Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for Grande Denali/Denali Bluffs Kingfisher Creek Intake Public Drinking Water System, McKinley Park, Alaska PWSID # 391794.003

DRINKING WATER PROTECTION REPORT 1850

Alaska Department of Environmental Conservation

February, 2009

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The Drinking Water Protection (DWP) section of the Drinking Water Program is producing Source Water Assessments in compliance with the Safe Drinking Water Act Amendments of 1996. Each assessment includes a delineation of the source water area, an inventory of potential and existing contaminant sources that may impact the water, a risk ranking for each of these contaminants, and an evaluation of the potential vulnerability of these drinking water sources.

These assessments are intended to provide public water systems owners/operators, communities, and local governments with the best available information that may be used to protect the quality of their drinking water. The assessments combine information obtained from various sources, including the U.S. Environmental Protection Agency, Alaska Department of Environmental Conservation (DEC), public water system owners/operators, and other public information sources. The results of this assessment are subject to change if additional data becomes available. It is anticipated this assessment will be updated every five years to reflect any changes in the vulnerability and/or susceptibility of public drinking water source. If you have any additional information that may affect the results of this assessment, please contact the DWP staff at the following number: 1-866-956-7656.

February, 2009

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Source Water Assessment for the Grande Denali/Denali Bluffs - Kingfisher Creek Drinking Water System, McKinley Park, Alaska

Drinking Water Protection
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The public water system for Grande Denali/Denali Bluffs is a Class B (transient/non-community) water system consisting of two wells and a surface water intake located at Mile 238.4 of the Parks Highway, near McKinley Park, Alaska. This report applies only to PWSID 391794.003, also known as the Kingfisher Creek intake. The Grande Denali/Denali Bluffs - Kingfisher Creek protection area received an overall susceptibility rating of **Very High**. *A rating of high to very high is typical for all systems with surface water intakes*. Potential and existing sources of the following contaminants were evaluated for the Source Water Assessment: bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals. The only potential source of contamination identified for this drinking water source was a road. This evaluation included all available water sampling data submitted to DEC by the system operator. The samples may have been collected from either raw water or post-treated water. Combining the susceptibility of the surface water source with the contaminant risks, this water system has received a vulnerability rating of **Medium** for each of the three contaminant categories. This assessment 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 Grande Denali/Denali Bluffs to protect public health.

DRINKING WATER SYSTEM AND AREA OVERVIEW

Grande Denali/Denali Bluffs public water system is a Class B (transient/non-community) water system. The system consists of two wells and a surface water intake located at Mile 238.4 of the Parks Highway, near McKinley Park, Alaska (see Map A in Appendix A). This report applies only to PWSID 391794.003, also known as the Kingfisher Creek intake. The intake obtains surface water from Kingfisher Creek near Grande Denali/Denali Bluffs.

The nearest community is McKinley Park, located 14 miles north at the entrance to Denali National Park. It sits in the Nenana River valley, which cuts through the steeply rising peaks of the Alaska Range. McKinley Park is primarily a seasonal community, with a population of 138 residents during the busy summer tourist season. The McKinley Park area lies in the Denali Borough (population 2,033), which encompasses more than 12,000 square miles and also includes the communities of Anderson, Cantwell, and Healy (ADCCED, 2009).

Most of the residents in the area operate businesses catering to the influx of park visitors, and the majority of the businesses are located along the river or on the gentler slopes at the base of the mountains. Average annual precipitation in the area is 11.3 inches, and temperatures range from lows if -22 degrees Fahrenheit in January to highs of 72 degrees Fahrenheit in July (ADCCED, 2009).

Residences and businesses in the area either haul water and use outhouses, or have private septic systems and wells. Refuse is hauled to the Denali Borough landfill south of Anderson (ADCCED, 2009).

The geology of the McKinley Park area is characterized by glacial sediments overlying bedrock. This glacial till has been reworked by rivers in some areas, and often consists of well-rounded to angular rock fragments, mixed with sand and silt. Local fractures in the bedrock can provide pathways for the migration of groundwater (Lanning, 1994).

The most recent sanitary survey for this system (08/11/2004) indicates that the water intake is screened and maintained. The survey also states that the average daily production of the system (when active) is approximately 35,000 gallons per day.

This system operates seasonally from May to the end of September and serves one hundred and fifty residents and up to seven hundred non-residents through thirty-eight service connections.

GRANDE DENALI/DENALI BLUFFS - KINGFISHER CREEK DRINKING WATER PROTECTION AREA

Identifying the pathways most likely for surface contamination to reach water intake areas is the first step in determining the water system's risk. These are initially determined by looking at the drainage area contributing overland water flow to a surface water source intake. The entire drainage area is also known as the "drinking water protection area".

The protection area established for surface water sources by the DEC is usually separated into three

zones, limited by the watershed boundary. These zones correspond to the overland-flow distance that water travels to get to the source. The DEC Drinking Water Protection Technical Advisory Committee developed guidelines for derivation of these zones in 1998. The following is a summary of the three protection area zones:

Table 1. Definition of Zones

Zone	Definition
A	Areas within 1000-ft of lakes or streams
B	Areas within 1-mile of lakes or streams
C	The watershed boundary

Due to the small size of the watershed, the protection area for the Grande Denali/Denali Bluffs - Kingfisher Creek water intake includes only Zones A and B (see Map A of Appendix A).

INVENTORY OF POTENTIAL AND EXISTING CONTAMINANT SOURCES

Drinking Water Protection staff has completed an inventory of potential and existing sources of contamination within Grande Denali/Denali Bluffs - Kingfisher Creek protection area. This inventory was completed through a search of agency records and other publicly available information. There is a wide array of potential contamination sources to surface water. These contaminants are found within agricultural, residential, commercial, and industrial areas, but *can also occur within areas that have little or no development.*

For Class B public water system assessments, three categories of drinking water contaminants were inventoried. They include:

- Bacteria and viruses;
- Nitrates and/or nitrites; and
- Volatile organic chemicals.

Sources identified in the Grande Denali/Denali Bluffs - Kingfisher Creek protection area are displayed on Map C of Appendix C and summarized in Table 1 of Appendix B.

RANKING OF CONTAMINANT RISKS

Once potential and existing sources of contamination have been identified, they are assigned a ranking according to what category and level of risk they represent. Ranking of contaminant risks for "potential" or "existing" sources of contamination is a function of the toxicity and the volume of specific contaminants associated with that source. Rankings include:

- Low;
- Medium;
- High; and
- Very High.

The time-of-travel for contaminants within the water is dependent on the physical and chemical characteristics of each contaminant. Bacteria and Viruses are only inventoried in Zone A because of their short life span. Only "Very High" and "High" rankings are inventoried within Zones B and C due to the probability of contaminant dilution by the time the contaminants reach the water intake.

The remaining tables in Appendix B (if necessary) contain the ranking of potential and existing sources of contamination with respect to bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals.

VULNERABILITY OF THE DRINKING WATER SYSTEM

Vulnerability of a drinking water source to contamination is a combination of two factors:

- Surface Water Susceptibility; and
- Contaminant risks.

The Surface Water Susceptibility of the source is reached by considering the properties of the water intake and the surrounding area.

Susceptibility of the Surface Water Source – always considered as "high".

+

Adequate Construction of the Intake

+

Runoff Potential Within Zone B

+

Dilution Capacity of the Surface Water

=

Overall Susceptibility

The surface water intake is not buffered from potential and existing contamination and is therefore always considered highly susceptible to contamination.

Table 2. Susceptibility of the Water Source

Category	Score	Rating
Overall Susceptibility	40	Very High

For contaminants, risks to a drinking water source depend on the type, number or density, and distribution of the contaminant sources. The Contaminant Risk score has been derived from an examination of existing, and historical contamination sources that have been detected in the protection area through routine sampling. It also evaluates potential sources of contamination. Flow charts are used to assign a point score, and ratings are assigned in the same way as the susceptibility:

Table 3 summarizes the Contaminant Risks for each category of drinking water contaminants.

Table 3. Grande Denali/Denali Bluffs - Kingfisher Creek Contaminant Risks

Category	Score	Rating
Bacteria and Viruses	12	Low
Nitrates and/or Nitrites	14	Low
Volatile Organic Chemicals	12	Low

Finally, an overall vulnerability assigned for each contaminant type by combining each of the contaminant risk with the overall susceptibility:

Susceptibility of the Surface Water Source

+

Contaminant Risks

=

Vulnerability of the Drinking Water Source to Contamination

Table 4 contains the overall vulnerability scores and ratings for each of the three categories of drinking water contaminants. Note: scores are rounded off to the nearest five.

Table 4. Grande Denali/Denali Bluffs - Kingfisher Creek Overall Vulnerability

Category	Score	Rating
Bacteria and Viruses	50	Medium
Nitrates and Nitrites	55	Medium
Volatile Organic Chemicals	50	Medium

Bacteria and Viruses

The contaminant risk for bacteria and viruses is **Low** with a road presenting the only risk to the drinking water source.

Coliforms (a type of bacteria) are found naturally in the environment and although they aren't necessarily a health threat, they are an indicator of other potentially harmful bacteria in the water, more specifically, fecal coliforms and *E. coli* which only come from human and animal fecal waste. Harmful bacteria can cause diarrhea, cramps, nausea, headaches, or other symptoms (EPA, 2008).

Typically, coliform detection in raw water samples collected from surface water sources is normal. Positive samples increase the overall vulnerability of the drinking water source, indicating that the source is susceptible to bacteria and virus contamination. Bacteria and viruses have not been detected during the last five years of sampling at the Grande Denali/Denali Bluffs - Kingfisher Creek (data reviewed in April, 2008).

After combining the contaminant risk for bacteria and viruses with the natural susceptibility of the source, the overall vulnerability of the source to bacteria and virus contamination is considered **Medium**.

Nitrates and Nitrites

The contaminant risk for nitrates and nitrites is **Low** with a road presenting the only risk to the drinking water source.

The Maximum Contaminant Level (MCL) for nitrates is 10 milligrams per liter (mg/L). The MCL is the maximum level of contaminant that is allowed to exist in drinking water and still be consumed by humans without harmful health effects (EPA, 2008).

The sampling history for the water source indicates that nitrates or nitrites have been detected within the last five years, with the highest concentration of 0.384 mg/L detected on 05/16/2007 (data reviewed in April, 2008).

After combining the contaminant risk for nitrates and nitrites with the natural susceptibility of the source, the overall vulnerability of the source to contamination is **Medium**.

Volatile Organic Chemicals

The contaminant risk for volatile organic chemicals is **Low** with a road presenting the only risk to the drinking water source.

The surface water source at the Grande Denali/Denali Bluffs - Kingfisher Creek has not been recently sampled for volatile organic chemicals (data reviewed in April, 2008).

After combining the contaminant risk for heavy metals with the natural susceptibility of the source, the overall vulnerability of the well to contamination is **Medium**.

Using the Source Water Assessment

This assessment of contaminant risks can be used as a foundation for local voluntary protection efforts as well as a basis for the continuous efforts on the part of Grande Denali/Denali Bluffs to protect public health. It is anticipated that Source Water Assessments will be updated every five years to reflect any changes in the vulnerability and/or susceptibility of the drinking water source.

REFERENCES

Alaska Department of Commerce, Community and Economic Development (ADCCED), Accessed 2009 [WWW document]. URL: http://www.commerce.state.ak.us/dca/commdb/CF_COMDB.htm

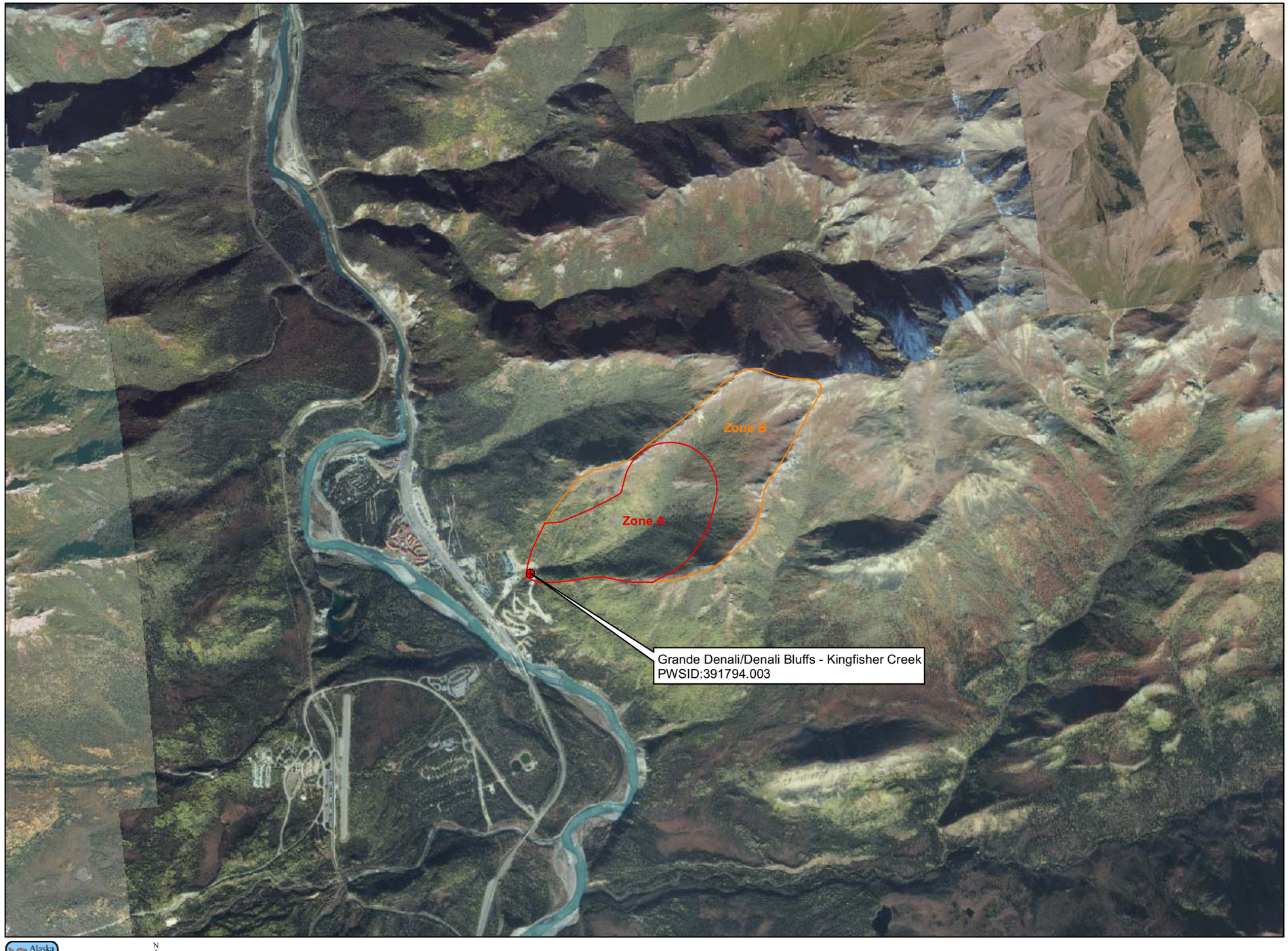
Lanning, David, 1994, Re: Request for Approval of a New Class B Well at Grizzly Bear Campground, Denali National Park, Alaska. Letter to the Alaska Department of Environmental Conservation dated May 11, 1994, Fairbanks, Alaska.

United States Environmental Protection Agency (EPA), Accessed 2008 [WWW document]. URL: http://www.epa.gov/safewater/contaminants/index.html.

APPENDIX A

Grande Denali/Denali Bluffs - Kingfisher Creek Drinking Water Protection Area Location Map (Map A)

Public Water Well System for PWS #391794.003 Grande Denali/Denali Bluffs - Kingfisher Creek



Legend

Class B Public Water System

Groundwater Protection Zones

Zone A Protection Area - Up to 1,000 Feet from Surface Water Body

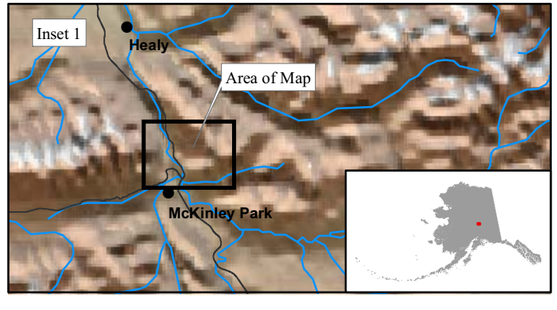
Zone B Protection Area - Up to 1 Mile from Surface Water Body

Data Sources:
Contaminant Sources, Public Water System Wells, Alaska Department of Environmental Conservation (ADEC)

All other data:
Alaska Statewide Digital Mapping Initiative (SDMI)

Drinking Water Protection Areas based on "Alaska Drinking Water Protection Program - Guidance Manual for Class B Public Water Systems" published by ADEC

URS Corporation does not guarantee the accuracy or validity of the data provided.



Alaska DEC

N
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S

0 0.5 1 2 Miles

Grande Denali/Denali Bluffs - Kingfisher Creek
PWS 391794.003

Appendix A Map A

APPENDIX B

Contaminant Source Inventory and Risk Rankings (Tables 1 - 7)

Table 1

Contaminant Source Inventory for
SW in Kingfisher Creek

PWSID 391794.003

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Highways and roads, paved (cement or asphalt)	X20	X20	A	C	1 road

Table 2

Contaminant Source Inventory and Risk Ranking for SW in Kingfisher Creek
Sources of Bacteria and Viruses

PWSID 391794.003

Contaminant Source Type	***Contaminant Source ID***	***CS ID tag***	***Zone***	***Risk Ranking for Analysis***	***Map Number***	***Comments***
Highways and roads, paved (cement or asphalt)	X20	X20	A	Low	C	1 road

Table 3

Contaminant Source Inventory and Risk Ranking for SW in Kingfisher Creek

Sources of Nitrates/Nitrites

PWSID 391794.003

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Highways and roads, paved (cement or asphalt)	X20	X20	A	Low	C	1 road

Table 4

Contaminant Source Inventory and Risk Ranking for SW in Kingfisher Creek
Sources of Volatile Organic Chemicals

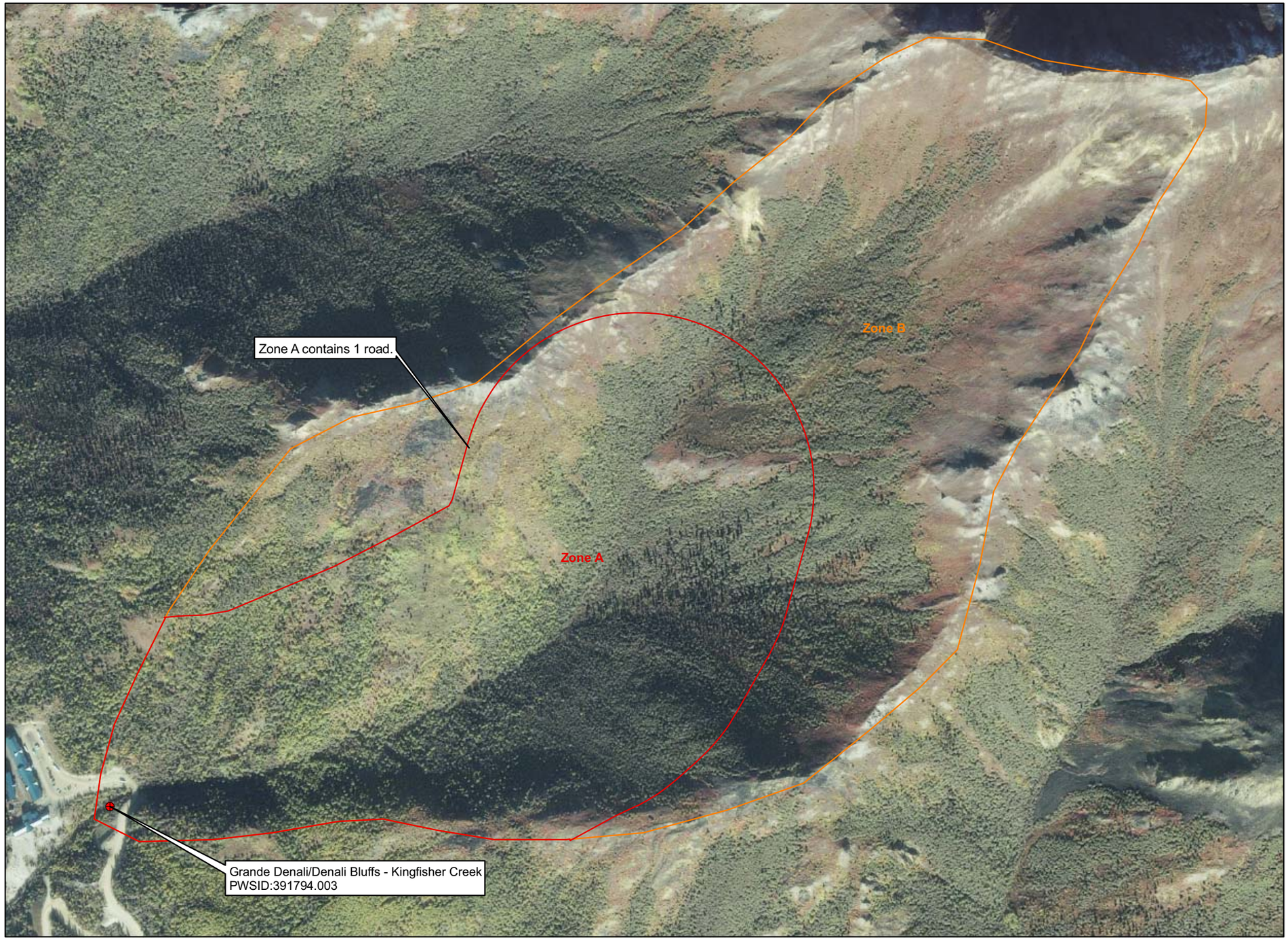
PWSID 391794.003

Contaminant Source Type	***Contaminant Source ID***	***CS ID tag***	***Zone***	***Risk Ranking for Analysis***	***Map Number***	***Comments***
Highways and roads, paved (cement or asphalt)	X20	X20	A	Low	C	1 road

APPENDIX C

Grande Denali/Denali Bluffs - Kingfisher Creek Drinking Water Protection Area and Potential and Existing Contaminant Sources (Map C)

Public Water Well System for PWS # 391794.003 Grande Denali/Denali Bluffs - Kingfisher Creek
Showing Potential and Existing Sources of Contamination



Legend

- Class B Public Water System

Groundwater Protection Zones

- *Zone A Protection Area - Up to 1,000 Feet from Surface Water Body*
- *Zone B Protection Area - Up to 1 Mile from Surface Water Body*

Data Sources:
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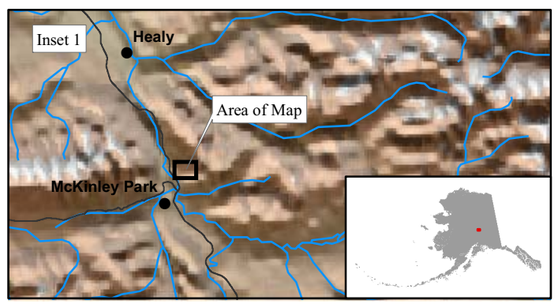

N
W E
S

0 500 1,000 2,000 Feet

Grande Denali/Denali Bluffs - Kingfisher Creek
PWS 391794.003

Appendix C Map C