

**Standard Operating Procedure (SOP)¹ for Clean Water Program
Establishing Effluent Limitations for Individual Sewage Permits
SOP No. BCW-PMT-033
Final, November 9, 2012
Revised, March 24, 2021
Version 1.9**

This SOP describes the procedures by which application managers will identify pollutants of concern, determine whether those pollutants should be monitored only or also be subject to numeric limitations, and determine the numeric values for effluent limitations when developing limit sets for individual NPDES sewage permits where design flows exceed 2,000 gallons per day. This SOP applies to the following authorization types: “MISF1” (Minor Sewage Facility <0.05 MGD), “MISF2” (Minor Sewage Facility >=0.05 and <1 MGD), “MISF3” (Minor Sewage Facility with CSO), “MASF1” (Major Sewage Facility >=1 and <5 MGD), “MASF2” (Major Sewage Facility >=5 MGD) and “MASF3” (Major Sewage Facility with CSO).

This SOP is referred to within the SOP for New and Reissuance Sewage Individual NPDES Permit Applications (BCW-PMT-002). It presents the general sequence of activities that application managers will undertake to establish effluent limitations.

In general, application managers will not make limitations less stringent in reissued permits unless the conditions of federal anti-backsliding regulations are met and the rationale is explained in the fact sheet.

I. Apply Minimum Technology and BPJ Standards

- A. The following are minimum technology-based and BPJ standards⁽¹⁾ for individual sewage permits, subject to comparison with water quality-based effluent limitations (WQBELs). Where the application manager determines that water quality modeling is not necessary, these standards should still be achieved, subject to the footnotes below.

Parameter	Minimum	Average Monthly	Average Weekly	IMAX	Basis
Flow (MGD)	XXX	Report	Report Max Daily	XXX	§§ 92a.27, 92a.61
CBOD5 (mg/L)	XXX	25	40 ⁽⁹⁾	50	§ 92a.47 ⁽²⁾
TSS (mg/L)	XXX	30	45 ⁽⁹⁾	60	§ 92a.47 ⁽²⁾
TRC (mg/L)	XXX	0.5	XXX	1.6	§§ 92a.47-48 ⁽³⁾⁽⁴⁾
NH3-N (mg/L)	XXX	25	XXX	50	BPJ ⁽⁵⁾
D.O. (mg/L)	4.0	XXX	XXX	XXX	BPJ ⁽⁶⁾
pH (SU)	6.0	XXX	XXX	9.0	§ 92a.47, § 95.2
Total N (mg/L)	XXX	Report	XXX	XXX	§ 92a.61 ⁽⁷⁾
Total P (mg/L)	XXX	Report	XXX	XXX	§ 92a.61 ⁽⁸⁾

¹ **DISCLAIMER:** The process and procedures outlined in this SOP are intended to supplement existing requirements. Nothing in the SOP shall affect regulatory requirements. The process, procedures and interpretations herein are not an adjudication or a regulation. There is no intent on the part of DEP to give the rules in this SOP that weight or deference. This document establishes the framework within which DEP will exercise its administrative discretion in the future. DEP reserves the discretion to deviate from this policy statement if circumstances warrant.

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Parameter	Minimum	Average Monthly	Average Weekly	IMAX	Basis
Fecal Coliform May-Sept (No./100 ml)	XXX	200 Geo Mean	XXX	1,000	§ 92a.47 ⁽¹⁰⁾⁽¹¹⁾
Fecal Coliform Oct-April (No./100 ml)	XXX	2,000 Geo Mean	XXX	10,000	§ 92a.47 ⁽¹⁰⁾⁽¹¹⁾
E. Coli (No./100 ml)	XXX	XXX	XXX	Report	§ 92a.61 ⁽¹¹⁾⁽¹²⁾

NOTE 1 – More stringent standards may apply under DRBC and ORSANCO regulations, particularly for discharges to special protection waters, and where discharges are to “dry streams.” Where a pollutant has a more stringent standard in DRBC and ORSANCO regulations or the discharge is to a dry stream, the more stringent standard will be used by the application manager to establish effluent limitations, as applicable.

NOTE 2 – Where POTWs are not expanding and qualify for a federal variance that provides for adjustment to these limitations, application managers will adjust the limits as provided for in federal regulations but will also consider water quality conditions as described in Section II B.4.

NOTE 3 – The average monthly limitation of 0.5 mg/L for TRC is a regulatory standard under §§ 92a.47(a)(8) and 92a.48(b), unless the permit writer develops a facility-specific BAT effluent limitation for TRC under § 92a.48(b)(1). In general, an IMAX limit of 1.6 mg/L will be established where the 0.5 mg/L average monthly limit is used.

NOTE 4 –Where ultraviolet (UV) disinfection is used, TRC limits are not applicable, but the limits table(s) in Part A will generally contain, at a minimum, routine monitoring of UV transmittance (%), UV dosage (μ Ws/cm² or mWs/cm² or mjoules/cm²) or UV intensity (μ W/cm² or mW/cm²) at the same monitoring frequency that would be used for TRC. This is not necessary for SRSTP and SFTF permits.

For existing facilities that are unable to monitor and report on UV system operation in one of the standard units listed above, a parameter of “UV Functional” may be reported on the Daily Effluent Monitoring Form (3800-FM-BCW0435). Permittees reporting using this method will select the “UV Functional” parameter with Units of “Y/N” on the Limits worksheet and report values of “1” for Yes (UV Functional) and “< 1” for No (UV Not Functional). The Part C 33 Condition – Ultraviolet (UV) System Monitoring Requirements, will be included in the permit. This should be assigned only after alternatives have been explored. Alternatives should include directing the permittee to contact their UV system’s manufacturer to obtain a conversion to standard units, adding a peripheral sampler or lab analysis to monitor one of the standard units, and encouraging facilities to upgrade the monitoring equipment or UV system to one that can report in one of the units above.

For major facilities, application managers should include in the fact sheet an explanation of why the facility is unable to upgrade their equipment to monitor in one of the standard units. Depending on the size of the facility, age of the equipment, compliance history, and whether it is believed that the permittee should reasonably be able to upgrade their equipment within the next permit term, a compliance schedule for UV monitoring equipment upgrades may be included in the permit at the discretion of the application manager and permits chief.

NOTE 5 – For new discharges, if WQM modeling results for summer indicates that an average monthly limit of 25 mg/L (default in model) is acceptable for ammonia-nitrogen, a technology-based limit of 25 mg/L should be established as a BPJ limit, along with a monitoring requirement in the

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winter. For existing discharges, if WQM modeling results for summer indicates that an average monthly limit of 25 mg/L is acceptable, the application manager will generally establish a year-round monitoring requirement for ammonia-nitrogen, at a minimum. A seasonal multiplier of 3 times the summertime average monthly limit should be established for the winter period.

NOTE 6 – A minimum Dissolved Oxygen (DO) limit of 4.0 mg/L should be established based on BPJ to ensure adequate operation and maintenance. The minimum DO limit may need to be increased due to water quality considerations.

NOTE 7 – In general, sewage discharges with design flows > 2,000 GPD will include monitoring, at a minimum, for Total Nitrogen in new and reissued permits, with a monitoring frequency equivalent to conventional pollutants in Table 6-3 of DEP's *Technical Guidance for the Development and Specification of Effluent Limitations* (362-0400-001) ("Permit Writer's Manual") where the facility discharges to nutrient-impaired waters, or a lesser frequency for discharges to waters not impaired for nutrients, at the discretion of the application manager. For sewage discharges to the Chesapeake Bay watershed, monitoring will be consistent with the Phase 2 WIP Wastewater Supplement.

NOTE 8 – In general, sewage discharges with design flows > 2,000 GPD will include monitoring, at a minimum, for Total Phosphorus in new and reissued permits, with a monitoring frequency equivalent to conventional pollutants in Table 6-3 of the Permit Writer's Manual where the facility discharges to nutrient-impaired waters, or a lesser frequency for discharges to waters not impaired for nutrients, at the discretion of the application manager. For sewage discharges to the Chesapeake Bay watershed, monitoring will be consistent with the Phase 2 WIP Wastewater Supplement.

In addition, pursuant to § 96.5, when it is determined that the discharge of Total Phosphorus, alone or in combination with the discharge of other pollutants, contributes or threatens to impair existing or designated uses in a free-flowing water, Total Phosphorus discharges will be limited to 2 mg/L as an average monthly limit, at a minimum (e.g., where a "stream enrichment risk analysis" has been performed). Where more stringent limits are appropriate, consult Section II.I below. For discharges to lakes and impoundments, the "LAKE Model" will be used to evaluate water quality-based limits.

NOTE 9 – In general, weekly average limits for CBOD5 and TSS will not be imposed where the sampling frequency is less than 1/week.

NOTE 10 – Delaware River Basin: For any discharge not direct to the Delaware River main stem, apply the fecal coliform limits as presented in the table above. For discharges directly to the Delaware River main stem, modify the fecal coliform limits applicable to the October through April period to 200 as a geometric mean instead of 2,000, and 1,000 as an IMAX instead of 10,000. The result is a year-round geometric mean limit of 200 and a year-round IMAX limit of 1,000 (not subject to the 10% rule). Alternatively, for a discharge direct to the Delaware River main stem, the region has the option to keep 10,000 as an IMAX for October through April and assign a supplemental condition that no more than 10% of samples may exceed 1,000.

NOTE 11 – Ohio River Basin: For any discharge not direct to the Ohio River main stem, apply the fecal coliform limits as presented in the table above. If the discharge is directly to the Ohio River, modify the fecal coliform limits as follows: May through October – 200 geometric mean, 400 IMAX, and November through April – 2,000 geometric mean, 10,000 IMAX.

For discharges to Lake Erie, E. coli may need to be limited in the permit if required by federal regulations.

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NOTE 12 – Sewage discharges will include monitoring, at a minimum, for E. Coli, in new and reissued permits, with a monitoring frequency of 1/month for design flows ≥ 1 MGD, 1/quarter for design flows ≥ 0.05 and < 1 MGD, 1/year for design flows of 0.002 – 0.05 MGD.

- B. Effluent concentrations of toxic pollutants should not exceed concentration-based ELGs that are applicable to the industrial category where the pollutants originate. If the origin is unclear or no ELG applies, effluent concentrations of toxic pollutants should not exceed concentration-based BPJ TBELs that the Department has established (see SOP for “Establishing Effluent Limitations for Individual Industrial Waste Permits”), unless the permit writer makes a less stringent determination based on 40 CFR § 125.3 considerations.
- C. To determine applicability of standards associated with dry streams, application managers will generally consider the following:
 - 1. If the stream flow (Q7-10) to wastewater flow (design flow) ratio is less than 3:1, proceed to paragraph C.2, otherwise skip to the next section.
 - 2. For new or expanding discharges, apply the more stringent treatment requirements in DEP’s *Policy and Procedure for Evaluating Wastewater Discharges to Intermittent and Ephemeral Streams, Drainage Channels and Swales, and Storm Sewers* (391-2000-014).
 - 3. For existing discharges, if the more stringent treatment requirements cannot be achieved, do not apply the standards in DEP guidance (391-2000-014) unless the receiving stream is impaired and the point source discharge contributes to the impairment. If this is the case, apply the more stringent treatment requirements and provide a schedule to meet final limitations not exceeding three years in the draft permit. Do not approve design flow increases without applying the more stringent treatment requirements where the discharge meets the criteria in the guidance for a dry stream.

II. Evaluate Water Quality-Based Effluent Limitations

- A. Review Final TMDLs.
 - 1. For renewals, if a final TMDL has been approved for any waters downstream of the discharge, review the TMDL for WLA(s) that are specific to the discharge. If WLA(s) in any final TMDL is applicable for any pollutant, establish effluent limit(s) consistent with the WLA(s) in the permit.
 - 2. For new applications, consult with the Bureau of Clean Water, Division of Water Quality to determine whether there is available capacity for pollutants of concern in the TMDL that may be assigned to the new discharge(s).
- B. Run WQM 7.0 Model.
 - 1. For the renewal of Minor individual sewage permit applications and/or any renewal of a discharge with a very large dilution ratio (e.g., discharges to large water bodies), application managers may, at their discretion, review the results of previous modeling efforts and determine that existing CBOD5 and NH3-N limitations are technically adequate and appropriate. This should only be considered where it is known that there have been no significant modifications to the facility, discharge or receiving waters and when water quality criteria have not been modified since the time the modeling was completed. If WQM modeling is not performed, the results of the prior modeling effort will be attached to the fact sheet to support continuation of existing limits.

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2. For new or expanding discharges, renewal of Major discharges, and other cases where modeling should be performed, run the WQM 7.0 model to determine if more stringent limitations for CBOD5 or NH3-N should be applied, using the latest information on Q7-10 stream flow, background water quality, and discharge characteristics. Use the 90th percentile of long-term data for background and discharge characteristics. Use the DO minimum criterion from Chapter 93 as in-stream objective for the model.

NOTE 13 – For new and expanding discharges to a CWF with naturally reproducing salmonid in early life stages, additionally run the WQM 7.0 model with only the new discharge (i.e., no other discharges) using a DO goal of 8.0 mg/L (DO Module only). Establish the resulting limits as winter time limits if they are more stringent than the results from the initial model run.

3. For sewage discharges, the design flow to use in modeling is the average annual design flow.
 4. In general, where a facility is eligible for technology-based limits of CBOD5 exceeding 25 mg/L, and the discharge is to a large waterbody, application managers will evaluate a WQBEL for CBOD5 as follows:
 - a. Model the discharge using the Toxics Management Spreadsheet (TMS).
 - b. Multiply the acute partial mix factor by the Q7-10 flow of the receiving waters.
 - c. Run the WQM 7.0 model using the adjusted Q7-10 and apply the WQBELs in the permit, if less than the technology-based limits.
 - d. Establish the average monthly concentration limit for TSS at the same concentration as for CBOD5 using BPJ, if the CBOD5 limit is a WQBEL.
- C. If chlorine is used for disinfection:
1. Use the TRC spreadsheet model to calculate water quality-based TRC limits, using the average annual design flow.
 2. Use 0.3 mg/L and 0 mg/L as default values for in-stream and discharge chlorine demand unless site-specific data supporting different values have been collected in accordance with *Implementation Guidance Total Residual Chlorine (TRC) Regulation (391-2000-015)*.
 3. Where site-specific TRC study data is more than 20 years old, the application manager will use the data to develop limits for the renewal, but will also include a requirement in Part C of the permit for the permittee to conduct a new site-specific study and provide the results with the subsequent permit renewal application.
 4. For existing discharges, where the existing TRC limit is at or below 0.1 mg/L, the existing limit may remain in the reissued permit (no modeling required).
- D. For new and expanding discharges to HQ/EV waters, evaluate anti-degradation requirements.
1. If not conducted as part of the sewage planning process, ensure that an adequate alternatives analysis was completed that evaluates the land discharge alternative, at a minimum.
 2. If preliminary effluent limitations (PELs) were developed in the sewage planning process for new or expanding discharges to HQ/EV waters, use the PELs. If PELs were not developed, then:

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- a. Determine WQBELs that will protect and maintain existing water quality for discharges to EV waters. If insufficient data exists to determine existing water quality characteristics, the application may require the collection of this information. Consult with Central Office as needed for guidance.
 - b. Determine WQBELs that will protect and maintain existing water quality for discharges to HQ waters, except where an SEJ has been approved in consultation with Central Office, in which case “ABACT” limits will be established for parameters of concern.
- E. Determine if the treatment requirements of § 95.10 related to TDS and its constituent solids are applicable. Refer to *Policy and Procedure for NPDES Permitting of Discharges of Total Dissolved Solids (TDS) -- 25 Pa. Code §95.10*, DEP ID: 385-2100-002. At a minimum, a monitoring requirement should be established for TDS for any discharge that exceeds 1,000 mg/L.
- F. Evaluate reasonable potential (RP) for other toxic pollutants to cause an excursion above water quality standards.
1. For the renewal of individual sewage permit applications, application managers will follow the *SOP for Establishing Water Quality-Based Effluent Limitations (WQBELs) and Permit Conditions for Toxic Pollutants in NPDES Permits for Existing Dischargers* (SOP No. BCW-PMT-037).
 2. For new discharges, application managers will complete an RP analysis and use the TMS to determine WQBELs consistent with the applicable specifications in Section I of SOP No. BCW-PMT-037.
 3. For conservative pollutants (e.g., TDS), consider whether a multiple discharge or multiple source analysis is necessary, based on whether the conservative pollutant is known to be an issue in the watershed.
 4. Where a WQBEL is established in the permit and is less than the Target QL in the application instructions, the application manager will generally establish a condition in Part C of the permit addressing WQBELs below quantitation limits (Part C 116) unless the application manager is aware that the permittee (i.e., permittee’s laboratory) can achieve the WQBEL. The Target QL from the application instructions will generally be established in the permit condition as the QL that must be met for compliance purposes. The application manager may use a more stringent QL if the justification is documented in the fact sheet.
- G. Consider special water quality requirements applicable based on interstate agreements.
1. Bioaccumulative pollutants for discharges direct to Lake Erie (e.g., Mercury, where criteria must be met end-of-pipe).
 2. Water Quality criteria for discharges to basins that drain to the Great Lakes (Note – select the proper criteria in the TMS).
 3. DRBC criteria and treatment requirements for discharges to the Delaware River Basin.
 4. ORSANCO criteria and treatment requirements for discharges direct to the Ohio River. (Note – select the proper criteria in the TMS).
- H. Consider downstream impairment where a TMDL has not been finalized, or where water quality-limited segments have not yet been listed on the 303(d) list, or when a TMDL has been finalized but there is no WLA for the discharge(s).

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1. If downstream waters (any waters downstream to the first order stream) are impaired for any pollutant that will not already be monitored as determined through the steps above, and that pollutant is present in the effluent at detectable concentrations, establish a monitor only requirement, at minimum. Consider applying a limit of the most stringent Chapter 93 criterion as an average monthly limit where the limit can be achieved.
2. Otherwise, if downstream waters are impaired for any pollutant, and that pollutant is present in the effluent at concentrations or loadings that have caused or contributed to the impairment as determined by the application manager or regional biologist, establish an effluent limit stringent enough to prevent or minimize contribution to the impairment until a new or revised final TMDL is issued. At a minimum, loadings of pollutants associated with the impairment must be “frozen” at existing levels such that no increase in loading of pollutants associated with the impairment may be authorized. In this context, “frozen” means that an average monthly mass loading limit will be applied. The limit should be calculated by multiplying the long-term mean of daily concentrations by the long-term mean of daily flows and the conversion factor (8.34), where long-term means two or more years.
3. Prior to the issuance of a final TMDL, any more stringent allocations necessary to prevent or remediate downstream impairment is at the discretion of the permits chief and the application manager.

III. Compare Technology-Based, BPJ and Water Quality-Based Limits for Each Pollutant and Apply the Most Stringent.

Concentration limits should be rounded in accordance with the *Technical Guidance for the Development and Specification of Effluent Limitations* (“Permit Writer’s Manual”) (362-0400-001). In addition, all concentration limits less than 10 should contain at least one decimal place (e.g., “6.0” instead of “6”). Concentration limits greater than or equal to 10 may or may not contain one or more decimal places, in accordance with the “Permit Writer’s Manual.”

IV. Determine Mass Loading Limitations

- A. Average monthly mass loading limits (lbs/day) will be based on the formula: design flow (average annual) (MGD) x concentration limit (mg/L) at design flow x conversion factor (8.34). Where necessary for TMDLs, Total Annual load limits (lbs/year) will be based on the average monthly mass loading limit x 365 or otherwise the WLA in the TMDL.
- B. For POTWs, mass loading limits will be established for CBOD5, TSS, NH3-N, and where necessary Total P and Total N. In general, average monthly mass loading limits will be established for CBOD5, TSS, NH3-N, and where necessary Total P and Total N, and average weekly mass loading limits will be established for CBOD5 and TSS.
- C. For non-municipal sewage facilities, and for toxic pollutants with effluent concentration limits, mass loading limits may be established at the application manager’s discretion.
- D. Round mass limits in accordance with Section III, above, and the “Permit Writer’s Manual.”

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Version History

Date	Version	Revision Reason
March 24, 2021	1.9	Corrected footnote references in limits table; Updated to include E. Coli monitoring requirements.
10/1/2020	1.8	Updated references of PENTOXSD to the TMS; Removed requirements for special parameters monitoring
1/6/2020	1.7	Revisions to Section I.A made to add notes and specifications for UV monitoring and reporting (see Note 4).
1/2019	1.6	Revisions to Section II.B made to remove reference to old DO criteria. Revisions to Section II.F made to refer to SOP No. BCW-PMT-037 for determining WQBELs for toxic pollutants. Added new section regarding emerging pollutants of concern.
8/23/2013	1.5	Updated the notes to Section II F.5 by removing references to the most sensitive MDLs in Chapter 16 and referring to Target QLs contained in the application instructions for the toxic screening analysis. Added paragraph 8 to Section II F to instruct application managers to use appropriate Part C permit language where appropriate when WQBELs are less than Target QLs. Clarified footnote 3 in Section I A that UV monitoring is unnecessary for SRSTPs and SFTFs.
5/16/2013	1.4	Updated footnote 3 in Section I A to include additional options for parameters and units for monitoring ultraviolet (UV) disinfection.
3/4/2013	1.3	Clarified in footnote 9 in Section I A that only discharges directly to the Delaware River should have a year-round geometric mean limit for fecal coliform (discharges to tributaries may have seasonal limits).
1/9/2013	1.2	Added new footnote 8 in Section I A to clarify that weekly average limits are not necessary for CBOD5 and TSS when sampling frequency is less than weekly.
12/28/2012	1.1	Added an IMAX limit of 60 mg/L for TSS in Section I A.
11/9/2012	1.0	Original