Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for Kamping Resorts of Alaska Drinking Water System, Glennallen, Alaska Kamping Resorts of Alaska # 291376

DRINKING WATER PROTECTION PROGRAM REPORT *255*
Alaska Department of Environmental Conservation

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By Shannon & Wilson, Inc.

DRINKING WATER PROTECTION PROGRAM REPORT *255*

The Drinking Water Protection 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. If you have any additional information that may affect the results of this assessment, please contact the Program Coordinator of DWPP, (907) 269-7521.

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Source Water Assessment for Kamping Resorts of Alaska Source of Public Drinking Water, Glennallen, Alaska

By Shannon & Wilson, Inc.

Drinking Water Protection Program
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The Kamping Resorts of Alaska is a Class B (transient/non-community) water system consisting of one surface water intake, located at Mile 153 of the Glenn Highway, approximately 35 miles southwest of Glennallen, Alaska. Identified potential and current sources of contaminants for Kamping Resorts of Alaska public drinking water source include: oil and gas extraction wells; roads; and campground/RV parks. These identified potential and existing sources of contamination are considered sources of bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals. Overall, the public water sources for Kamping Resorts of Alaska received a vulnerability rating of **Medium** for volatile organic chemicals, **Very High** for bacteria and viruses, and **Very High** for nitrates and nitrites.

INTRODUCTION

The Alaska Department of Environmental Conservation (ADEC) is completing source water assessments for all public drinking water sources in the State of Alaska. The purpose of this assessment is to provide owners and/or operators, communities, and local governments with information they can use to preserve the quality of Alaska's public drinking water supplies. The results of this source water assessment can be used to decide where voluntary protection efforts are needed and feasible, and also what efforts will be most effective in reducing contaminant risks to your water system. Shannon & Wilson has been contracted to perform these assessments under the supervision of ADEC.

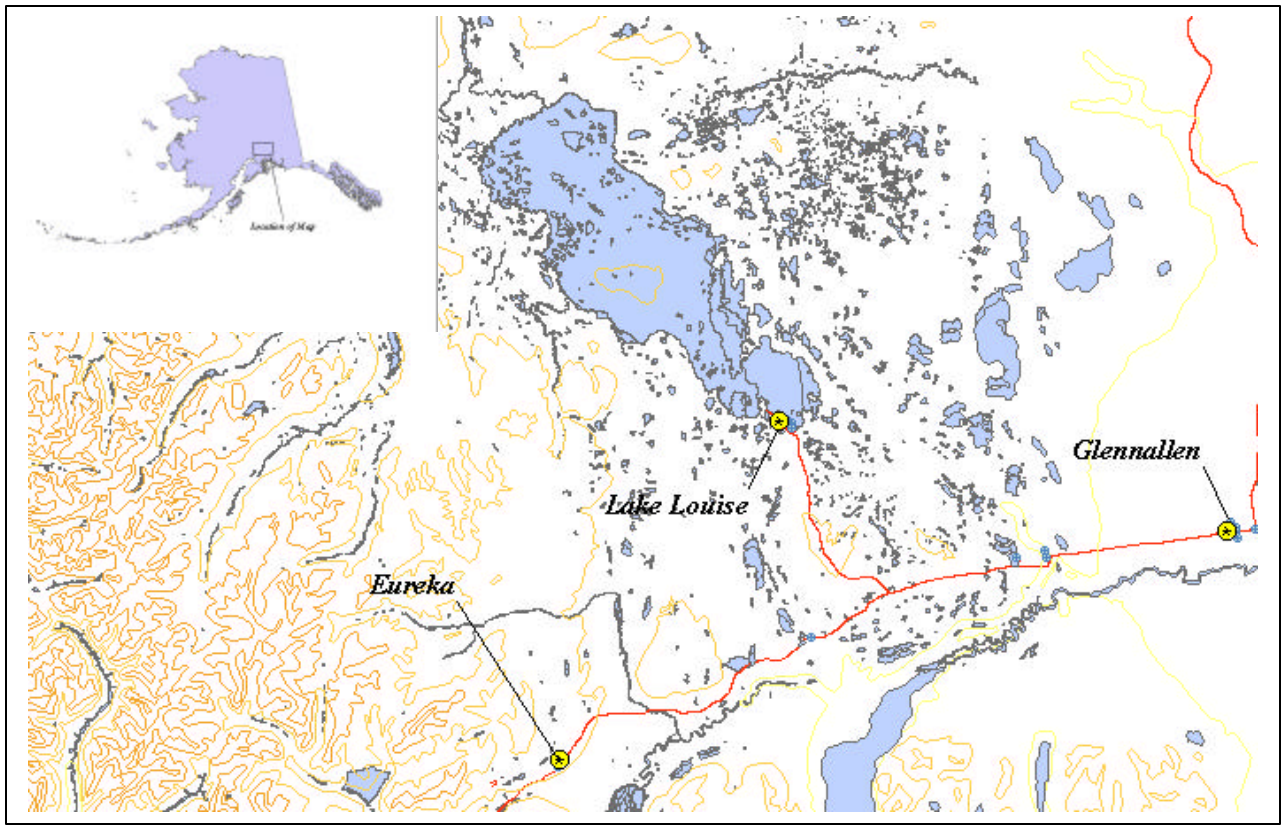


Figure 1. Index map showing the location of the Western Copper River Basin.

This source water assessment combines a review of the natural conditions at the site and the potential and existing contaminant risks. These are combined to determine the overall vulnerability of the drinking water source to contamination.

DESCRIPTION OF THE WESTERN COPPER RIVER BASIN

Location

The western portion of the Copper River Basin encompasses the headwaters of the Nelchina, Little Nelchina, Tazlina and Gulkana Rivers and generally includes Lake Louise. The area is located west of the community of Glennallen, as shown in Figure 1. While Lake Louise is located in the Matanuska-Susitna (Mat-Su) Borough, other portions of the Copper River Basin are not located within the Mat-Su Borough.

A large lake occupied the Copper River Basin before the Copper River cut an outlet through the Chugach Mountains and entered the Gulf of Alaska east of Cordova. The former lake and glaciers that reached the lake margins, coupled with recent alluvial forces, have shaped the landforms of the Copper River Basin. Landforms common in the western portion of the Copper River Basin include gentle undulating terrain and low ridges, terraces, and numerous lakes and streams.

Precipitation

Glennallen averages about 12 inches of precipitation per year.

Topography and Drainage

The area topography varies from about 3,000 feet at Tahneta Pass (separating the Matanuska and Copper River drainage basins) to 2,000 feet at Tolsona Creek, due west of Glennallen. Drainages along the Glenn Highway in this area generally flow south into Tazlina Lake or Tazlina River and then into the Copper River.

Groundwater

Although the quality can vary significantly in a short distance, groundwater supplies are generally abundant in the area. Many homes and businesses in the area rely on individual wells for their water supply. Most of these wells are shallow with depths of less than 100 feet to 200 feet. Static water levels in many of these wells are less than 15 feet below the surface. The coarse, alluvial, sandy gravel in the floodplains of the areas streams and rivers provides a large aquifer even in the winter when infiltration is low.

Geology and Soils

The unconsolidated soils in the western Copper River Basin include fine-grained lacustrine deposits (silts and clays deposited in a lake depositional environment), fine to coarse-grained soils deposited at the margins of the glaciers, and reworked sands and gravels along the streams and rivers. Much of the soils in the area provide good sources of sand, gravel.

KAMPING RESORTS OF ALASKA PUBLIC DRINKING WATER SYSTEM

Kamping Resorts of Alaska is a Class B (transient/non-community) water system. The system consists of one surface water intake from the Mendeltna River, approximately 35 miles swouthwest of Glennallen, Alaska.

The surface water intake was initially put into operation prior to 1975. The most recent Sanitary Survey (5/2/98) indicates the intake was adequately constructed. An adequately constructed intake may provide protection against debris and contaminants from entering the system. The surface water source that the system draws from (Mendeltna River) has a discharge of 20,000 to 90,000 cfs.

This system operates year-round and serves 2 residents and more than 200 non-residents through one service connection.

KAMPING RESORTS OF ALASKA DRINKING WATER PROTECTION AREA

In order to evaluate whether a drinking water source is at risk, we must first evaluate what are the most likely pathways for surface contamination to reach the water source. These pathways are determined by looking at the characteristics of the lake, surrounding area, and the intake.

The most probable area for contamination to reach the drinking water system is the area that contributes water to the surface water body that water is being drawn from. This area is designated as the Drinking Water Protection Area (DWPA). Because a release of contaminants within the DWPA are most likely to impact the drinking water system, this area will serve as the focus for voluntary protection efforts.

The size and shape of the DWPAs were established based on aerial distances from the surface water body, and the watershed that recharges the surface water body. Additional methods were also used to take into account any uncertainties in surface water flow and

topographic characteristics to arrive at a meaningful DWPA (Please refer to the Guidance Manual for Class B Public Water Systems for additional information).

The DWPAs established for surface water systems by the ADEC are separated into three zones. These zones correspond to different distances from the surface water body, and the watershed that recharges the surface water body. The following is a summary of the three DWPA zones and their definitions:

Table 1. Definition of Zones

Zone	Definition
A	1000 Feet From the Surface Water Body
B	1 Mile From the Surface Water Body
C	The Entire Watershed

INVENTORY OF POTENTIAL AND EXISTING CONTAMINANT SOURCES

The Drinking Water Protection Program has completed an inventory of potential and existing sources of contamination within the Kamping Resorts of Alaska DWPA. This inventory was completed through a search of agency records and other publicly available information. Potential sources of contamination to the drinking water system 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 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.

Inventoried potential sources of contamination within Zones A through Zone C were associated with residential and commercial type activities. The sources are summarized in the tables in Appendix B.

RANKING OF CONTAMINANT RISKS

Once the potential and existing sources of contamination have been identified, they are sorted and ranked according to what type and level of risk they represent. Ranking of contaminant risks for a "potential" or "existing" source of contamination is a function of toxicity and volumes of specific contaminants associated with that source. Further, contaminant risks are a function of the number and density of those types of contaminant sources as well as the proximity of those sources to the intake.

VULNERABILITY OF KAMPING RESORTS OF ALASKA DRINKING WATER SOURCE

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

- Natural susceptibility; and
- Contaminant risks.

Each of the three categories of drinking water contaminants has been analyzed and an overall vulnerability score of 0 to 100 is ultimately assigned:

Natural Susceptibility (0 – 50 points)

+

Contaminant Risks (0 – 50 points)

=

Vulnerability of the
Drinking Water Source to Contamination (0 – 100).

A score for the Natural Susceptibility is achieved by analyzing the properties of the well and the aquifer.

Susceptibility of the Surface Water Source
(0 – 50 Points)

The surface water intake for Kamping Resorts of Alaska is completed in the Mendeltna River. Because the river is recharged by surface water and precipitation, contaminants at the surface have the potential to adversely impact this water. Table 2 shows the Overall Susceptibility score and rating for Kamping Resorts of Alaska.

Table 2. Natural Susceptibility - Susceptibility of the Surface Water Source to Contamination

	Score	Rating
Natural Susceptibility	37	High

Contaminant risks to a drinking water source depend on the type, number or density, and distribution of contaminant sources. This data has been derived from an examination of existing or historical contamination that has been detected at the drinking water source through routine sampling. It also evaluates potential sources of contamination. Table 3 summarizes the Contaminant Risks for each category of drinking water contaminants.

Table 3. Contaminant Risks

Category	Score	Rating
Bacteria and Viruses	50	Very High
Nitrates and/or Nitrites	45	Very High
Volatile Organic Chemicals	12	Low

Appendix D contains seven charts, which together form the 'Vulnerability Analysis' for a source water assessment for a public drinking water source. Chart 1 analyzes the 'Susceptibility of the Surface Water Source' to contamination by looking at the construction of the intake and its surrounding area and naturally-occurring attributes of the water source and influences on the groundwater system that might lead to contamination. Chart 2 analyzes 'Contaminant Risks' for the drinking water source with respect to bacteria and viruses. The 'Contaminant Risks' portion of the analysis considers potential sources of contaminants as well as a review of contamination that has or may have occurred, but has not arrived or been detected at the well. Chart 3 contains the 'Vulnerability Analysis for Bacteria and Viruses.' Charts 4 through 7 contain the Contaminant Risks and Vulnerability Analyses for nitrates and nitrites and volatile organic chemicals, respectively.

Table 4 contains the overall vulnerability scores (0 - 100) and ratings for each of the three categories of drinking water contaminants. Note: scores are rounded off to the nearest five.

Table 4. Overall Vulnerability of Kamping Resorts of Alaska to Contamination by Category

Category	Score	Rating
Bacteria and Viruses	85	Very High
Nitrates and Nitrites	80	Very High
Volatile Organic Chemicals	50	Medium

Tables 2 through 4 in Appendix B contain the ranking of potential and existing sources of contamination with respect to bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals.

The oil and gas extraction wells; roads; and campground/RV parks create a risk increase for the bacteria and viruses, nitrates and nitrites, and volatile organic compounds.

Only a small amount of bacteria and viruses are required to endanger public health. Bacteria and viruses have been detected during a recent water sampling of the system at Kamping Resorts of Alaska.

Nitrates and/or nitrites are found in natural background concentration at this site, as elsewhere throughout Alaska. Nitrate concentrations in uncontaminated groundwater are typically less than 2 milligrams per liter (mg/L) and are derived primarily from the decomposition of organic matter in soils, adopted from the U.S. Geological Survey (Wang, et al., 2000).

Sampling history for Kamping Resorts of Alaska indicates that low concentrations of nitrate have been detected (see Chart 5 - Contaminant Risks for Nitrates and/or Nitrites in Appendix D). Existing nitrate concentration is approximately 0.929 mg/L or 9% of the Maximum Contaminant Level (MCL) of 10 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. Due to the high solubility and weak retention by soil, nitrates are very mobile, moving at approximately the same rate as water. Though existing nitrate contamination was detected at the site, concentrations remain at very safe levels with respect to human health.

The oil and gas extraction wells; roads; and campground/RV parks located in Zone A form the greatest risk for volatile organic chemicals.

SUMMARY

A *Source Water Assessment* has been completed for the sources of public drinking water serving Kamping Resorts of Alaska. The overall vulnerability of this source to contamination is **Medium** for volatile organic chemicals, **Very High** for bacteria and viruses, and **Very High** for nitrates and nitrites. 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 Kamping Resorts of Alaska 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 Kamping Resorts of Alaska public drinking water source.

REFERENCES CITED

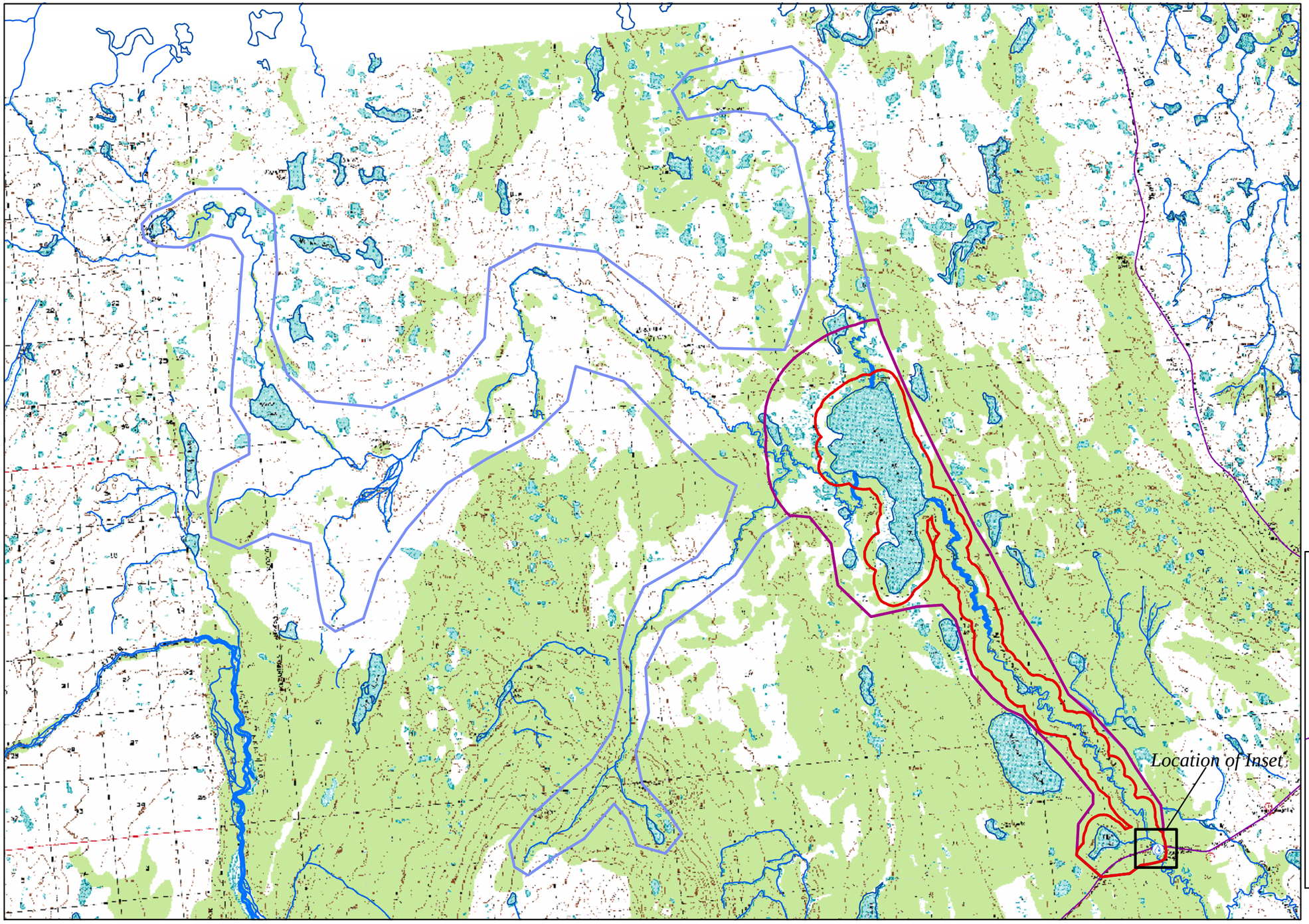
Wang, B., Strelakos, P.M., and Jokela, J.B., 2000, Nitrate source indicators in ground water of the scimitar subdivision, Peters Creek Area, Anchorage, Alaska: US Geological Survey Water-Resources Investigations Report 00-4137.

Weather Underground, June 18, 2002, Web extension to the *Western Regional Climate Center*[WWW document]. URL http://www.wunderground.com

APPENDIX A

Kamping Resorts of Alaska
Drinking Water Protection Area
(Map 1)

Drinking Water Protection Areas for Kamping Resorts of Alaska



Kamping Resorts of Alaska Intake

MSB Roads

Site Buildings

Zone A Protection Area

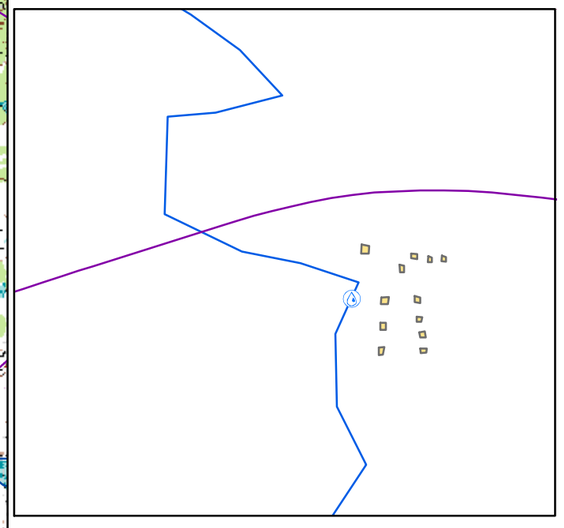
1000 Feet from Surface Water Body

Zone B Protection Area

1 Mile from Surface Water Body

Zone C Protection Area

Entire Watershed



4 2 0 4 Miles

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N W E S

Map 1

APPENDIX B

Contaminant Source Inventory and Risk Ranking for Kamping Resorts of Alaska (Tables 1-4)

Table 1 *Contaminant Source Inventory for Kamping Resorts of Alaska* ***PWSID 291376.001***

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Location*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	Assumed near the Restaurant.	3	
Oil and gas extraction wells	W07	W7-1	A	NW of Kamping Resorts of Alaska	3	
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Glenn Highway	2	
Campgrounds and RV Parks	X35	X35-1	A	East of Kamping Resorts of Alaska Intake	3	

Contaminant Source Inventory and Risk Ranking for

Table 2 ***PWSID 291376.001***

Kamping Resorts of Alaska

Sources of Bacteria and Viruses

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Overall Rank after Analysis*	*Location*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	High	1	Assumed near the Restaurant.	3	
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	2	Glenn Highway	2	
Campgrounds and RV Parks	X35	X35-1	A	Low	3	East of Kamping Resorts of Alaska	3	

Contaminant Source Inventory and Risk Ranking for

Table 3 ***PWSID 291376.001***

Kamping Resorts of Alaska

Sources of Nitrates/Nitrites

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Overall Rank after Analysis*	*Location*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	High	1	Assumed near the Restaurant.	3	
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	2	Glenn Highway	2	
Campgrounds and RV Parks	X35	X35-1	A	Low	3	East of Kamping Resorts of Alaska	3	

Contaminant Source Inventory and Risk Ranking for

Table 4 ***PWSID 291376.001***

Kamping Resorts of Alaska

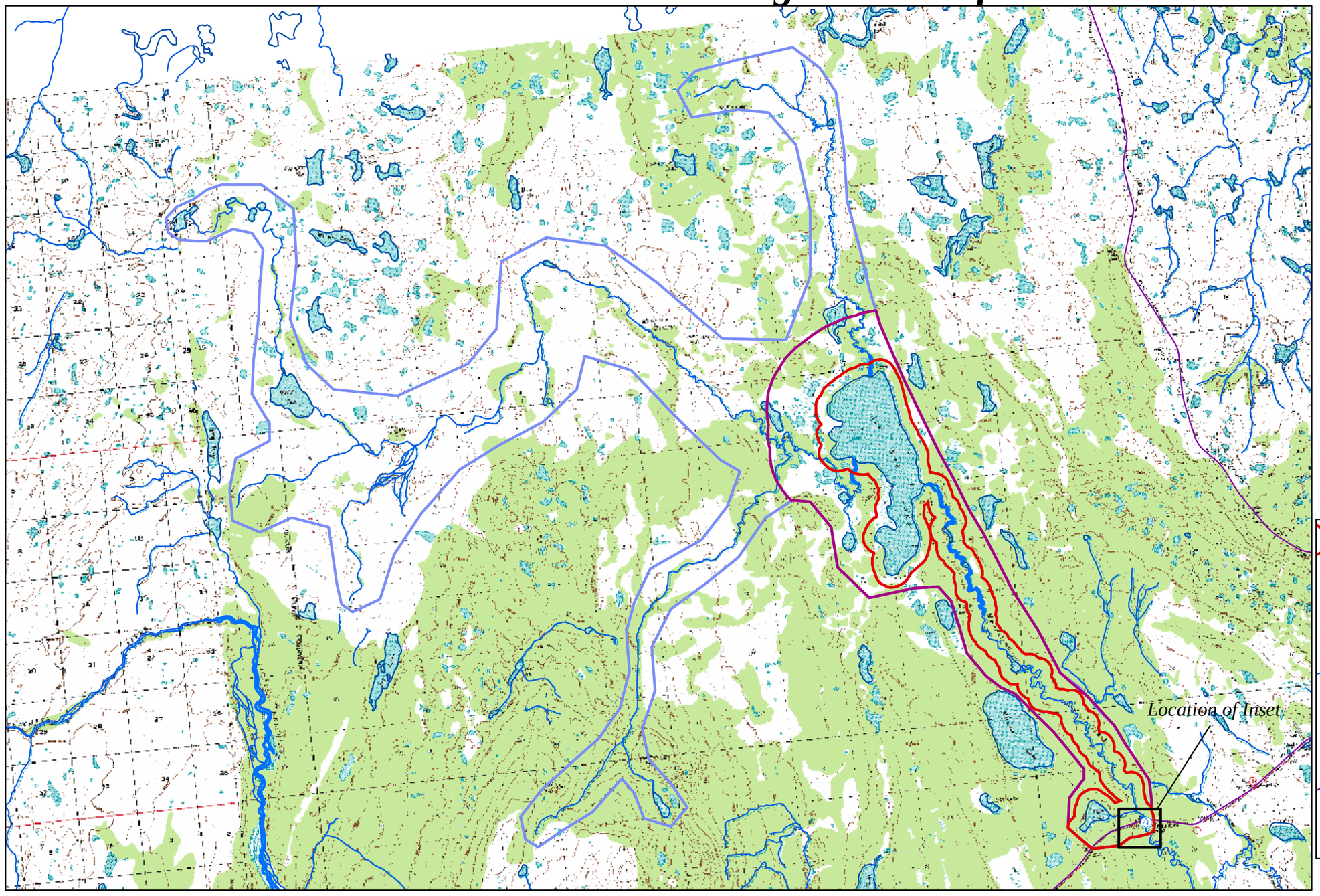
Sources of Volatile Organic Chemicals

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Overall Rank after Analysis*	*Location*	*Map Number*	*Comments*
Oil and gas extraction wells	W07	W7-1	A	Low	1	NW of Kamping Resorts of Alaska Park	3	
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	2	Glenn Highway	2	
Campgrounds and RV Parks	X35	X35-1	A	Low	3	East of Kamping Resorts of Alaska	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	Low	4	Assumed near the Restaurant.	3	

APPENDIX C

Kamping Resorts of Alaska
Drinking Water Protection Area
and Potential and Existing Contaminant Sources
(Maps 2-3)

Drinking Water Protection Areas for Kamping Resorts of Alaska and Potential and Existing Sources of Contamination



Kamping Resorts of Alaska Intake

MSB Roads

Site Buildings

Zone A Protection Area

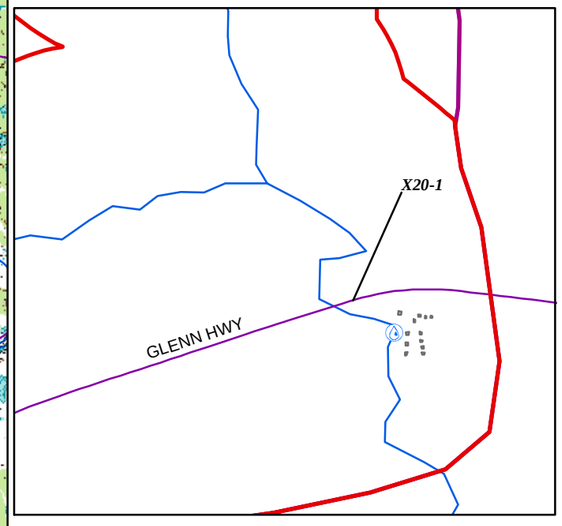
1000 Feet from Surface Water Body

Zone B Protection Area

1 Mile from Surface Water Body

Zone C Protection Area

Entire Watershed



4 2 0 4 Miles

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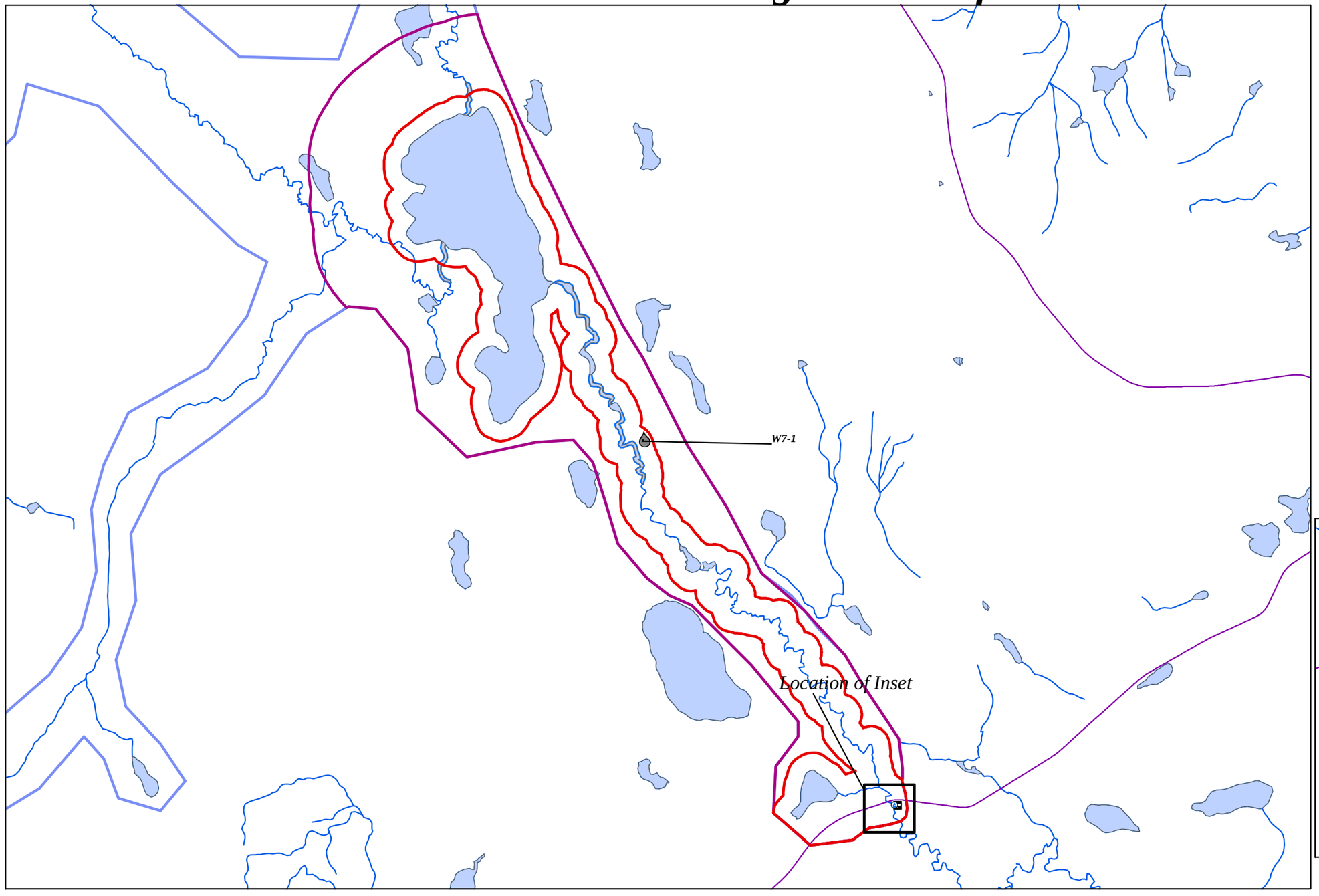
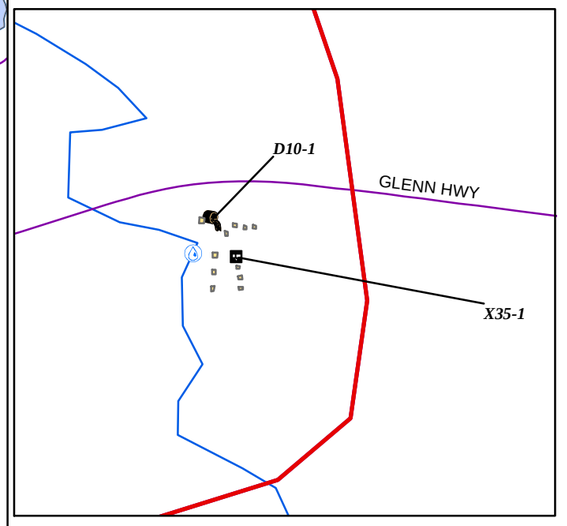
N W E S

Map 2

Drinking Water Protection Areas for Kamping Resorts of Alaska and Potential and Existing Sources of Contamination



Kamping Resorts of Alaska Intake
Oil and Gas Extraction Well (W7)
Large Capacity Septic Systems (D10)
Campgrounds or RV Parks (X35)
MSB Roads
Lakes
Zone A Protection Area
1000 Feet from Surface Water Body
Zone B Protection Area
1 Mile from Surface Water Body
Zone C Protection Area
Entire Watershed



2 1 0 2 Miles

PWSID 291376.001

N
W E
S

Map 3

APPENDIX D

Vulnerability Analysis for Kamping Resorts of Alaska Public Drinking Water Source (Charts 1-7)

Chart 1. Susceptibility of the Surface Water Source - Kamping Resorts of Alaska

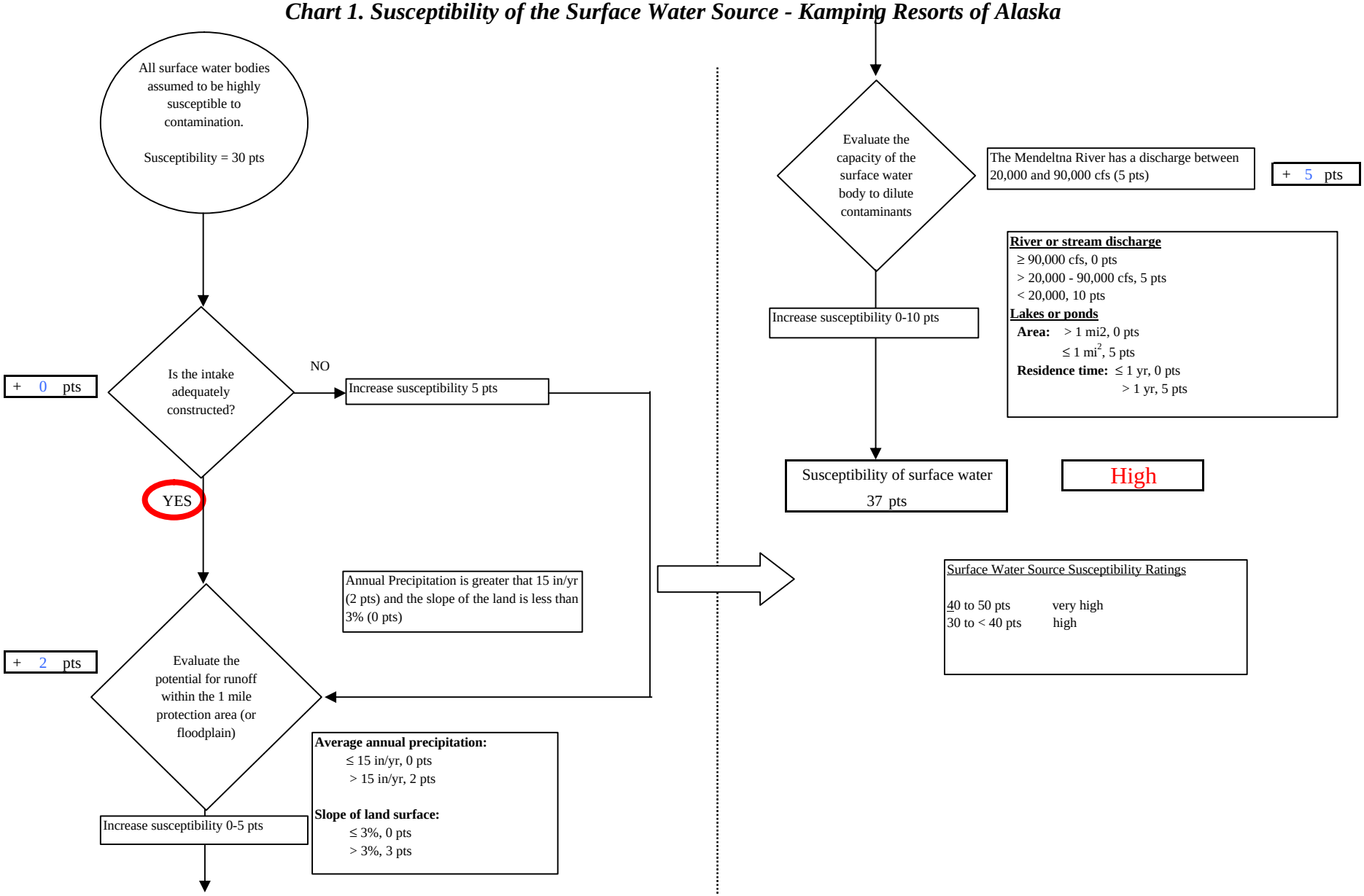
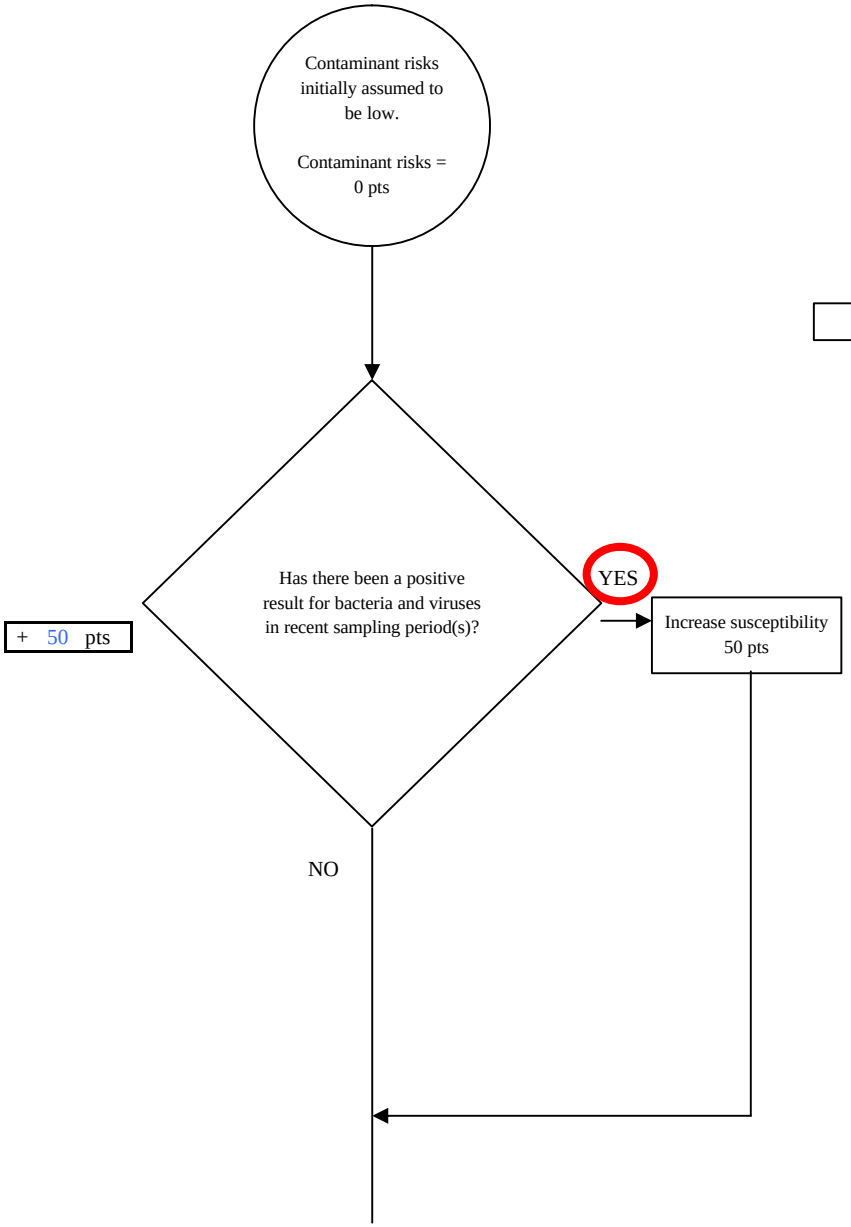
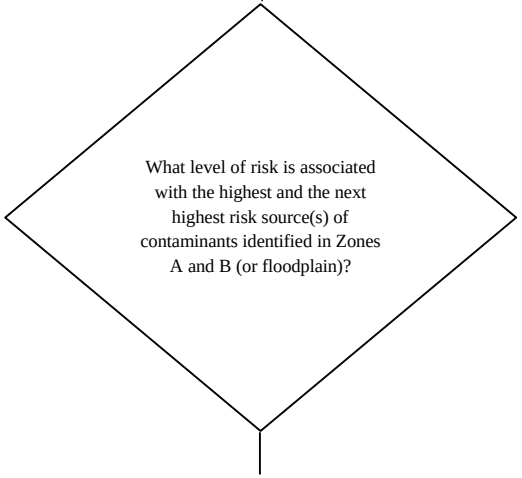


Chart 2. Contaminant Risks for Kamping Resorts of Alaska - Bacteria & Viruses





+ 30 pts

Risk Rankings for Contaminant Sources Identified in Zones A and B

	Zone A	Zone B	Total
Very Highs(s)	0	0	0
High(s)	1	0	1
Medium(s)	0		0
Low(s)	2		2

	LOW 10 pts	**MEDIUM** 20 pts	**HIGH** 30 pts	**VERY HIGH** 40 pts
LOW	³ 10 sources + 10 pts	≥ 10 sources + 5 pts	≥ 20 sources + 5 pts	----
MEDIUM	----	≥ 2 sources + 5 pts	≥ 5 sources + 5 pts	≥ 10 sources + 5 pts
HIGH	----	----	≥ 1 source + 10 pts	≥ 2 sources + 10 pts
VERY HIGH	----	----	----	≥ 1 source + 10 pts

Matrix Score 30

Note: Septic systems, sewerlines, and roads are each assigned a risk ranking for each individual contaminant source in the CSI. The VA, however, counts these contaminant sources as a group and assigns a calculated number of either "lows" or "mediums" based on the density.

Chart 2. Contaminant Risks for Kamping Resorts of Alaska - Bacteria & Viruses

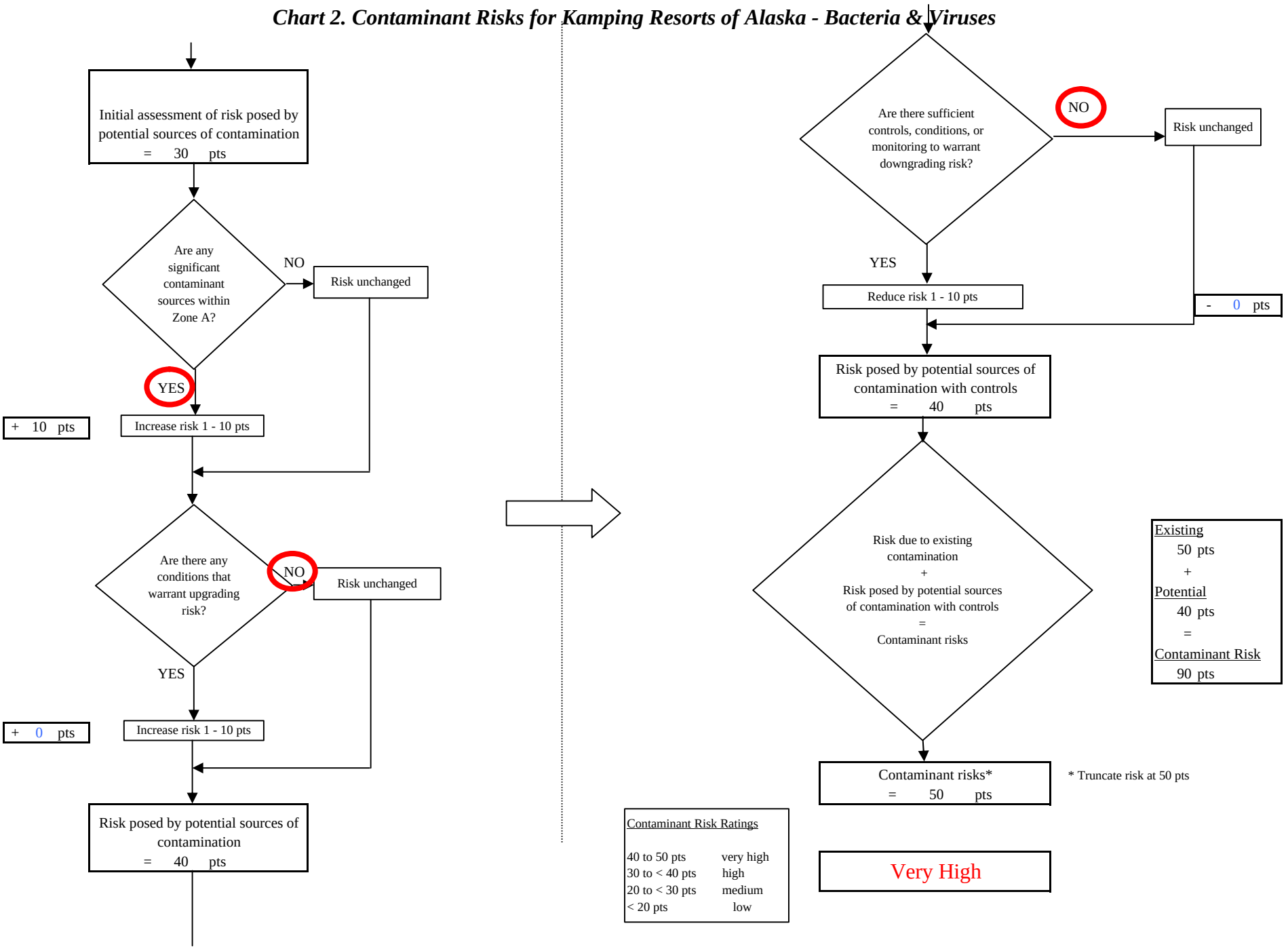


Chart 3. Vulnerability Analysis for Kamping Resorts of Alaska - Bacteria & Viruses

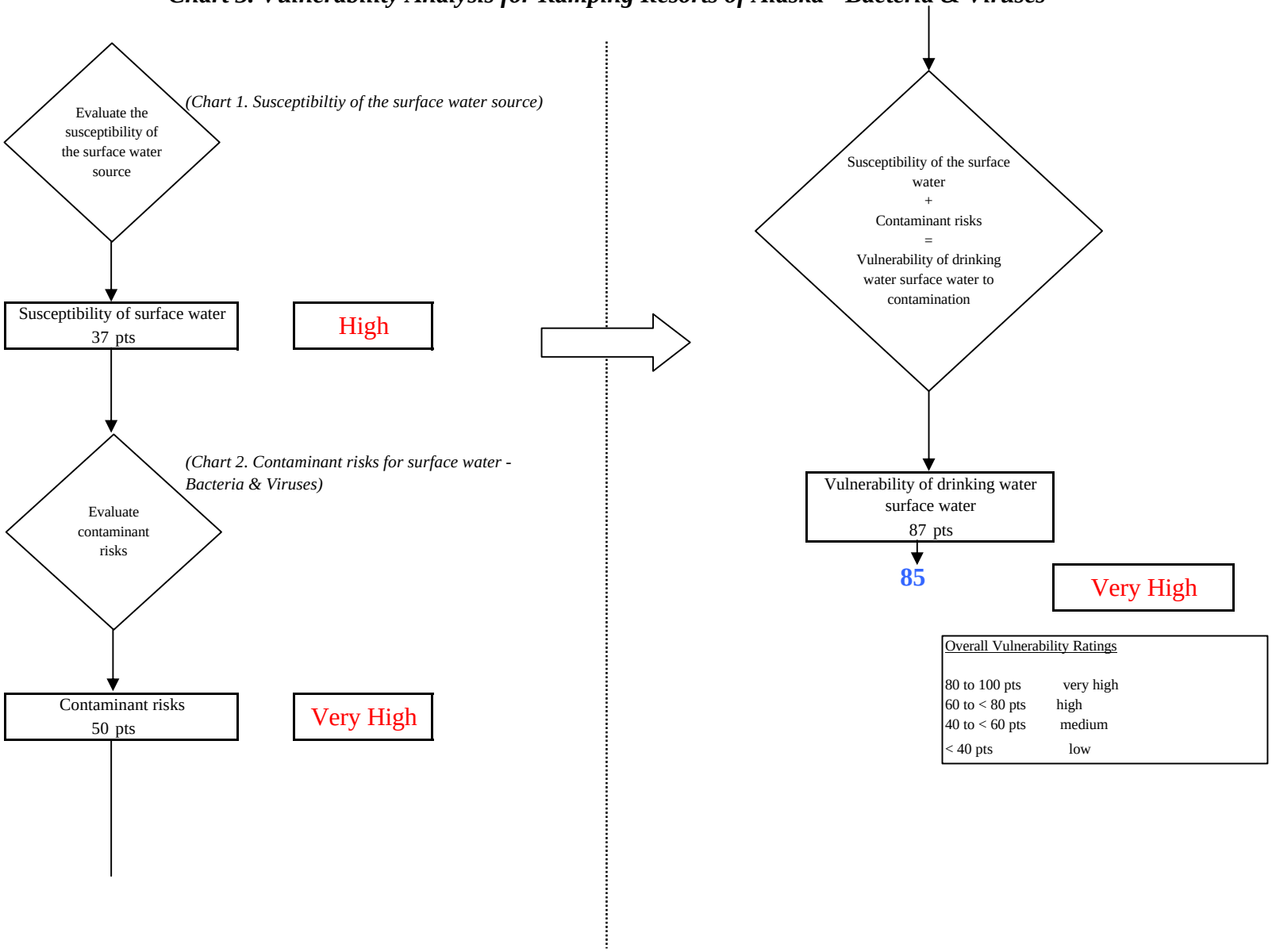


Chart 4. Contaminant Risks for Kamping Resorts of Alaska - Nitrates and Nitrites

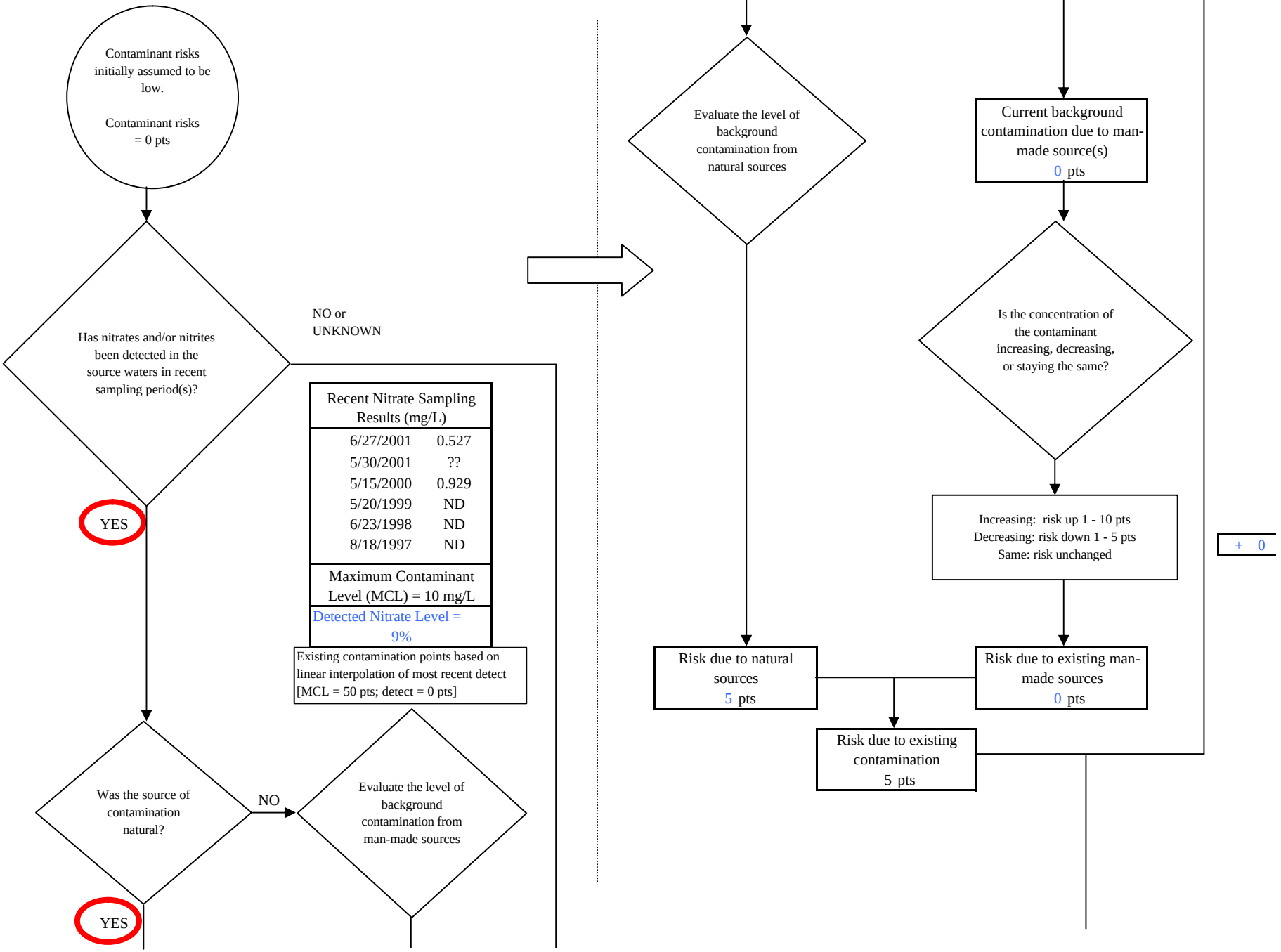


Chart 4. Contaminant Risks for Kamping Resorts of Alaska - Nitrates and Nitrites

+ 30 pts

What level of risk is associated with the highest and the next highest risk sources(s) of contaminants identified in Zones A and B? (see Risk Matrix below)

Initial assessment of risk posed by potential sources of contamination = 30 pts

Are any significant sources in Zone A?

NO → Risk unchanged

YES → Increase risk 1 - 10 pts

+ 10

Risk Levels for Contaminant Sources identified in Zones A and B

	Zone A	Zone B	Total
Very Highs(s)	0	0	0
High(s)	1	0	1
Medium(s)	0		0
Low(s)	2		2

	LOW 10 pts	**MEDIUM** 20 pts	**HIGH** 30 pts	**VERY HIGH** 40 pts
LOW	[3] 10 sources + 10 pts	≥ 10 sources + 5 pts	≥ 20 sources + 5 pts	----
MEDIUM	----	≥ 2 sources + 5 pts	≥ 5 sources + 5 pts	≥ 10 sources + 5 pts
HIGH	----	----	≥ 1 source + 10 pts	≥ 2 sources + 10 pts
VERY HIGH	----	----	----	≥ 1 source + 10 pts

Matrix Score 30

Note: Septic systems, sewerlines, and roads are each assigned a risk ranking for each individual contaminant source in the CSI. The VA, however, counts these contaminant sources as a group and assigns a calculated number of either "lows" or "mediums" based on the density.

Chart 4. Contaminant Risks for Kamping Resorts of Alaska - Nitrates and Nitrites

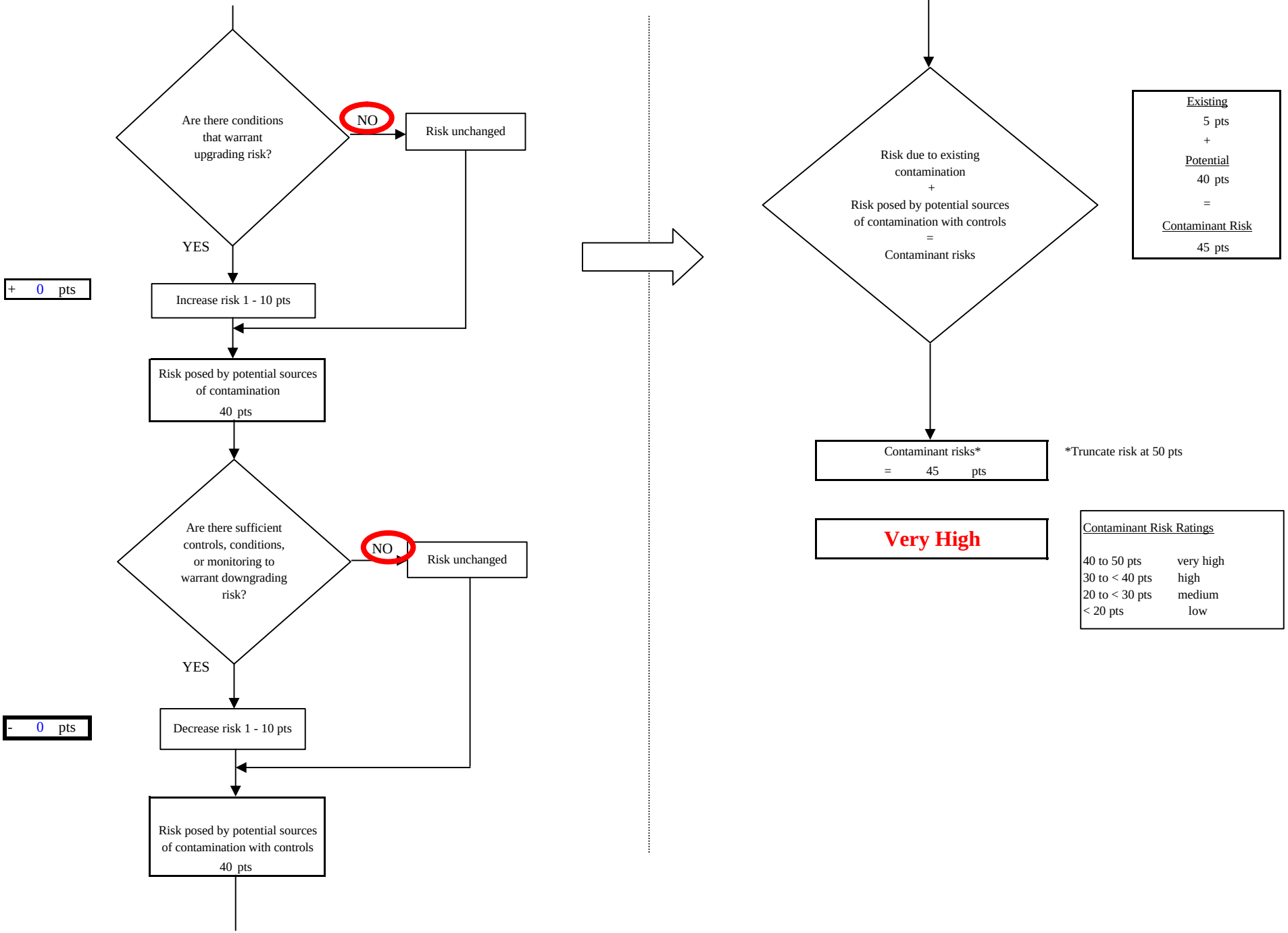


Chart 5. Vulnerability Analysis for Kamping Resorts of Alaska - Nitrates and Nitrites

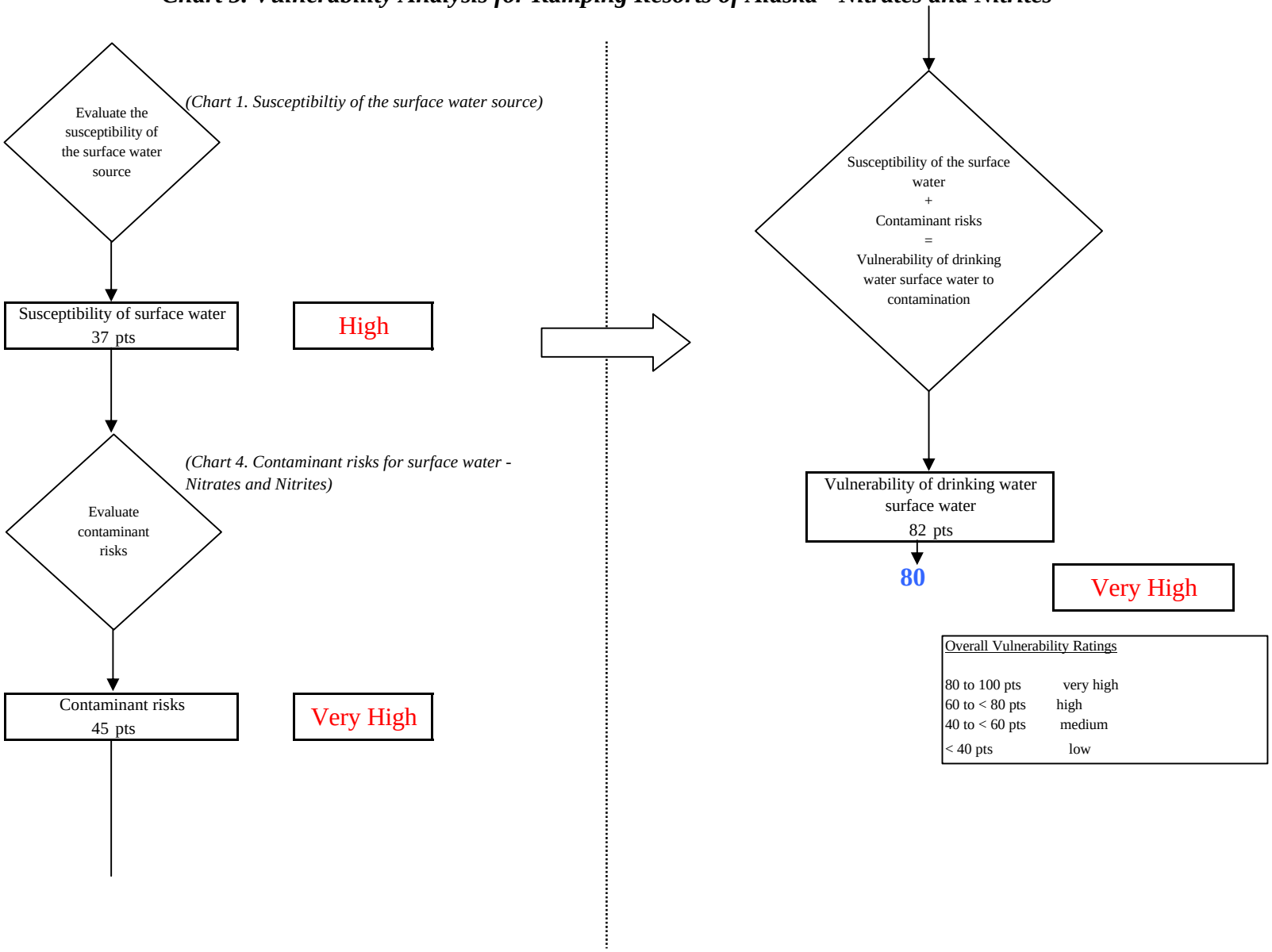


Chart 6. Contaminant Risks for Kamping Resorts of Alaska - Volatile Organic Chemicals

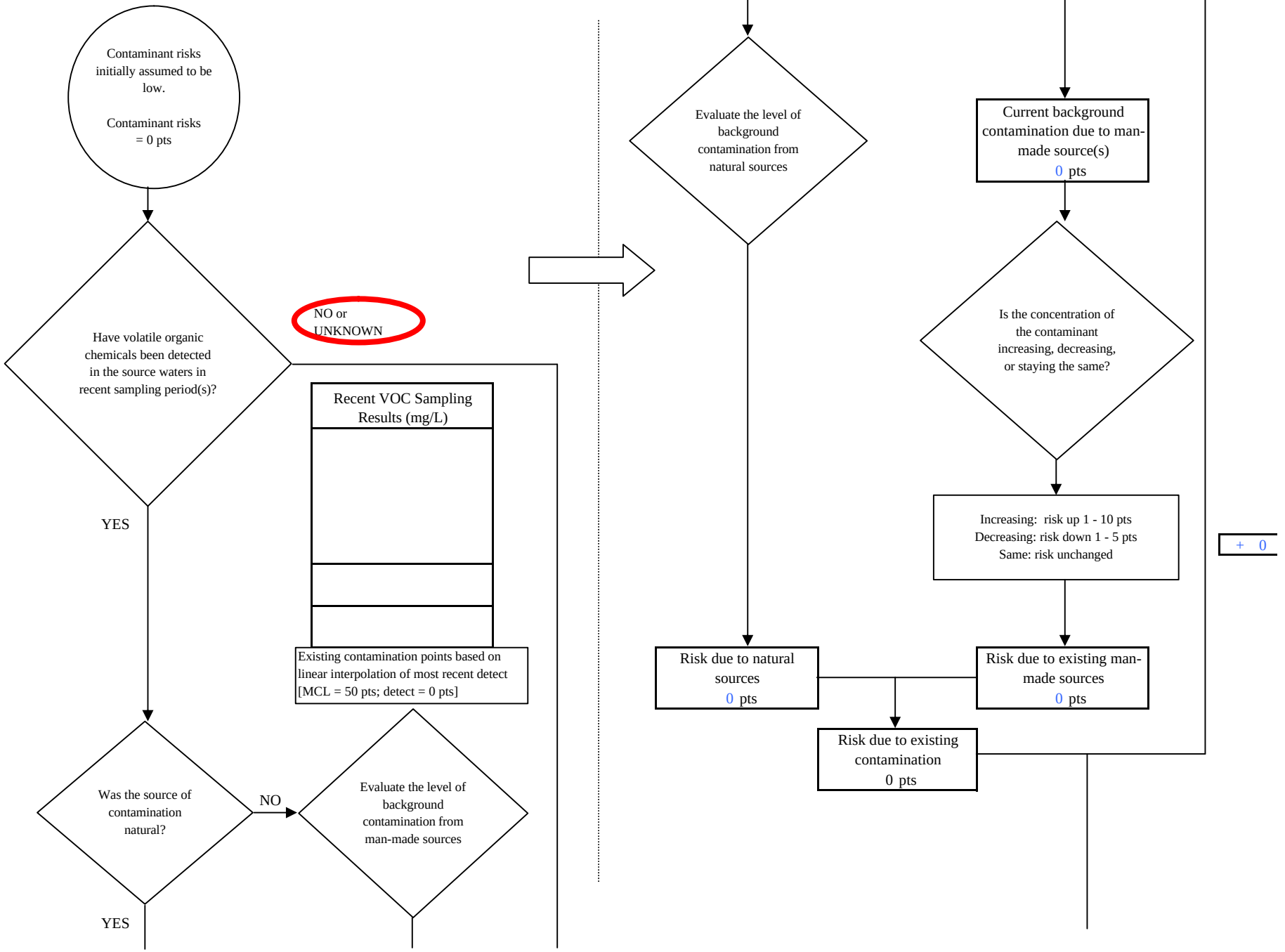


Chart 6. Contaminant Risks for Kamping Resorts of Alaska - Volatile Organic Chemicals

+ 10 pts

What level of risk is associated with the highest and the next highest risk sources(s) of contaminants identified in Zones A and B? (see Risk Matrix below)

Initial assessment of risk posed by potential sources of contamination = 10 pts

Risk Levels for Contaminant Sources identified in Zones A and B

	Zone A	Zone B	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	0		0
Low(s)	4		4

	LOW 10 pts	**MEDIUM** 20 pts	**HIGH** 30 pts	**VERY HIGH** 40 pts
LOW	[3] 10 sources + 10 pts	≥ 10 sources + 5 pts	≥ 20 sources + 5 pts	----
MEDIUM	----	≥ 2 sources + 5 pts	≥ 5 sources + 5 pts	≥ 10 sources + 5 pts
HIGH	----	----	≥ 1 source + 10 pts	≥ 2 sources + 10 pts
VERY HIGH	----	----	----	≥ 1 source + 10 pts

Are any significant sources in Zone A?

NO

Risk unchanged

YES

Increase risk 1 - 10 pts

+ 2

Matrix Score 10

Note: Septic systems, sewerlines, and roads are each assigned a risk ranking for each individual contaminant source in the CSI. The VA, however, counts these contaminant sources as a group and assigns a calculated number of either "lows" or "mediums" based on the density.

Chart 6. Contaminant Risks for Kamping Resorts of Alaska - Volatile Organic Chemicals

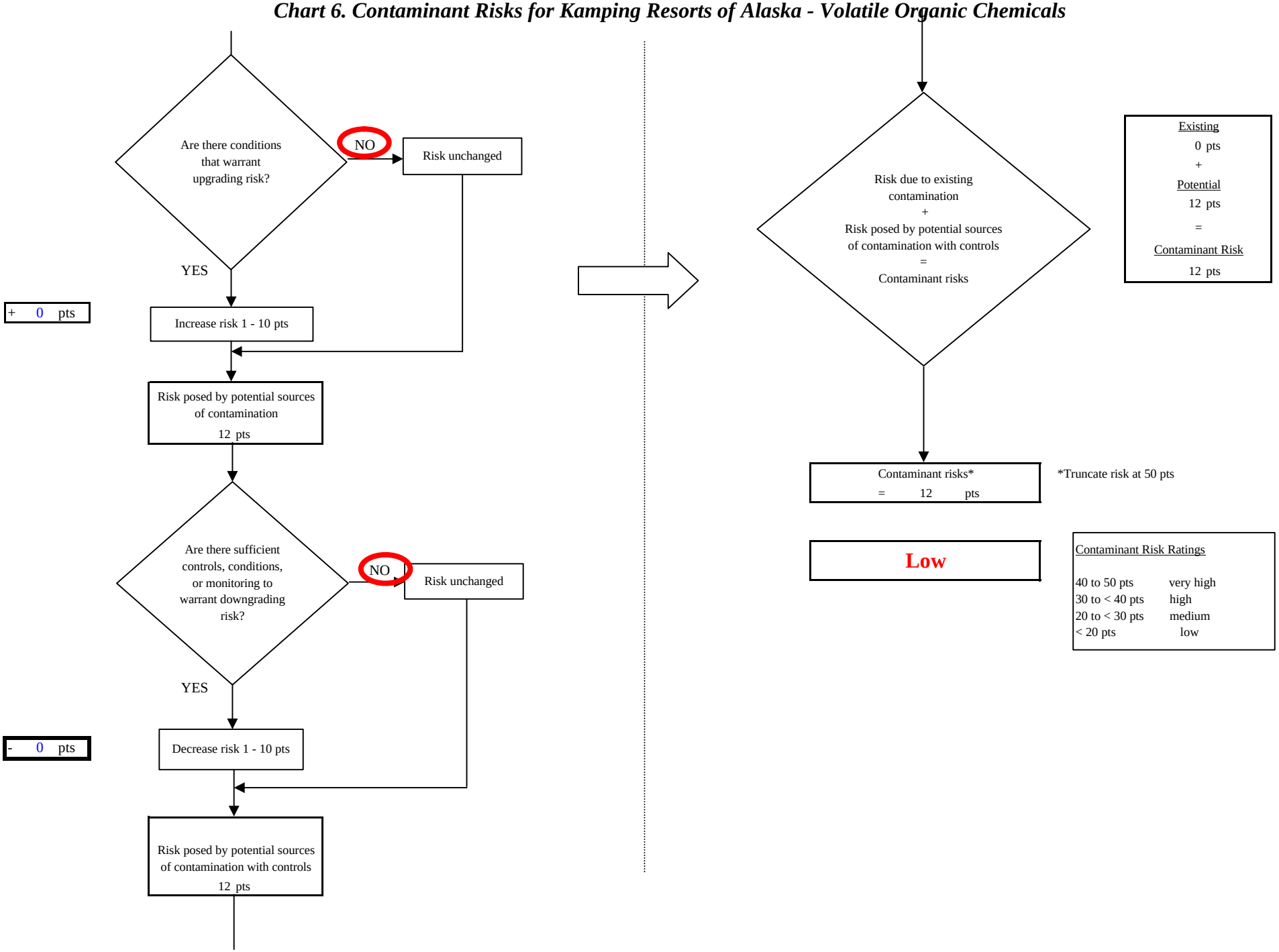


Chart 7. Vulnerability Analysis for Kamping Resorts of Alaska - Volatile Organic Chemicals