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25-013

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Determination of Groundwater Under the Direct Influence of Surface Water (GWUDI) – Engineering Review

Background

The Title 179 NAC 13 Attachment 2 provides the Department’s protocol for the determination of the influence of surface water on groundwater sources. Sections III.A and III.B outline conditions for new sources and existing sources, respectively, whereas **if any one of the conditions** is true, then the source water is determined to be potentially at risk to the direct influence of surface water.

Per Section III.D of Title 179 NAC 13 Attachment 2:

“If a source water is determined to be potentially at risk to the direct influence of surface water in accordance with the criteria in III.A or III.B above, particulate analysis samples must be taken from the source as follows:

- 1. A minimum of a set of two samples must be collected and analyses performed for the presence of green algae, blue-green algae, diatoms, nematodes, flagellates, and gastrotrichs. The second sample must be taken a minimum of 24 hours after the conclusion of the previous sampling. Samples must be collected in accordance with the Consensus Method for Determining Groundwaters under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA) which is incorporated herein by reference. This publication is available from the National Technical Information Service, NTIS PB93-180818, U.S. Department of Commerce, 5301 Shawnee Road, Alexandria, Virginia 22161. The toll-free number is 800-553-6847. This document may be inspected at the Division of Public Health of the Department of Health and Human Services, 301 Centennial Mall South, Lincoln, NE 68509. Sample collection must be at such times as the ground water source is most vulnerable to surface water infiltration (e.g., during periods of high surface water stages, after heavy rainfall or runoff events); however, sample collection will not be required when the source would not be used due to abnormal conditions including but not limited to flooding and natural disasters. Sample volumes must be at least 500 gallons. Analysis must be made by a certified laboratory that has entered into an agreement with the Department laboratory as specified in 179 NAC 20.*
- 2. The identification of giardia or cryptosporidium cyst in any source water samples will be considered conclusive evidence of direct surface water influence. The presence of any of the indicators given in III.D.1 in both samples will be considered evidence of potential surface water influence and trigger an engineering review of the source. The engineering*

review will include but will not be limited to risk levels presented in the MPA results. If the source is determined to be ground water under the direct influence of surface water, it will be subject to Title 179 regulations regarding surface water and ground water under the direct influence of surface water unless the system is able to determine that a structural defect led to the presence of the indicator organisms in the sample(s). If a structural defect is found and corrected, the system may sample again in order to determine if the source is under the direct influence of surface water.”

The following section highlights the Department’s engineering review procedure following the collection of the MPA samples that will be utilized to determine if a source water is groundwater under the direct influence of surface water.

Engineering Review Guidance

Following the collection of two MPA samples in accordance with Title 179 NAC 13A Attachment 2, the results will be analyzed as follows in this section to determine if the source water is groundwater under the direct influence of surface water. Scoring will be in accordance with the Environmental Protection Agency’s Consensus Method for Determining Groundwaters under the Direct Influence of Surface Water Using Microscopic Particulate Analysis.

- I. If both MPA analyses have a low-risk score (each has a risk score of less than 10), the source water will be classified as groundwater.
- II. If any MPA analysis has a high-risk score (risk score greater than 19), the source water will be classified as groundwater under the direct influence of surface water.
- III. If both MPA analyses each have a risk score greater than 14, the source water will be classified as groundwater under the direct influence of surface water.
- IV. If any MPA analysis has a moderate-risk score ($10 \leq \text{risk score} \leq 19$) and the source is not already determined to be GWUDI in Item III., then two additional MPA analyses must be conducted, and water source classification will be made as follows:
 - a. If all four of the MPA risk scores are less than 15, the water source is classified as groundwater.
 - b. If any MPA risk score is greater than 19 or two or more MPA risk scores are each greater than 14, the water source is classified as groundwater under the influence.
 - c. If only one of the four MPA risk scores is greater than 14 but less than 20, additional analysis will be required. This may include collecting additional MPA samples, one year of water quality monitoring, a hydrogeologic evaluation prepared by a professional geologist or professional engineer submitted to the Department for review, and/or other method as may be required by the Department.

Appendix A. EPA Relative Risk Tables from Consensus Method for Determining Groundwaters under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (October 1992)

Table 1. Numerical range of each primary bio-indicator (particulate) counted per 100 gallons water.

Indicators of surface water ¹	EH ³	H	M	R	NS
Giardia ²	>30	16-30	6-15	1-5	<1
Coccidia ²	>30	16-30	6-15	1-5	<1
Diatoms ⁴	>150	41-149	11-40	1-10	<1
Other Algae ⁴	>300	96-299	21-95	1-20	<1
Insects/Larvae	>100	31-99	16-30	1-15	<1
Rotifers	>150	61-149	21-60	1-20	<1
Plant Debris ⁴	>200	71-200	26-70	1-25	<1

1. According to EPA "Guidance Manual for Compliance with the Filtration and Disinfection Requirements for Public Water Systems Using Surface Water Sources", March 1991 ed.
2. If Giardia cysts or coccidia are found in any sample, irrespective of volume, score as above.
3. Key: EH – extremely heavy; H – heavy; M – moderate; R – rare; NS – not significant
4. Chlorophyll containing

Table 2. Relative surface water risk factors associated with scoring of primary bio-indicators (particulate) present during MPA of subsurface water sources.

Indicators of surface water ¹	Relative Risk Factor ³				
	EH ²	H	M	R	NS
Giardia	40	30	25	20	0
Coccidia	35	30	25	20	0
Diatoms	16	13	11	6	0
Other Algae	14	12	9	4	0
Insects/Larvae	9	7	5	3	0
Rotifers	4	3	2	1	0
Plant Debris	3	2	1	0	0

1. According to EPA "Guidance Manual for Compliance with the Filtration and Disinfection Requirements for Public Water Systems Using Surface Water Sources", March 1991 ed.
2. Refer to Table 1 for range of indicators counted per 100 gallons.
Key: EH – extremely heavy; H – heavy; M – moderate; R – rare; NS – not significant
3. Refer to Table 3 for risk of surface water contamination

Table 3. Risk of Groundwater Contamination by Surface Water Influence²

$\geq 20^1$	High Risk
10-19	Moderate Risk
≤ 9	Low Risk

1. Refer to Table 2 for numerical relative risk factor.
2. The relative risk factors for each indicator should be added together to obtain the total risk score above.

Appendix B. Determination of Groundwater Sources Under the Direct Influence of Surface Water Flowchart

