Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for Kennicott Glacier Lodge, McCarthy, Alaska PWSID #292241

DRINKING WATER PROTECTION PROGRAM REPORT NO. 877

Alaska Department of Environmental Conservation

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The Drinking Water Protection Program (DWPP) 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 DWPP, (907) 269-7521.

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Source Water Assessment for Kennicott Glacier Lodge, McCarthy, Alaska

Drinking Water Protection Program
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EXECUTIVE SUMMARY

The public water system for Kennicott Glacier Lodge is a Class B (transient/non-community) water system consisting of one surface water intake from National Creek, northeast of McCarthy, Alaska. The surface water intake received a susceptibility rating of **Very High**. A rating of High to Very High is typical for all surface water systems. Identified potential and current sources of contaminants for Kennicott Glacier Lodge's public drinking water source include paved highways and roads. This identified potential and existing source of contamination includes sources of bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals. Contaminant sources could potentially contribute bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals into the source waters. Overall, the public water sources for Kennicott Glacier Lodge received a vulnerability rating of **Medium** for bacteria and viruses; **High** for nitrates and nitrites; and **Medium** for volatile organic chemicals.

KENNICOTT GLACIER LODGE PUBLIC DRINKING WATER SYSTEM

Kennicott Glacier Lodge public water system is a Class B (transient/non-community) water system. The system consists of one surface water intake and is located north of McCarthy, Alaska. McCarthy lies 61 miles east of Chitina off the Edgerton Highway. It is on the Kennicott River at the mouth of McCarthy Creek, 12 miles northeast of the junction of the Nizina and Chitina Rivers, in the heart of the Wrangell-St. Elias National Park and Preserve. The population of McCarthy is approximately 20.

McCarthy's snowfall averages 52 inches, with total precipitation of 12 inches per year. The groundwater sources underlying the area are recharged through the infiltration of precipitation and surface water. Groundwater sources in the region generally occur in the fractured bedrock and unconsolidated sediments deposited by glaciers and/or rivers. The elevation for McCarthy is about 1,500 feet above sea level.

According to a Sanitary Survey dated June 17, 1992, the surface water intake was adequately constructed. An adequately constructed intake may provide protection against debris and contaminants from entering the system. The raw water is treated by filtration and disinfection. There is a potential for runoff within the area surrounding the surface water.

This system operates seasonally from May through September and serves approximately 12 residents and 32 non-residents through 1 service connection.

KENNICOTT GLACIER LODGE 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 creek. These areas are determined by looking at the characteristics of the creek, surrounding contaminant sources, 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 from which that water is being drawn. This area is designated as the Drinking Water Protection Area (DWPA). Because releases 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. 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 entire 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	1,000 feet from the Surface Water Body
B	1 mile from the Surface Water Body
C	Entire Watershed

The DWPA for Kennicott Glacier Lodge extends throughout the entire watershed area. Development in the vicinity of the surface water intake is limited to only Zone A (See Map 1 of Appendix A).

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 Kennicott Glacier Lodge DWPA. This inventory was completed through a search of agency records and other publicly-available information. Potential sources of contamination to the drinking water source 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;
- Volatile organic chemicals

RANKING OF CONTAMINANT RISKS

Once the potential and existing sources of contamination have been identified, they are 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 function of toxicity and volumes of specific contaminants associated with that source. Rankings include:

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

The TOT for contaminants within the water varies and is dependent on the physical and chemical characteristics of each contaminant. Bacteria and Viruses are only inventoried in Zones A and B because of their short life span.

VULNERABILITY OF KENNICOTT GLACIER LODGE DRINKING WATER SYSTEM

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 30 to 100 is ultimately assigned:

Natural Susceptibility (30 – 50 points)

+

Contaminant Risks (0 – 50 points)

=

Vulnerability of the
Drinking Water Source to Contamination (30 – 100).

A score for the Natural Susceptibility is achieved by analyzing the properties of the surface water source.

Natural Susceptibility
(Susceptibility of the Surface Water Source)
(30 – 50 Points)

The surface water intake for Kennicott Glacier Lodge is National Creek. Because the creek is recharged by surface water runoff and precipitation, contaminants at or near the creek have the potential to adversely impact this drinking water source. Table 2 shows the Overall Susceptibility score and rating for Kennicott Glacier Lodge.

Table 2. Natural Susceptibility

	Score	Rating
Natural Susceptibility	45	Very 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	12	Low
Nitrates and/or Nitrites	17	Low
Volatile Organic Chemicals	2	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 surface water source. 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 (30 – 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

Category	Score	Rating
Bacteria and Viruses	55	Medium
Nitrates and Nitrites	60	High
Volatile Organic Chemicals	45	Medium

Bacteria and Viruses

The contaminant risk for bacteria and viruses is **Low** with the paved highways and roads representing the risk to this source of public drinking water (See Chart 2 – Contaminant Risks for Bacteria and Viruses in Appendix D).

Only a small amount of bacteria and viruses are required to endanger public health. Bacteria and viruses have not been detected during recent water sampling of the system at the Kennicott Glacier Lodge. Combining the contaminant risks with the overall natural susceptibility of the surface water source, the vulnerability of the surface water source to contamination by bacteria and viruses is **Medium**.

Nitrates and Nitrites

The contaminant risk for nitrates and nitrites is **Low** with the paved highways and roads representing the risk to this source of public drinking water (See Chart 4 - Contaminant Risks for Nitrates and/or Nitrites in Appendix D).

Sampling history for Kennicott Glacier Lodge indicates that nitrates have been detected in the water, but only in very low concentrations (at 1.60 mg/L on 05/14/02) or 16% of the Maximum Contaminant Level (MCL). 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.

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

Volatile Organic Chemicals

The contaminant risk for volatile organic chemicals is **Low** with the paved highways and roads creating the only known risks for volatile organic chemicals (See Chart 6 – Contaminant Risks for Volatile Organic Chemicals in Appendix D).

Sampling history indicates that volatile organic chemicals have not been detected in the water. Combining the contaminant risk for volatile organic chemicals with the natural susceptibility of the surface water source, the overall vulnerability of the surface water source to contamination by volatile organic chemicals is **Medium**.

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King, P.B., compiler, 1969, Tectonic map of North America: US Geological Survey Map (Scale 1:5,000,000) 2 sheets.

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APPENDIX A

Kennicott Glacier Lodge
Drinking Water Protection Area Location Map
(Map 1)

Kennicott Glacier Lodge

Location of Map

Map 1: Kennicott Glacier Lodge Drinking Water Protection Areas

PWSID: 292241.001

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

0 600 1,200 2,400 3,600 4,800 Feet

1:14,327

Data Sources:

Background image - USGS 1:63,000 mapping

Legend

- Public Drinking Water Systems

DWPA Zone A

- 1000 Feet from Surface Water Body

DWPA Zone B

- Entier Watershed

0 1.25 2.5 5 Miles

August 4, 2003

APPENDIX B

Contaminant Source Inventory and Risk Ranking for Kennicott Glacier Lodge (Tables 1-4)

Table 1 **Contaminant Source Inventory for Kennicott Glacier Lodge** **PWSID 292241.001**

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Map Number	Comments
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	2	Road Northeast of Kennicott Glacier Lodge

Table 2

Contaminant Source Inventory and Risk Ranking for Kennicott Glacier Lodge Sources of Bacteria and Viruses

PWSID 292241.001

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	X20-1	A	Low	2	Road Northeast of Kennicott Glacier Lodge

Table 3

Contaminant Source Inventory and Risk Ranking for Kennicott Glacier Lodge Sources of Nitrates/Nitrites

PWSID 292241.001

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	X20-1	A	Low	2	Road Northeast of Kennicott Glacier Lodge

Table 4

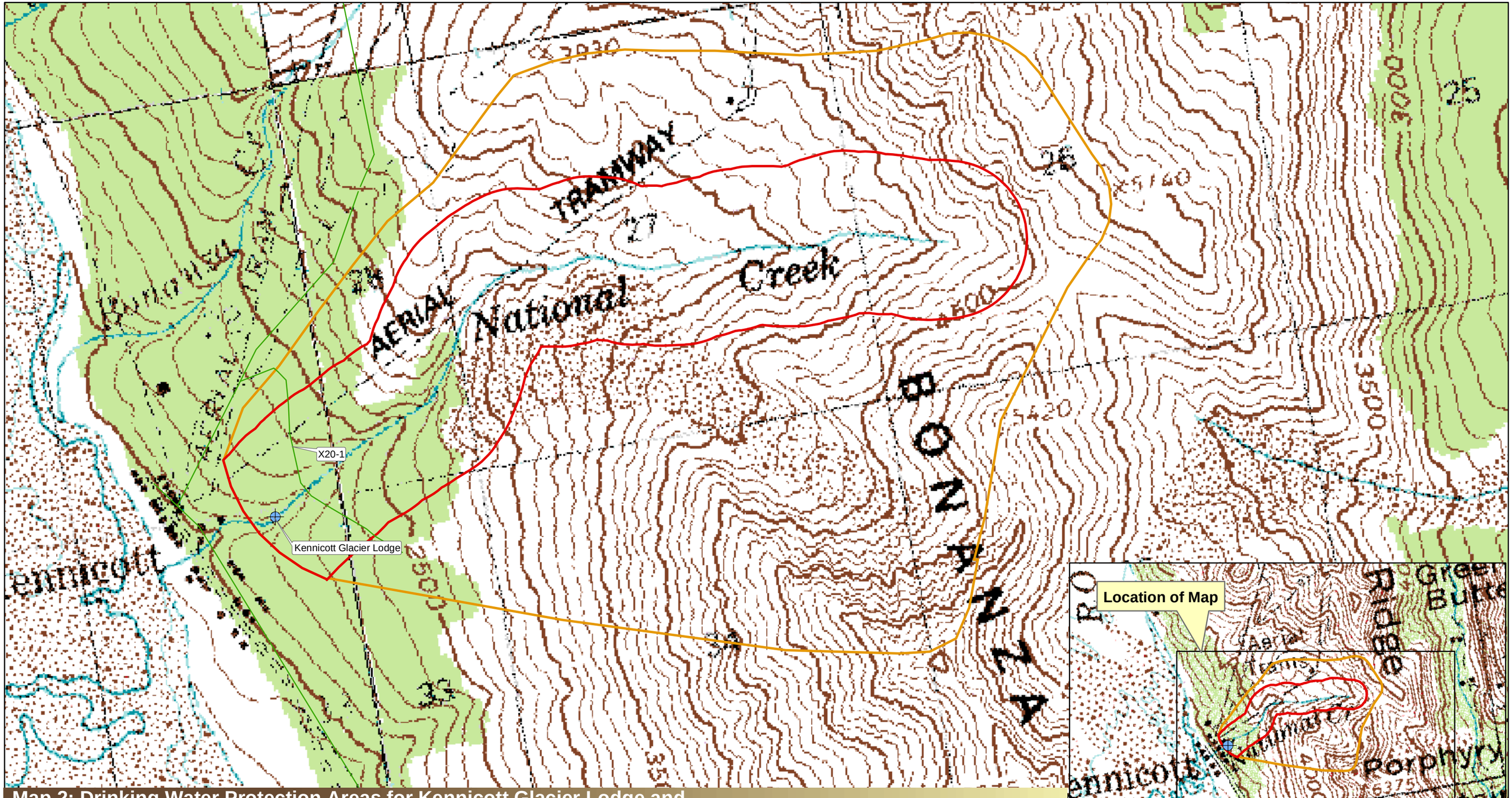
Contaminant Source Inventory and Risk Ranking for Kennicott Glacier Lodge Sources of Volatile Organic Chemicals

PWSID 292241.001

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	X20-1	A	Low	2	Road Northeast of Kennicott Glacier Lodge

APPENDIX C

Kennicott Glacier Lodge
Drinking Water Protection Area
and Potential and Existing Contaminant Sources
(Map 2)



Map 2: Drinking Water Protection Areas for Kennicott Glacier Lodge and Potential and Existing Sources of Contamination

PWSID: 292241.001

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

0 550 1,100 2,200 3,300 4,400 Feet

1:13,715

Data Sources:

Background image - USGS 1:63,000 mapping

Legend

- Public Drinking Water Systems
- Roads (X20)

DWPA Zone A

- 1000 Feet from Surface Water Body

DWPA Zone B

- Entire Watershed

0 0.5 1 2 Miles

APPENDIX D

Vulnerability Analysis for Kennicott Glacier Lodge Public Drinking Water Source

(Charts 1-7)

Chart 1. Susceptibility of the surface water source - Kennicott Glacier Lodge

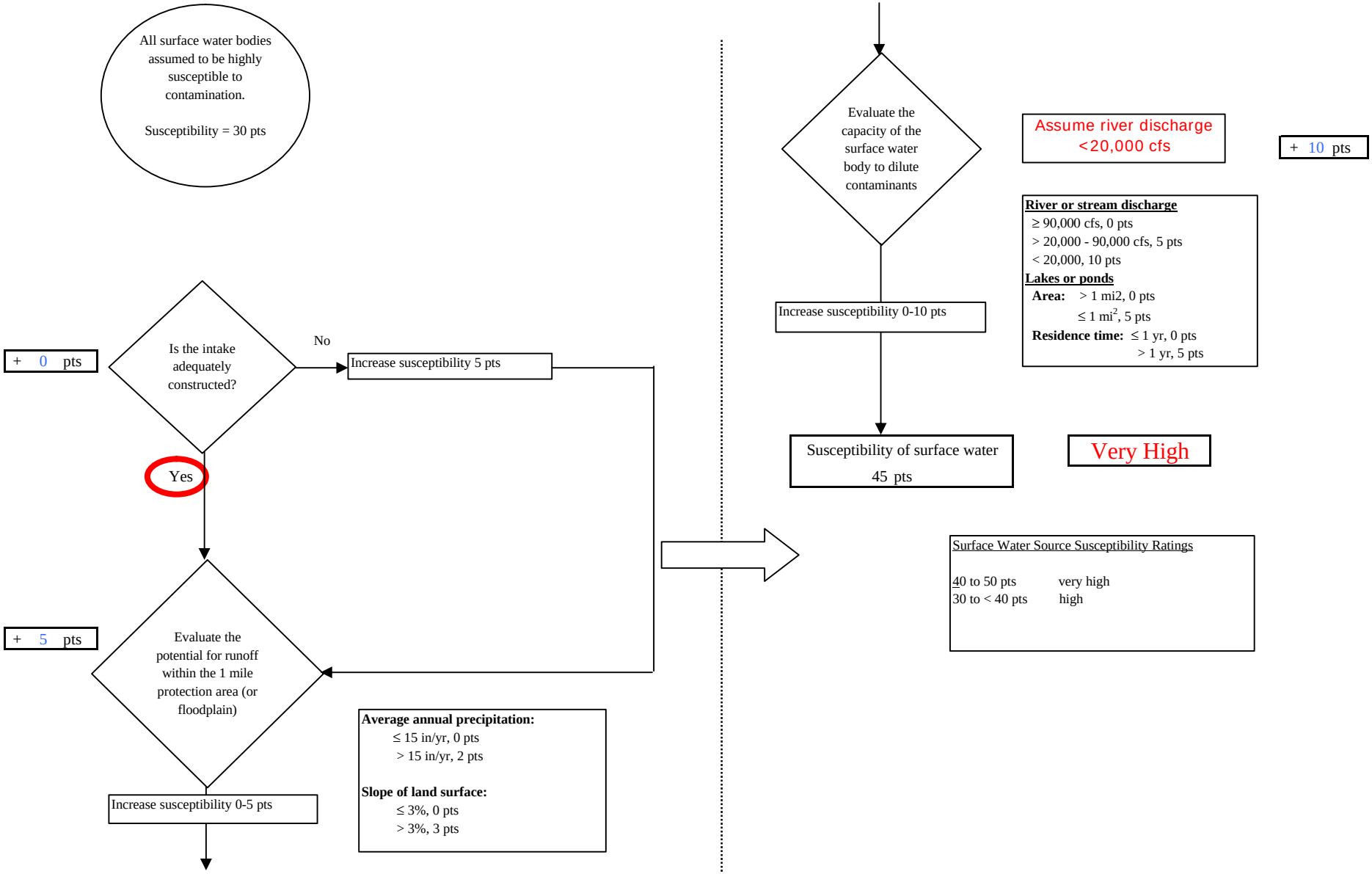
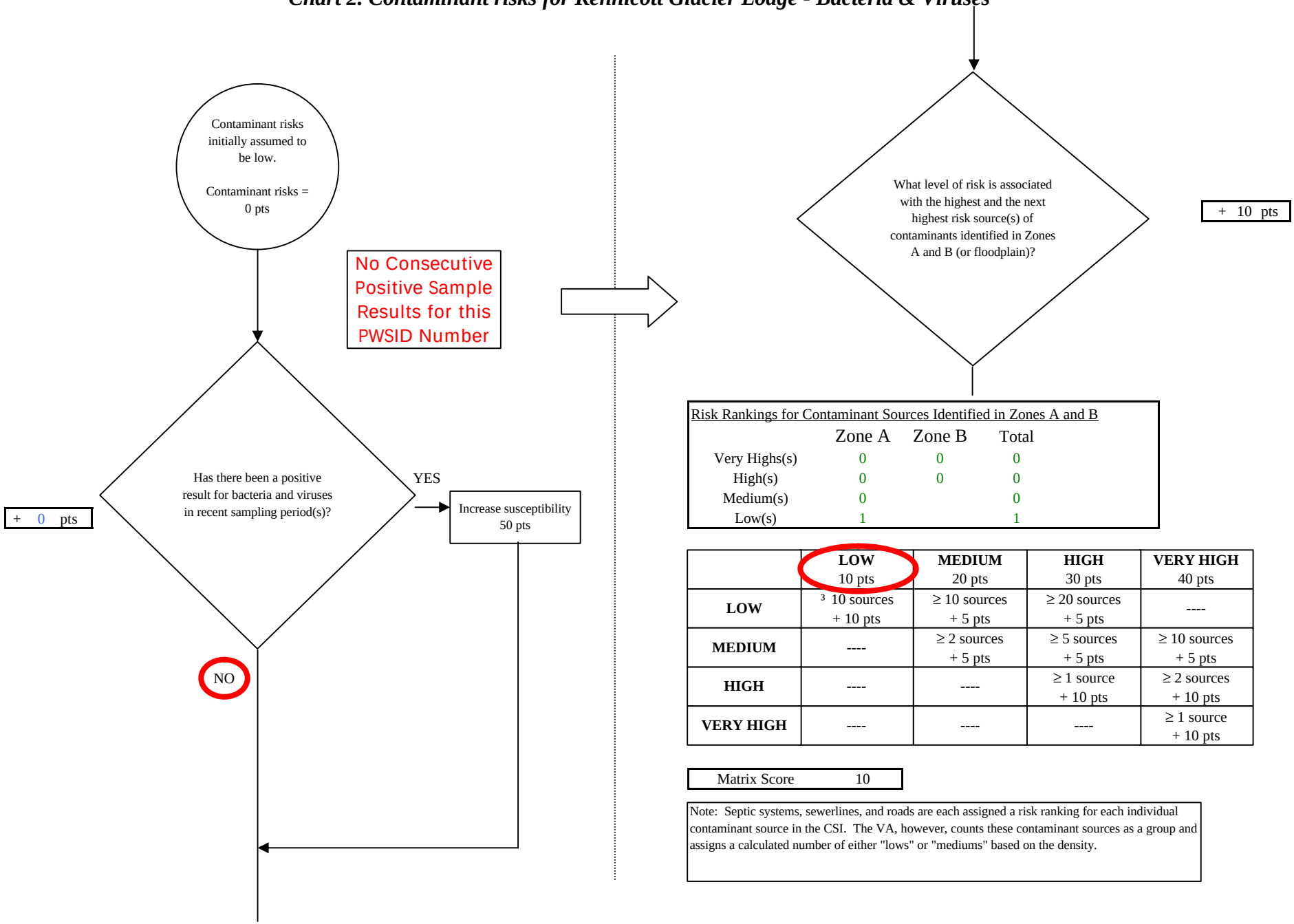


Chart 2. Contaminant risks for Kennicott Glacier Lodge - Bacteria & Viruses



Risk Rankings 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)	1		1

	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 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 2. Contaminant risks for Kennicott Glacier Lodge - Bacteria & Viruses

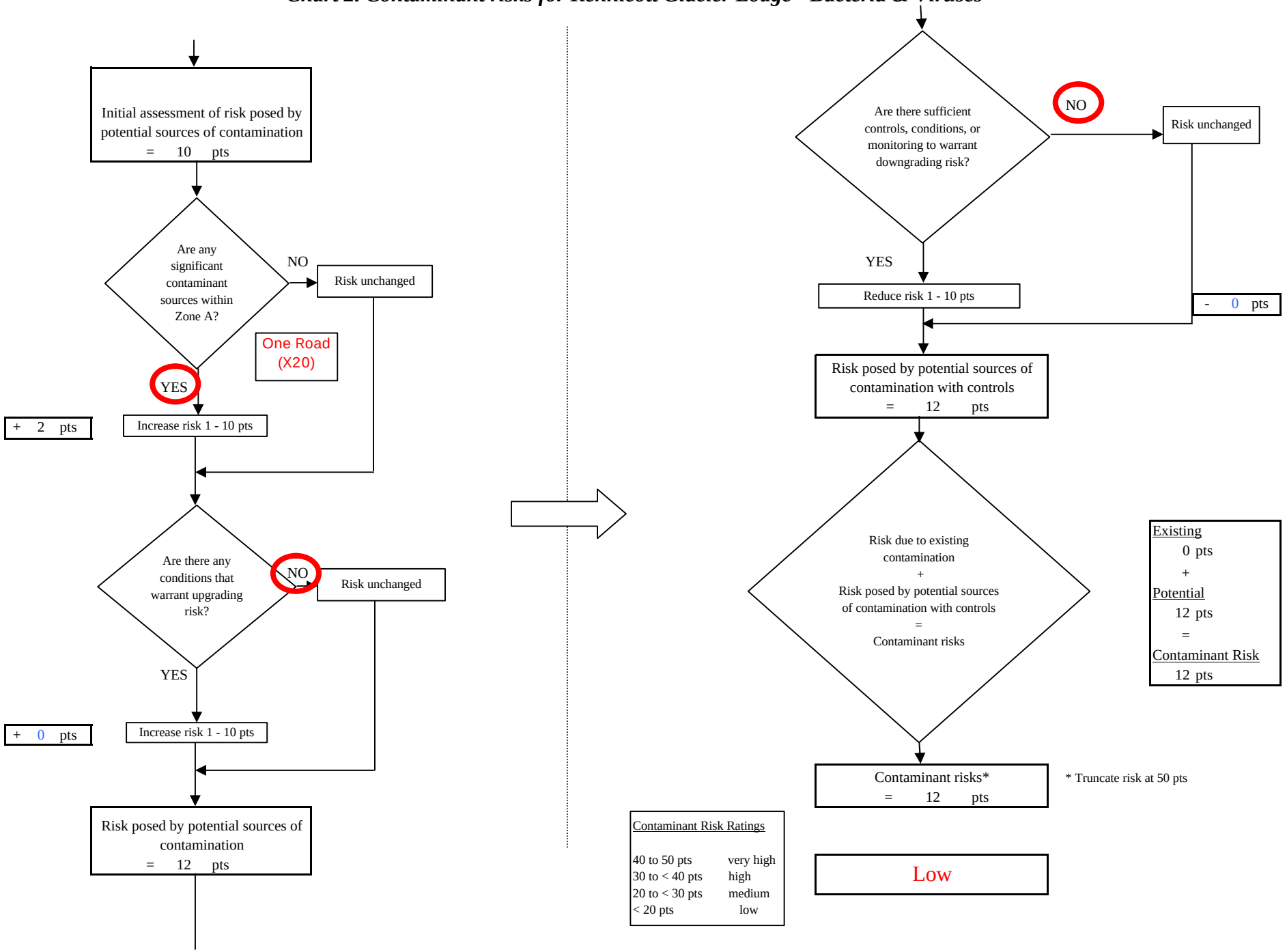


Chart 3. Vulnerability analysis for Kennicott Glacier Lodge - Bacteria & Viruses

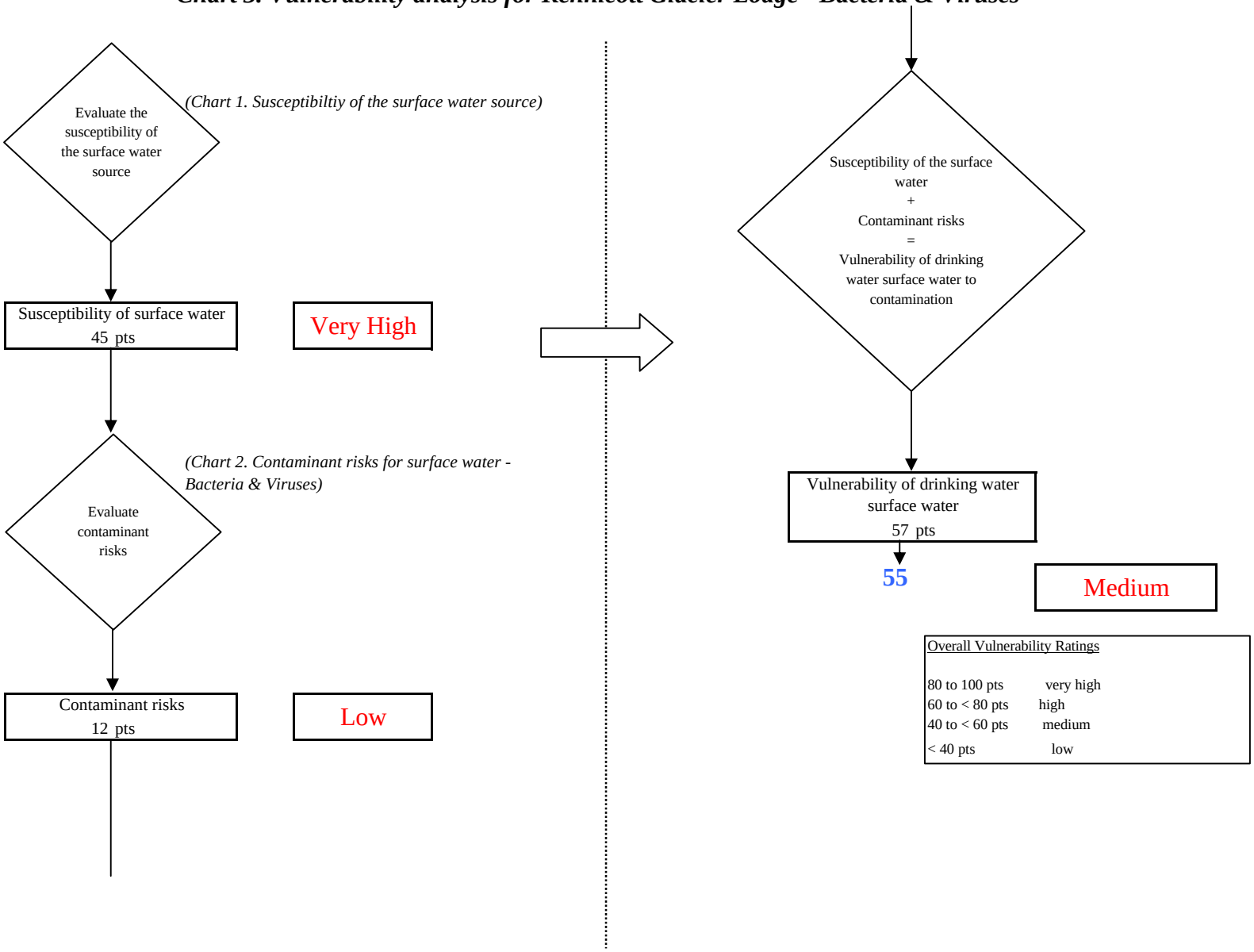


Chart 4. Contaminant risks for Kennicott Glacier Lodge - Nitrates and Nitrites

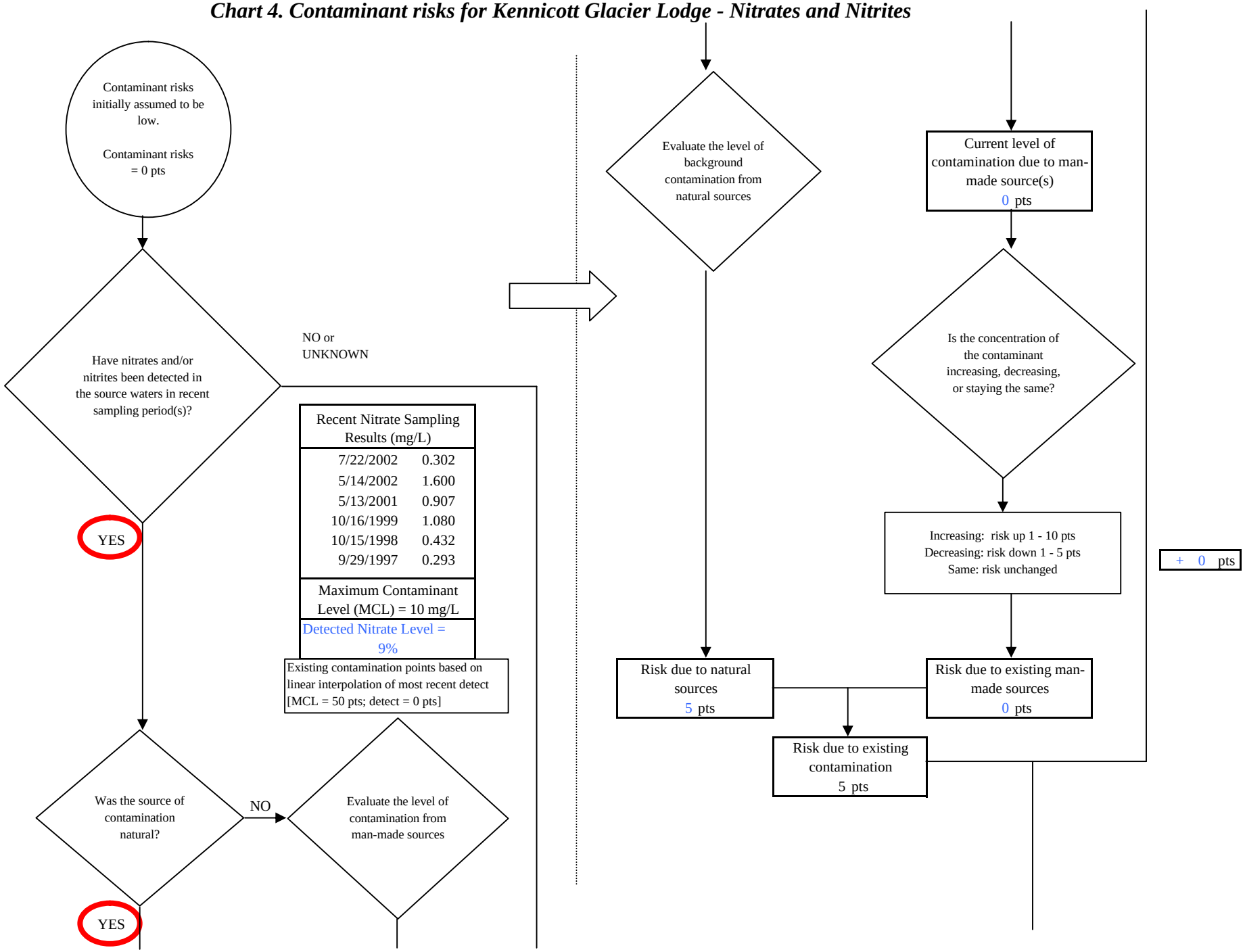


Chart 4. Contaminant risks for Kennicott Glacier Lodge - Nitrates and Nitrites

+ 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

Are any significant sources in Zone A?

NO → Risk unchanged

YES

One Road (X20)

Increase risk 1 - 10 pts

+ 2 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)	1		1

	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 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 4. Contaminant risks for Kennicott Glacier Lodge - Nitrates and Nitrites

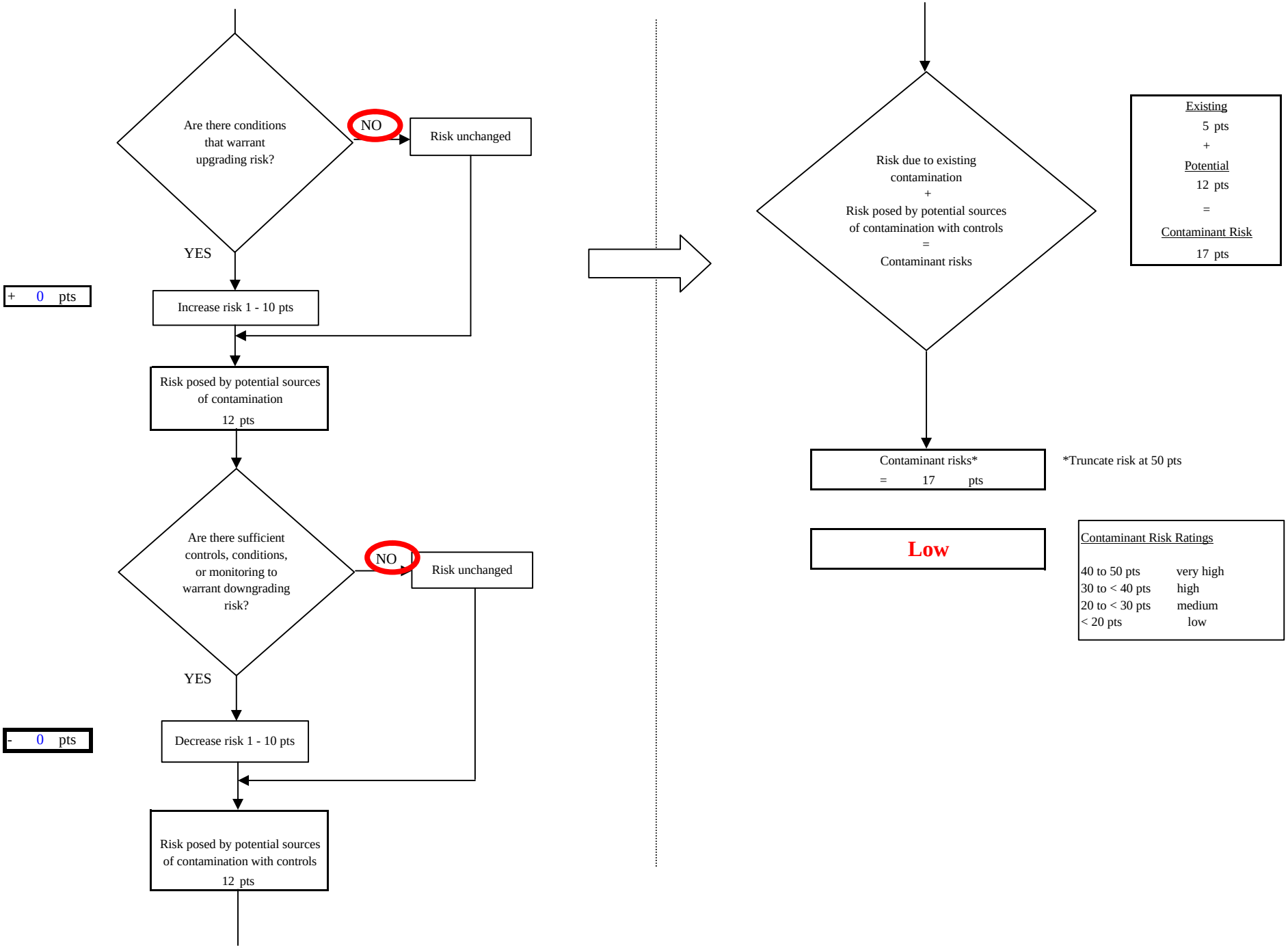


Chart 5. Vulnerability analysis for Kennicott Glacier Lodge - Nitrates and Nitrites

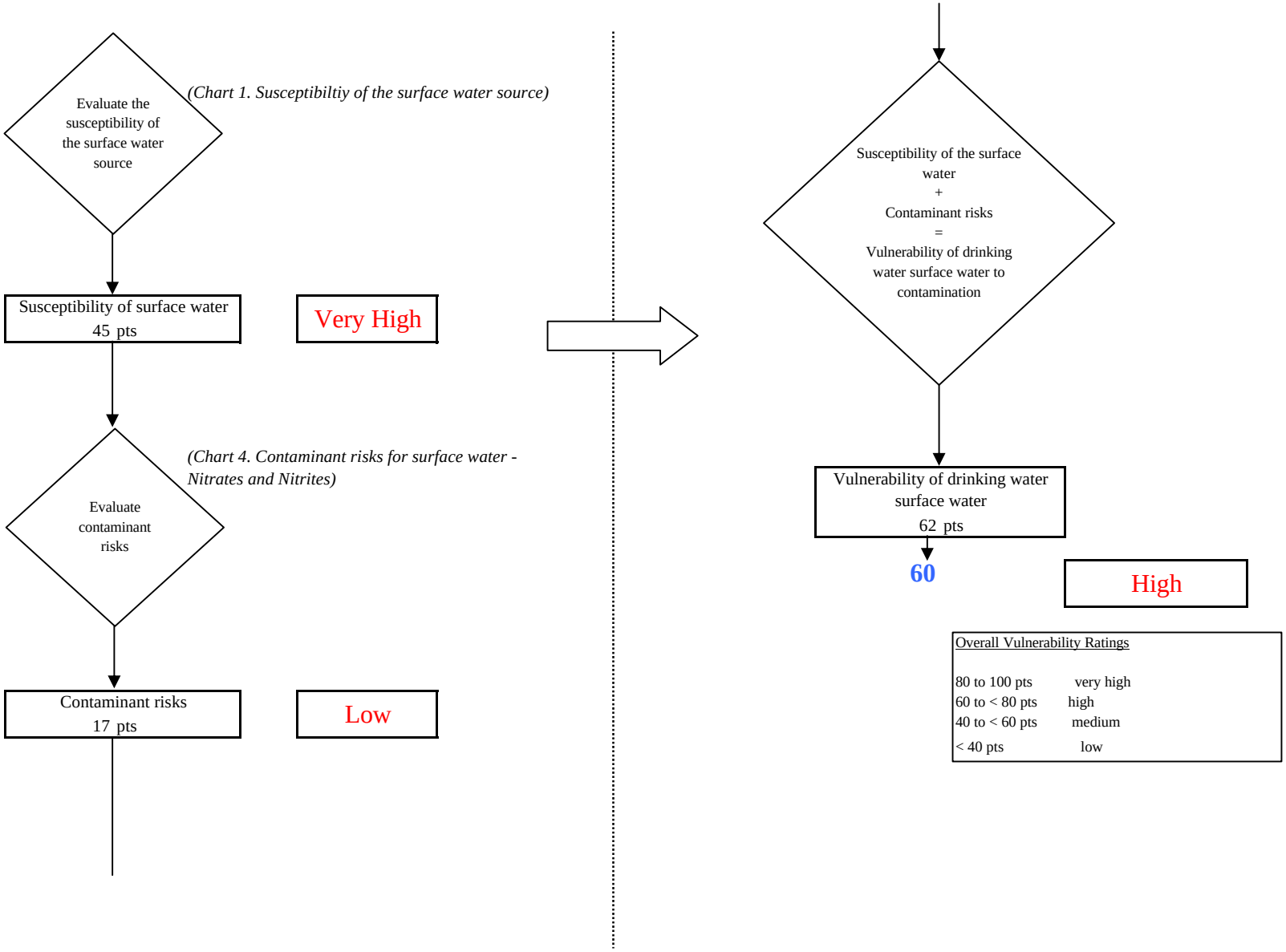


Chart 6. Contaminant risks for Kennicott Glacier Lodge - Volatile Organic Chemicals

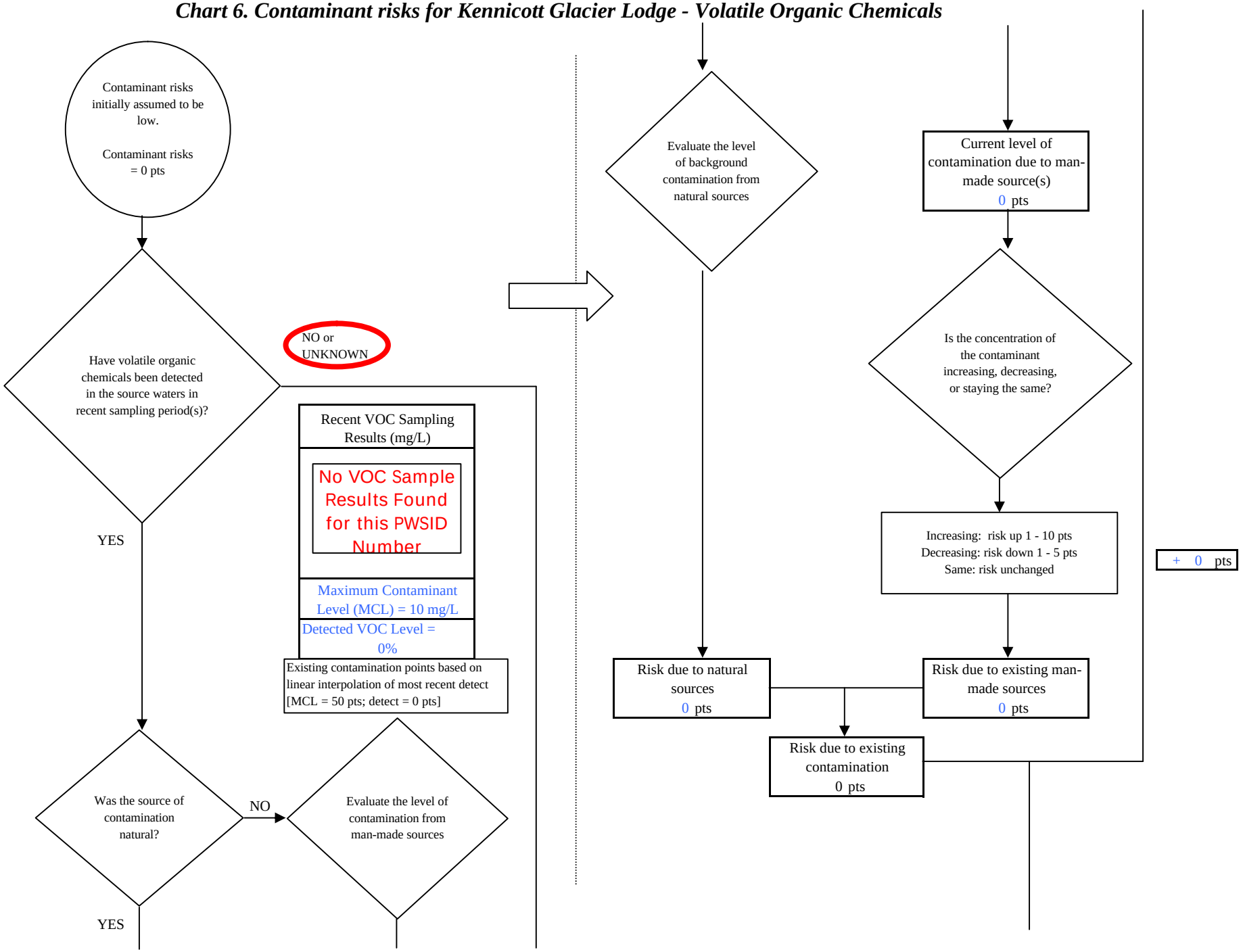


Chart 6. Contaminant risks for Kennicott Glacier Lodge - Volatile Organic Chemicals

+ 0 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)

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)	1		0

	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 0

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.

Initial assessment of risk posed by potential sources of contamination = 0 pts

Are any significant sources in Zone A?

NO

Risk unchanged

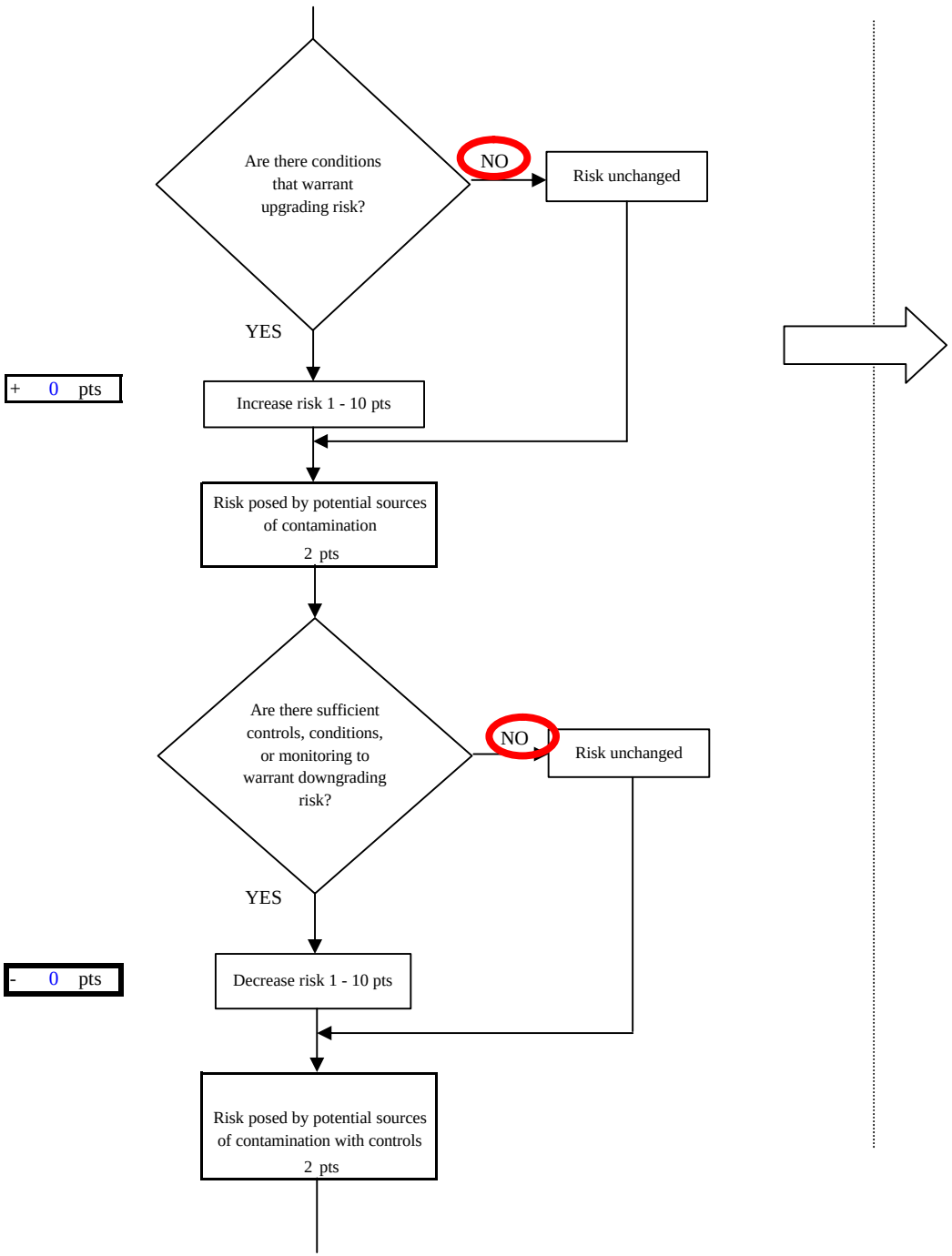
YES

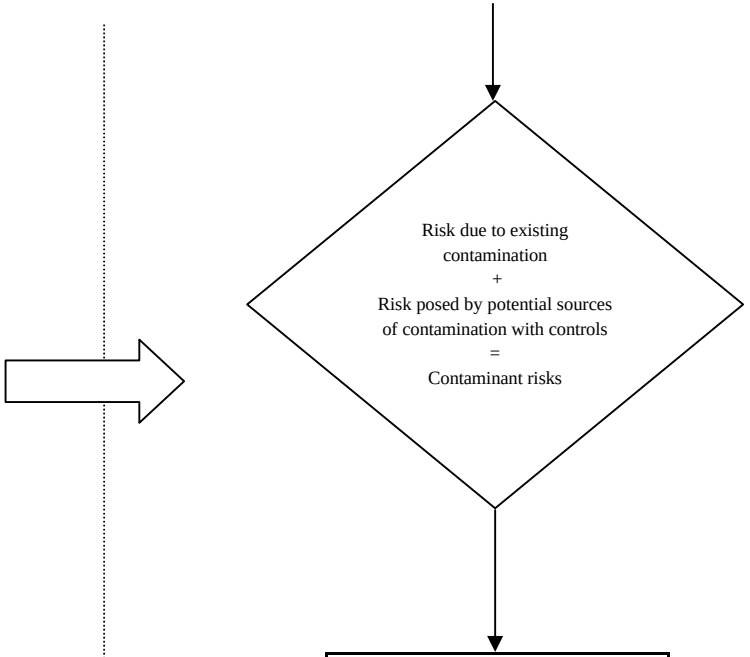
One Road (X20)

Increase risk 1 - 10 pts

+ 2 pts

Chart 6. Contaminant risks for Kennicott Glacier Lodge - Volatile Organic Chemicals





Existing
0 pts
+
Potential
2 pts
=
Contaminant Risk
2 pts

Contaminant risks*
= 2 pts

*Truncate risk at 50 pts

Low

Contaminant Risk Ratings

40 to 50 pts	very high
30 to < 40 pts	high
20 to < 30 pts	medium
< 20 pts	low

Chart 7. Vulnerability analysis for Kennicott Glacier Lodge - Volatile Organic Chemicals