Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for Manoogs Isle Mobile Home Park Well #1 Public Drinking Water System, Anchorage, Alaska PWSID# 218630.001

DRINKING WATER PROTECTION REPORT 1852

Alaska Department of Environmental Conservation

February, 2011

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The Drinking Water Protection (DWP) team 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 DWP staff at #1-866-956-7656.

February, 2011

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EXECUTIVE SUMMARY

The public water system for Manoogs Isle Mobile Home Park is a Community Water System (CWS) consisting of one well at 2611 Pago Pago Avenue, Anchorage, Alaska. An assessment of the susceptibility of the wellhead and aquifer to contamination, and the vulnerability of the public water system to potential and existing contamination were evaluated as of January, 2011. The wellhead received a susceptibility rating of **Low** and the aquifer received a susceptibility rating of **Medium**. Combining these two ratings produces a **Low** rating for the natural susceptibility of the well. Identified potential and existing sources of contamination for the Manoogs Isle Mobile Home Park Well #1 public drinking water system include agricultural, residential, and commercial sources, military activity, parks, airports, roads, pipelines, and a contaminated site. These are considered sources of bacteria and viruses, nitrates and/or nitrites, volatile organic chemicals (VOCs), heavy metals, cyanide, and other inorganic chemicals, synthetic organic chemicals (SOCs), and other organic chemicals (OOCs). Additionally, a presumably natural source of nitrate, thallium and chromium is also present.

Combining the natural susceptibility of the well with the six (6) contaminant risk categories, the public water system for Manoogs Isle Mobile Home Park Well #1 received an overall vulnerability rating of **Medium** for bacteria and viruses**, Medium** for nitrates and/or nitrites, **Medium** for VOCs, **Low** for heavy metals, cyanide, and other inorganic chemicals, **Medium** for SOCs, and **Medium** for OOCs.

MANOOGS ISLE MOBILE HOME PARK WELL #1 PUBLIC DRINKING WATER SYSTEM

Manoogs Isle Mobile Home Park Well #1 public water system is a community water system. The system consists of one well at 2611 Pago Pago Avenue, Anchorage, Alaska (Tract C-3A, Simonian Subdivision) (See Map 1 of Appendix A). Anchorage, located in southcentral Alaska, encompasses 1,697 square miles of land and 264 square miles of water. The area containing a majority of the urban development, commonly referred to as the Anchorage Bowl, is bound on the east by the Chugach Mountains and the north, west, and south by the Knik and Turnagain Arms of Cook Inlet. Anchorage's current population is approximately 290,588 making it the most populated city in the state (2009 ADCCED Certified Population). Communities located within the municipality include: Anchorage, Eagle River, Chugiak, Eklutna, and Girdwood.

The majority of homes in Anchorage are connected to Anchorage Water and Wastewater Utility, providing water and sewerage. Natural gas is available to most homes through ENSTAR Natural Gas Company. Refuse is transported to the Anchorage Regional Landfill on Hiland Road. The municipality collects hazardous wastes and waste oil. Anchorage Recycling Center collects cans, metal, paper, and newspaper (ADCCED 2009).

According to the most recent sanitary survey (11/27/2006) for this water system, the depth of the well is estimated at 220 feet below the ground surface and is completed in a confined aquifer. This system operates year-round and serves one thousand two hundred (1200) residents through four hundred (400) service connections.

MANOOGS ISLE MOBILE HOME PARK WELL #1 DRINKING WATER PROTECTION AREA

The pathways most likely for surface contamination to reach the groundwater are identified as the first step in determining a drinking water system's risk. These areas are determined by looking at the characteristics of the soil, groundwater, aquifer, and well.

The most probable area for contamination to reach the drinking water well is the drinking water protection area. The drinking water protection area is the area circling 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 protection area are most likely to impact the well, this area will serve as the focus for voluntary protection efforts.

There are many different methods for calculating the size of protection areas. Drinking Water Protection (DWP) uses a combination of two simple groundwater flow equations, the Thiem and uniform flow equations for all groundwater wells screened in unconsolidated material. The orientation of the protection zone is then drawn using a water table elevation map (if available)

or a land surface elevation map of the area. The protection zone calculated by the DWP is an estimate using the available information and resources, and may differ slightly from the actual capture zone. Because of uncertainties and changing site conditions, a factor of safety is added to the protection zone to form the drinking water protection area for the well.

The parameters used to calculate the shape of this protection area are general for the whole alluvial plain and were obtained from various United States Geological Survey (USGS) reports, area well logs, and the Groundwater textbook by Freeze and Cherry (1979).

The drinking water protection areas (DWPAs) established for wells by the DEC are usually separated into two zones, limited by the watershed. These zones correspond to differences in the time-of-travel (TOT) of the water moving through the aquifer to the well. An analytical calculation was used to determine the size and shape of the protection area. The input parameters describing the attributes of the aquifer in this calculation were adopted from the Alaska Division of Geological & Geophysical Surveys Preliminary Interpretative Report (*Combellick, R.A., 1999*) and U.S. Geological Survey (*Clark, Yount and Bartsch,* 1976).

The time of travel for contaminants within the water varies and is dependent on the physical and chemical characteristics of each contaminant. The following is a summary of the two protection area zones for wells and the calculated time-of-travel for each:

Table 1. Definition of Zones

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

The DWPA for the Manoogs Isle Mobile Home Park Well #1 found on Map 1 of Appendix A will serve as the focus for voluntary protection efforts.

INVENTORY OF POTENTIAL AND EXISTING CONTAMINANT SOURCES

Drinking Water Protection (DWP) has completed an inventory of potential and existing sources of contamination within the Manoogs Isle Mobile Home Park Well #1 DWPA. This inventory was completed through a search of agency records and other publicly available information. Potential sources of contamination to the drinking water aquifer 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.

For the basis of all Community public water system assessments, the following six categories of drinking water contaminants were inventoried:

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

The sources are displayed on Map 2 of Appendix C and summarized in Table 1 of Appendix B.

RANKING OF CONTAMINANT RISKS

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

- Low
- Medium
- High
- Very High

The time-of-travel for contaminants within the water varies and is dependent on the physical and chemical characteristics of each contaminant.

Tables 2 through 7 in Appendix B contain the ranking of inventoried 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 chemical

VULNERABILITY OF MANOOGS ISLE MOBILE HOME PARK WELL #1 PUBLIC DRINKING WATER SYSTEM

The vulnerability of public drinking water systems to regulated contaminants is determined by assessing the susceptibility of the wellhead, the susceptibility of the aquifer and the potential contaminant sources identified within the DWPA.

Drinking Water Protection staff developed a vulnerability assessment tool that assigns a vulnerability risk ranking based upon various factors associated with the well, aquifer and potential and existing contaminants identified within the DWPA.

Factors contributing to the susceptibility of the wellhead are: whether the sanitary seal in place, protection from flooding, and if the well casing is properly grouted.

The wellhead for the Manoogs Isle Mobile Home Park Well #1 received a **Low** susceptibility rating. A sanitary survey (completed 12/26/2001) indicates that the well is capped with a sanitary seal, the land surface is sloped away from the well, and the well is properly grouted. A sanitary seal prevents potential contaminants from entering the well while sloping of the land surface and grouting help to prevent potential contaminants from traveling down the outside of the well casing.

Factors contributing to the susceptibility of the aquifer are: whether the aquifer is confined or unconfined, whether the well is completed in unconsolidated or fractured bedrock, whether other wells and bore holes are penetrating the aquifer and, if applicable, and the characteristics of the confining layer.

The aquifer that the Manoogs Isle Mobile Home Park Well #1 well is completed in received a **Medium** susceptibility rating. The aquifer is confined by approximately thirty (30) cumulative feet of confining layers (gravelly clay, cemented sandy gravel and silty clay). Confining layers may help inhibit transport of contaminants to the aquifer. The system received a Medium susceptibility rating because of a number of wells within the protections areas penetrating the confining layer. The presence of other wells penetrating the confining layer can allow contaminants to travel into the shared aquifer with precipitation and runoff.

Table 2 summarizes the susceptibility scores and ratings for Manoogs Isle Mobile Home Park Well #1.

Table 2. Susceptibility

	Rating
Susceptibility of the Wellhead	Low
Susceptibility of the Aquifer	Medium
Natural Susceptibility	Low

The Contaminant Risk was derived from an evaluation of the routine sampling results of the water system and the presence of potential sources of contamination. Contaminant risks to a drinking water source depend on the type and distribution of contaminant sources.

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

Table 3. Contaminant Risks

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

Finally, an overall vulnerability is determined for each water system by combining each of the contaminant risk scores with the natural susceptibility score:

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

Table 4 contains the overall ratings for each of the six categories of drinking water contaminants.

Table 4. Overall Vulnerability

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

Bacteria and Viruses

The sewer lines, parks, and livestock stable in the protection area represent the greatest risk for bacteria and viruses to the drinking water well.

Only a small amount of bacteria and viruses are required to endanger public health. Coliform bacteria are found naturally in the environment and although they aren't necessarily a health threat, it is an indicator of other potentially harmful bacteria in the water, more specifically, fecal coliform bacteria and E. coli which only come from human and animal fecal waste (EPA, 2002). Harmful bacteria can cause diarrhea, cramps, nausea, headaches, or other symptoms (EPA, 2002). No total coliform or fecal coliform have been detected for this well. After combining the contaminant risk for

bacteria and viruses with the natural susceptibility of the well, the overall vulnerability of the well to contamination is **Medium**.

Nitrates and Nitrites

The sewer lines, parks, livestock stable and lawn and garden supply/service in the protection area and natural sources represent the greatest risk for nitrates and nitrites to this source of public drinking water.

Nitrates are very mobile, moving at approximately the same rate as water. Nitrates have not been detected in natural background concentrations at the site, as elsewhere in Alaska. Sampling history of Manoogs Isle Mobile Home Park Well #1 source water indicates low concentrations of nitrate. Existing nitrate concentrations average at 4% of the allowable limit (MCL) for this contaminant. The Maximum Contaminant Limit or 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. Due to the low and constant levels of nitrates detected in the Manoogs Isle Mobile Home Park well #1 source, it is assumed that the detected nitrates can be attributed to erosion of natural deposits.

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

Volatile Organic Chemicals

The airports, heavy equipment rental/storage, motor/motor vehicle repair shop and oil/gas pipelines represent the greatest risk for volatile organic chemicals (VOCs) to the well.

VOCs have not been detected within source waters. After combining the contaminant risk for volatile organic chemicals with the natural susceptibility of the well, the overall vulnerability of the well to contamination is **Medium**.

Heavy Metals, Cyanide, and Other Inorganic Chemicals

The motor/motor vehicle repair shop and military shooting range in the protection area and natural sources represent the greatest risk for inorganic chemicals to the well.

Heavy metals and other inorganic chemicals were collected on several occasions. Thallium and chromium were detected well below their respective maximum contaminant levels (MCLs). Thallium and chromium have no man-made source in this area and is presumed to be naturally occurring.

After combining the contaminant risk for heavy metals, cyanide and other inorganic chemicals with the natural susceptibility of the well, the overall vulnerability of the well to contamination is **Low**.

Synthetic Organic Chemicals

The lawn and garden supply/service and airports represent the greatest risk for synthetic organic chemicals (SOCs) to the well.

SOCs have not been sampled for this well. After combining the contaminant risk for SOCs with the natural susceptibility of the well, the overall vulnerability of the well to contamination is **Medium**.

Other Organic Chemicals

The oil/gas pipelines, heavy equipment rental/storage, motor/motor vehicle repair shop and airports represent the greatest risk for other organic chemicals (OOCs) to the well.

OOCs have not been sampled from this well. After combining the contaminant risk for OOCs with the natural susceptibility of the well, 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 Manoogs Isle Mobile Home Park Well #1 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 Manoogs Isle Mobile home Park Well #1 drinking water source.

REFERENCES

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

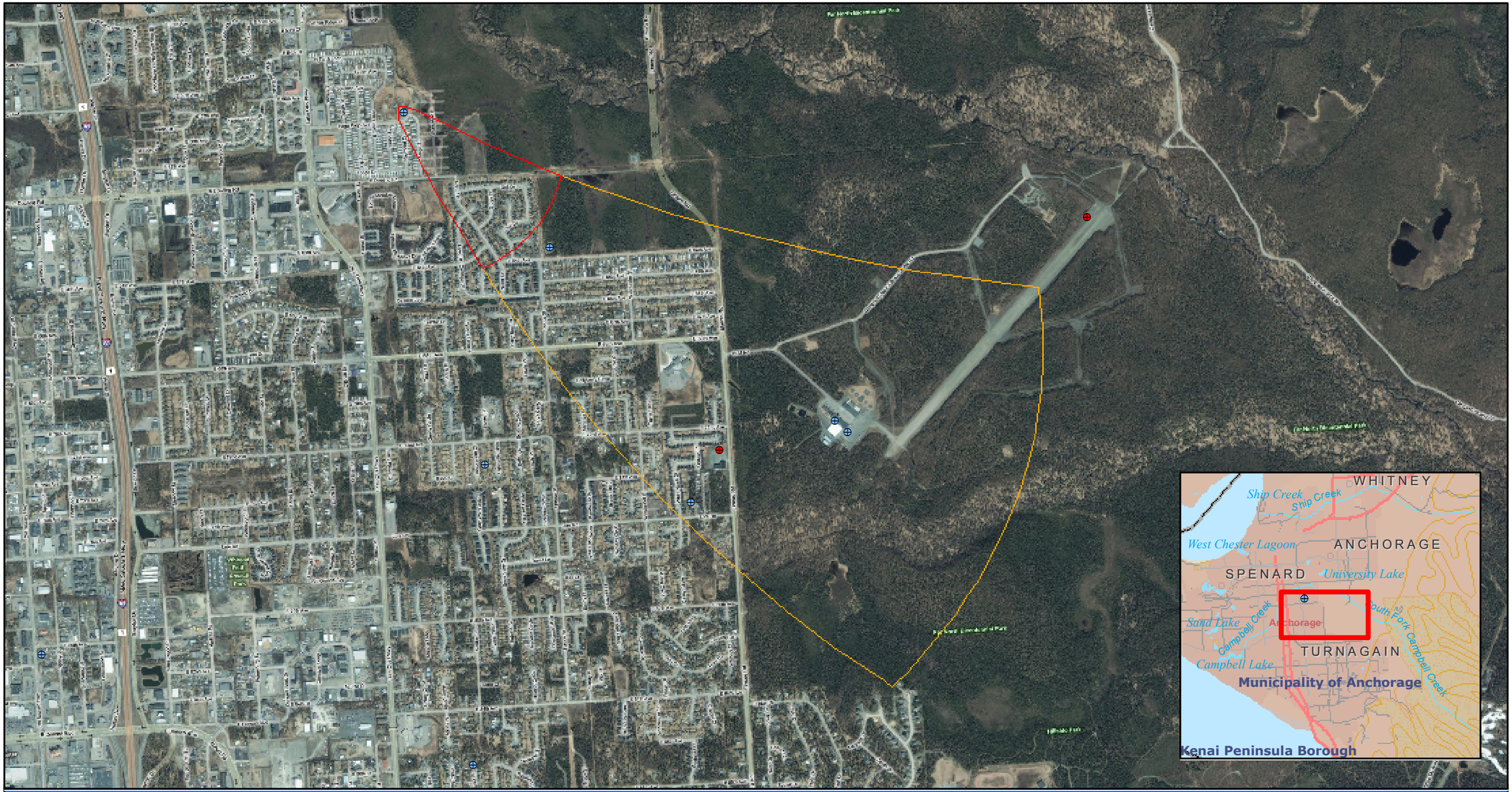
Freeze, R.A. and Cherry, J.A., 1979. Groundwater. Prentice-Hall, Englewood Cliffs, NJ.

Alaska Division of Geological & Geophysical Surveys Preliminary Interpretative Report (*Combellick, R.A., 1999*) and U.S. Geological Survey (*Clark, Yount and Bartsch*, 1976)

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

APPENDIX A

Manoogs Isle Mobile Home Park Well #1
Drinking Water Protection Area Location Map
(Map 1)



Map 1 - Manoog's Isle MHP

PWS ID# 218630.001

Alaska Department of Environmental Conservation

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N W E S

Public Water Systems

- Class A Water Systems (C/NTNC)
- Class B Water Systems (TNC)
- Class C Water Systems (State Regulated)

Drinking Water Protection Areas

- Zone A: Several-month time-of-travel for groundwater sources.
- Zone B: Two-year time-of-travel for groundwater sources.

Created by Anne Gleason on 07/14/2010.

APPENDIX B

Contaminant Source Inventory and Risk Ranking for Manoogs Isle Mobile Home Park Well #1 (Tables 1-7)

Table 1

Contaminant Source Inventory for ***Manoogs Isle MHP***

PWSID 218630.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-01-07	A	2	7 Sewerline (Mains)
Residential Areas	R01	R01	A	2	Identified ~25 Acres of residential lots in Zone A.
Municipal or city parks (with green areas)	X04	X04-01	A	2	Campbell Park (Municipality of Anchorage)
Highways and roads, paved (cement or asphalt)	X20	X20-01-10	A	2	10 roads
Highways and roads, paved (cement or asphalt)	X20	X20-11-16	A	2	6 roads platted but not built yet as of 06/10/2010.
Livestock stables/corrals	A09	A09-01	B	2	F-Bar-J Ranch @ 4140 Lore Road, Anchorage, AK 99507
Construction trade areas and materials	C09	C09-01	B	2	C R Service @ 7112 Henderson Loop, Anchorage, AK 99507
Construction trade areas and materials	C09	C09-02	B	2	Noble Mechanical Inc. @ 3651 E. 67th Ave., Anchorage, AK 99507
Construction trade areas and materials	C09	C09-03	B	2	RHK Construction Co. @ 6807 Spruce St., Anchorage, AK.
Construction trade areas and materials	C09	C09-04	B	2	Rock Solid Repair & Modeling @ 3637 E. 67th Ave., Anchorage, AK.
Heavy equipment rental/storage	C18	C18-01	B	2	Discount Bob Cat Services @ 7070 Miranda Drive, Anchorage, AK 99507
Laboratories (chemical, soils, and research)	C20	C20-01	B	2	Northern Consultants @ 4107 E. 68th Ave., Anchorage, AK 99507.
Lawn and garden supplies/services	C23	C23-01	B	2	Cook Inlet Landscapes @ 3933 E. 67th Ave., Anchorage, AK 99507.
Motor /motor vehicle repair shops	C31	C31-01	B	2	Deer Mountain Auto & Tire Service @ 3637 E. 65th Ave., Anchorage, AK 99507
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-08-46	B	2	39 Sewerline (Mains)
Ordinances (military stock piles or shooting ranges, detonated or undetonated?)	M03	M03-01	B	2	FUDS Campbell Creek Range and Maneuver Area. Active Status. Ordinance related issues. The Campbell Creek Range and Maneuver Area was the site of a WWII-era airfield and maneuver area.
Residential Areas	R01	R01	B	2	Identified ~130 Acres of residential lots in Zone B.
Septic systems (serves one single-family home)	R02	R02-01-33	B	2	33 Residential Septics identified in Zone B.
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-01	B	2	AHFC Properties - East 64th Avenue. Cleanup Complete. Chlorinated hydrocarbons and TPH in high contamination levels at residential yard. Extends over 5' in depth. Total extent of contamination and human health impact rated serious.
Water supply wells	W09	W09-01	B	2	Sixty-Fourth Ave., Anchorage, AK
Water supply wells	W09	W09-02	B	2	Unnamed Rd (off of Abbott Loop Rd), Anchorage, AK

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Water supply wells	W09	W09-03	B	2	Unnamed Rd (off of Abbott Loop Rd), Anchorage, AK
Water supply wells	W09	W09-04	B	2	White Hawk Rd, Anchorage, AK
Water supply wells	W09	W09-05	B	2	Abbott Loop Rd, Anchorage, AK
Water supply wells	W09	W09-06-44	B	2	Identified 44 Private Wells withing Zone B.
Municipal or city parks (with green areas)	X04	X04-02	B	2	Far North Bicentennial/Hillside Park (Municipality of Anchorage)
Airports	X14	X14-01	B	2	Campbell Airstrip (Both in DWPP Point and DWPP Poly.)
Airports	X14	X14-02	B	2	BLM - Campbell Heliport.
Highways and roads, paved (cement or asphalt)	X20	X20-17-46	B	2	Identified 30 roads in Zone B.
Pipelines (oil and gas)	X28	X28-01-02	B	2	

Table 2

Contaminant Source Inventory and Risk Ranking for Manoogs Isle MHP

Sources of Bacteria and Viruses

PWSID 218630.001

Contaminant Source Type	***Contaminant Source ID***	***CS ID tag***	***Zone***	***Risk Ranking for Analysis***	***Map Number***	***Comments***
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-01-07	A	Medium	2	7 Sewerline (Mains)
Residential Areas	R01	R01	A	Low	2	Identified ~25 Acres of residential lots in Zone A.
Municipal or city parks (with green areas)	X04	X04-01	A	Medium	2	Campbell Park (Municipality of Anchorage)
Highways and roads, paved (cement or asphalt)	X20	X20-01-10	A	Low	2	10 roads
Highways and roads, paved (cement or asphalt)	X20	X20-11-16	A	Low	2	6 roads platted but not built yet as of 06/10/2010.
Livestock stables/corrals	A09	A09-01	B	Medium	2	F-Bar-J Ranch @ 4140 Lore Road, Anchorage, AK 99507
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-08-46	B	Medium	2	39 Sewerline (Mains)
Residential Areas	R01	R01	B	Low	2	Identified ~130 Acres of residential lots in Zone B.
Septic systems (serves one single-family home)	R02	R02-01-33	B	Low	2	33 Residential Septics identified in Zone B.
Municipal or city parks (with green areas)	X04	X04-02	B	Medium	2	Far North Bicentennial/Hillside Park (Municipality of Anchorage)
Highways and roads, paved (cement or asphalt)	X20	X20-17-46	B	Low	2	Identified 30 roads in Zone B.

Table 3

Contaminant Source Inventory and Risk Ranking for Manoogs Isle MHP
Sources of Nitrates/Nitrites

PWSID 218630.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-01-07	A	Medium	2	7 Sewerline (Mains)
Residential Areas	R01	R01	A	Low	2	Identified ~25 Acres of residential lots in Zone A.
Municipal or city parks (with green areas)	X04	X04-01	A	Medium	2	Campbell Park (Municipality of Anchorage)
Highways and roads, paved (cement or asphalt)	X20	X20-01-10	A	Low	2	10 roads
Highways and roads, paved (cement or asphalt)	X20	X20-11-16	A	Low	2	6 roads platted but not built yet as of 06/10/2010.
Livestock stables/corrals	A09	A09-01	B	Medium	2	F-Bar-J Ranch @ 4140 Lore Road, Anchorage, AK 99507
Lawn and garden supplies/services	C23	C23-01	B	Medium	2	Cook Inlet Landscapes @ 3933 E. 67th Ave., Anchorage, AK 99507.
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-08-46	B	Medium	2	39 Sewerline (Mains)
Ordinances (military stock piles or shooting ranges, detonated or undetonated?)	M03	M03-01	B	Low	2	FUDS Campbell Creek Range and Maneuver Area. Active Status. Ordinance related issues. The Campbell Creek Range and Maneuver Area was the site of a WWII-era airfield and maneuver area.
Residential Areas	R01	R01	B	Low	2	Identified ~130 Acres of residential lots in Zone B.
Septic systems (serves one single-family home)	R02	R02-01-33	B	Low	2	33 Residential Septics identified in Zone B.
Municipal or city parks (with green areas)	X04	X04-02	B	Medium	2	Far North Bicentennial/Hillside Park (Municipality of Anchorage)
Airports	X14	X14-01	B	Low	2	Campbell Airstrip (Both in DWPP Point and DWPP Poly.)
Airports	X14	X14-02	B	Low	2	BLM - Campbell Heliport.
Highways and roads, paved (cement or asphalt)	X20	X20-17-46	B	Low	2	Identified 30 roads in Zone B.

Table 4

Contaminant Source Inventory and Risk Ranking for Manoogs Isle MHP
Sources of Volatile Organic Chemicals

PWSID 218630.001

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Map Number	Comments
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-01-07	A	Low	2	7 Sewerline (Mains)
Residential Areas	R01	R01	A	Low	2	Identified ~25 Acres of residential lots in Zone A.
Highways and roads, paved (cement or asphalt)	X20	X20-01-10	A	Low	2	10 roads
Highways and roads, paved (cement or asphalt)	X20	X20-11-16	A	Low	2	6 roads platted but not built yet as of 06/10/2010.
Construction trade areas and materials	C09	C09-01	B	Low	2	C R Service @ 7112 Henderson Loop, Anchorage, AK 99507
Construction trade areas and materials	C09	C09-02	B	Low	2	Noble Mechanical Inc. @ 3651 E. 67th Ave., Anchorage, AK 99507
Construction trade areas and materials	C09	C09-03	B	Low	2	RHK Construction Co. @ 6807 Spruce St., Anchorage, AK.
Construction trade areas and materials	C09	C09-04	B	Low	2	Rock Solid Repair & Modeling @ 3637 E. 67th Ave., Anchorage, AK.
Heavy equipment rental/storage	C18	C18-01	B	Medium	2	Discount Bob Cat Services @ 7070 Miranda Drive, Anchorage, AK 99507
Laboratories (chemical, soils, and research)	C20	C20-01	B	Low	2	Northern Consultants @ 4107 E. 68th Ave., Anchorage, AK 99507.
Motor /motor vehicle repair shops	C31	C31-01	B	Medium	2	Deer Mountain Auto & Tire Service @ 3637 E. 65th Ave., Anchorage, AK 99507
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-08-46	B	Low	2	39 Sewerline (Mains)
Residential Areas	R01	R01	B	Low	2	Identified ~130 Acres of residential lots in Zone B.
Septic systems (serves one single-family home)	R02	R02-01-33	B	Low	2	33 Residential Septics identified in Zone B.
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-01	B	Low	2	AHFC Properties - East 64th Avenue. Cleanup Complete. Chlorinated hydrocarbons and TPH in high contamination levels at residential yard. Extends over 5' in depth. Total extent of contamination and human health impact rated serious.
Airports	X14	X14-01	B	High	2	Campbell Airstrip (Both in DWPP Point and DWPP Poly.)
Airports	X14	X14-02	B	High	2	BLM - Campbell Heliport.
Highways and roads, paved (cement or asphalt)	X20	X20-17-46	B	Low	2	Identified 30 roads in Zone B.

Contaminant Source Inventory and Risk Ranking for Manoogs Isle MHP

Sources of Volatile Organic Chemicals

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Pipelines (oil and gas)	X28	X28-01-02	B	Medium	2	

Table 5

Contaminant Source Inventory and Risk Ranking for Manoogs Isle MHP

Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals

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Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-01-07	A	Low	2	7 Sewerline (Mains)
Residential Areas	R01	R01	A	Low	2	Identified ~25 Acres of residential lots in Zone A.
Municipal or city parks (with green areas)	X04	X04-01	A	Low	2	Campbell Park (Municipality of Anchorage)
Highways and roads, paved (cement or asphalt)	X20	X20-01-10	A	Low	2	10 roads
Highways and roads, paved (cement or asphalt)	X20	X20-11-16	A	Low	2	6 roads platted but not built yet as of 06/10/2010.
Construction trade areas and materials	C09	C09-01	B	Low	2	C R Service @ 7112 Henderson Loop, Anchorage, AK 99507
Construction trade areas and materials	C09	C09-02	B	Low	2	Noble Mechanical Inc. @ 3651 E. 67th Ave., Anchorage, AK 99507
Construction trade areas and materials	C09	C09-03	B	Low	2	RHK Construction Co. @ 6807 Spruce St., Anchorage, AK.
Construction trade areas and materials	C09	C09-04	B	Low	2	Rock Solid Repair & Modeling @ 3637 E. 67th Ave., Anchorage, AK.
Heavy equipment rental/storage	C18	C18-01	B	Low	2	Discount Bob Cat Services @ 7070 Miranda Drive, Anchorage, AK 99507
Laboratories (chemical, soils, and research)	C20	C20-01	B	Low	2	Northern Consultants @ 4107 E. 68th Ave., Anchorage, AK 99507.
Lawn and garden supplies/services	C23	C23-01	B	Low	2	Cook Inlet Landscapes @ 3933 E. 67th Ave., Anchorage, AK 99507.
Motor /motor vehicle repair shops	C31	C31-01	B	Medium	2	Deer Mountain Auto & Tire Service @ 3637 E. 65th Ave., Anchorage, AK 99507
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-08-46	B	Low	2	39 Sewerline (Mains)
Ordinances (military stock piles or shooting ranges, detonated or undetonated?)	M03	M03-01	B	Medium	2	FUDS Campbell Creek Range and Maneuver Area. Active Status. Ordinance related issues. The Campbell Creek Range and Maneuver Area was the site of a WWII-era airfield and maneuver area.
Residential Areas	R01	R01	B	Low	2	Identified ~130 Acres of residential lots in Zone B.
Septic systems (serves one single-family home)	R02	R02-01-33	B	Low	2	33 Residential Septics identified in Zone B.
Municipal or city parks (with green areas)	X04	X04-02	B	Low	2	Far North Bicentennial/Hillside Park (Municipality of Anchorage)

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Airports	X14	X14-01	B	Low	2	Campbell Airstrip (Both in DWPP Point and DWPP Poly.)
Airports	X14	X14-02	B	Low	2	BLM - Campbell Heliport.
Highways and roads, paved (cement or asphalt)	X20	X20-17-46	B	Low	2	Identified 30 roads in Zone B.
Pipelines (oil and gas)	X28	X28-01-02	B	Low	2	

Table 6

Contaminant Source Inventory and Risk Ranking for Manoogs Isle MHP
Sources of Synthetic Organic Chemicals

PWSID 218630.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-01-07	A	Low	2	7 Sewerline (Mains)
Residential Areas	R01	R01	A	Low	2	Identified ~25 Acres of residential lots in Zone A.
Municipal or city parks (with green areas)	X04	X04-01	A	Low	2	Campbell Park (Municipality of Anchorage)
Livestock stables/corrals	A09	A09-01	B	Low	2	F-Bar-J Ranch @ 4140 Lore Road, Anchorage, AK 99507
Lawn and garden supplies/services	C23	C23-01	B	Medium	2	Cook Inlet Landscapes @ 3933 E. 67th Ave., Anchorage, AK 99507.
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-08-46	B	Low	2	39 Sewerline (Mains)
Residential Areas	R01	R01	B	Low	2	Identified ~130 Acres of residential lots in Zone B.
Septic systems (serves one single-family home)	R02	R02-01-33	B	Low	2	33 Residential Septics identified in Zone B.
Municipal or city parks (with green areas)	X04	X04-02	B	Low	2	Far North Bicentennial/Hillside Park (Municipality of Anchorage)
Airports	X14	X14-01	B	Medium	2	Campbell Airstrip (Both in DWPP Point and DWPP Poly.)
Airports	X14	X14-02	B	Medium	2	BLM - Campbell Heliport.

Table 7

Contaminant Source Inventory and Risk Ranking for Manoogs Isle MHP

Sources of Other Organic Chemicals

PWSID 218630.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-01-07	A	Low	2	7 Sewerline (Mains)
Residential Areas	R01	R01	A	Low	2	Identified ~25 Acres of residential lots in Zone A.
Highways and roads, paved (cement or asphalt)	X20	X20-01-10	A	Low	2	10 roads
Highways and roads, paved (cement or asphalt)	X20	X20-11-16	A	Low	2	6 roads platted but not built yet as of 06/10/2010.
Construction trade areas and materials	C09	C09-01	B	Low	2	C R Service @ 7112 Henderson Loop, Anchorage, AK 99507
Construction trade areas and materials	C09	C09-02	B	Low	2	Noble Mechanical Inc. @ 3651 E. 67th Ave., Anchorage, AK 99507
Construction trade areas and materials	C09	C09-03	B	Low	2	RHK Construction Co. @ 6807 Spruce St., Anchorage, AK.
Construction trade areas and materials	C09	C09-04	B	Low	2	Rock Solid Repair & Modeling @ 3637 E. 67th Ave., Anchorage, AK.
Heavy equipment rental/storage	C18	C18-01	B	Medium	2	Discount Bob Cat Services @ 7070 Miranda Drive, Anchorage, AK 99507
Motor /motor vehicle repair shops	C31	C31-01	B	Medium	2	Deer Mountain Auto & Tire Service @ 3637 E. 65th Ave., Anchorage, AK 99507
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-08-46	B	Low	2	39 Sewerline (Mains)
Residential Areas	R01	R01	B	Low	2	Identified ~130 Acres of residential lots in Zone B.
Septic systems (serves one single-family home)	R02	R02-01-33	B	Low	2	33 Residential Septics identified in Zone B.
Airports	X14	X14-01	B	Medium	2	Campbell Airstrip (Both in DWPP Point and DWPP Poly.)
Airports	X14	X14-02	B	Medium	2	BLM - Campbell Heliport.
Highways and roads, paved (cement or asphalt)	X20	X20-17-46	B	Low	2	Identified 30 roads in Zone B.
Pipelines (oil and gas)	X28	X28-01-02	B	High	2	

APPENDIX C

Manoogs Isle Mobile Home Park Well #1
Drinking Water Protection Area
and Potential and Existing Contaminant Sources
(Map 2)

Manoogs Isle MHP WL001
PWS ID# 218630.001

Zone A Contaminant Sources:
7 Sewerlines - Mains (D01)
25 Acres of Residential Areas (R01)
16 Roads (X20)

Zone B Contaminant Sources:
39 Sewerlines - Mains (D01)
30 Acres of Residential Areas (R01)
33 Residential Septics (R02)
30 Roads (X20)
(See Legend for others)

FYFECIR
FUJIST
MEGOST
DOWLINGRD
NADINEST
DOILDR
DOILCIR
BURLWOODST
PETERSBURGST
QUINHAGAKST
TUTTLEPL
LAURELST
SIXTY-THIRDAV
ROSE HIPCIR
NEWTDR
NORMDR
SIXTY-FOURTHAV
DESIREELP
ASKELANDST
GALATEADR
CARRIAGEDR
SPRUCEST
C31
SIXTY-FIFTHAV
ABBOTT LOOPRD
SIXTY-SIXTHAV
D19
TESHLARDR
TIFFANYTER
BABY BEARDR
EILEENST
C09
C23
C20
IVANDR
X28
SIXTY-EIGHTHAV
TONDILA
SHANEPL
BUGLECT
UNNAMEDRD
X14
M03
OAKWOODDR
BURLWOODDR
HYATTST
STELLAPL
ZURICHST
OBRIENST
LAKE OTISPKWY
DURENDACIR
GENNYCIR
BASSST
KOVEYST
C18
HENDERSONLP
TRAVISCIR
REDHAWKCIR
SEVENTY-SECONDAV
LEWISPL
WHITE HAWKDR
DAYTONDR
A09
SEVENTY-THIRDAV
SEVENTY-FOURTHAV
SEVENTY-FIFTHAV
BASELST
BERNST
LORERD
HARTZELLRD
DIMOND HOOKDR
AZURITECT
NADINEST
EVANSCIR
SABRINAST
MEDELLINCIR
PINBROOKCIR
SANDYCIR
KIPCT
EIGHTIETHAV
IONACIR
COVENTRYDR
TRURODR
WELLSLEYCT
UNNAMED ACCESSRD
CAMPBELL AIRSTRIP RD
X04

Map 2 - Manoogs Isle MHP

PWS ID# 218630.001

Alaska Department of Environmental Conservation

0 0.125 0.25 0.5 Miles

1:12,240

N W E S

DATA SOURCES:

Aerial Imagery: Virtual Earth, Microsoft Live Search Maps (http://maps.live.com); Anchorage ArcIMS Image Service (http://munimaps.muni.org)

Public Drinking Water Sources, Drinking Water Protection Areas and Potential/Existing Sources of Contamination: Alaska Department of Environmental Conservation

Legend

Public Water Systems
- Class A Water Systems (C/NTNC)
- Class B Water Systems (TNC)
- Class C Water Systems (State Regulated)

Drinking Water Protection Areas
- Zone A: Several-month time-of-travel for groundwater sources.
- Zone B: Two-year time-of-travel for groundwater sources.

Potential/Existing Sources of Contamination
- Livestock stables/corrals (A09)
- Construction trade areas and materials (C09)
- Heavy equipment rental/storage (C18)
- Laboratories (chemical, soils, and research) (C20)
- Lawn and garden supplies/services (C23)
- Motor /motor vehicle repair shops (C31)
- Ordinances (stockpile- detonated/undetonated) (M03)
- Airports (X14)
- Residential Septics (R02)
- Contaminated Sites (U04)
- Oil/Gas Pipelines (X28)
- Sewerlines (D01)
- Storm water basins and overflows (D19)
- Parks (with green areas) (X04)

Created by Anne Gleason on 02/01/2011