

INTERNAL MANAGEMENT DIRECTIVE

Interim Procedure for Addressing Naturally Occurring Arsenic in NPDES Permits



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1.0 SCOPE AND APPLICATION

The procedure described in the following document is generally applicable for the development of NPDES permits for domestic and industrial point source discharges where concentrations of total arsenic in the effluent have resulted in an affirmative finding for the Reasonable Potential Analysis. The term of the procedure is for the interim period until a new human health criterion can be approved by the Environmental Quality Commission and US Environmental Protection Agency (EPA), and are implemented.

2.0 BACKGROUND

Many of Oregon's surface waters, ground waters and soils possess high concentrations of naturally occurring arsenic (i.e. >1 ug/l). Since these waters are used in public water supplies and industrial applications, the arsenic is conveyed into the final effluent. Additionally, arsenic can also be inadvertently introduced via inflow and infiltration into municipal sewer collection systems.

Compared to the typical concentration of naturally occurring arsenic, the EPA approved state human health criterion for arsenic (total) is very low (0.0022 ug/l) and there are no treatment technologies for high volume applications readily available that are capable of meeting it. The criterion is considerably below the Department's minimum quantitation limit¹ (QL) of 0.50 ug/l². The state aquatic water quality criteria are in the range of 36 to 360 ug/l, well above the typical levels of naturally occurring arsenic.

The currently available administrative/regulatory pathways (TMDLs, Variances or Use Attainability Analyses) for addressing naturally occurring pollutants in surface waters are extremely resource intensive to implement and would likely result in little to no environmental benefit. By 2012, the Standards and Assessments Section (Standards) plans to revise the human health arsenic criterion (will establish revised criterion for inorganic arsenic of 2.3 ug/l) and will also recommend that the EQC adopt other rule-based options that can be used to address background pollutants. If warranted, water bodies with naturally occurring concentrations of arsenic above the new standard may address the issue through use attainability analysis or basin specific adjustment of the water quality standards.

3.0 ISSUE

The Department has determined that the implementation of the current water quality criterion for total arsenic is problematic because there is inadequate data to determine the extent and concentration of naturally occurring arsenic. Additionally, due to limitations in analytic technology there is inadequate data to quantify the contribution of arsenic from various sources. Finally, most of the current treatment systems employed by permitted dischargers are primarily designed to address basic water quality

¹ In cases where a water quality criterion is below the quantitation limit (QL) of an analytic method, the QL becomes the effective "Compliance Point" for RPA or compliance purposes.

² A QL of 1 ug/l was established by the 2005 revisions of the RPA IMD, and revised to 0.50 ug/l in the 2007 RPA IMD update

pollutants (e.g. BOD, TSS, pH, nutrients, bacteria, etc.) and only remove incidental concentrations of arsenic. These systems are incapable of meeting the current water quality criterion for arsenic.

Due to the fact that the traditional regulatory remedies are extremely resource intensive, the Department has planned to address these concerns through an upcoming revision of the arsenic criterion. Accordingly, the Department is developing an interim procedure that will ensure that sources are continuing to employ technology based controls that use best available technology and treat to the highest and best practicable level and that these sources also collect the data necessary to develop effective additional water quality based effluent limits based upon the revised criterion.

4.0 DISCUSSION

As part of the revised toxics standards rule package, the standards section, EPA and a stakeholder committee are working together to develop new human health criterion for inorganic arsenic and a series of rule-based options for addressing high or elevated background concentrations of various pollutants.

The approach most favored by the group is a re-calculation of the federal criterion using regionally specific variables. This is expected to result in a new human health criterion (based on *inorganic arsenic*) of 2.3 ug/l. The new criterion would replace the old criterion (based on *total arsenic*) of 0.0022 ug/l. The rule making and EPA approval is expected to be complete by 2012. The Department also intends to include an intake credit provision in the rule-making that will allow for the deduction of arsenic from surface or ground water sources from the reasonable potential calculation.

While the new criterion and rule-based implementation tools are being proposed, adopted and approved, the Department is implementing this interim plan to ensure that permittees will employ appropriate technology based controls, identify and characterize sources of arsenic, and implement a quantification plan to ensure that sufficient data is available to impose appropriate water quality based controls in the future. The elements of this *Interim Monitoring and Source Control Strategy for Arsenic* (strategy) are described below. **Figure B-1** located in **Appendix B** at the end of the document, has been prepared to assist permit writers in determining if the strategy is applicable for a specific permit.

4.1 Interim Monitoring and Sources Control Strategy

Step 1: *The permit writer should determine if the permittee has knowledge of any introduced sources of anthropogenic arsenic in detectable concentrations that are present in the regulated discharge. If present, the permit writer should evaluate the source relative to its Standard Industrial Classification (SIC) and corresponding technology based effluent limit (TBEL) as described in 40 CFR Parts 405-499. If a corresponding SIC is identified, the permit writer should include a requirement in the permit for the permittee to treat the identified sources to ensure compliance with an appropriate TBEL.*

Step 2: *The Permit Writer should include a narrative technology-based requirement in the permit, that the facility's existing treatment technologies which may achieve incidental arsenic reductions be operated to provide the "highest and best practicable treatment". The permit writer should calculate a non-regulatory numeric benchmark to use in assessing whether the applicable treatment technology is providing the "highest and best practicable treatment" for arsenic in the discharge. This requirement will be in effect until implementation of the revised water quality criterion and it can be determined by the Department that the facility does not have "Reasonable Potential" for inorganic arsenic³, or the end of the permit term.*

Step 3: *The Permit Writer should include language establishing water quality based effluent limits (WQBEL) in the permit based on aquatic toxicity unless a reasonable potential analysis has been performed that indicates such limits are not needed. This would be effective upon the date of permit issuance.*

Step 4: Monitoring and quantification requirements:

- a) *The Permit Writer should include language requiring that the permittee collect the minimum amount of ambient and effluent data per EPA regulation and Departmental guidance⁴*
- b) *In addition to the conditions in **Step 4 a**, the Permit Writer should include language requiring that the permittee collect quarterly monitoring information to determine whether the technology based benchmarks⁵ discussed in **Step 2** and any WQBELs based on aquatic criterion discussed in **Step 3** are being met. The data will also be used during the next permit renewal to determine if there is a potential to exceed the current (total) or future (inorganic arsenic) water quality criteria. If necessary, the data can be used as the basis for the rule-based implementation options currently under development by the Standards Section. The permittee shall collect data until it can be determined by the Department that the facility does not have the "Reasonable Potential" to exceed the anticipated water quality criterion or the end of the permit term⁶.*
- c) *In addition to the conditions in **Step 4 a & b**, the Permit Writers should include language requiring that the permittee must develop and submit to the Department, for approval, an Arsenic Quantification Plan to identify the source and speciation of arsenic and to quantify the mass loading of arsenic. This plan should include data from **Steps 4 a & b**, in addition to*

³ Normally, this would occur at the mid-permit term review conference. If supported by evaluation using available Total Arsenic data, an automatic "sunset provision" upon implementation of the revised criterion may be written into the permit.

⁴ Reasonable Potential Analysis Internal Management Directive and January 1, 2007 Departmental guidance on ambient monitoring.

⁵ The benchmark is a monitoring and reporting requirement that the Department will use as a tool to assist in determining whether the "highest and best practicable treatment" is being achieved.

⁶ The minimum number of ambient and effluent data points required to adequately characterize the effluent is 10, or two and a half years of quarterly monitoring.

any additional data collected by the permittee or acquired from another entity. This plan may be amended to include any additional data required to support any future administrative actions selected by the permittee.

Step 5: *Typically, data will be collected over the course of a five year permit cycle. At the mid-term of the cycle or at the Pre-application Conference, the permit writer and permittee will evaluate the collected data to determine if there might be an affirmative reasonable potential analysis (RPA) finding for the applicable arsenic inorganic criterion.*

Step 6: *If the preliminary data indicates the potential for an affirmative RPA finding, the Department expects the permittee to have the option of pursuing one of the aforementioned, long-term options that will be in place by this point in time (late 2011). The permittee would have the remainder of the permit cycle to collect any additional data⁷ for the selected option and undertake any required administrative actions (i.e. variance, site specific criterion, etc.).*

Since the general intent of the strategy is to address naturally occurring sources of arsenic, **Step 1** is designed to ensure that introduced sources of anthropogenic arsenic corresponding to specific SIC codes are addressed by TBELs where EPA has established an Effluent Limitation Guideline for the activity.

Since the narrative effluent limit which includes a numeric benchmark described in **Step 2** above is a narrative requirement to operate the treatment facility at the *highest and best extent practicable*, the permit writer should require the facility to submit or make available upon request its operation and maintenance procedures for treatment operations. The permit writer should develop and include in the permit a numerical benchmark as a *performance measure* and at minimum, a quarterly monitoring requirement⁸ for the facility. In the event that the quarterly average effluent concentration should exceed the benchmark, the facility would be required to submit a report to the Department explaining the reasons why the benchmark was exceeded. The Department will use the report, monitoring information and operational records to determine if the facility failed to comply with the narrative operational requirements.

When developing the benchmark, the permit writer should consider any existing TBELs from the previous permit, or applicable technology-based or pretreatment effluent limits listed in federal regulation. In the event that these resources do not provide a clear basis for establishing a TBEL, the permit writer should use best professional judgment and Departmental guidance⁹ to calculate a "*maximum concentration*" to reflect the anticipated limit of operational performance.

⁷ Some of the options considered might require a more comprehensive investigation, such as in-stream chemical and toxicity characterization, or determination of pollutant fate, transport and chemical transformation.

⁸ Data and any notification of exceedance will be reported by the permittee in the Discharge Monitoring Report. All other data collected as part of the Monitoring Plan, but not a Schedule A or B condition, will be submitted to the Permit Writer prior to the mid term permit review or pre-application conference, as indicated in the permit.

⁹ i.e. It is suggested that that the methodology described in the Reasonable Potential Analysis IMD and the RPA Spreadsheet be used to calculate the "Calculated Maximum Effluent Concentration" given the

The term of the narrative limits and benchmarks are until the revised criterion is approved and it can be determined by the Department that there is not reasonable potential to exceed the new inorganic arsenic water quality criterion. If supported by the use of available total arsenic effluent and inorganic arsenic ambient data, the permit writer may include into the permit an automatic narrative limit and benchmark “*sunset provision*” upon implementation of the revised criterion.

5.0 SAMPLE PERMIT AND FACT SHEET LANGUAGE

The following is sample permit and fact sheet language for an industrial permittee. Please note that the language specific to the interim procedure is presented in **bold** and **blue**.

5.1 Permit Language: (Schedule A, Waste Discharge Limitations)

Outfall 001: Wastewater Discharge to enter name River

Parameter	Daily Maximum	Monthly Average
Flow	0.79 MGD	N/A
TSS	1,420 lb/day	532 lb/day
...
Total Arsenic	Operate sand filtration and pH adjustment treatment processes at the <i>highest and best extent practicable</i> (See Note)	

Note: The Department has established a quarterly average enter value ug/l total arsenic as a non-regulatory numeric benchmark to use in assessing whether the applicable treatment technology is providing the highest and best practicable treatment for arsenic in the discharge. An exceedance of this average value shall not in itself constitute a violation of this permit, but the Department will require the facility to submit a report to the Department detailing the conditions that resulted in the elevated value. The Department will use the report, monitoring information and operational records to assist in the determination of whether or not the facility was in compliance with the narrative operational requirements for total arsenic. The permittee must comply with this requirement until it can be determined by the Department that the facility does not have the reasonable potential to exceed the anticipated water quality criterion or the end of the permit term. The Department will notify the permittee via written memorandum and include a copy into the file.

facilities operational data. This would reflect a worst case scenario, making calculations using historical discharge and ambient data at the 95% confidence level. Alternative guidance might include EPA’s Technical Support Document for Water Quality-Based Toxics Control.

5.2 Permit Language: (Schedule B: Monitoring and Reporting Requirements)

The Permittee is required at all times to meet the following minimum monitoring requirements:

Outfall 001: Wastewater Discharge to enter name River

Parameter	Minimum Frequency	Sample Type	Units
Flow	Daily	Continuous Recorder	MGD
TSS	2/week	Composite	mg/L
...
Metals (including total arsenic), inorganic arsenic , cyanide and total phenols	2/year	Composite	µg/L

The Permittee is required to meet the following enhanced arsenic sampling and evaluation program until it can be determined by the Department that the facility does not have the reasonable potential to exceed the anticipated inorganic arsenic water quality criterion or at the end of the permit term:

Parameter	Minimum Frequency	Sample Type	Units
Total and inorganic arsenic	Quarterly	Composite	µg/L

In addition to the requirements above, the Permittee is required to implement an Arsenic Quantification Plan in accordance with Schedule D, part 10.

5.3 Permit Language: (Schedule D: Special Conditions)

Arsenic Quantification Plan

Within sixty days¹⁰ of permit issuance, the permittee must develop and submit to the Department for approval an additional Arsenic Quantification Plan. The plan will detail how the facility will collect additional ambient (intake) and effluent data beyond that required in previous section of this permit to identify the source and speciation of arsenic and to quantify the mass loading of arsenic. The plan will include proposed sample locations, frequency, seasonality, data sources, analytic methods and applicable quantitation limits. Based upon a demonstration of qualitative robustness, applicability to the discharge location and Departmental approval, the facility may include data from other sources in-lieu of site-specific sampling. The permittee may develop a phased approach which relies upon incremental analytical results to determine the necessity for additional data collection and plan continuation. The plan will include any conditions under which the plan would be considered, by the Department, to be complete. The permittee shall collect data until it can be determined by the Department that the facility does not have the

¹⁰ The time frame for submission of the monitoring plan should be based upon permit writer discretion. In some simple cases (i.e. non-contact cooling water), it might be possible to entirely base the monitoring plan on the minimum sampling requirements as long as the ambient and effluent are adequately characterized.

“Reasonable Potential” to exceed the anticipated water quality criterion, the Department notifies the permittee in writing of plan completion or the end of the permit term.

The permittee must begin implementation the Arsenic Quantification Plan within two weeks of notification of plan approval by the Department. If the Department determines that the plan is not approvable, the Department will notify the permittee in writing of the missing program elements. The permittee is required to implement the plan until written notification by the Department that further implementation is unwarranted.

5.4 Fact Sheet Language: (included in “Toxic Pollutant” section)

Arsenic: Arsenic is found at naturally occurring elevated levels in many of the streams in Oregon, including the enter name River. Much of the facility’s process and cooling waters are taken from the enter name River where the total arsenic concentrations have been measured at approximately enter value ug/l. The total arsenic concentration in the facility’s effluent was measured at enter value µg/l..

The Department is currently in the process of revising its human health arsenic criterion and will be proposing a criterion to better reflect the more toxic speciation’s of arsenic (inorganic arsenic) using a regionally appropriate health-risk calculation method. This will result in a shift of the standard from “total” to the “inorganic” fraction, and re-valuation to better reflect regional health risks. Given these imminent changes, the facility is being directed to ensure that current treatment facilities are being operated at the highest and best extent practicable and that they implement an interim monitoring and source control strategy to collect the necessary data to implement the new standard during the next permit cycle. The minimum safeguards are discussed below:

The facility has conducted a preliminary source investigation of all chemicals, production materials and other additives with the potential to enter the facilities effluent to ensure none contain arsenic. There are no federally mandated “Technology-Based Effluent Limits” for arsenic for the facility’s industrial category. There are no aquatic toxicity criterion for total arsenic and discharges are well below the aquatic toxicity criteria for Arsenic III (190/360 ug/l). The facility is currently treating effluent with sand filter and pH stabilization process. Accordingly, these are effectively removing the sediment-based arsenic and precipitating a small percentage of dissolved arsenic. Based upon calculations using past monitoring data, the anticipated limit of operational performance for the facility is enter value ug/l of total arsenic. For the purposes of the Departments’ arsenic interim implementation procedure and this permit, the combination of the processes will be considered the “Best Available Treatment” and the requirement for the facility to continue to operate these processes at the “highest and best extent practicable” in the proposed permit. As a performance measure, if quarterly average concentrations of total arsenic exceed enter value ug/l¹¹, the facility will be required to submit a report to the Department detailing the conditions that lead to the exceedance. The Department will use the report, monitoring information and operational records to determine if the facility failed to comply with the narrative operational requirements.

¹¹The benchmark is calculated as a reflection of the performance limits of the treatment facility given a “worst case” treatment scenario. This would be calculated using historical discharge and ambient data at the 95% confidence level. In this example, it was assumed that there were no other available performance based effluent limits, including *technology*, *aquatic toxicity* and *pretreatment*, available to reflect more established best available treatment performance measures.

The "*monitoring strategy*" will require that the facility perform the following steps:

- The permit will include the requirements (in Schedule D) for the facility to develop and submit for approval, within 60 days, an additional Arsenic Quantification Plan showing how the facility will collect ambient and effluent data to identify the source and speciation of arsenic, and to quantify the mass loading of arsenic. This will include proposed sample locations, frequency, seasonality data sources, analytic methods and applicable quantification limits. This is not a monitoring requirement imposed under 40 CFR 122.21 (j) or (g), although any required monitoring data may be used the data collection elements of the plan.
- The permit will require that the facility begin implementation of the approved plan within two weeks of Departmental approval.
- After 2.5 years (mid-permit term), the Department intends to confer with the facility with the purpose of evaluating the collected data to determine if there might be an affirmative Reasonable Potential Analysis (RPA) finding for the applicable arsenic (total/inorganic) criterion.
- If the preliminary data indicates the potential for an affirmative RPA finding, the Department expects the facility to develop a management strategy to ensure compliance by the end of the permit period or approved compliance schedule. The facility would have the remainder of the permit cycle to collect any additional data to support the management strategy and undertake any required administrative actions (i.e. variance, site-specific criterion, compliance schedule, permit modification, etc.).
- Upon approval of the revised inorganic arsenic criterion, if the preliminary data indicates a negative RPA finding, the facility may conclude any monitoring or compliance requirements to address the narrative arsenic effluent limits or benchmarks.
- The Department will notify the permittee of the RPA findings via written memorandum and include a copy into the file.

Appendix A: Revision History.

Revision	Date	Changes	Editor
1.0	05/18/2010	Initial publishing of document	SRB

Appendix B: Decision making matrix

The figure below should be used to assist the permit writer in determining if the *Interim Monitoring and Source Control Strategy for Arsenic* is applicable to their specific permit. Please note, that answering differently from the indicated answers in the figure does not necessarily disqualify a permit from applicability by the procedure. Please contact Surface Water Management for additional help or guidance.

**Figure B-1
 Decision Making Matrix and Strategy Summary**

