



Source Water Assessment

A Hydrogeologic Susceptibility and
Vulnerability Assessment for

BP Milne Point

PWSID # 333364

September 2006

Drinking Water Protection Report #1582

Alaska Department of Environmental Conservation

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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 (ADEC), 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 Program Coordinator of DWP, (907) 269-7521.

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Source Water Assessment for the BP Milne Point Drinking Water System,

Drinking Water Protection Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The public water system for BP Milne Point is a Class A water system that obtains water from 6 Mile Lake, immediately adjacent to Mine Site B. The BP Milne Point protection area received a 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, heavy metals, cyanide, and other inorganic chemicals, synthetic organic chemicals, volatile organic chemicals, and other organic chemicals. Roads, pipelines, and oil wells are some potential sources of contaminants identified for the drinking water source. This evaluation included all available water sampling data submitted to ADEC 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 “**very high**” for OOCs, “**high**” for VOCs, SOCs, and Heavy metals and other inorganic compounds; and, “**medium**” for bacteria and viruses, and nitrates and nitrites. 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 BP to protect public health.

DRINKING WATER SYSTEM AND AREA OVERVIEW

BP Milne Point (Sec. 08, T011N, R011E, Umiat Meridian) is located along Six Mile Lake approximately 22 miles west of Prudhoe Bay.

The BP Milne Point public water system is a Class A water system that operates year-round and obtains water from Six Mile Lake.

The sanitary survey from 6/26/2001 indicates that the water intake is screened and protected from ice buildup and siltation. In addition, the screen is maintained, and inspected daily. The survey also states that the average daily production of the system is approximately 12,000 gallons per day for 250 non-residents through 1 service connection.

BP MILNE POINT 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”. Please refer to pages 10-11 of the “Guidance Manual for Class A Public Water Systems” for additional information.

The protection area established for surface water sources by the ADEC 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 ADEC 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

The protection area for the BP Milne Point water intake includes each of these Zones. Due to the small size of the overall protection area, Zones B and C cover the same region (See Map 1 of Appendix A).

INVENTORY OF POTENTIAL AND EXISTING CONTAMINANT SOURCES

Drinking Water Protection has completed an inventory of potential and existing sources of contamination within BP Milne Point 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 A public water system assessments, six categories of drinking water contaminants were inventoried. They include:

- Bacteria and viruses;
- Nitrates and/or nitrites;
- Volatile organic chemicals;
- Heavy metals, cyanide, and other inorganic chemicals;
- Synthetic Organic Chemicals; and
- Other Organic Chemicals.

Sources identified in the BP Milne Point protection area are displayed on Map 2 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
- 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, volatile organic chemicals, heavy metals, cyanide, and other inorganic chemicals, synthetic organic chemicals, and other 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 to be “high”.

+

Adequate Construction of the Intake

+

Runoff Potential Within Zone B

+

Dilution Capacity of the Surface Water

=

Natural Susceptibility

Table 2. Susceptibility of the Water Source

<i>Overall Susceptibility</i>	<i>40</i>	<i>Rating Very High</i>
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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. BP Milne Point Contaminant Risks

Category	Rating
Bacteria and Viruses	Low
Nitrates and/or Nitrites	Low
Volatile Organic Chemicals	High
Heavy Metals, Cyanide, and Other Inorganic Chemicals	High
Synthetic Organic Chemicals	Low
Other Organic Chemicals	Very High

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 six categories of drinking water contaminants. Note: scores are rounded off to the nearest five.

Table 4. BP Milne Point Overall Vulnerability

Category	Rating
Bacteria and Viruses	Medium
Nitrates and Nitrites	Medium
Volatile Organic Chemicals	High
Heavy Metals, Cyanide, and Other Inorganic Chemicals	High
Synthetic Organic Chemicals	High
Other Organic Chemicals	Very High

Bacteria and Viruses

The contaminant risk for bacteria and viruses is “**low**”.

Coliforms (a 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, 2006). Positive samples increase the overall vulnerability of the drinking water source, indicating that the source is susceptible to bacteria and virus contamination. Typically, coliform detection in raw water samples collected from surface water sources is normal.

No positive bacteria counts have been detected during the 2005 sampling period.

Roads could serve as possible sources of bacteria for the drinking water system. See Table 2 in Appendix C for a complete listing.

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**”. Nitrates are very mobile, moving at approximately the same rate as water.

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, 2006).

Sampling history for the water source indicates that low concentrations of nitrates (2% of the MCL) were detected in sampling performed in 2005.

Possible sources of nitrate/nitrites within the protection area are roads. See Table 3 in Appendix C for a complete listing.

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 “**high**”.

Trihalomethanes were detected at levels exceeding the MCL (230% of the MCL) in samples from 8/2/2005, although this chemical typically originates during the process of water treatment and not from the source waters. The MCL for total trihalomethanes (TTHMs) is 0.1 mg/L. In a sample from 10/11/2005, TTHMs were detected at levels 75% of the MCL.

Aside from being byproducts of the drinking water treatment process, possible sources of volatile organic chemicals include roads, pipelines, and oil wells. See Table 4 in Appendix C for a complete listing.

After combining the contaminant risk for volatile organic chemicals with the natural susceptibility of the source, the overall vulnerability of the source to contamination remains “**high**”.

Heavy Metals, Cyanide, and Other Inorganic Chemicals

The contaminant risk for heavy metals is “**high**”. Low levels of arsenic were detected in a sample from 2/3/2004 (10% of the MCL). The MCL for arsenic is 0.01 mg/l. Sampling from 2005 did not detect arsenic in the source water.

Arsenic is a naturally occurring heavy metal found in sediments throughout Alaska. Possible sources of heavy

metals, cyanide and other inorganic chemicals include roads, pipelines and oil wells.

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

See Table 5 in Appendix C for a listing of the identified possible sources of heavy metals, cyanide, and other organic chemicals in the Protection Area.

Synthetic Organic Chemicals

The contaminant risk for synthetic organic chemicals is “**low**”. After combining the contaminant risk with the natural susceptibility of the source, the overall vulnerability to synthetic organic chemicals of the source is “**high**” (See Chart 11 – Contaminant Risks for Synthetic Organic Chemicals in Appendix D).

Review of the historical sampling data indicates that test results for 2,4-D in 1995 were negative. Potential sources for SOC contamination to the water source include oil wells.

See Table 6 in Appendix C for a listing of the identified possible sources of synthetic organic chemicals in the Protection Area.

Other Organic Chemicals

The contaminant risk for other organic chemicals is “**very high**”. After combining the contaminant risk with the natural susceptibility of the source, the overall vulnerability to other organic chemicals of the source is “**very high**”.

Review of the historical sampling data indicates that no other organic chemicals have been detected in sampling from 1995. Possible sources of OOCs include roads, pipelines, and oil wells.

See Table 7 in Appendix C for a listing of the identified possible sources of other organic chemicals in the Protection Area.

Using the Source Water Assessment

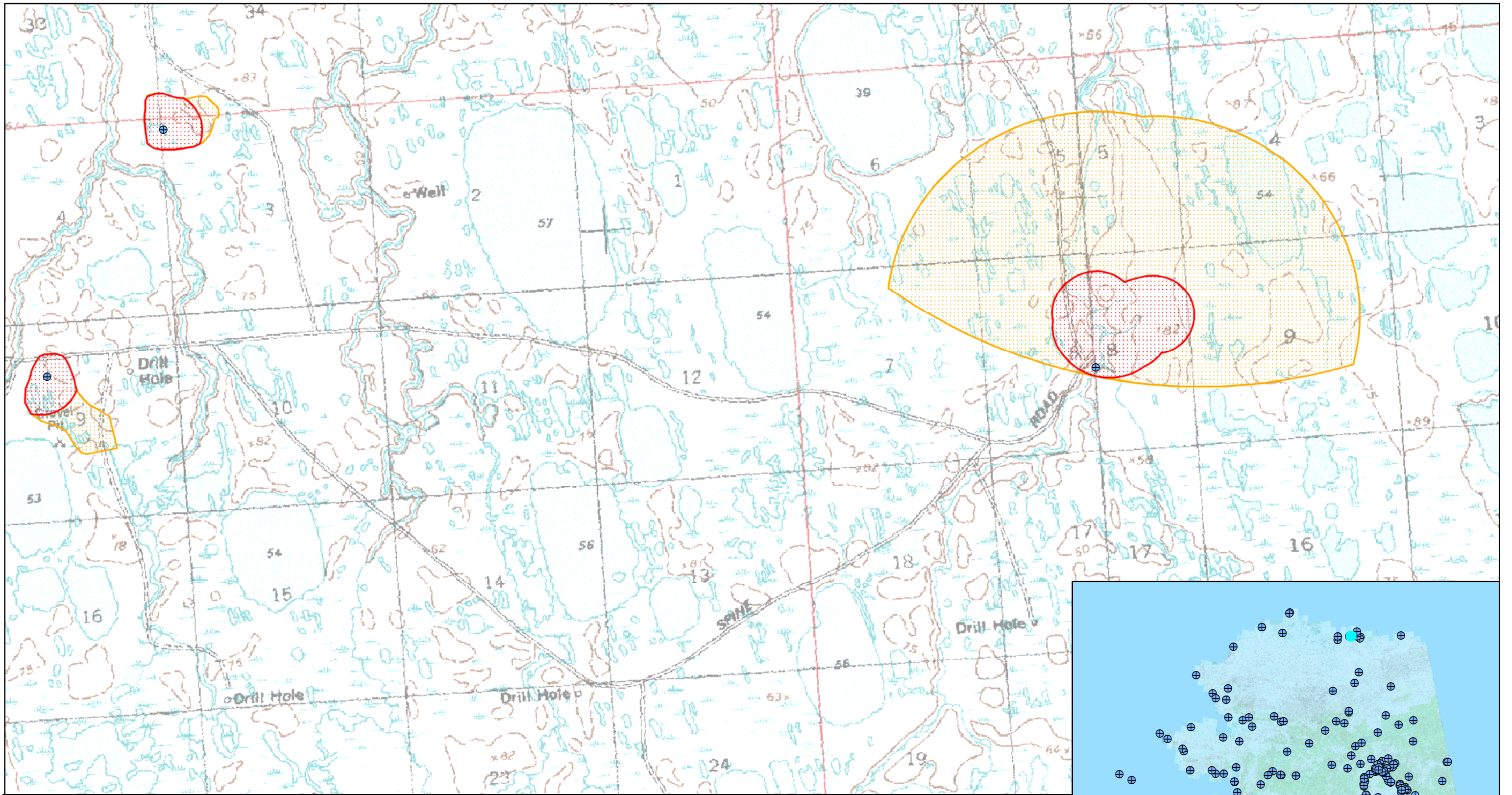
This assessment of contaminant risks can be used as a foundation for local voluntary protection efforts as well as a basis for the continuous efforts on the part of BP Milne Point to protect public health. It is anticipated that Source Water Assessments will be updated every five years to reflect any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

REFERENCES

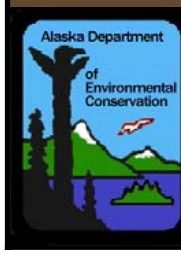
United States Environmental Protection Agency (EPA), 2006 [WWW document]. URL: <http://www.epa.gov/safewater/mcl.html>.

APPENDIX A

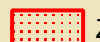
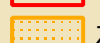
BP Milne Point Drinking Water Protection Area Location Map (Map 1)

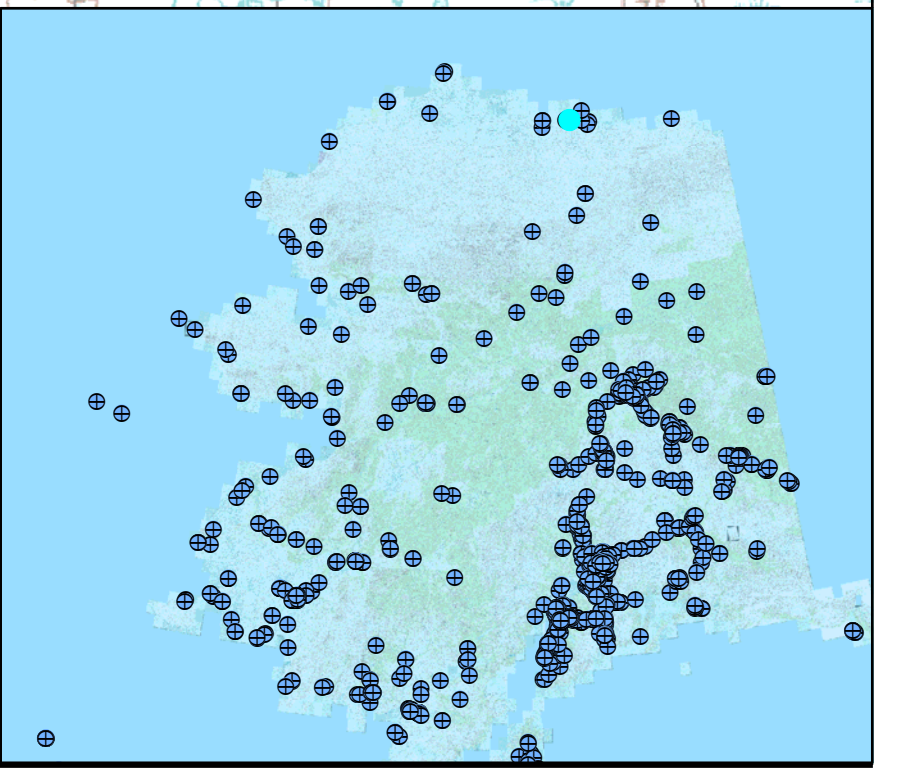


Map 1- BP Milne Point and Surrounding Water Systems PWSID: 333364.001





	Public Water Sources
	Zone A Protection Area
	Zone B Protection Area



APPENDIX B

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

Table 1

**Contaminant Source Inventory for
BP Exploration Milne Point**

PWSID 333364.001

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Map Number	Comments
Highways and roads, paved (cement or asphalt)	X20	X20-1-3	A		
Pipelines (oil and gas)	X28	X28-1-3	A		
Oil and gas extraction wells	W07	W07-1	B		

Table 2

*Contaminant Source Inventory and Risk Ranking for
BP Exploration Milne Point
Sources of Bacteria and Viruses*

PWSID 333364.001

<i>Contaminant Source Type</i>	<i>Contaminant Source ID</i>	<i>CS ID tag</i>	<i>Zone</i>	<i>Risk Ranking for Analysis</i>	<i>Map Number</i>	<i>Comments</i>
Highways and roads, paved (cement or asphalt)	X20	X20-1-3	A	Low		

Table 3

*Contaminant Source Inventory and Risk Ranking for
BP Exploration Milne Point
Sources of Nitrates/Nitrites*

PWSID 333364.001

<i>Contaminant Source Type</i>	<i>Contaminant Source ID</i>	<i>CS ID tag</i>	<i>Zone</i>	<i>Risk Ranking for Analysis</i>	<i>Map Number</i>	<i>Comments</i>
Highways and roads, paved (cement or asphalt)	X20	X20-1-3	A	Low		

Table 4

*Contaminant Source Inventory and Risk Ranking for
BP Exploration Milne Point
Sources of Volatile Organic Chemicals*

PWSID 333364.001

<i>Contaminant Source Type</i>	<i>Contaminant Source ID</i>	<i>CS ID tag</i>	<i>Zone</i>	<i>Risk Ranking for Analysis</i>	<i>Map Number</i>	<i>Comments</i>
Highways and roads, paved (cement or asphalt)	X20	X20-1-3	A	Low		
Pipelines (oil and gas)	X28	X28-1-3	A	Medium		
Oil and gas extraction wells	W07	W07-1	B	Low		

Table 5

*Contaminant Source Inventory and Risk Ranking for
BP Exploration Milne Point
Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals*

PWSID 333364.001

<i>Contaminant Source Type</i>	<i>Contaminant Source ID</i>	<i>CS ID tag</i>	<i>Zone</i>	<i>Risk Ranking for Analysis</i>	<i>Map Number</i>	<i>Comments</i>
Highways and roads, paved (cement or asphalt)	X20	X20-1-3	A	Low		
Pipelines (oil and gas)	X28	X28-1-3	A	Low		
Oil and gas extraction wells	W07	W07-1	B	High		

Table 6

*Contaminant Source Inventory and Risk Ranking for
BP Exploration Milne Point
Sources of Synthetic Organic Chemicals*

PWSID 333364.001

<i>Contaminant Source Type</i>	<i>Contaminant Source ID</i>	<i>CS ID tag</i>	<i>Zone</i>	<i>Risk Ranking for Analysis</i>	<i>Map Number</i>	<i>Comments</i>
Oil and gas extraction wells	W07	W07-1	B	Medium		

Table 7

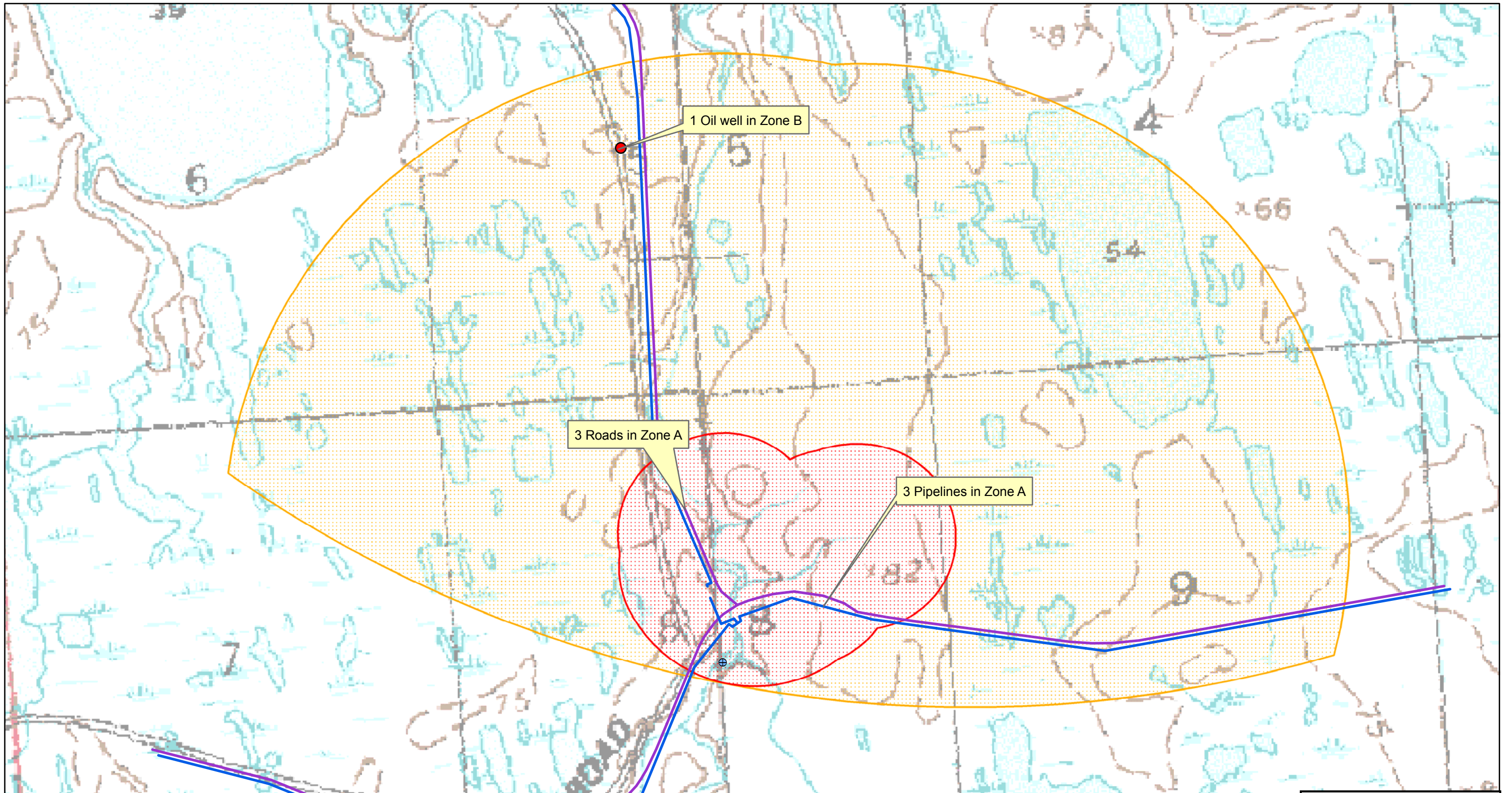
*Contaminant Source Inventory and Risk Ranking for
BP Exploration Milne Point
Sources of Other Organic Chemicals*

PWSID 333364.001

<i>Contaminant Source Type</i>	<i>Contaminant Source ID</i>	<i>CS ID tag</i>	<i>Zone</i>	<i>Risk Ranking for Analysis</i>	<i>Map Number</i>	<i>Comments</i>
Highways and roads, paved (cement or asphalt)	X20	X20-1-3	A	Low		
Pipelines (oil and gas)	X28	X28-1-3	A	High		
Oil and gas extraction wells	W07	W07-1	B	Medium		

APPENDIX C

BP Milne Point Drinking Water Protection Area and Potential and Existing Contaminant Sources (Maps 2)



Map 2- BP Milne Point Potential Contaminants

PWSID: 333364.001



0 1:12,453 2,600 Feet

Data Sources:
Kenai Borough: Roads and parcels
Aerial Photo: USGS and Microsoft Terraserver
Potential Sources of Contamination: ADEC

- Zone A Protection Area
- Zone B Protection Area
- Pipelines
- Roads
- Public Water Sources
- Oil Wells