pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Northcentral Regional Office
CLEAN WATER PROGRAM

NPDES PERMIT FACT SHEET
INDIVIDUAL SEWAGE

Application Type	**Renewal**	Application No.	**PA0228869**
Facility Type	**Non-Municipal**	APS ID	**1042976**
Major / Minor	**Minor**	Authorization ID	**1361255**

Applicant and Facility Information

Applicant Name	**PA DCNR Kettle Creek State Park**	Facility Name	**Kettle Creek State Park**
Applicant Address	97 Kettle Creek Park Lane Renovo, PA 17764-9400	Facility Address	97 Kettle Creek Park Lane Renovo, PA 17764-9400
Applicant Contact	Sarah Lindgren	Facility Contact	Sarah Lindgren
Applicant Phone	(570) 923-6004	Facility Phone	(570) 923-6004
Client ID	51149	Site ID	246345
Ch 94 Load Status	Not Overloaded	Municipality	Leidy Township
Connection Status	No Limitations	County	Clinton
Date Application Received	July 8, 2021	EPA Waived?	Yes
Date Application Accepted	August 16, 2021	If No, Reason	

Purpose of Application: Renewal of an existing NPDES permit for the discharge of treated sewage.

Summary of Review

DEP will publish notice of the receipt of the NPDES permit application and a tentative decision to issue the individual NPDES permit in the *Pennsylvania Bulletin* in accordance with 25 Pa. Code § 92a.82. Upon publication in the *Pennsylvania Bulletin*, DEP will accept written comments from interested persons for a 30-day period (which may be extended for one additional 15-day period at DEP's discretion), which will be considered in making a final decision on the application. Any person may request or petition for a public hearing with respect to the application. A public hearing may be held if DEP determines that there is significant public interest in holding a hearing. If a hearing is held, notice of the hearing will be published in the *Pennsylvania Bulletin* at least 30 days prior to the hearing and in at least one newspaper of general circulation within the geographical area of the discharge.

Approve	Deny	Signatures	Date
X		*Jonathan P. Peterman* Jonathan P. Peterman / Project Manager	May 25, 2022
X		*Nicholas W. Hartranft* Nicholas W. Hartranft, P.E. / Environmental Engineer Manager	May 31, 2022

Discharge, Receiving Waters and Water Supply Information			
Outfall No.	001	Design Flow (MGD)	0.0022
Latitude	41º 20' 19.64"	Longitude	-77º 54' 29.28"
Quad Name	Keating	Quad Code	0822
Wastewater Description:	Sewage Effluent		
Receiving Waters	Kettle Creek (TSF)	Stream Code	23661
NHD Com ID	61115219	RMI	6.51
Drainage Area	229	Yield (cfs/mi^2)	0.03
Q_{7-10} Flow (cfs)	8.05	Q_{7-10} Basis	Gage No. 01545000
Elevation (ft)	765	Slope (ft/ft)	0.03
Watershed No.	9-B	Chapter 93 Class.	TSF
Existing Use	TSF	Existing Use Qualifier	N/A
Exceptions to Use	None	Exceptions to Criteria	N/A
Assessment Status	Impaired.		
Cause(s) of Impairment	Metals, pH.		
Source(s) of Impairment	Abandoned mine drainage.		
TMDL Status	Approved	Name	2/7/2007
Nearest Downstream Public Water Supply Intake	PA American Water White Deer		
PWS Waters	West Branch Susquehanna River	Flow at Intake (cfs)	682
PWS RMI	10.5	Distance from Outfall (mi)	105

Changes Since Last Permit Issuance: The updated Q_{7-10} data was obtained from the updated stream gage information obtained from *Stuckey, M.H., and Roland, M.A., 2011, Selected Streamflow Statistics for Streamgage Locations In and Near Pennsylvania*. A comparative stream analysis was conducted using a downstream gage (01545000) on Kettle Creek. The Q_{7-10} calculations, which are attached in Appendix A, indicate that the Q_{7-10} is 8.05 cfs. Is identical to what was used in the previous review.
Other Comments: None.

Treatment Facility Summary				
Treatment Facility Name: PA DCNR Kettle Creek State Park				
WQM Permit No.	**Issuance Date**	**Comments:**		
1804402	3/13/2006	Construction of package treatment plant.		
Waste Type	**Degree of Treatment**	**Process Type**	**Disinfection**	**Avg Annual Flow (MGD)**
Sewage	Secondary	Extended Aeration	Ultraviolet	0.0022
Hydraulic Capacity (MGD)	**Organic Capacity (lbs/day)**	**Load Status**	**Biosolids Treatment**	**Biosolids Use/Disposal**
0.0044	_----__	Not Overloaded	None	Other WWTP

Treatment System Components for Outfall 001:
- One (1) Raw sewage lift station.
- One (1) Influent EQ tank.
- One (1) Equalization tank.
- One (1) Aeration tank.
- One (1) Clarifier.
- Two (2) Anthracite filters.
  - Filter backwash.
  - Two (2) backwash pumps.
  - Backwash mudwell.
  - Backwash clearwell.
- One (1) UV disinfection system.
- One (1) Chlorine disinfection system with contact tank.
- One (1) Outfall 001.

- One (1) Aerobic digester.

Changes Since Last Permit Issuance: None.
Other Comments: None.

Anti-Backsliding

In accordance with 40 CFR 122.44(l)(1) and (2), this permit does not contain effluent limitations, standards, or conditions that are less stringent than the previous permit.

TMDL Impairment

The Department's Geographic Information System (GIS) shows that Kettle Creek is impaired and a TMDL does exist for the stream segment. All impairments resulted from acid mine drainage. The TMDL addresses the three primary metals associated with acid mine drainage (iron, manganese, aluminum). There is currently no industrial waste being discharged into the treatment plant and this discharge is not expected to contribute to the level of metals in the stream. Given the regulations contained in 40 CFR §122.44(d)(1)(ii)&(iii), it can be determined that the type of effluent from this facility has no "Reasonable potential to cause, or contributes to an in-stream excursion above the allowable ambient concentration of a State numeric criteria within a State water quality standard for an individual pollutant." Therefore, the permit will not be required to contain effluent limits for the pollutant addressed in the TMDL. Previously, the facility was required to monitor for metals (iron, manganese and aluminum) to ensure that they are not contributing to the impairment. The monitoring confirms that this facility is not contributing to the impairment of the stream. The sample results in the compliance history section below indicate that his facility is discharging these metals in concentrations less than Ch. 93 water quality standards (0.750 mg/l for Aluminum, 1.50 mg/l for Iron, and 1.00 mg/L for Manganese). No further monitoring will be required unless it is done for the TMDL and the entire watershed is sampled.

Chesapeake Bay Requirements

Since this facility's hydraulic design capacity is 0.0044 MGD, the permittee previously monitored and reported TN and TP concentrations over a two year term. In accordance with the Phase II WIP Chesapeake Bay Strategy for Phase V facilities (0.002 MGD to 0.2 MGD), yearly monitoring requirements for nutrients is not required if this monitoring has been conducted and documented in the previous fact sheet. The previous the monitoring results at as follows:

Date (Mo.-Yr.)	Flow (MGD)	TN (mg/L)	TP (mg/L)
Jun-10	0.004	45.39	7.58
Sep-10	0.001	56.63	14.64
Nov-08	0.0005	28.38	6.62
Sep-08	0.0001	57.94	11.90
Jun-08	0.0046	51.89	10.62
Nov-07	0.0002	27.62	11.75
Sep-07	0.0012	101.29	16.34
Jun-07	0.0006	101.29	12.01

Existing Effluent Limitations and Monitoring Requirements

Existing Limits – Outfall 001

Parameter	Effluent Limitations						Monitoring Requirements	
	Mass Units (lbs/day) (1)		Concentrations (mg/L)				Minimum (2) Measurement Frequency	Required Sample Type
	Average Monthly	Average Weekly	Minimum	Average Monthly	Maximum	Instant. Maximum		
Flow (MGD)	Report	XXX	XXX	XXX	XXX	XXX	1/week	Measured
pH (S.U.) Oct 1 - Apr 30	XXX	XXX	6.0	XXX	9.0	XXX	3/week	Grab
pH (S.U.) May 1 - Sep 30	XXX	XXX	6.0	XXX	9.0	XXX	1/day	Grab
Dissolved Oxygen Oct 1 - Apr 30	XXX	XXX	Report	XXX	XXX	XXX	3/week	Grab
Dissolved Oxygen May 1 - Sep 30	XXX	XXX	Report	XXX	XXX	XXX	1/day	Grab
Total Residual Chlorine (TRC) Oct 1 - Apr 30	XXX	XXX	XXX	1.0	XXX	2.3	3/week	Grab
Total Residual Chlorine (TRC) May 1 - Sep 30	XXX	XXX	XXX	1.0	XXX	2.3	1/day	Grab
Carbonaceous Biochemical Oxygen Demand (CBOD5)	XXX	XXX	XXX	25.0	XXX	50	2/month	Grab
Total Suspended Solids	XXX	XXX	XXX	30.0	XXX	60	2/month	Grab

Parameter	Effluent Limitations						Monitoring Requirements	
	Mass Units (lbs/day) (1)		Concentrations (mg/L)				Minimum (2) Measurement Frequency	Required Sample Type
	Average Monthly	Average Weekly	Minimum	Average Monthly	Maximum	Instant. Maximum		
Fecal Coliform (No./100 ml) Oct 1 - Apr 30	XXX	XXX	XXX	2000 Geo Mean	XXX	10000	2/month	Grab
Fecal Coliform (No./100 ml) May 1 - Sep 30	XXX	XXX	XXX	200 Geo Mean	XXX	1000	2/month	Grab
Ammonia-Nitrogen	XXX	XXX	XXX	Report	XXX	XXX	1/quarter	Grab
Aluminum, Total	XXX	XXX	XXX	Report	XXX	XXX	1/year	Grab
Iron, Total	XXX	XXX	XXX	Report	XXX	XXX	1/year	Grab
Manganese, Total	XXX	XXX	XXX	Report	XXX	XXX	1/year	Grab

*The existing effluent limits for Outfall 001 were based on a design flow of 0.0022 MGD.

Development of Effluent Limitations

Outfall No. 001 **Design Flow (MGD)** 0.0022
Latitude 41° 21' 19" **Longitude** 77° 55' 28"
Wastewater Description: Treated Sewage Effluent

Technology-Based Limitations

The following technology-based limitations apply, subject to water quality analysis and BPJ where applicable:

Pollutant	Limit (mg/l)	SBC	Federal Regulation	State Regulation
$CBOD_5$	25	Average Monthly	133.102(a)(4)(i)	92a.47(a)(1)
	40	Average Weekly	133.102(a)(4)(ii)	92a.47(a)(2)
Total Suspended Solids	30	Average Monthly	133.102(b)(1)	92a.47(a)(1)
	45	Average Weekly	133.102(b)(2)	92a.47(a)(2)
pH	6.0 – 9.0 S.U.	Min – Max	133.102(c)	95.2(1)
Fecal Coliform (5/1 – 9/30)	200 / 100 ml	Geo Mean	-	92a.47(a)(4)
Fecal Coliform (5/1 – 9/30)	1,000 / 100 ml	IMAX	-	92a.47(a)(4)
Fecal Coliform (10/1 – 4/30)	2,000 / 100 ml	Geo Mean	-	92a.47(a)(5)
Fecal Coliform (10/1 – 4/30)	10,000 / 100 ml	IMAX	-	92a.47(a)(5)
Total Residual Chlorine	0.5	Average Monthly	-	92a.48(b)(2)

Water Quality-Based Limitations

To establish whether or not water-quality based effluent limitations (WQBELs) are required, the Department models in-stream conditions. In order to determine limitations for CBOD5, ammonia-N and dissolved oxygen, the Department utilizes the WQM 7.0 v1.0b model and in order to determine limitations for toxics, the Department utilizes the Toxics Management Spreadsheet. This spreadsheet was not utilized for this review.

WQM 7.0 for Windows, Version 1.0b, Wasteload Allocation Program for Dissolved Oxygen and Ammonia Nitrogen
The previous model was run using the latest information on Q7-10 stream flow, background water quality, average annual design flow, and other discharge characteristics. There were no changes to the facility or watershed since the previous review. The existing technology based effluent limit for $CBOD_5$ (25 mg/l) and NH3-N (25 mg/l) were used as inputs for the modeling. The DO minimum daily average criterion from §93.7 (5.0 mg/L for CWF) was used for the in-stream objective for the model. The summary of the output is as follows:

Parameter	Effluent Limit		
	30 Day Average	Maximum	Minimum
CBOD5	25	N/A	N/A
Ammonia-N	25	50	N/A
Dissolved Oxygen	N/A	N/A	3

The model does not recommend water-quality based effluent limitations with regards to CBOD5, ammonia-nitrogen, and dissolved oxygen. Refer to the Appendix for the WQM 7.0 inputs and results.

Best Professional Judgment (BPJ) Limitations

See the Dissolved Oxygen section below.

Additional Considerations

None

Proposed Effluent Limitations and Monitoring Requirements

The limitations and monitoring requirements specified below are proposed for the draft permit, and reflect the most stringent limitations amongst the abovementioned technology, water quality, and BPJ. Instantaneous Maximum (IMAX) limits are determined using multipliers of 2 (conventional pollutants) or 2.5 (toxic pollutants). Sample frequencies and types are derived from the "NPDES Permit Writer's Manual" (362-0400-001) and/or BPJ.

Proposed Limits - Outfall 001, Effective Period: Permit Effective Date through Permit Expiration Date

Parameter	Effluent Limitations						Monitoring Requirements	
	Mass Units (lbs/day) (1)		Concentrations (mg/L)				Minimum (2) Measurement Frequency	Required Sample Type
	Average Monthly	Average Weekly	Minimum	Average Monthly	Maximum	Instant. Maximum		
Flow (MGD)	Report	XXX	XXX	XXX	XXX	XXX	1/week	Measured
pH (S.U.) Oct 1 - Apr 30	XXX	XXX	6.0	XXX	9.0	XXX	3/week	Grab
pH (S.U.) May 1 - Sep 30	XXX	XXX	6.0	XXX	9.0	XXX	1/day	Grab
Dissolved Oxygen Oct 1 - Apr 30	XXX	XXX	Report	XXX	XXX	XXX	3/week	Grab
Dissolved Oxygen May 1 - Sep 30	XXX	XXX	Report	XXX	XXX	XXX	1/day	Grab
Total Residual Chlorine (TRC) Oct 1 - Apr 30	XXX	XXX	XXX	1.0	XXX	2.3	3/week	Grab
Total Residual Chlorine (TRC) May 1 - Sep 30	XXX	XXX	XXX	1.0	XXX	2.3	1/day	Grab
Carbonaceous Biochemical Oxygen Demand (CBOD5)	XXX	XXX	XXX	25.0	XXX	50	2/month	Grab

Parameter	Effluent Limitations						Monitoring Requirements	
	Mass Units (lbs/day) (1)		Concentrations (mg/L)				Minimum (2) Measurement Frequency	Required Sample Type
	Average Monthly	Average Weekly	Minimum	Average Monthly	Maximum	Instant. Maximum		
Total Suspended Solids	XXX	XXX	XXX	30.0	XXX	60	2/month	Grab
Fecal Coliform (No./100 ml) Oct 1 - Apr 30	XXX	XXX	XXX	2000 Geo Mean	XXX	10000	2/month	Grab
Fecal Coliform (No./100 ml) May 1 - Sep 30	XXX	XXX	XXX	200 Geo Mean	XXX	1000	2/month	Grab
Ammonia-Nitrogen	XXX	XXX	XXX	Report	XXX	XXX	1/quarter	Grab
E. Coli	XXX	XXX	XXX	XXX	XXX	Report	1/year	Grab

*The proposed effluent limits for Outfall 001 were based on a design flow of 0.0022 MGD.

Effluent Limit Determination for Outfall 001

General Information
All effluent limits were then rounded down in accordance with the rounding rules established in the *Technical Guidance for the Development and Specification of Effluent Limitations (362-0400-001)*, Chapter 5 - Specifying Effluent Limitations in NPDES Permits. The existing monitoring frequencies and sample types for these parameters generally correspond with the *Technical Guidance for the Development and Specification of Effluent Limitations* (362-0400-001) Table 6-3 and will remain.

Flow
Reporting of the average monthly flow is consistent with monitoring requirements for other treatment plants and will remain.

Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)
The results of the WQM 7.0 model show that the previously applied secondary treatment standards (25 PA Code §92a.47 (a) (1&2)) for $CBOD_5$ are protective of water quality and will remain.

Total Suspended Solids (TSS)
The previously applied technology based secondary treatment standards (25 PA Code §92a.47 (a) (1&2)) for TSS will remain as well.

pH
CFR Title 40 §133.102(c) and 25 PA Code §95.2(1) provide the basis of effluent limitations for pH.

Fecal Coliforms
The existing fecal coliform limits with I-max limits were previously updated from the previous Chapter 92 code to correspond with what is specified in the updated 25 PA Code § 92a.47 (a)(4)&(5). The existing effluent limits will remain.

Ammonia-Nitrogen (NH3-N)
The results of the WQM 7.0 model show that the existing monitoring requirement for ammonia-nitrogen is appropriate and will remain.

Dissolved Oxygen (DO)
25 PA Code §93.7 provides specific water quality criteria for DO and monitoring for this parameter will ensure that the facility is not creating or contributing to an in-stream excursion below these water quality standards. Additionally, the *Technical Guidance for the Development and Specification of Effluent Limitations* (362-0400-001) lists DO under the self-

monitoring requirements for sewage discharges and monitoring of DO is consistent with other discharges of this size and type.

E. Coli
25 PA Code § 92a.61 provide the basis of monitoring requirements for E. Coli. Yearly monitoring will be required going forward.

UV Intensity
This facility currently utilizes UV as primary disinfection method. The operator previously indicated that the disinfection system is not equipped with a meter. Given that there is no existing UV meter, effluent monitoring requirements will not be placed in the final permit. This is consistent with the current permit which does not contain UV monitoring.

Total Residual Chlorine (TRC)
Chlorine is not the primary form of disinfection, but it is introduced into the clearwell when there is a the lack of flow through the system. A site specific BAT limit that was developed based on the use, intermittent discharges, and the distance to the outfall. The attached TRC model indicates that the existing BAT effluent limits of 1.0 mg/L (Average Monthly) and 2.3 mg/L (Instantaneous Maximum) are protective of water quality. Since this is an ancillary disinfection process and the sampling location for TRC is a significant distance from the outfall (approximately 500 ft.) which is a submerged outfall. Given that there are no water quality concerns and it is anticipated that the residual chlorine will be consumed before the discharge, the currently permitted effluent limits for TRC shall remain. The proposed monitoring frequency for TRC (1/ Day for May - Sep. and 3/Week for Oct. – April) is consistent with the DCNR agreement for off-season monitoring and shall be included in this permit renewal.

Compliance History

Summary of Inspections -The last inspection of the facilities was conducted by the Department on 6/10/21 which reveals the facility was operating normally.
WMS Query Summary - A WMS Query was run at *Reports - Violations & Enforcements – Open Violations for Client Report* to determine whether there are any unresolved violations associated with the client that will affect issuance of the permit (per CSL Section 609). This query revealed that there were no unresolved violations.
DMRs Summary -Upon review of the DMR's, the facility generally appears to be operating within the given concentration limits. Some minor exceedances were noted over the last permit term.

Compliance History

DMR Data for Outfall 001 (from April 1, 2021 to March 31, 2022)

Parameter	MAR-22	FEB-22	JAN-22	DEC-21	NOV-21	OCT-21	SEP-21	AUG-21	JUL-21	JUN-21	MAY-21	APR-21
Flow (MGD) Average Monthly					0.00005	0.00018	0.000002	0.000197	0.001023	0.00089	0.000562	0.00059
pH (S.U.) Minimum					6.1	6.1	6.1	6.0	6.0	6.0	6.1	6.4
pH (S.U.) Maximum					6.9	7.0	7.2	7.3	8.1	7.0	7.4	7.4
DO (mg/L) Minimum					3.7	3.1	2.0	1.0	0.7	2	1.1	3.2
TRC (mg/L) Average Monthly					0.73	0.44	0.5	0.5	0.5	0.58	0.5	0.49
TRC (mg/L) Instantaneous Maximum					2.1	1.4	1.76	2.1	1.2	1.5	1.6	1.2
CBOD5 (mg/L) Average Monthly					0.2	2.16	3.22	0.91	2.7	2.4	6.3	5.7
TSS (mg/L) Average Monthly					11.0	< 5.0	< 5.0	5.0	11.0	6.0	8.0	11.0
Fecal Coliform (No./100 ml) Geometric Mean					1.0	< 1.0	< 3.0	< 1.0	< 1.0	< 1.0	< 1	3.0
Fecal Coliform (No./100 ml) Instantaneous Maximum					1.0	< 1.0	6.3	< 1.0	< 1.0	< 1.0	< 1	8.6
Ammonia (mg/L) Average Monthly				16.9			1.12			47.71		
Total Aluminum (mg/L) Average Monthly				0.5								
Total Iron (mg/L) Average Monthly				0.134								
Total Manganese (mg/L) Average Monthly				0.146								

Tools and References Used to Develop Permit	
☒	WQM for Windows Model (see Attachment **A**)
☐	Toxics Management Spreadsheet (see Attachment)
☒	TRC Model Spreadsheet (see Attachment **B**)
☐	Temperature Model Spreadsheet (see Attachment)
☐	Water Quality Toxics Management Strategy, 361-0100-003, 4/06.
☒	Technical Guidance for the Development and Specification of Effluent Limitations, 362-0400-001, 10/97.
☐	Policy for Permitting Surface Water Diversions, 362-2000-003, 3/98.
☒	Policy for Conducting Technical Reviews of Minor NPDES Renewal Applications, 362-2000-008, 11/96.
☐	Technology-Based Control Requirements for Water Treatment Plant Wastes, 362-2183-003, 10/97.
☐	Technical Guidance for Development of NPDES Permit Requirements Steam Electric Industry, 362-2183-004, 12/97.
☐	Pennsylvania CSO Policy, 385-2000-011, 9/08.
☐	Water Quality Antidegradation Implementation Guidance, 391-0300-002, 11/03.
☐	Implementation Guidance Evaluation & Process Thermal Discharge (316(a)) Federal Water Pollution Act, 391-2000-002, 4/97.
☒	Determining Water Quality-Based Effluent Limits, 391-2000-003, 12/97.
☐	Implementation Guidance Design Conditions, 391-2000-006, 9/97.
☒	Technical Reference Guide (TRG) WQM 7.0 for Windows, Wasteload Allocation Program for Dissolved Oxygen and Ammonia Nitrogen, Version 1.0, 391-2000-007, 6/2004.
☐	Interim Method for the Sampling and Analysis of Osmotic Pressure on Streams, Brines, and Industrial Discharges, 391-2000-008, 10/1997.
☐	Implementation Guidance for Section 95.6 Management of Point Source Phosphorus Discharges to Lakes, Ponds, and Impoundments, 391-2000-010, 3/99.
☐	Technical Reference Guide (TRG) PENTOXSD for Windows, PA Single Discharge Wasteload Allocation Program for Toxics, Version 2.0, 391-2000-011, 5/2004.
☒	Implementation Guidance for Section 93.7 Ammonia Criteria, 391-2000-013, 11/97.
☐	Policy and Procedure for Evaluating Wastewater Discharges to Intermittent and Ephemeral Streams, Drainage Channels and Swales, and Storm Sewers, 391-2000-014, 4/2008.
☒	Implementation Guidance Total Residual Chlorine (TRC) Regulation, 391-2000-015, 11/1994.
☐	Implementation Guidance for Temperature Criteria, 391-2000-017, 4/09.
☐	Implementation Guidance for Section 95.9 Phosphorus Discharges to Free Flowing Streams, 391-2000-018, 10/97.
☐	Implementation Guidance for Application of Section 93.5(e) for Potable Water Supply Protection Total Dissolved Solids, Nitrite-Nitrate, Non-Priority Pollutant Phenolics and Fluorides, 391-2000-019, 10/97.
☐	Field Data Collection and Evaluation Protocol for Determining Stream and Point Source Discharge Design Hardness, 391-2000-021, 3/99.
☐	Implementation Guidance for the Determination and Use of Background/Ambient Water Quality in the Determination of Wasteload Allocations and NPDES Effluent Limitations for Toxic Substances, 391-2000-022, 3/1999.
☒	Design Stream Flows, 391-2000-023, 9/98.
☐	Field Data Collection and Evaluation Protocol for Deriving Daily and Hourly Discharge Coefficients of Variation (CV) and Other Discharge Characteristics, 391-2000-024, 10/98.
☐	Evaluations of Phosphorus Discharges to Lakes, Ponds and Impoundments, 391-3200-013, 6/97.
☒	Pennsylvania's Chesapeake Bay Tributary Strategy Implementation Plan for NPDES Permitting, 4/07.
☐	SOP:
☐	Other:

APPENDIX A

Q^{7-10} ANALYSIS

Table 1. List of U.S. Geological Survey streamgage locations in and near Pennsylvania with updated streamflow statistics.—Continued

[Latitude and Longitude in decimal degrees; mi², square miles]

Streamgage number	Streamgage name	Latitude	Longitude	Drainage area (mi²)	Regulated[1]
01541303	West Branch Susquehanna River at Hyde, Pa.	41.005	-78.457	474	Y
01541308	Bradley Run near Ashville, Pa.	40.509	-78.584	6.77	N
01541500	Clearfield Creek at Dimeling, Pa.	40.972	-78.406	371	Y
01542000	Moshannon Creek at Osceola Mills, Pa.	40.850	-78.268	68.8	N
01542500	WB Susquehanna River at Karthaus, Pa.	41.118	-78.109	1,462	Y
01542810	Waldy Run near Emporium, Pa.	41.579	-78.293	5.24	N
01543000	Driftwood Branch Sinnemahoning Creek at Sterling Run, Pa.	41.413	-78.197	272	N
01543500	Sinnemahoning Creek at Sinnemahoning, Pa.	41.317	-78.103	685	N
01544000	First Fork Sinnemahoning Creek near Sinnemahoning, Pa.	41.402	-78.024	245	Y
01544500	Kettle Creek at Cross Fork, Pa.	41.476	-77.826	136	N
01545000	Kettle Creek near Westport, Pa.	41.320	-77.874	233	Y
01545500	West Branch Susquehanna River at Renovo, Pa.	41.325	-77.751	2,975	Y
01545600	Young Womans Creek near Renovo, Pa.	41.390	-77.691	46.2	N
01546000	North Bald Eagle Creek at Milesburg, Pa.	40.942	-77.794	119	N
01546400	Spring Creek at Houserville, Pa.	40.834	-77.828	58.5	N
01546500	Spring Creek near Axemann, Pa.	40.890	-77.794	87.2	N
01547100	Spring Creek at Milesburg, Pa.	40.932	-77.786	142	N
01547200	Bald Eagle Creek below Spring Creek at Milesburg, Pa.	40.943	-77.786	265	N
01547500	Bald Eagle Creek at Blanchard, Pa.	41.052	-77.604	339	Y
01547700	Marsh Creek at Blanchard, Pa.	41.060	-77.606	44.1	N
01547800	South Fork Beech Creek near Snow Shoe, Pa.	41.024	-77.904	12.2	N
01547950	Beech Creek at Monument, Pa.	41.112	-77.702	152	N
01548005	Bald Eagle Creek near Beech Creek Station, Pa.	41.081	-77.549	562	Y
01548500	Pine Creek at Cedar Run, Pa.	41.522	-77.447	604	N
01549000	Pine Creek near Waterville, Pa.	41.313	-77.379	750	N
01549500	Blockhouse Creek near English Center, Pa.	41.474	-77.231	37.7	N
01549700	Pine Creek below Little Pine Creek near Waterville, Pa.	41.274	-77.324	944	Y
01550000	Lycoming Creek near Trout Run, Pa.	41.418	-77.033	173	N
01551500	WB Susquehanna River at Williamsport, Pa.	41.236	-76.997	5,682	Y
01552000	Loyalsock Creek at Loyalsockville, Pa.	41.325	-76.912	435	N
01552500	Muncy Creek near Sonestown, Pa.	41.357	-76.535	23.8	N
01553130	Sand Spring Run near White Deer, Pa.	41.059	-77.077	4.93	N
01553500	West Branch Susquehanna River at Lewisburg, Pa.	40.968	-76.876	6,847	Y
01553700	Chillisquaque Creek at Washingtonville, Pa.	41.062	-76.680	51.3	N
01554000	Susquehanna River at Sunbury, Pa.	40.835	-76.827	18,300	Y
01554500	Shamokin Creek near Shamokin, Pa.	40.810	-76.584	54.2	N
01555000	Penns Creek at Penns Creek, Pa.	40.867	-77.048	301	N
01555500	East Mahantango Creek near Dalmatia, Pa.	40.611	-76.912	162	N
01556000	Frankstown Branch Juniata River at Williamsburg, Pa.	40.463	-78.200	291	N
01557500	Bald Eagle Creek at Tyrone, Pa.	40.684	-78.234	44.1	N
01558000	Little Juniata River at Spruce Creek, Pa.	40.613	-78.141	220	N
01559000	Juniata River at Huntingdon, Pa.	40.485	-78.019	816	LF
01559500	Standing Stone Creek near Huntingdon, Pa.	40.524	-77.971	128	N
01559700	Sulphur Springs Creek near Manns Choice, Pa.	39.978	-78.619	5.28	N
01560000	Dunning Creek at Belden, Pa.	40.072	-78.493	172	N

Table 2. Selected low-flow statistics for streamgage locations in and near Pennsylvania.—Continued

[ft³/s; cubic feet per second; —, statistic not computed; <, less than]

Streamgage number	Period of record used in analysis[1]	Number of years used in analysis	1-day, 10-year (ft³/s)	7-day, 10-year (ft³/s)	7-day, 2-year (ft³/s)	30-day, 10-year (ft³/s)	30-day, 2-year (ft³/s)	90-day, 10-year (ft³/s)
01530500	1940–2008	69	5.0	6.1	11.0	7.6	13	9.0
01531000	[2]1981–2008	28	138	147	237	169	296	203
01531000	[3]1905–1979	68	86.3	97.0	175	116	219	161
01531500	[2]1981–2008	28	550	592	1,030	733	1,340	952
01531500	[3]1915–1979	65	539	571	990	675	1,230	928
01532000	1915–2008	94	2.2	2.8	9.7	4.6	14.4	9.4
01532850	1967–1979	13	.1	.2	.4	.3	.8	.7
01533400	[2]1981–2008	28	602	648	1,110	790	1,430	1,060
01533500	1942–1958	17	.4	.6	1.5	.8	2.0	1.7
01533950	1962–1978	17	.2	.3	1.0	.6	1.4	1.0
01534000	1915–2008	94	15.2	17.3	35.9	24.2	51.0	38.7
01534300	1960–2008	49	1.1	1.7	5.1	2.8	7.6	4.8
01534500	[2]1961–2008	48	16.7	18.8	29.2	21.9	35.8	27.6
01534500	[3]1941–1959	19	18.8	23.0	33.3	25.6	39.2	34.9
01536000	[2]1961–2008	48	28.7	32.7	51.7	40.8	68.1	54.3
01536000	[3]1940–1959	20	77.8	93.9	119	105	138	124
01536500	[2]1981–2008	28	828	872	1,450	1,030	1,830	1,350
01536500	[3]1901–1979	79	778	811	1,350	927	1,640	1,260
01537000	1943–1993	51	1.3	2.0	4.9	3.1	6.4	4.7
01537500	1941–1990	50	.2	.3	1.9	.5	3.1	1.6
01538000	1921–2008	88	3.1	3.6	7.1	5.0	9.3	7.5
01539000	1940–2008	69	15.4	16.8	36.8	21.1	51.1	36.8
01539500	1942–1958	17	.1	.3	1.4	1.0	3.3	2.3
01540200	1965–1981	17	0	0	.3	.1	.3	.1
01540500	[2]1981–2008	28	1,080	1,120	1,870	1,320	2,330	1,690
01540500	[3]1906–1979	74	927	978	1,660	1,160	2,050	1,590
01541000	1915–2008	94	25.3	27.9	50.7	35.3	66.6	49.6
01541200	[2]1967–2008	40	34.6	45.2	66.0	63.1	100	92.4
01541200	[3]1957–1965	9	22.9	24.7	44.7	27.7	58.2	36.4
01541303	1980–2008	29	53.4	58.5	94.0	74.4	123	102
01541308	1969–1979	11	1.3	1.3	1.9	1.6	2.4	2.1
01541500	[2]1962–2008	47	39.0	41.9	66.5	51.9	86.3	70.6
01541500	[3]1915–1960	46	14.9	21.3	41.9	28.5	55.0	42.9
01542000	1942–1993	52	8.1	9.1	14.8	11.3	17.8	14.6
01542500	[2]1967–2008	33	216	235	326	285	435	402
01542500	[3]1941–1965	20	—	131	189	152	243	221
01542810	1966–2008	43	.1	.1	.3	.2	.5	.3
01543000	1915–2008	94	2.9	4.2	16.0	9.6	27.4	19.2
01543500	1940–2008	69	10.7	14.5	44.9	26.6	74.9	50.5
01544000	[2]1957–2008	52	3.3	6.9	19.0	11.2	31.1	19.0
01544500	1942–2008	67	4.2	4.9	12.5	7.5	17.4	11.7
01545000	[2]1964–2008	45	6.8	8.2	21.2	12.0	32.7	20.7
01545500	[2]1963–2008	46	217	238	446	306	629	428
01545500	[3]1909–1961	53	125	141	278	190	387	296
01545600	1966–2008	43	1.2	1.5	4.4	2.4	6.7	4.2

Q_{7-10} Analysis

Facility: PA DCNR - Kettle Creek State Park
Outfall: 001

NPDES Permit No.: PA0228869
RMI at Outfall: 6.51 Elev. 765

Reference Stream Gage Information	
Stream Name	Kettle Creek
Reference Gage	1545000
Station Name	Kettle Creek near Westport, PA
Gage Drainage Area (sq. mi.)	233
Q_{7-10} at gage (cfs)	8.2
Yield Ratio (cfs/mi^2)	0.0352

Was Ecoflows Used?	No
Correlation From Ecoflows	N/A

Check Dilution Ratio		
Discharge at Outfall (wf) (mgd)	0.022	
	sf (cfs)	wf (cfs)
Dilution Ratio = sf/wf	8.0592	0.034039033
Dilution Ratio =	236.7642929 to 1	

Q_{7-10} at Outfall	
Drainage Area at site (sq. mi.)	229
Q_{7-10} at discharge site (cfs)	8.0592
Q_{7-10} at discharge site (mgd)	5.2088
Low Flow Yield Ratio of 0.1 cfs/mi^2 (For Approx. Comparison Only)	
Q_{7-10} at discharge site (cfs)	22.9000
Q_{7-10} at discharge site (mgd)	14.8007

Q_{7-10} at Downstream Reach #1	
Drainage Area at Reach (sq. mi.)	231
RMI	5.24
Q_{7-10} at reach (cfs)	8.1296
Q_{7-10} at reach (mgd)	5.2543
	Elev. 751

Q_{7-10} at Downstream Reach #2	
Drainage Area at Reach (sq. mi.)	[Drainage Area @ Reach #2]
RMI	[RMI @ Reach #2]
Q_{7-10} at reach (cfs)	#VALUE!
Q_{7-10} at reach (mgd)	#VALUE!

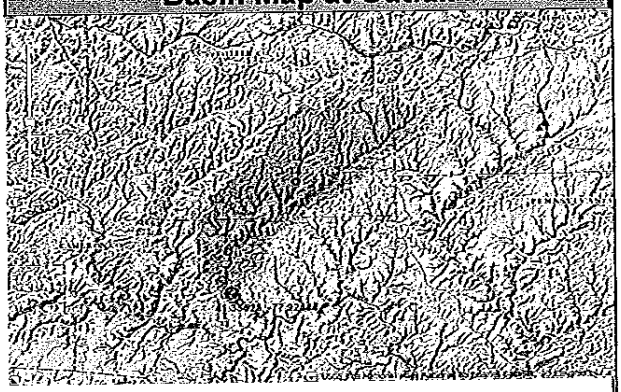
Q_{7-10} at Downstream Reach #3	
Drainage Area at Reach (sq. mi.)	[Drainage Area @ Reach #3]
RMI	[RMI @ Reach #3]
Q_{7-10} at reach (cfs)	#VALUE!
Q_{7-10} at reach (mgd)	#VALUE!

Basin Characteristics Report at [Site / Reach]

Date: Thurs Mar 24, 2016 8:50:13 AM GMT-4
Study Area: Pennsylvania
NAD 1983 Latitude: 41.3392 (41 20 21)
NAD 1983 Longitude: -77.9082 (-77 54 30)

DRNAREA	229
STRMTOT	405.95
STRDEN	1.77
BSLOPD	14.6
CENTROIDX	17159.9
CENTROIDY	281632.9
OUTLETX	7675
OUTLETY	259735
LONG_OUT	-77.90829
BSLOPDRAW	14.89
FOREST	96
PRECIP	41
URBAN	0
GLACIATED	0
ROCKDEP	4.5
CARBON	0
STORAGE	0
ELEV	1806.5
MAXTEMP	55
DRN	3.3
IMPNLCD01	0
LC01DEV	1
LC11IMP	0.049
LC11DEV	0.81

Basin Map at Outfall



APPENDIX B

WQM 7.0 MODEL RESULTS

Input Data WQM 7.0

SWP Basin	Stream Code	Stream Name	RMI	Elevation (ft)	Drainage Area (sq mi)	Slope (ft/ft)	PWS Withdrawal (mgd)	Apply FC
09B	23661	KETTLE CREEK	**6.510**	765.00	229.00	0.00000	0.00	☑

Stream Data

Design Cond.	LFY (cfsm)	Trib Flow (cfs)	Stream Flow (cfs)	Rch Trav Time (days)	Rch Velocity (fps)	WD Ratio	Rch Width (ft)	Rch Depth (ft)	Tributary Temp (°C)	Tributary pH	Stream Temp (°C)	Stream pH
Q7-10	0.100	0.00	8.05	0.000	0.000	0.0	0.00	0.00	20.00	7.00	0.00	0.00
Q1-10		0.00	0.00	0.000	0.000							
Q30-10		0.00	0.00	0.000	0.000							

Discharge Data

Name	Permit Number	Existing Disc Flow (mgd)	Permitted Disc Flow (mgd)	Design Disc Flow (mgd)	Reserve Factor	Disc Temp (°C)	Disc pH
Kettle Creek SP	PA0228869	0.0000	0.0044	0.0000	0.000	25.00	7.00

Parameter Data

Parameter Name	Disc Conc (mg/L)	Trib Conc (mg/L)	Stream Conc (mg/L)	Fate Coef (1/days)
CBOD5	25.00	2.00	0.00	1.50
Dissolved Oxygen	3.00	8.24	0.00	0.00
NH3-N	25.00	0.00	0.00	0.70

Input Data WQM 7.0

SWP Basin	Stream Code	Stream Name	RMI	Elevation (ft)	Drainage Area (sq mi)	Slope (ft/ft)	PWS Withdrawal (mgd)	Apply FC
09B	23661	KETTLE CREEK	**5.240**	751.00	231.00	0.00000	0.00	☑

Stream Data

Design Cond.	LFY (cfsm)	Trib Flow (cfs)	Stream Flow (cfs)	Rch Trav Time (days)	Rch Velocity (fps)	WD Ratio	Rch Width (ft)	Rch Depth (ft)	Tributary Temp (°C)	Tributary pH	Stream Temp (°C)	Stream pH
Q7-10	0.100	0.00	8.13	0.000	0.000	0.0	0.00	0.00	20.00	7.00	0.00	0.00
Q1-10		0.00	0.00	0.000	0.000							
Q30-10		0.00	0.00	0.000	0.000							

Discharge Data

Name	Permit Number	Existing Disc Flow (mgd)	Permitted Disc Flow (mgd)	Design Disc Flow (mgd)	Reserve Factor	Disc Temp (°C)	Disc pH
		0.0000	0.0000	0.0000	0.000	25.00	7.00

Parameter Data

Parameter Name	Disc Conc (mg/L)	Trib Conc (mg/L)	Stream Conc (mg/L)	Fate Coef (1/days)
CBOD5	25.00	2.00	0.00	1.50
Dissolved Oxygen	3.00	8.24	0.00	0.00
NH3-N	25.00	0.00	0.00	0.70

WQM 7.0 Hydrodynamic Outputs

SWP Basin	Stream Code	Stream Name
09B	23661	KETTLE CREEK

RMI	Stream Flow (cfs)	PWS With (cfs)	Net Stream Flow (cfs)	Disc Analysis Flow (cfs)	Reach Slope (ft/ft)	Depth (ft)	Width (ft)	W/D Ratio	Velocity (fps)	Reach Trav Time (days)	Analysis Temp (°C)	Analysis pH
Q7-10 Flow												
6.510	8.05	0.00	8.05	.0068	0.00209	.806	52.56	65.23	0.19	0.408	20.00	7.00
Q1-10 Flow												
6.510	6.67	0.00	6.67	.0068	0.00209	NA	NA	NA	0.17	0.453	20.01	7.00
Q30-10 Flow												
6.510	11.75	0.00	11.75	.0068	0.00209	NA	NA	NA	0.24	0.330	20.00	7.00

WQM 7.0 Modeling Specifications

Parameters	Both	Use Inputted Q1-10 and Q30-10 Flows	☑
WLA Method	EMPR	Use Inputted W/D Ratio	☐
Q1-10/Q7-10 Ratio	0.829	Use Inputted Reach Travel Times	☐
Q30-10/Q7-10 Ratio	1.46	Temperature Adjust Kr	☑
D.O. Saturation	90.00%	Use Balanced Technology	☑
D.O. Goal	5		

WQM 7.0 Wasteload Allocations

SWP Basin	Stream Code	Stream Name
09B	23661	KETTLE CREEK

NH3-N Acute Allocations

RMI	Discharge Name	Baseline Criterion (mg/L)	Baseline WLA (mg/L)	Multiple Criterion (mg/L)	Multiple WLA (mg/L)	Critical Reach	Percent Reduction
6.510	Kettle Creek SP	9.67	50	9.67	50	0	0

NH3-N Chronic Allocations

RMI	Discharge Name	Baseline Criterion (mg/L)	Baseline WLA (mg/L)	Multiple Criterion (mg/L)	Multiple WLA (mg/L)	Critical Reach	Percent Reduction
6.510	Kettle Creek SP	1.92	25	1.92	25	0	0

Dissolved Oxygen Allocations

RMI	Discharge Name	CBOD5		NH3-N		Dissolved Oxygen		Critical Reach	Percent Reduction
		Baseline (mg/L)	Multiple (mg/L)	Baseline (mg/L)	Multiple (mg/L)	Baseline (mg/L)	Multiple (mg/L)		
6.51	Kettle Creek SP	25	25	25	25	3	3	0	0

WQM 7.0 D.O.Simulation

SWP Basin	Stream Code	Stream Name
09B	23661	KETTLE CREEK

RMI	Total Discharge Flow (mgd)	Analysis Temperature (°C)	Analysis pH
6.510	0.004	20.004	7.000
Reach Width (ft)	**Reach Depth (ft)**	**Reach WDRatio**	**Reach Velocity (fps)**
52.563	0.806	65.226	0.190
Reach CBOD5 (mg/L)	**Reach Kc (1/days)**	**Reach NH3-N (mg/L)**	**Reach Kn (1/days)**
2.02	0.012	0.02	0.700
Reach DO (mg/L)	**Reach Kr (1/days)**	**Kr Equation**	**Reach DO Goal (mg/L)**
8.239	3.774	Tsivoglou	5
Reach Travel Time (days)			
0.408			

Subreach Results

TravTime (days)	CBOD5 (mg/L)	NH3-N (mg/L)	D.O. (mg/L)
0.041	2.02	0.02	8.24
0.082	2.02	0.02	8.24
0.122	2.02	0.02	8.24
0.163	2.02	0.02	8.24
0.204	2.01	0.02	8.24
0.245	2.01	0.02	8.24
0.286	2.01	0.02	8.24
0.326	2.01	0.02	8.24
0.367	2.01	0.02	8.24
0.408	2.01	0.02	8.24

WQM 7.0 Effluent Limits

SWP Basin	Stream Code	Stream Name
09B	23661	KETTLE CREEK

RMI	Name	Permit Number	Disc Flow (mgd)	Parameter	Effl. Limit 30-day Ave. (mg/L)	Effl. Limit Maximum (mg/L)	Effl. Limit Minimum (mg/L)
6.510	Kettle Creek SP	PA0228869	0.000	CBOD5	25		
				NH3-N	25	50	
				Dissolved Oxygen			3

APPENDIX C

TRC ANALYSIS SPREADSHEET

1A	B	C	D	E	F	G
2	**TRC EVALUATION**			**Kettle Creek State Park PA0228869**		
3	Input appropriate values in B4:B8 and E4:E7					
4	8.05	= Q stream (cfs)		0.5	= CV Daily	
5	0.0022	= Q discharge (MGD)		0.5	= CV Hourly	
6	4	= no. samples		1	= AFC_Partial Mix Factor	
7	0.3	= Chlorine Demand of Stream		1	= CFC_Partial Mix Factor	
8	0	= Chlorine Demand of Discharge		15	= AFC_Criteria Compliance Time (min)	
9	1	= BAT/BPJ Value		720	= CFC_Criteria Compliance Time (min)	
	0	= % Factor of Safety (FOS)		0	=Decay Coefficient (K)	
10	Source	Reference	AFC Calculations		Reference	CFC Calculations
11	TRC	1.3.2.iii	WLA afc =	754.544	1.3.2.iii	WLA cfc = 735.614
12	PENTOXSD TRG	5.1a	LTAMULT afc =	0.373	5.1c	LTAMULT cfc = 0.581
13	PENTOXSD TRG	5.1b	LTA_afc=	281.161	5.1d	LTA_cfc = 427.651
14						
15	Source		Effluent Limit Calculations			
16	PENTOXSD TRG	5.1f	AML MULT =	1.720		
17	PENTOXSD TRG	5.1g	AVG MON LIMIT (mg/l) =	1.000	BAT/BPJ	
18			INST MAX LIMIT (mg/l) =	2.340		

WLA afc	(.019/e(-k*AFC_tc)) + [(AFC_Yc*Qs*.019/Qd*e(-k*AFC_tc))...
	...+ Xd + (AFC_Yc*Qs*Xs/Qd)]*(1-FOS/100)
LTAMULT afc	EXP((0.5*LN(cvh^2+1))-2.326*LN(cvh^2+1)^0.5)
LTA_afc	wla_afc*LTAMULT_afc
WLA_cfc	(.011/e(-k*CFC_tc) + [(CFC_Yc*Qs*.011/Qd*e(-k*CFC_tc))...
	...+ Xd + (CFC_Yc*Qs*Xs/Qd)]*(1-FOS/100)
LTAMULT_cfc	EXP((0.5*LN(cvd^2/no_samples+1))-2.326*LN(cvd^2/no_samples+1)^0.5)
LTA_cfc	wla_cfc*LTAMULT_cfc
AML MULT	EXP(2.326*LN((cvd^2/no_samples+1)^0.5)-0.5*LN(cvd^2/no_samples+1))
AVG MON LIMIT	MIN(BAT_BPJ,MIN(LTA_afc,LTA_cfc)*AML_MULT)
INST MAX LIMIT	1.5*((av_mon_limit/AML_MULT)/LTAMULT_afc)

APPENDIX D

FACILITY MAP AND SCHEMATIC

PA DCNR - Kettle Creek State Park
OUTFALL 001 - Kettle Creek (TSF)
Kettle Creek State Park
Leidy Twp., Clinton County
Drainage Area at Outfall 001
Drawn By: J. Peterman
Date: 3/23/16
0 0.075 0.15 0.3 0.45 0.6
Miles
pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Northcentral Regional Office
208 West Third Street, Suite 101, Williamsport, PA 17701-6448
Phone: (570) 327-0536
Fax: (570) 327-3565