7.1E+01**
Zinc	0	5.5E+01	5.5E+01	na	2.6E+04	3.1E+02	3.3E+02	na	2.3E+05	1.4E+01	1.4E+01	na	2.6E+03	7.6E+01	8.4E+01	na	2.3E+04	**7.6E+01**	**8.4E+01**	**na**	**2.3E+04**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
   Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens and Harmonic Mean for Carcinogens. To apply mixing ratios from a model set the stream flow equal to (mixing ratio - 1), effluent flow equal to 1 and 100% mix.

Metal	Target Value (SSTV)
Antimony	5.6E+02
Arsenic	1.4E+02
Barium	na
Cadmium	5.1E-01
Chromium III	3.2E+01
Chromium VI	8.9E+00
Copper	3.2E+00
Iron	na
Lead	3.9E+00
Manganese	na
Mercury	7.1E-01
Nickel	8.6E+00
Selenium	4.6E+00
Silver	4.1E-01
Zinc	3.1E+01

Note: do not use QL's lower than the minimum QL's provided in agency guidance

Facility = Totopotomoy WWTP – 7 MGD
Chemical = Ammonia
Chronic averaging period = 30
WLAa = 26.7 mg/L
WLAc = 3.58 mg/L
Q.L. = 1
# samples/mo. = 30
# samples/wk. = 8

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average = 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity

Maximum Daily Limit = 7.22325893443039
Average Weekly Limit = 4.30871069117639
Average Monthly Limit = 3.58

The data are:

9 mg/L

A concentration of 9 mg/L is used to force a limitation per Guidance Memorandum 00-2011.

Per DEQ practice, the sample frequency of once per day matches the $cBOD_5$ monitoring frequency.

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Totopotomoy WWTP -- 10 MGD Permit No.: VA0089915

Receiving Stream: Pamunkey River Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information

Mean Hardness (as CaCO3) =	33	mg/L
90% Temperature (Annual) =	26.4	deg C
90% Temperature (Wet season) =		deg C
90% Maximum pH =	7.5	SU
10% Maximum pH =	6.3	SU
Tier Designation (1 or 2) =	2	
Public Water Supply (PWS) Y/N? =	n	
Trout Present Y/N? =	n	
Early Life Stages Present Y/N? =	y	

Stream Flows

1Q10 (Annual) =	32	MGD
7Q10 (Annual) =	36	MGD
30Q10 (Annual) =	42	MGD
1Q10 (Wet season) =		MGD
30Q10 (Wet season) =		MGD
30Q5 =	54	MGD
Harmonic Mean =	199	MGD

Mixing Information

Annual - 1Q10 Mix =	100	%
- 7Q10 Mix =	100	%
- 30Q10 Mix =	100	%
Wet Season - 1Q10 Mix =	100	%
- 30Q10 Mix =	100	%

Effluent Information

Mean Hardness (as CaCO3) =	76.8	mg/L
90% Temp (Annual) =	23.6	deg C
90% Temp (Wet season) =		deg C
90% Maximum pH =	7.65	SU
10% Maximum pH =	7.2	SU
Discharge Flow =	10	MGD

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Acenapthene	0	--	--	na	9.9E+02	--	--	na	6.3E+03	--	--	na	9.9E+01	--	--	na	6.3E+02	--	--	na	6.3E+02
Acrolein	0	--	--	na	9.3E+00	--	--	na	6.0E+01	--	--	na	9.3E-01	--	--	na	6.0E+00	--	--	na	6.0E+00
Acrylonitrile[C]	0	--	--	na	2.5E+00	--	--	na	5.2E+01	--	--	na	2.5E-01	--	--	na	5.2E+00	--	--	na	5.2E+00
Aldrin [C]	0	3.0E+00	--	na	5.0E-04	1.3E+01	--	na	1.0E-02	7.5E-01	--	na	5.0E-05	3.2E+00	--	na	1.0E-03	3.2E+00	--	na	1.0E-03
Ammonia-N (mg/l) (Yearly)	0	1.90E+01	2.05E+00	na	--	7.97E+01	1.07E+01	na	--	4.74E+00	5.14E-01	na	--	1.99E+01	2.67E+00	na	--	1.99E+01	2.67E+00	na	--
Ammonia-N (mg/l) (High Flow)	0	1.57E+01	3.78E+00	na	--	1.57E+01	3.78E+00	na	--	3.93E+00	9.44E-01	na	--	3.93E+00	9.44E-01	na	--	3.93E+00	9.44E-01	na	--
Anthracene	0	--	--	na	4.0E+04	--	--	na	2.6E+05	--	--	na	4.0E+03	--	--	na	2.6E+04	--	--	na	2.6E+04
Antimony	0	--	--	na	6.4E+02	--	--	na	4.1E+03	--	--	na	6.4E+01	--	--	na	4.1E+02	--	--	na	4.1E+02
Arsenic	0	3.4E+02	1.5E+02	na	--	1.4E+03	6.9E+02	na	--	8.5E+01	3.8E+01	na	--	3.6E+02	1.7E+02	na	--	3.6E+02	1.7E+02	na	--
Barium	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Benzene [C]	0	--	--	na	5.1E+02	--	--	na	1.1E+04	--	--	na	5.1E+01	--	--	na	1.1E+03	--	--	na	1.1E+03
Benzidine[C]	0	--	--	na	2.0E-03	--	--	na	4.2E-02	--	--	na	2.0E-04	--	--	na	4.2E-03	--	--	na	4.2E-03
Benzo (a) anthracene [C]	0	--	--	na	1.8E-01	--	--	na	3.8E+00	--	--	na	1.8E-02	--	--	na	3.8E-01	--	--	na	3.8E-01
Benzo (b) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	3.8E+00	--	--	na	1.8E-02	--	--	na	3.8E-01	--	--	na	3.8E-01
Benzo (k) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	3.8E+00	--	--	na	1.8E-02	--	--	na	3.8E-01	--	--	na	3.8E-01
Benzo (a) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	3.8E+00	--	--	na	1.8E-02	--	--	na	3.8E-01	--	--	na	3.8E-01
Bis2-Chloroethyl Ether[C]	0	--	--	na	5.3E+00	--	--	na	1.1E+02	--	--	na	5.3E-01	--	--	na	1.1E+01	--	--	na	1.1E+01
Bis2-Chloroisopropyl Ether	0	--	--	na	6.5E+04	--	--	na	4.2E+05	--	--	na	6.5E+03	--	--	na	4.2E+04	--	--	na	4.2E+04
Bis 2-Ethylhexyl Phthalate [C]	0	--	--	na	2.2E+01	--	--	na	4.6E+02	--	--	na	2.2E+00	--	--	na	4.6E+01	--	--	na	4.6E+01
Bromoform [C]	0	--	--	na	1.4E+03	--	--	na	2.9E+04	--	--	na	1.4E+02	--	--	na	2.9E+03	--	--	na	2.9E+03
Butylbenzylphthalate	0	--	--	na	1.9E+03	--	--	na	1.2E+04	--	--	na	1.9E+02	--	--	na	1.2E+03	--	--	na	1.2E+03
Cadmium	0	1.5E+00	5.8E-01	na	--	6.4E+00	2.7E+00	na	--	3.8E-01	1.4E-01	na	--	1.6E+00	6.7E-01	na	--	1.6E+00	6.7E-01	na	--
Carbon Tetrachloride [C]	0	--	--	na	1.6E+01	--	--	na	3.3E+02	--	--	na	1.6E+00	--	--	na	3.3E+01	--	--	na	3.3E+01
Chlordane [C]	0	2.4E+00	4.3E-03	na	8.1E-03	1.0E+01	2.0E-02	na	1.7E-01	6.0E-01	1.1E-03	na	8.1E-04	2.5E+00	4.9E-03	na	1.7E-02	2.5E+00	4.9E-03	na	1.7E-02
Chloride	0	8.6E+05	2.3E+05	na	--	3.6E+06	1.1E+06	na	--	2.2E+05	5.8E+04	na	--	9.0E+05	2.6E+05	na	--	9.0E+05	2.6E+05	na	--
TRC	0	1.9E+01	1.1E+01	na	--	8.0E+01	5.1E+01	na	--	4.8E+00	2.8E+00	na	--	2.0E+01	1.3E+01	na	--	2.0E+01	1.3E+01	na	--
Chlorobenzene	0	--	--	na	1.6E+03	--	--	na	1.0E+04	--	--	na	1.6E+02	--	--	na	1.0E+03	--	--	na	1.0E+03

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Chlorodibromomethane[C]	0	--	--	na	1.3E+02	--	--	na	2.7E+03	--	--	na	1.3E+01	--	--	na	2.7E+02	--	--	na	2.7E+02
Chloroform	0	--	--	na	1.1E+04	--	--	na	7.0E+04	--	--	na	1.1E+03	--	--	na	7.0E+03	--	--	na	7.0E+03
2-Chloronaphthalene	0	--	--	na	1.6E+03	--	--	na	1.0E+04	--	--	na	1.6E+02	--	--	na	1.0E+03	--	--	na	1.0E+03
2-Chlorophenol	0	--	--	na	1.5E+02	--	--	na	9.6E+02	--	--	na	1.5E+01	--	--	na	9.6E+01	--	--	na	9.6E+01
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	3.5E-01	1.9E-01	na	--	2.1E-02	1.0E-02	na	--	8.7E-02	4.7E-02	na	--	8.7E-02	4.7E-02	na	--
Chromium III	0	2.9E+02	3.7E+01	na	--	1.2E+03	1.7E+02	na	--	7.2E+01	9.2E+00	na	--	3.0E+02	4.2E+01	na	--	3.0E+02	4.2E+01	na	--
Chromium VI	0	1.6E+01	1.1E+01	na	--	6.7E+01	5.1E+01	na	--	4.0E+00	2.8E+00	na	--	1.7E+01	1.3E+01	na	--	1.7E+01	1.3E+01	na	--
Chromium, Total	0	--	--	1.0E+02	--	--	--	na	--	--	--	1.0E+01	--	--	--	6.4E+01	--	--	--	na	--
Chrysene [C]	0	--	--	na	1.8E-02	--	--	na	3.8E-01	--	--	na	1.8E-03	--	--	na	3.8E-02	--	--	na	3.8E-02
Copper	0	6.1E+00	4.3E+00	na	--	2.6E+01	2.0E+01	na	--	1.5E+00	1.1E+00	na	--	6.4E+00	5.0E+00	na	--	6.4E+00	5.0E+00	na	--
Cyanide, Free	0	2.2E+01	5.2E+00	na	1.6E+04	9.2E+01	2.4E+01	na	1.0E+05	5.5E+00	1.3E+00	na	1.6E+03	2.3E+01	6.0E+00	na	1.0E+04	2.3E+01	6.0E+00	na	1.0E+04
DDD [C]	0	--	--	na	3.1E-03	--	--	na	6.5E-02	--	--	na	3.1E-04	--	--	na	6.5E-03	--	--	na	6.5E-03
DDE [C]	0	--	--	na	2.2E-03	--	--	na	4.6E-02	--	--	na	2.2E-04	--	--	na	4.6E-03	--	--	na	4.6E-03
DDT [C]	0	1.1E+00	1.0E-03	na	2.2E-03	4.6E+00	4.6E-03	na	4.6E-02	2.8E-01	2.5E-04	na	2.2E-04	1.2E+00	1.2E-03	na	4.6E-03	1.2E+00	1.2E-03	na	4.6E-03
Demeton	0	--	1.0E-01	na	--	--	4.6E-01	na	--	--	2.5E-02	na	--	--	1.2E-01	na	--	--	1.2E-01	na	--
Diazinon	0	1.7E-01	1.7E-01	na	--	7.1E-01	7.8E-01	na	--	4.3E-02	4.3E-02	na	--	1.8E-01	2.0E-01	na	--	1.8E-01	2.0E-01	na	--
Dibenz(a,h)anthracene [C]	0	--	--	na	1.8E-01	--	--	na	3.8E+00	--	--	na	1.8E-02	--	--	na	3.8E-01	--	--	na	3.8E-01
1,2-Dichlorobenzene	0	--	--	na	1.3E+03	--	--	na	8.3E+03	--	--	na	1.3E+02	--	--	na	8.3E+02	--	--	na	8.3E+02
1,3-Dichlorobenzene	0	--	--	na	9.6E+02	--	--	na	6.1E+03	--	--	na	9.6E+01	--	--	na	6.1E+02	--	--	na	6.1E+02
1,4-Dichlorobenzene	0	--	--	na	1.9E+02	--	--	na	1.2E+03	--	--	na	1.9E+01	--	--	na	1.2E+02	--	--	na	1.2E+02
3,3-Dichlorobenzidine[C]	0	--	--	na	2.8E-01	--	--	na	5.9E+00	--	--	na	2.8E-02	--	--	na	5.9E-01	--	--	na	5.9E-01
Dichlorobromomethane [C]	0	--	--	na	1.7E+02	--	--	na	3.6E+03	--	--	na	1.7E+01	--	--	na	3.6E+02	--	--	na	3.6E+02
1,2-Dichloroethane [C]	0	--	--	na	3.7E+02	--	--	na	7.7E+03	--	--	na	3.7E+01	--	--	na	7.7E+02	--	--	na	7.7E+02
1,1-Dichloroethylene	0	--	--	na	7.1E+03	--	--	na	4.5E+04	--	--	na	7.1E+02	--	--	na	4.5E+03	--	--	na	4.5E+03
1,2-trans-dichloroethylene	0	--	--	na	1.0E+04	--	--	na	6.4E+04	--	--	na	1.0E+03	--	--	na	6.4E+03	--	--	na	6.4E+03
2,4-Dichlorophenol	0	--	--	na	2.9E+02	--	--	na	1.9E+03	--	--	na	2.9E+01	--	--	na	1.9E+02	--	--	na	1.9E+02
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
1,2-Dichloropropane[C]	0	--	--	na	1.5E+02	--	--	na	3.1E+03	--	--	na	1.5E+01	--	--	na	3.1E+02	--	--	na	3.1E+02
1,3-Dichloropropene [C]	0	--	--	na	2.1E+02	--	--	na	4.4E+03	--	--	na	2.1E+01	--	--	na	4.4E+02	--	--	na	4.4E+02
Dieldrin [C]	0	2.4E-01	5.6E-02	na	5.4E-04	1.0E+00	2.6E-01	na	1.1E-02	6.0E-02	1.4E-02	na	5.4E-05	2.5E-01	6.4E-02	na	1.1E-03	2.5E-01	6.4E-02	na	1.1E-03
Diethyl Phthalate	0	--	--	na	4.4E+04	--	--	na	2.8E+05	--	--	na	4.4E+03	--	--	na	2.8E+04	--	--	na	2.8E+04
2,4-Dimethylphenol	0	--	--	na	8.5E+02	--	--	na	5.4E+03	--	--	na	8.5E+01	--	--	na	5.4E+02	--	--	na	5.4E+02
Dimethyl Phthalate	0	--	--	na	1.1E+06	--	--	na	7.0E+06	--	--	na	1.1E+05	--	--	na	7.0E+05	--	--	na	7.0E+05
Di-n-Butyl Phthalate	0	--	--	na	4.5E+03	--	--	na	2.9E+04	--	--	na	4.5E+02	--	--	na	2.9E+03	--	--	na	2.9E+03
2,4 Dinitrophenol	0	--	--	na	5.3E+03	--	--	na	3.4E+04	--	--	na	5.3E+02	--	--	na	3.4E+03	--	--	na	3.4E+03
2-Methyl-4,6-Dinitrophenol	0	--	--	na	2.8E+02	--	--	na	1.8E+03	--	--	na	2.8E+01	--	--	na	1.8E+02	--	--	na	1.8E+02
2,4-Dinitrotoluene [C]	0	--	--	na	3.4E+01	--	--	na	7.1E+02	--	--	na	3.4E+00	--	--	na	7.1E+01	--	--	na	7.1E+01
Dioxin 2,3,7,8-tetrachlorodibenzo-p-dioxin	0	--	--	na	5.1E-08	--	--	na	3.3E-07	--	--	na	5.1E-09	--	--	na	3.3E-08	--	--	na	3.3E-08
1,2-Diphenylhydrazine[C]	0	--	--	na	2.0E+00	--	--	na	4.2E+01	--	--	na	2.0E-01	--	--	na	4.2E+00	--	--	na	4.2E+00
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	9.2E-01	2.6E-01	na	5.7E+02	5.5E-02	1.4E-02	na	8.9E+00	2.3E-01	6.4E-02	na	5.7E+01	2.3E-01	6.4E-02	na	5.7E+01
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	9.2E-01	2.6E-01	na	5.7E+02	5.5E-02	1.4E-02	na	8.9E+00	2.3E-01	6.4E-02	na	5.7E+01	2.3E-01	6.4E-02	na	5.7E+01
Alpha + Beta Endosulfan	0	2.2E-01	5.6E-02	--	--	9.2E-01	2.6E-01	--	--	5.5E-02	1.4E-02	--	--	2.3E-01	6.4E-02	--	--	2.3E-01	6.4E-02	--	--
Endosulfan Sulfate	0	--	--	na	8.9E+01	--	--	na	5.7E+02	--	--	na	8.9E+00	--	--	na	5.7E+01	--	--	na	5.7E+01
Endrin	0	8.6E-02	3.6E-02	na	6.0E-02	3.6E-01	1.7E-01	na	3.8E-01	2.2E-02	9.0E-03	na	6.0E-03	9.0E-02	4.1E-02	na	3.8E-02	9.0E-02	4.1E-02	na	3.8E-02
Endrin Aldehyde	0	--	--	na	3.0E-01	--	--	na	1.9E+00	--	--	na	3.0E-02	--	--	na	1.9E-01	--	--	na	1.9E-01

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Ethylbenzene	0	--	--	na	2.1E+03	--	--	na	1.3E+04	--	--	na	2.1E+02	--	--	na	1.3E+03	--	--	na	**1.3E+03**
Fluoranthene	0	--	--	na	1.4E+02	--	--	na	9.0E+02	--	--	na	1.4E+01	--	--	na	9.0E+01	--	--	na	**9.0E+01**
Fluorene	0	--	--	na	5.3E+03	--	--	na	3.4E+04	--	--	na	5.3E+02	--	--	na	3.4E+03	--	--	na	**3.4E+03**
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Guthion	0	--	1.0E-02	na	--	--	4.6E-02	na	--	--	2.5E-03	na	--	--	1.2E-02	na	--	--	**1.2E-02**	na	--
Heptachlor [C]	0	5.2E-01	3.8E-03	na	7.9E-04	2.2E+00	1.7E-02	na	1.7E-02	1.3E-01	9.5E-04	na	7.9E-05	5.5E-01	4.4E-03	na	1.7E-03	**5.5E-01**	**4.4E-03**	na	**1.7E-03**
Heptachlor Epoxide[C]	0	5.2E-01	3.8E-03	na	3.9E-04	2.2E+00	1.7E-02	na	8.2E-03	1.3E-01	9.5E-04	na	3.9E-05	5.5E-01	4.4E-03	na	8.2E-04	**5.5E-01**	**4.4E-03**	na	**8.2E-04**
Hexachlorobenzene[C]	0	--	--	na	2.9E-03	--	--	na	6.1E-02	--	--	na	2.9E-04	--	--	na	6.1E-03	--	--	na	**6.1E-03**
Hexachlorobutadiene[C]	0	--	--	na	1.8E+02	--	--	na	3.8E+03	--	--	na	1.8E+01	--	--	na	3.8E+02	--	--	na	**3.8E+02**
Hexachlorocyclohexane Alpha-BHC[C]	0	--	--	na	4.9E-02	--	--	na	1.0E+00	--	--	na	4.9E-03	--	--	na	1.0E-01	--	--	na	**1.0E-01**
Hexachlorocyclohexane Beta-BHC[C]	0	--	--	na	1.7E-01	--	--	na	3.6E+00	--	--	na	1.7E-02	--	--	na	3.6E-01	--	--	na	**3.6E-01**
Hexachlorocyclohexane Gamma-BHC[C] (Lindane)	0	9.5E-01	na	na	1.8E+00	4.0E+00	--	na	3.8E+01	2.4E-01	--	na	1.8E-01	1.0E+00	--	na	3.8E+00	**1.0E+00**	--	na	**3.8E+00**
Hexachlorocyclopentadiene	0	--	--	na	1.1E+03	--	--	na	7.0E+03	--	--	na	1.1E+02	--	--	na	7.0E+02	--	--	na	**7.0E+02**
Hexachloroethane[C]	0	--	--	na	3.3E+01	--	--	na	6.9E+02	--	--	na	3.3E+00	--	--	na	6.9E+01	--	--	na	**6.9E+01**
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	9.2E+00	na	--	--	5.0E-01	na	--	--	2.3E+00	na	--	--	**2.3E+00**	na	--
Indeno (1,2,3-cd) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	3.8E+00	--	--	na	1.8E-02	--	--	na	3.8E-01	--	--	na	**3.8E-01**
Iron	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Isophorone[C]	0	--	--	na	9.6E+03	--	--	na	2.0E+05	--	--	na	9.6E+02	--	--	na	2.0E+04	--	--	na	**2.0E+04**
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	**0.0E+00**	na	--
Lead	0	4.1E+01	4.5E+00	na	--	1.7E+02	2.1E+01	na	--	1.0E+01	1.1E+00	na	--	4.3E+01	5.2E+00	na	--	**4.3E+01**	**5.2E+00**	na	--
Malathion	0	--	1.0E-01	na	--	--	4.6E-01	na	--	--	2.5E-02	na	--	--	1.2E-01	na	--	--	**1.2E-01**	na	--
Manganese	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Mercury	0	1.4E+00	7.7E-01	--	--	5.9E+00	3.5E+00	--	--	3.5E-01	1.9E-01	--	--	1.5E+00	8.9E-01	--	--	**1.5E+00**	**8.9E-01**	--	--
Methyl Bromide	0	--	--	na	1.5E+03	--	--	na	9.6E+03	--	--	na	1.5E+02	--	--	na	9.6E+02	--	--	na	**9.6E+02**
Methylene Chloride [C]	0	--	--	na	5.9E+03	--	--	na	1.2E+05	--	--	na	5.9E+02	--	--	na	1.2E+04	--	--	na	**1.2E+04**
Methoxychlor	0	--	3.0E-02	na	--	--	1.4E-01	na	--	--	7.5E-03	na	--	--	3.5E-02	na	--	--	**3.5E-02**	na	--
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	**0.0E+00**	na	--
Nickel	0	9.0E+01	9.8E+00	na	4.6E+03	3.8E+02	4.5E+01	na	2.9E+04	2.3E+01	2.5E+00	na	4.6E+02	9.5E+01	1.1E+01	na	2.9E+03	**9.5E+01**	**1.1E+01**	na	**2.9E+03**
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Nitrobenzene	0	--	--	na	6.9E+02	--	--	na	4.4E+03	--	--	na	6.9E+01	--	--	na	4.4E+02	--	--	na	**4.4E+02**
N-Nitrosodimethylamine[C]	0	--	--	na	3.0E+01	--	--	na	6.3E+02	--	--	na	3.0E+00	--	--	na	6.3E+01	--	--	na	**6.3E+01**
N-Nitrosodiphenylamine[C]	0	--	--	na	6.0E+01	--	--	na	1.3E+03	--	--	na	6.0E+00	--	--	na	1.3E+02	--	--	na	**1.3E+02**
N-Nitrosodi-n-propylamine[C]	0	--	--	na	5.1E+00	--	--	na	1.1E+02	--	--	na	5.1E-01	--	--	na	1.1E+01	--	--	na	**1.1E+01**
Nonylphenol	0	2.8E+01	6.6E+00	--	--	1.2E+02	3.0E+01	na	--	7.0E+00	1.7E+00	--	--	2.9E+01	7.6E+00	--	--	**2.9E+01**	**7.6E+00**	na	--
Parathion	0	6.5E-02	1.3E-02	na	--	2.7E-01	6.0E-02	na	--	1.6E-02	3.3E-03	na	--	6.8E-02	1.5E-02	na	--	**6.8E-02**	**1.5E-02**	na	--
PCB Total[C]	0	--	1.4E-02	na	6.4E-04	--	6.4E-02	na	1.3E-02	--	3.5E-03	na	6.4E-05	--	1.6E-02	na	1.3E-03	--	**1.6E-02**	na	**1.3E-03**
Pentachlorophenol [C]	0	4.8E+00	3.6E+00	na	3.0E+01	2.0E+01	1.7E+01	na	6.3E+02	1.2E+00	9.1E-01	na	3.0E+00	5.0E+00	4.2E+00	na	6.3E+01	**5.0E+00**	**4.2E+00**	na	**6.3E+01**
Phenol	0	--	--	na	8.6E+05	--	--	na	5.5E+06	--	--	na	8.6E+04	--	--	na	5.5E+05	--	--	na	**5.5E+05**
Pyrene	0	--	--	na	4.0E+03	--	--	na	2.6E+04	--	--	na	4.0E+02	--	--	na	2.6E+03	--	--	na	**2.6E+03**
Radionuclides	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Gross Alpha Activity (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Beta and Photon Activity (mrem/yr)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Radium 226 + 228 (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Uranium (ug/l)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Selenium, Total Recoverable	0	2.0E+01	5.0E+00	na	4.2E+03	8.4E+01	2.3E+01	na	2.7E+04	5.0E+00	1.3E+00	na	4.2E+02	2.1E+01	5.8E+00	na	2.7E+03	**2.1E+01**	**5.8E+00**	**na**	**2.7E+03**
Silver	0	8.2E-01	--	na	--	3.5E+00	--	na	--	2.1E-01	--	na	--	8.6E-01	--	na	--	**8.6E-01**	**--**	**na**	**--**
Sulfate	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
1,1,2,2-Tetrachloroethane[C]	0	--	--	na	4.0E+01	--	--	na	8.4E+02	--	--	na	4.0E+00	--	--	na	8.4E+01	**--**	**--**	**na**	**8.4E+01**
Tetrachloroethylene[C]	0	--	--	na	3.3E+01	--	--	na	6.9E+02	--	--	na	3.3E+00	--	--	na	6.9E+01	**--**	**--**	**na**	**6.9E+01**
Thallium	0	--	--	na	4.7E-01	--	--	na	3.0E+00	--	--	na	4.7E-02	--	--	na	3.0E-01	**--**	**--**	**na**	**3.0E-01**
Toluene	0	--	--	na	6.0E+03	--	--	na	3.8E+04	--	--	na	6.0E+02	--	--	na	3.8E+03	**--**	**--**	**na**	**3.8E+03**
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Toxaphene [C]	0	7.3E-01	2.0E-04	na	2.8E-03	3.1E+00	9.2E-04	na	5.9E-02	1.8E-01	5.0E-05	na	2.8E-04	7.7E-01	2.3E-04	na	5.9E-03	**7.7E-01**	**2.3E-04**	**na**	**5.9E-03**
Tributyltin	0	4.6E-01	7.2E-02	na	--	1.9E+00	3.3E-01	na	--	1.2E-01	1.8E-02	na	--	4.8E-01	8.3E-02	na	--	**4.8E-01**	**8.3E-02**	**na**	**--**
1,2,4-Trichlorobenzene	0	--	--	na	7.0E+01	--	--	na	4.5E+02	--	--	na	7.0E+00	--	--	na	4.5E+01	**--**	**--**	**na**	**4.5E+01**
1,1,2-Trichloroethane[C]	0	--	--	na	1.6E+02	--	--	na	3.3E+03	--	--	na	1.6E+01	--	--	na	3.3E+02	**--**	**--**	**na**	**3.3E+02**
Trichloroethylene [C]	0	--	--	na	3.0E+02	--	--	na	6.3E+03	--	--	na	3.0E+01	--	--	na	6.3E+02	**--**	**--**	**na**	**6.3E+02**
2,4,6-Trichlorophenol [C]	0	--	--	na	2.4E+01	--	--	na	5.0E+02	--	--	na	2.4E+00	--	--	na	5.0E+01	**--**	**--**	**na**	**5.0E+01**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Vinyl Chloride[C]	0	--	--	na	2.4E+01	--	--	na	5.0E+02	--	--	na	2.4E+00	--	--	na	5.0E+01	**--**	**--**	**na**	**5.0E+01**
Zinc	0	5.8E+01	5.7E+01	na	2.6E+04	2.4E+02	2.6E+02	na	1.7E+05	1.4E+01	1.4E+01	na	2.6E+03	6.1E+01	6.6E+01	na	1.7E+04	**6.1E+01**	**6.6E+01**	**na**	**1.7E+04**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information. Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens and Harmonic Mean for Carcinogens. To apply mixing ratios from a model set the stream flow equal to (mixing ratio - 1), effluent flow equal to 1 and 100% mix.

Metal	Target Value (SSTV)
Antimony	4.1E+02
Arsenic	1.0E+02
Barium	na
Cadmium	4.0E-01
Chromium III	2.5E+01
Chromium VI	6.7E+00
Copper	2.6E+00
Iron	na
Lead	3.1E+00
Manganese	na
Mercury	5.3E-01
Nickel	6.8E+00
Selenium	3.5E+00
Silver	3.5E-01
Zinc	2.4E+01

Note: do not use QL's lower than the minimum QL's provided in agency guidance

Facility = Totopotomoy WWTP – 10 MGD
Chemical = Ammonia
Chronic averaging period = 30
WLAa = 19.9 mg/L
WLAc = 2.67 mg/L
Q.L. = 1
# samples/mo. = 30
# samples/wk. = 8

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average = 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity

Maximum Daily Limit = 5.38717914942155
Average Weekly Limit = 3.21347976129636
Average Monthly Limit = 2.67

The data are:

9 mg/L

A concentration of 9 mg/L is used to force a limitation per Guidance Memorandum 00-2011.

Per DEQ practice, the sample frequency of once per day matches the $cBOD_5$ monitoring frequency.

Facility = Totopotomoy WWTP – 10 MGD
Chemical = Chloride
Chronic averaging period = 4
WLAa = 900,000 µg/L
WLAc = 260,000 µg/L
Q.L. = 1
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 47000
Variance = 7952400
C.V. = 0.6
97th percentile daily values = 114370.
97th percentile 4 day average = 78198.1
97th percentile 30 day average = 56684.5
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

47,000 µg/L

If a limitation is not needed at 10 MGD, then a limitation will not be needed at 7 MGD using the same effluent data. This analysis therefore, has not been repeated for the 7 MGD flow tier.

Facility = Totopotomoy WWTP – 10 MGD
Chemical = Dissolved Copper
Chronic averaging period = 4
WLAa = 6.4 µg/L
WLAc = 5 µg/L
Q.L. = 1
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 3
Expected Value = 1.38333
Variance = .6889
C.V. = 0.6
97th percentile daily values = 3.36622
97th percentile 4 day average = 2.30157
97th percentile 30 day average = 1.66837
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

1.1 µg/L
1.62 µg/L
1.43 µg/L

If a limitation is not needed at 10 MGD, then a limitation will not be needed at 7 MGD using the same effluent data. This analysis therefore, has not been repeated for the 7 MGD flow tier.

Facility = Totopotomoy WWTP
Chemical = Dissolved Nickel
Chronic averaging period = 4
WLAa = 95 µg/L
WLAc = 11 µg/L
Q.L. = 1
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 3
Expected Value = 1.50333
Variance = .813604
C.V. = 0.6
97th percentile daily values = 3.65823
97th percentile 4 day average = 2.50123
97th percentile 30 day average = 1.81310
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

2 µg/L
1.25 µg/L
1.26 µg/L

If a limitation is not needed at 10 MGD, then a limitation will not be needed at 7 MGD using the same effluent data. This analysis therefore, has not been repeated for the 7 MGD flow tier.

Facility = Totopotomoy WWTP – 10 MGD
Chemical = Dissolved Zinc
Chronic averaging period = 4
WLAa = 61 µg/L
WLAc = 66 µg/L
Q.L. =
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 10
Expected Value = 32.8750
Variance = 9.72947
C.V. = 0.094880
97th percentile daily values = 39.1071
97th percentile 4 day average = 35.9013
97th percentile 30 day average = 33.9462
< Q.L. = 0
Model used = lognormal

No Limit is required for this material

The data are:

36.7 µg/L
36 µg/L
37.5 µg/L
32.3 µg/L
32.9 µg/L
32.3 µg/L
30.2 µg/L
27.8 µg/L
32.7 µg/L
30.2 µg/L

If a limitation is not needed at 10 MGD, then a limitation will not be needed at 7 MGD using the same effluent data. This analysis therefore, has not been repeated for the 7 MGD flow tier.

Attachment 10

Certificate to Construct for 7 MGD Facility

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
PIEDMONT REGIONAL OFFICE
4949-A Cox Road, Glen Allen, Virginia 23060
(804) 527-5020 Fax (804) 527-5106
www.deq.virginia.gov

L. Preston Bryant, Jr.
Secretary of Natural Resources

David K. Paylor
Director

Gerard Seeley, Jr.
Regional Director

October 1, 2008

CERTIFICATE TO CONSTRUCT
LOCATION: Hanover County
Facility – Totopotomoy WWTP
Project: 7.0 MGD Expansion
PT Log# 24158

Mr. Frank Harksen, Director
Hanover County Department of Public Utilities
P.O. Box 470
Hanover, Virginia 23069-0470

Dear Mr. Harksen:

This Department has received plans and specifications for the hydraulic expansion of the Totopotomoy Wastewater Treatment Plant (WWTP) as prepared by Hazen and Sawyer. The plans include thirty-five (35) sheets, entitled "County of Hanover Virginia Totopotomoy Wastewater Treatment Plant 7 MGD Expansion" and bear a P.E. seal date of August 6, 2008. The specifications are entitled "Project Manual August 2008 Totopotomoy Wastewater Treatment Plant 7 MGD Expansion" and also bear a P.E. seal date of August 6, 2008.

The project consists of the following modifications: construction of additional parallel piping between the Screening Facility and the Biological Treatment Facility; modification of the Blower Building air piping so that the aeration blowers and the digester blowers operate as one system; the installation of additional diffusers in the existing biological treatment tanks; replacement of four nitrified recycle pumps; and installation of additional chemical feed facilities. A detailed description of the project can be found in Attachment A.

The 7.0 MGD expansion project will have a peak flow of 12.5 MGD. The project is designed to meet an annual average total nitrogen concentration of 8.0 mg/l and an annual average total phosphorus concentration of 2.0 mg/l.

The evaluation of these plans and specifications has been confined to technical requirements and design criteria as stipulated in the Commonwealth of Virginia *Sewage Collection and Treatment Regulations* (9 VAC 25-790).

In accordance with the *Code of Virginia* 1950, as amended, Title 62.1, Section 62.1-44.19, this letter report is to advise that the previously mentioned plans and specifications are technically adequate and are approved with the following conditions:

October 1, 2008

CERTIFICATE TO CONSTRUCT
LOCATION: Hanover County
Facility – Totopotomoy WWTP
Project: 7.0 MGD Expansion
PT Log# 24158

1. A revised operation and maintenance manual for the WWTP must be submitted to the Piedmont Regional Office.

This letter provides your authorization to construct the previously described project. This approval is valid for 5 years from the date of this approval letter. This letter also provides your authorization to operate the previously described project for 30 days following construction, prior to issuance of a Certificate to Operate. Please be aware that disturbance of any streams and/or wetlands may also require permitting. If you believe that this may be the case, please contact the Piedmont DEQ Office for further information on the permitting process.

Once construction is complete, a Statement of Completion of Construction must be submitted to this office in compliance with the requirements of 9 VAC 25-790-180.C. by the licensed engineer who oversaw construction of the project. At that time, the Piedmont Regional office will initiate the Certificate to Operate (CTO) issuance process.

One copy of the previously described plans and specifications with Office of Wastewater Engineering approval is enclosed.

Please note: DEQ Office of Wastewater Engineering program approvals and staff knowledge of project status and project issues do not substitute for nor relieve any parties from compliance with requirements for other DEQ divisions including WQIF grant and VRLF loan programs, consent orders, permits, and other regulatory and enforcement matters of DEQ and other agencies.

If you have questions, I can be reached at 804-527-5114 or by e-mail at jnpuricelli@deq.virginia.gov.

Sincerely,

Jeanne N. Puricelli

Jeanne N. Puricelli, P.E.
Area Engineer
Office of Wastewater Engineering

cc: Mr. Dave Van Gelder, Hanover County DPU
Curtis Linderman, P.E., DEQ-PRO
Mr. Ronald Taylor, P.E., Hazen and Sawyer, Raleigh NC
Hanover County Building Inspector
Director, Chickahominy Health District

ATTACHMENT A
FACILITY SUMMARY – SEPTEMBER 2008
Hanover County Totopotomoy WWTP 7.0 MGD Upgrade

Flow Basis

- Average Daily Flow (design flow) 7.0 MGD
- Peak Hour Flow 12.5 MGD

Note: In order to meet reliability and redundancy requirements, the peak flow to the plant will be limited to 12.5 MGD. The O&M manual will reflect procedures to limit the peak inflow to the plant.

Screening

- 1 existing mechanically-cleaned step screen (3 mm opening) with 12.5 MGD capacity
- 1 existing manually-cleaned bar screen (2-inch spacing) with 25.0 MGD
- Screened wastewater is conveyed by gravity to the biological treatment through a single 20-inch line. One additional 20-inch gravity pipe will be installed to increase the hydraulic capacity. Not required for this project, but the work is being done in preparation for the future 10 MGD expansion.

Grit Removal

This facility has no grit removal unit other than the peripheral removal through the step screen. The owner requested and received an exception to the design standard in the regulations based on a commitment from the owner to remove grit from the influent channel where it should settle out. DWE-OWE allowed the exception, but does not endorse it. Any resulting compliance issues will be the owner's responsibility. The allowed exception may not be used as a mitigating factor in any future enforcement actions that may arise.

Biological Treatment System - Plug Flow Reactors – Suspended Growth System

- Four existing bioreactors each with 10 cells (A through J) which are designed as a 5-stage Bardenpho with 5 zones (cells A-D have odor control):

Zone	Type	Volume, MG	Comment
		.212	Mixing (influent channel)
A	Anaerobic	.084	Mixing
B+C	Pre-Anoxic	.251	Mixing + NRCY Return
D-H	Aerobic	.519	Aeration (Cell D has mixing, Cell H has NRCY pumps)
I	Post-Anoxic	.084	Mixing
J	Re-Aeration	.042	Aeration + NRCY Pumps
		.139	Effluent Channel
Total		0.979 MG	Total Biological Volume

- Total bioreactor volume = 0.979 MG x 4 = 3.916 MG
- HRT = 13.4 hours at 7.0 MGD
- NRCY capacity: 24 MGD total = 3.4Q, each reactor has 2 pumps (8 total) at 2.5 MGD. Replacing 4 of the 8 pumps with 3.5 MGD at 18.7 TDH, therefore 24 MGD (3.4Q) total and 20.5 MGD firm (2.9Q). The 4 remaining pumps will be replaced with the future 10 MGD expansion.

Aeration System

- Blowers: 3 existing aeration blowers at 2,750 scfm and 2 existing digester blowers at 1,310 scfm are being combined into one system. Capacity = 10,870 scfm total and 8,120 scfm firm
- Installing 428 (107 per train) additional fine bubble diffusers; total = 693x4+428=3,200 total
- Air requirements based on historical peak day of 1.7 for BOD and 1.72 for TKN
- Peak air = (1.2)(7.0)(8.34)(1.7)(201-1)+(7.0)(8.34)(33.0-1)(1.72)(4.6-2.86) = 29,410 lb/day O_2
- Air needed for aeration = 5,613 scfm air for peak day (1.75 scfm per diffuser OK)
- Digester mixing air = 867,000 gal / 7.481 x 20 scfm / 1,000 cuft = 2,318 scfm air for digestion
- Aeration + Digester mixing air = 7,931 scfm total vs 8,120 scfm firm OK
- Anaerobic stage: 0.335 MG total: HRT= 1.15 hrs; BOD:P loading = 24:1 OK
- Anoxic stages: 1.35 MG total: HRT=4.6 hrs; BOD:TKN loading = 7.1:1 (Low)

Secondary Clarifiers

- 2 existing 130 ft. diameter, 15.1 foot side wall depth
- weir length: 408 feet each; Surface area: 13,270 sqft each
- At 7.0 MGD with one offline: SOR = 527 gpd/sqft; at 12.5 MGD with both online: SOR = 471
- At 7.0 MGD with one offline: weir loading rate = 17,156 gpd/lf ; at 12.5 MGD with both online: weir loading rate = 15,303 gpd/lf
- At 7.0 MGD and 4,180 MLSS: solids loading rate = 0.77 lb/sf/hr and 1.07 at 12.5 MGD peak with both online (with one offline: 1.14 at 7 MGD and 1.54 at 12.5 MGD)

RAS/WAS Pumping

- 3 existing RAS pumps at 5.0 mgd each; 10.0 mgd firm cpacity > 1Q
- WAS pumps draw suction from the RAS pump station discharge
- 2 existing WAS pumps at 900 gpm

UV Disinfection

- Existing system is designed for 12.5 MGD at 57,780 uWs/cm^2
- 4 channels, 200 lamps per channel

Flow Monitoring

- Parshall flume with 25 MGD capacity

Effluent Pump Station

- Existing pumps: 2 at 2.5 MGD and 2 at 7.5 MGD
- Total capacity = 20 MGD, firm capacity = 12.5 MGD

Post Aeration

- Cascade steps prior to discharge to Pamunkey River
- Existing cascade designed for 37.5 MGD

Sludge Thickening

- Predicted max month WAS flowrate is 0.24 MGD at 7.0 MGD or 15,200 lb/day
- 1 existing 3-meter GBT rated at 2,250 lb/hr and 750 gpm
- 1 existing progressive cavity thickened WAS pump rated at 50 to 200 gpm
- Operation time: 6.8 hrs/7 days per week, or 9.5 hours/5 days per week
- Sludge thickening can be bypassed in case of equipment failure, and the sludge can be thickened by digester decant

Aerobic Digestion

- 2 existing digesters 60 ft diameter and 20.5 foot side wall depth = 867,000 gallons combined
- SCAT requirement for digester volume=20% of ADF was waived. County provided data showing adequate stabilization/VSS reduction for landfill disposal. DEQ-OWE allowed the exception, but does not endorse it.
- Fine bubble membrane disc diffusers
- Aeration is cycled to provide denitrification and alkalinity release
- Installing new ORP controller to minimize anaerobic conditions and phosphorus release when aeration is turned off
- Combining the biological and digester blower system

Sludge Dewatering

- 1 existing 2-meter belt filter press rated at 1,800 lb/hr
- 2 existing progressive cavity belt filter press pumps at 200 gpm each
- Dewatered solids are landfilled
- At max month solids production, 8.4 operating hours 7 days/week or 11.8 hours 5 days/week
- Will be installing a second press with the 10 mgd expansion, but no redundant press for this expansion
- Back-up operations in case of equipment failure are: emergency repairs, using the sludge thickener and holding in the digester, increasing MLSS in the biological reactors, or renting a trailer-mounted BFP.

Odor Control

- Existing 2-stage scrubber treats foul air from Screening, biological treatment influent channel and Cells A-D, septage receiving, drain pump station, and solids handling building
- Sodium hydroxide and sodium hypochlorite are used for sulfide destruction

Chemical Addition

- Alum (existing) for P precipitation. One 6,000 gallon storage tank, three 25 gph feed pumps. Existing feeds to secondary clarifier distribution boxes, drain pump station and digesters.
- Polymer (existing) to aid settling in the secondary clarifiers. Two 8 gph feed pumps.
- Sodium hydroxide (existing) for odor control scrubber. New feed to aerobic zones for pH control with one 78 gph pump.
- Sodium hypochlorite (existing) for odor control scrubber. One 10,000 gallon tank and three 25 gph pumps. New feed line to RAS for filament control.
- Sodium Aluminate (new): New storage and feed facilities for phosphorus removal in the filtrate. New feed upstream of the BFP and at the drain pump station. Tote storage with two12.2 gph pumps.

Attachment 11

Whole Effluent Toxicity (WET) Analysis

Jenkins, Ray (DEQ)

From: DeBiasi, Deborah (DEQ)
Sent: Wednesday, June 06, 2012 4:20 PM
To: Jenkins, Ray (DEQ)
Subject: RE: Totopotomoy WWTP VA0089915

I made a couple of edits in the permit language. Let me know if you have questions. Good job!

D. Whole Effluent Toxicity (WET) Testing

1. Biological Monitoring:

a. In accordance with the schedule in Part I.D.2 below, the permittee shall conduct chronic toxicity tests annually for the duration of the permit. The permittee shall collect 24-hour flow-proportioned composite samples of final effluent from Outfall 001. The chronic tests to use are:

Chronic 3-Brood Static Renewal Survival and Reproduction Test using *Ceriodaphnia dubia*

Chronic 7-Day Static Renewal Survival and Growth Test using *Pimephales promelas*

These chronic tests shall be conducted in such a manner and at sufficient dilutions (minimum of five dilutions, derived geometrically) to determine the "No Observed Effect Concentration" (NOEC) for survival and reproduction or growth. Results which cannot be determined (i.e., a "less than" NOEC value) are not acceptable, and a retest will have to be performed. A retest of a non-acceptable test must be performed during the same compliance period as the test it is replacing. Report the LC_{50} at 48 hours and the IC_{25} with the NOEC's in the test report.

b. The test dilutions should be able to determine compliance with the following endpoints:

(1) For the 7 MGD tier: NOEC ≥ 12% equivalent to TUc ≤ 8.33 ~~for the 7 MGD facility in 100% of the tests conducted~~.

(2) For the 10 MGD tier: NOEC ≥ 15% equivalent to TUc ≤ 6.66 ~~for the 10 MGD facility in 100% of the tests conducted~~.

c. The permittee may provide additional samples to address data variability; these data shall be reported and may be included in the evaluation of effluent toxicity. Test procedures and reporting shall be in accordance with the WET testing methods cited in 40 CFR 136.3

d. The test data will be evaluated for reasonable potential at the conclusion of the permit term, or sooner if toxicity has been noted. Should evaluation of the data indicate that

a limitation is needed, a WET limitation and compliance schedule will be required and the toxicity tests in Part I.D.1.a may be discontinued.

e. The permit may be modified or revoked and reissued to include pollutant specific limits in lieu of a WET limit should it be demonstrated that toxicity is due to specific parameters. The pollutant specific limits must control the toxicity of the effluent.

2. Reporting Schedule:

The permittee shall submit toxicity test reports specified in this WET testing program to the DEQ Piedmont Regional Office in accordance with the following schedule:

Deborah L. DeBiasi, Virginia DEQ
Office of Water Permit and Compliance Assistance Programs
Email: **Deborah.DeBiasi@deq.virginia.gov**
PH: 804-698-4028

From: Jenkins, Ray (DEQ)
Sent: Wednesday, June 06, 2012 3:52 PM
To: DeBiasi, Deborah (DEQ)
Subject: Totopotomoy WWTP VA0089915

Deborah, attached is my work for the WET portion of this draft permit. I would appreciate your review and comments.

Thanks

Ray R. Jenkins, Jr.
Environmental Specialist Senior
Telephone: 804/527-5037
E-mail: ray.jenkins@deq.virginia.gov
Fax: 804/527-5106

Attachment 11

VPDES Permit VA00089915 – Totopotomoy Wastewater Treatment Plant

Interim CTOs were issued on April 1, 2004 and June 18, 2004. A final CTO was issued on September 14, 2004. Discharge began in April 2004.

This facility is an activated sludge plant (BNR mode) with screening and grit removal, chemical feed, secondary clarification, UV disinfection, and post aeration.

Results of **acute** toxicity tests (48-hour static tests) during term of the 1999 permit and evaluated for permit reissuance in 2007:

Permit endpoint: $LC_{50} \geq 100\%$ in at least 75% of the tests

TEST DATE	*Ceriodaphnia dubia*		*Pimephales promelas*		Laboratory
	LC_{50}	PERCENT SURVIVAL IN 100% EFFLUENT	LC_{50}	PERCENT SURVIVAL IN 100% EFFLUENT	
December 1, 2004	>100	100	>100	100	J. R. Reed
March 2, 2005	>100	100	>100	100	J. R. Reed
May 4, 2005	>100	100	>100	100	J. R. Reed
August 10, 2005	>100	100	>100	90	J. R. Reed

Results of **chronic** toxicity tests (3-brood static renewal for *Ceriodaphnia dubia*; 7-day static renewal for *Pimephales promelas*) during term of the 1999 permit and evaluated for reissuance in 2007:

Permit endpoints: NOEC $\geq$9.4% at 5 MGD; and $\geq$18.7% at 10 MGD in at least 75% of the tests

TEST DATE**	*Ceriodaphnia dubia*		*Pimephales promelas*		Laboratory
	Survival	Reproduction	Survival	Growth	
November 29, 2004	100	50	100	100	J. R. Reed
February 25, 2005	100	100	100	100	J. R. Reed
May 2, 2005	100	100	100	100	J. R. Reed
August 8, 2005	100	100	100	100	J. R. Reed

Results of **acute** toxicity tests after August 2005:

TEST DATE	*Ceriodaphnia dubia*		*Pimephales promelas*		Laboratory
	LC_{50}	PERCENT SURVIVAL IN 100% EFFLUENT	LC_{50}	PERCENT SURVIVAL IN 100% EFFLUENT	
October 5, 2005	>100	100	>100	100	J. R. Reed
October 19, 2006	>100	100	>100	100	J. R. Reed
Acute testing not required in permit reissued in August 2007					

Results of **chronic** toxicity tests after August 2005. The permit was reissued in August 2007. The reissued permit required chronic toxicity testing only. A 7 MGD tier was added with this reissuance. A CTO for the 7 MGD tier was issued on October 18, 2010.

Permit endpoints: NOEC ≥8% at 5 MGD; ≥11% at 7 MGD; ≥15% at 10 MGD in 100% of the tests

TEST DATE**	*Ceriodaphnia dubia*		*Pimephales promelas*		Laboratory
	Survival	Reproduction	Survival	Growth	
October 3, 2005	100	100	100	50	J. R. Reed
October 16, 2006	100	100	100	100	J. R. Reed
September 24, 2007	100	43	100	100	J. R. Reed
September 15, 2008	100	100	100	100	J. R. Reed
October 12, 2009	100	100	100	100	J. R. Reed
November 29, 2010	100	100	100	100	J. R. Reed
May 24, 2011	100	100	100	100	J. R. Reed
May 8, 2012	100	100	100	100	J. R. Reed

Discussion

WETLIM10 spreadsheets for 7 and 10 MGD flows, and STATS evaluations for chronic *Ceriodaphnia dubia* and *Pimephales promelas* at 10 MGD are attached to this data summary. STATS indicates that chronic WET limitations are not needed. (As limitations were not indicated at 10 MGD, analysis at 7 MGD is not needed because the wasteload allocations at 7 MGD are greater.)

Acute toxicity has never been indicated. Acute testing was not retained in the 2007 permit reissuance given that all acute testing to that date had shown LC_{50}s $\geq$100%. Additionally, all chronic testing to present has shown LC_{50}s at 48 hours $\geq$100%.

The 2012 draft permit therefore, maintains the present requirement of annual, chronic testing for *Ceriodaphnia dubia* and *Pimephales promelas*. Note that the endpoint at 7 MGD has increased from $\geq$11% to $\geq$12% due a decrease in stream flow. (The endpoint at 10 MGD remains at $\geq$15%.)

Spreadsheet for determination of WET test endpoints or WET limits

Excel 97
Revision Date: 01/10/05
File: WETLIM10.xls
(MIX.EXE required also)

Enter data in the cells with blue type:

Entry Date:	06/06/12
Facility Name:	Totopotomoy WWTP
VPDES Number:	VA0089915
Outfall Number:	1
Plant Flow:	7 MGD
Acute 1Q10:	32 MGD
Chronic 7Q10:	36 MGD

Acute Endpoint/Permit Limit — **Use as LC_{50} in Special Condition, as TUa on DMR**

ACUTE	100% =	NOAEC	LC_{50} =	NA	% Use as	NA	TUa
ACUTE WLAa		1.67142857					

Note: Inform the permittee that if the mean of the data exceeds this TUa: 1.0 a limit may result using WLA.EXE

Chronic Endpoint/Permit Limit — **Use as NOEC in Special Condition, as TUc on DMR**

CHRONIC	8.98438734	TU_c	NOEC =	12	% Use as	8.33	TU_c
BOTH*	16.7142861	TU_c	NOEC =	6	% Use as	16.66	TU_c
AML	8.98438734	TU_c	NOEC =	12	% Use as	8.33	TU_c

ACUTE WLAa,c	16.7142857
CHRONIC WLAc	6.14285714

* Both means acute expressed as chronic

Note: Inform the permittee that if the mean of the data exceeds this TUc: 3.6920861 a limit may result using WLA.EXE

% Flow to be used from MIX.EXE

Acute	100	%
Chronic	100	%

Difuser /modeling study?

Enter Y/N	n	
Acute	1	:1
Chronic	1	:1

Are data available to calculate CV? (Y/N)	N	(Minimum of 10 data points, same species, needed)	Go to Page 2
Are data available to calculate ACR? (Y/N)	N	(NOEC<LC50, do not use greater/less than data)	Go to Page 3

IWC_a	17.94871795	%	Plant flow/plant flow + 1Q10
IWC_c	16.27906977	%	Plant flow/plant flow + 7Q10

NOTE: If the IWCa is >33%, specify the NOAEC = 100% test/endpoint for use

Dilution, acute	5.571428571	100/IWCa
Dilution, chronic	6.142857143	100/IWCc

WLA_a		1.671428571	Instream criterion (0.3 TUa) X's Dilution, acute
WLA_c		6.142857143	Instream criterion (1.0 TUc) X's Dilution, chronic
$WLA_{a,c}$		16.71428571	ACR X's WLA_a - converts acute WLA to chronic units
ACR -acute/chronic ratio		10	LC50/NOEC (Default is 10 - if data are available, use tables Page 3)
CV-Coefficient of variatior		0.6	Default of 0.6 - if data are available, use tables Page 2)
Constants	eA	0.4109447	Default = 0.41
	eB	0.6010373	Default = 0.60
	eC	2.4334175	Default = 2.43
	eD	2.4334175	Default = 2.43 (1 samp)

No. of sample 1

****The Maximum Daily Limit is calculated from the lowest LTA, X's eC. The LTAa,c and MDL using it are driven by the ACR.**

$LTA_{a,c}$	6.868647129	WLAa,c X's eA							
LTA_c	3.692086271	WLAc X's eB					Rounded NOEC's		%
MDL** with $LTA_{a,c}$	16.71428612	TU_c	NOEC =	5.982906	(Protects from acute/chronic toxicity)		NOEC =	6	%
MDL** with LTA_c	8.984387344	TU_c	NOEC =	11.130419	(Protects from chronic toxicity)		NOEC =	12	%
AML with lowest LTA	8.984387344	TU_c	NOEC =	11.130419	Lowest LTA X's eD		NOEC =	12	

IF ONLY ACUTE ENDPOINT/LIMIT IS NEEDED, CONVERT MDL FROM TU_c to TU_a

							Rounded LC50's		%
MDL with $LTA_{a,c}$	1.671428612	TU_a	LC50 =	59.829058	%		LC50 =	60	%
MDL with LTA_c	0.898438734	TU_a	LC50 =	111.304195	%	Use NOAEC=100%	LC50 =	NA	

Page 2 - Follow the directions to develop a site specific CV (coefficient of variation)

IF YOU HAVE AT LEAST 10 DATA POINTS THAT ARE QUANTIFIABLE (NOT "<" OR ">") FOR A SPECIES, ENTER THE DATA IN EITHER COLUMN "G" (VERTEBRATE) OR COLUMN "J" (INVERTEBRATE). THE 'CV' WILL BE PICKED UP FOR THE CALCULATIONS BELOW. THE DEFAULT VALUES FOR eA, eB, AND eC WILL CHANGE IF THE 'CV' IS ANYTHING OTHER THAN 0.6.

	Vertebrate IC_{25} Data or LC_{50} Data	LN of data	Invertebrate IC_{25} Data or LC_{50} Data	LN of data
	**********		**********	
1			1	
2			2	
3			3	
4			4	
5			5	
6			6	
7			7	
8			8	
9			9	
10			10	
11			11	
12			12	
13			13	
14			14	
15			15	
16			16	
17			17	
18			18	
19			19	
20			20	
St Dev	NEED DATA	NEED DATA	St Dev	NEED DATA	NEED DATA
Mean	0	0	Mean	0	0
Variance	0	0.000000	Variance	0	0.000000
CV	0		CV	0	

Coefficient of Variation for effluent tests

CV = 0.6 (Default 0.6)

δ^2 = 0.3074847

δ = 0.554513029

Using the log variance to develop eA

(P. 100, step 2a of TSD)

Z = 1.881 (97% probability stat from table

A = -0.88929666

eA = 0.410944686

Using the log variance to develop eB

(P. 100, step 2b of TSD)

δ_4^2 = 0.086177696

δ_4 = 0.293560379

B = -0.50909823

eB = 0.601037335

Using the log variance to develop eC

(P. 100, step 4a of TSD)

δ^2 = 0.3074847

δ = 0.554513029

C = 0.889296658

eC = 2.433417525

Using the log variance to develop eD

(P. 100, step 4b of TSD)

n = 1 This number will most likely stay as "1", for 1 sample/month.

δ_n^2 = 0.3074847

δ_n = 0.554513029

D = 0.889296658

eD = 2.433417525

Page 3 - Follow directions to develop a site specific ACR (Acute to Chronic Ratio)

To determine Acute/Chronic Ratio (ACR), insert usable data below. Usable data is defined as valid paired test results, acute and chronic, tested at the same temperature, same species. The chronic NOEC must be less than the acute LC_{50}, since the ACR divides the LC_{50} by the NOEC. LC_{50}'s >100% should not be used.

Table 1. ACR using Vertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
				ACR for vertebrate data:			0

Table 1. Result:	Vertebrate ACR 0
Table 2. Result:	invertebrate ACR 1.795597071
	Lowest ACR 1.795597071

Table 2. ACR using Invertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	100	61	1.639344	0.4942963	0.49429632	1.63934426	0
2	100	50	2	0.6931472	0.5853376	1.79559707	1.795597071
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
				ACR for vertebrate data:			1.795597071

Table 3. Convert LC_{50}'s and NOEC's to Chronic TU's for use in WLA.EXE

ACR used: 10

	Enter LC_{50}	TUc	Enter NOEC	TUc
1		NO DATA		NO DATA
2		NO DATA		NO DATA
3		NO DATA		NO DATA
4		NO DATA		NO DATA
5		NO DATA		NO DATA
6		NO DATA		NO DATA
7		NO DATA		NO DATA
8		NO DATA		NO DATA
9		NO DATA		NO DATA
10		NO DATA		NO DATA
11		NO DATA		NO DATA
12		NO DATA		NO DATA
13		NO DATA		NO DATA
14		NO DATA		NO DATA
15		NO DATA		NO DATA
16		NO DATA		NO DATA
17		NO DATA		NO DATA
18		NO DATA		NO DATA
19		NO DATA		NO DATA
20		NO DATA		NO DATA

If WLA.EXE determines that an acute limit is needed, you need to convert the TUc answer you get to TUa and then an LC50,

enter it here:	NO DATA	$\%LC_{50}$
	NO DATA	TUa

DILUTION SERIES TO RECOMMEND

Table 4.	Monitoring % Effluent	Monitoring TUc	Limit % Effluent	Limit TUc
Dilution series based on data mean	27.1	3.692086		
Dilution series to use for limit			12	8.3333333
Dilution factor to recommend:	0.5204321		0.3464102	
Dilution series to recommend:	100.0	1.00	100.0	1.00
	52.0	1.92	34.6	2.89
	27.1	3.69	12.0	8.33
	14.1	7.09	4.2	24.06
	7.34	13.63	1.4	69.44
Extra dilutions if needed	3.82	26.19	0.5	200.47
	1.99	50.33	0.2	578.70

Cell: I9
Comment:
This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: K18
Comment: This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: J22
Comment: Remember to change the "N" to "Y" if you have ratios entered, otherwise, they won't be used in the calculations.

Cell: C40
Comment:
If you have entered data to calculate an ACR on page 3, and this is still defaulted to "10", make sure you have selected "Y" in cell E21

Cell: C41
Comment: If you have entered data to calculate an effluent specific CV on page 2, and this is still defaulted to "0.6", make sure you have selected "Y" in cell E20

Cell: L48
Comment:
See Row 151 for the appropriate dilution series to use for these NOEC's

Cell: G62
Comment:
Vertebrates are:
Pimephales promelas
Oncorhynchus mykiss
Cyprinodon variegatus

Cell: J62
Comment:
Invertebrates are:
Ceriodaphnia dubia
Mysidopsis bahia

Cell: C117
Comment: Vertebrates are:

Pimephales promelas
Cyprinodon variegatus

Cell: M119
Comment: The ACR has been picked up from cell C34 on Page 1. If you have paired data to calculate an ACR, enter it in the tables to the left, and make sure you have a "Y" in cell E21 on Page 1. Otherwise, the default of 10 will be used to convert your acute data.

Cell: M121
Comment: If you are only concerned with acute data, you can enter it in the NOEC column for conversion and the number calculated will be equivalent to the TUa. The calculation is the same: 100/NOEC = TUc or 100/LC50 = TUa.

Cell: C138
Comment: Invertebrates are:

Ceriodaphnia dubia
Mysidopsis bahia

Spreadsheet for determination of WET test endpoints or WET limits

Excel 97
Revision Date: 01/10/05
File: WETLIM10.xls
(MIX.EXE required also)

Acute Endpoint/Permit Limit — **Use as LC_{50} in Special Condition, as TUa on DMR**

ACUTE	100% =	NOAEC	LC_{50} =	NA	% Use as	NA	TUa

ACUTE WLAa 1.26

Note: Inform the permittee that if the mean of the data exceeds this TUa: 1.0 a limit may result using WLA.EXE

Chronic Endpoint/Permit Limit — **Use as NOEC in Special Condition, as TUc on DMR**

CHRONIC	6.72784355	TU_c	NOEC =	15	% Use as	6.66	TU_c
BOTH*	12.6000003	TU_c	NOEC =	8	% Use as	12.50	TU_c
AML	6.72784355	TU_c	NOEC =	15	% Use as	6.66	TU_c

Enter data in the cells with blue type:

ACUTE WLAa,c 12.6
CHRONIC WLAc 4.6
* Both means acute expressed as chronic

Note: Inform the permittee that if the mean of the data exceeds this TUc: 2.76477145 a limit may result using WLA.EXE

Entry Date:	06/06/12	
Facility Name:	Totopotomoy WWTP	
VPDES Number:	VA0089915	
Outfall Number:	1	
Plant Flow:	10	MGD
Acute 1Q10:	32	MGD
Chronic 7Q10:	36	MGD

% Flow to be used from MIX.EXE

Plant Flow:	10	MGD
Acute 1Q10:	32	MGD
Chronic 7Q10:	36	MGD
Acute	100	%
Chronic	100	%

Difuser /modeling study?

Enter Y/N	n	
Acute	1	:1
Chronic	1	:1

Are data available to calculate CV? (Y/N) N (Minimum of 10 data points, same species, needed) Go to Page 2
Are data available to calculate ACR? (Y/N) N (NOEC<LC50, do not use greater/less than data) Go to Page 3

IWC_a	23.80952381	%	Plant flow/plant flow + 1Q10
IWC_c	21.73913043	%	Plant flow/plant flow + 7Q10

NOTE: If the IWCa is >33%, specify the NOAEC = 100% test/endpoint for use

Dilution, acute	4.2	100/IWCa
Dilution, chronic	4.6	100/IWCc
WLA_a	1.26	Instream criterion (0.3 TUa) X's Dilution, acute
WLA_c	4.6	Instream criterion (1.0 TUc) X's Dilution, chronic
$WLA_{a,c}$	12.6	ACR X's WLA_a - converts acute WLA to chronic units
ACR -acute/chronic ratio	10	LC50/NOEC (Default is 10 - if data are available, use tables Page 3)
CV-Coefficient of variatior	0.6	Default of 0.6 - if data are available, use tables Page 2)
Constants eA	0.4109447	Default = 0.41
eB	0.6010373	Default = 0.60
eC	2.4334175	Default = 2.43
eD	2.4334175	Default = 2.43 (1 samp)

No. of sample 1

****The Maximum Daily Limit is calculated from the lowest LTA, X's eC. The LTAa,c and MDL using it are driven by the ACR.**

$LTA_{a,c}$	5.17790322	WLAa,c X's eA						
LTA_c	2.76477158	WLAc X's eB					Rounded NOEC's	%
MDL** with $LTA_{a,c}$	12.60000031	TU_c	NOEC =	7.936508	(Protects from acute/chronic toxicity)		NOEC = 8	%
MDL** with LTA_c	6.727843546	TU_c	NOEC =	14.863604	(Protects from chronic toxicity)		NOEC = 15	%
AML with lowest LTA	6.727843546	TU_c	NOEC =	14.863604	Lowest LTA X's eD		NOEC = 15	

IF ONLY ACUTE ENDPOINT/LIMIT IS NEEDED, CONVERT MDL FROM TU_c to TU_a

							Rounded LC50's	%
MDL with $LTA_{a,c}$	1.260000031	TU_a	LC50 =	79.365077	%		LC50 = 80	%
MDL with LTA_c	0.672784355	TU_a	LC50 =	148.636037	%	Use NOAEC=100%	LC50 = NA	

Page 2 - Follow the directions to develop a site specific CV (coefficient of variation)

IF YOU HAVE AT LEAST 10 DATA POINTS THAT ARE QUANTIFIABLE (NOT "<" OR ">") FOR A SPECIES, ENTER THE DATA IN EITHER COLUMN "G" (VERTEBRATE) OR COLUMN "J" (INVERTEBRATE). THE 'CV' WILL BE PICKED UP FOR THE CALCULATIONS BELOW. THE DEFAULT VALUES FOR eA, eB, AND eC WILL CHANGE IF THE 'CV' IS ANYTHING OTHER THAN 0.6.

	Vertebrate IC_{25} Data or LC_{50} Data	LN of data		Invertebrate IC_{25} Data or LC_{50} Data	LN of data
	**********			**********	
1			1		
2			2		
3			3		
4			4		
5			5		
6			6		
7			7		
8			8		
9			9		
10			10		
11			11		
12			12		
13			13		
14			14		
15			15		
16			16		
17			17		
18			18		
19			19		
20			20		
St Dev	NEED DATA	NEED DATA	St Dev	NEED DAT/	NEED DATA
Mean	0	0	Mean	0	0
Variance	0	0.000000	Variance	0	0.000000
CV	0		CV	0	

Coefficient of Variation for effluent tests

CV = 0.6 (Default 0.6)

δ^2 = 0.3074847

δ = 0.554513029

Using the log variance to develop eA

(P. 100, step 2a of TSD)

Z = 1.881 (97% probability stat from table

A = -0.88929666

eA = 0.410944686

Using the log variance to develop eB

(P. 100, step 2b of TSD)

δ_4^2 = 0.086177696

δ_4 = 0.293560379

B = -0.50909823

eB = 0.601037335

Using the log variance to develop eC

(P. 100, step 4a of TSD)

δ^2 = 0.3074847

δ = 0.554513029

C = 0.889296658

eC = 2.433417525

Using the log variance to develop eD

(P. 100, step 4b of TSD)

n = 1 This number will most likely stay as "1", for 1 sample/month.

δ_n^2 = 0.3074847

δ_n = 0.554513029

D = 0.889296658

eD = 2.433417525

Page 3 - Follow directions to develop a site specific ACR (Acute to Chronic Ratio)

To determine Acute/Chronic Ratio (ACR), insert usable data below. Usable data is defined as valid paired test results, acute and chronic, tested at the same temperature, same species. The chronic NOEC must be less than the acute LC_{50}, since the ACR divides the LC_{50} by the NOEC. LC_{50}'s >100% should not be used.

Table 1. ACR using Vertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
				ACR for vertebrate data:			0

Table 1. Result:	Vertebrate ACR 0
Table 2. Result:	Invertebrate ACR 1.795597071
	Lowest ACR 1.795597071

Table 2. ACR using Invertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	100	61	1.639344	0.4942963	0.49429632	1.63934426	0
2	100	50	2	0.6931472	0.5853376	1.79559707	1.795597071
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
				ACR for vertebrate data:			1.795597071

Convert LC_{50}'s and NOEC's to Chronic TU's for use in WLA.EXE

Table 3. ACR used: 10

	Enter LC_{50}	TUc	Enter NOEC	TUc
1		NO DATA		NO DATA
2		NO DATA		NO DATA
3		NO DATA		NO DATA
4		NO DATA		NO DATA
5		NO DATA		NO DATA
6		NO DATA		NO DATA
7		NO DATA		NO DATA
8		NO DATA		NO DATA
9		NO DATA		NO DATA
10		NO DATA		NO DATA
11		NO DATA		NO DATA
12		NO DATA		NO DATA
13		NO DATA		NO DATA
14		NO DATA		NO DATA
15		NO DATA		NO DATA
16		NO DATA		NO DATA
17		NO DATA		NO DATA
18		NO DATA		NO DATA
19		NO DATA		NO DATA
20		NO DATA		NO DATA

If WLA.EXE determines that an acute limit is needed, you need to convert the TUc answer you get to TUa and then an LC50,

enter it here:		NO DATA	%LC_{50}
		NO DATA	TUa

DILUTION SERIES TO RECOMMEND

Table 4.

	Monitoring % Effluent	Monitoring TUc	Limit % Effluent	Limit TUc
Dilution series based on data mean	36.2	2.764771		
Dilution series to use for limit			15	6.6666667
Dilution factor to recommend:	0.6014096		0.3872983	
Dilution series to recommend:	100.0	1.00	100.0	1.00
	60.1	1.66	38.7	2.58
	36.2	2.76	15.0	6.67
	21.8	4.60	5.8	17.21
	13.08	7.64	2.3	44.44
Extra dilutions if needed	7.87	12.71	0.9	114.76
	4.73	21.13	0.3	296.30

Cell: I9
Comment:
This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: K18
Comment: This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: J22
Comment: Remember to change the "N" to "Y" if you have ratios entered, otherwise, they won't be used in the calculations.

Cell: C40
Comment:
If you have entered data to calculate an ACR on page 3, and this is still defaulted to "10", make sure you have selected "Y" in cell E21

Cell: C41
Comment: If you have entered data to calculate an effluent specific CV on page 2, and this is still defaulted to "0.6", make sure you have selected "Y" in cell E20

Cell: L48
Comment:
See Row 151 for the appropriate dilution series to use for these NOEC's

Cell: G62
Comment:
Vertebrates are:
Pimephales promelas
Oncorhynchus mykiss
Cyprinodon variegatus

Cell: J62
Comment:
Invertebrates are:
Ceriodaphnia dubia
Mysidopsis bahia

Cell: C117
Comment: Vertebrates are:

Pimephales promelas
Cyprinodon variegatus

Cell: M119
Comment: The ACR has been picked up from cell C34 on Page 1. If you have paired data to calculate an ACR, enter it in the tables to the left, and make sure you have a "Y" in cell E21 on Page 1. Otherwise, the default of 10 will be used to convert your acute data.

Cell: M121
Comment: If you are only concerned with acute data, you can enter it in the NOEC column for conversion and the number calculated will be equivalent to the TUa. The calculation is the same: 100/NOEC = TUc or 100/LC50 = TUa.

Cell: C138
Comment: Invertebrates are:

Ceriodaphnia dubia
Mysidopsis bahia

Facility = Totopotomoy WWTP – 10 MGD
Chemical = Chronic Toxicity – Ceriodaphnia dubia
Chronic averaging period = 4
WLAa = 12.6
WLAc = 4.6
Q.L. = 1
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 12
Expected Value = 1.18734
Variance = .131381
C.V. = 0.305273
97th percentile daily values = 1.99102
97th percentile 4 day average = 1.56152
97th percentile 30 day average = 1.31182
< Q.L. = 0
Model used = lognormal

No Limit is required for this material

The data are:

2
1
1
1
1
2.3
1
1
1
1

Facility = Totopotomoy WWTP – 10 MGD
Chemical = Chronic Toxicity – Pimephales promelas
Chronic averaging period = 4
WLAa = 12.6
WLAc = 4.6
Q.L. = 1
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 12
Expected Value = 1.08088
Variance = .047725
C.V. = 0.202113
97th percentile daily values = 1.54363
97th percentile 4 day average = 1.29992
97th percentile 30 day average = 1.15591
< Q.L. = 0
Model used = lognormal

No Limit is required for this material

The data are:

1
1
1
1
2
1
1
1
1
1
1
1