Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for Twin Creek RV Park, Petersburg, Alaska PWSID #130669

DRINKING WATER PROTECTION PROGRAM REPORT NO. 740

Alaska Department of Environmental Conservation

Source Water Assessment for
Twin Creek RV Park
Petersburg, Alaska
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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 Twin Creek RV Park, Petersburg, Alaska

Drinking Water Protection Program
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EXECUTIVE SUMMARY

The public water system for Twin Creek RV Park is a Class B (transient/non-community) water system consisting of one spring, located on Mitkof Highway, Petersburg, Alaska. The spring received a susceptibility rating of **Low** and the aquifer received a susceptibility rating of **High**. Combining these two ratings produces a **Medium** rating for the natural susceptibility of the spring. Identified potential and current sources of contaminants for Twin Creek RV Park public drinking water source include: septic systems; above-ground heating oil tanks; paved highway and roads; campground and RV parks; and logging activity. 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 Twin Creek RV Park received a vulnerability rating of **High** for bacteria and viruses, and nitrates and nitrites; and **Medium** for volatile organic chemicals.

TWIN CREEK RV PARK PUBLIC DRINKING WATER SYSTEM

Twin Creek RV Park public water system is a Class B (transient/non-community) water system. The system consists of one spring at near Twin Creek, at Mile 7.5 Mitkof Highway, Petersburg, Alaska (See Map 1 of Appendix A). Petersburg is located at the northern end of Wrangell Narrows, halfway between Juneau and Ketchikan, on the northwest tip of Mitkof Island (please see the inset of Map 1 in Appendix A for location). The population of Petersburg is approximately 3,400.

Petersburg averages about 110 inches of precipitation per year, and approximately 97 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 of the spring is unknown.

The most recent Sanitary Survey (July 27, 1998) indicates the spring is enclosed by a permanent structure, was not susceptible to flooding, and that the intake was adequately constructed. However, the survey also notes that at the time of this survey an overflow pipe from the storage tank at the spring is in contact with the ground and is not screened. A properly constructed intake prevents contamination of the source at the system connection.

This system operates year round and serves approximately 8 residents and 30 non-residents through 29 service connections.

TWIN CREEK RV PARK 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 spring. Some areas are more likely to allow contamination to reach the spring than others. These areas are determined by looking at the characteristics of the soil, groundwater, aquifer, and intake.

The most probable area for contamination to reach the spring intake is the area that contributes water to the aquifer area. 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, this area will serve as the focus for voluntary protection efforts. Please refer to the Guidance Manual for Class B Public Water Systems for additional information.

The DWPAs established for springs by the ADEC are separated into three zones. These zones correspond to differences in the aerial distances from the spring intake and the entire watershed boundary. Little is known about the time of travel for contaminants, thus conservative distances have been established to provide protection for the spring. The following is a summary of the three DWPA zones and the calculations for each.

Table 1. Definition of Zones

Zone	Definition
A	1,000 feet from the Spring Intake
B	1 mile from the Spring Intake
C	Entire Watershed

The DWPA for Twin Creek RV Park extends over the entire watershed. Development in the vicinity of the spring is limited to only Zone A, with only logging activity in Zones 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 Twin Creek RV Park 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.

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.

VULNERABILITY OF TWIN CREEK RV PARK DRINKING WATER SYSTEM

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

- Natural susceptibility; and
- Contaminant risks.

Appendix D contains eight 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 Spring Outlet/Intake' to contamination by looking at the construction of the spring and its surrounding area. Chart 2 analyzes the 'Susceptibility of the Aquifer' to contamination by looking at the naturally occurring attributes of the water source and influences on the groundwater system that might lead to contamination. Chart 3 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 spring. Lastly, Chart 4 contains the 'Vulnerability Analysis for Bacteria and Viruses'. Charts 5 through 8 contain the Contaminant Risks and Vulnerability Analyses for nitrates and nitrites and volatile organic chemicals, respectively.

A score for the Natural Susceptibility is reached by considering the properties of the spring and the aquifer.

Susceptibility of the Spring (0 – 25 Points)
(Chart 1 of Appendix D)

+

Susceptibility of the Aquifer (0 – 25 Points)
(Chart 2 of Appendix D)

=

Natural Susceptibility (Susceptibility of the Spring)
(0 – 50 Points)

A ranking is assigned for the Natural Susceptibility according to the point score:

Natural Susceptibility Ratings

40 to 50 pts	Very High
30 to < 40 pts	High
20 to < 30 pts	Medium
< 20 pts	Low

The spring intake for Twin Creek RV Park is located on a steep hillside. Because the spring is recharged by groundwater, surface water and precipitation that migrates downward from the surface, contaminants at the surface have the potential to adversely impact this aquifer. Table 2 shows the Susceptibility scores and ratings for Twin Creek RV Park

Table 2. Susceptibility

	Score	Rating
Susceptibility of the Spring	5	Low
Susceptibility of the Aquifer	16	High
Natural Susceptibility	21	Medium

Contaminant risks to a drinking water source depend on the type, number or density, and distribution of contaminant sources. This score has been derived from an examination of existing and historical contamination that has been detected at the drinking water source through routine sampling. It also evaluates potential sources of contamination. Flow charts are used to assign a point score, and ratings are assigned in the same way as for the natural susceptibility:

Contaminant Risk Ratings

40 to 50 pts	Very High
30 to < 40 pts	High
20 to < 30 pts	Medium
< 20 pts	Low

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

Table 3. Contaminant Risks

Category	Score	Rating
Bacteria and Viruses	40	Very High
Nitrates and/or Nitrites	41	Very High
Volatile Organic Chemicals	25	Medium

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

Natural Susceptibility (0 – 50 points)

+

Contaminant Risks (0 – 50 points)

=

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

Again, rankings are assigned according to a point score:

Overall Vulnerability Ratings

80 to 100 pts	Very High
60 to < 80 pts	High
40 to < 60 pts	Medium
< 40 pts	Low

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

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

Bacteria and Viruses

The contaminant risk for bacteria and viruses is **Very High** with the septic systems; highways and roads; and campgrounds and RV parks representing the risk to this source of public drinking water (See Chart 3 – 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 Twin Creek RV Park. After combining the contaminant risks with the overall natural susceptibility of the spring, the vulnerability of the spring to contamination by bacteria and viruses is **High**.

Nitrates and Nitrites

The contaminant risk for nitrates and nitrites is **Very High** with the septic systems; highways and roads; and campgrounds; and RV parks representing the risk to this source of public drinking water (See Chart 5 - Contaminant Risks for Nitrates and/or Nitrites in Appendix D).

Sampling history for Twin Creek RV Park spring indicates that nitrates have been detected in the water, but only in very low concentrations (most recently at 0.110 mg/L on 6/4/2001) or 1% 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 spring, the overall vulnerability of the spring to contamination by nitrates and nitrites is **High**.

Volatile Organic Chemicals

The contaminant risk for volatile organic chemicals is **Medium** with the septic systems; highways and roads; and campgrounds and RV parks representing the risk to this source of public drinking water (See Chart 7 – Contaminant Risks for Volatile Organic Chemicals in Appendix D).

Sampling history for Twin Creek RV Park was not available. However, combining the contaminant risk for volatile organic chemicals with the natural susceptibility of the spring, the overall vulnerability of the spring to contamination by volatile organic chemicals is **Medium**.

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APPENDIX A

Twin Creek RV Park
Drinking Water Protection Area Location Map
(Map 1)

Map 1: Twin Creek RV Park Drinking Water Protection Area

PWSID: 130669.001

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

0 1,000 2,000 4,000 6,000 8,000 Feet

1:22,772

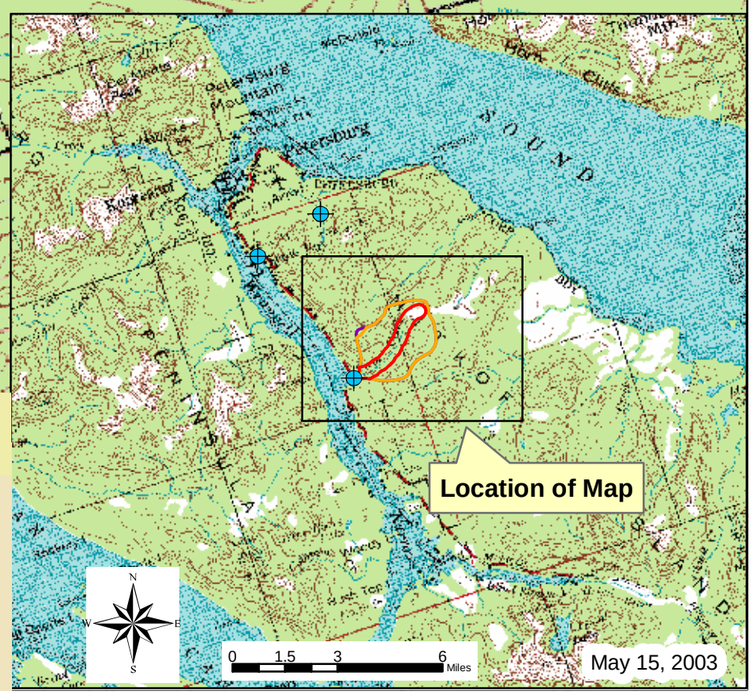
Data Source:

Background image - USGS 1:63,000 mapping

Protection zones were delineated based upon streams noted on USGS 1:63,000 mapping.

Legend

- **Public Drinking Water Systems**
- **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 B

Contaminant Source Inventory and Risk Ranking for Twin Creek RV Park (Tables 1-4)

Table 1 *Contaminant Source Inventory for* ***PWSID 130669.001***

Twin Creek RV Park

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 West of Twin Creek RV Park
Septic systems (serves one single-family home)	R02	R02-2	A	2	Residence West of Twin Creek RV Park
Tanks, heating oil, residential (above ground)	R08	R08-1	A	2	Residence West of Twin Creek RV Park
Tanks, heating oil, residential (above ground)	R08	R08-2	A	2	Residence West of Twin Creek RV Park
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	2	Mitkof Highway
Highways and roads, paved (cement or asphalt)	X20	X20-2	A	2	Road to Twin Creek RV Park
Campgrounds and RV Parks	X35	X35-1	A	2	Twin Creek RV Park
Logging (active or inactive?)	E02	E02-1	B	2	USFS Logging East of RV Park
Logging (active or inactive?)	E02	E02-2	C	2	USFS Logging Northeast of RV Park
Logging (active or inactive?)	E02	E02-3	C	2	USFS Logging Northeast of RV Park
Logging (active or inactive?)	E02	E02-4	C	2	USFS Logging Northeast of RV Park

Contaminant Source Inventory and Risk Ranking for

Table 2 ***PWSID 130669.001***

Twin Creek RV Park

Sources of Bacteria and Viruses

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Septic systems (serves one single-family home)	R02	R02-1	A	Low	2	Residence West of Twin Creek RV Park
Septic systems (serves one single-family home)	R02	R02-2	A	Low	2	Residence West of Twin Creek RV Park
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	2	Mitkof Highway
Highways and roads, paved (cement or asphalt)	X20	X20-2	A	Low	2	Road to Twin Creek RV Park
Campgrounds and RV Parks	X35	X35-1	A	Low	2	Twin Creek RV Park

Contaminant Source Inventory and Risk Ranking for

Table 3 ***PWSID 130669.001***

Twin Creek RV Park

Sources of Nitrates/Nitrites

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Septic systems (serves one single-family home)	R02	R02-1	A	Low	2	Residence West of Twin Creek RV Park
Septic systems (serves one single-family home)	R02	R02-2	A	Low	2	Residence West of Twin Creek RV Park
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	2	Mitkof Highway
Highways and roads, paved (cement or asphalt)	X20	X20-2	A	Low	2	Road to Twin Creek RV Park
Campgrounds and RV Parks	X35	X35-1	A	Low	2	Twin Creek RV Park
Logging (active or inactive?)	E02	E02-1	B	Low	2	USFS Logging East of RV Park
Logging (active or inactive?)	E02	E02-2	C	Low	2	USFS Logging Northeast of RV Park
Logging (active or inactive?)	E02	E02-3	C	Low	2	USFS Logging Northeast of RV Park
Logging (active or inactive?)	E02	E02-4	C	Low	2	USFS Logging Northeast of RV Park

Contaminant Source Inventory and Risk Ranking for

Table 4 ***PWSID 130669.001***

Twin Creek RV Park

Sources of Volatile Organic Chemicals

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Septic systems (serves one single-family home)	R02	R02-1	A	Low	2	Residence West of Twin Creek RV Park
Septic systems (serves one single-family home)	R02	R02-2	A	Low	2	Residence West of Twin Creek RV Park
Tanks, heating oil, residential (above ground)	R08	R08-1	A	Medium	2	Residence West of Twin Creek RV Park
Tanks, heating oil, residential (above ground)	R08	R08-2	A	Medium	2	Residence West of Twin Creek RV Park
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	2	Mitkof Highway
Highways and roads, paved (cement or asphalt)	X20	X20-2	A	Low	2	Road to Twin Creek RV Park
Campgrounds and RV Parks	X35	X35-1	A	Low	2	Twin Creek RV Park
Logging (active or inactive?)	E02	E02-1	B	Low	2	USFS Logging East of RV Park
Logging (active or inactive?)	E02	E02-2	C	Low	2	USFS Logging Northeast of RV Park
Logging (active or inactive?)	E02	E02-3	C	Low	2	USFS Logging Northeast of RV Park
Logging (active or inactive?)	E02	E02-4	C	Low	2	USFS Logging Northeast of RV Park

APPENDIX C

Twin Creek RV Park
Drinking Water Protection Area
and Potential and Existing Contaminant Sources
(Map 2)

Map 1: Twin Creek RV Park Drinking Water Protection Area

PWSID: 130669.001

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

0 875 1,750 3,500 5,250 7,000 Feet

1:20,053

Data Source:

Background image - USGS 1:63,000 mapping

Protection zones were delineated based upon streams noted on USGS 1:63,000 mapping.

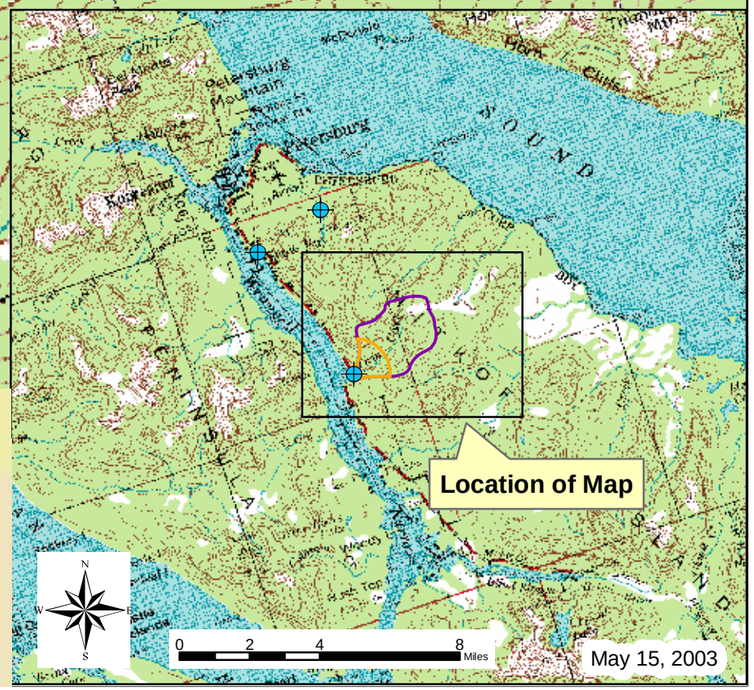
Legend

Public Drinking Water Systems

Zone A Protection Area
1000 Feet from Spring Water Intake

Zone B Protection Area
1 Mile from Spring Water Intake

Zone C Protection Area
Entire Watershed



APPENDIX D

Vulnerability Analysis for Twin Creek RV Park Public Drinking Water Source

(Charts 1-8)

Chart 1. Susceptibility of the spring outlet/intake - Twin Creek RV Park

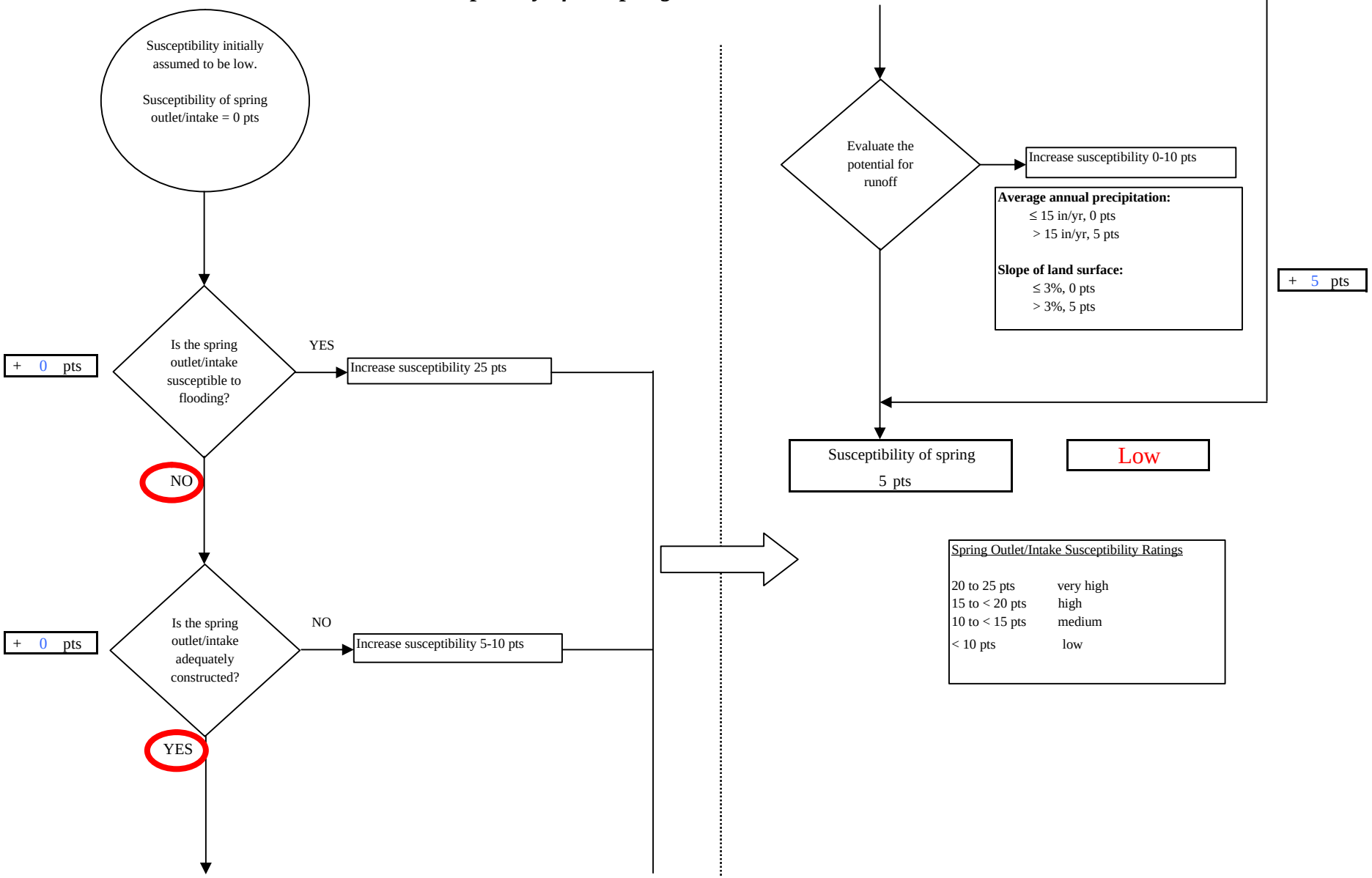


Chart 2. Susceptibility of the aquifer - Twin Creek RV Park

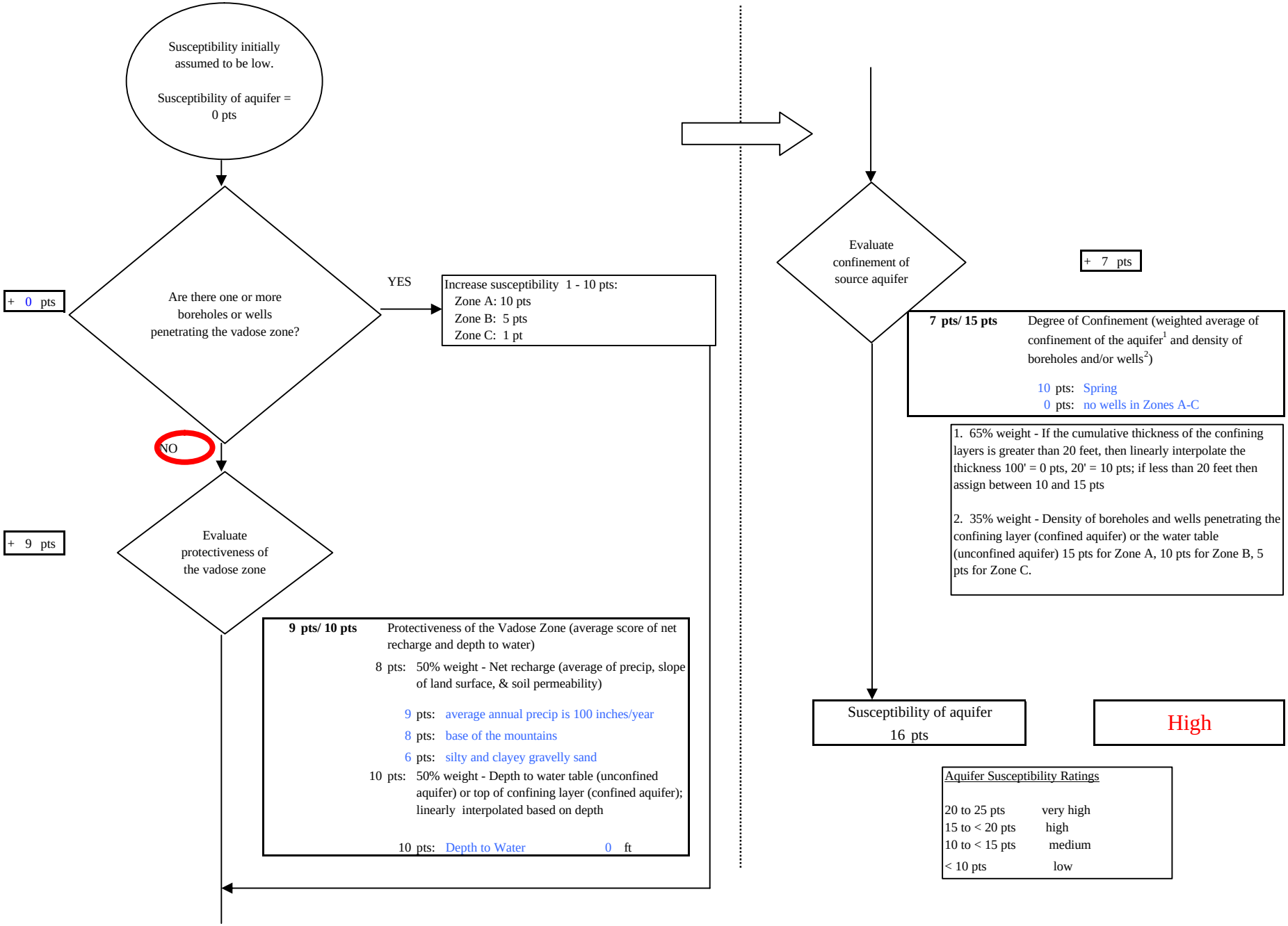
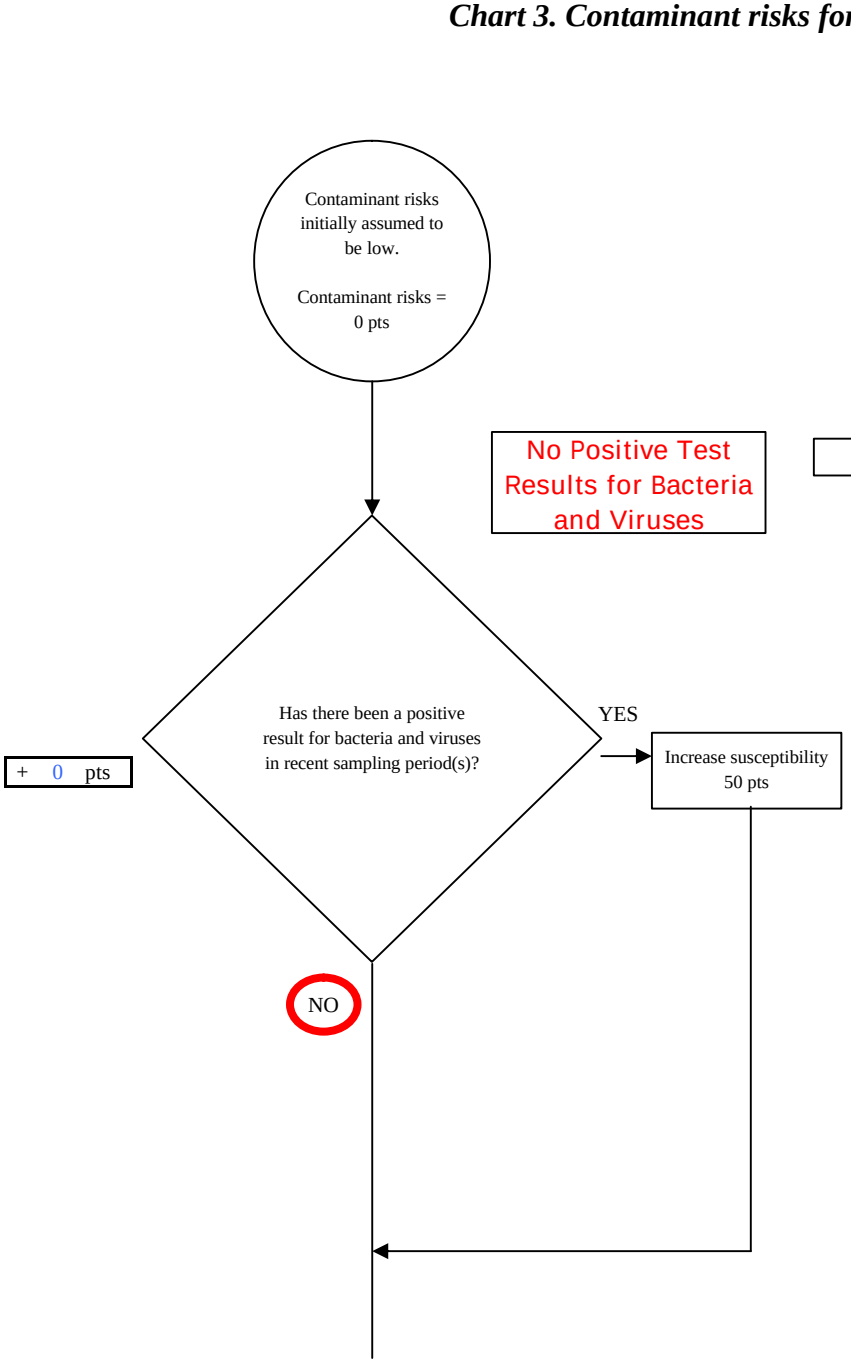
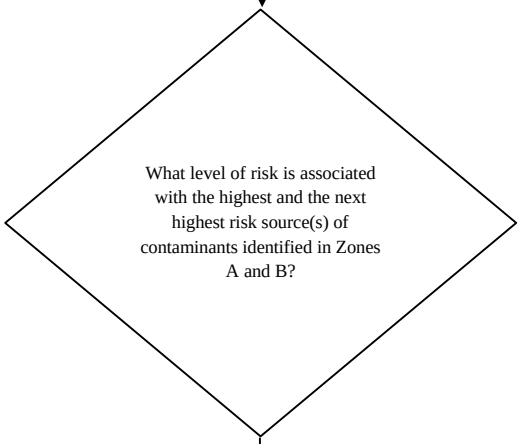


Chart 3. Contaminant risks for Twin Creek RV Park - Bacteria & Viruses



No Positive Test Results for Bacteria and 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	0
Low(s)	4	0	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

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 3. Contaminant risks for Twin Creek RV Park - Bacteria & Viruses

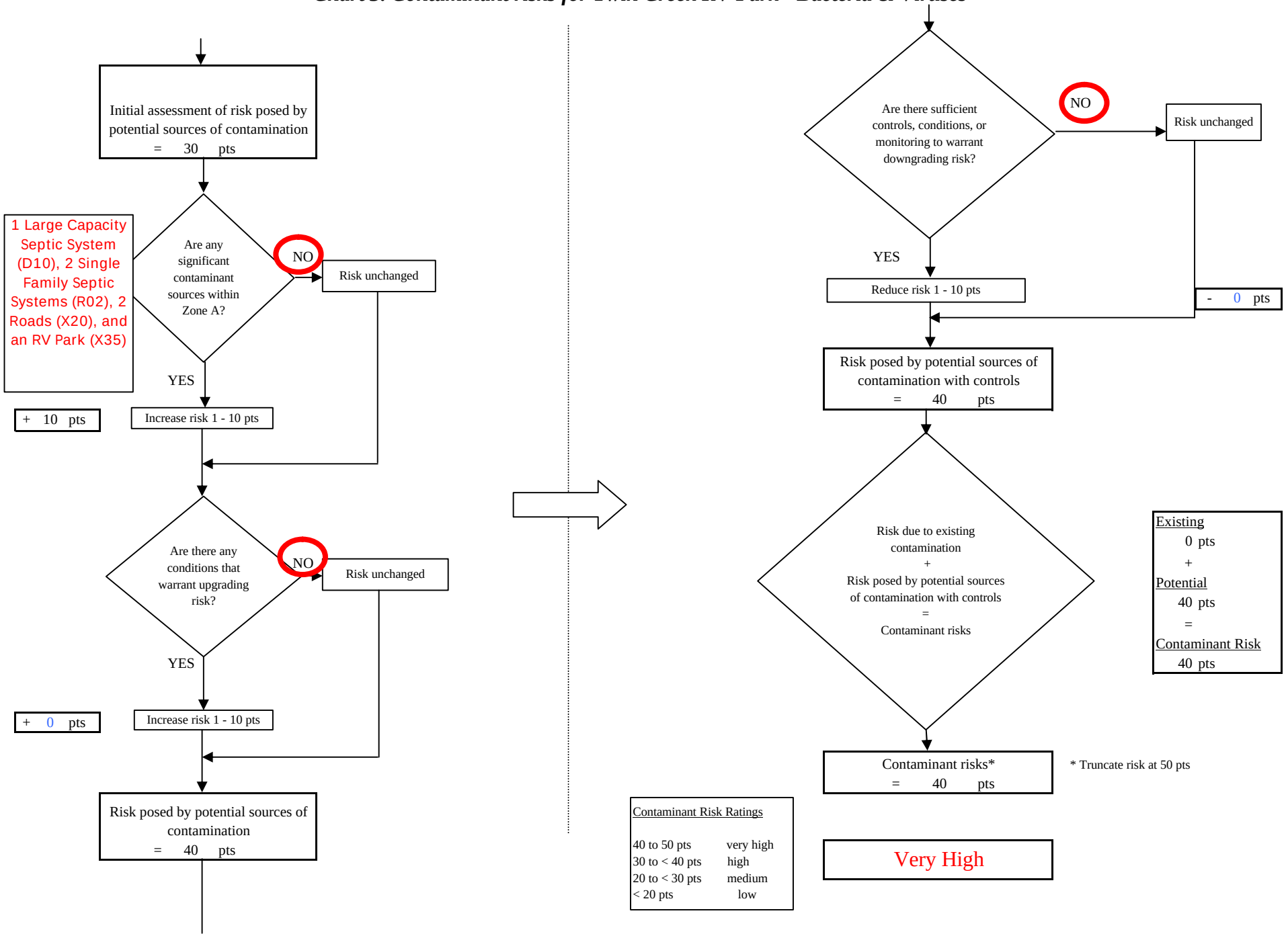


Chart 4. Vulnerability analysis for Twin Creek RV Park - Bacteria & Viruses

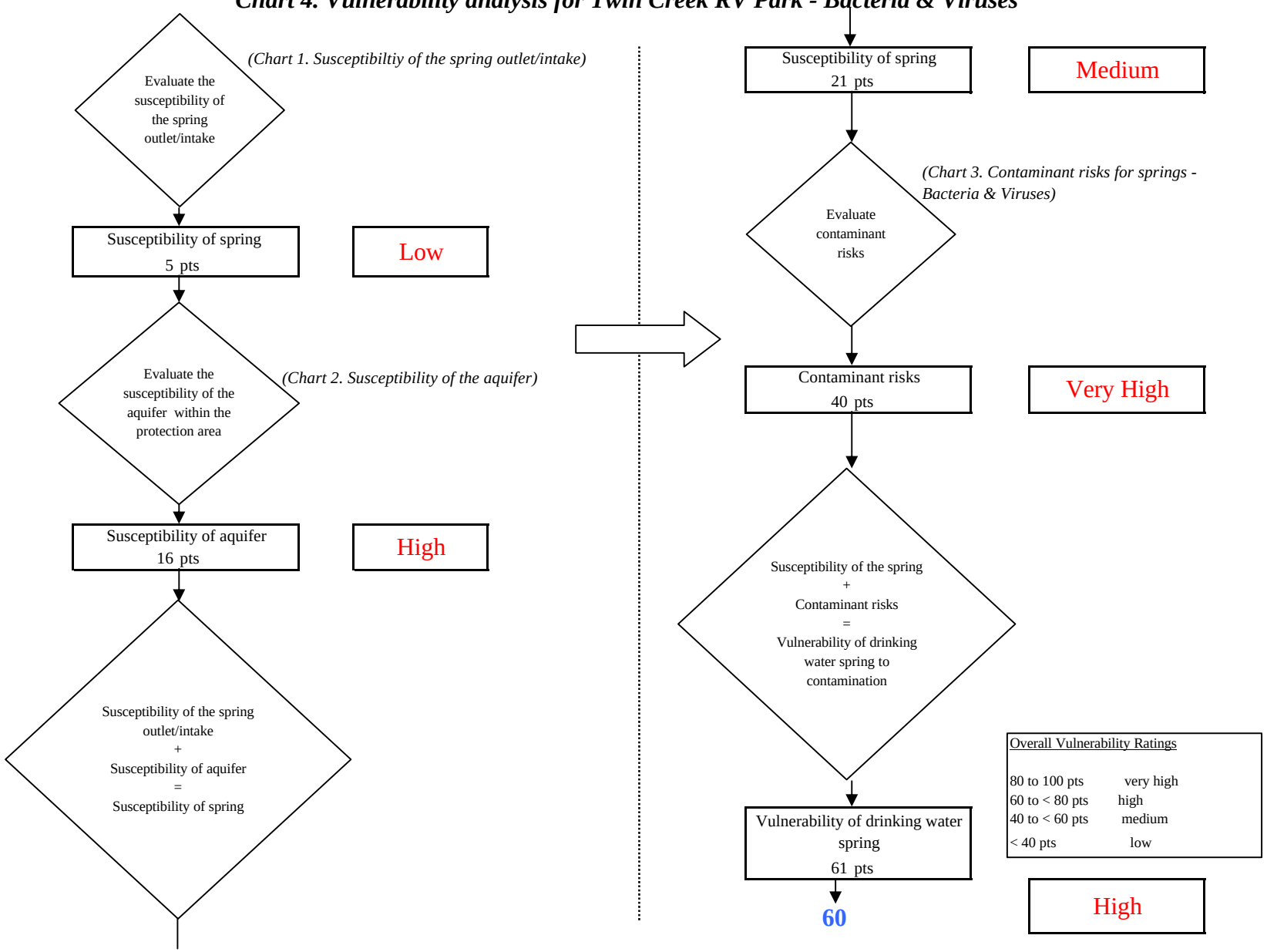


Chart 5. Contaminant risks for Twin Creek RV Park - Nitrates and Nitrites

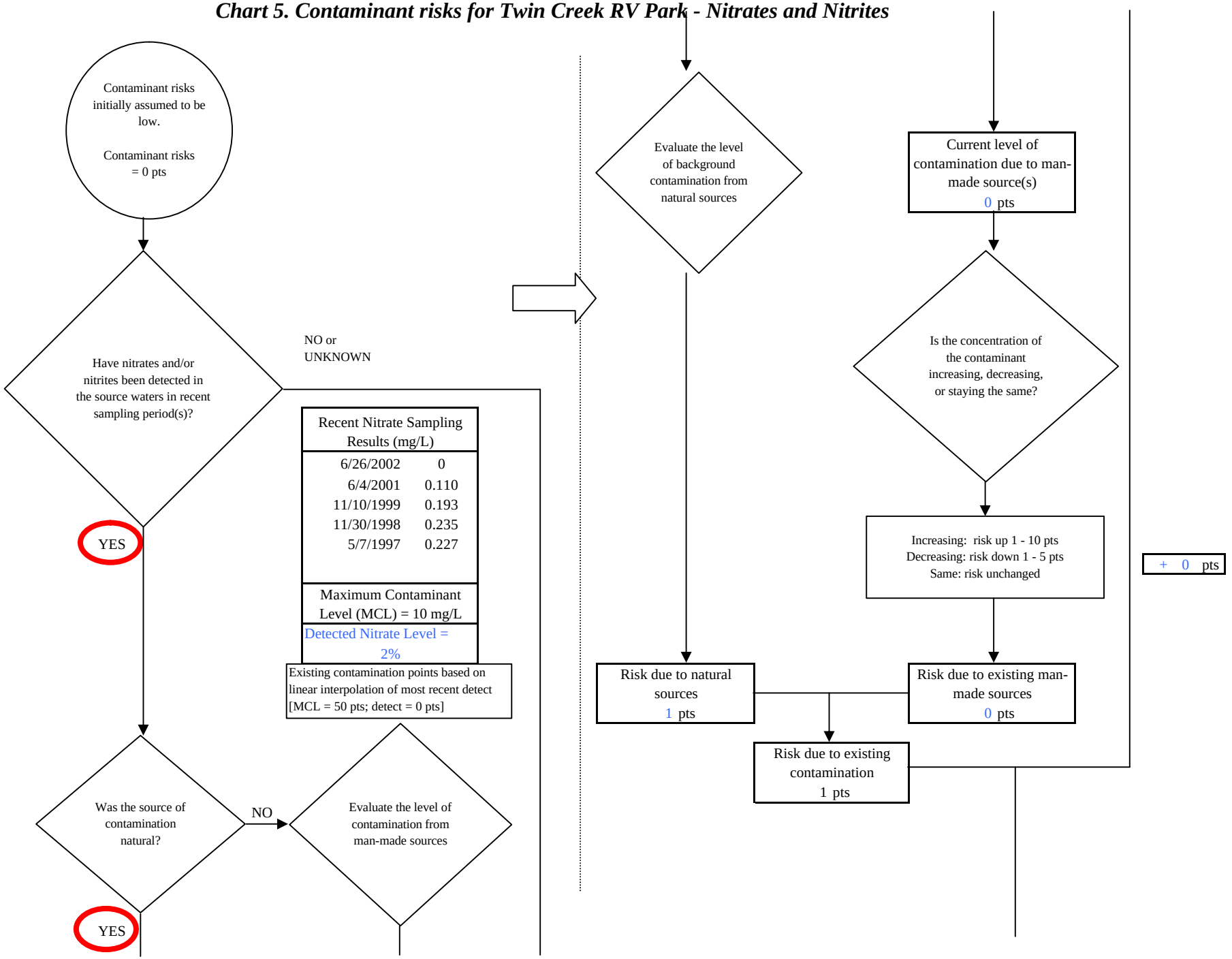


Chart 5. Contaminant risks for Twin Creek RV Park - Nitrates and Nitrites

+ 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

1 Large Capacity Septic System (D10), 2 Single Family Septic Systems (R02), 2 Roads (X20), and an RV Park (X35)

+ 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)	1	0	1
Medium(s)	0	0	0
Low(s)	4	1	5

	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 5. Contaminant risks for Twin Creek RV Park - Nitrates and Nitrites

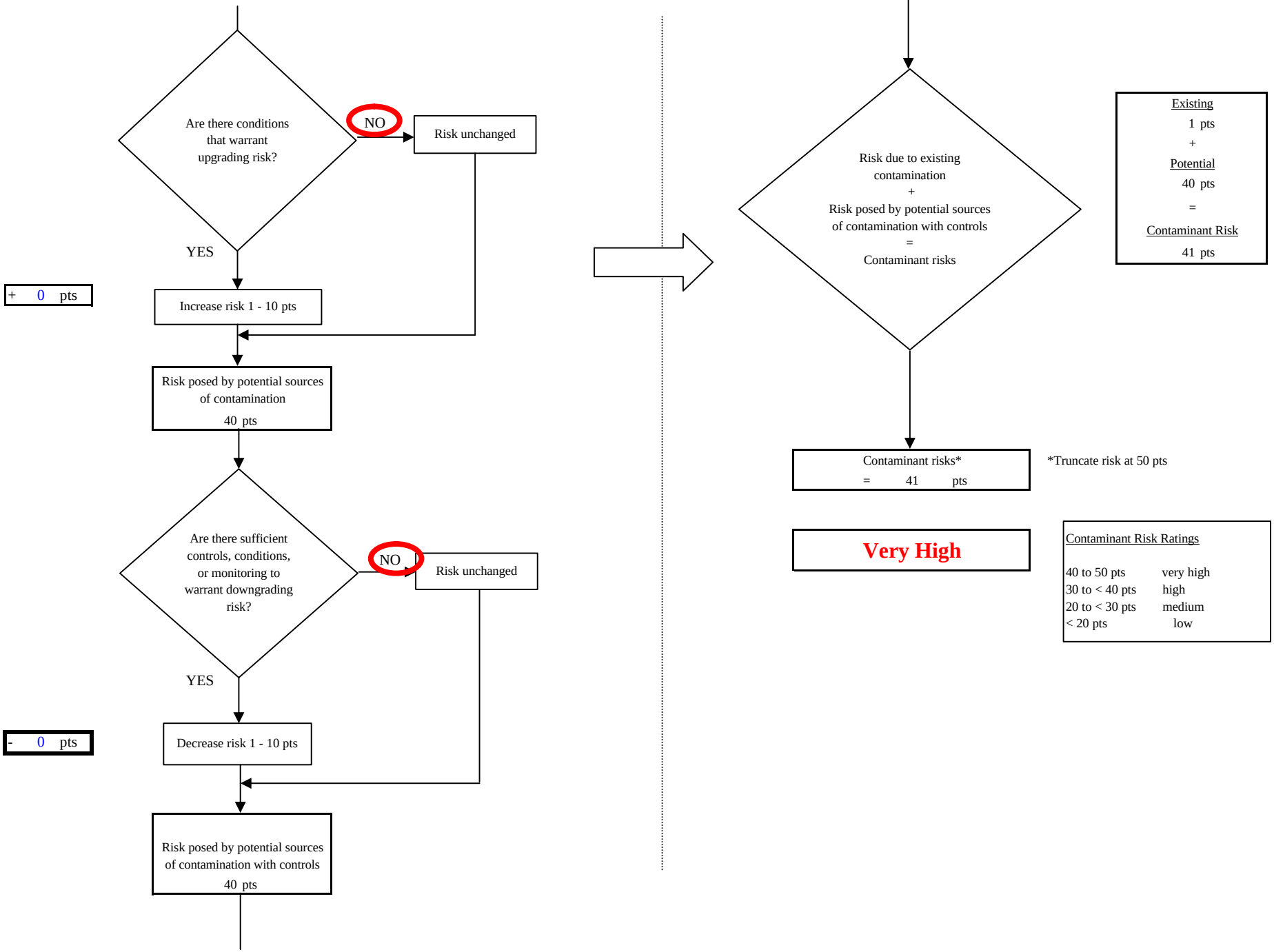


Chart 6. Vulnerability analysis for Twin Creek RV Park - Nitrates and Nitrites

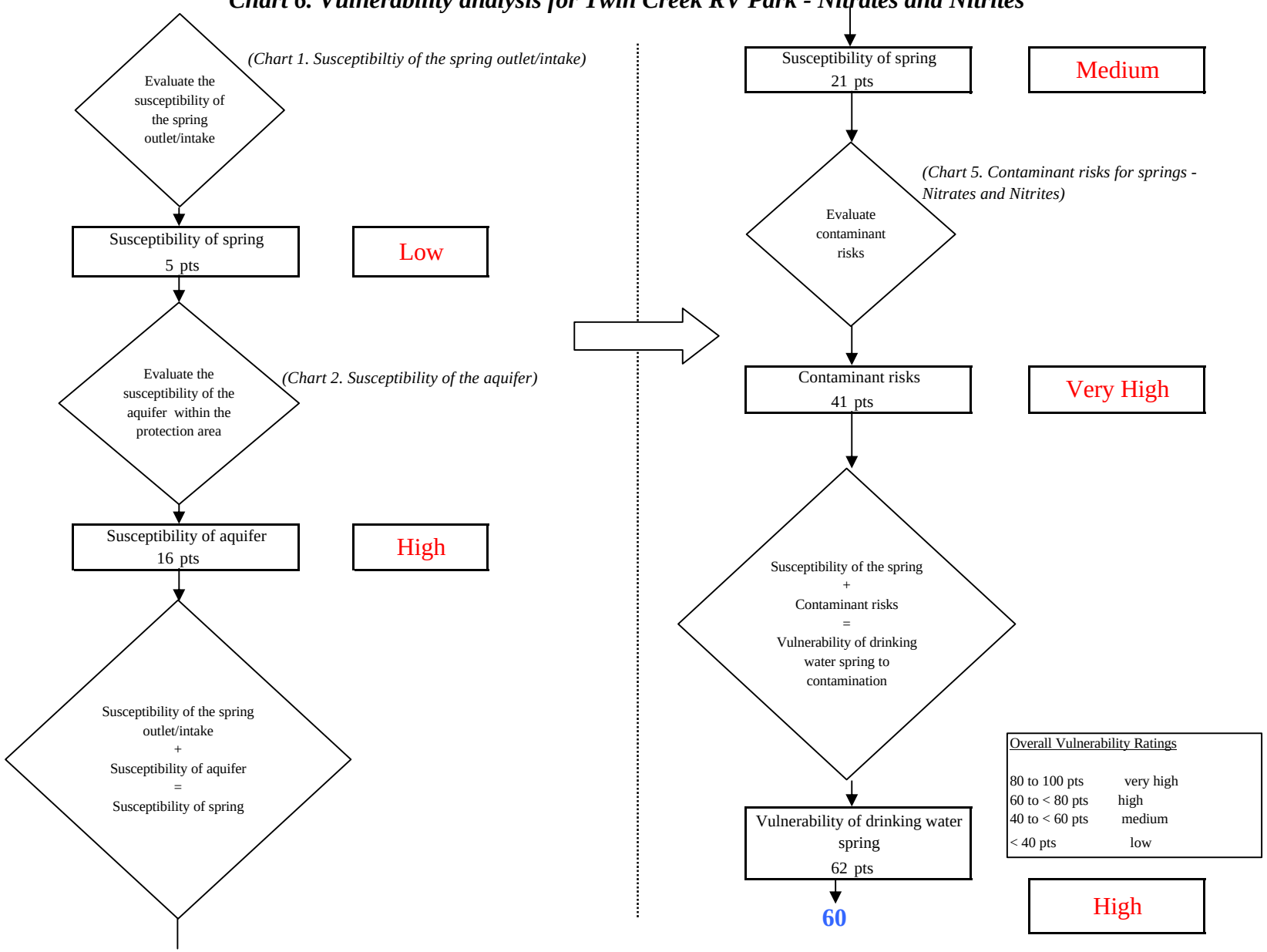


Chart 7. Contaminant risks for Twin Creek RV Park - Volatile Organic Chemicals

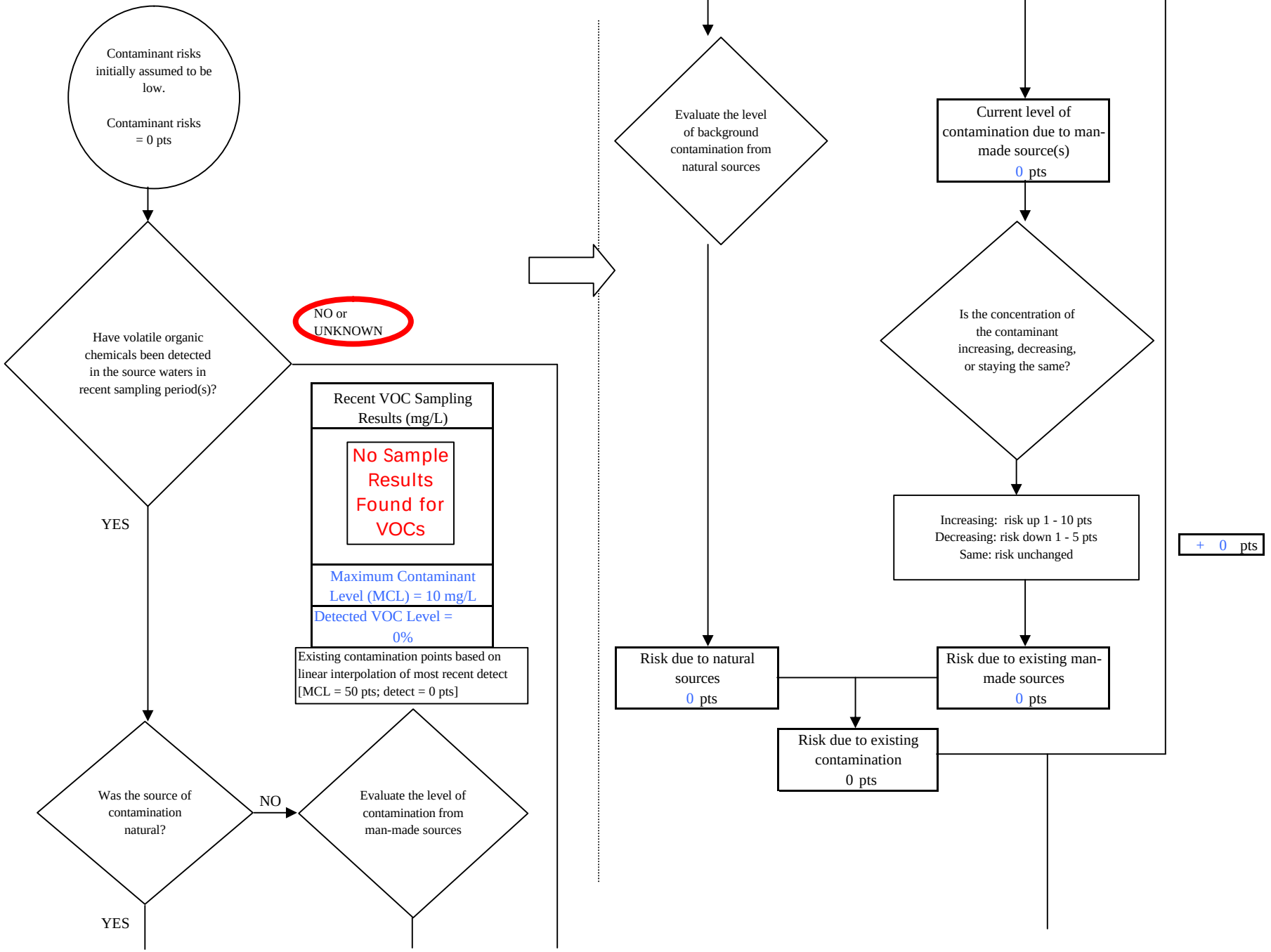


Chart 7. Contaminant risks for Twin Creek RV Park - Volatile Organic Chemicals

+ 20 pts

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

Initial assessment of risk posed by potential sources of contamination = 20 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)	2	0	2
Low(s)	4	1	5

	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 20

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.

Are any significant sources in Zone A?

NO

Risk unchanged

YES

Increase risk 1 - 10 pts

1 Large Capacity Septic System (D10), 2 Single Family Septic Systems (R02), 2 Residential Heating Oil Tanks (R08), 1 RV Park (X35), 2 Roads (X20), and 4 USFS Logging Areas (E02).

+ 5 pts

Chart 7. Contaminant risks for Twin Creek RV Park - Volatile Organic Chemicals

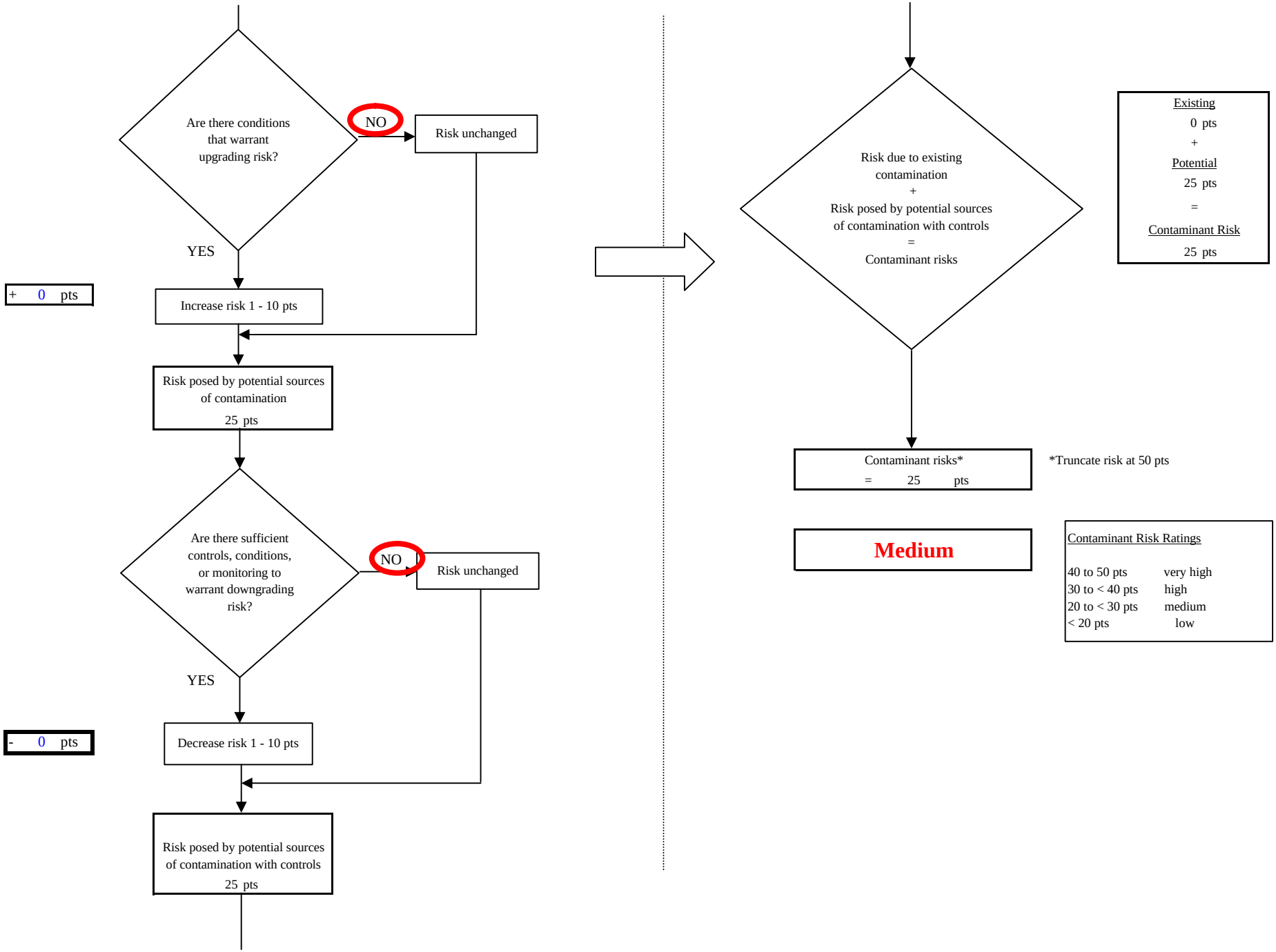


Chart 8. Vulnerability analysis for Twin Creek RV Park - Volatile Organic Chemicals