



Source Water Assessment

A Hydrogeologic Susceptibility and
Vulnerability Assessment for
Whaler's Cove Lodge,
Angoon, Alaska
PWSID #133333

DRINKING WATER PROTECTION PROGRAM REPORT NO. 744

Alaska Department of Environmental Conservation

Source Water Assessment for Whaler's Cove Lodge Angoon, Alaska PWSID #133333

DRINKING WATER PROTECTION PROGRAM REPORT NO. 744

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.

CONTENTS

SECTION		Page
	Executive Summary	1
	Whaler's Cove Lodge Public Drinking Water System	1
	Whaler's Cove Lodge Drinking Water Protection Area	1
	Inventory of Potential and Existing Contaminant Sources	2
	Ranking of Contaminant Risks	2
	Vulnerability of Whaler's Cove Lodge Drinking Water System	2
	References	4

TABLES

TABLE		
	1. Definition of Zones	2
	2. Susceptibility	2
	3. Contaminant Risks	3
	4. Overall Vulnerability	3

APPENDICES

APPENDIX		
	A. Whaler's Cove Lodge Drinking Water Protection Area (Map 1)	
	B. Contaminant Source Inventory for Whaler's Cove Lodge (Table 1)	
	Contaminant Source Inventory and Risk Ranking for Whaler's Cove Lodge - Bacteria and Viruses (Table 2)	
	Contaminant Source Inventory and Risk Ranking for Whaler's Cove Lodge – Nitrates/Nitrites (Table 3)	
	Contaminant Source Inventory and Risk Ranking for Whaler's Cove Lodge – Volatile Organic Chemicals (Table 4)	
	C. Whaler's Cove Lodge Drinking Water Protection Area and Potential and Existing Contaminant Sources (Map 2)	
	D. Vulnerability Analysis for Contaminant Source Inventory and Risk Ranking for Whaler's Cove Lodge Public Drinking Water Source (Charts 1 – 7)	

Source Water Assessment for Whaler's Cove Lodge, Angoon, Alaska

Drinking Water Protection Program Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The public water system for Whaler's Cove Lodge is a Class B (transient/non-community) water system consisting of one surface water intake from a spring-fed reservoir. Whaler's Cove Lodge is a remote lodge located about 4 miles south of Angoon, Alaska on Killisnoo Island. The surface water intake received a susceptibility rating of **Very High**. A rating of High to Very High is typical of all surface water systems. Identified potential and current sources of contaminants for Whaler's Cove Lodge public drinking water source include a septic system; aboveground heating oil, diesel, and gasoline tanks; and boat yards and marinas. Identified potential and existing sources of contamination include 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 Whaler's Cove Lodge received a vulnerability rating of **High** for bacteria and viruses; **Very High** for nitrates and nitrites; and **High** for volatile organic chemicals.

WHALER'S COVE LODGE PUBLIC DRINKING WATER SYSTEM

Whaler's Cove Lodge public water system is a Class B (transient/non-community) water system. The system for Whaler's Cove Lodge consists of one surface water intake near Angoon, Alaska. Whaler's Cove Lodge is located on Killisnoo Island, separated from Admiralty Island by about 200 yards of tidewater. Admiralty Island is located on Chatham Strait at the mouth of Kootznahoo Inlet, 60 miles northeast of Juneau, Alaska (please see the inset of Map 1 in Appendix A for location). The population of Angoon is approximately 600.

Angoon averages about 40 inches of precipitation per year; and approximately 65 inches of snow. The groundwater aquifers underlying the area are recharged through the infiltration of precipitation and surface water. Groundwater aquifers in the region generally occur in the fractured bedrock and unconsolidated sediments deposited by glaciers and/or rivers. The elevation for Angoon is near sea level.

According to a Letter provided to ADEC dated August 12, 1999, the surface water intake consists of two open spring-fed reservoirs, pumped through 1½-inch plastic line through a sand filter and recirculating pump, it is then chlorinated and filtered before reaching the various cabins and lodge. This water is used only for washing and showers. Guest, visitors and employees are advised to drink only bottled water. The intake was adequately constructed. An adequately constructed intake may provide protection against debris and contaminants from entering the system. There is a potential for runoff within the area surrounding the surface water.

This system operates seasonally from May through September and serves approximately 40 residents and about 400 non-residents through one connection.

WHALER'S COVE 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 that water is being drawn from. 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 Whaler’s Cove Lodge extends over the entire watershed. 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 Whaler’s Cove 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 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 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 WHALER’S COVE 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:

$$\begin{aligned}
 &\text{Natural Susceptibility (30 – 50 points)} \\
 &+ \\
 &\text{Contaminant Risks (0 – 50 points)} \\
 &= \\
 &\text{Vulnerability of the} \\
 &\text{Drinking Water Source to Contamination (30 – 100).}
 \end{aligned}$$

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

$$\begin{aligned}
 &\text{Natural Susceptibility} \\
 &(\text{Susceptibility of the Surface Water Source}) \\
 &(30 – 50 Points)
 \end{aligned}$$

The surface water intake for Whaler’s Cove Lodge is from two spring-fed reservoirs. Because the springs are recharged by surface water runoff and precipitation, contaminants at or near the reservoir have the potential to adversely impact this drinking water source. Table 2 shows the Overall Susceptibility score and rating for Whaler’s Cove Lodge.

Table 2. Natural Susceptibility

	Score	Rating
Natural Susceptibility	40	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	30	High
Nitrates and/or Nitrites	45	Very High
Volatile Organic Chemicals	35	High

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 (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	70	High
Nitrates and Nitrites	85	Very High
Volatile Organic Chemicals	75	High

Bacteria and Viruses

The contaminant risk for bacteria and viruses is **High** with a septic system located within Zone A representing the risks to the 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 Whaler’s Cove Lodge. Combining the contaminant risks with the overall natural susceptibility of the well, the vulnerability of the well to contamination by bacteria and viruses is **High**.

Nitrates and Nitrites

The contaminant risk for nitrates and nitrites is **Very High** with a septic system, and boat yards and marinas located within Zone A representing the risks to the drinking water (See Chart 4 - Contaminant Risks for Nitrates and/or Nitrites in Appendix D).

Sampling history for Whaler’s Cove Lodge well indicates that nitrates have been detected in the water, but only in very low concentrations (most recently at 1.09 mg/L on 7/14/1997) or 11% 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 well, the overall vulnerability of the well to contamination by nitrates and nitrites is **Very High**.

Volatile Organic Chemicals

The contaminant risk for volatile organic chemicals is **High** with a septic system; aboveground heating oil, diesel, and gasoline tanks; and boat yards and marinas creating the only known risks for volatile organic chemicals (See Chart 6 – Contaminant Risks for Volatile Organic Chemicals in Appendix D).

Sampling history for volatile organic chemicals was not available. Combining the contaminant risk for volatile organic chemicals with the natural susceptibility of the well, the overall vulnerability of the well to contamination by volatile organic chemicals is **High**.

REFERENCES

Alaska Department of Community and Economic Development (ADCED), 2002 [WWW document]. URL http://www.dced.state.ak.us/mra/CF_BLOCK.cfm.

Alaska Geospatial Data Clearinghouse, 2003. URL: <http://agdc.usgs.gov/data/datasets.html>.

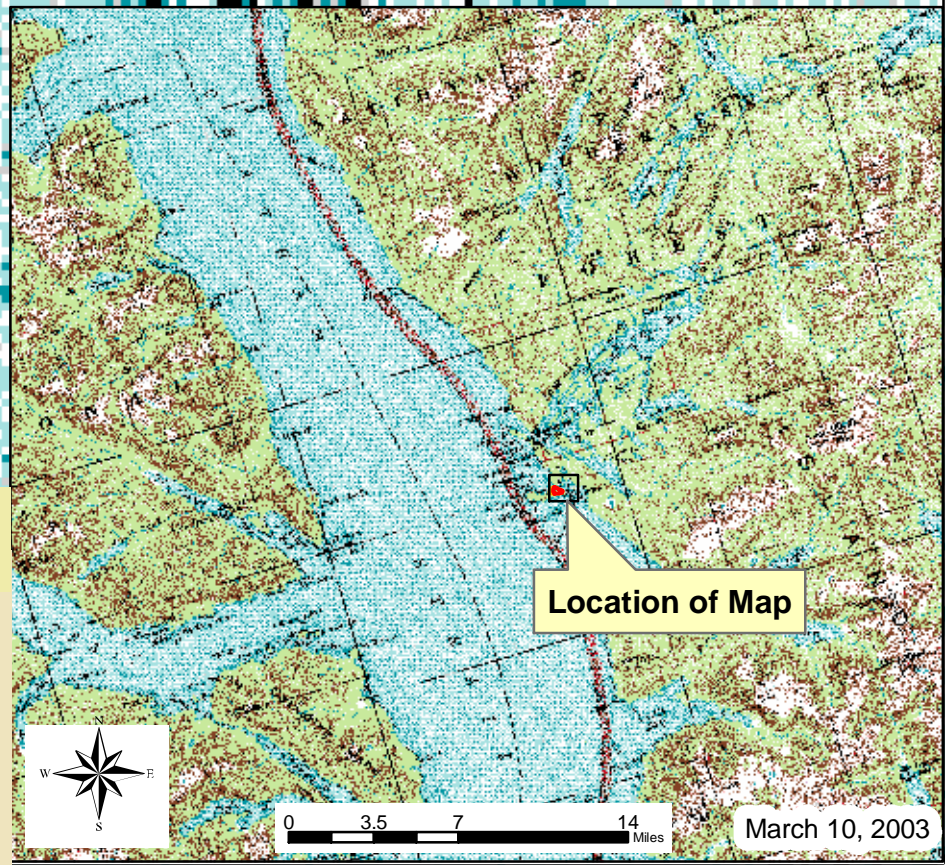
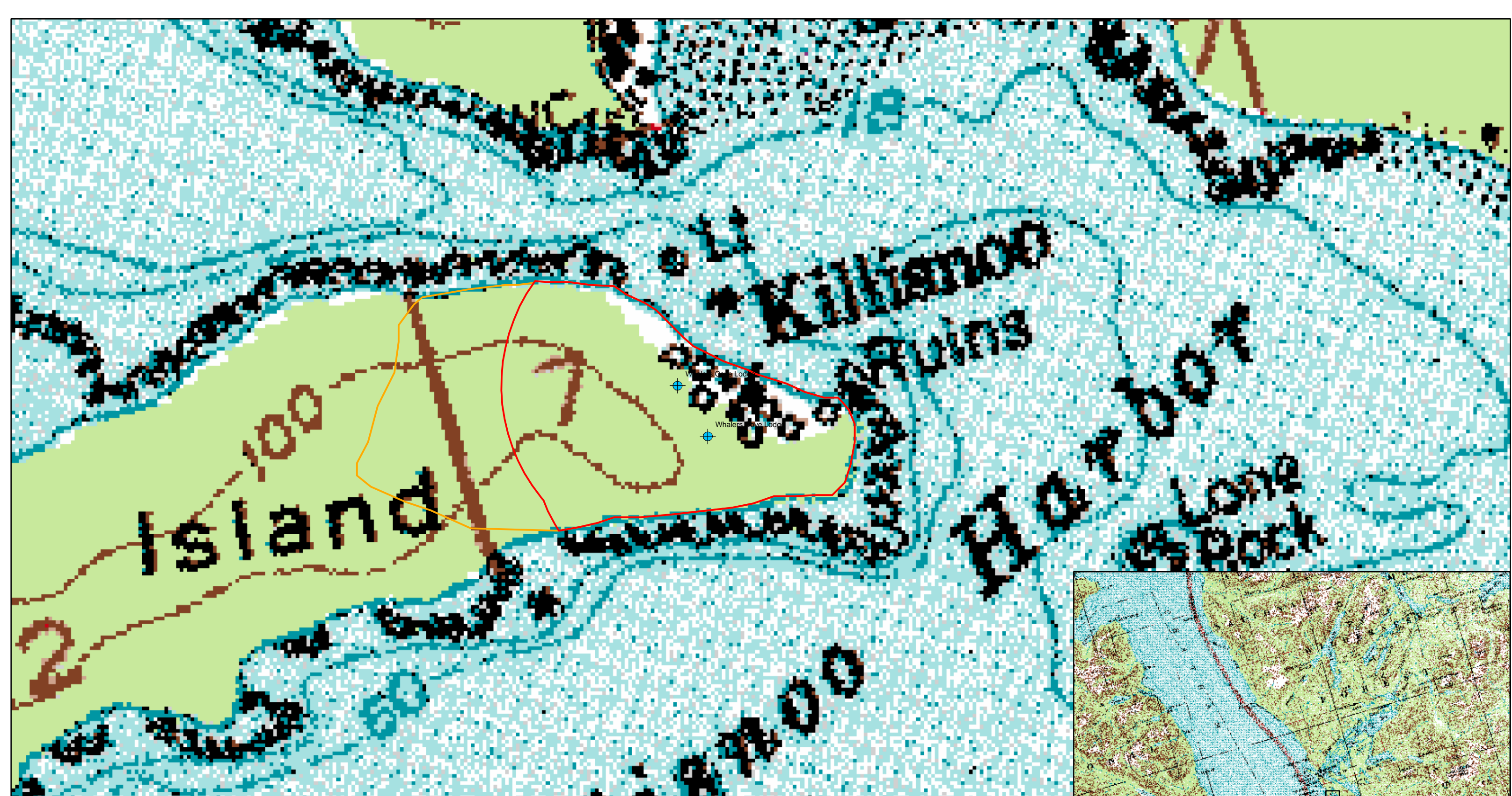
Gehrels, G.E., Berg, H.C., Geologic Map of Southeastern Alaska: U.S. Geological Survey Map (scale 1:600,000), Map I-1867, 1sheet.

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

United States Environmental Protection Agency (EPA), 2002 [WWW document]. URL: <http://www.epa.gov/safewater/mcl.html>.

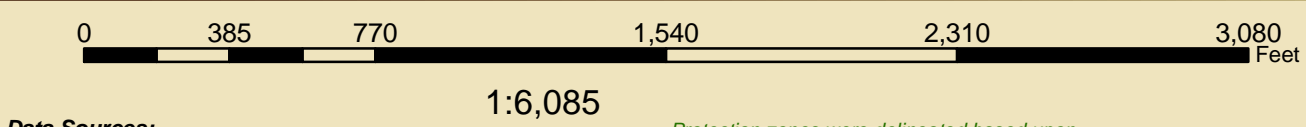
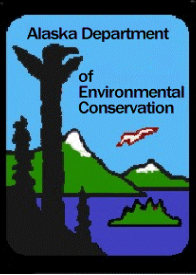
APPENDIX A

Whaler's Cove Lodge Drinking Water Protection Area Location Map (Map 1)



Map 1: Whaler's Cove Lodge Drinking Water Protection Area

PWSID: 133333.001



Data Sources:
 Background image - USGS 1:63,000 mapping
 Lakes & streams - U.S. Forest Service, Tongass
 Roads - Ketchikan Gateway Borough

Protection zones were delineated based upon streams noted on USGS 1:63,000 mapping.
For this PWS, Zone C (the entire watershed) covers the same area as Zone B (areas within 1-mile of the stream).

- Legend**
- Public Drinking Water Systems
 - Zone A Protection Area
 - Zone B Protection Area
 - Entire Watershed



March 10, 2003

APPENDIX B

Contaminant Source Inventory and Risk Ranking for Whaler's Cove Lodge (Tables 1-4)

Table 1

*Contaminant Source Inventory for
Whalers Cove Lodge*

PWSID 133333.001

<i>Contaminant Source Type</i>	<i>Contaminant Source ID</i>	<i>CS ID tag</i>	<i>Zone</i>	<i>Map Number</i>	<i>Comments</i>
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	2	Whaler's Cove Lodge Septic System
Tanks, heating oil, residential (above ground)	R08	R08-1	A	2	Heating Oil for Cabin 1
Tanks, heating oil, residential (above ground)	R08	R08-2	A	2	Heating Oil for Cabin 2
Tanks, heating oil, residential (above ground)	R08	R08-3	A	2	Heating Oil for Cabin 3
Tanks, heating oil, residential (above ground)	R08	R08-4	A	2	Heating Oil for Cabin 4
Tanks, diesel (above ground)	T06	T06-1	A	2	Diesel Tank for Generator Shed
Tanks, gasoline (above ground)	T10	T10-1	A	2	Boat Dock Gas Tank
Tanks, heating oil, nonresidential (aboveground)	T14	T14-1	A	2	Heating Oil for Lodge
Tanks, heating oil, nonresidential (aboveground)	T14	T14-2	A	2	Heating Oil for 4-Plex
Boat yards and marinas	X15	X15-1	A	2	Boat Marina

Contaminant Source Inventory and Risk Ranking for

PWSID 133333.001

Table 2

*Whalers Cove Lodge
Sources of Bacteria and Viruses*

<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>
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	High	2	Whaler's Cove Lodge Septic System

Contaminant Source Inventory and Risk Ranking for

PWSID 133333.001

Table 3

*Whalers Cove Lodge
Sources of Nitrates/Nitrites*

<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>
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	High	2	Whaler's Cove Lodge Septic System
Boat yards and marinas	X15	X15-1	A	Low	2	Boat Marina

Contaminant Source Inventory and Risk Ranking for

PWSID 133333.001

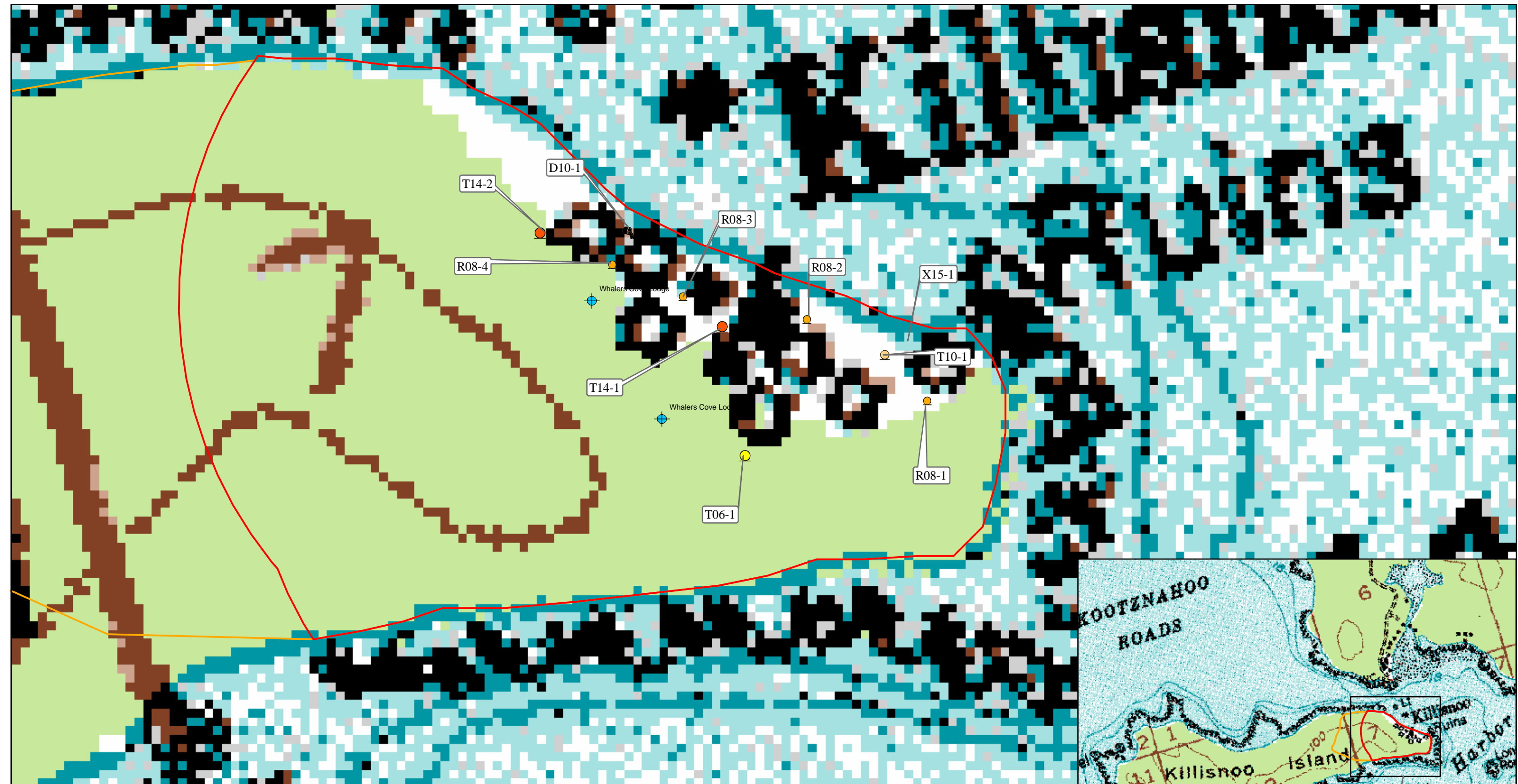
Table 4

*Whalers Cove Lodge
Sources of Volatile Organic Chemicals*

<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>
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	Low	2	Whaler's Cove Lodge Septic System
Tanks, heating oil, residential (above ground)	R08	R08-1	A	Low	2	Heating Oil for Cabin 1
Tanks, heating oil, residential (above ground)	R08	R08-2	A	Low	2	Heating Oil for Cabin 2
Tanks, heating oil, residential (above ground)	R08	R08-3	A	Low	2	Heating Oil for Cabin 3
Tanks, heating oil, residential (above ground)	R08	R08-4	A	Low	2	Heating Oil for Cabin 4
Tanks, diesel (above ground)	T06	T06-1	A	Medium	2	Diesel Tank for Generator Shed
Tanks, gasoline (above ground)	T10	T10-1	A	Medium	2	Boat Dock Gas Tank
Tanks, heating oil, nonresidential (aboveground)	T14	T14-1	A	Low	2	Heating Oil for Lodge
Tanks, heating oil, nonresidential (aboveground)	T14	T14-2	A	Low	2	Heating Oil for 4-Plex
Boat yards and marinas	X15	X15-1	A	Medium	2	Boat Marina

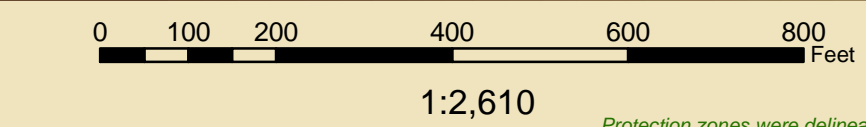
APPENDIX C

Whaler's Cove Lodge Drinking Water Protection Area and Potential and Existing Contaminant Sources (Map 2)



Map 2: Drinking Water Protection Area for Whaler's Cove Lodge and Potential and Existing Sources of Contamination

PWSID: 133333.001



Data Sources:
 Background image - USGS 1:63,000 mapping
 Lakes & streams - U.S. Forest Service, Tongass

Protection zones were delineated based upon streams noted on USGS 1:63,000 mapping.
For this PWS, Zone C (the entire watershed) covers the same area as Zone B (areas within 1-mile of the stream).

- Legend**
- Public Drinking Water Systems
 - Large Capacity Septic System (D10)
 - Residential Heating Oil Tank (R08)
 - Diesel Tank (T06)
 - Gas Tank (T10)
 - Nonresidential Heating Oil Tank (T14)
 - Boat Marina (X15)
 - Zone A Protection Area
 - Zone B Protection Area
 - Entire Watershed



May 15, 2003

APPENDIX D

Vulnerability Analysis for Whaler's Cove Lodge Public Drinking Water Source (Charts 1-7)

Chart 1. Susceptibility of the surface water source - Whaler's Cove Lodge

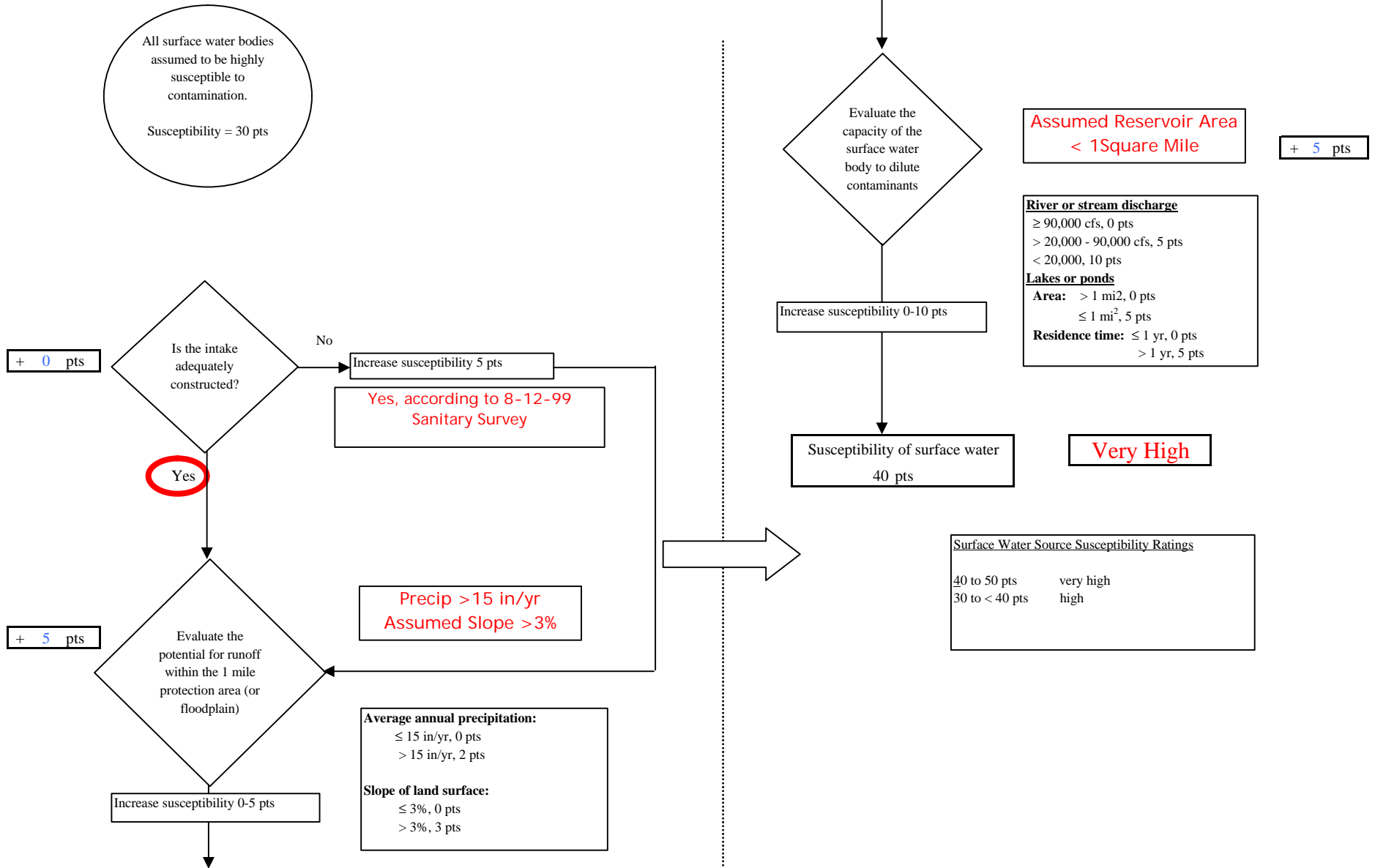


Chart 2. Contaminant risks for Whaler's Cove Lodge - Bacteria & Viruses

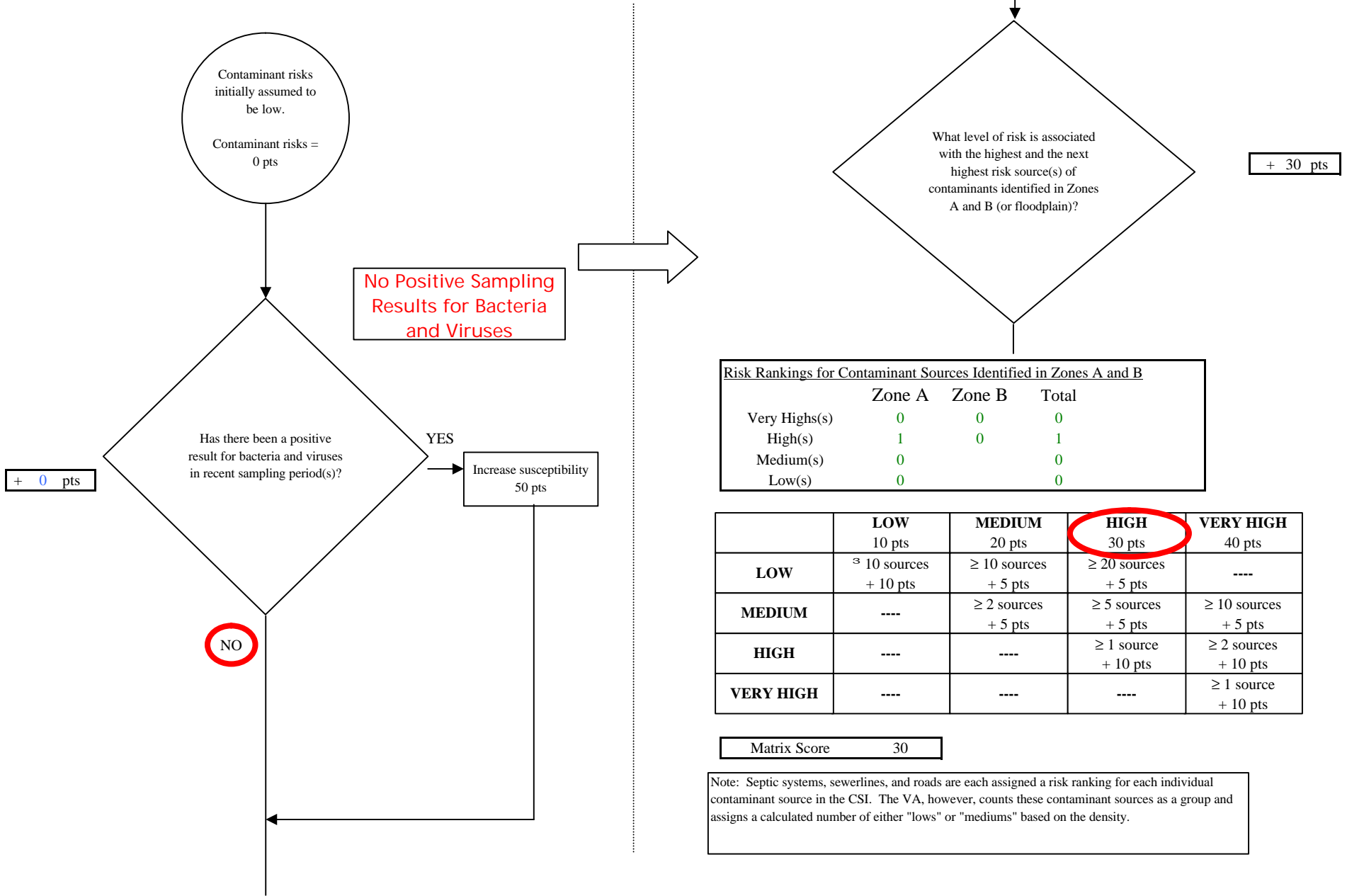
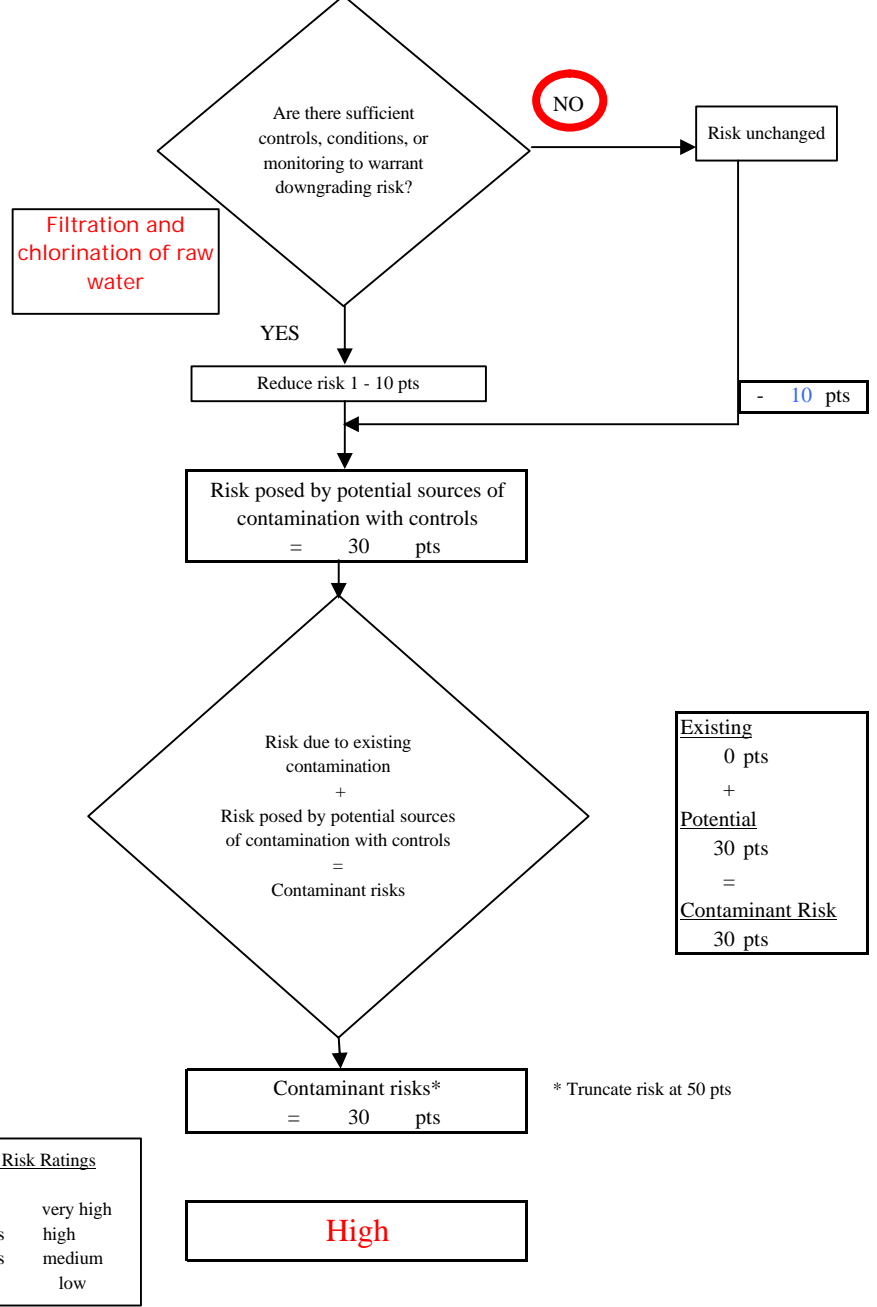
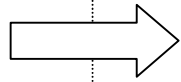
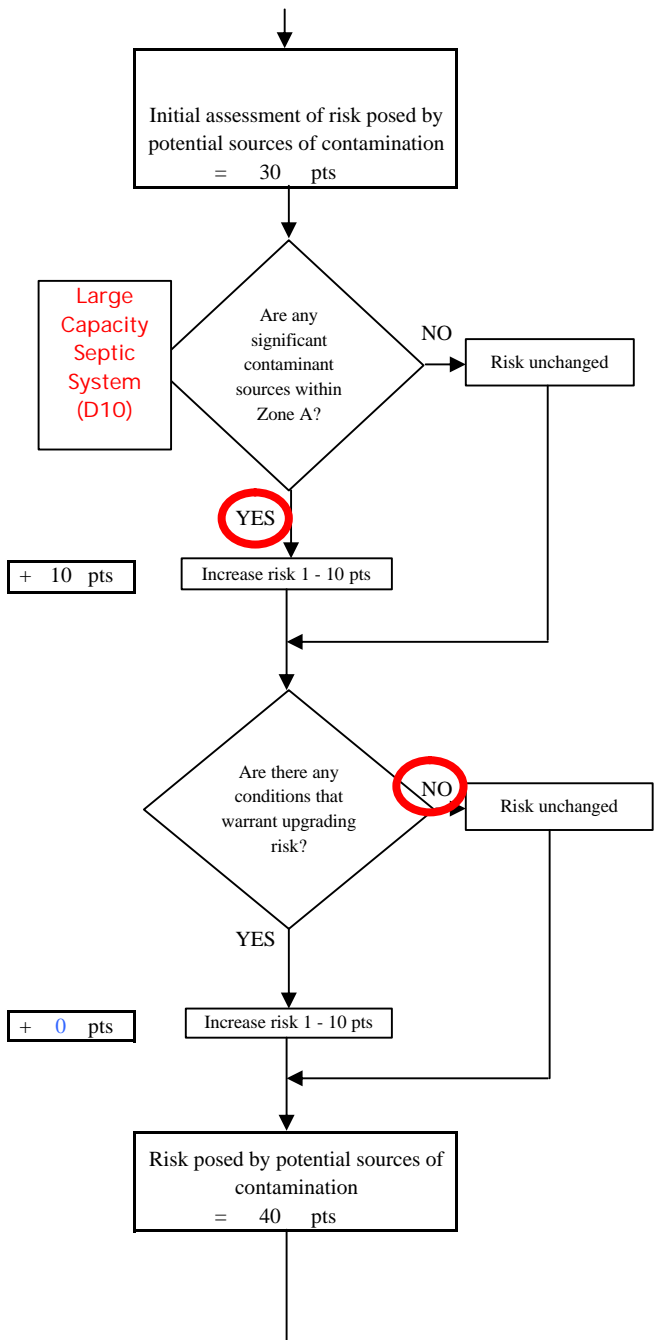


Chart 2. Contaminant risks for Whaler's Cove Lodge - Bacteria & Viruses



Contaminant Risk Ratings	
40 to 50 pts	very high
30 to < 40 pts	high
20 to < 30 pts	medium
< 20 pts	low

Existing	0 pts
+	
Potential	30 pts
=	
Contaminant Risk	30 pts

* Truncate risk at 50 pts

Chart 3. Vulnerability analysis for Whaler's Cove Lodge - Bacteria & Viruses

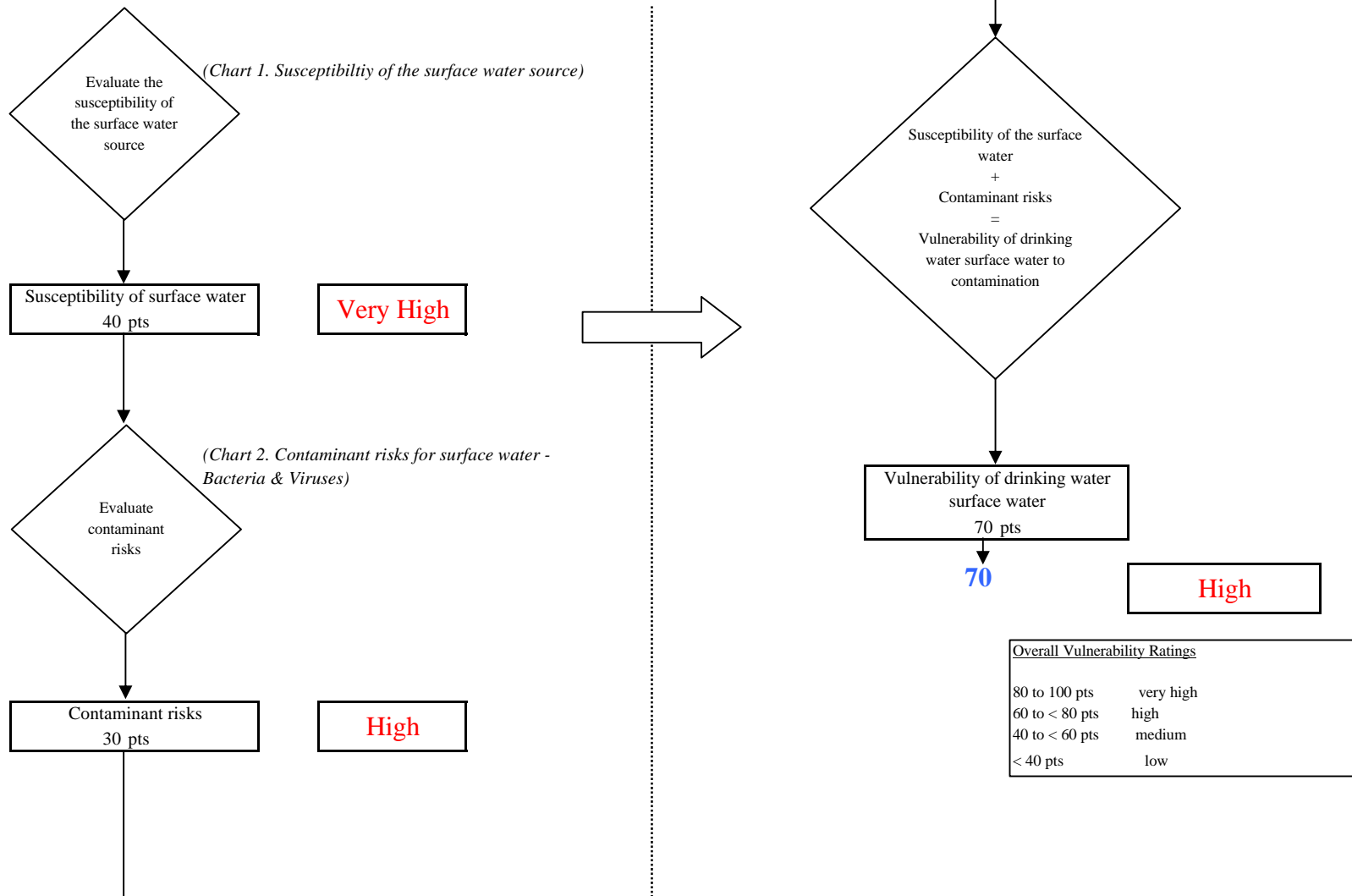


Chart 4. Contaminant risks for Whaler's Cove Lodge - Nitrates and Nitrites

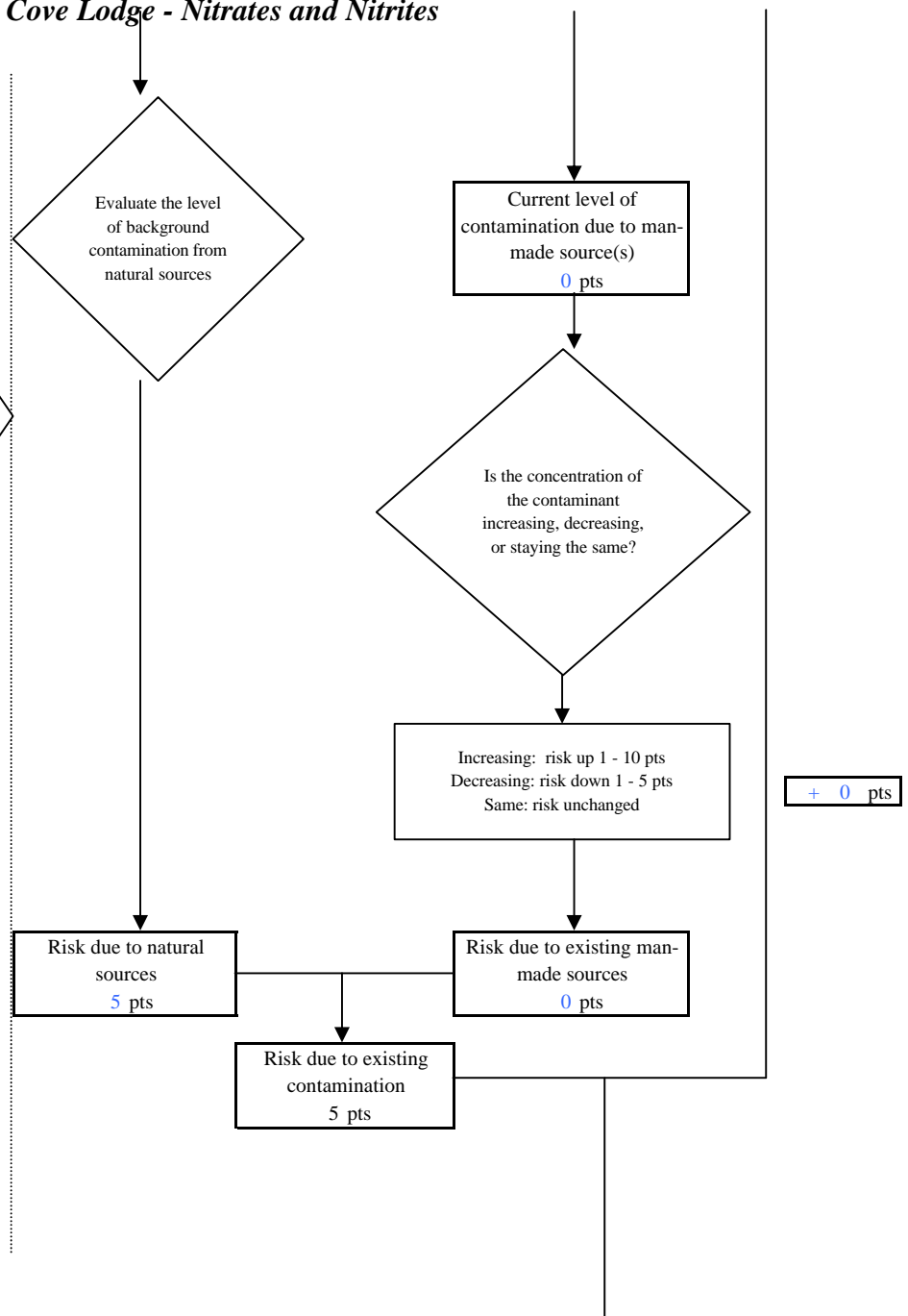
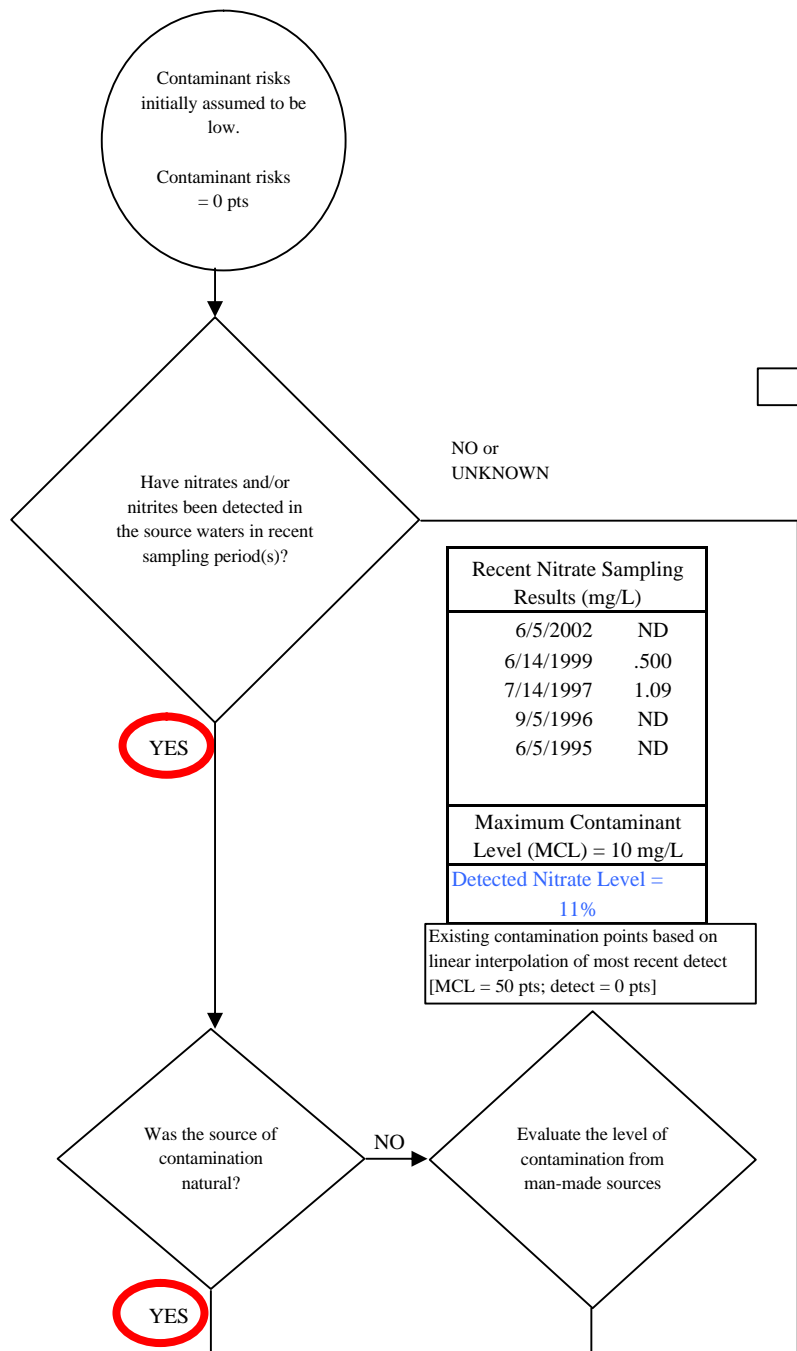
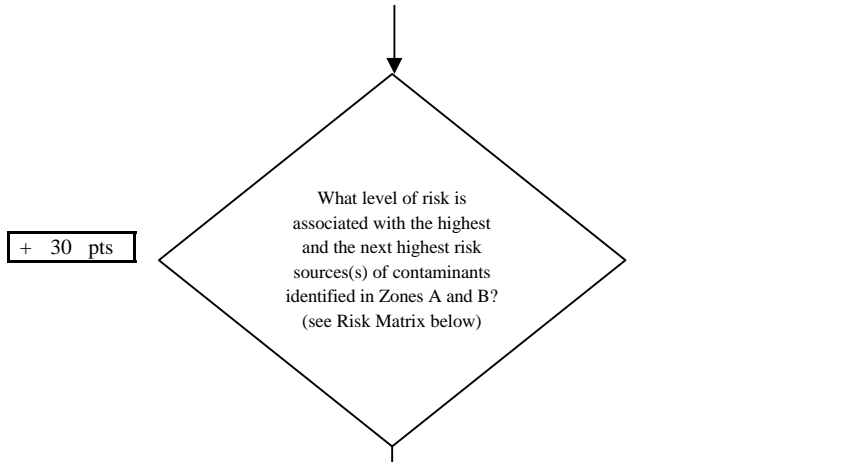


Chart 4. Contaminant risks for Whaler's Cove Lodge - Nitrates and Nitrites



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	0
Low(s)	1	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 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.

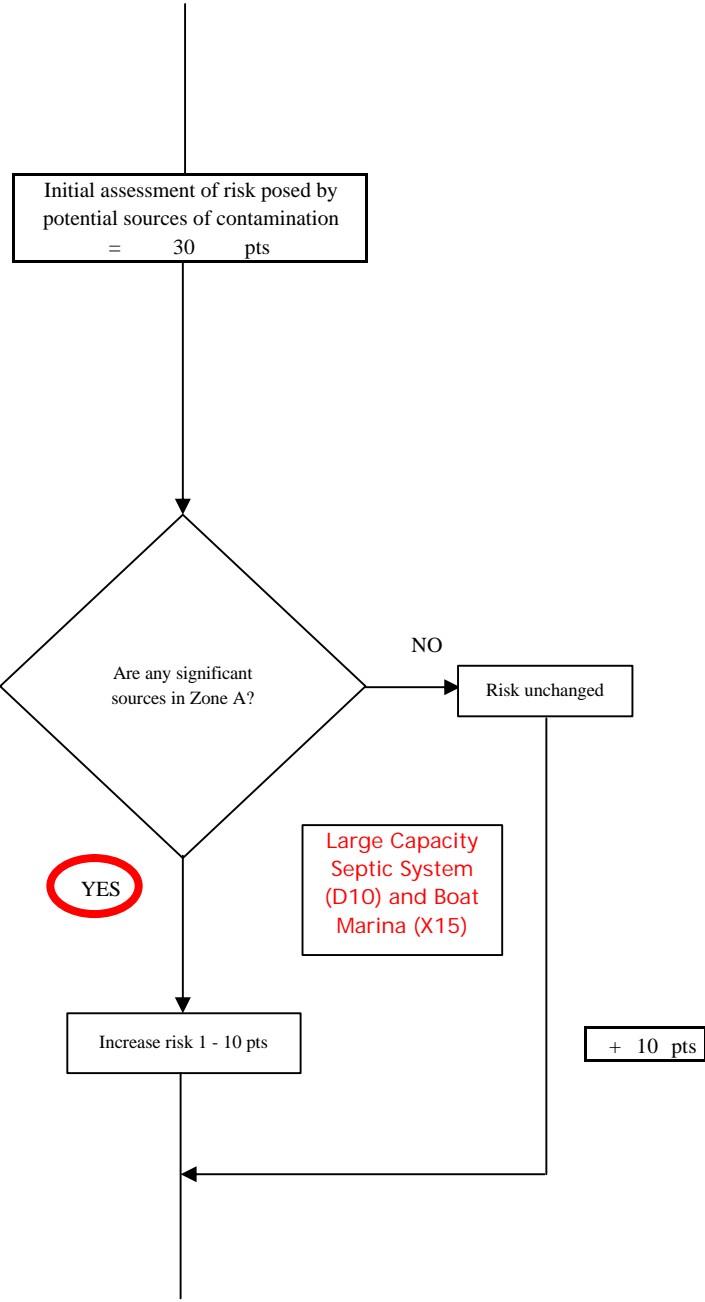
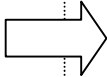


Chart 4. Contaminant risks for Whaler's Cove Lodge - Nitrates and Nitrites

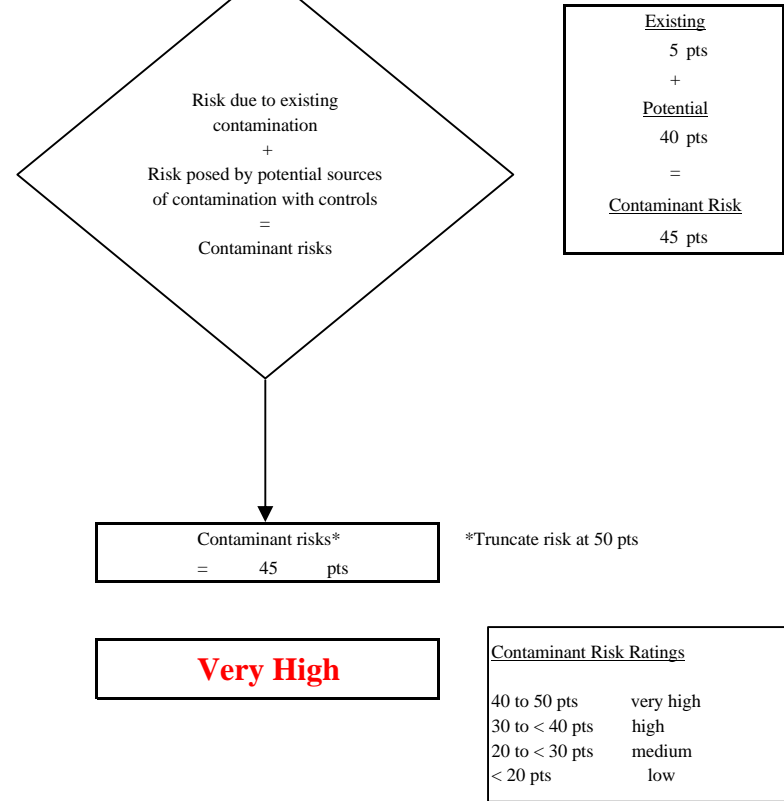
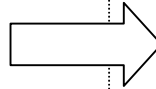
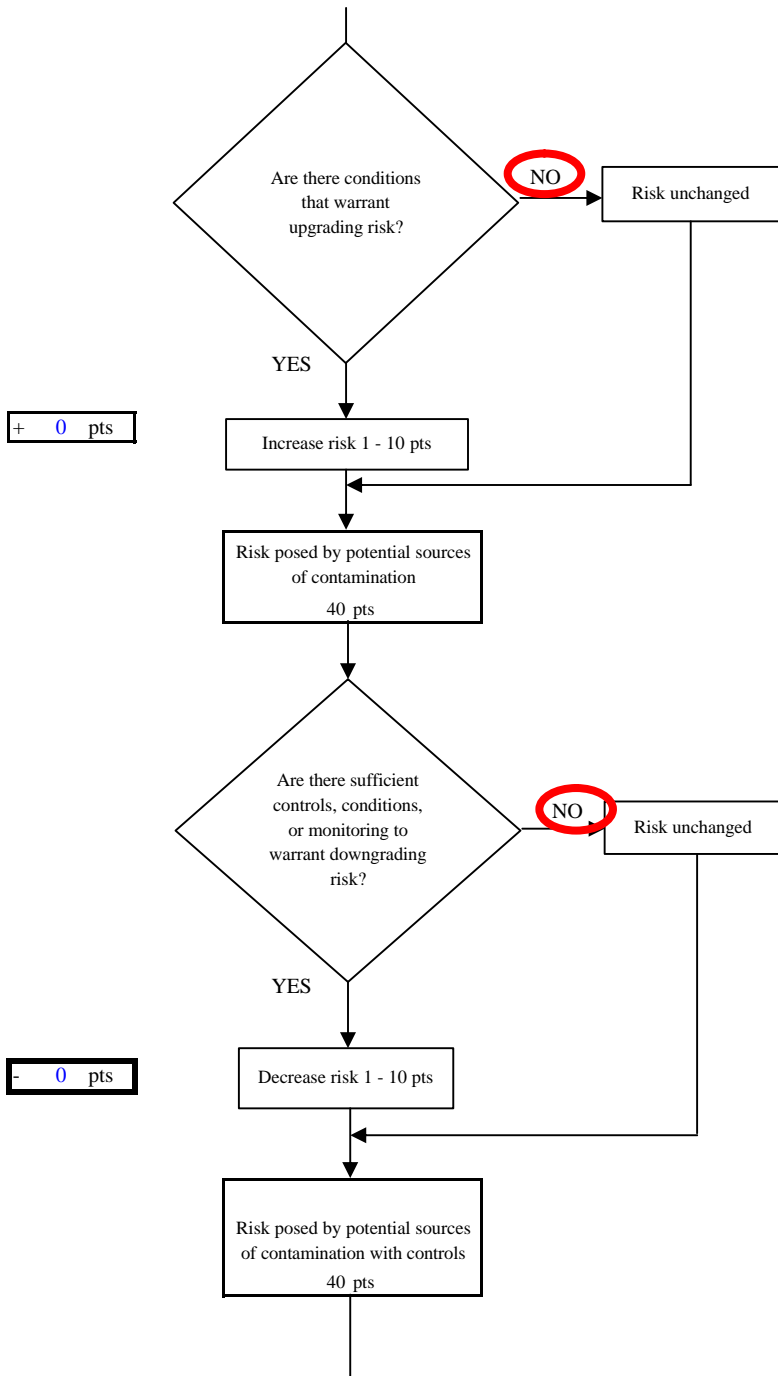


Chart 5. Vulnerability analysis for Whaler's Cove Lodge - Nitrates and Nitrites

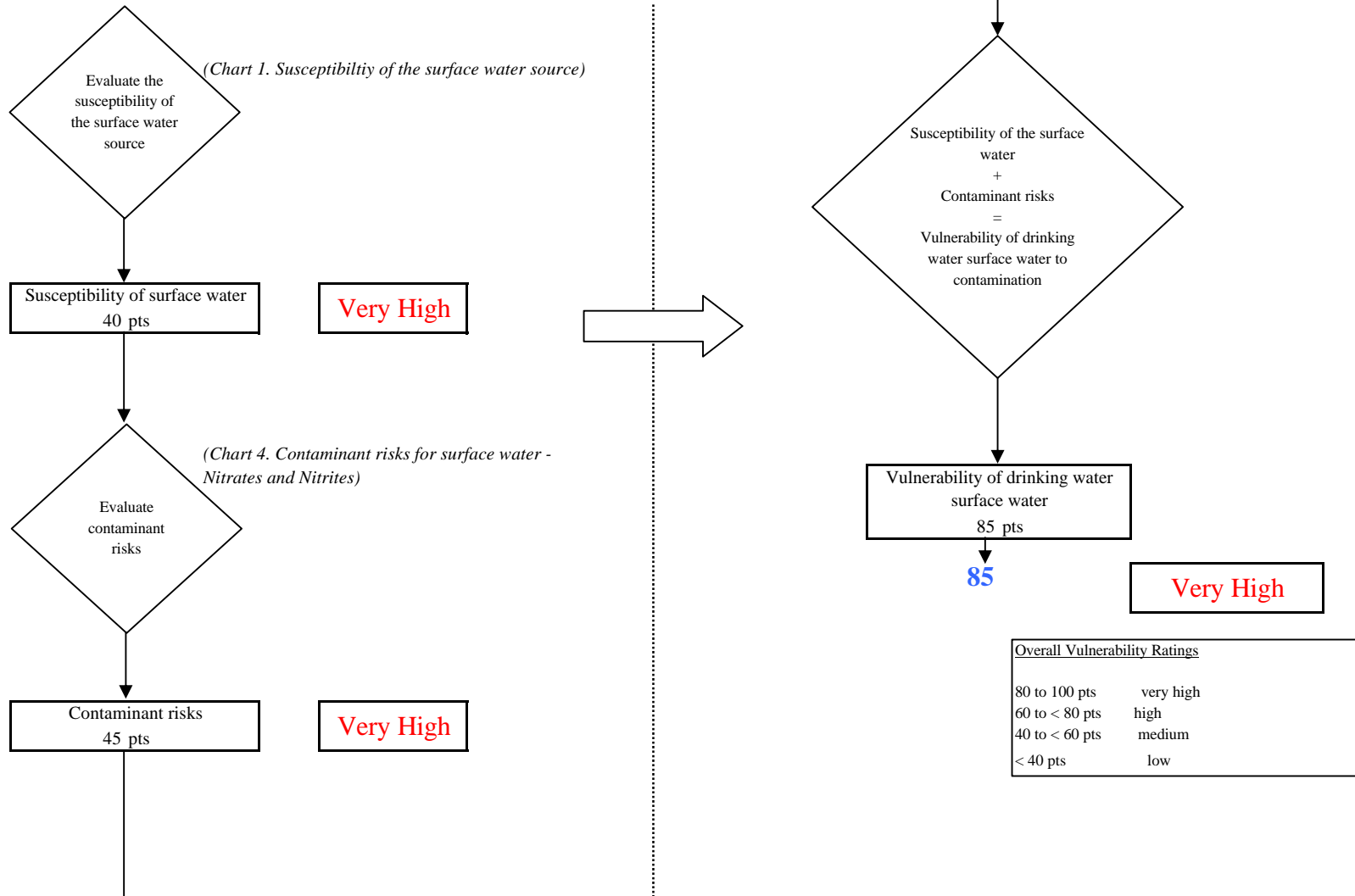


Chart 6. Contaminant risks for Whaler's Cove Lodge - Volatile Organic Chemicals

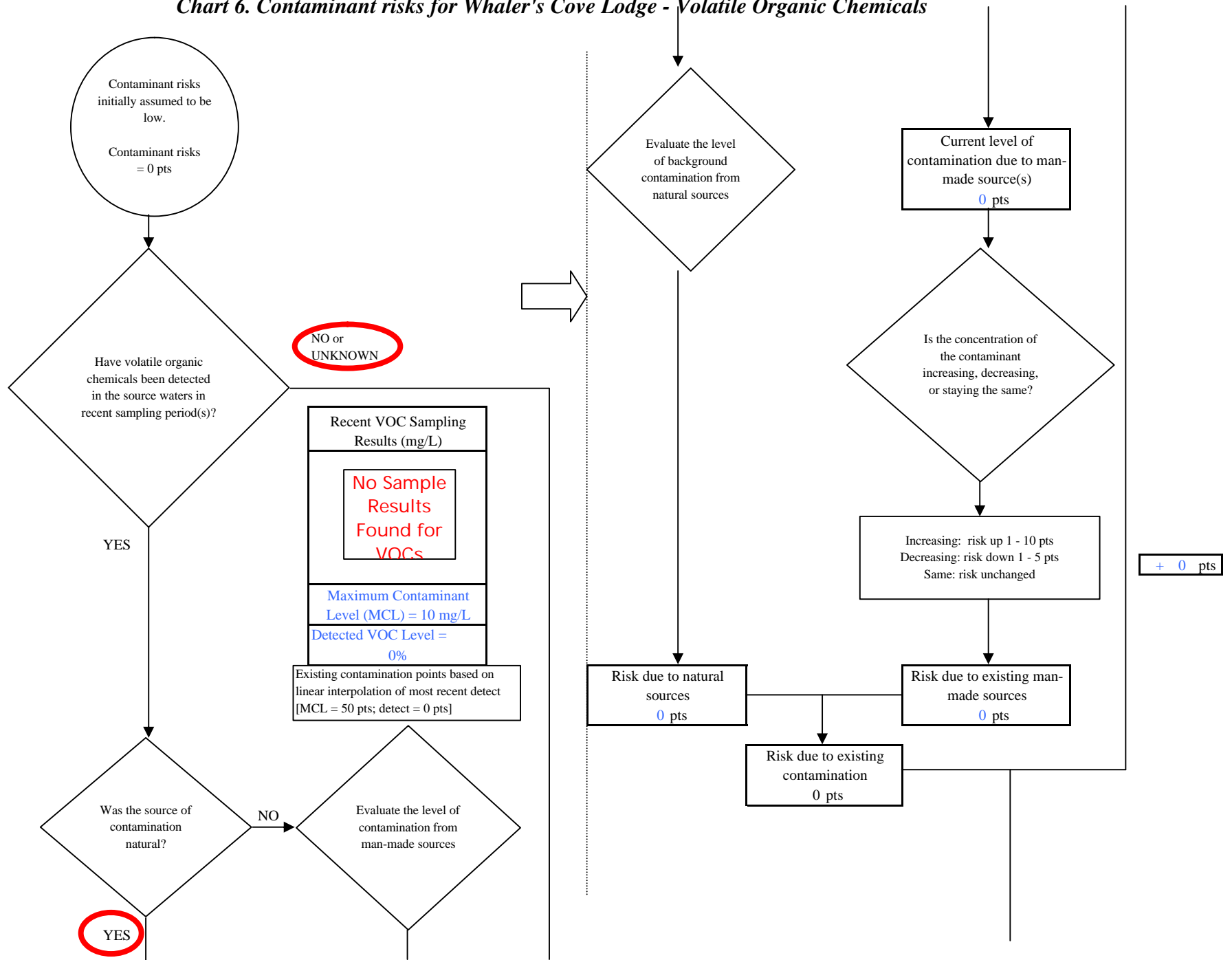
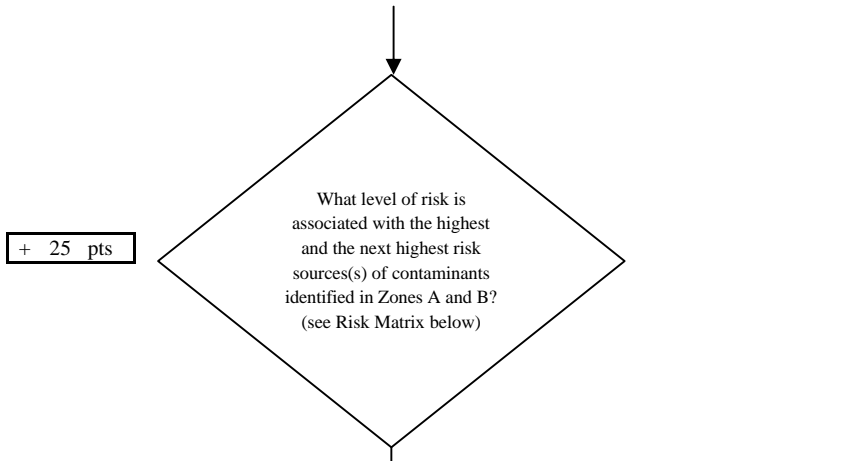


Chart 6. Contaminant risks for Whaler's Cove Lodge - Volatile Organic Chemicals



+ 25 pts

Risk Levels for Contaminant Sources identified in Zones A and B			
	Zone A	Zone B	Total
Very High(s)	0	0	0
High(s)	0	0	0
Medium(s)	3		3
Low(s)	7		7

	LOW 10 pts	MEDIUM 20 pts	HIGH 30 pts	VERY HIGH 40 pts
LOW	≥ 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 25

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.

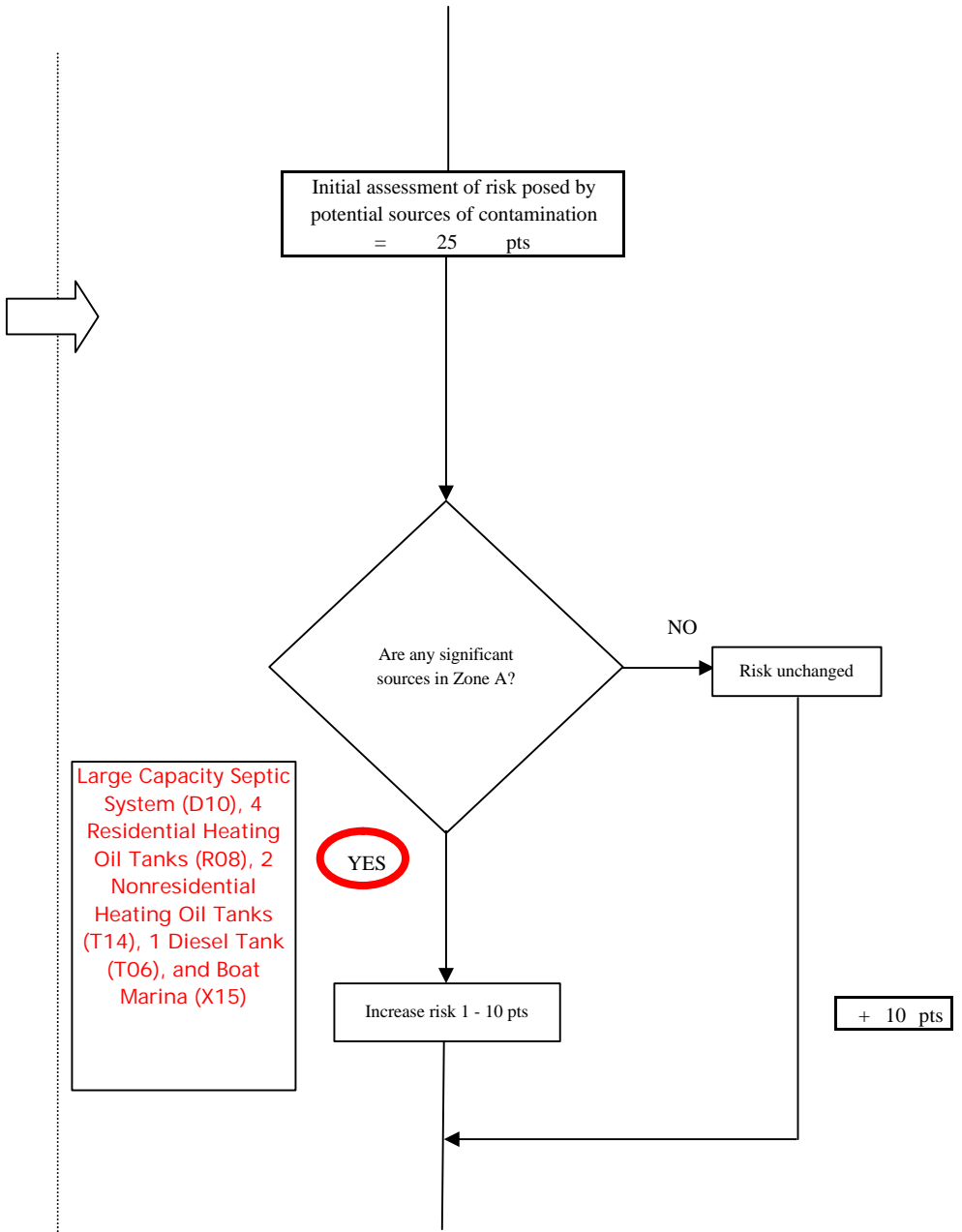


Chart 6. Contaminant risks for Whaler's Cove Lodge - Volatile Organic Chemicals

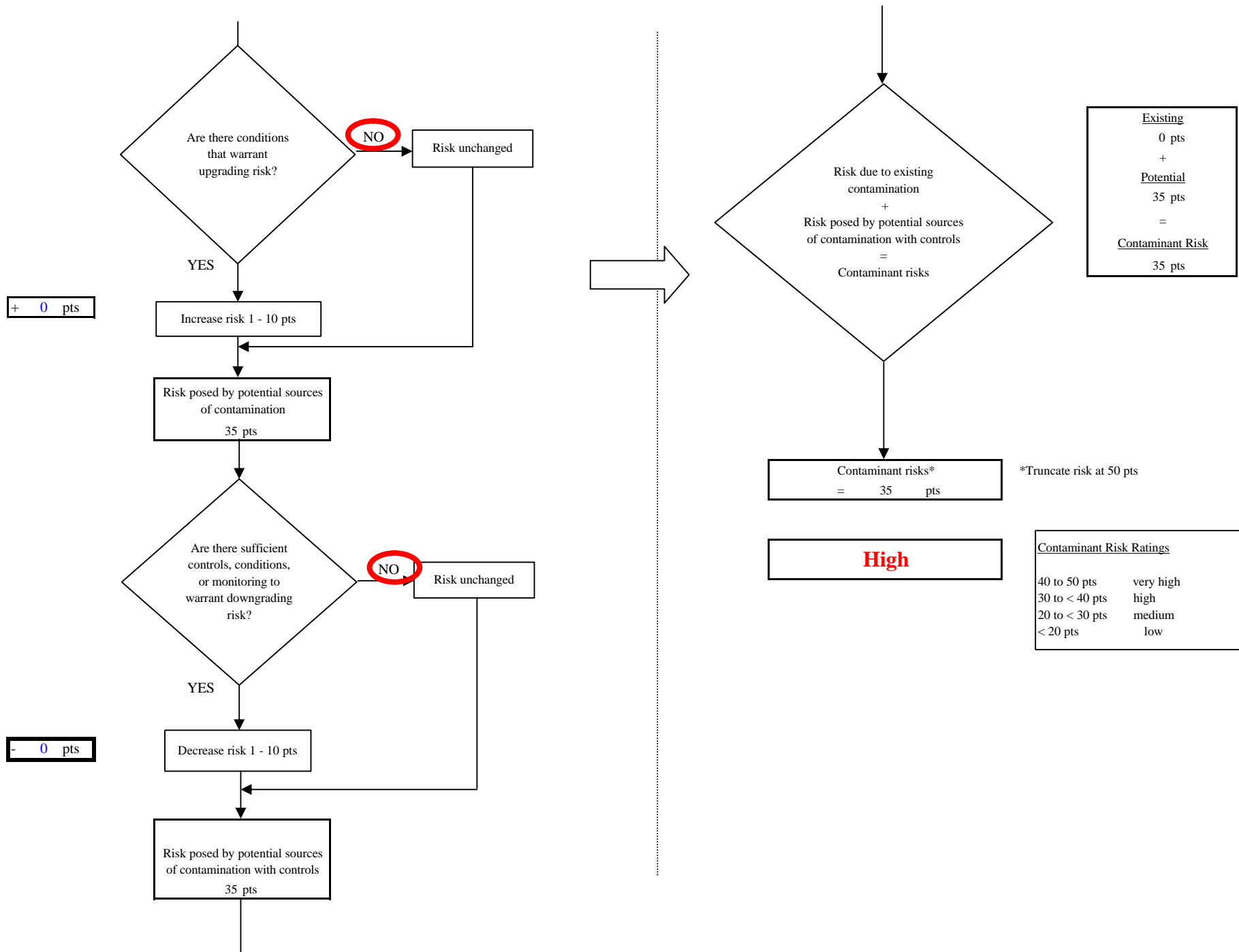


Chart 7. Vulnerability analysis for Whaler's Cove Lodge - Volatile Organic Chemicals

