

Appendix U

Missouri State Operating Permits Monitoring Frequencies & Sampling Types

Purpose

This appendix provides justifications for applying best professional judgment considerations on developing new, modified, or renewed site-specific wastewater Missouri State Operating Permits (MSOP) with monitoring frequencies and sampling types that differ from the minimum requirements established in Missouri's Effluent Regulations.

References

- (1) Federal Clean Water Act § 308.
- (2) Missouri Clean Water Commission Regulation 10 CSR 20-7.015 Effluent Regulations
- (3) Technical Support Document for Water Quality-based Toxics Controls (EPA/505/2-90-001)
- (4) Guidance for Data Quality Assessment: Practical Methods for Data Analysis (EPA/600/R-96/084)
- (5) U.S. EPA NPDES Permit Writer's Manual (EPA-833-B-96-003)
- (6) Missouri's Water Pollution Control Permit Manual, Chapter 6 – Monitoring & Reporting Requirements
- (7) Lagoon Operating Permit Renewal Guidance
- (8) Total Ammonia Nitrogen Criteria Implementation Guidance
- (9) Missouri's Compliance Manual, Chapter 5.6 Water Pollution Control Branch Criteria for Issuing a Notice of Violation or Heightened Enforcement Response.

Forms Required

- (1) None.

Reports Required

- (1) None.

Responsibilities

Because a site-specific permit, termed an individual permit by the EPA, is tailored to the characteristics of and conditions at a particular facility, sampling frequencies and sampling types for an operating permit should be determined on a case-by-case basis. Department permit writers are assigned responsibilities for drafting site-specific MSOPs. Therefore, each permit writer must determine the appropriate sampling frequency and sampling type.

The Minimum Requirements

(1) Missouri's Effluent Regulations 10 CSR 20-7.015 establishes Minimum Sampling Requirements and Sampling Types. Sampling frequencies are based on any given facility's design flow and receiving water-body category, while sampling types are based on treatment, please see the tables below.

**Table 1 – Minimum Requirements
Missouri & Mississippi Rivers [10 CSR 20-7.015(2)]
All Other Waters [10 CSR 20-7.015(8)]**

Design Flow (DF) In gallons per day (gpd)	Monitoring Frequency (not flow)	Sample Type (not flow)	Monitoring Frequency & Sample Type (flow only)
DF < 25,000	May only require an annual report	Lagoons – may be grab Mechanical Plants – 24 hour composite	Not specified
DF > 1,000,000*	20 samples per year (spread evenly throughout the year)	Lagoons – may be grab Mechanical Plants – 24 hour composite	Not specified
For every 50,000 gpd of DF*	One sample per year	Lagoons – may be grab Mechanical Plants – 24 hour composite	Not specified

* - For DF above 1 MGD, the 50,000 gpd / 1 sample per year approach should be used.

Table 2
Lakes & Reservoirs [10 CSR 20-7.015(3)]
Losing Streams [10 CSR 20-7.015(4)]
Metropolitan No-Discharge Streams [10 CSR 20-7.015(5)]
Special Streams [10 CSR 20-7.015(6)]
Subsurface Water [10 CSR 20-7.015(7)]**

Design Flow (DF) In gallons per day (gpd)	Monitoring Frequency (not flow)	Sample Type (not flow)	Monitoring Frequency & Sample Type (flow only)
DF < 5,000	May only require an annual report	Lagoons – may be grab Mechanical Plants – 24 hour composite	Not specified
DF > 1,300,000*	52 samples per year (spread evenly throughout the year)	Lagoons – may be grab Mechanical Plants – 24 hour composite	Not specified
For every 25,000 gpd of DF*	One sample per year	Lagoons – may be grab Mechanical Plants – 24 hour composite	Not specified

* - For DF above 1.3 MGD, the 25,000 gpd / 1 sample per year approach should be used.

** - The permit writer must review this section to verify that the discharge is allowed and will not impact any aquifer. Usually, discharges that fall under this effluent regulation are subject to [10 CSR 20-7.015(4)].

Determining Sampling Frequency – per best professional judgment considerations

Each sub-section of the Effluent Regulations contains language that states, “*The monitoring frequency and sample types stated in paragraphs (above) are minimum requirements. The permit writer shall establish monitoring frequencies and sampling types to fulfill the site-specific informational needs of the department.*” However, the Effluent Regulation do not contain language on (1) how to determine alternative monitoring frequencies, (2) what are the informational needs to be fulfilled, and (3) when to do so?

The sections below will clearly inform the permit writer when it is appropriate to divert from the Effluent Regulation’s Minimum Requirements, and how to do so.

(1) Alternative Sampling Frequencies – *Lagoon Operating Permit Renewal Guidance*: Table 2 (Lagoon Guidance) establishes alternative sampling frequencies based on known water quality impacts caused by the lagoon. The Lagoon Guidance then recommends increased sampling frequencies based on: (1) Facility Age, (2) Actual Flow ÷ Design Flow, or (3) Stream Flow ÷ Design Flow. When this is the case, the permit writer may require an increase in monitoring frequency above the minimum requirements. The Lagoon Guidance will ensure collection of an adequate number of samples to conduct reasonable potential and facility compliance analyses. The Lagoon Guidance is located in Chapter 11 of Missouri’s Water Pollution Control Permit Manual.

(2) Alternative Sampling Frequencies – *Total Ammonia Nitrogen Criteria Implementation Guidance* (Ammonia Guidance). The Ammonia Guidance informs the permit writer that a Reasonable Potential Analysis (RPA) will need to be conducted to determine whether a discharge may cause or contribute to an excursion above applicable water quality criteria with the adequate data. Adequate data has been established as at least ten (10) data points, with the ideal data set having twelve (12) or more. This is by no means saying that RPA's can not be conducted on any given pollutant with less than ten (10) data points, but the department and the EPA both recommend using more than ten (10) data points for the purpose of being more statically valid. By applying the minimum of once per quarter sampling, this will allow the permit writer to at least have ten (10) data points for each season (i.e. Summer and Winter). The Ammonia Guidance is located in Chapter 11 of Missouri's Water Pollution Control Permit Manual.

The permit writer should note that utilization of this monitoring frequency determination is specific to the parameter of Total Ammonia as Nitrogen.

(3) Alternative Sampling Frequencies – New Facilities. When the department develops a permit for a new facility, it is based largely on the information contained in the permit application and/or a Water Quality Review Sheet as compared to the development of a permit for an existing facility, which is based on the application, operating records, inspections, characteristics of the receiving waterbody, and monitoring reports. **Department permit writers should establish a sampling requirement, at a minimum, of once per month for new facilities.** However, if a more frequent sampling frequency is required by the Effluent Regulations, then the permit writer should establish the Minimum Sampling Requirement per the Effluent Regulations.

Having a minimum monthly sampling requirement will satisfy the “informational needs of the department” by allowing the department, through submitted monthly Discharge Monitoring Reports, to review the new facility's effluent performance. This ensures that the new facility's discharge is not causing or having a prolonged negative impact on the receiving stream. The permit writer may also establish in the Fact Sheet or Statement of Basis that the permittee may apply for a modification, with the appropriate fees, to have the sampling frequency reduced within a period of time after issuance of the operating permit, which is usually three (3) years. However, if the permittee can obtain a adequate data set of 10 or more, then they may apply for a modification prior to three (3) years.

(4) Alternative Sampling Frequencies – Variability. The permit writers may determine if a given treatment facility has significant variability by reviewing effluent data from said facility. A highly variable discharge should require more frequent monitoring than a discharge that is relatively consistent over time. Variability as a factor to determine sampling frequency should focus on the

facilities design treatment parameters. For all domestic discharge treatment facilities the pollutant to be used to determine variability will either be 5-day Biochemical Oxygen Demand (BOD₅), Carbonaceous BOD, or Total Ammonia (if data is available) depending on the operating permit. If the treatment facility is design to treat an alternative pollutant, then the specific pollutant can be used to determine variability.

Per the Guidance for Data Quality Assessment, 1.1.3, Table 1-1, if the pollutant's Coefficient of Variation (CV) is 1.5 or greater, then a permit writer can require more samples in order to ensure protection to human health and/or the environment.

- Example. After obtaining Discharge Monitoring Reports, a permit writer subjected the facility's BOD₅ data to the RPA portion that determines a CV value. The calculated CV value from the data set is 1.45. The permit writer should default to the Effluent Regulations or to any of the applicable Alternative Sampling Frequencies.
- Example. After obtaining Discharge Monitoring Reports, a permit writer subjected the facility's BOD₅ data to the RPA portion that determines a CV value. The calculated CV value from the data set is 1.8. The permit writer can increase the sampling frequency to the next more common frequency. That is if the previously permitted sampling frequency was Once/Quarter, then it should be modified to Once/Month; Once/Month to Twice/Month; Twice/Month to Once/week; etc...

(5) Alternative Sampling Frequencies – Actual Flow. Due to the fact that Missouri's Effluent Regulation place significance on design flow as a determining factor for sampling frequency, there is an equal importance that should be placed on a facility's actual flow in certain circumstances. That is when the facility's actual flow is greater than the design flow. .

If a facility's actual flow is greater than the facility's design flow, then the permit writer should use the facility's actual flow to determine the monitoring frequency with the same method used in Table 1 or Table 2 located above. The permit writer may also use any of the applicable above listed Alternative Sampling Frequencies if the monitoring frequency is determined to be more frequent.

(6) Alternative Sampling Frequencies – Batch Releases. For facilities that utilize the batch discharge method the sampling frequency shall be based on flow (i.e. the greater between actual flow or design flow) with the same method established in the Effluent Regulations (i.e., Table 1 or Table 2). After determining the sampling frequency, this number should be multiplied by the applicable time period that the permittee discharges during. See examples below.

- Example. Facility A discharges during the non-recreational season to avoid the department's bacteria standard. They only discharge from November 1 to March 31, have a design flow of 400,000 gpd and an actual flow of 100,000 gpd, and discharge to an unnamed tributary of Clear Creek. The applicable Effluent Regulation is 10 CSR 20-7.015(8). The permit writer then uses the design flow of 400,000 gpd and Effluent Regulation and determines that the sampling as follows:

Sampling Frequency (SF) = (400,000 gpd) ÷ (50,000 gpd/samples per year)

SF = 8 samples per year.

However, the facility discharges only 5 months out of the year or out of 12 months. Therefore, the permit writer must then determine the appropriate sampling frequency to adhere to the minimum requirements, as follows:

SF = (8 samples/year) ÷ 5 months of the year discharge occurs = 1.6

This is the number of samples the permittee will need to obtain per month in order to achieve the minimum requirement of eight samples per year.

However, collecting 1.6 samples is impossible, so therefore, 1.6 should be rounded up to two (2) samples per month (twice/month).

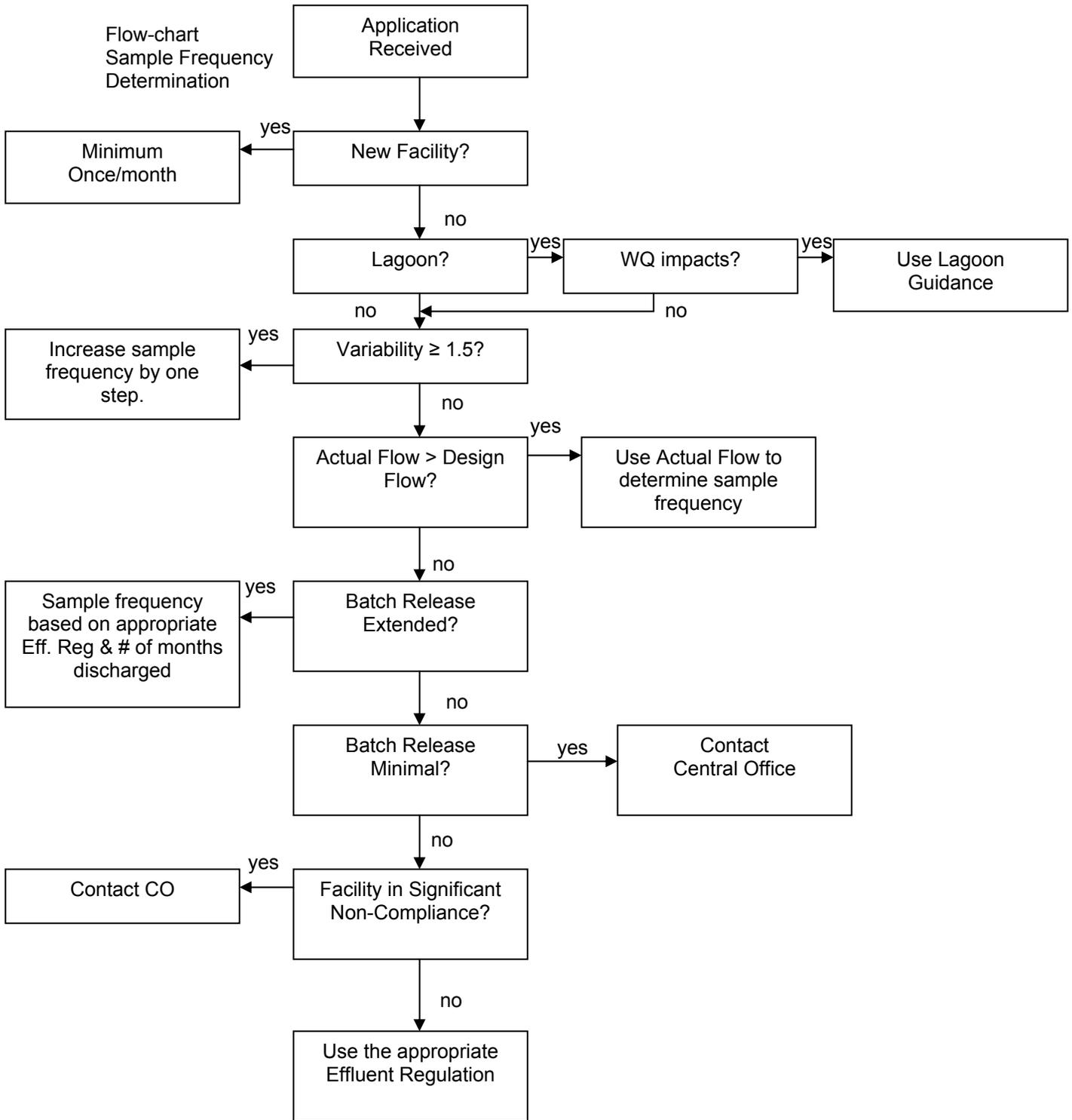
Note: if the Batch release facility discharges to an alternative receiving stream (i.e., losing), then the samples per year is factor is 25,000 gpd.

(7) Alternative Sampling Frequencies – Batch Releases. For facilities that utilize this method but only discharge in short durations. That is the facility does not discharge for continuous batch periods (i.e. months), but only during very minimal time frames (weeks or days), the permit writer should contact the Central Office to determine an appropriate sampling frequency.

(8) Alternative Sampling Frequencies – Significant Non-Compliance. If a facility is found to meet the criteria for Significant Non-Compliance per Chapter 5.6 in Missouri's Compliance Manual, then the permit writer may establish a more frequent sampling frequency. Due to the complexity of the criteria for determining Significant Non-Compliance, the department strongly recommended that the permit writer discuss this matter with the Water Protection Program's Compliance & Enforcement Section to determine if the permittee meets the criteria. If the permittee is found to meet the criteria, then the permit writer may increase the monitoring frequency per their best professional judgment or in concurrence with the Compliance and Enforcement Section.

(9) Due to the number of differing types of alternative sampling frequency methods available to use when determining a sampling frequency, please see the flow-chart below. This flow-chart establishes a method for permit writers to determine when to apply best professional judgment.

Flow-chart
Sample Frequency
Determination



If the facility has more than one yes, then the permit writer can use the more increased monitoring frequency

Determining Sampling Type – per best professional judgment considerations

In addition to establishing the sample frequency, permit writers must also specify the type of sample that must be collected. Again, each sub-section of the Effluent Regulations contains language that states, “*The monitoring frequency and sample types stated in paragraphs (above) are minimum requirements. The permit writer shall establish monitoring frequencies and sampling types to fulfill the site-specific informational needs of the department.*” However, the Effluent Regulation do not contain language on how to determine alternative sampling types, what are the informational needs to be fulfilled, and when to do so?

The two (2) basic collection methods are grab and composite. The Effluent Regulations establish that (1) sample types for lagoons may be grab, and that (2) sample types for mechanical plants shall be 24-hour composites, unless otherwise specified in the operating permit. Unlike the Effluent Regulations Minimum Requirements for sampling frequency, the Effluent Regulations with regards to sampling type determination allow flexibility. Therefore, the regulations have been interpreted to mean the following:

- Lagoons sampling type should be grab; and
- Mechanical plants sampling type should be 24-hour composite.

(1) Particular parameters have been established to be collected with a specified type. The following are to be collected via grab sampling.

- Storm water run-off;
- Parameter is one of the following: ph, temperature, dissolved oxygen, residual chlorine, total ammonia as nitrogen, volatile organics, sulfides, oil & grease, coliform bacteria, cyanide, phenols, and chromium (VI);

(2) For Whole Effluent Toxicity (WET), 24-hour composite samples are to be used for continuous dischargers (except domestic lagoons).

(3) Definitions:

- Grab Sample – a single sample collected at a particular time and place that represents the composition of the wastestream only at that time and place. When the quality and flow of the wastestream being sampled is not likely to change over time, a grab sample is appropriate.
- Composite Sample – a collection of individual samples obtained at regular intervals, usually based upon time or flow volume. For the purposes of this Appendix, there are two (2) types of composite sampling used (1) 24 hour Composite, and (2) 24 hour Modified Composite.

- 24 hour Composite – a combination of 24 sample aliquots collected at periodic intervals (usually 50 minutes) over a 24 hour period.
- 24 hour Modified Composite – a combination of sample aliquots (less than 24) collected at periodic intervals over a 24 hour period.

Additionally, if the permit writer has reason to believe that a specific time for a sample should be established, then the permit writer can establish a specific time of the day. This can be used for grab or composite sampling. If the permit writer so determines this approach, then they will need to justify their reasoning in the fact sheet.

(4) Alternative Sampling Types - Variability. Due to the fact that Missouri's Effluent Regulation do not place importance on flow as a determining factor for sample type (i.e. grab vs. 24-hour composite), any method for sample type determination using flow should be avoided. The EPA Permit Manual does place importance on the role of variability as a determining factor for sample method.

Keeping with the Effluent Regulation Minimum Requirements, the variability method should only be applied to "upgrade" (i.e. from grab to composite) and not to "reduce" a sample type (i.e. from composite to grab). Additionally, the use of variability as a means to determine sampling type should be carefully weighted by the permit writer. Will the upgrade sampling type produce data that is useful? Can the variability be explained by the operator? Is the variability caused by an in-direct discharger (industry)?

- A permit writer has calculated a CV value of 1.51 for a permitted lagoon. The existing permit requires grab samples. However, due to the variability of the effluent, the permit writer may require composite sampling, which should be some type of modified composite and not a true 24 hour composite.
- If the facility had modified composite sampling, then the next step "up" is 24-hour composite sampling (with one sample taken every hour).

(5) Alternative Sampling Types – Impractical. Again the US EPA Permit Manual places importance on impracticality. If composite sampling is impractical or the compositing process is liable to introduce artifacts of sampling, then the permit writer may "reduce" the sample method from composite to grab. For most small discharging mechanical plants the practicality may be determined if the cost of a composite sampler is an "economic burden." However, it is the responsibility of the permittee to inform the permit writer of such, preferably in writing, and documented in either the fact sheet or statement of basis.

(6) Alternative Sampling Types – Intermittent Flows. Again, the EPA Permit Manual indicates that grab samples should be used when effluent flows are intermittent from well-mixed batch process tanks, and that each batch dumping event should be sampled.

(7) Alternative Sampling Types – Permittee’s Request. In the event that a permittee request a more “stringent” sampling type with reason, the permit writer should establish the requested sampling type – with justification.

For each of the alternative sampling type determination methods above, the permit writer should work with the permittee to determine the best sample type to be used by the facility and should be justified to some detail in the fact sheet or statement of basis.

Derivation Language

The derivation for sampling frequencies and sampling types should be set forth and justified in the operating permit’s Fact Sheet or Statement of Basis. Permit writers must avoid using language that only indicates the best professional judgment consideration is based on this Appendix (example: “Sampling Frequency is in accordance with Appendix U of Missouri’s Water Pollution Control Permit Manual.”) More appropriate language for justification is as follows: “A CV value of 2.1 was calculated for this facility’s BOD₅; therefore, in accordance with Appendix U of Missouri’s Water Pollution Control Permit Manual, the monitoring frequency is being increased from once per quarter – to once per month.

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