



A Source Water Assessment (SWA) for PWSID #260228 - CHIGNIK BAY WATER SYSTEM –IN001

What is an SWA?

The Drinking Water Protection group of the Drinking Water Program is producing Source Water Assessments (SWAs) in compliance with the Safe Drinking Water Act (SDWA) Amendments of 1996. Each SWA includes:

- A delineation of the drinking water source area;
- Inventory of potential and existing sources of contamination;
- Risk ranking for the identified contaminants;
- Evaluation of the overall vulnerability to the PWS source.

What is a Protection Area?

The most probable area for contamination to reach the drinking water well is within the drinking water protection area (DWPA). The DWPA for a groundwater source is the area around the well (the area influenced by pumping) and also the area upgradient of the well, usually forming a parabola shape. Because releases of contaminants within the DWPA are most likely to impact the well, this area will serve as the focus for voluntary protection efforts.

The DWPAs established for wells by DEC are separated into 2 zones, limited by the watershed. The following is a summary of the two zones for wells and the estimated time-of-travel for each:

Zone	Definition
A	Several months time-of-travel
B	Less than the 2 year time-of-travel

Natural Susceptibility

Susceptibility of a groundwater source is a measure of a water supply's potential to become contaminated based on information gathered on the wellhead and the aquifer.

Table 1: Public Water System Source Information

<i>PWS Name</i>	Chignik Bay Water System
<i>PWS ID Number</i>	260228
<i>State Asgn ID No.</i>	IN001
<i>Facility Name</i>	IN Surface Water Source
<i>Source Type</i>	Surface Water
<i>Federal Classification</i>	Community water system
<i>River/Stream Discharge</i>	<20,000 cfs*

*"cfs" = cubic feet per second

Executive Summary

The public water system (PWS) for CHIGNIK BAY WATER SYSTEM is a Community water system (CWS) consisting of two (2) groundwater wells and one intake, at the time of this report, located in Chignik Bay, Alaska. This report is for IN001 (IN Surface Water Source). The drinking water protection area (DWPA) for IN001 is approximately 3.2 square miles in size and received a susceptibility rating of **Very High**. *A rating of High to Very High is typical for all systems with surface water intakes.* No potential or existing sources of contamination were identified within the DWPA for Chignik Bay Water System IN001. Potential sources of contamination include those posing a risk of 1) bacteria and viruses; 2) nitrates and/or nitrites (nitrates); 3) volatile organic chemicals (VOCs); 4) heavy metals, cyanide, and other inorganic chemicals (inorganics); 5) synthetic organic chemicals (SOCs); and 6) other organic chemicals (OOCs).

Combining the natural susceptibility of the well and aquifer with the six (6) contaminant risk categories, CHIGNIK BAY WATER SYSTEM IN001 received an overall vulnerability rating of **Medium** for bacteria and viruses; **Medium** for nitrates and/or nitrites; **Medium** for VOCs; **Medium** for inorganic chemicals; and a **Medium** for SOCs and **Medium** for OOCs.

Introduction

Source Water Assessments (SWAs) are intended to provide PWS operators, owners, communities, and local governments with the best available information that may be used to protect the quality of their drinking water. The SWA for the CHIGNIK BAY WATER SYSTEM IN001 is a tool to be used as the foundation or “stepping stone” to comprehensive management and protection of its groundwater resource. Protecting the quality of your drinking water is a sensible investment.

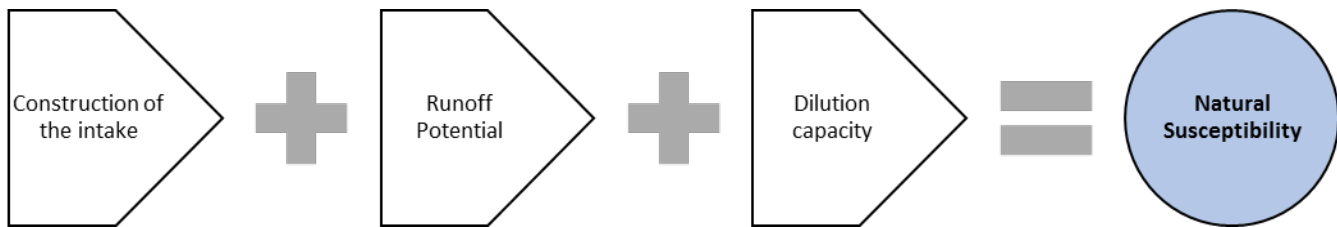
Drinking Water Protection Area

For groundwater sources, a combination of a numerical flow model and natural factors such as drainage divides, subsurface barriers, and manmade structures are used to determine the size and shape of the Drinking Water Protection Area (DWPA). The orientation of the DWPA is typically drawn using a groundwater surface, or a land surface, elevation map. Because of uncertainties and changing site conditions, a factor of safety is added in calculating the size of the DWPA. (See Map1 of the Appendices)

Natural Susceptibility (Surface Water Source)

The natural susceptibility of a surface water source to the introduction of contaminants is determined by, but not limited to, the following risk factors: the general adequacy of intake construction, the potential for runoff or flooding, and the capacity of the surface water body to dilute contaminants.

Based on the most recent sanitary surveys (completed October 12, 2009 and October 16, 2006) and properties of the surrounding area, the Natural Susceptibility of the surface water source for CHIGNIK BAY IN001 received a rating of Very High.



Inventory of Potential and Existing Sources Contamination

The Drinking Water Protection (DWP) group has completed an inventory of potential and existing sources of contamination within the DWPA for the CHIGNIK BAY WATER SYSTEM IN001. This inventory was completed through a search of agency records and other publicly available information. Potential sources of contamination include a wide range of categories and types. Potential drinking water contaminants are found within agricultural, residential, commercial, and industrial areas, but can also occur within areas that have little or no development. The identified potential sources of contamination are summarized in Table 3 and are portrayed in Map 2 of the Appendices.

Table 3: Contaminant Source Inventory

Contaminant Source Type	Contaminant Source ID	Zone	Comments
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None Identified	N/A	N/A	N/A
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Contaminant Risks

Inventoried contaminant sources are sorted by the Drinking Water Protection (DWP) group according to the six (6) major categories of contaminants regulated for drinking water: 1) bacteria and viruses; 2) nitrates and/or nitrites; 3) volatile organic chemicals (VOCs); 4) heavy metals, cyanide, and other inorganic chemicals (inorganic chemicals); 5) synthetic organic chemicals (SOCs); and 6) other organic chemicals (OOCs). The contaminant sources are then given a ranking (within each category) according to the density of sources within the DWPA, the PWS sampling history, as well as the degree of risk posed to human health based on the volume, toxicity, persistence, and the mobility of the contaminants involved. The contaminant risk rankings are summarized in Table 4.

Table 4: Contaminant Risk Rankings

Contaminant Source Type	Contaminant Source ID	Zone	Bacteria & Viruses	Nitrates and/or Nitrites	VOCs	Inorganic Chemicals*	SOCs	OOCs
None Identified	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Contaminant Category Risk Ranking**			Low	Low	Low	Low	Low	Low

* Includes heavy metals, cyanide, and other inorganic chemicals.

** Scores based on additional factors, such as sampling history, and number/density of sources.

The contaminant category risk ranking for Bacteria & Viruses is **Low**. . There are no identified potential sources of contamination for Bacteria and Viruses located within the DWPA. A positive Total Coliform (which may include fecal coliform and *E. Coli*, but not a confirmation of the presence of either) has not been detected in recent years. Coliforms are naturally present in the environment, as well as feces; fecal coliforms and *E. Coli* only come from human and animal fecal waste. Total Coliforms is not a health threat in itself; it is used to indicate whether other potentially harmful bacteria may be present.

The contaminant category risk ranking for Nitrates and/or Nitrites is **Low**. . There are no identified potential sources of contamination for Nitrates and/or Nitrites located within the DWPA. Nitrates and/or nitrites have been detected in samples collected in recent years, but an increasing or decreasing trend is not apparent; the most recent sample collected March 2012, showed a total nitrate-nitrite concentration of 0.11 milligrams per liter (mg/L), which is 1% of the maximum contaminant level (MCL) of 10 mg/L for nitrate. Sources of nitrate and/or nitrite may include runoff from fertilizer use, leaking from septic tanks, sewage, and/or erosion from natural deposits. A relatively low concentration and absence of a clear trend implies that the source is natural, rather than anthropogenic. Potential health effects include serious illness and, if untreated, death for infants below the age of six months; symptoms include a shortness of breath and blue-baby syndrome.

The contaminant category risk ranking for VOCs is **Low**. There are no identified potential sources of contamination for VOCs located within the DWPA. VOCs have been detected in recent samples. Toluene was detected in samples taken September 2014 at a concentration of 0.51 micrograms per liter (µg/L), which is .05% of the maximum contaminant level (MCL) of 1 mg/L (1000 µg/L) for toluene. The major source of toluene in drinking water is discharge from petroleum factories. Potential health effects from long term exposure above the maximum contaminant level (MCL) are problems with nervous system, kidneys, or liver. Xylenes were detected in samples taken August 2013 at a concentration of 0.55 micrograms per liter (µg/L), which is .01% of the maximum contaminant level (MCL) of 10 mg/L (1000 µg/L) for xylenes.

The major source of xylenes in drinking water is discharge from petroleum and chemical factories. A Potential health effect from long term exposure above the maximum contaminant level (MCL) is damage to the nervous system.

The contaminant category risk ranking for Inorganic Chemicals is **Low**. There are no identified potential sources of contamination for Inorganic Chemicals located within the DWPA. Barium was detected at a concentration of 3.13 micrograms per liter ($\mu\text{g/L}$) (0.16% of the MCL of 2000 $\mu\text{g/L}$) July 2011. The major sources of barium in drinking water are discharge of drilling wastes; discharge from metal refineries; and erosion of natural deposits. A potential health effect from long-term exposure above the MCL is an increase in blood pressure.

The contaminant category risk ranking for SOCs is **Low**. There are no identified potential sources of contamination for SOCs located within the DWPA. This PWS has received an SOC Monitoring Waiver for compliance periods 2011-2013, 2005-2007, and 2002-2004.

The contaminant category risk ranking for OOCs is **Low**. There are no identified potential sources of contamination for OOCs located within the DWPA. This PWS has received an SOC Monitoring Waiver for compliance periods 2011-2013, 2005-2007, and 2002-2004.

Overall Vulnerability of the Drinking Water Source to Contamination

An overall vulnerability is determined by combining each of the contaminant category risk rankings with the natural susceptibility score:

Overall Vulnerability of the Drinking Water Source to Contamination = Natural Susceptibility + Contaminant Risks

Table 5 summarizes the overall vulnerability ratings for each of the six (6) contaminant categories.

<i>Category</i>	<i>Rating</i>
Bacteria and Viruses	Medium
Nitrates and/or Nitrites	Medium
Volatile Organic Chemicals	Medium
Heavy Metals, Cyanide, and Other Inorganic Chemicals	Medium
Synthetic Organic Chemicals	Medium
Other Organic Chemicals	Medium

Using the Source Water Assessment

This assessment of contaminant risks and source vulnerability can be used as a foundation for local voluntary protection efforts as well as a basis for the continuous efforts on the part of the CHIGNIK BAY WATER SYSTEM PWS to protect public health. Communities can use the Source Water Assessment (SWA) to create a drinking water protection plan to manage the identified potential and existing sources of regulated drinking water contaminants and to prevent or minimize new contaminant threats in the drinking water protection area.

The CHIGNIK BAY WATER SYSTEM PWS can use a number of different drinking water protection methods to limit or prevent contamination of its drinking water source.

- *Non-Regulatory Options include:*
 - Public education about where drinking water comes from and the effects of contaminants is probably the most effective and least costly method of protection;
 - Household hazardous waste collection - household hazardous wastes are usually generated in small amounts but can have a big impact on the environment;
 - The source water assessment report is a tool that can be used to prioritize protection strategies identified in a drinking water protection plan;
 - Taking proactive measures towards proper waste storage and disposal can help eliminate the need to find an alternative drinking water source by preventing source water contamination;
 - Conservation easements - easements can assist in protecting the area by limiting development;
 - Make a written plan on what you will do if an accidental spill happens that could contaminate your source of drinking water; and
 - Local drinking water protection plan (an example or template is available from DEC).

- *Regulatory Options include:*
 - Source protection regulations prohibiting the presence or use of all or specific chemicals within the drinking water protection area;
 - Zoning ordinances to control development within the different protection areas around the source;
 - Subdivision ordinance; and
 - Operating standards for industrial and other activities within the different protection areas around the source.

Source Water Assessments can be updated to reflect any changes in the vulnerability and/or susceptibility of the CHIGNIK BAY WATER SYSTEM IN001. The data that is used to generate the SWA is updated on an on-going basis as identified in the field or if changes are identified and brought to the attention of the Drinking Water Program.

Where to go from here?

The SWA is a comprehensive evaluation of the potential risk of contamination to the PWS and the source(s) of drinking water used by the system. Identifying potential sources of contamination and the vulnerability of the PWS is an important first step in protecting the drinking water source from contamination. However, in order to prevent contamination from occurring, action must be taken by the PWS owner and/or operator. The SWA can be used by the PWS to educate the local community and to prioritize community-driven protection strategies. Inviting community members, council members, and local government officials to help develop a drinking water protection plan is one essential component towards successful drinking water protection efforts. For questions regarding, or assistance to begin, the process of developing a drinking water protection plan, please contact the Drinking Water Protection group toll-free at #1-866-956-7656 (within Alaska only), or direct at #907-269-7656.

Other Resources

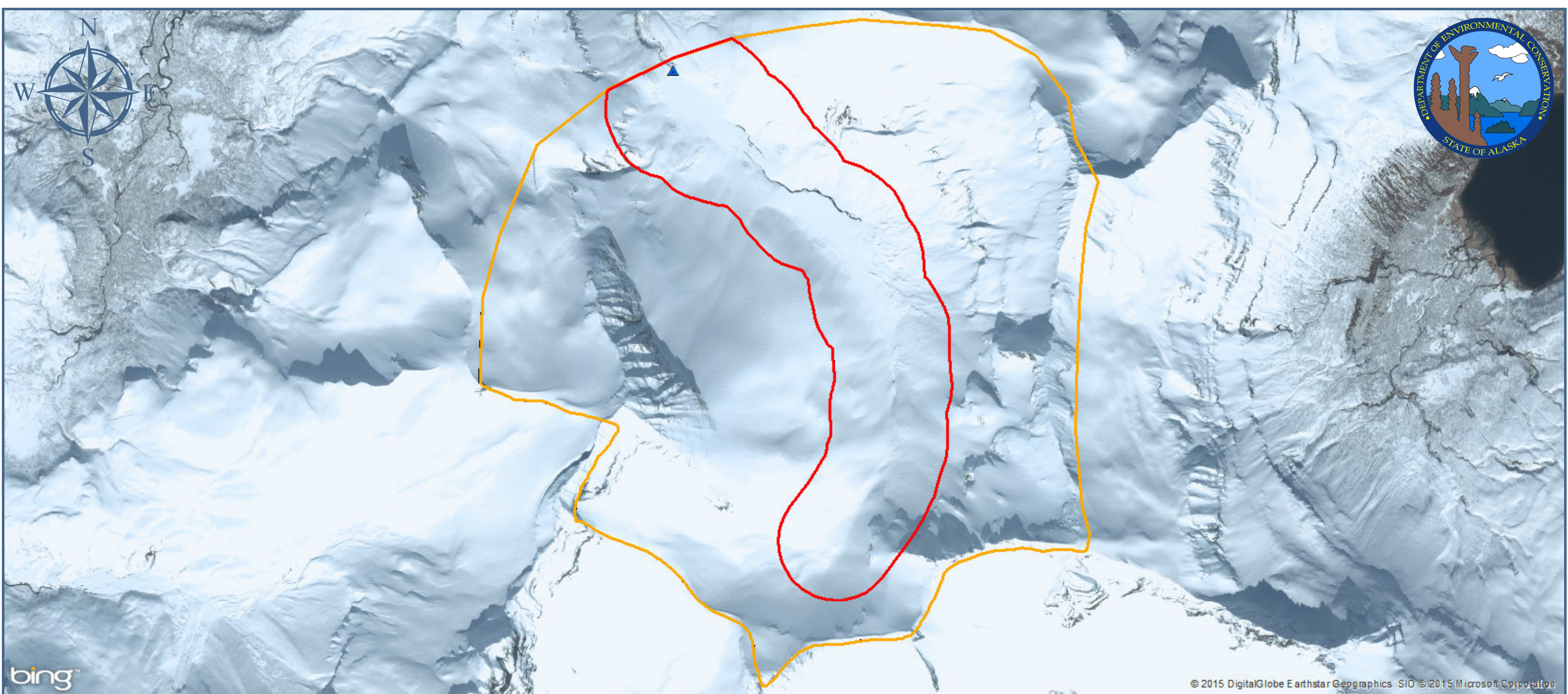
The Drinking Water Protection group, the Environmental Protection Agency (EPA), and local organizations are available to help you build on this SWA report as you continue to improve drinking water protection in your community.

- DEC, Drinking Water Protection - http://dec.alaska.gov/eh/dw/DWP/DWP_main.html

- EPA, Drinking Water Protection - <http://cfpub.epa.gov/safewater/sourcewater/index.cfm>
- Groundwater Foundation - <http://www.groundwater.org>
- Groundwater Protection Council- <http://www.gwpc.org>
- National Ground Water Association: <http://www.ngwa.org/Pages/default.aspx>

Appendices

- CHIGNIK BAY WATER SYSTEM IN001 Drinking Water Protection Area Location Map (Map 1);
- CHIGNIK BAY WATER SYSTEM IN001 Drinking Water Protection Area with Potential and Existing Contaminant Sources (Map 2);
- Example Best Management Strategies for Potential Contaminants Identified within a Drinking Water Protection Area.



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Source Water Assessment Report

Map 1 - Contaminant Source Inventory

PWSID 260228: Chignik Bay Water System
IN001: Surface Water Source



Legend

- ▲ Community Water System (Active)
- ◐ Community Water System (Inactive)
- ▲ NonCommunity Water System (Active)
- ◐ NonCommunity Water System (Inactive)
- ▲ NonPublic Water System (Active)
- ◐ NonPublic Water System (Inactive)
- ▲ NonTransient/NonCommunity Water System (Active)
- ◐ NonTransient/NonCommunity Water System (Inactive)

Identified Drinking Water Protection Areas (DWPAs)

- ◻ Zone A (GW-Several Months Time of Travel or SW 1000 ft buffer)
- ◻ Zone B (GW-2 Yr Time of Travel or SW-1 mile buffer)
- ◻ Zone C Surface Water (Watershed Boundary)

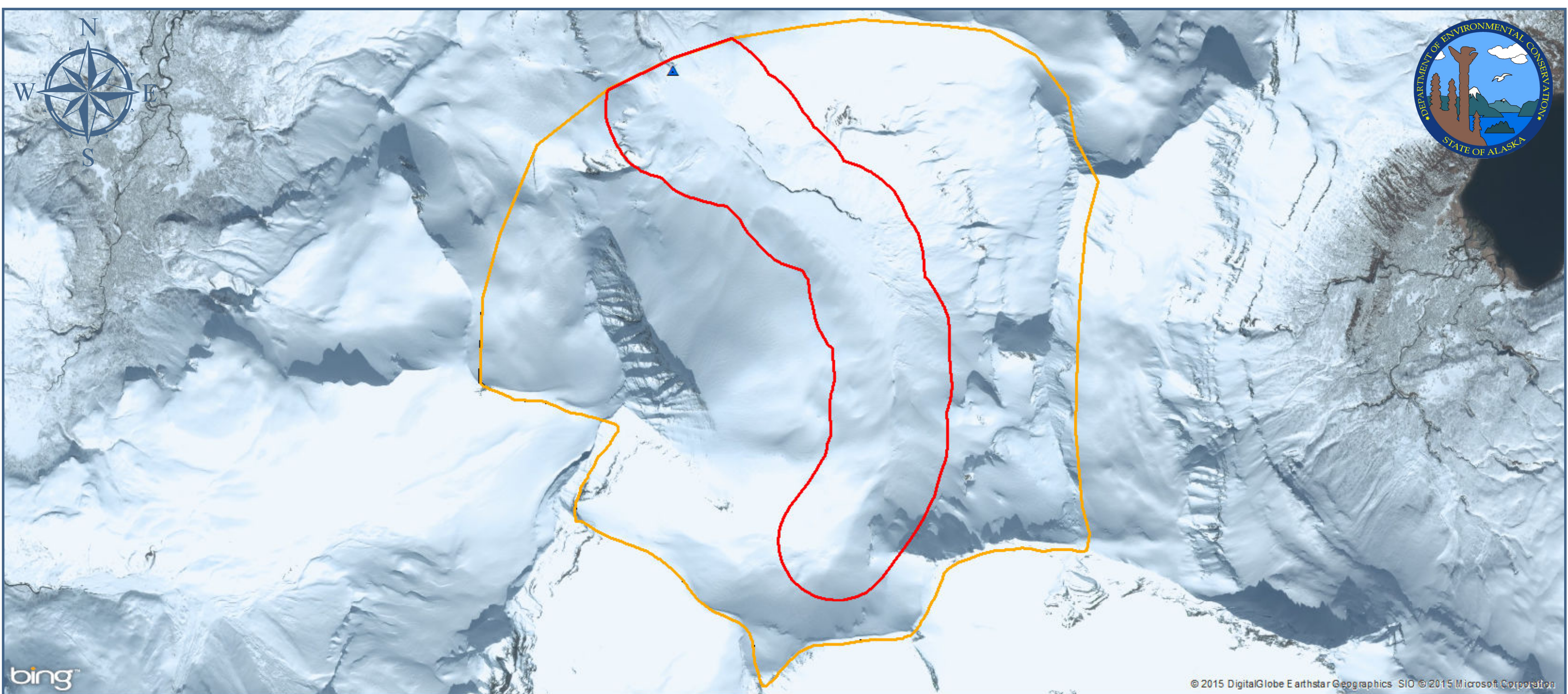
0 650 1,300 2,600 Feet
1 inch = 1,600 feet

Data sources: Alaska DEC: Public Water System sources and Drinking Water Protection Areas; Alaska Mapped Best Data Layer Web Map Service: Aerial Imagery.

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Source Water Assessment Report

Map 2 - Contaminant Source Inventory

PWSID 260228: Chignik Bay Water System
IN001: Surface Water Source



Legend

- ▲ Community Water System (Active)
- Community Water System (Inactive)
- ▲ NonCommunity Water System (Active)
- NonCommunity Water System (Inactive)
- ▲ NonPublic Water System (Active)
- NonPublic Water System (Inactive)
- ▲ NonTransient/NonCommunity Water System (Active)
- NonTransient/NonCommunity Water System (Inactive)

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