



Source Water Assessment

A Hydrogeologic Susceptibility and
Vulnerability Assessment for
Clover Pass Resort,
Ketchikan, Alaska
PWSID #120020

DRINKING WATER PROTECTION PROGRAM REPORT NO. 711

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 Clover Pass Resort, Ketchikan, Alaska

Drinking Water Protection Program Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The public water system for Clover Pass Resort is a Class B (transient/non-community) water system consisting of one surface water intake from an unnamed creek near Ketchikan, 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 Clover Pass Resort public drinking water source include septic systems; aboveground diesel tanks; dirt/gravel highways and roads; and an electric substation. These 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 Clover Pass Resort received a vulnerability rating of **Medium** for bacteria and viruses; and nitrates and nitrites; and **High** for volatile organic chemicals.

CLOVER PASS RESORT PUBLIC DRINKING WATER SYSTEM

Clover Pass Resort public water system is a Class B (transient/non-community) water system. The system consists of one surface water intake near Ketchikan, Alaska. Ketchikan Gateway Borough and City is located on Revillagigedo Island, on Tongass Narrows, 235 miles south of Juneau, Alaska (please see the inset of Map 1 in Appendix A for location). Ketchikan is Alaska's southern most major city, and the fourth largest. The population of Ketchikan is approximately 15,100.

Ketchikan averages about 160 inches of precipitation per year; and approximately 32 inches of snow. 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 Ketchikan is at sea level.

According to a Sanitary Survey dated July 21, 1998, 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 April through September and serves approximately 4 residents and 80 non-residents through 30 service connections.

CLOVER PASS RESORT 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 Clover Pass Resort extends throughout the entire watershed area. Development in the vicinity of the surface water intake is limited to only Zones A, B, and C (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 Clover Pass Resort 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 CLOVER PASS RESORT 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 Clover Pass Resort is an unnamed 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 Clover Pass Resort.

Table 2. Natural Susceptibility

	Score	Rating
Natural Susceptibility	42	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	5	Low
Nitrates and/or Nitrites	12	Low
Volatile Organic Chemicals	25	Medium

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	45	Medium
Nitrates and Nitrites	55	Medium
Volatile Organic Chemicals	65	High

Bacteria and Viruses

The contaminant risk for bacteria and viruses is **Low** with the septic systems, and dirt/gravel 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 Clover Pass Resort. 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 septic systems, and dirt/gravel 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).

Nitrates have not been detected in the water during recent sampling events for Clover Pass Resort. 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 **Medium**.

Volatile Organic Chemicals

The contaminant risk for volatile organic chemicals is **Medium** with the septic systems; aboveground diesel tank; dirt/gravel highways and roads; and electric substation 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 **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.
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- United States Environmental Protection Agency (EPA), 2002 [WWW document]. URL: <http://www.epa.gov/safewater/mcl.html>.

APPENDIX A

Clover Pass Resort Drinking Water Protection Area Location Map (Map 1)

APPENDIX B

Contaminant Source Inventory and Risk Ranking for Clover Pass Resort (Tables 1-4)

Table 1**Contaminant Source Inventory for
Clover Pass Resort****PWSID 120020.001**

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Map Number	Comments
Septic systems (serves one single-family home)	R02	R02-1	A	2	Residence Southeast of Clover Pass Resort
Septic systems (serves one single-family home)	R02	R02-2	A	2	Residence Southeast of Clover Pass Resort
Septic systems (serves one single-family home)	R02	R02-3	A	2	Residence Southeast of Clover Pass Resort
Tanks, diesel (above ground)	T06	T06-1	A	2	Diesel Tank for Radio Towers
Water supply wells	W09	W09-1	A	2	Residence Southeast of Clover Pass Resort
Water supply wells	W09	W09-2	A	2	Residence Southeast of Clover Pass Resort
Water supply wells	W09	W09-3	A	2	Residence Southeast of Clover Pass Resort
Highways and roads, dirt/gravel	X24	X24-1	A	2	Road South of Clover Pass Resort
Highways and roads, dirt/gravel	X24	X24-2	A	2	Road Southeast of Clover Pass Resort
Highways and roads, dirt/gravel	X24	X24-3	A	2	Road Goes By Substation
Electric substation	X37	X37-1	A	2	Substation South of Clover Pass Resort

Contaminant Source Inventory and Risk Ranking for
Clover Pass Resort
Sources of Bacteria and Viruses

Table 2

PWSID 120020.001

<i>Contaminant Source Type</i>	<i>Contaminant Source ID</i>	<i>CS ID tag</i>	<i>Zone</i>	<i>Risk Ranking for Analysis</i>	<i>Map Number</i>	<i>Comments</i>
Septic systems (serves one single-family home)	R02	R02-1	A	Low	2	Residence Southeast of Clover Pass Resort
Septic systems (serves one single-family home)	R02	R02-2	A	Low	2	Residence Southeast of Clover Pass Resort
Septic systems (serves one single-family home)	R02	R02-3	A	Low	2	Residence Southeast of Clover Pass Resort
Highways and roads, dirt/gravel	X24	X24-1	A	Low	2	Road South of Clover Pass Resort
Highways and roads, dirt/gravel	X24	X24-2	A	Low	2	Road Southeast of Clover Pass Resort
Highways and roads, dirt/gravel	X24	X24-3	A	Low	2	Road Goes By Substation

Contaminant Source Inventory and Risk Ranking for
Clover Pass Resort
Sources of Nitrates/Nitrites

Table 3

PWSID 120020.001

<i>Contaminant Source Type</i>	<i>Contaminant Source ID</i>	<i>CS ID tag</i>	<i>Zone</i>	<i>Risk Ranking for Analysis</i>	<i>Map Number</i>	<i>Comments</i>
Septic systems (serves one single-family home)	R02	R02-1	A	Low	2	Residence Southeast of Clover Pass Resort
Septic systems (serves one single-family home)	R02	R02-2	A	Low	2	Residence Southeast of Clover Pass Resort
Septic systems (serves one single-family home)	R02	R02-3	A	Low	2	Residence Southeast of Clover Pass Resort
Highways and roads, dirt/gravel	X24	X24-1	A	Low	2	Road South of Clover Pass Resort
Highways and roads, dirt/gravel	X24	X24-2	A	Low	2	Road Southeast of Clover Pass Resort
Highways and roads, dirt/gravel	X24	X24-3	A	Low	2	Road Goes By Substation

Contaminant Source Inventory and Risk Ranking for

PWSID 120020.001

Table 4

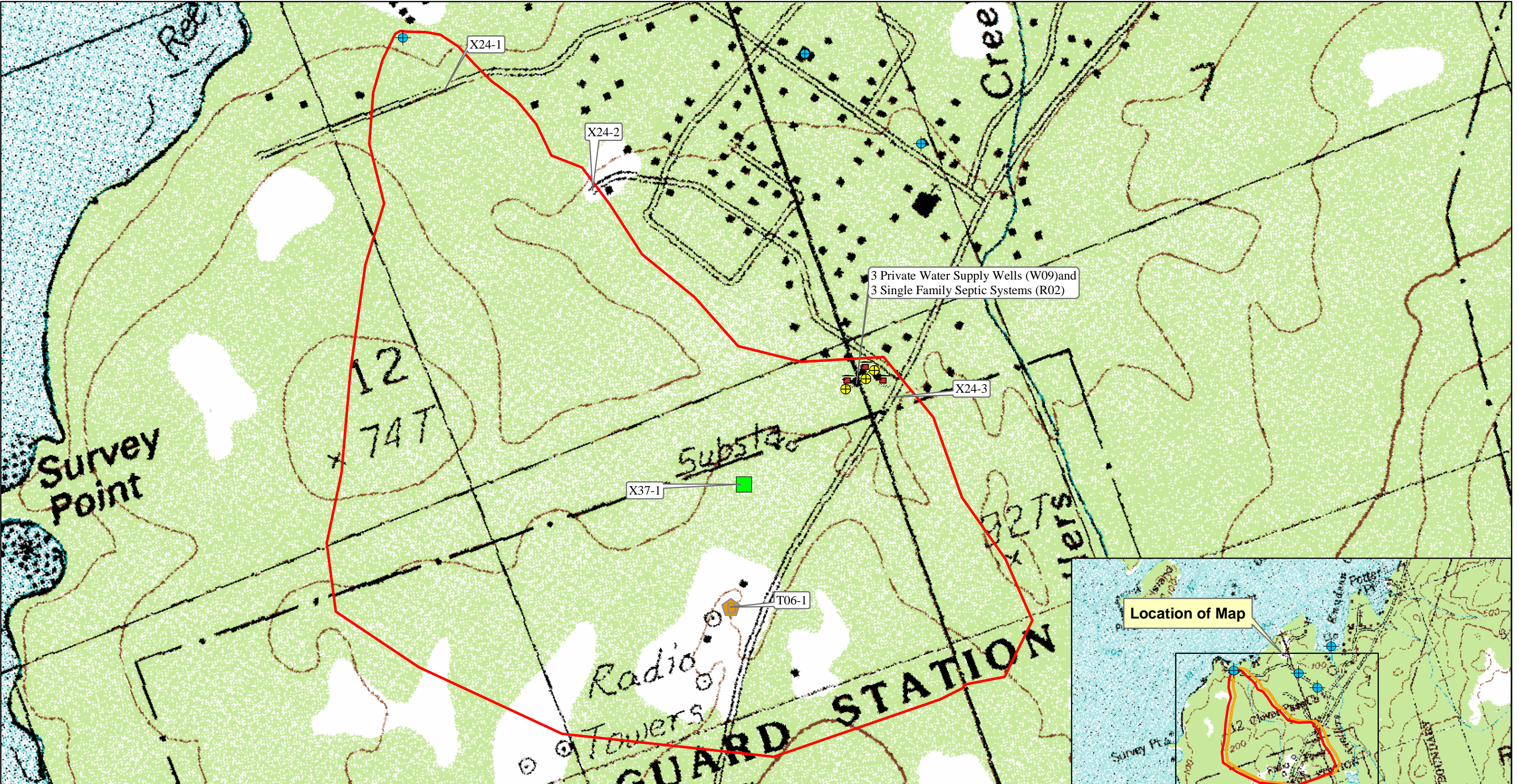
Clover Pass Resort

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>
Septic systems (serves one single-family home)	R02	R02-1	A	Low	2	Residence Southeast of Clover Pass Resort
Septic systems (serves one single-family home)	R02	R02-2	A	Low	2	Residence Southeast of Clover Pass Resort
Septic systems (serves one single-family home)	R02	R02-3	A	Low	2	Residence Southeast of Clover Pass Resort
Tanks, diesel (above ground)	T06	T06-1	A	Medium	2	Diesel Tank for Radio Towers
Highways and roads, dirt/gravel	X24	X24-1	A	Low	2	Road South of Clover Pass Resort
Highways and roads, dirt/gravel	X24	X24-2	A	Low	2	Road Southeast of Clover Pass Resort
Highways and roads, dirt/gravel	X24	X24-3	A	Low	2	Road Goes By Substation
Electric substation	X37	X37-1	A	Low	2	Substation South of Clover Pass Resort



APPENDIX C

Clover Pass Resort Drinking Water Protection Area and Potential and Existing Contaminant Sources (Map 2)



Map 2: Drinking Water Protection Area for Clover Pass Resort and Potential and Existing Sources of Contamination

PWSID: 120020.001



0 287.5 575 1,150 1,725 2,300 Feet

1:6,401

Protection zones were delineated based upon topography from the CAD Drawing

For this PWS, Zone C (the entire watershed) covers the same area as Zone B (areas within 1-Mile of the surface water body) and Zone A (areas within 1000 Feet of the surface water body)

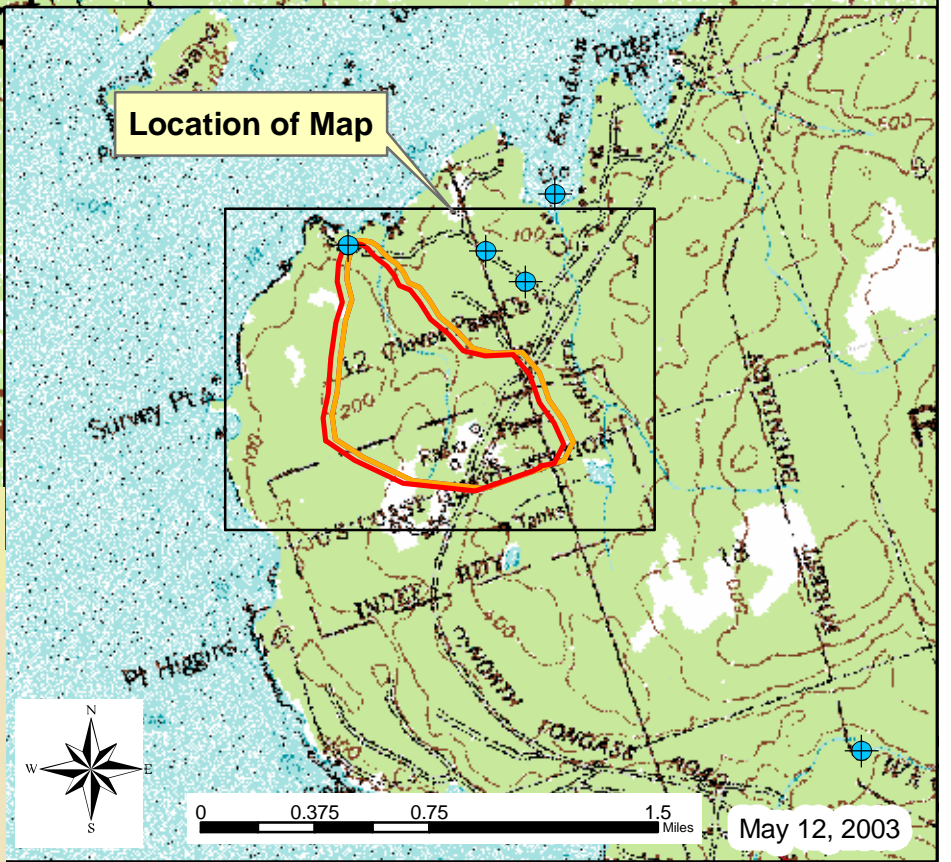
Legend

- Public Drinking Water Systems
- Electric Substation (X37)
- Above Ground Diesel Tank (T06)
- Large Capacity Septic System (D10)
- Private Water Supply Well (W09)
- Single Family Septic System (R02)

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



APPENDIX D

Vulnerability Analysis for Clover Pass Resort Public Drinking Water Source (Charts 1-7)

Chart 1. Susceptibility of the surface water source - Clover Pass Resort

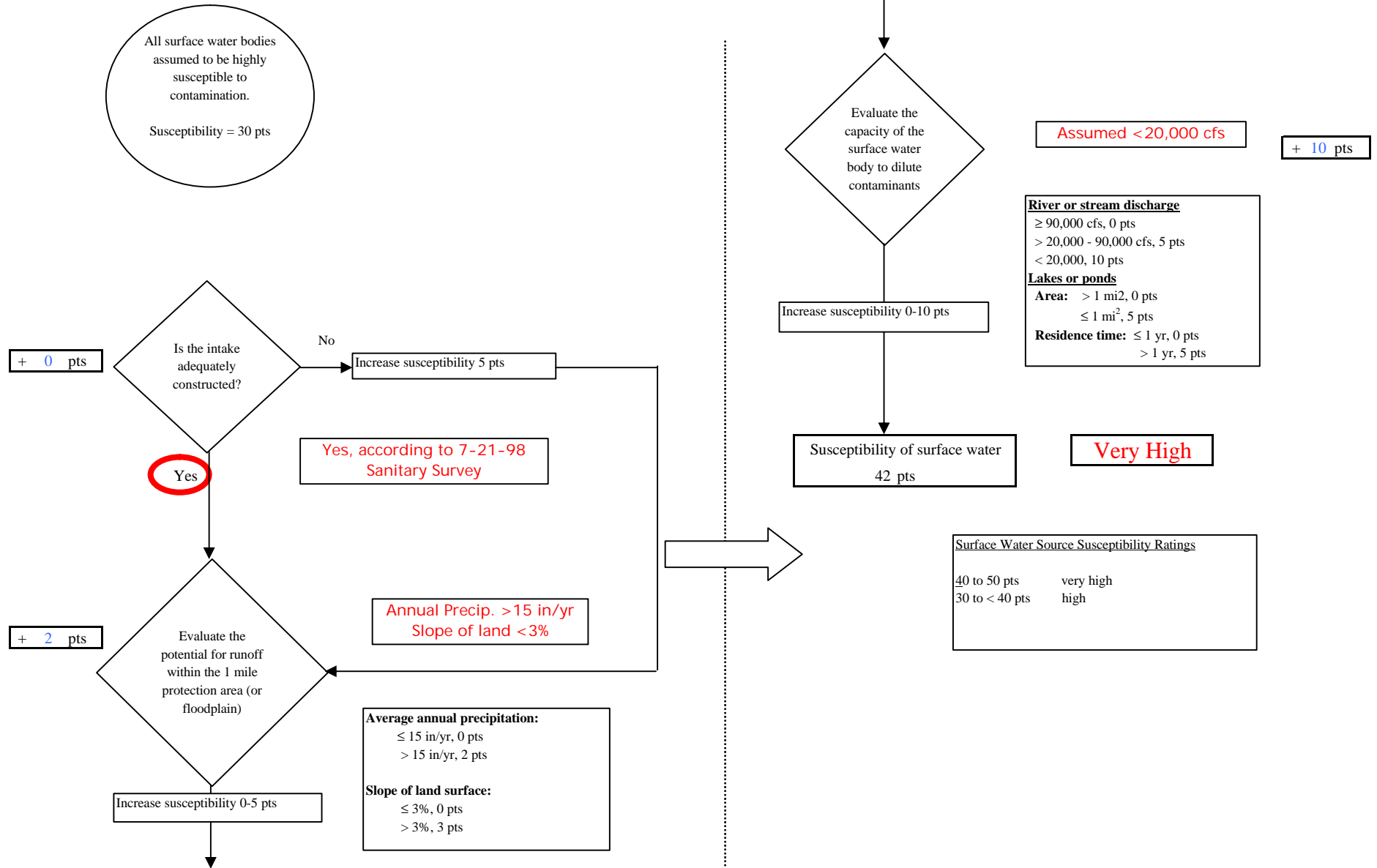


Chart 2. Contaminant risks for Clover Pass Resort - Bacteria & Viruses

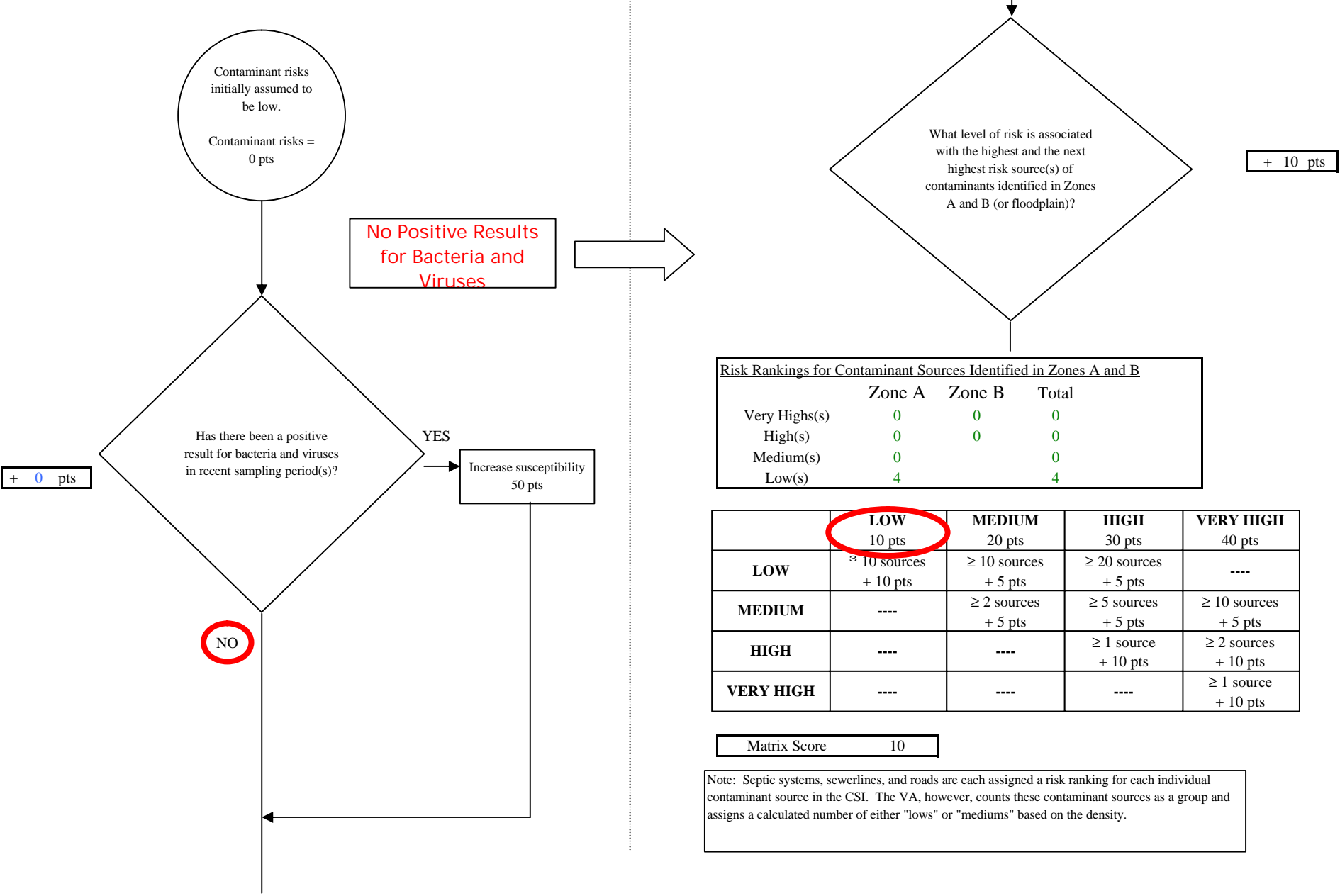
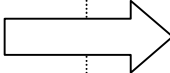
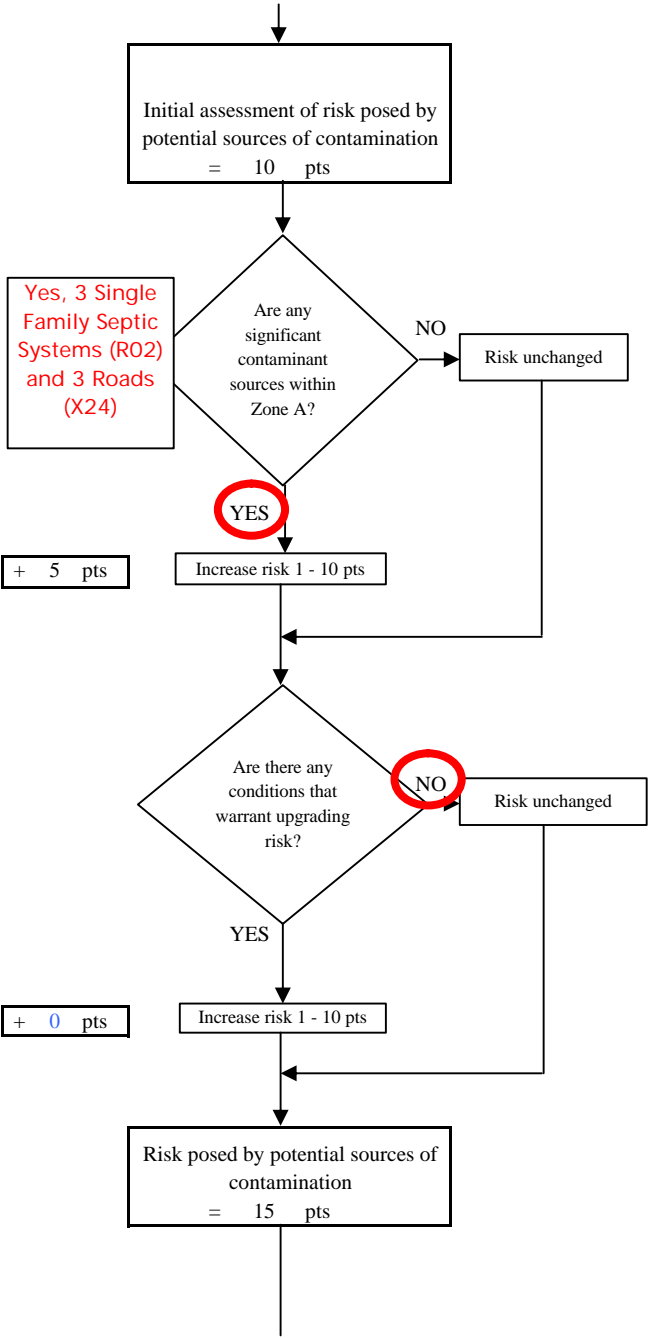


Chart 2. Contaminant risks for Clover Pass Resort - Bacteria & Viruses



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

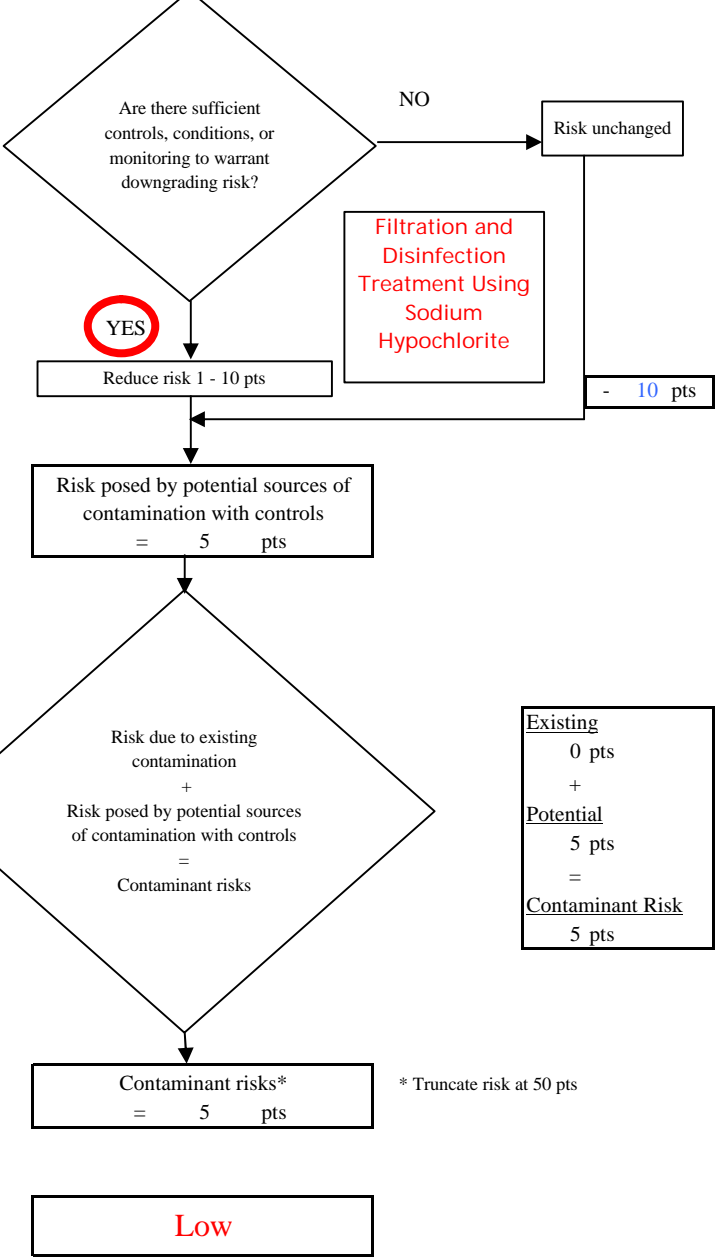


Chart 3. Vulnerability analysis for Clover Pass Resort - Bacteria & Viruses

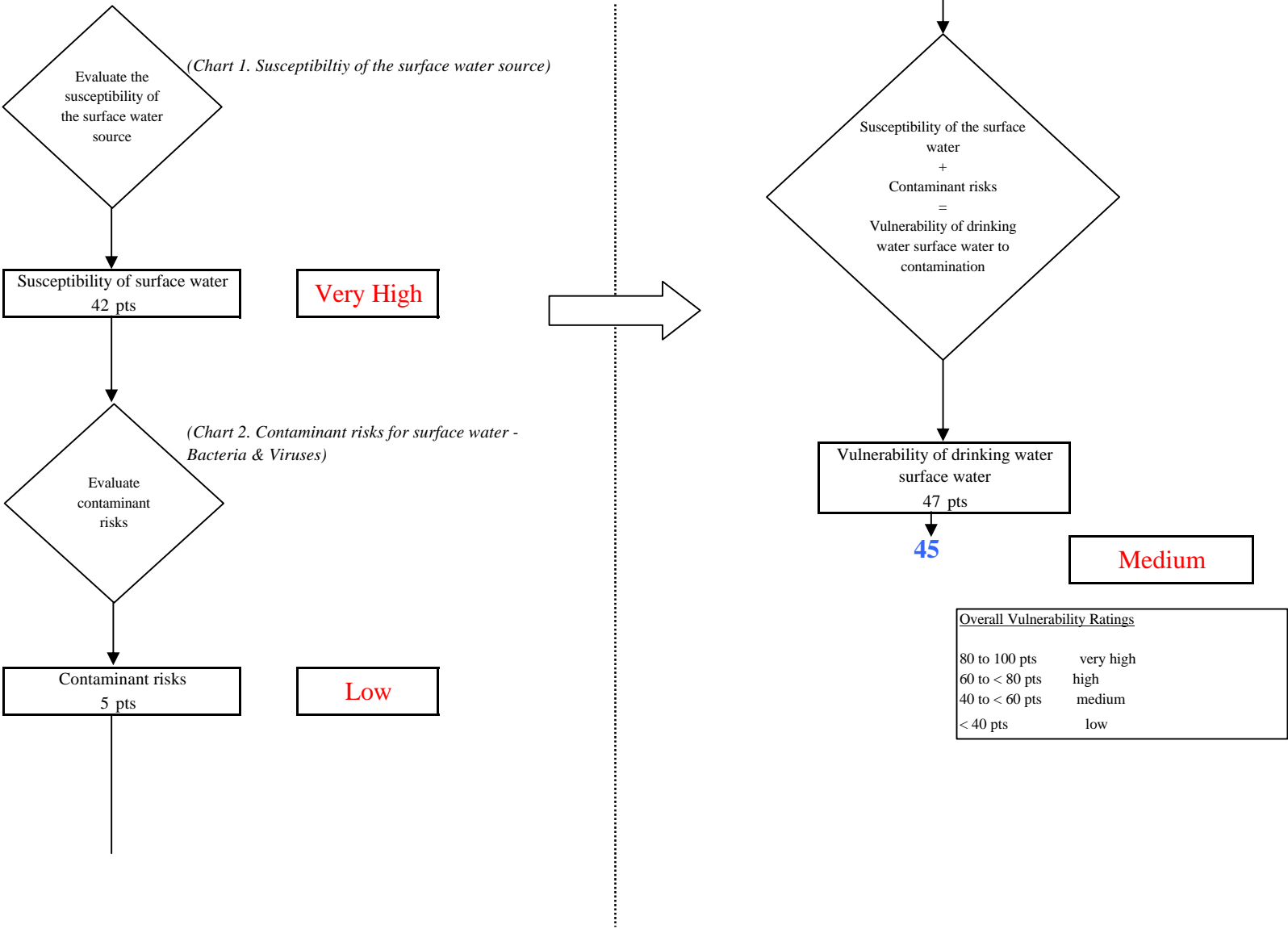


Chart 4. Contaminant risks for Clover Pass Resort - Nitrates and Nitrites

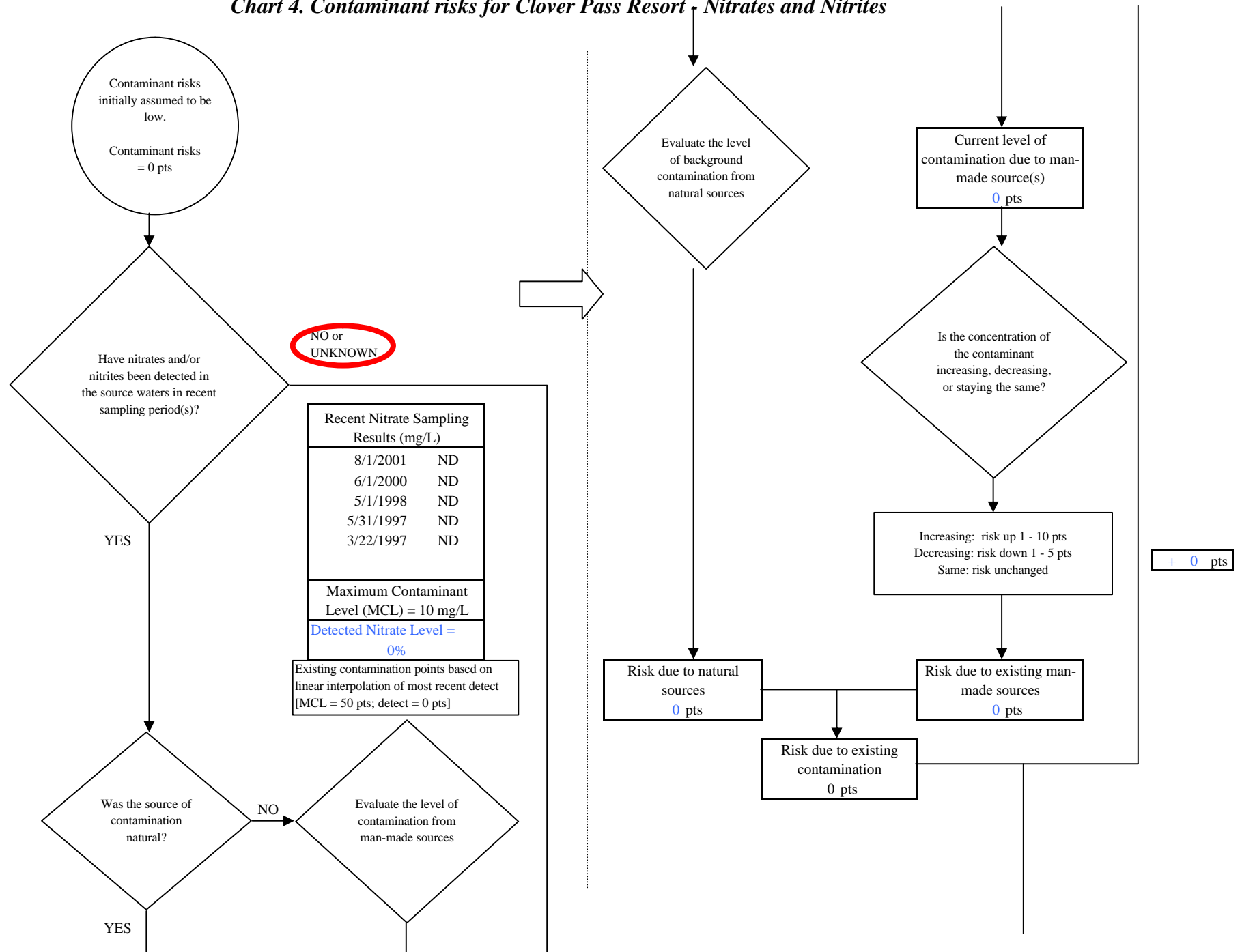


Chart 4. Contaminant risks for Clover Pass Resort - Nitrates and Nitrites

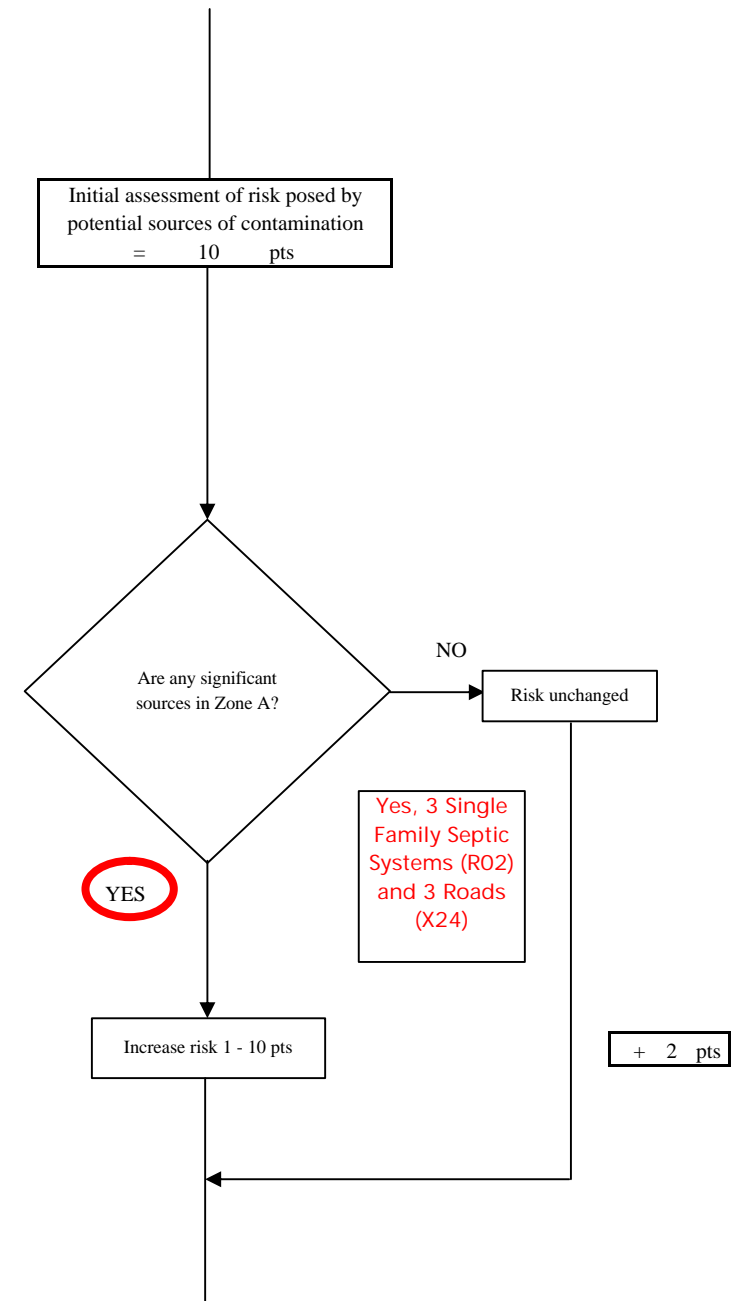
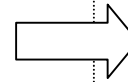
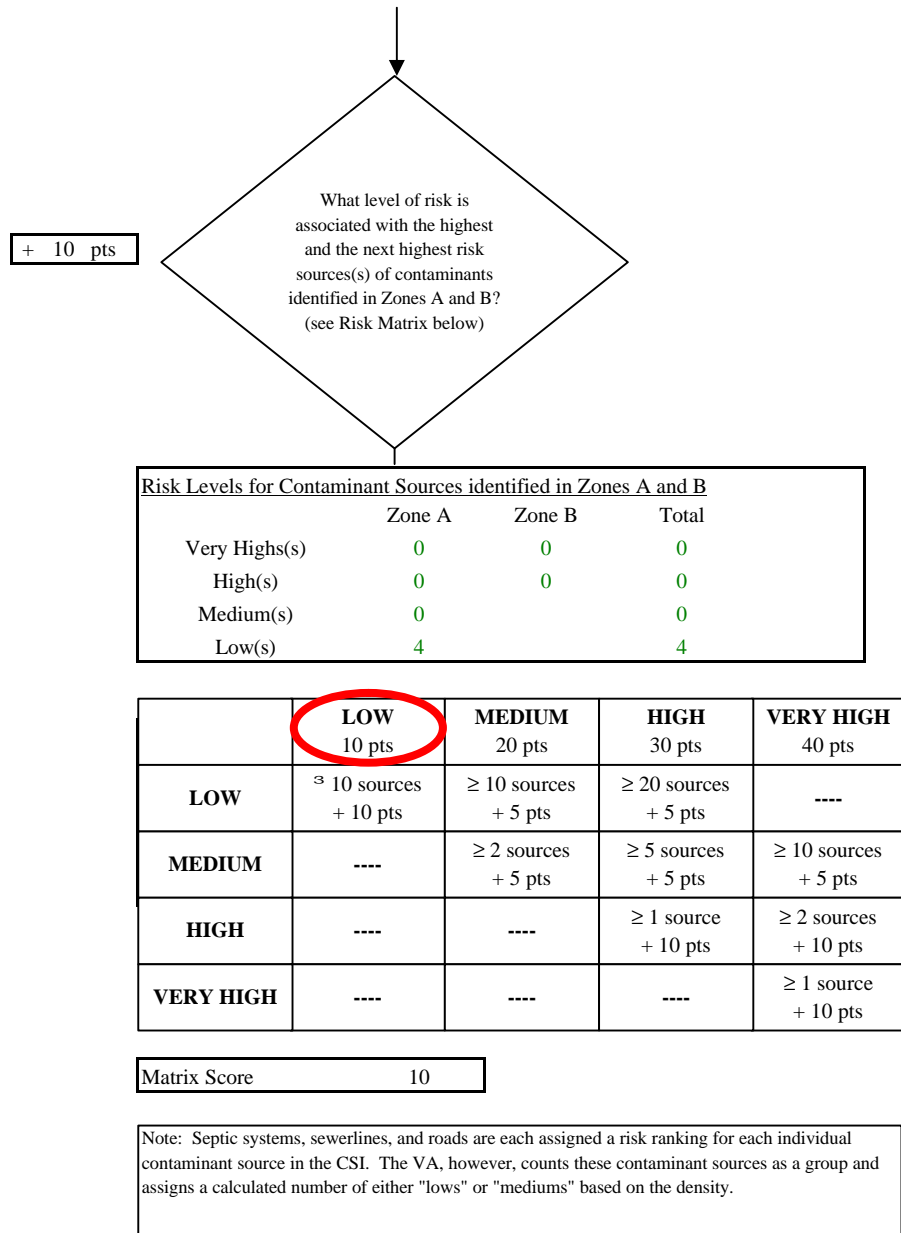


Chart 4. Contaminant risks for Clover Pass Resort - Nitrates and Nitrites

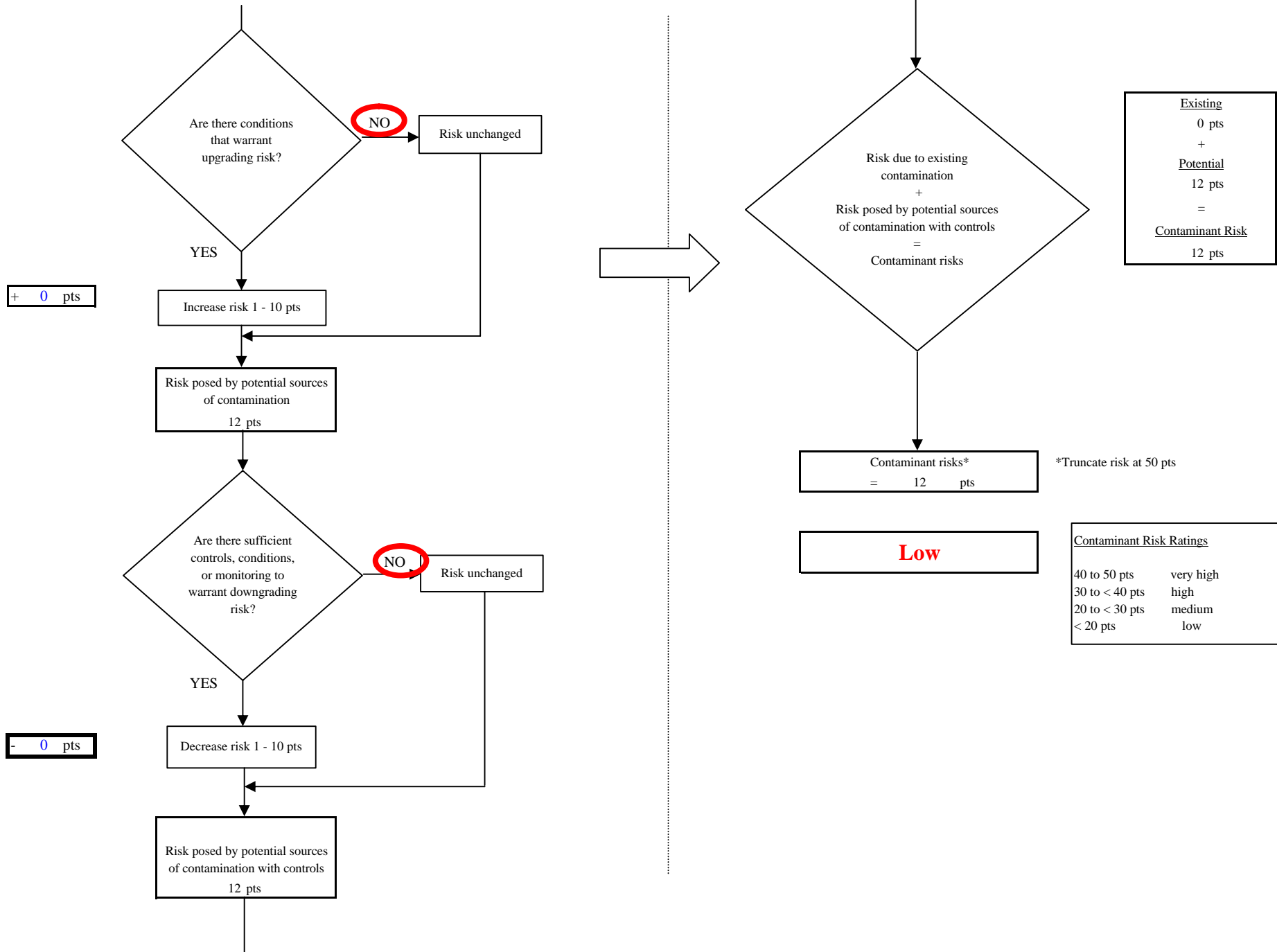


Chart 5. Vulnerability analysis for Clover Pass Resort - Nitrates and Nitrites

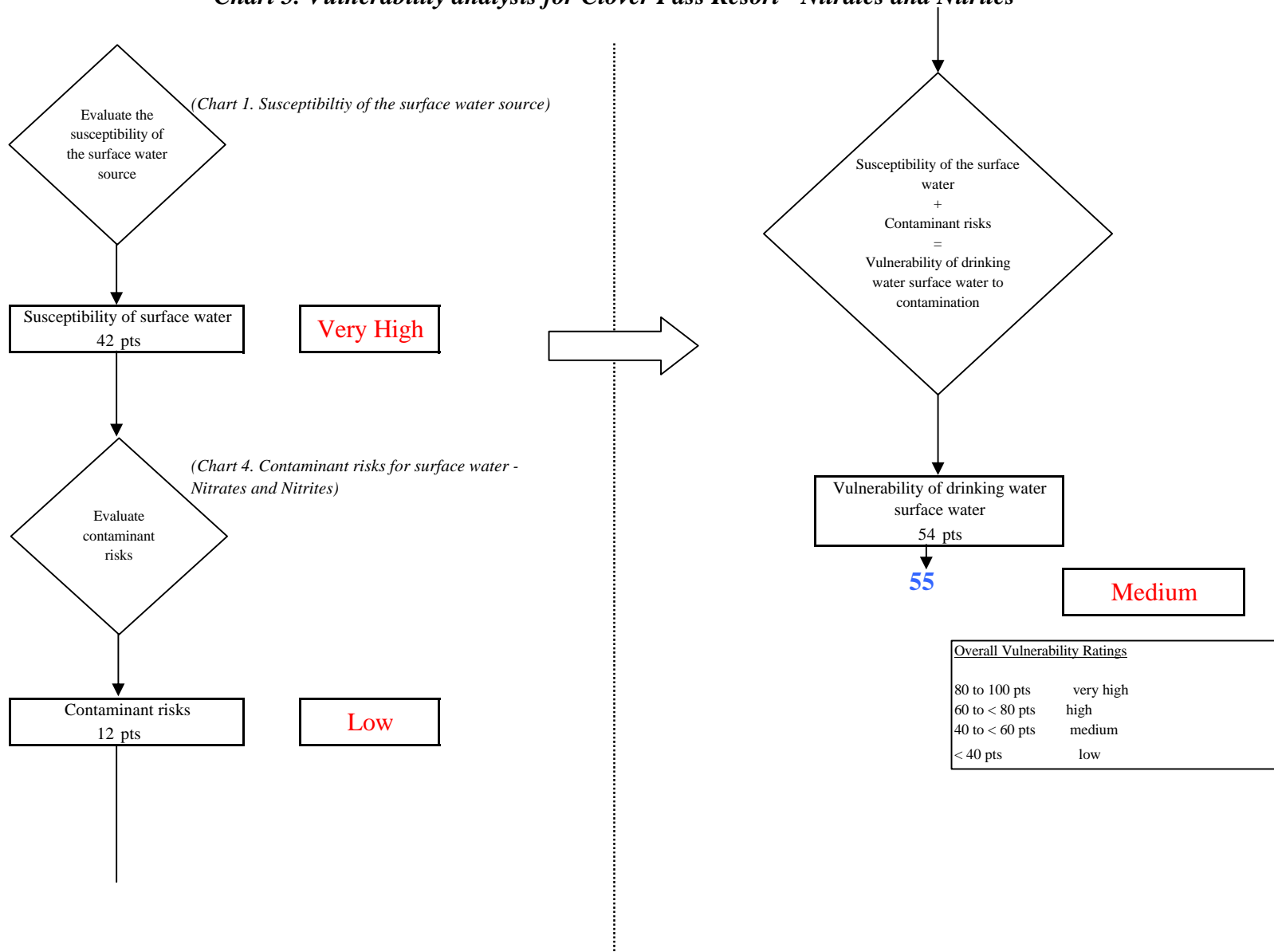


Chart 6. Contaminant risks for Clover Pass Resort - Volatile Organic Chemicals

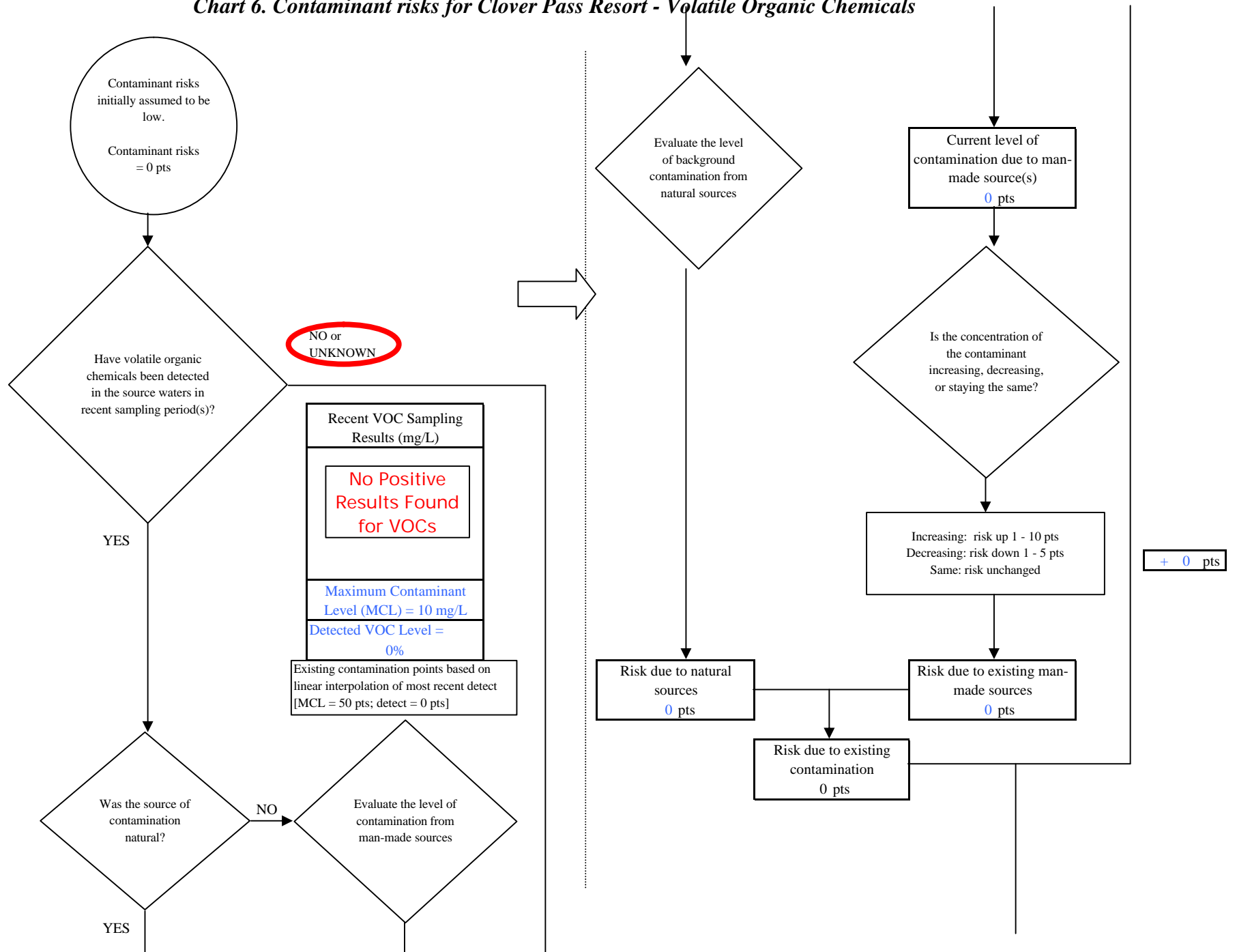


Chart 6. Contaminant risks for Clover Pass Resort - Volatile Organic Chemicals

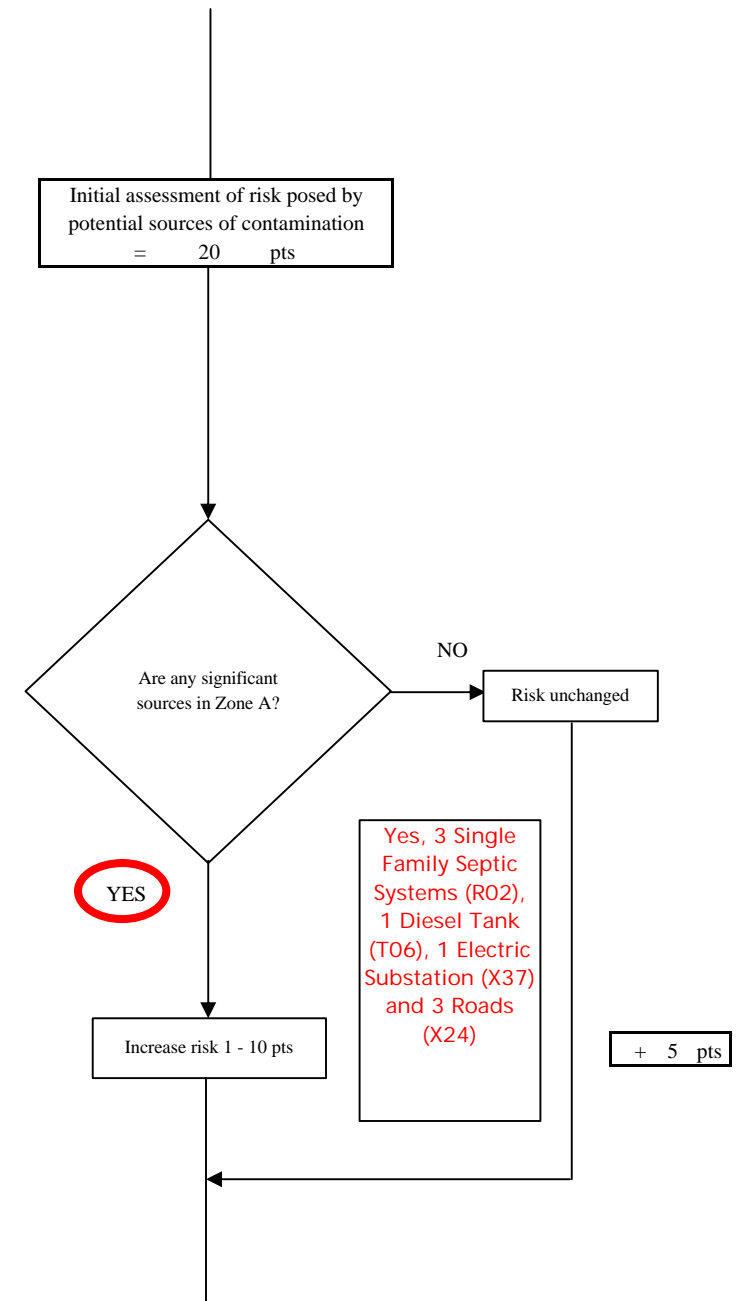
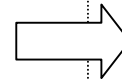
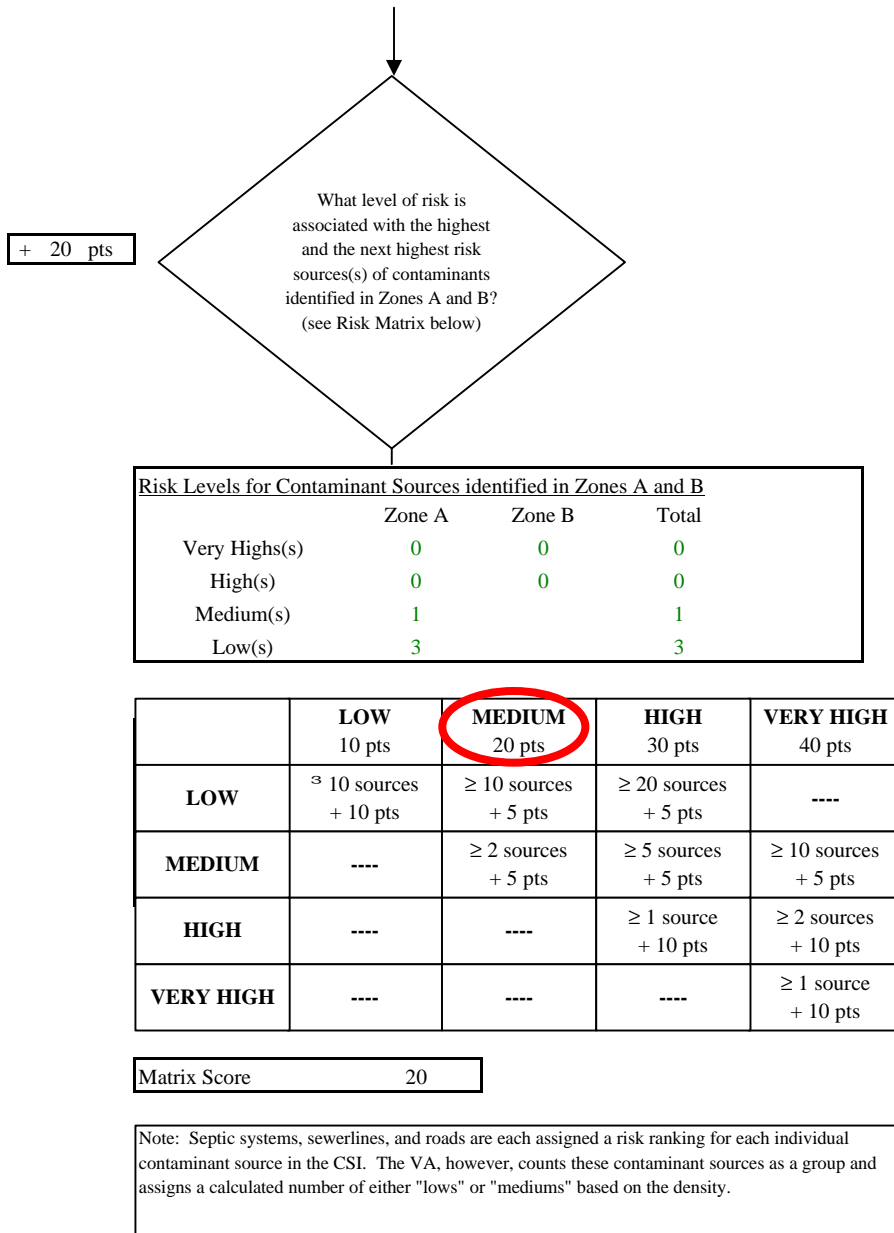


Chart 6. Contaminant risks for Clover Pass Resort - Volatile Organic Chemicals

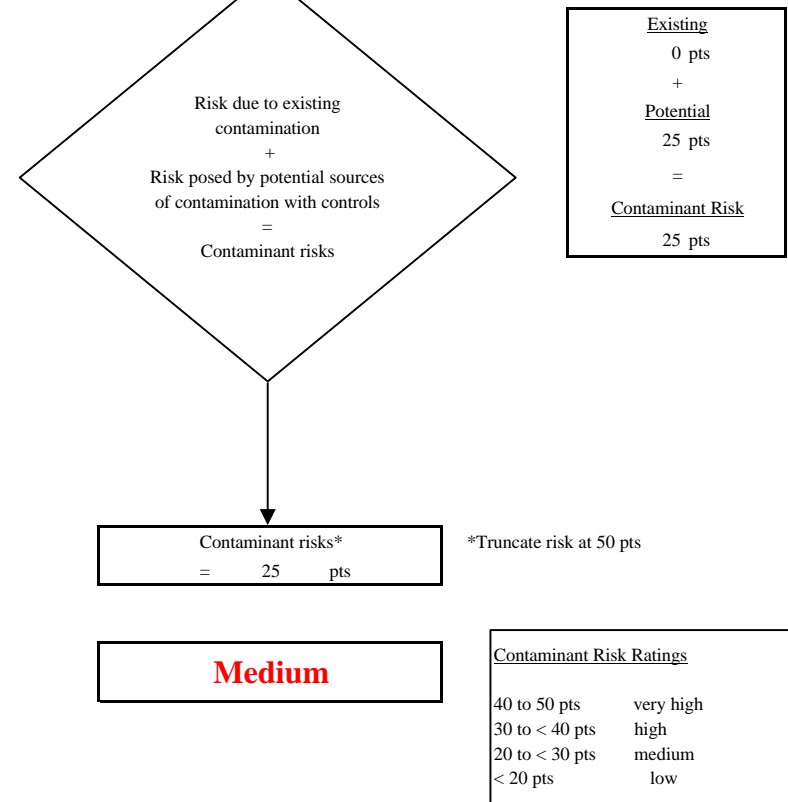
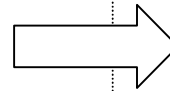
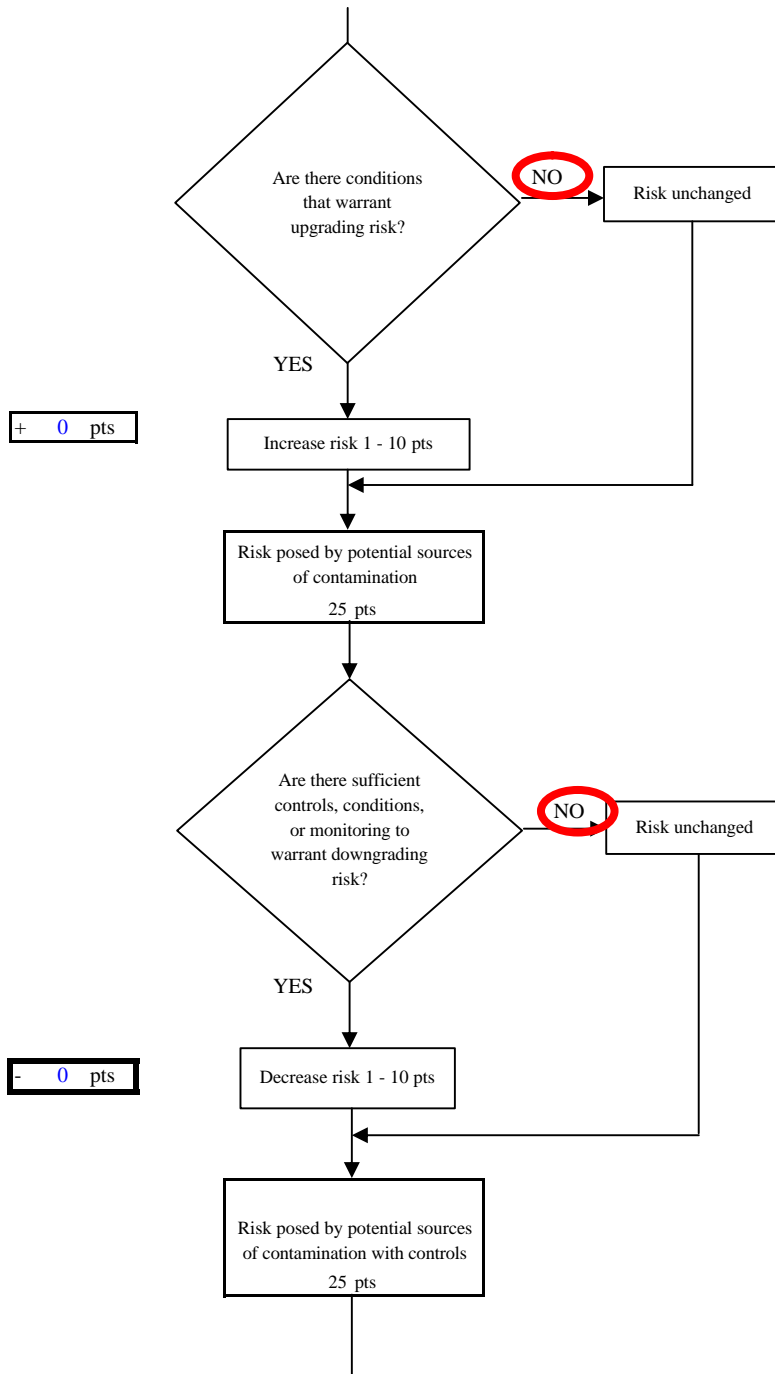


Chart 7. Vulnerability analysis for Clover Pass Resort - Volatile Organic Chemicals

