Internal Management Directive

Arsenic Reduction Policy in Surface Water Drinking Water Source Areas

Version 1.0

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Department of
Environmental
Quality

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Disclaimer

This internal management directive (IMD) represents the Department of Environmental Quality's (DEQ) current directions to staff on how to implement OAR 340-041-0033(7). This rule describes the Arsenic Reduction Policy which DEQ developed as part of the human health toxics criteria revisions adopted by the Environmental Quality Commission (EQC) on June 16, 2011.

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Table of Contents

1.0 Introduction and Background

1.1 Purpose

The purpose of this document is to provide guidance to Department of Environmental Quality (DEQ) permitting staff in implementing the Arsenic Reduction Policy, set forth in OAR 340-041-0033(7). This rule ensures that Oregon's revised arsenic criteria, which are intended to account for natural conditions, do not unintentionally allow preventable human health risk due to the addition of anthropogenic (human-caused) sources of arsenic into surface water drinking water source areas. In order to minimize the amount of arsenic added to surface waters from human-caused sources, the rule is targeted at industrial dischargers who meet water quality standards for arsenic, but nonetheless, contribute inorganic arsenic to Oregon waters and have the potential to impact the quality of a surface water public drinking water supply downstream of its discharge. In specific circumstances, an individual industrial discharger may be required to develop an arsenic reduction plan, describing all feasible measures it will take, to reduce its inorganic arsenic addition to the receiving water. Upon DEQ review and approval, the plan, including the proposed measures, monitoring and reporting requirements, and a schedule for those actions, will be incorporated into the source's NPDES permit.

1.2 Arsenic Reduction Policy Applicability

This rule is not applicable to individual industrial dischargers, general permits and industrial stormwater permits, or agricultural lands outside the boundary of surface water drinking water source areas. The Arsenic Reduction Policy only applies to new or existing individual NPDES industrial discharges to surface water drinking water source areas that significantly increase the concentration of arsenic in the receiving stream (see Section 3.0, Step 3). DEQ delineated these surface water drinking water source areas for the purpose of protecting public or community drinking water supplies from contaminants found in surface water sources, such as rivers and lakes. There are currently 59 individual NPDES industrial facilities discharging to these areas (see **Appendix C**). In addition, this rule is further focused on receiving waterbodies that have ambient inorganic arsenic concentrations equal to or lower than the applicable numeric criterion (i.e. not currently impaired for arsenic)[1]. **This rule is not applicable when a discharge causes or contributes to a water quality standard exceedance for arsenic.** The permittee must explore other compliance options to meet effluent limits.

Note that some industrial facilities increase the concentration of arsenic present in their source water through, as an example, multiple-pass non-contact cooling processes. However, this rule applies only to industrial processes that add arsenic mass to drinking water sources, rather than concentrate it (by removal of water volume) from source waters. Therefore, this rule does not apply to industrial dischargers that only concentrate arsenic.

[1] The human health "water + organism" arsenic criterion of 2.1 µg/L applies here because the waterbodies included within the surface water drinking water source areas are designated for domestic drinking water supply (i.e. "water") and fishing, including fish consumption (i.e. "organism").

The Arsenic Reduction Policy also directed DEQ to develop information on potential inputs of arsenic from sources covered by general permits or industrial stormwater permits. If future data or information show that these discharges are impacting downstream surface water drinking water source areas, then DEQ will evaluate options for reducing inorganic arsenic at the time of permit renewal or through evaluation of Stormwater Pollution Control Plans (OAR 340-041-0033(7)(f)(A)(i)). Section 7 of this IMD provides descriptions of these permits and the likelihood of arsenic contributions. At this time, available information does not suggest further reduction measures are warranted. Consequently, additional best management practices for specific reductions of arsenic are likely not necessary in addition to those already required by the permits.

Additionally, it is the general policy of the Environmental Quality Commission that landowners engaged in agricultural or development practices on land where use of pesticides, fertilizers, or soil amendments containing arsenic have previously or have currently been applied in surface water drinking water source areas should employ conservation practices to minimize erosion of soil to waters of the state (OAR 340-041-0033(7)(g)). The Department of Agriculture's Water Quality Management Program Area Plans and Rules contain sediment Prevention and Control Measures that are required on agricultural and rural lands. Information currently available does not suggest the need to develop additional soil conservation practices specifically for arsenic. Therefore, at this time, DEQ staff do not need to conduct further assessments of soil conservation practices. See Section 8 of this IMD for more information on agricultural use of arsenical pesticides in Oregon and DEQ's Toxics Reduction Strategy.

See Section 3.0 for detailed rule applicability information. If permit writers or other DEQ staff have further questions about the applicability of this rule, contact Headquarters' permitting or water quality standards staff.

1.3 History and Development

During the 2008 – 2011 rulemaking for the human health toxics criteria revisions, DEQ worked with a group of stakeholders to revise criteria for arsenic (a carcinogen), iron, and manganese. These three elements are naturally occurring in soil and, for arsenic, can be found in Oregon waters at natural background concentrations greater than the previous "water + org" human health criterion of 0.0022 µg/L. Therefore, DEQ worked with stakeholders to develop arsenic criteria that were protective of human health, yet accounted for natural levels of arsenic in Oregon waterbodies. In addition, Oregon has a Maximum Contaminant Level for drinking water established under the Safe Drinking Water Act of 10 µg/L which specifically protects consumers from arsenic in drinking water. Oregon also has arsenic criteria for the protection of aquatic life, such as fish, shellfish, and aquatic insects.

In June 2011, the Environmental Quality Commission adopted less stringent arsenic criteria based on a higher cancer risk level (i.e. 1 x 10^{-4} for "water + org" criterion) than the risk DEQ typically uses (i.e. 1 x 10^{-6}) when establishing numeric criteria, and incorporated a smaller bioconcentration factor (BCF) than EPA's national default BCF value for arsenic[2]. EPA subsequently approved the revised arsenic criteria in October 2011 (see **Table 1**). This resulted in a change in human health criteria from 0.0022 µg/L for total

[2] ODEQ. Issue Paper: Water Quality Standards Review and Recommendations: Arsenic. April 21, 2011. See: http://www.deq.state.or.us/wq/standards/docs/toxics/metals/AppEArsenicIssuePaper.pdf

arsenic to 2.1 µg/L for total inorganic arsenic. The revised criteria are based on total inorganic arsenic because that form is more toxic than organic forms of arsenic.

DEQ and the stakeholder group developed the Arsenic Reduction Policy to work in tandem with the revised arsenic criteria by limiting inputs of human-caused arsenic to downstream public water systems that use surface water as a source of its drinking water. For more information on the development of criteria for arsenic, including the criteria revisions for iron and manganese, see rulemaking documents at: http://www.deq.state.or.us/wq/standards/metals.htm.

Table 1: Effective Arsenic Criteria for the Protection of Human Health

Pollutant	CAS No.	Carcinogen	Aquatic Life Criterion	*Human Health Criteria for the Consumption of:*	
				Water + Organism (µg/L)	Organism Only (µg/L)
Arsenic (inorganic)[A]	7440382	y	no	2.1	2.1(freshwater) 1.0 (saltwater)
[A] The arsenic criteria are expressed as total inorganic arsenic. The "organism only" criteria are based on a risk level of approximately of 1.1 x 10^{-5}, and the "water + organism" criterion is based on a risk level of 1 x 10^{-4}					

1.4 Arsenic Sources and Health Effects

Arsenic occurrence in water is caused by the weathering and dissolution of arsenic bearing rocks, minerals, and ores and from various industrial and other human-caused processes. Although arsenic exists in both organic and inorganic forms, the inorganic forms are more prevalent in water and more toxic. According to the EPA[3], approximately 90 percent of industrial arsenic in the U.S. is currently used as a wood preservative (i.e. Copper Chromated Arsenate or CCA) for "pressure-treated wood". Arsenic is also used in paints, dyes, metals, drugs, soaps and semi-conductors. High arsenic levels can also come from certain fertilizers, pesticides, and animal feeding operations. Industry practices such as copper smelting, mining and coal burning can also contribute to arsenic in the environment.

The EPA has classified arsenic as a Class A human carcinogen. These are pollutants with adequate human data indicating the chemical causes cancer in people. Exposure to arsenic can cause a variety of dermal, gastro-intestinal, liver, neurologic, and cardiovascular effects, as well as an increased risk of skin, lung, and bladder cancers.[4]

2.0 Data Needs

Information needed to determine if the Arsenic Reduction Policy applies to an industrial discharger can generally be obtained through data collected as part of federal and state monitoring requirements. Sections

[3] USEPA. Basic Information About the Arsenic Rule. See: http://water.epa.gov/lawsregs/rulesregs/sdwa/arsenic/Basic-Information.cfm

[4] Agency for Toxic Substances and Disease Registry. Case Studies in Environmental Medicine: Arsenic Toxicity. October 1, 2009. See: http://www.atsdr.cdc.gov/csem/arsenic/docs/arsenic.pdf

2.1 and 2.2 below describe monitoring requirements for arsenic, including data needs and other considerations when applying this rule.

2.1 Industrial Monitoring Requirements for Arsenic

Not all industrial dischargers are required to monitor for arsenic. Industrial NPDES permits have a complex process to determine monitoring requirements based on the Standard Industrial Classification (SIC) category and the potential for toxic pollutants in the effluent and in the receiving waterbody. Industries are generally classified as either primary or non-primary.

An industry is considered a primary industry if it is listed in Appendix A in 40 CFR Part 122[5]. Please refer to Section 2 of the *Reasonable Potential Analysis for Toxics Pollutants IMD* (RPA IMD)[6] for more information on determining the category of an industrial facility. Depending on the industry type, the permittee must monitor for specific toxics listed in EPA Application Form 2C[7]. The major/minor designation for industries is based on the *NPDES Permit Rating Worksheet*[8] and accounts for flow and other characteristics. All primary industries, regardless of major/minor status, must monitor for toxic metals[9], including total arsenic, as part of the Priority Pollutant Scan. Federal regulations do not require non-primary industries to monitor for toxic metals, including total arsenic, unless the discharger (or permit writer) believes it is present at 10 µg/L or greater in its discharge. Seven out of eight major industrial facilities located within surface water drinking water source areas currently monitor for arsenic, while almost half of the minor industrial facilities (approximately 20) discharging to surface water drinking water source areas monitor for arsenic. See **Appendix C** for this list of major and minor industrial facilities.

In order for DEQ to determine whether or not the arsenic load from an industrial discharger listed in **Appendix C** is likely to increase the concentration of arsenic to a downstream drinking water supply, the permit writer must conduct the applicability analysis described in Section 3.2. Preliminary data review of arsenic effluent monitoring results from industrial discharges in drinking water source areas indicate that

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[5] Certain industrial categories per 40 CFR Part 122 Appendix A: Adhesives and sealants, Aluminum forming, Auto and other laundries, Battery manufacturing, Coal mining, Coil coating, Copper forming, Electrical and electronic components, Electroplating, Explosives manufacturing, Foundries, Gum and wood chemicals, Inorganic chemicals manufacturing, Iron and steel manufacturing, Leather tanning and finishing, Mechanical products manufacturing, Nonferrous metals manufacturing, Ore mining, Organic chemicals manufacturing, Paint and ink formulation, Pesticides, Petroleum refining, Pharmaceutical preparations, Photographic equipment and supplies, Plastics processing, Plastic and synthetic materials manufacturing, Porcelain enameling, Printing and publishing, Pulp and paper mills, Rubber processing, Soap and detergent manufacturing, Steam electric power plants, Textile mills, and Timber products processing

[6] ODEQ. Reasonable Potential Analysis for Toxics Pollutants Internal Management Directive, Rev. 3.1. February 2012. See also: http://www.deq.state.or.us/wq/pubs/pubs.htm#imds

[7] EPA. Application Form 2C – Wastewater Discharge Information. Consolidated Permits Program. EPA Form 3510-2C. Revised August 1990. See also: http://www.mde.state.md.us/programs/Permits/WaterManagementPermits/Documents/www.mde.state.md.us/assets/document/permit/3510-2C.pdf

[8] See http://deq05/wq/wqpermits/Tools/NPDESPRWrkShtFillable.pdf

[9] per Table III in Appendix D (40 CFR 122.21(g)(7)(v)(B).

some dischargers have a potential to increase arsenic concentrations to downstream drinking water suppliers; therefore, **the permit writer should conduct the applicability analysis for any permittee performing arsenic monitoring required by state or federal regulations.** Further, a permit writer should require arsenic monitoring for any industrial facility that does not currently perform arsenic monitoring if the permit writer determines that its industrial process is likely to add arsenic to downstream drinking water sources. In the permit, these monitoring requirements should be noted in *Schedule B*.

2.2 Data Needs and Considerations

The arsenic criteria for human health and the Arsenic Reduction Policy are both based on total inorganic arsenic which represents the most toxic form of arsenic. **Because many facilities do not yet collect inorganic data, DEQ recommends the use of total arsenic data to conservatively approximate the amount of total inorganic arsenic present, until such time inorganic arsenic data is available**. Hereafter, any reference to inorganic arsenic also includes total arsenic data if inorganic data is not available.

Permit holders must use approved analytical methods and quantitation limits (OAR 340-041-0033(7)(f)(B)) to quantify either total arsenic (0.5 µg/L) or total inorganic arsenic (1 µg/L) according to the most current version of the *Quantitation Limits for NPDES Permitting IMD*[10]. The approved analytical method for total inorganic arsenic is EPA Method 1632 A, while the approved analytical method for total arsenic is EPA Method 200.8.

Generally, the data collected by the permittee as part of its *Schedule B* monitoring requirements for arsenic, if applicable, is sufficient to conduct this analysis. Permit writers may need additional data from a public water system if the calculation to assess significant arsenic addition is conducted at the public water system source water intake (see Section 3.2, Step 3). Typically, the permit writer will analyze the data collected during Tier I and Tier II monitoring to calculate significance and, if applicable, the discharger will develop an arsenic reduction plan as part of its renewed permit. However, if a discharger does not have sufficient data for the permit writer to conduct the arsenic analysis at permit renewal, the permit writer will include sampling requirements in *Schedule B* that are sufficient to conduct the analysis at the next permit renewal.

At renewal, the discharger must submit the following available arsenic data in **Table 2** to the permit writer, and in accordance with monitoring requirements described in Section 2.2.4 “Industrial Facilities: Evaluation and Monitoring Requirements” in the RPA IMD:

[10] In development, as of March 2013

Table 2: Required Arsenic Data

Required Arsenic Data:
1. All relevant arsenic data collected from the effluent as part of the Tier 1 (year 0-2 of permit cycle) and Tier II (year 3 of permit cycle) Priority Pollutant Scan (i.e. generally, a minimum of four composite samples collected semiannually over two years) or other required monitoring, including effluent discharge flow.
2. Arsenic concentration and flow data from facility source water intake if representative of upstream ambient conditions of receiving stream.
If the source water is not from the receiving stream (e.g. groundwater, other surface water, or community water system sources), the permittee must collect upstream ambient arsenic data and flow to calculate mixing if not otherwise available. Typically, ambient data is collected as part of Tier II monitoring requirements.
3. Arsenic concentration and flow data from downstream drinking water source intake **IF** the permit writer uses this alternative calculation.

Permit writers may also access other data sources, such as data collected through DEQ's Toxics Monitoring Program[11] or LASAR database, and data from USGS to find arsenic or flow data representative of upstream conditions.

Any arsenic monitoring requirements should be described in *Schedule B* according to Section 2.5 "Schedule B: Suggested Monitoring Requirement Language" in the RPA IMD. The permit holder should provide a tabular summary of the water quality data to the permit writer according to established procedures described in Section 2.4 "Reporting Procedures" in the RPA IMD.

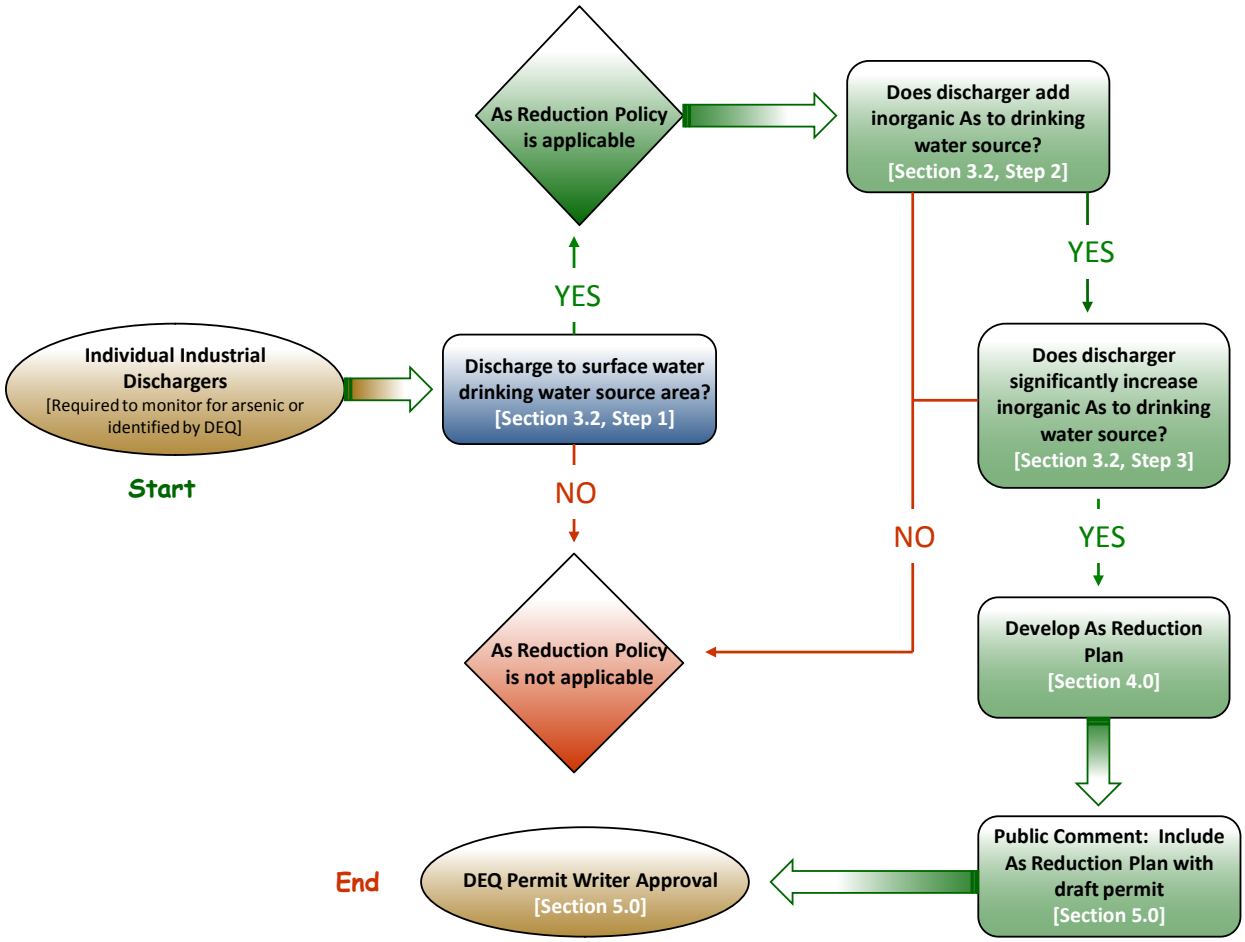
3.0 Applicability Determination for an Industrial Discharger

3.1 Flowchart Overview

The flow chart below in **Figure 1** describes the step by step process of determining the applicability of the Arsenic Reduction Policy to an industrial discharger, whether the discharger adds and significantly increases inorganic arsenic to a drinking water source, and the need to develop an arsenic reduction plan. The flowchart includes references to where more information may be found in the IMD.

[11] DEQ is collecting toxics data, including arsenic, on a rotating basis in different watersheds throughout Oregon. The Willamette data is now final and includes 20 monitoring sites along the mainstem Willamette and its largest tributaries. Sampling in central Oregon was completed in 2012 and sampling is scheduled for coastal Oregon in 2013. See website: http://www.deq.state.or.us/lab/wqm/toxics.htm.

Figure 1: Arsenic Reduction Policy Flowchart



3.2 Steps to Determine Policy Applicability

Step 1: Does an Individual NPDES Industry Discharge to a Surface Water Drinking Water Source Area?

If an industrial discharger does not discharge to a surface water drinking water source area, this policy does not apply. DEQ staff analyzed information from DEQ's Source Information System (SIS) database and the surface water drinking water protection area maps to determine which industrial dischargers are affected by this rule. Surface water drinking water source areas are delineated by DEQ (in cooperation with the Oregon Health Authority) for the purpose of protecting public water systems that use surface water sources. For surface water systems, the drinking water source area delineation process is performed by using the fifth-field hydrologic unit (watershed) boundaries. All drinking water intakes are located with

a Geographic Positioning System. The surface water delineation includes the entire watershed area upstream of the intake structure. Source water assessments[12] for public water systems meeting specific requirements have all been completed in Oregon and include delineation, an inventory of potential contaminant sources, and a susceptibility analysis.

Appendix C contains a list and map of all industries with individual NPDES permits discharging to surface water drinking water source areas. This list is current as of August 2012. Although DEQ intends to update this list periodically, permit writers should confirm whether or not this rule pertains to any new or renewing industrial permit. The drinking water program staff at DEQ headquarters (see: http://www.deq.state.or.us/wq/dwp/contacts.htm) can assist permit writers in determining if a new NPDES industrial facility discharges to a drinking water source area.

Step 2: Does a Discharger Add Arsenic to the Receiving Stream?

The second step in the process is to determine whether the industrial discharge adds inorganic arsenic (i.e. arsenic mass added from the industrial process rather than originating from the surface water source). To conduct this assessment, the permit writer needs arsenic data from the discharger and the receiving waterbody (See Section 2.2).

Because this rule focuses on arsenic added by an industrial source rather than any arsenic that may already be present in source water itself, the permit writer should subtract the mass of inorganic arsenic (or total arsenic, depending on the data available) taken into the facility from the surface water source from the mass of inorganic arsenic in the discharge before conducting the analysis. **If the calculation demonstrates that all the arsenic present in the effluent is coming from its surface water source and not from the industrial process, then this rule does not apply.** Note that the permit writer cannot subtract arsenic mass from industrial source water originating from groundwater sources.[13] This is because groundwater may contain high levels of arsenic that may not have otherwise reached a surface water source had it not been intercepted by the industrial discharger.

Step 3: Does a Discharger Significantly Increase Arsenic to the Receiving Stream?

If the calculation above demonstrates that a discharger adds arsenic from its industrial process, the permit writer must then determine if that load is likely to increase the concentration of inorganic arsenic in a downstream public drinking water supply. This is determined by calculating whether the discharge **increases the concentration of arsenic in the river by 10% or more above the upstream ambient concentration after mixing with the harmonic mean flow of the receiving water.** Alternatively, permit writers can demonstrate that the arsenic contribution from the discharge **will not increase the arsenic concentration in**

[12] For more information on source water assessments, see: http://www.deq.state.or.us/wq/dwp/dwp.htm

[13] OAR 340-041-0033(7)(c)(A): "Add inorganic arsenic" means to discharge a net mass of inorganic arsenic from a point source (the mass of inorganic arsenic discharged minus the mass of inorganic arsenic taken into the facility from a surface water source).

the downstream water supply by more than 0.021 µg/L based on a mass balance calculation. This concentration represents 1% of the human health criterion of 2.1 µg/L. The former calculation focuses at the point of discharge, while the latter calculation measures increases of arsenic at the drinking water intake, which could be some distance downstream of the point source discharge (assuming the entire mass load is transported downstream to the intake location).

If the calculation indicates that the 10% threshold is exceeded at the point of discharge, the permit writer may also conduct the alternative analysis by determining whether the source water for the downstream public water supplier is impacted by the industrial source upstream. If this alternate calculation shows that the water supply is not increased by 0.021 µg/L, then the permit writer may conclude the discharge does not significantly contribute arsenic and a pollutant reduction plan is not required. This situation may occur when the industrial discharge point is much farther upstream of the public water supplier source water; consequently, the arsenic mass in the receiving stream at the discharge point is diluted by tributary or groundwater inputs downstream.

Although certain water suppliers will have monitoring data for arsenic collected within the distribution system (i.e. at the tap after any treatment), some public water suppliers or DEQ's Drinking Water Protection Program may also be able to provide permit writers with raw water arsenic data from the public water systems' source water. Contact information and previous monitoring results for each public water supply are listed in the Oregon Health Authority's Drinking Water Data Online database.

The RPA spreadsheet was updated to build in the significance test calculation procedure described above, however, if permit writers have any questions regarding these calculations, contact Headquarters' permitting staff.

An Arsenic Reduction Plan is required if the industrial discharge increases the concentration of arsenic in the receiving stream by 10% or more, or increases the arsenic concentration of a downstream water supply by more than 0.021µg/L. Otherwise, an Arsenic Reduction Plan is not needed. See Section 4.0 below for more detail in developing a plan.

4.0 Arsenic Reduction Plan Development

Once the permit writer determines that a discharge significantly increases the concentration of inorganic arsenic in the receiving stream as determined in Step 3 above, the industrial discharger must develop an Arsenic Reduction Plan (hereafter referred to as "Plan"). The intent of the Plan is to reduce pollutant contributions to the receiving stream to the maximum extent practicable. The range of reduction measures will vary depending on the industrial process. Because this rule directs permit writers to subtract the amount of arsenic found in its source water as part of the analysis, the remaining arsenic is either coming from the raw products used in the industrial process, stormwater runoff, is specifically added to optimize the industrial process, or from its groundwater source, if applicable. Therefore, the discharger will need to review the entire industrial process to determine the source(s) of arsenic. This might include the review of Material Safety Data Sheets, Chemical Specification Sheets, etc.

Once the source is identified, the discharger can research product alternatives, optimize treatment removal processes, or improve containment of arsenic-containing compounds to minimize pathways to waterbodies

(e.g. Stormwater Pollution Control Plan). In some cases, there may not be any product alternatives available, or treatment optimization costs may be unreasonable or prohibitive. In these circumstances, the discharger should provide a justification for why reduction measure are infeasible. **Table 3** below describes the minimum elements a permittee must include in their Plan.

Table 3: Pollutant Reduction Plan Minimum Elements

Pollutant Reduction Plan Minimum Elements (OAR 340-041-0033(7)(e))

The Plan must include the following elements:

1. All proposed feasible arsenic reduction measures (See Section 4.1),
2. Monitoring and reporting requirements (See Section 4.2), and
3. Implementation schedule for those actions (See Section 4.3)

The Plan will be described in the permit fact sheet and incorporated into the discharger's NPDES permit in *Schedule D*. The language should state that the permit holder must comply with the attached Pollutant Reduction Plan, and that the permit holder may not amend the Plan without DEQ approval. These Plans must accompany the permit as part of the public comment and review process and be approved by the DEQ permit writer.

For approval, DEQ expects, at a minimum, that the elements listed below in Sections 4.1 through 4.3 be included as part of the Plan. A table, such as **Table 5** in Section 4.3 below may be helpful in displaying this information. The discharger should also provide a narrative to support the reduction measures included in the Plan.

4.1 Arsenic Reduction Measures

The Plan must evaluate specific measures to reduce the input of arsenic to the receiving waterbody. If not already known, the discharger should first conduct a source assessment to determine the source of arsenic. If the source is originating from chemicals used in the industrial process, the discharger may need to research whether there are any alternatives to that chemical and if they are appropriate to use.

For example, chromated copper arsenate (CCA) is a pesticide that is used as a preservative in pressure treated wood to protect wood from rotting due to insects and microbes. According to the Toxics Release Inventory (TRI)[14], Oregon has historically had reported releases of arsenic from wood treating facilities—presumably from CCA treated wood. CCA treated wood was used extensively in residential products such as decks and playground equipment. Since December 31, 2003, no wood treater or manufacturer may treat wood with CCA for residential uses[15], although CCA continues to be used in industrial applications. There are now alternative chemicals to CCA that wood treating industries may use, such as Alkaline

[14] EPA. Toxics Release Inventory. See: http://www.epa.gov/tri/

[15] EPA Website. Office of Prevention, Pesticides, and Toxic Substances. See: http://www.epa.gov/oppad001/reregistration/cca/

Copper Quaternary, borates, copper azole, cyproconazole, and propiconazole.[16] Some of the wood treaters permitted in Oregon have already switched to these arsenic-free preservatives.

It may be difficult to find alternative products in situations where the source of arsenic is in the raw materials used for that industry (e.g. wood products). In these cases, adjustments made to the treatment system to optimize arsenic removal may be more feasible. DEQ anticipates that industries will be aware of resources to research available and feasible treatment technologies or other pollution reduction alternatives. **Table 4** below provides several of these resources. Additional information on arsenic removal technologies for drinking water sources that could be applicable to industrial facilities are described under Section 4.1.2.

Table 4: Treatment Technology Resources

Resources	Website
EPA Technical Document Search	http://www.epa.gov/research/npd/waterqualityresearch-pubs.htm
EPA National Risk Management Research Laboratory—Arsenic Research website	http://www.epa.gov/nrmrl/wswrd/dw/arsenic/
National Association of Clean Water Agencies	http://www.nacwa.org
National Council for Air and Stream Improvement	http://www.ncasi.org
Water Environment Research Federation	http://www.werf.org

Given the range of pollution reduction options available to any given industrial process, the list of measures developed by the discharger will vary. However, the permit writer should ensure that the discharger conducted a thorough evaluation of all available options. Once a comprehensive list is developed, the discharger should evaluate the feasibility of each reduction option. If any of the measures are infeasible (see explanation under Section 4.1.2 below), the discharger should state the reasons why. The final list of reasonable feasible reduction measures must include a supporting narrative and express how much reduction is anticipated. A quantitative estimate of reduction potential is preferable, but a qualitative analysis may suffice if this is not possible. Each reduction measure must include an implementation schedule as part of the Plan.

4.1.1 Estimated Reduced Risk to Human Health

The discharger must provide an estimate of the reduction in risk to human health based on the proposed arsenic reduction measures (OAR 340-041-0033(7)(e)(C). One way of estimating risk reduction is to first determine the current level of risk associated with the receiving stream given the current arsenic discharge using EPA's equation for linear carcinogens (See **Figure 2**). Instead of calculating the ambient water quality criterion for arsenic, the concentration of arsenic after mixing with the receiving stream is substituted and then the equation solved for risk associated with that concentration (See **Figure 3**). The next step is to plug in the expected concentration of arsenic in the receiving stream after pollutant reduction measures are implemented and solve for the associated risk. The estimate in risk reduction to

[16] EPA Website. Office of Prevention, Pesticides, and Toxic Substances. See: http://www.epa.gov/oppad001/reregistration/cca/

human health would be the difference between the two risks. In some circumstances, this difference could be negligible.

The variables below are derived from EPA default values with the exception of the Risk Factor, Bioconcentration Factor, Inorganic Fraction of arsenic, and the Fish Consumption Rate which are DEQ-derived variables. These variables were used to develop the "water + org" human health criterion. For more information about the development of these variables, please see the arsenic rulemaking Issue Paper.[17]

Figure 2: Equation for Linear Cancer Effects

$$AWQC = \frac{RF \times BW}{CSF \times [DW + (BCF \times FCR \times IF)]}$$

Where:

AWQC (Arsenic Ambient Water Quality Criterion) = Water + fish ingestion criterion = 0.0021 mg/L
RF (Risk Factor) = 0.0001
BW (Body Weight) = 70 kg
CSF (Cancer Slope Factor) = 1.5 kg day/mg
IF (Inorganic Fraction of Arsenic) = 0.1
DW (Drinking Water Intake) = 2 L/day
BCF (Bioconcentration Factor) = 14 L/kg
FCR (Fish Consumption Rate) = 0.175 kg/day

Figure 3: Reconfigured Linear Cancer Equation to Determine Risk

$$RF = \frac{AWQC \times [CSF \times (DW + (BCF \times FCR \times IF))]}{BW}$$

or simplified as:

RF = AWQC mg/L x 0.048107

Where:

AWQC (Ambient Water Quality Criterion mg/L) = the concentration of arsenic in receiving stream after mixing with the harmonic mean flow. First use the current receiving stream concentration and then re-calculate using the expected reduced stream concentration.

If the quantitative estimate is not meaningful because the difference in calculated risk is negligible, the discharger may use a qualitative assessment to assess risk and risk reduction. These considerations may include such information as:

[17] ODEQ. Issue Paper: Water Quality Standards Review and Recommendations: Arsenic. April 21, 2011. See: http://www.deq.state.or.us/wq/standards/docs/toxics/metals/AppEArsenicIssuePaper.pdf

- Proximity of drinking water intakes to the point of discharge;
- Concentrations of arsenic detected at downstream public or community water systems;
- Whether tributaries or streams downstream from the point of discharge help to dilute the effects of the discharge prior to reaching a drinking water intake; and
- Intermittent versus continuous discharge flow

Note that the above information should be provided by the discharger regardless of whether the risk analysis is quantitative or qualitative.

4.1.2 Feasibility Evaluation of Reduction Options

There could be a number of measures to reduce arsenic from an industrial discharge to a drinking water source, but not all options are necessarily feasible. As part of the reduction measure evaluation, the permit holder should evaluate treatment technologies, alternative chemical use and/or raw materials, or other possible pollutant reduction strategies. The facility can meet this requirement by indicating in the evaluation that arsenic treatment technology for that type of facility is either not proven or the technology is unaffordable, or that various pollution reduction strategies would not result in measurable reductions of arsenic. In some cases, optimizing existing treatment technology (i.e. beyond standard proper operation and maintenance requirements), rather than installing new treatment technologies, may produce some reduction in arsenic without huge expenditures of capital.

The EPA documents, *Arsenic Treatment Technology Evaluation Handbook for Small Systems*[18] and *Costs of Arsenic Removal Technologies for Small Water Systems: U.S. EPA Arsenic Removal Technology Demonstration Program*[19] are excellent references on arsenic removal technologies and associated costs. Although these documents were developed to assist small community water systems comply with the revised Maximum Contaminant Level for arsenic (10 µg/L) promulgated in 2001, they provide detailed information about various removal technologies, costs, and other considerations based on 50 demonstration projects across the country (several in Oregon). Average water demand for these size systems is normally less than 1.4 million gallons per day.

Some of the considerations and conditions described in the handbook could apply to an industrial discharge depending on particular circumstances (e.g. design flow, source water chemistry, industrial process, percent arsenic removal required, etc.)[20]. These documents note that many treatment technologies for inorganic arsenic removal require that arsenite (As III) be oxidized to arsenate (As V) to achieve optimal performance. Effective oxidizing agents include chlorine, permanganate, ozone, and Filox-R™. Also note that any arsenic residuals resulting from treatment processes must be disposed of in the proper

[18]USEPA. Arsenic Treatment Technology Evaluation Handbook for Small Systems. Office of Water. EPA 816-R-03-014. July 2003. See: http://water.epa.gov/drink/info/arsenic/upload/2005_11_21_arsenic_handbook_arsenic_treatment-tech.pdf

[19] USEPA. Costs of Arsenic Removal Technologies for Small Water Systems: U.S. EPA Arsenic Removal Technology Demonstration Program. National Risk Management Research Laboratory. EPA/600/R-11/090. September 2011. See: http://nepis.epa.gov/EPA/html/DLwait.htm?url=/Exe/ZyPDF.cgi?Dockey=P100CAXP.PDF

[20] Note that to remove arsenic concentrations to 2.1 µg/L or less, industrial dischargers may need to use both a precipitation/coagulation technology and then an adsorptive media to "polish" the waste stream to further reduce arsenic levels. *Pers. communication with Tom Sorg, EPA National Risk Management Research Laboratory. July 30, 2012.*

manner (e.g. hazardous landfill if necessary)[21]. For more information on EPA research on arsenic removal and costs, see EPA's Arsenic Research website: http://www.epa.gov/nrmrl/wswrd/dw/arsenic/index.html.

In summary, the feasibility analysis should have sufficient detail to demonstrate the discharger has researched and evaluated the feasibility of arsenic reduction measures. As part of this analysis, the discharger should weigh the technical and economic feasibility of an arsenic reduction measure against the reduced human health risk that is expected to result in deciding which measures to implement. For measures not pursued, the discharger should state specifically why any measure was considered infeasible. The discharger can conduct an economic analysis, such as described in *EPA's 1995 Interim Economic Guidance for Water Quality Standards*[22] which describes the steps involved in the determination of "substantial and widespread economic and social impact" for point sources, but this level of analysis is not necessary to meet the feasibility demonstration under this rule.

4.2 Monitoring and Reporting Requirements to Document Progress

The supporting narrative should identify how the permit holder will track and assess progress towards the pollutant reduction goals established for arsenic, as well as the accomplishments of specific activities. DEQ expects permit holders to consider both quantitative (numeric) and qualitative performance measures or metrics for both plan activities and goals.

Performance Metrics Examples:

1. *Percent completion of an improved Stormwater Pollution Control Plan.*
2. *Number of source identification sampling events held by December 2014.*
3. *Number of business and manufacturing partners contacted regarding material process change by March 2015.*
4. *Percentage of facility treatment upgrade completed by January 2016.*
5. *Concentration of arsenic in effluent in relation to baseline measurement. Concentration will be measured during two sampling events no later than December 2014.*

The permit writer should work with the discharger to determine monitoring requirements sufficient to ascertain any progress accomplished from reduction measures implemented over the permit cycle. Current monitoring requirements for arsenic may already be sufficient, but in other circumstances, increased monitoring could be warranted. Monitoring requirements should be detailed in *Schedule B* of the permit.

4.3 Implementation Schedule

The permittee must develop an implementation schedule to track important milestones in implementing arsenic reduction measures. It may be helpful for the discharger to develop a pollution reduction measure

[21] Note that none of the arsenic treatment technology residuals in the 50 demonstration projects resulted in an exceedance of the TCLP hazardous waste limit for arsenic (i.e. 5 mg/L). *Pers. communication with Tom Sorg, EPA National Risk Management Research Laboratory. July 30, 2012.*

[22] EPA. 1995 Interim Economic Guidance for Water Quality Standards (EPA-823-B-95-002), updated 3/17/11. Also includes helpful worksheets and guidance in conducting the economic analysis.
See http://water.epa.gov/scitech/swguidance/standards/economics/

chart as a way to track implementation of arsenic reduction measures, including other components of a Plan, including outputs/deliverables and performance metrices (see example below in **Table 5**).

Table 5: Pollutant Reduction Measure Chart Example

Reduction Measure	Outputs/Deliverables	Implementation Schedule		Performance Metric
		Begin Date	End Date	
Installation of treatment technology	a)Plan submittal to DEQ for review and approval	1/1/16	3/1/16	Reduce arsenic in discharge by 80%
	b) Contract awarded		6/1/16	
	c) Build and install upgrade	9/1/16	6/1/17	
	d) Tested and fully operational		9/1/17	
Chemical Substitution	a)Batch testing with alternative chemical to confirm feasibility and product quality	1/1/16	7/1/16	100% substitution of arsenic-containing chemical
	b) Secure contract with chemical supplier		10/1/16	
	c) Full production		1/1/17	
Standard Operating Procedures: Wood Treatment Containment Plan	a) Treated wood is stored on drip pad for a minimum of 48 hours prior to storage in other areas of the site	Immediate		Contain wood preservatives onsite to minimize runoff to nearby waterways/ditches
	b) Cover storage area for treated wood	1/1/16	3/1/16	

5.0 Public Comment and DEQ Approval

The proposed Arsenic Reduction Plan must be included with the draft NPDES permit for public comment. Following public comment and DEQ approval, the Plan will be incorporated into the discharger's NPDES permit. The DEQ permit writer has the primary responsibility to approve each Plan.

6.0 Renewal

The Arsenic Reduction Plan will be reviewed at each permit renewal. The permit writer will review each reduction measure and evaluate progress in meeting the associated performance metric and determine whether new measures are warranted, including reduction measures that were originally infeasible that may now be feasible. The Plan or any revisions to the Plan are subject to public comment and DEQ approval. If the Plan results in measurable reductions of arsenic, so that the discharge no longer significantly increases (per OAR 340-041-0033(7)(c)(C)) arsenic contributions to surface water drinking water source areas, then the Plan is no longer required. To confirm that the reduction measures established in the earlier Plan(s) maintain low or unquantifiable arsenic levels, the permit writer will continue to conduct the analysis required to meet this rule at each permit renewal. This analysis also includes permits where previous analyses indicated a pollutant reduction plan was not required.

7.0 Applicability to Other NPDES Permits

The requirements in the Arsenic Reduction Policy rule apply to industrial dischargers that receive individual permits. However, the rule may be applicable to general permits or industrial stormwater permits if these sources are likely to contribute arsenic to downstream drinking water sources. In these cases, DEQ will evaluate options for reducing arsenic in the discharge during permit renewal or evaluation of Stormwater Pollution Control Plans. This rule does not apply to Municipal Separate Storm Sewer Systems (MS4), construction permits, or Water Pollution Control Facilities (WPCF). The following sections describe how this rule applies to general permits and industrial stormwater permits.

7.1 General Permits

A general permit is a permit that covers facilities that have similar operations and types of discharge. In order to apply for this kind of permit, the discharge must be able to meet all of the requirements and effluent limitations that are relevant to that category of discharge. Generally speaking, these permits are used to cover minor discharge sources or minor activities that will have a minimal effect on the environment (OAR 340-045-0033(1) and (2)). There are nine categories of general permits found in surface water drinking water source areas in Oregon and include such discharges as non-contact cooling water, fish hatcheries, and log ponds. The total number of general permits in these areas is **265** based on location information for dischargers provided in WQ SIS. None of these general permits require monitoring for arsenic because these discharges are not known to add arsenic or discharge arsenic in significant quantities. See **Appendix D** for the table and associated map of facilities with general permits discharging to source water drinking water source areas. If DEQ determines that any particular category of general permit could significantly add arsenic to downstream drinking water sources, DEQ may include additional permit conditions at permit renewal.

7.2 Industrial Stormwater Permits

The NPDES stormwater program regulates stormwater discharges from three potential sources: MS4s, construction activities, and industrial activities. The Arsenic Reduction Policy focuses on industrial stormwater permits. DEQ issues two industrial stormwater permits in surface water drinking water source areas: **1200A** (sand & gravel mining) and **1200Z** (specific SIC codes[23]). DEQ previously issued the **1300J** permit covering discharges of oily stormwater; however, those permits were discontinued in 2006. Instead, these permittees must apply for an individual permit or address their discharge in a different stormwater permit. The 1300J permit did not require arsenic monitoring. The 1200COLS permit does not apply to this rule because there are no drinking water intakes along the Columbia Slough.

[23] There are approximately110 different types of industrial sectors under the 1200Z stormwater permits that discharge to surface water drinking water source areas. Some of these facilities include; airports, canned and frozen fruits and vegetables, fabricated metal products, trucking, various wood products, refuse and sewerage systems, and scrap and waste materials.

Based on location information for dischargers provided in WQ SIS, **464** industrial stormwater facilities discharge to these drinking water source areas. See **Appendix E** for the table and map of industrial stormwater facilities discharging to surface water drinking water source areas.

1200 A Permits

The 1200A sand and gravel stormwater permit was reissued in December 2012. The permit has mandatory best management practices (BMP) requirements which are treated as narrative technology based effluent limits in the permit. DEQ also included numeric effluent limits for certain categories of facilities operating under the permit.[24] Mining operations must also monitor pollutant benchmarks to determine if their BMPs are effective. If a facility is not consistently achieving desired benchmarks or numeric effluent limits, it must implement BMPs to reduce the pollutants in the discharge and hire a professional engineer or certified engineering geologist to design the stormwater plan. Arsenic is not one of the benchmarks in this permit, but if the facility's receiving stream is impaired for arsenic on the 303(d) list, the permit holder is required to monitor for arsenic two times per year for two years. If samples exceed the arsenic reference concentration,[25] the facility must determine the source of arsenic and take corrective actions to reduce the pollutant in its discharge.

1200 Z Permits

The 1200Z was reissued on October 1, 2011, with further modifications finalized on March 28, 2012. Similar to the 1200A permit, the permit has mandatory BMP requirements which are treated as narrative technology based effluent limits in the permit. 1200Z facilities must monitor certain pollutant benchmarks to determine if their BMPs are effective. Although arsenic is not one of the benchmarks, facilities must monitor for arsenic two times a year if the receiving stream is 303(d) listed for arsenic. If samples exceed the arsenic reference concentration, the facility must determine the source of arsenic and take corrective actions to reduce the pollutant in its discharge.

Summary

Generally, the 1200A and 1200Z industrial stormwater permits focus on BMPs sufficient to capture pollutants likely to be in its stormwater, unlike other industrial permits covering a wide range of processes, materials, treatment technologies, etc. Although these permits may discharge some level of arsenic, current knowledge suggests it is unlikely to be significant. For example, earth-disturbing activities conducted under the 1200A permit may mobilize arsenic in areas where it is naturally present in the soils in high concentrations. However, BMPs established for benchmark pollutants, such as total suspended solids would likely also reduce arsenic that may be present in stormwater. Moreover, if monitoring indicates that arsenic is present in concentrations that exceed reference concentrations, permittees are required to take corrective actions and implement additional BMPs. Therefore, additional BMPs for specific reduction of arsenic are likely not necessary in addition to those already required by the permits. However, if future data or information suggests this is not the case, development of specific benchmarks for arsenic and related revisions to the Stormwater Pollution Control Plan may be explored at the time of permit renewal.

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[24] Numeric effluent limits for pH will apply to construction sand and gravel and crushed stone operators; limits for both pH and total suspended solids will apply to industrial sand operations.

[25] The reference concentration is based upon the human health criterion of 2.1 μg/L.

8.0 Applicability to Agriculture

The Arsenic Reduction Policy also applies to agricultural practices where pesticides, fertilizers, or soil amendments containing arsenic are currently or have previously been applied (OAR 340-041-0033(7)(g)). The following discussion describes current or former use of pesticides containing arsenic in Oregon, as well as current agricultural practices to minimize the introduction of arsenic into waterways as a result of erosion control practices. The Oregon DEQ has also developed a Toxics Reduction Strategy that DEQ may leverage to reduce loadings of specific toxics, including arsenic, to streams and rivers. Generally, for the purposes of this rule and supported by the discussion below, DEQ staff will not likely need to further assess agricultural use of arsenic or review soil conservation practices that minimize erosion of arsenic to waters of the State in order to implement this rule.

Use of Arsenical Pesticides

Organic forms of arsenic were historically used in various agricultural insecticides and poisons. For example, lead hydrogen arsenate was a common insecticide used on fruit trees to combat gypsy and codling moth infestations, but because of its toxicity and persistent residues on fruit, EPA banned all insecticidal uses of lead arsenate in the U.S. in 1988. Lead arsenate was historically used in large quantities in agricultural areas of the Willamette Basin.[26] Consequently, despite EPA's ban on this pesticide, lead arsenate compounds may continue to persist in soils where lead arsenate was applied.[27]

The herbicides, MSMA (monosodium methyl arsenate), DSMA (disodium methyl arsenate), and CAMA (calcium acid methanearsonate)—less toxic forms of organic arsenic—replaced the use of lead arsenate and were registered for weed control on cotton, turf grass and lawns, and under trees, vines, and shrubs. In September 2009 at the voluntary request of its registrants, EPA cancelled pesticide registration for these pesticides (total of 77) with several exceptions[28]. Use of MSMA on sod farms, golf courses, and highway rights-of-way is prohibited after December 31, 2013.

A search of Washington State University's Pesticide Information Center Online (PICOL) database indicated that there are only two current use pesticides containing arsenic compounds registered in Oregon.[29] These are arsenic acid and arsenic pentoxide, both used in wood treatment. Most likely these pesticides are used for treatment of wood for industrial purposes, rather than residential. There does not appear to be any current agricultural use of arsenical pesticides in Oregon.

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[26] USGS. Hinkle, S.R., and Polette, D.J. Arsenic in Ground Water of the Willamette Basin, OR. Water-Resources Investigations Report 98–4205 . 1999. See: http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/5064/PB2002100743.pdf?sequence=1

[27] Peryea, Francis J. Tree Fruit Research and Extension Center, Washington State University, Wenatchee, Washington, USA 98801. *Historical Use of Lead Arsenate Insecticides, Resulting Soil Contamination and Implications for Soil Remediation.* Proceedings 16th World Congress of Soil Science (CD Rom), Montpellier, France. 20-26 Aug. 1998. See: http://soils.tfrec.wsu.edu/leadhistory.htm

[28] EPA. Organic Arsenicals; Product Cancellation Order and Amendments to Terminate Uses. Federal Register. September 30, 2009 (Volume 74, Number 188). Page 50187-50194. See: http://www.epa.gov/fedrgstr/EPA-PEST/2009/September/Day-30/p23319.htm

[29] PICOL database. See http://cru66.cahe.wsu.edu/LabelTolerance.html

Agricultural Water Quality Management Plans

The Oregon Department of Agriculture's Agricultural Water Quality Management (AgWQM) Program is responsible for developing and implementing agricultural pollution prevention and control programs to protect the quality of Oregon's waters. There are currently 38 Agricultural Water Quality Management Area Plans covering Oregon. Each plan has an accompanying administrative rule. The administrative rules outline requirements for landowners to prevent and control water pollution from agricultural activities and soil erosion. While the emphasis of the plans are on voluntary action by landowners to control the factors affecting water quality, the Prevention and Control Measures in the area rules are minimum standards that must be met on all agricultural or rural lands. Prevention and Control Measures common to all management areas prohibit activities that cause pollution and require maintenance of streamside vegetation. Some area rules also address locally important agricultural water quality issues, such as upland erosion, irrigation, and nutrient management. Landowners who fail to address these Prevention and Control Measures may be subject to enforcement procedures based upon the administrative rules. For more information about the AgWQM Program or to access all the Area Plans and Rules, see http://www.oregon.gov/ODA/NRD/Pages/water_quality_front.aspx.

DEQ's Toxics Reduction Strategy

To address a broad array of toxic pollutants in Oregon, DEQ developed a Toxics Reduction Strategy. The strategy includes 25 actions to reduce and assess toxics in Oregon. Although there are no actions at this time in the Toxics Reduction Strategy that are specific to arsenic reduction, **Action I-3** is relevant to achieving the objectives of the Arsenic Reduction Policy:

> **Action I-3: From Toxics Reduction Strategy**
>
> Use existing rural planning and resource management programs to reduce loadings of Focus List toxics into Oregon waterbodies through natural resource agency collaboration.

This action is relevant to any Focus List chemical (which includes almost all toxic pollutants that exceed water quality standards in Oregon, including arsenic) that could be found on rural lands, including heavy metals and legacy pesticides. DEQ is prioritizing toxics reduction actions based on a number of criteria. For details on the Toxics Reduction Strategy, see http://www.deq.state.or.us/toxics/. If DEQ determines that there are major concerns regarding arsenic in fertilizers or pesticides/legacy pesticides, then the strategy can be updated over time to reflect these needs.

Summary

Generally, most agricultural uses of arsenic have diminished and/or will further diminish as EPA cancellations on several organic arsenic pesticides take effect. However, because of historical agricultural use of arsenic, DEQ expects landowners in surface water drinking water source areas will employ or continue to employ soil conservation practices in accordance with ODA's Area Plans and Rules to minimize migration of soil potentially containing arsenic compounds into nearby waterways. Further, DEQ may update **Action I-3** in the Toxics Reduction Strategy if DEQ determines that arsenic is migrating to nearby waterways as a result of insufficient soil conservation practices.

Appendix A: Revisions History

Revision	Date	Changes	Editor
Version 1.0	May 7, 2013	Initial Publication	Andrea Matzke

Appendix B: Arsenic Reduction Policy Rule Language

Note: The final rule language below contains several typographical errors (see red strikethrough in text below). The majority of these typos incorrectly reference the Arsenic Reduction Policy as section 4, rather than section 7. These typos will be corrected as part of an anticipated rulemaking for the aquatic life toxics criteria in 2013.

OAR 340-041-0033(7)

(7) Arsenic Reduction Policy: The inorganic arsenic criterion for the protection of human health from the combined consumption of organisms and drinking water is 2.1 micrograms per liter. While this criterion is protective of human health and more stringent than the federal maximum contaminant level (MCL) for arsenic in drinking water, which is 10 micrograms per liter, it nonetheless is based on a higher risk level than the Commission has used to establish other human health criteria. This higher risk level recognizes that much of the risk is due to naturally high levels of inorganic arsenic in Oregon's waterbodies. In order to maintain the lowest human health risk from inorganic arsenic in drinking water, the Commission has determined that it is appropriate to adopt the following policy to limit the human contribution to that risk.

(a) The arsenic reduction policy established by this rule section does not become applicable for purposes of ORS chapter 468B or the federal Clean Water Act unless and until the numeric arsenic criteria established by this rule are approved by EPA pursuant to 40 CFR 131.21 (4/27/2000).

(b) It is the policy of the Commission that the addition of inorganic arsenic from new or existing anthropogenic sources to waters of the state within a surface water drinking water protection area be reduced the maximum amount feasible. The requirements of this rule section (OAR 340-041-0033(~~4~~7)) apply to sources that discharge to surface waters of the state with an ambient inorganic arsenic concentration equal to or lower than the applicable numeric inorganic arsenic criteria for the protection of human health.

(c) The following definitions apply to this section (OAR 340-041-0033(~~4~~7)):

(A) "Add inorganic arsenic" means to discharge a net mass of inorganic arsenic from a point source (the mass of inorganic arsenic discharged minus the mass of inorganic arsenic taken into the facility from a surface water source).

(B) A "surface water drinking water protection area," for the purpose of this section, means an area delineated as such by DEQ under the source water assessment program of the federal Safe Drinking Water Act, 42 U.S.C. ¦ 300j 13. The areas are delineated for the purpose of protecting public or community drinking water supplies that use surface water sources. These delineations can be found at DEQ's drinking water program website.

(C) "Potential to significantly increase inorganic arsenic concentrations in the public drinking water supply source water" means:

(i) to increase the concentration of inorganic arsenic in the receiving water for a

discharge by 10 percent or more after mixing with the harmonic mean flow of the receiving water; or

(ii) as an alternative, if sufficient data are available, the discharge will increase the concentration of inorganic arsenic in the surface water intake water of a public water system by 0.021 micrograms per liter or more based on a mass balance calculation.

(d) Following the effective date of this rule, applications for an individual NPDES permit or permit renewal received from industrial dischargers located in a surface water drinking water protection area and identified by DEQ as likely to add inorganic arsenic to the receiving water must include sufficient data to enable DEQ to determine whether:

(A) The discharge in fact adds inorganic arsenic; and

(B) The discharge has the potential to significantly increase inorganic arsenic concentrations in the public drinking water supply source water.

(e) Where DEQ determines that both conditions in subsection (d) of this section (~~4~~7) are true, the industrial discharger must develop an inorganic arsenic reduction plan and propose all feasible measures to reduce its inorganic arsenic loading to the receiving water. The proposed plan, including proposed measures, monitoring and reporting requirements, and a schedule for those actions, will be described in the fact sheet and incorporated into the source's NPDES permit after public comment and DEQ review and approval. In developing the plan, the source must:

(A) Identify how much it can minimize its inorganic arsenic discharge through pollution prevention measures, process changes, wastewater treatment, alternative water supply (for groundwater users) or other possible pollution prevention and/or control measures;

(B) Evaluate the costs, feasibility and environmental impacts of the potential inorganic arsenic reduction and control measures;

(C) Estimate the predicted reduction in inorganic arsenic and the reduced human health risk expected to result from the control measures;

(D) Propose specific inorganic arsenic reduction or control measures, if feasible, and an implementation schedule; and

(E) Propose monitoring and reporting requirements to document progress in plan implementation and the inorganic arsenic load reductions.

(f) In order to implement this section, DEQ will develop the following information and guidance within 120 days of the effective date of this rule and periodically update it as warranted by new information:

(A) A list of industrial sources or source categories, including industrial stormwater and sources covered by general permits, that are likely to add inorganic arsenic to surface waters of the State.

(i) For industrial sources or source categories permitted under a general permit that have been identified by DEQ as likely sources of inorganic arsenic, DEQ will evaluate options for reducing inorganic arsenic during permit renewal or evaluation of Stormwater

Pollution Control Plans.

(B) Quantitation limits for monitoring inorganic arsenic concentrations.

(C) Information and guidance to assist sources in estimating, pursuant to paragraph (~~d~~e)(C) of this section, the reduced human health risk expected to result from inorganic arsenic control measures based on the most current EPA risk assessment.

(g) It is the policy of the Commission that landowners engaged in agricultural or development practices on land where pesticides, fertilizers, or soil amendments containing arsenic are currently being or have previously been applied, implement conservation practices to minimize the erosion and runoff of inorganic arsenic to waters of the State or to a location where such material could readily migrate into waters of the State.

[ED. NOTE: Tables referenced are available from the agency.]

Stat. Auth.: ORS 468.020, 468B.030, 468B.035 & 468B.048
Stats. Implemented: ORS 468B.030, 468B.035 & 468B.048
Hist.: DEQ 17-2003, f. & cert. ef. 12-9-03; DEQ 3-2004, f. & cert. ef. 5-28-04; DEQ 17-2010, f. & cert. ef. 12-21-10; DEQ 8-2011, f. & cert. ef. 6-30-11; DEQ 10-2011, f. & cert. ef. 7-13-11

Appendix C: List and Map of Industrial Dischargers to Surface Water Drinking Water Source Areas

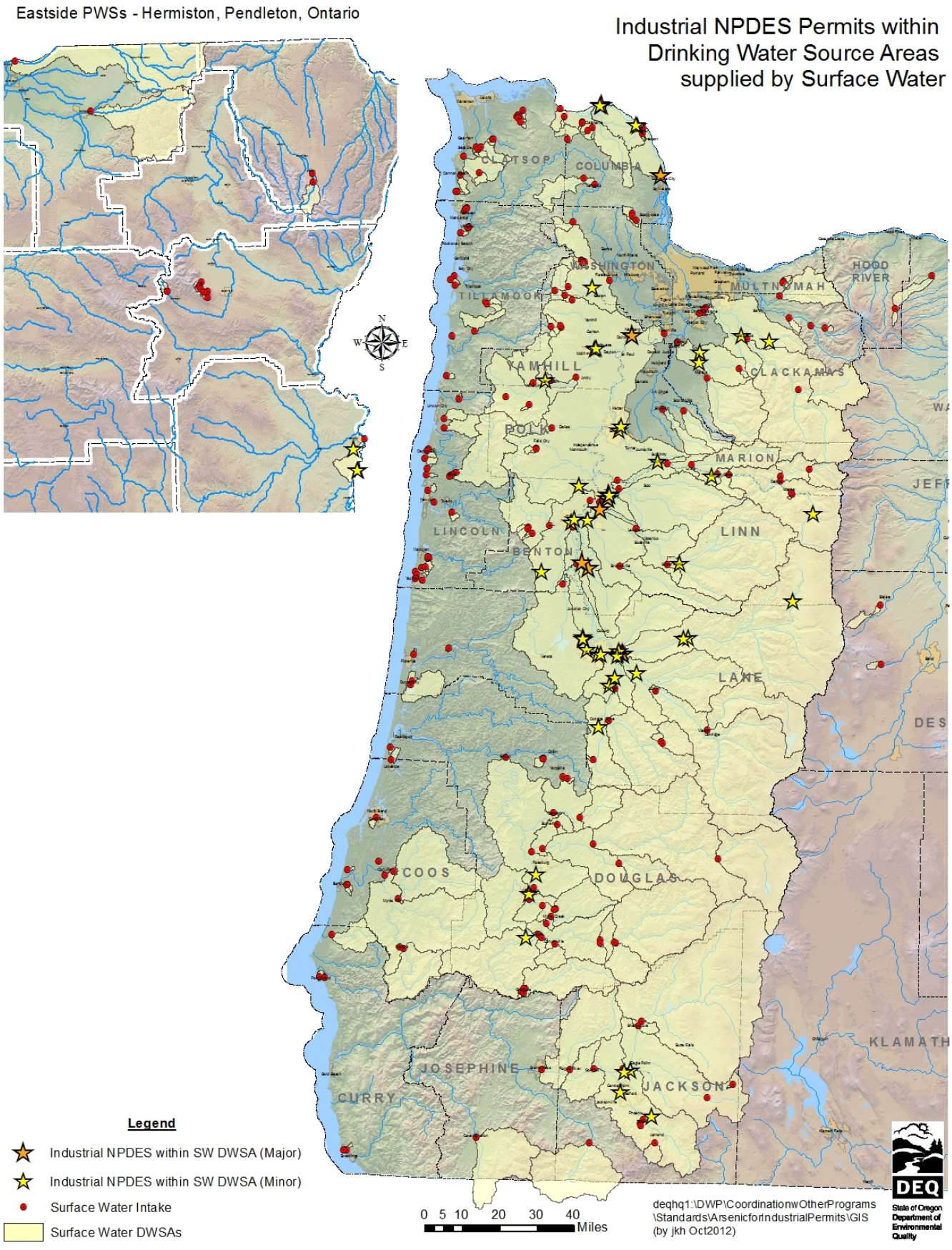
The list of facilities in the following table represent individual industrial NPDES permits located within surface water drinking water source areas. Permit locations are based on latitude and longitude recorded in DEQ's SIS database. This list is current as of August 2012. Although DEQ intends to update this list periodically, permit writers should confirm whether or not this rule pertains to any new or renewing industrial permit. The drinking water program staff at DEQ headquarters (see: http://www.deq.state.or.us/wq/dwp/contacts.htm) can assist permit writers in determining if a NPDES industrial facility discharges to a drinking water source area. Note that "Eastside PWSs" on the accompanying map refer to Eastside Public Water Systems.

No.	Legal Name (Common Name)	Major/ Minor	Facility Type	City	Receiving Stream	Downstream Public Water System
1	Cascade Pacific Pulp, LLC	Major	Pulp Mills	Halsey	Willamette River	Adair Village Water System
2	Dyno Nobel Inc.	Major	Nitrogenous Fertilizers	St. Helens	Columbia River	Rainier Water Department
3	Georgia-Pacific Consumer Products LP Limited Partnership (Halsey Mill)	Major	Paper Mills(No Building Paper)	Halsey	Willamette River	Adair Village Water System
4	International Paper Company (Springfield Paper Mill)	Major	Pulp Mills	Springfield	McKenzie River	Eugene Water & Electric Board
5	International Paper Company (Albany Paper Mill) *Out Of Business as of Aug. 2012*	Major	Paper Mills(No Building Paper)	Albany	Willamette River	City of Wilsonville
6	Oregon Metallurgic, LLC (ATI Albany Operations)	Major	Primary Smelt Nonferrous Metal	Albany	Oak Creek	City of Albany
7	Port of St. Helens (Port of St. Helens Industrial Outfall)	Major	Electric Services	Clatskanie	Columbia River	PGE Beaver Generating Station
8	SP Newsprint Co., LLC	Major	Paper Mills(No Building Paper)	Newberg	Willamette River	City of Wilsonville
9	TDY Industries, LLC (Wah Chang)	Major	Primary Smelt Nonferrous Metal	Albany	Truax Creek	City of Wilsonville
10	Allweather Wood, LLC	Minor	Wood Preserving	White City	Rogue River	City of Gold Hill
11	Amalgamated Sugar Company LLC, The	Minor	Beet Sugar	Nyssa	Snake River	City of Ontario
12	Arclin U.S.A. LLC	Minor	Plastics Materials, Synthetics	Springfield	Patterson Slough	Pope & Talbot Inc.
13	Arden Development, Inc. (Green Diamond	Minor	Ferroalloy Ores (No	Riddle	Crawford Creek	City of Riddle

No.	Legal Name (Common Name)	Major/ Minor	Facility Type	City	Receiving Stream	Downstream Public Water System
	Sand Products)		Vanadium)			
14	Bob Mcayeal (Mcayeals Wardrobe Cleaners Air Stripper)	Minor	Coin-Op Laundries & Cleaners	Eugene	Willamette River	City of Monroe
15	Boise Cascade Wood Products, L.L.C.	Minor	Softwood Veneer And Plywood	Medford	Bear Creek	City of Gold Hill
16	Cascade Steel Rolling Mills, Inc.	Minor	Blast Furnaces & Steel Mills	McMinnville	South Yamhill River	City of Wilsonville
17	Cascade Wood Products, Inc.	Minor	Millwork	White City	Military Slough	Medford Water Commission
18	Conrad Wood Preserving Co.	Minor	Wood Preserving	Rainier	Columbia River	PGE Beaver Generating Station
19	Douglas County Public Works Department (Roseburg Landfill Leachate Treatment System)	Minor	Refuse Systems	Roseburg	South Umpqua River	City of Elkton
20	Eugene Water & Electric Board	Minor	Electric Services	Eugene	McKenzie River	Eugene Water & Electric Board
21	Evanite Fiber Corporation	Minor	Other Wood Products	Corvallis	Willamette River	Adair Village Water System
22	Flakeboard America Limited (Duraflake)	Minor	Reconstituted Wood Products	Albany	Murder Creek	City of Wilsonville
23	Foster Poultry Farms, Inc.	Minor	Poultry Slaughtering	Creswell	Camas Swale Creek	Pope & Talbot Inc.
24	Frank Lumber Co., Inc.	Minor	Sawmills And Planing Mills	Lyons	North Santiam River	Lyons Mehama Water District
25	Georgia-Pacific Chemicals LLC (GP Millersburg Resin Plant)	Minor	Plastics Materials, Synthetics	Albany	Murder Creek	City of Wilsonville
26	Georgia-Pacific Chemicals LLC	Minor	Plastics Materials, Synthetics	Eugene	Amazon Creek	City of Monroe
27	Guernsey Stone Company (Lancaster Ready Mix)	Minor	Construction Sand And Gravel	Salem	Mill Creek	City of Wilsonville
28	Hoover Treated Wood Products, Inc.	Minor	Other Chemical Preparations	Winston	South Umpqua River	Roberts Creek Water District
29	Hull-Oakes Lumber Co.	Minor	Sawmills And Planing Mills	Monroe	Oliver Creek	Adair Village Water System
30	J.H. Baxter & Co., Inc.	Minor	Wood Preserving	Eugene	Amazon Diversion Canal	City of Monroe
31	Jasper Wood Products, LLC	Minor	Wood Preserving	Jasper	Middle Fork Willamette River	Springfield Utility Board
32	Kingsford Manufacturing Company	Minor	Other Wood Products	Springfield	Patterson Slough	Pope & Talbot Inc.
33	Lane County - Waste Management Division (Short Mountain Landfill)	Minor	Refuse Systems	Eugene	Camas Swale Creek	Pope & Talbot Inc.
34	McFarland Cascade	Minor	Wood	Eugene	Unknown	City of Monroe

No.	Legal Name (Common Name)	Major/ Minor	Facility Type	City	Receiving Stream	Downstream Public Water System
	Pole & Lumber Company		Preserving			
35	Norpac Foods, Inc.	Minor	Frozen Fruits,Juice,Vegetables	Stayton	Mill Creek	City of Wilsonville
36	Oregon Department Of Corrections (Oregon State Penitentiary)	Minor	Correctional Institutions	Salem	Mill Creek	City of Wilsonville
37	ODFW (Leaburg Hatchery)	Minor	Operating Fish Hatchery	Leaburg	McKenzie River	Eugene Water & Electric Board
38	ODFW (Mckenzie River Hatchery)	Minor	Operating Fish Hatchery	Leaburg	McKenzie River	Eugene Water & Electric Board
39	ODFW (Clackamas River Hatchery)	Minor	Operating Fish Hatchery	Estacada	Clackamas River	Clackamas River Water - Clackamas
40	ODFW (Marion Forks Hatchery)	Minor	Operating Fish Hatchery	Idanha	Horn Creek	City of Gates
41	Oregon System Of Higher Education (OSU)	Minor	Testing Laboratories	Albany	Calapooia River	City of Wilsonville
42	Oregon System Of Higher Education (OSU - Microbiology, Salmon Disease Laboratory)	Minor	Colleges & Universities	Corvallis	Willamette River	Adair Village Water System
43	Oregon System Of Higher Education (U of O - Central Heat Plant)	Minor	Colleges & Universities	Eugene	Willamette River	Pope & Talbot Inc.
44	Owyhee Ditch Company	Minor	Irrigation Systems	Ontario	Owyhee River	City of Ontario
45	Owyhee Irrigation District	Minor	Irrigation Systems	Nyssa	Malheur River	City of Ontario
46	Pacific Wood Preserving of Oregon, Inc.	Minor	Wood Preserving	Sheridan	South Yamhill River	City of Sheridan
47	Portland General Electric Company (PGE Beaver)	Minor	Electric Services	Clatskanie	Columbia River	PGE Beaver Generating Station
48	Precision Drying Services Inc.	Minor	Wood Preserving	Rainier	Rinearson Slough	PGE Beaver Generating Station
49	Recology Valley View Inc. (Valley View Landfill)	Minor	Refuse Systems	Ashland	Jeffery Creek	City of Gold Hill
50	Rosboro, LLC	Minor	Softwood Veneer And Plywood	Springfield	Patterson Slough	Pope & Talbot Inc.
51	Royal Pacific Industries, Inc.	Minor	Wood Preserving	McMinnville	North Yamhill River	City of Wilsonville
52	Sanders Wood Products, Inc. (RSG Forest Products - Liberal)	Minor	Sawmills And Planing Mills	Liberal	Molalla River	Canby Utility
53	Seneca Sawmill Company	Minor	Sawmills And Planing Mills	Eugene	Unknown	City of Monroe
54	Stimson Lumber Company	Minor	Sawmills And Planing Mills	Gaston	Scoggins Creek	Hillsboro & JWC Plant
55	Sunstone Circuits, LLC	Minor	Printed Circuit Boards	Mulino	Milk Creek	Canby Utility
56	USDOI; Fish & Wildlife Service (Eagle Creek	Minor	Operating Fish Hatchery	Estacada	Eagle Creek	Clackamas River Water - Clackamas

No.	Legal Name (Common Name)	Major/ Minor	Facility Type	City	Receiving Stream	Downstream Public Water System
	National Fish Hatchery)					
57	Valley Landfills, Inc. (Coffin Butte Landfill)	Minor	Refuse Systems	Corvallis	Unknown	City of Wilsonville
58	Weyerhaeuser NR Company (Engineered Lumber Products - Foster)	Minor	Softwood Veneer And Plywood	Foster	Wiley Creek	City of Sweet Home
59	Weyerhaeuser NR Company (Cottage Grove Lumber)	Minor	Softwood Veneer And Plywood	Cottage Grove	Coast Fork Willamette River	City of Creswell

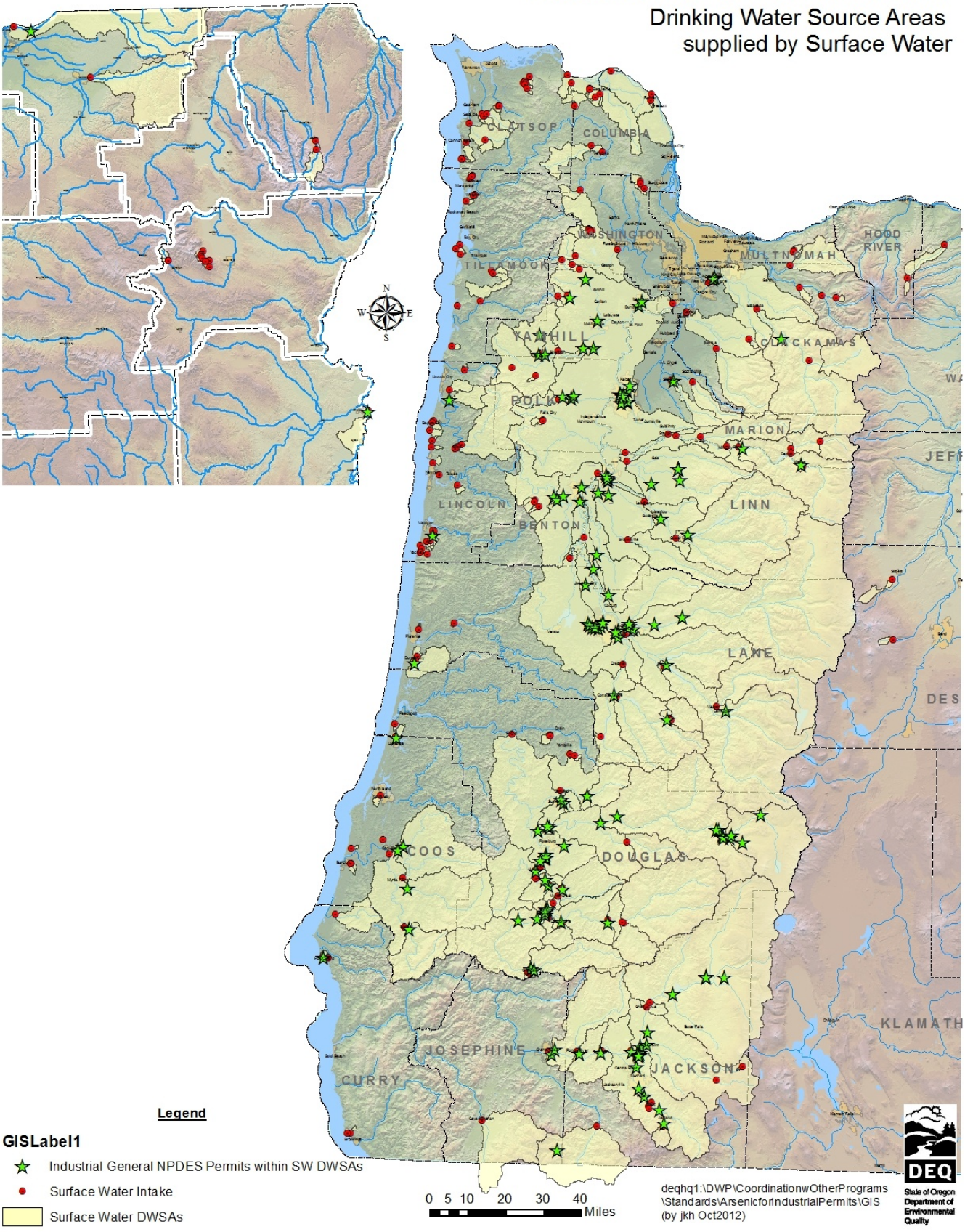

Eastside PWSs - Hermiston, Pendleton, Ontario
Industrial NPDES Permits within Drinking Water Source Areas supplied by Surface Water
CLATSOP
COLUMBIA
WASHINGTON
TILLAMOOK
HOOD RIVER
MULTNOMAH
CLACKAMAS
YAMHILL
POLK
MARION
LINCOLN
BENTON
LINN
LANE
COOS
DOUGLAS
JOSEPHINE
JACKSON
CURRY
KLAMATH
N
W
E
S
Legend
Industrial NPDES within SW DWSA (Major)
Industrial NPDES within SW DWSA (Minor)
Surface Water Intake
Surface Water DWSAs
0 5 10 20 30 40
Miles
deqhq1:\DWP\CoordinationwOtherPrograms\Standards\ArsenicforIndustrialPermits\GIS (by jkh Oct2012)
DEQ
State of Oregon Department of Environmental Quality

Appendix D: Summary List and Map of General Permit Dischargers to Surface Water Drinking Water Source Areas

Note that "Eastside PWSs" on the accompanying map refer to Eastside Public Water Systems.

No.	General Permit Category	Discharge Description	Total Number	Arsenic Monitoring Required?
1	**100J**	non-contact cooling water	39	No
2	**200J**	treatment of drinking water, such as filter backwash and reservoir cleaning	43	No
3	**300J**	fish hatcheries	6	No
4	**400J**	log ponds	15	No
5	**500J**	boiler blowdown	6	No
6	**700PM**	suction dredges and non-motorized instream devices used in placer mining for precious metals.	115	No
7	**900J**	seafood processing and stormwater from seafood processing	1	No
8	**1500A**	petroleum hydrocarbon cleanup from groundwater or surface water	7	No
9	**1700A**	fixed and mobile washwater operations	33	No
TOTAL			**265**	

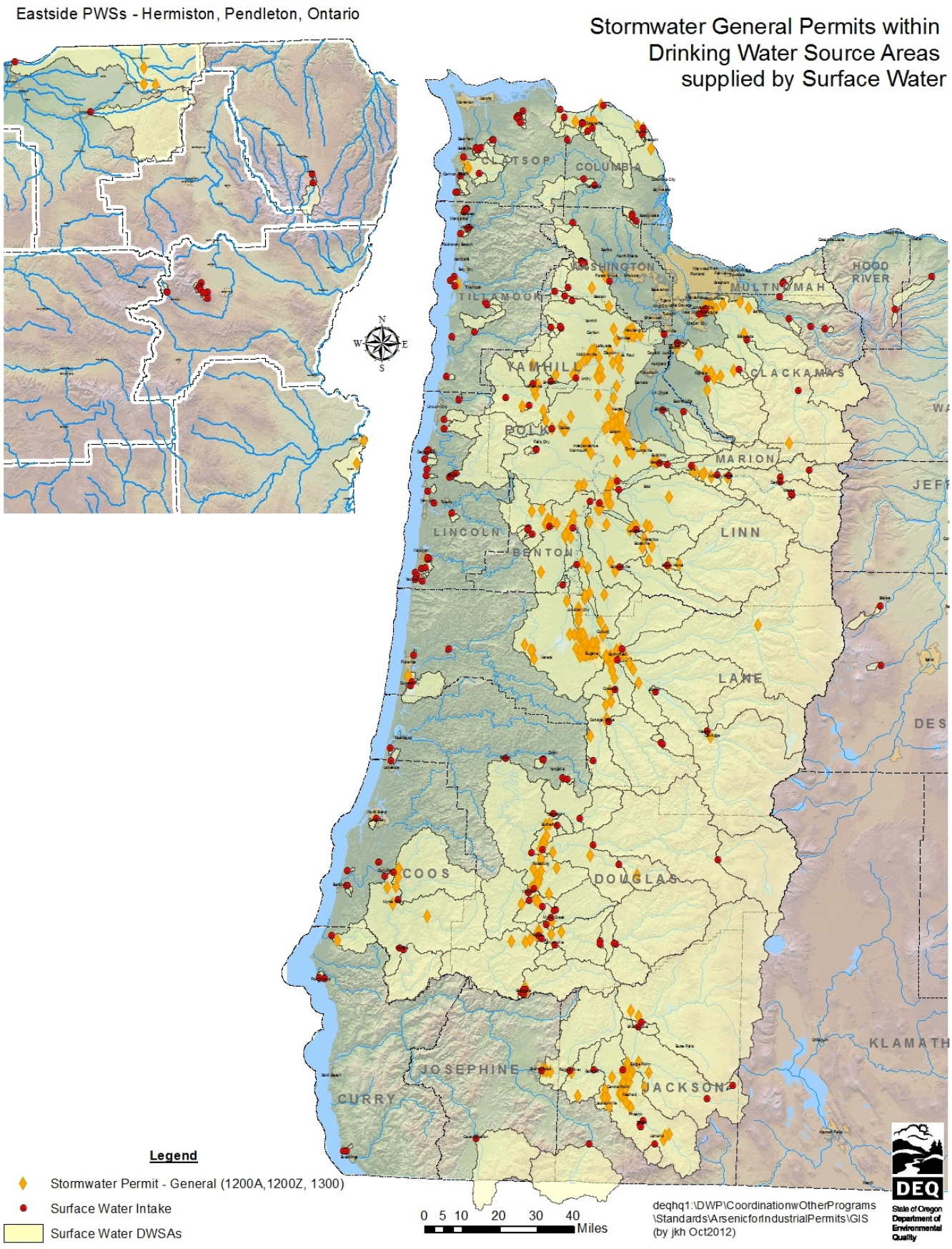
Eastside PWSs - Hermiston, Pendleton, Ontario



Appendix E: Summary List and Map of Industrial Stormwater Permit Dischargers to Surface Water Drinking Water Source Areas

Note that "Eastside PWSs" on the accompanying map refer to Eastside Public Water Systems.

No.	Industrial Stormwater Permit Category	Stormwater Description	Total Number	Arsenic Monitoring Required?
1	**1200A**	sand and gravel mining, rock quarries, concrete batch and hot mix asphalt operations (jointly administered by the Oregon Department of Geology and Mineral Industries)	116	No—unless receiving stream listed for arsenic
2	**1200Z**	specific SIC codes (includes 110 industrial sectors)	346	No—unless receiving stream listed for arsenic
3	**1300J**	oily stormwater and oil & water separators—permit was discontinued in 2006	2	No
TOTAL			**464**	


Eastside PWSs - Hermiston, Pendleton, Ontario
Stormwater General Permits within
Drinking Water Source Areas
supplied by Surface Water
CLATSOP
COLUMBIA
WASHINGTON
TILLAMOOK
HOOD RIVER
MULTNOMAH
YAMHILL
CLACKAMAS
POLK
MARION
LINCOLN
BENTON
LINN
LANE
COOS
DOUGLAS
JOSEPHINE
CURRY
JACKSON
KLAMATH
N
W
E
S
Legend
Stormwater Permit - General (1200A,1200Z, 1300)
Surface Water Intake
Surface Water DWSAs
0 5 10 20 30 40
Miles
deqhq1:\DWP\CoordinationwOtherPrograms
\Standards\ArsenicforIndustrialPermits\GIS
(by jkh Oct2012)
DEQ
State of Oregon
Department of
Environmental
Quality