Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for Port Protection, Alaska

Spring Intake

PWSID # 121123.001

August 2004

Drinking Water Protection Program Report #1559

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.

CONTENTS

TABLES

APPENDICES

Source Water Assessment for the Port Protection Water System – Spring Intake

Drinking Water Protection Program
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The Port Protection public water system is a Class A (community) water system that obtains water from a spring located approximately 1200-feet east of Wooden Wheel Cove upslope of all development in the area. The Port Protection drinking water protection area is approximately 1.8 square miles in size and received a susceptibility rating of "**medium**". The aquifer in this area received a susceptibility rating of "**high**". Potential and existing sources of the following contaminants were evaluated for the Source Water Assessment: bacteria and viruses, nitrates and/or nitrites, heavy metals, cyanide, and other inorganic chemicals, synthetic organic chemicals, volatile organic chemicals, and other organic chemicals. Residential septic systems, residential areas, above ground fuel tanks, potential logging areas, and a gravel road were identified as potential sources of contaminants for the drinking water source. This evaluation included all available water sampling data submitted to ADEC by the system operator. The samples may have been collected from either raw water or post-treated water. Combining the susceptibility of the surface water source with the contaminant risks, this water system has received a vulnerability rating of **"medium"** for bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals; and **"low"** for other organic chemicals, synthetic organic chemicals, and heavy metals. This assessment can be used as a foundation for local voluntary protection efforts as well as a basis for the continuous efforts on the part of Port Protection to protect public health.

DRINKING WATER SYSTEM AND AREA OVERVIEW

Port Protection (Sec. 19, T064S, R076E, Copper River Meridian) is located on the northern tip of Prince of Wales Island and is 145 miles south of Juneau and 50 miles west of Wrangell. It lies in the Tongass National Forest (Please see the inset of Map 1 in Appendix A for location). The current population is approximately 57 (ADCED, 2004). The Port Protection water system is a Class A (community) water system that operates year round and obtains water from both Lilly Lake and the Port Protection. The Port Protection intake is a spring located approximately 1200-feet east of Wooden Wheel Cove upslope of all development in the area. (See Map 1 of Appendix A).

The spring water is available from a water tank maintained by the Port Protection Community Association. Homes are fully plumbed. Most residents use outdoor privies or outfall pipes for sewage disposal, although a few individual septic tanks exist. There is no central electric system; individual generators supply power (ADCED, 2004).

The geography and vegetation of the Port Protection area is generally composed of shallow, well-drained soils that support hemlock and hemlock-spruce forests. In areas where glacial till is present and inhibits the fast infiltration of surface waters, wetlands are common. Because the carbonate bedrock create underground fractures and conduits for water flow, watershed boundaries do not necessarily follow surface topography (USDA, 2001).

Prince of Wales Island is dominated by a cool, moist, maritime climate. Average summer temperatures range from 49 to 63; winter temperatures average from 32 to 42. Average annual precipitation is 120 inches, including 40 inches of snow (ADCED, 2004).

PORT PROTECTION DRINKING WATER PROTECTION AREA

Identifying the pathways most likely for surface contamination to reach water intake areas is the first step in determining the water system's risk. These are initially determined by looking at the drainage area contributing overland water flow to a spring source intake. The entire drainage area is also known as the "drinking water protection area". Please refer to pages 9-10 of the "Guidance Manual for Class A Public Water Systems" for additional information.

The protection area established for spring source intakes by the ADEC is usually separated into three zones, limited by the watershed boundary. These zones correspond to differing distances from the spring intake location. The ADEC Drinking Water Protection Program's Technical Advisory Committee developed guidelines for derivation of these zones in 1998. The following is a summary of the three protection area zones:

Table 1. Definition of Zones

Zone	Definition
A	Areas within 1000-ft of the spring intake
B	Areas within 1-mile of the spring intake
C	The watershed boundary

The drinking water protection area for the Port Protection spring intake includes each of these Zones (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 protection area. This inventory was completed through a search of agency records and other publicly available information. There is a wide array of potential contamination sources to surface water. These contaminants are found within agricultural, residential, commercial, and industrial areas, but *can also occur within areas that have little or no development*.

For Class A public water system assessments, six categories of drinking water contaminants were inventoried. They include:

- Bacteria and viruses;
- Nitrates and/or nitrites;
- Volatile organic chemicals;
- Heavy metals, cyanide, and other inorganic chemicals;
- Synthetic Organic Chemicals; and
- Other Organic Chemicals.

Sources identified in the protection area are displayed on Map 2 of Appendix C and summarized in Table 1 of Appendix B.

RANKING OF CONTAMINANT RISKS

Once potential and existing sources of contamination have been identified, they are assigned a ranking according to what category and level of risk they represent. Ranking of contaminant risks for "potential" or "existing" sources of contamination is a function of the toxicity and the volume of specific contaminants associated with that source. Rankings include:

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

The time-of-travel for contaminants within the water 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. Only "Very High" and "High" rankings are inventoried within Zones B and C due to the probability of contaminant dilution by the time the contaminants reach the water intake.

The remaining tables in Appendix B (if necessary) contain the ranking of potential and existing sources of contamination with respect to bacteria and viruses, nitrates and/or nitrites, volatile organic chemicals, heavy metals, cyanide, and other inorganic chemicals, synthetic organic chemicals, and other organic chemicals.

VULNERABILITY OF THE DRINKING WATER SYSTEM

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

- Natural susceptibility of the spring; and
- Contaminant risks.

Appendix D contains 14 charts, which together form the 'Vulnerability Analysis' for the public drinking water Source Water Assessment. Chart 1 analyzes the 'Susceptibility of the spring outlet/intake" to contamination by looking at the climate, terrain, and intake location. Chart 2 analyzes the "Susceptibility of the Aquifer" by looking at some basic aquifer characteristics. 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 intake area. Chart 4 contains the 'Vulnerability Analysis for Bacteria and Viruses', which is a composite score of the Vulnerability Analysis and the overall Susceptibility. Charts 5 through 14 repeat the Contaminant Risks and Vulnerability Analyses for nitrates and nitrites, volatile organic chemicals, heavy metals, cyanide, and other inorganic chemicals, synthetic organic chemicals, and other organic chemicals, respectively.

A score for the Natural Susceptibility of the spring is reached by considering the properties of the spring and the surrounding area. The derivation of this information is presented below and the data for this source is shown in Charts 1 and 2 of Appendix D.

Susceptibility of the Spring (0 - 25 points)

+

Susceptibility of the Aquifer (0 - 25 points)

=

Natural Susceptibility of the Spring
(0 – 50 Points)

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

Surface Water Source Susceptibility Ratings	
40 to 50 pts	Very High
30 to 39 pts	High
20 to 29 pts	Medium
0 to 19 pts	Low

Table 2. Susceptibility of the Water Source

	Score	Rating
Susceptibility of the Spring	10	Medium
Susceptibility of the Aquifer	16	High
Natural Susceptibility	26	Medium

For contaminants, risks to a drinking water source depend on the type, number or density, and distribution of the contaminant sources. The Contaminant Risk score has been derived from an examination of existing, and historical contamination sources that have been detected in the protection area 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 the 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. Port Protection Contaminant Risks

Category	Score	Rating
Bacteria and Viruses	25	Medium
Nitrates and/or Nitrites	25	Medium
Volatile Organic Chemicals	25	Medium
Heavy Metals, Cyanide, and Other Inorganic Chemicals	12	Low
Synthetic Organic Chemicals	12	Low
Other Organic Chemicals	12	Low

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

Susceptibility of the Water Source

(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 and ratings for each of the six categories of drinking water contaminants. Note: scores are rounded off to the nearest five.

Table 4. Port Protection Overall Vulnerability

Category	Score	Rating
Bacteria and Viruses	50	Medium
Nitrates and Nitrites	50	Medium
Volatile Organic Chemicals	50	Medium
Heavy Metals, Cyanide, and Other Inorganic Chemicals	35	Low
Synthetic Organic Chemicals	35	Low
Other Organic Chemicals	35	Low

Bacteria and Viruses

The contaminant risk for bacteria and viruses is "medium". Typically, coliform detection in raw water samples collected from surface water sources is normal. (See Chart 2 – Contaminant Risks for Bacteria and Viruses in Appendix D).

Coliforms (a bacteria) are found naturally in the environment and although they aren't necessarily a health threat, they are an indicator of other potentially harmful bacteria in the water, more specifically, fecal coliforms and E. coli which only come from human and animal fecal waste. Harmful bacteria can cause diarrhea, cramps, nausea, headaches, or other symptoms (EPA, 2003). Positive samples increase the overall vulnerability of the drinking water source, indicating that the source is susceptible to bacteria and virus contamination.

No positive bacteria counts have been detected recent sampling. A possible source of bacteria could be from residential areas, septic systems, or paved/gravel roads.

After combining the contaminant risk for bacteria and viruses with the natural susceptibility of the source, the overall vulnerability of the source to bacteria and virus contamination remains "medium".

Nitrates and Nitrites

The contaminant risk for nitrates and nitrites is "medium" (See Chart 4 - Contaminant Risks for Nitrates and/or Nitrites in Appendix D). Nitrates are very mobile, moving at approximately the same rate as water.

No nitrate/nitrite have been detected in recent sampling. The Maximum Contaminant Level (MCL) for nitrates is 10 milligrams per liter (mg/L). The MCL is the maximum level of contaminant that is allowed to exist in drinking water and still be consumed by humans without harmful health effects (EPA, 2003).

A possible source of nitrates/nitrites could be from residential areas, septic systems, logging areas, or paved/gravel roads.

After combining the contaminant risk for nitrates and nitrites with the natural susceptibility of the source, the overall vulnerability of the source to contamination is "medium".

Volatile Organic Chemicals

The contaminant risk for volatile organic chemicals is "medium" (See Chart 6 – Contaminant Risks for Volatile Organic Chemicals in Appendix D).

Chloroform and trihalomethanes were detected at levels below the MCL during sampling in 2001, although both of these chemicals typically originate during the process of water treatment and not from the source waters. The MCL for chloroform is 0.2 milligrams per liter (mg/L) and the MCL for total trihalomethanes is 0.1 mg/L.

A possible source of volatile organic chemicals could be from residential areas, septic systems, fuel tanks, logging areas, or paved/gravel roads.

After combining the contaminant risk for volatile organic chemicals with the natural susceptibility of the source, the overall vulnerability of the source to contamination is "medium".

Heavy Metals, Cyanide, and Other Inorganic Chemicals

The contaminant risk for heavy metals is "low". No heavy metals have been detected in recent sampling (See Chart 8 – Contaminant Risks for Heavy Metals, Cyanide, and Other Inorganic Chemicals in Appendix D). The MCL for copper is 1.3 mg/l. and the MCL for lead is 0.015 mg/l.

The most common source of these chemicals is the infrastructure of the distribution system following the treatment process. Residential areas, septic systems, logging areas, or paved/gravel roads can also contribute heavy metals.

After combining the contaminant risk for heavy metals with the natural susceptibility of the source, the overall vulnerability of the well to contamination is "low".

Synthetic Organic Chemicals

The contaminant risk for synthetic organic chemicals is "low". After combining the contaminant risk with the natural susceptibility of the source, the overall vulnerability to synthetic organic chemicals of the source is "low" (See Chart 11 – Contaminant Risks for Synthetic Organic Chemicals in Appendix D).

Review of the historical sampling data indicates no recent sampling for SOC's at Port Protection.

Other Organic Chemicals

The contaminant risk for other organic chemicals is "low". After combining the contaminant risk with the natural susceptibility of the source, the overall vulnerability to other organic chemicals of the source is "low" (See Chart 13 – Contaminant Risks for Other Organic Chemicals in Appendix D).

Review of the historical sampling data indicates that no other organic chemicals have been sampled recently.

Using the Source Water Assessment

This assessment of contaminant risks can be used as a foundation for local voluntary protection efforts as well as a basis for the continuous efforts on the part of Port Protection to protect public health. It is anticipated that Source Water Assessments will be updated every five years to reflect any changes in the vulnerability and/or susceptibility of this drinking water source.

REFERENCES

Alaska Department of Community and Economic Development (ADCED), 2004 [WWW document]. URL http://www.dced.state.ak.us/cbd/commdb/CF_COMDB.htm

United States Forest Service – Alaska Region (USDA), 2001. Technical Publication No. R10-TP-75. Ecological Subsections of Southeast Alaska and Neighboring Areas of Canada.

United States Environmental Protection Agency (EPA), 2004 [WWW document]. URL http://www.epa.gov/safewater/mcl.html.

APPENDIX A

Port Protection
Drinking Water Protection Area Location Map
(Map 1)

Port Protection -
Drinking Water Protection Area

Area enlarged at left

Kake
Petersburg
Wrangell
Whale Pass
Thorne Bay
Ketchikan
Craig
Hollis
Hydaburg

Map 1: Port Protection - Drinking Water Protection Area

PWSID: 121123.001

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

0 3,500 7,000 14,000 21,000 28,000 Feet

1:84,000

Data Sources:
Background image
- USGS 1:63,000 mapping
Lakes, streams, & roads
- 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 spring).

Legend

- Port Protection - Spring
- Zone A Protection Area
- Zone B Protection Area
- Zone C Protection Area
- Stream
- Lake

0 15 30 60 Miles

June 24, 2004

APPENDIX B

Contaminant Source Inventory and Risk Rankings (Tables 1 - 7)

Table 1

Contaminant Source Inventory for

Port Protection

PWSID 121123.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Residential Areas	R01	R01-1	A	2	From Community Profile Mapping
Septic systems (serves one single-family home)	R02	R02 1-20	A	2	(Assumed) From Community Profile Mapping
Tanks, fuel, residential (above ground)	R07	R07 1-20	A	2	(Assumed) From Community Profile Mapping
Logging (potential)	E02	E02-1	B	2	From U.S. Forest Service Data
Highways and roads, dirt/gravel	X24	X24-1	B	2	From U.S. Forest Service Data

Table 2

Contaminant Source Inventory and Risk Ranking for Port Protection Sources of Bacteria and Viruses

PWSID 121123.001

Contaminant Source Type	***Contaminant Source ID***	***CS ID tag***	***Zone***	***Risk Ranking for Analysis***	***Map Number***	***Comments***
Residential Areas	R01	R01-1	A	Low	2	From Community Profile Mapping
Septic systems (serves one single-family home)	R02	R02 1-20	A	Low	2	(Assumed) From Community Profile Mapping
Highways and roads, dirt/gravel	X24	X24-1	B	Low	2	From U.S. Forest Service Data

Table 3

Contaminant Source Inventory and Risk Ranking for Port Protection Sources of Nitrates/Nitrites

PWSID 121123.001

Contaminant Source Type	***Contaminant Source ID***	***CS ID tag***	***Zone***	***Risk Ranking for Analysis***	***Map Number***	***Comments***
Residential Areas	R01	R01-1	A	Low	2	From Community Profile Mapping
Septic systems (serves one single-family home)	R02	R02 1-20	A	Low	2	(Assumed) From Community Profile Mapping
Logging (potential)	E02	E02-1	B	Low	2	From U.S. Forest Service Data
Highways and roads, dirt/gravel	X24	X24-1	B	Low	2	From U.S. Forest Service Data

Table 4

Contaminant Source Inventory and Risk Ranking for Port Protection

Sources of Volatile Organic Chemicals

PWSID 121123.001

Contaminant Source Type	***Contaminant Source ID***	***CS ID tag***	***Zone***	***Risk Ranking for Analysis***	***Map Number***	***Comments***
Residential Areas	R01	R01-1	A	Low	2	From Community Profile Mapping
Septic systems (serves one single-family home)	R02	R02 1-20	A	Low	2	(Assumed) From Community Profile Mapping
Tanks, fuel, residential (above ground)	R07	R07 1-20	A	Medium	2	(Assumed) From Community Profile Mapping
Logging (potential)	E02	E02-1	B	Medium	2	From U.S. Forest Service Data
Highways and roads, dirt/gravel	X24	X24-1	B	Low	2	From U.S. Forest Service Data

Table 5

Contaminant Source Inventory and Risk Ranking for Port Protection

Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals

PWSID 121123.001

Contaminant Source Type	***Contaminant Source ID***	***CS ID tag***	***Zone***	***Risk Ranking for Analysis***	***Map Number***	***Comments***
Residential Areas	R01	R01-1	A	Low	2	From Community Profile Mapping
Septic systems (serves one single-family home)	R02	R02 1-20	A	Low	2	(Assumed) From Community Profile Mapping
Logging (potential)	E02	E02-1	B	Low	2	From U.S. Forest Service Data
Highways and roads, dirt/gravel	X24	X24-1	B	Low	2	From U.S. Forest Service Data

Table 6

Contaminant Source Inventory and Risk Ranking for Port Protection

Sources of Synthetic Organic Chemicals

PWSID 121123.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Residential Areas	R01	R01-1	A	Low	2	From Community Profile Mapping
Septic systems (serves one single-family home)	R02	R02 1-20	A	Low	2	(Assumed) From Community Profile Mapping

Table 7

Contaminant Source Inventory and Risk Ranking for Port Protection

Sources of Other Organic Chemicals

PWSID 121123.001

Contaminant Source Type	***Contaminant Source ID***	***CS ID tag***	***Zone***	***Risk Ranking for Analysis***	***Map Number***	***Comments***
Residential Areas	R01	R01-1	A	Low	2	From Community Profile Mapping
Septic systems (serves one single-family home)	R02	R02 1-20	A	Low	2	(Assumed) From Community Profile Mapping
Highways and roads, dirt/gravel	X24	X24-1	B	Low	2	From U.S. Forest Service Data

APPENDIX C

Port Protection
Drinking Water Protection Area
and Potential and Existing Contaminant Sources
(Map 2)

R01 - 1
Residential Area

Spring Location

R07 1-20
Above ground fuel tanks

R02 1-20
Residential septic systems

E02 -1
Potential logging area

X24 - 1
Gravel / dirt road

Area enlarged at left

Map 2: Potential and Existing Contaminant Sources

PWSID: 121123.001

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

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

1:15,000

Data Sources:

Background map - USGS 1:63,000 mapping
Background photo - ADCED Community Profile Map
Lakes, streams, & roads - U.S. Forest Service

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 spring).

Legend

- Port Protection - Spring
- Zone A Protection Area
- Zone B Protection Area
- Zone C Protection Area
- Residential Areas
- Potential Logging Area
- Roads
- Streams

N W E S

0 1 2 4 Miles

June 24, 2004

APPENDIX D

Vulnerability Analysis and Contaminant Risks (Charts 1-14)

Chart 1. Susceptibility of the spring - Port Protection

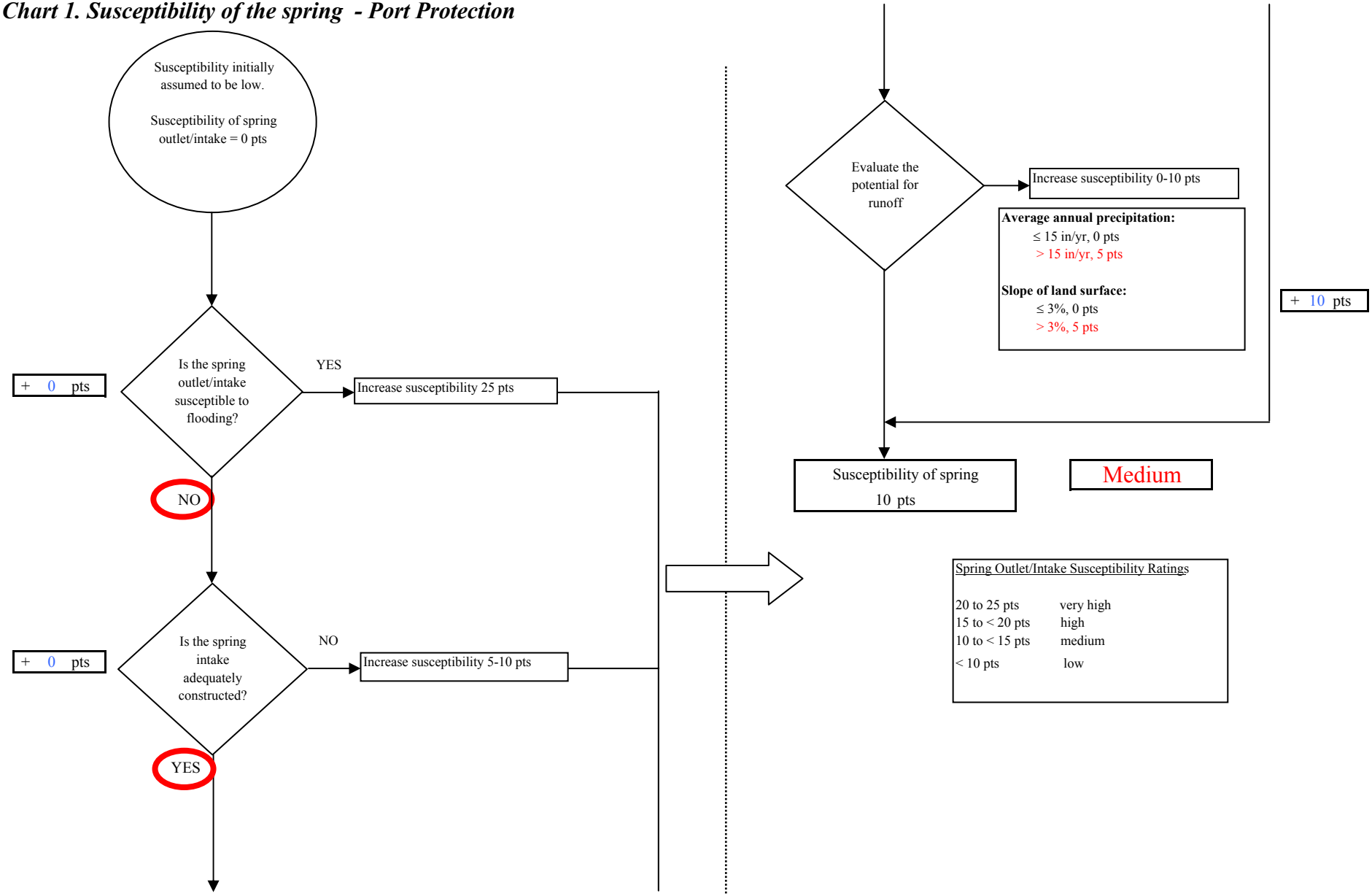


Chart 2. Susceptibility of the aquifer - Port Protection

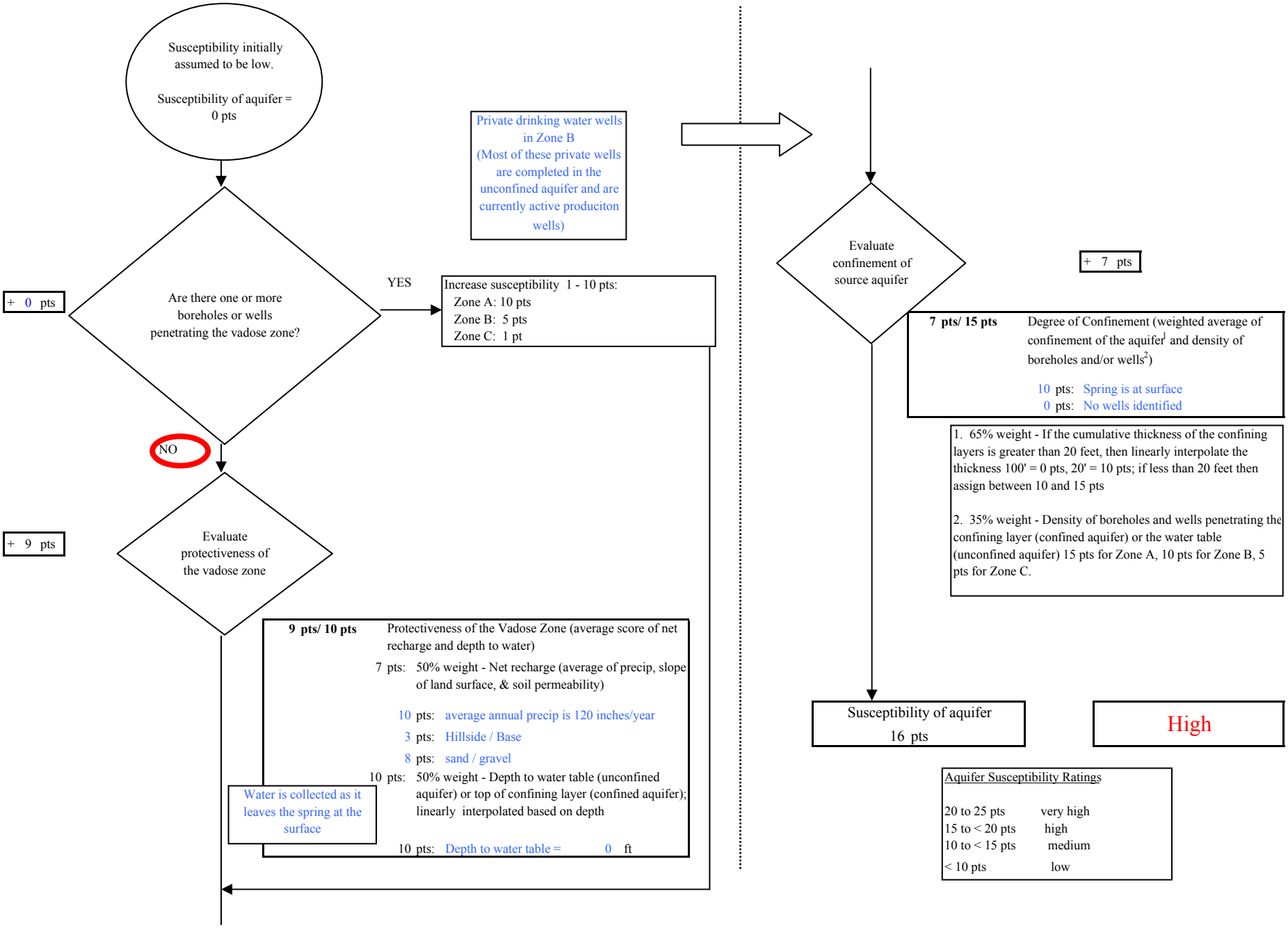
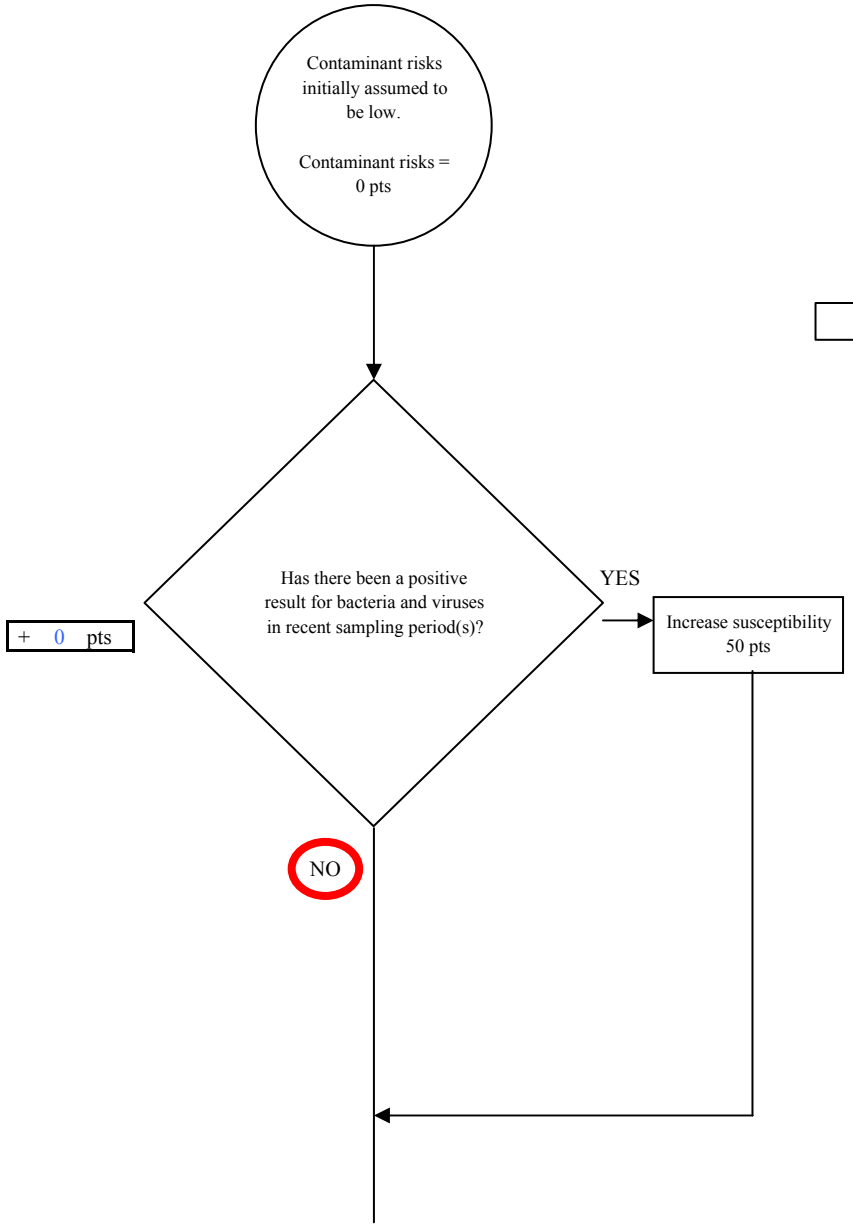
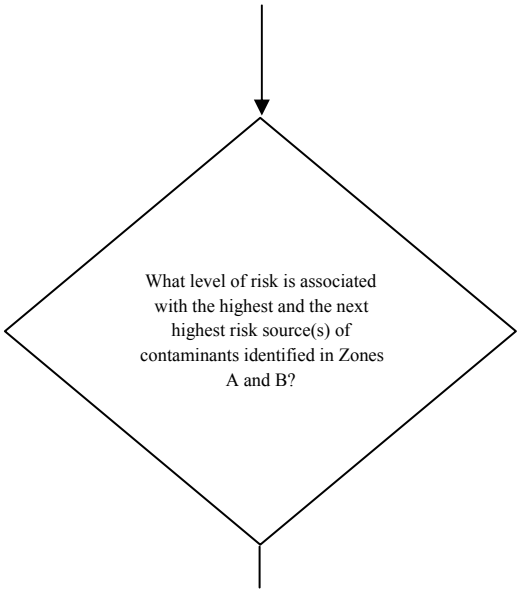


Chart 3. Contaminant risks for Port Protection - Bacteria & Viruses





+ 20 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)	0	0	0
Medium(s)	0	0	0
Low(s)	21	1	22

	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 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.

Chart 3. Contaminant risks for Port Protection - Bacteria & Viruses

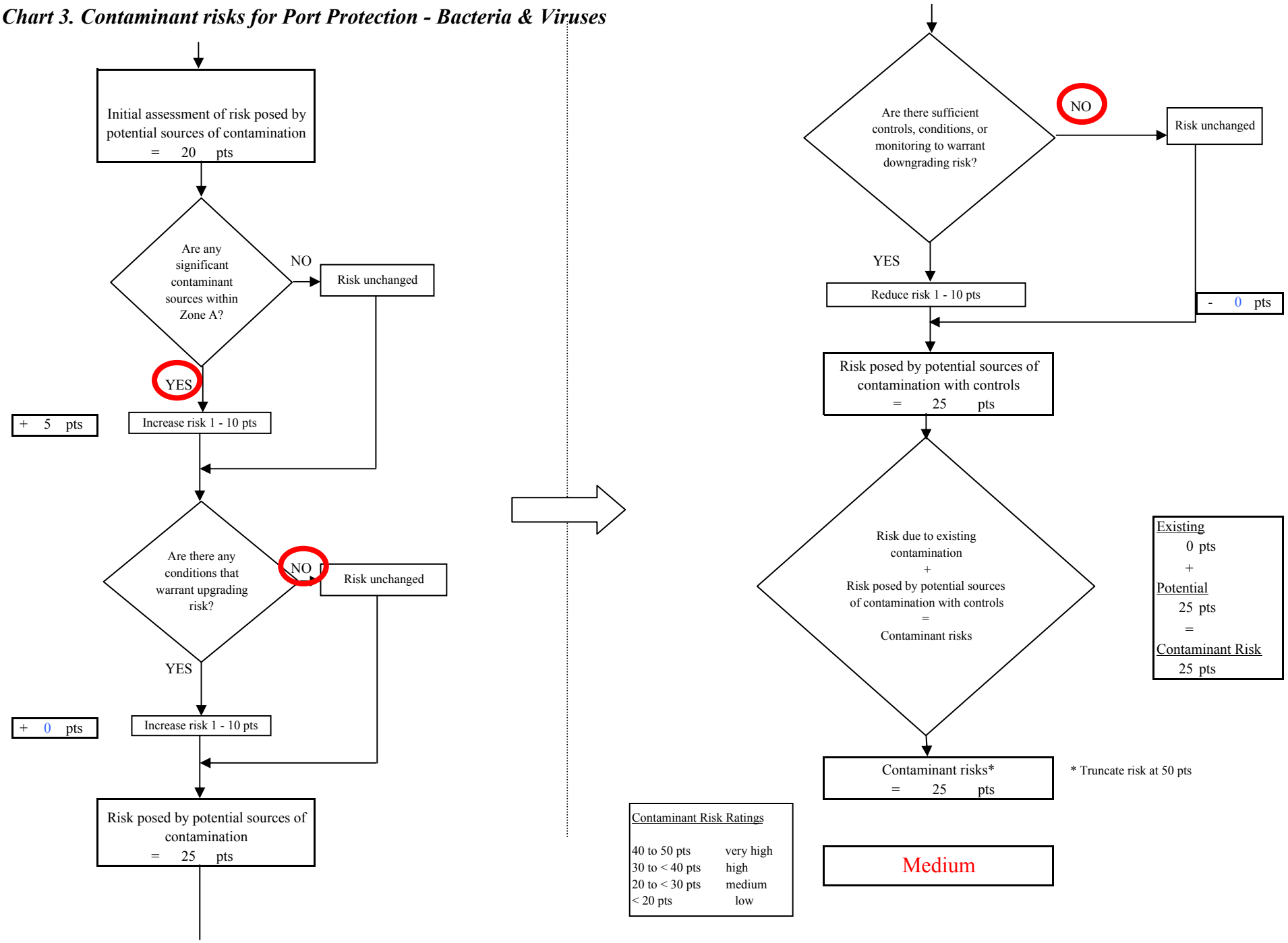


Chart 4. Vulnerability analysis for Port Protection - Bacteria & Viruses

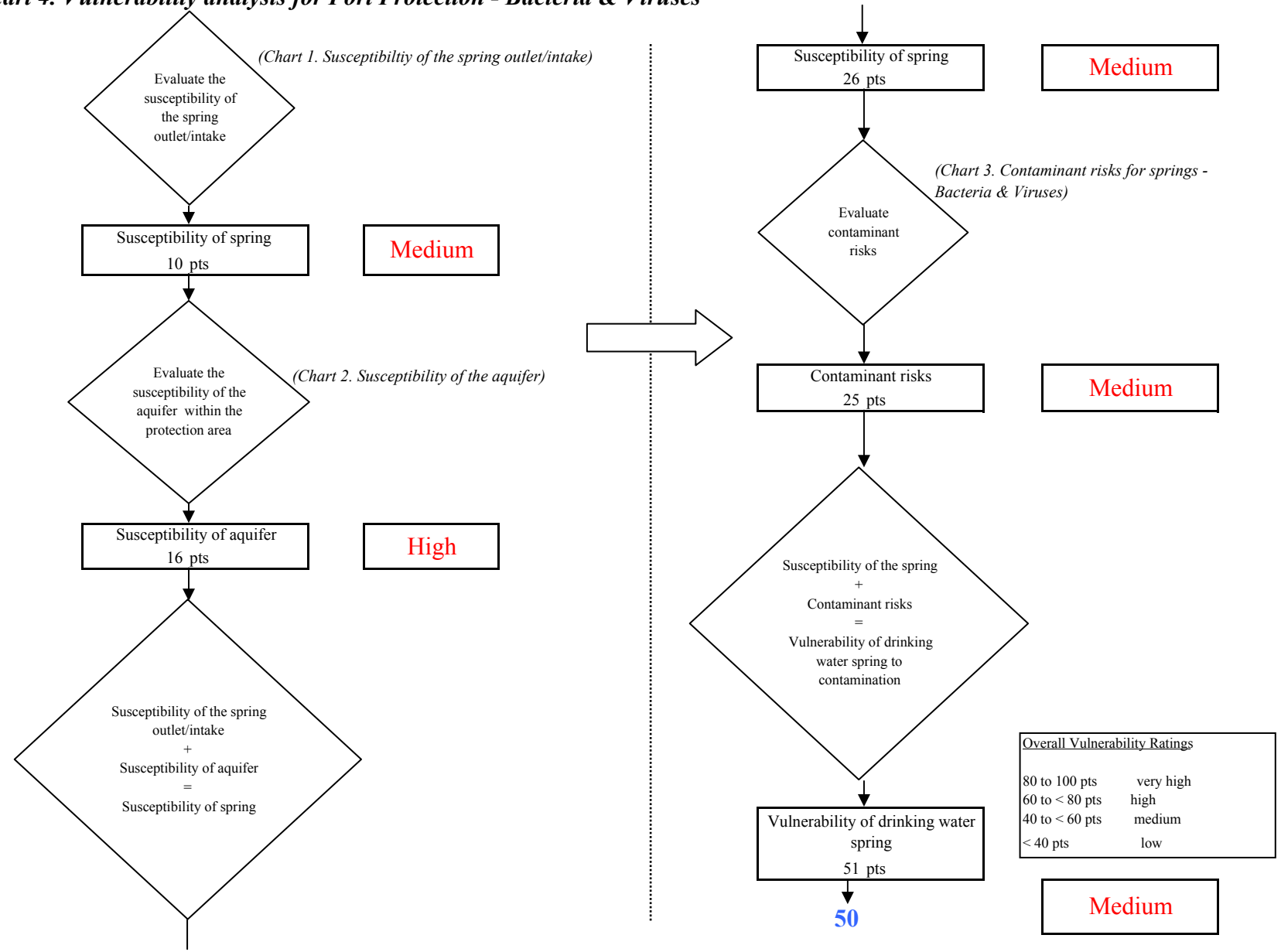


Chart 5. Contaminant risks for Port Protection - Nitrates and Nitrites

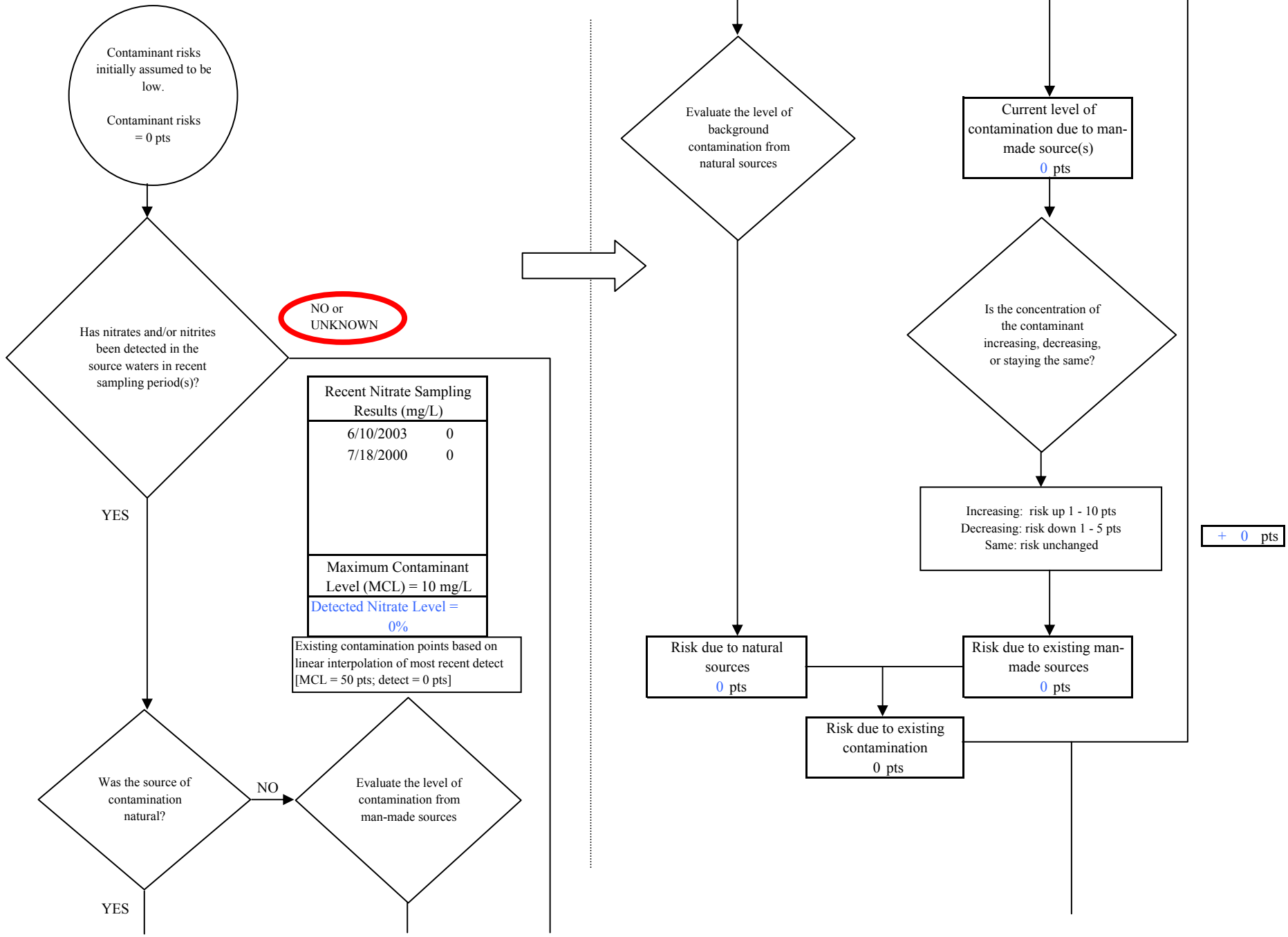


Chart 5. Contaminant risks for Port Protection - Nitrates and Nitrites

+ 20 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	0
Low(s)	21	2	23

	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 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.

Initial assessment of risk posed by potential sources of contamination = 20 pts

Are any significant sources in Zone A?

NO

Risk unchanged

YES

Increase risk 1 - 10 pts

+ 5 pts

Chart 5. Contaminant risks for Port Protection - Nitrates and Nitrites

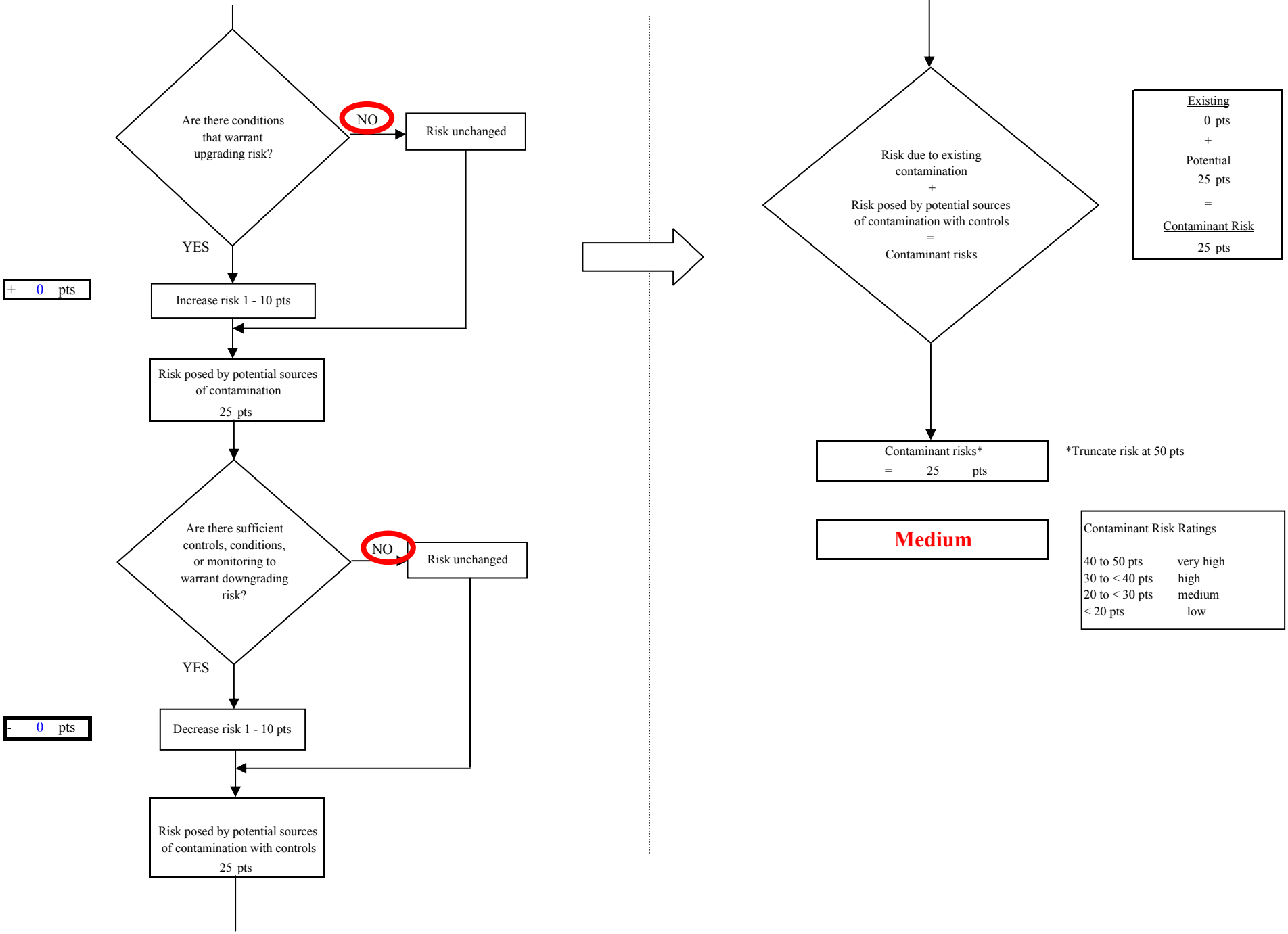


Chart 6. Vulnerability analysis for Port Protection - Nitrates and Nitrites

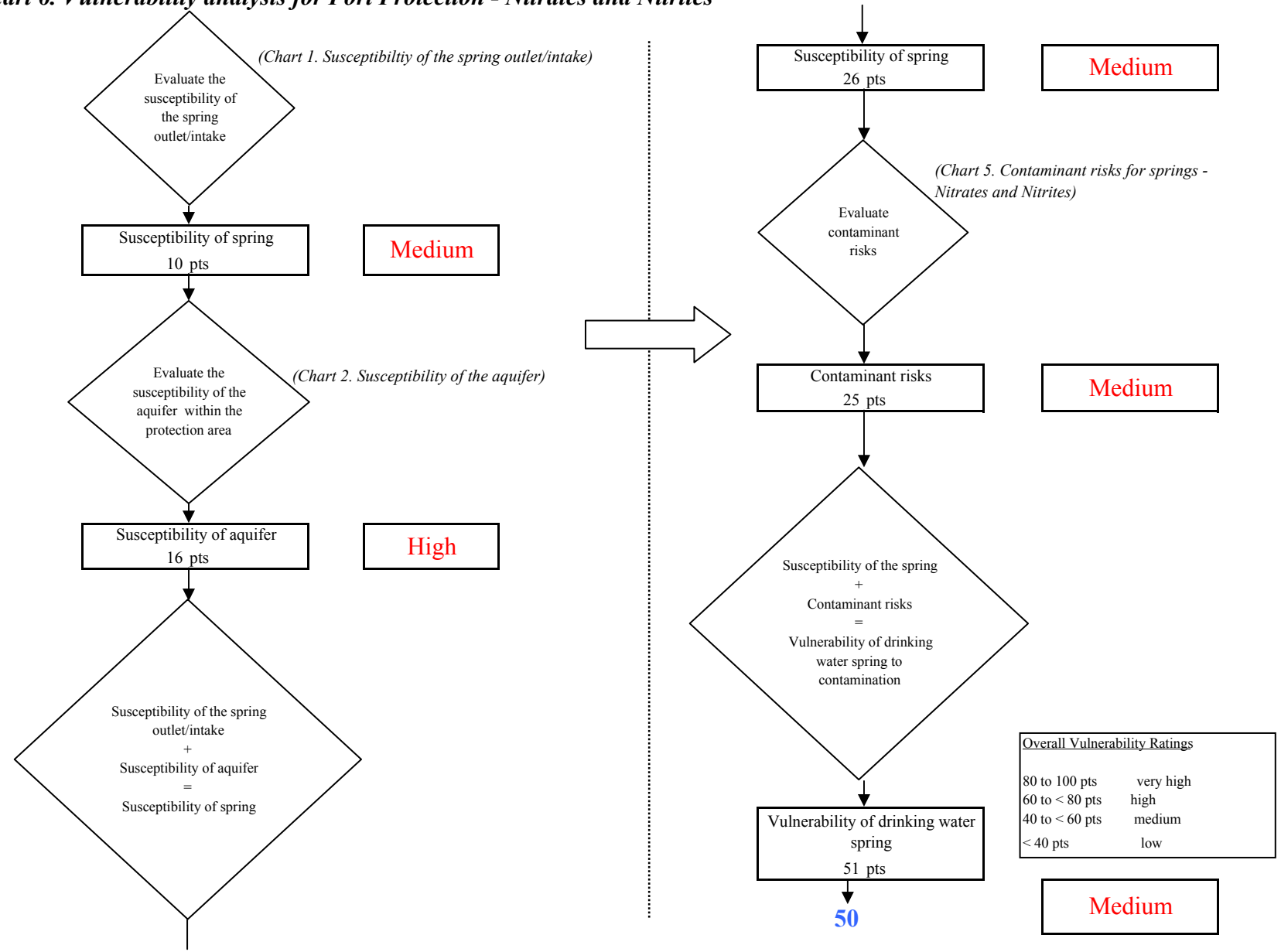


Chart 7. Contaminant risks for Port Protection - Volatile Organic Chemicals

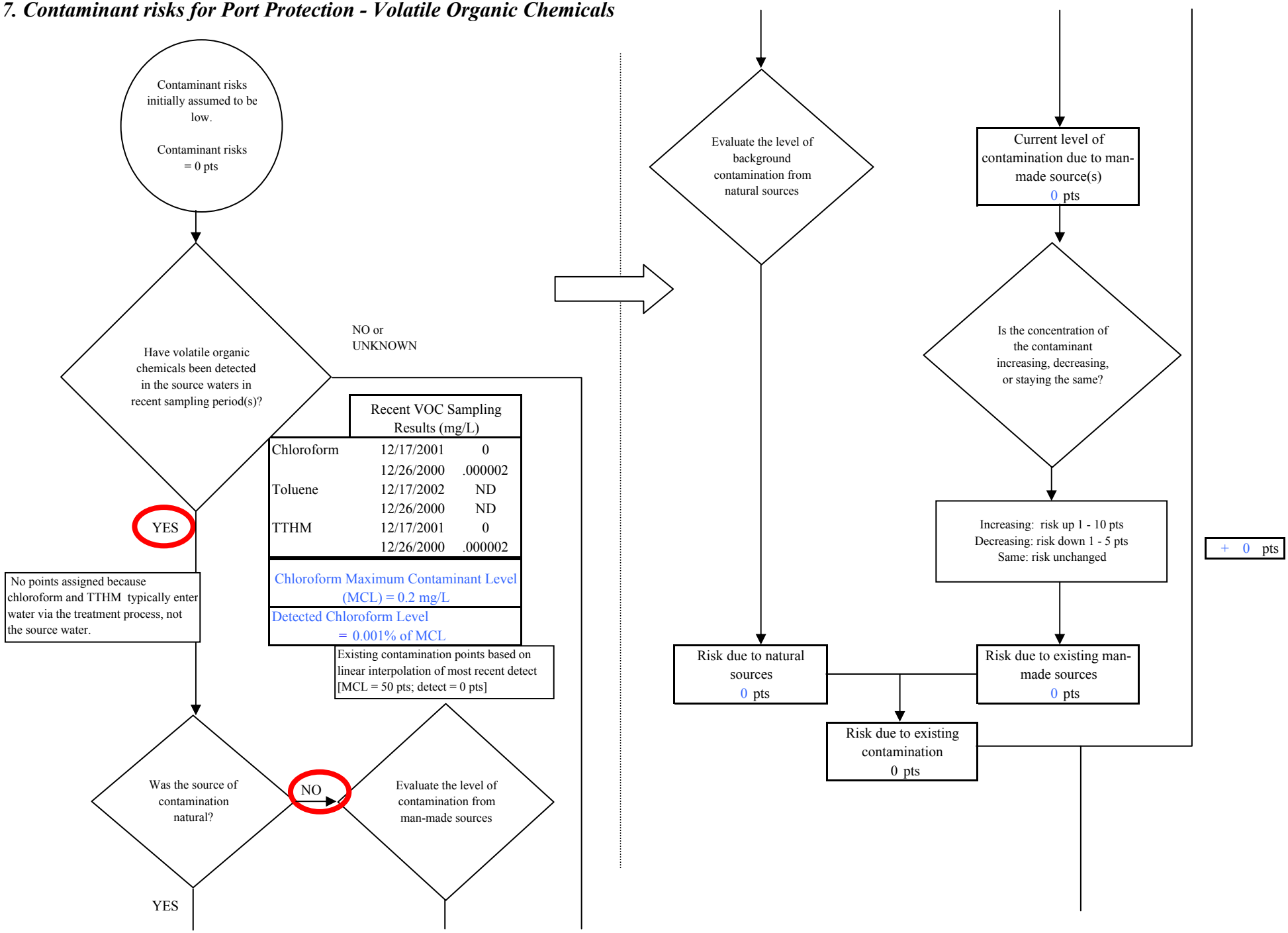
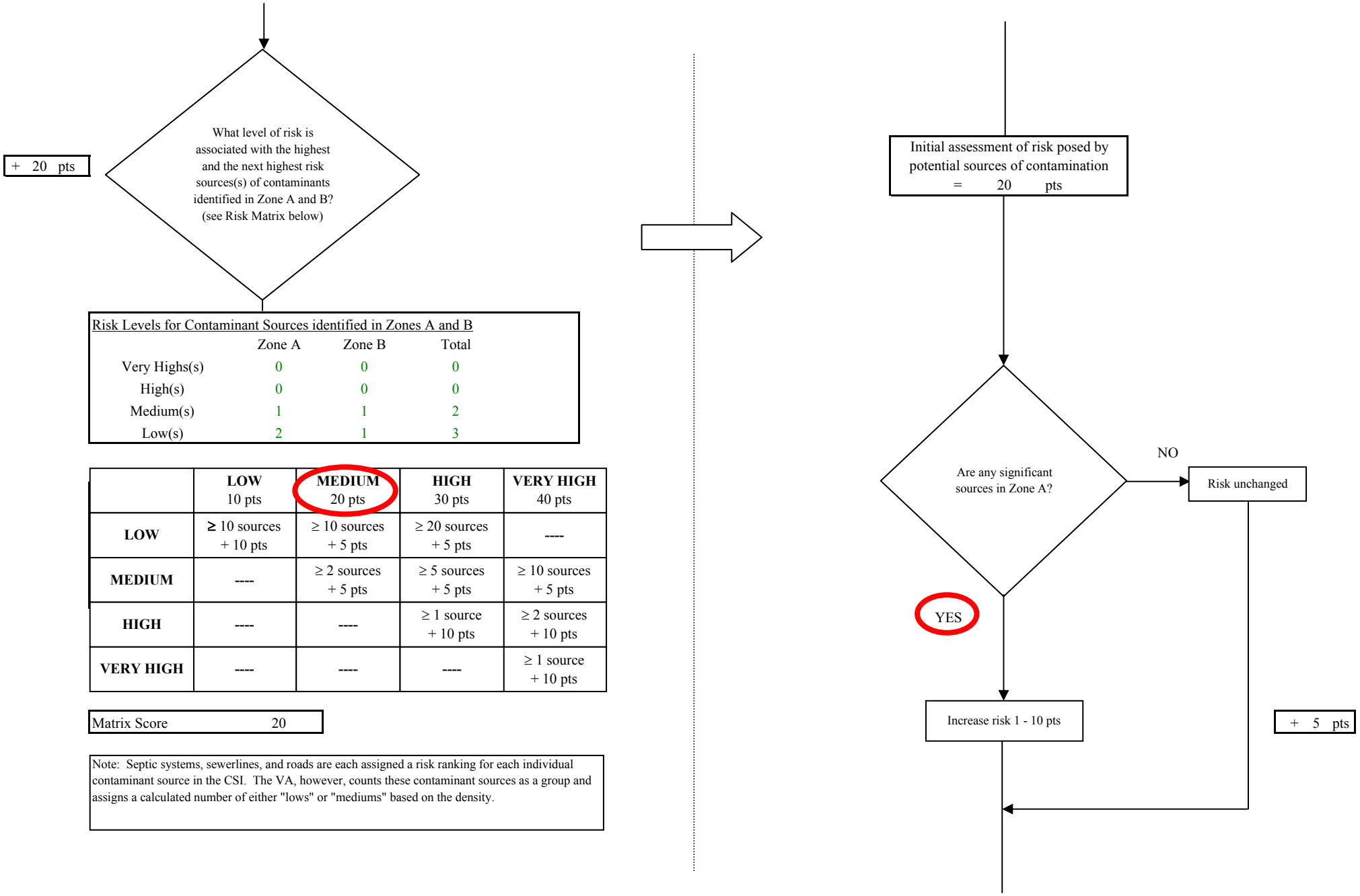


Chart 7. Contaminant risks for Port Protection - Volatile Organic Chemicals



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)	1	1	2
Low(s)	2	1	3

	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 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.

Chart 7. Contaminant risks for Port Protection - Volatile Organic Chemicals

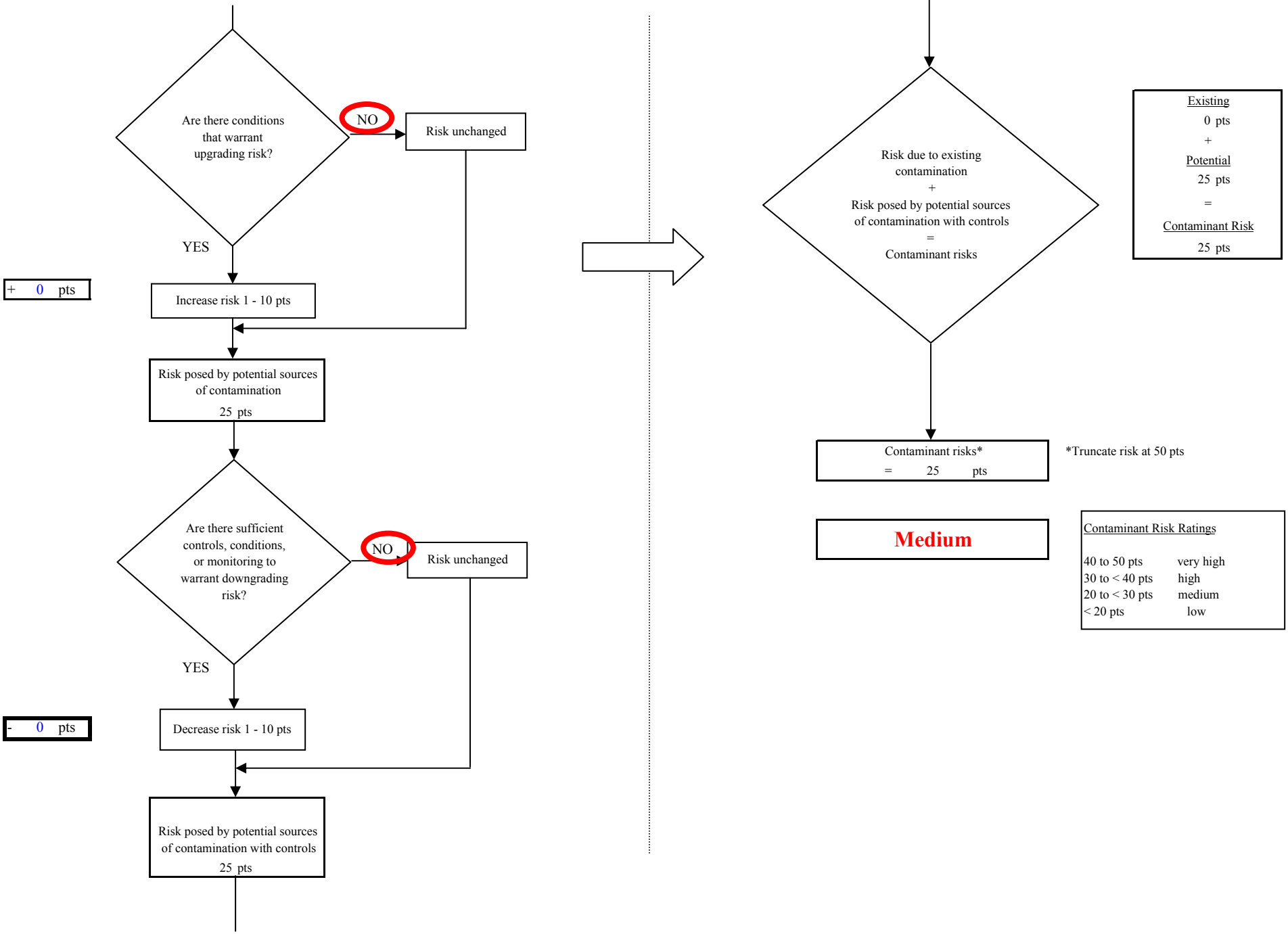


Chart 8. Vulnerability analysis for Port Protection - Volatile Organic Chemicals

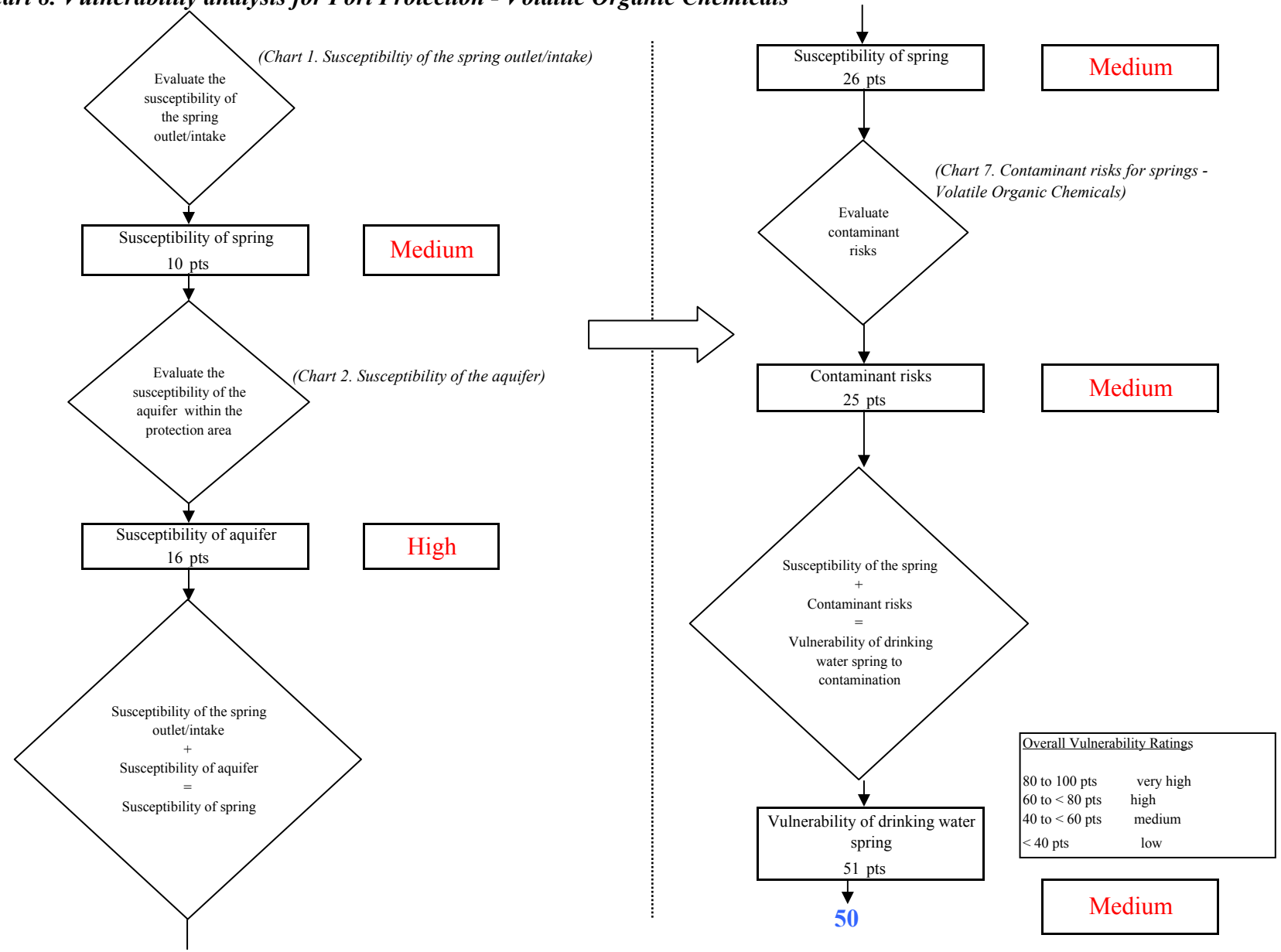


Chart 9. Contaminant risks for Port Protection - Heavy Metals, Cyanide and Other Inorganic Chemicals

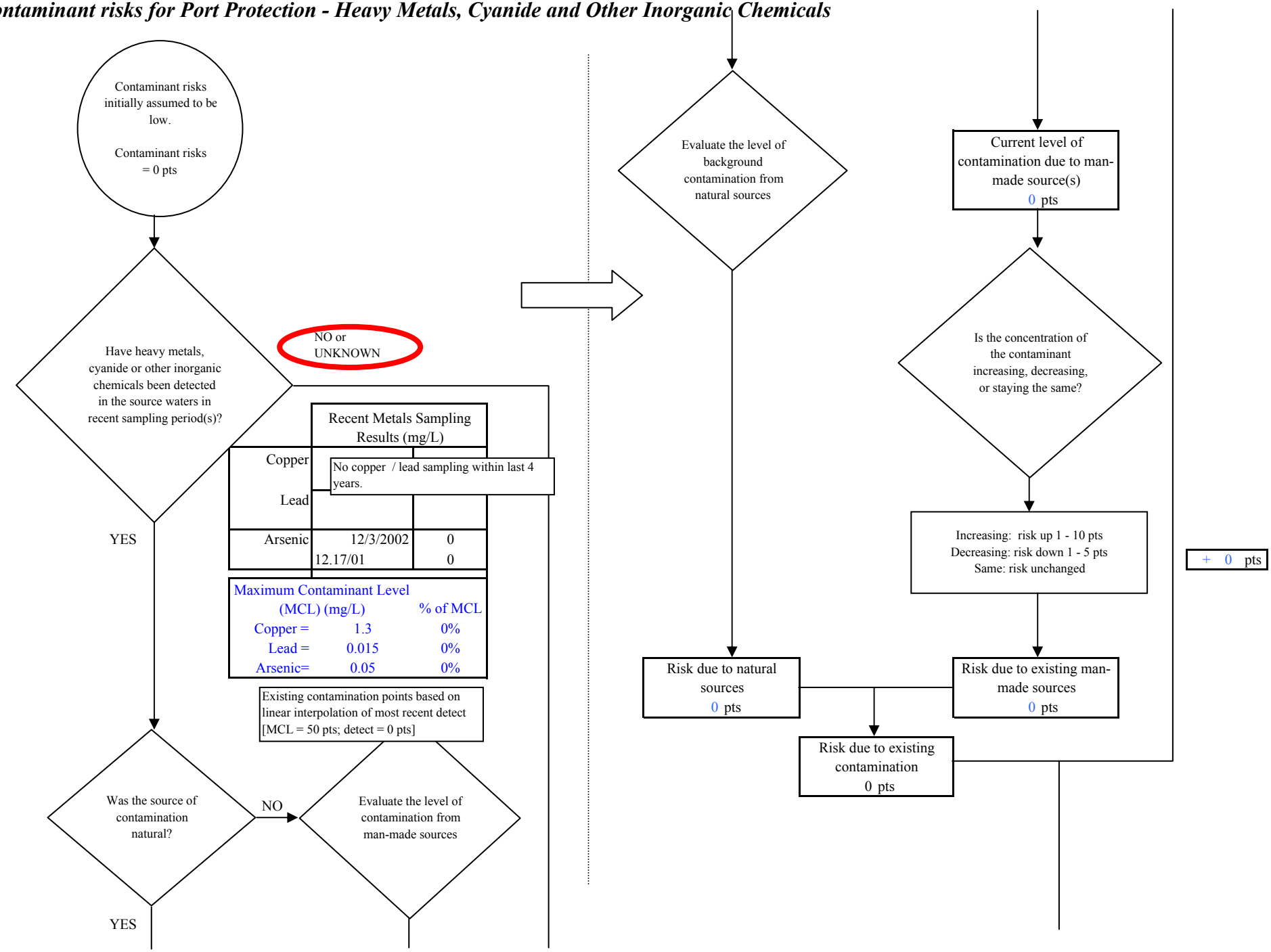


Chart 9. Contaminant risks for Port Protection - Heavy Metals, Cyanide and Other Inorganic Chemicals

+ 10 pts

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

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

Are any significant sources in Zone A?

NO → Risk unchanged

YES → 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	0
Low(s)	2	2	4

	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 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 9. Contaminant risks for Port Protection - Heavy Metals, Cyanide and Other Inorganic Chemicals

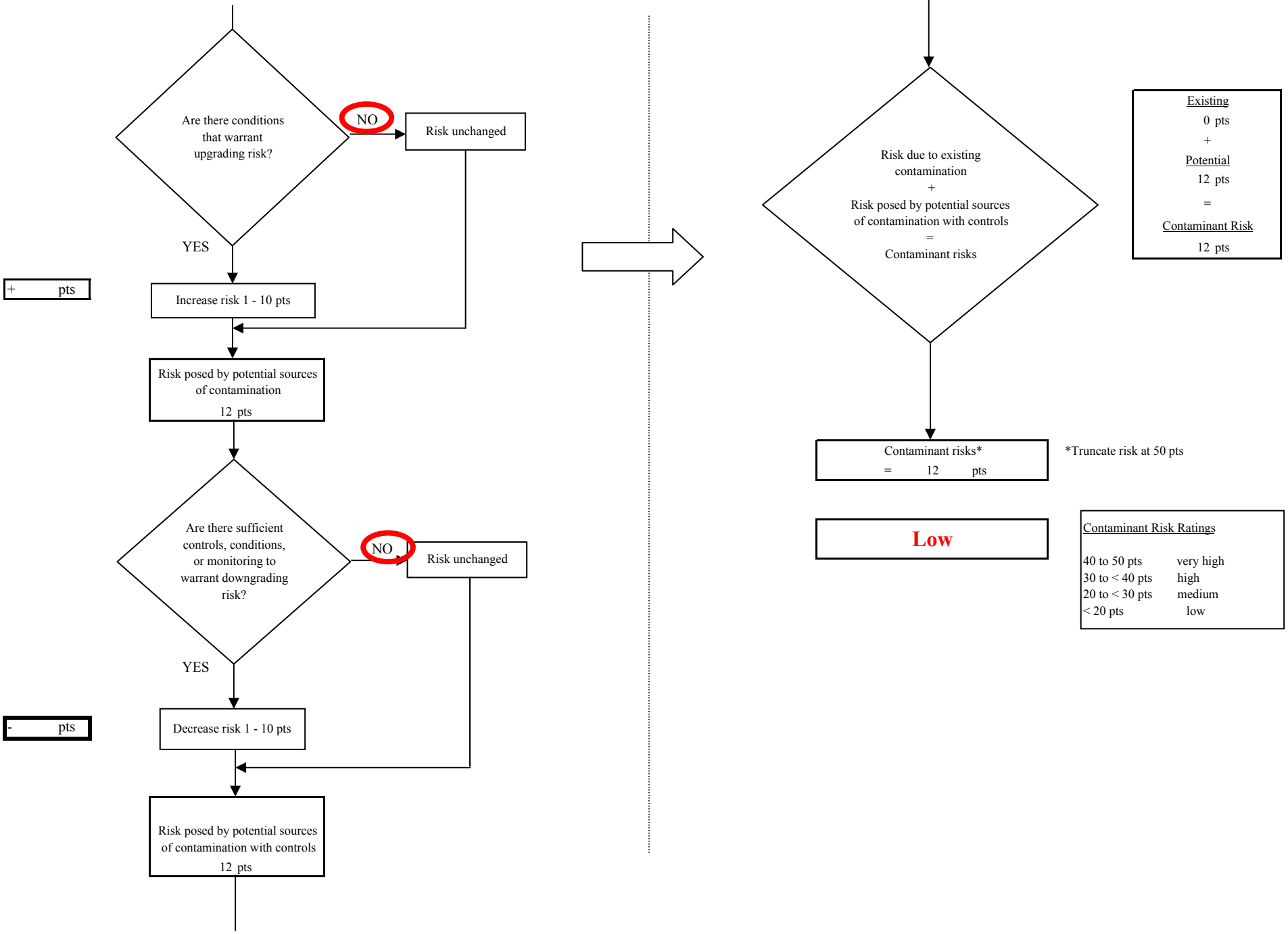


Chart 10. Vulnerability analysis for Port Protection - Heavy Metals, Cyanide and Other Inorganic Chemicals

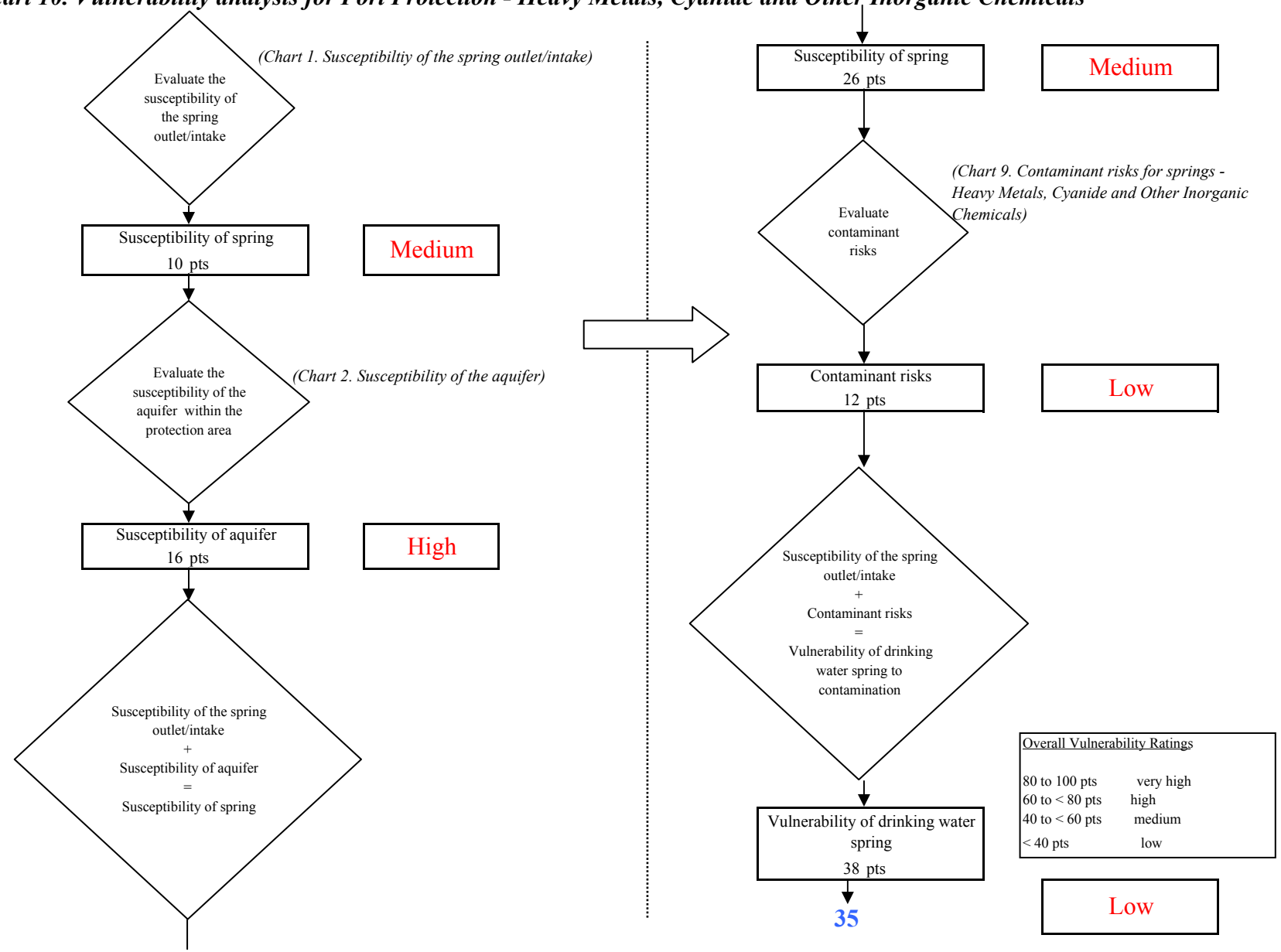


Chart 11. Contaminant risks for Port Protection - Synthetic Organic Chemicals

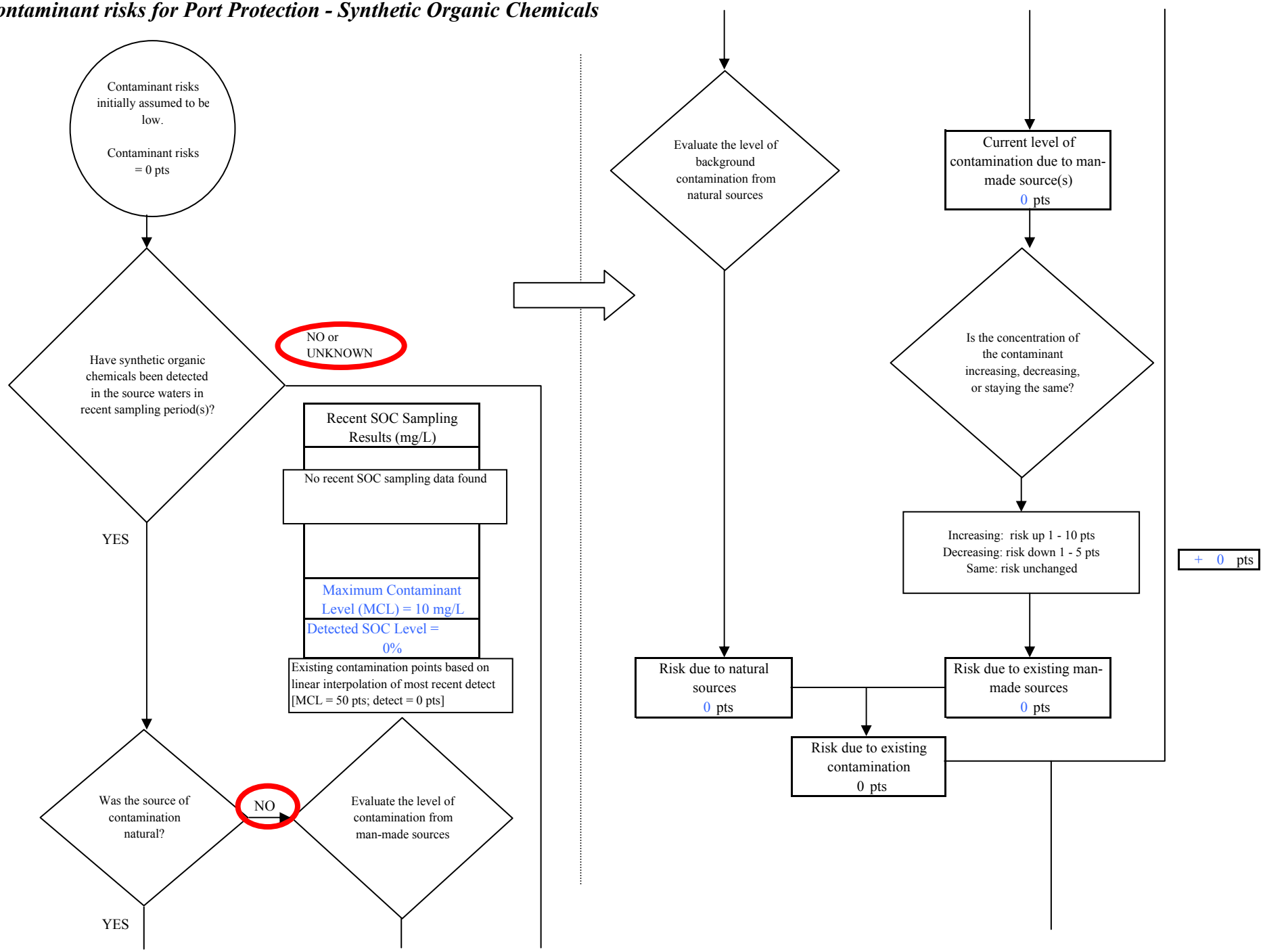
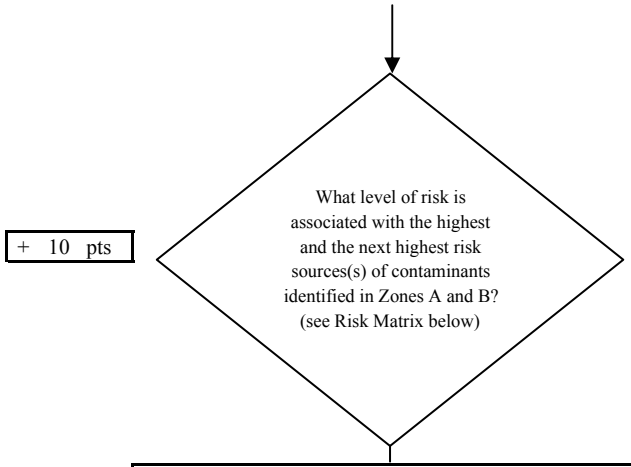


Chart 11. Contaminant risks for Port Protection - Synthetic Organic Chemicals



+ 10 pts

Risk Levels for Contaminant Sources identified in Zones A and B

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

	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 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.

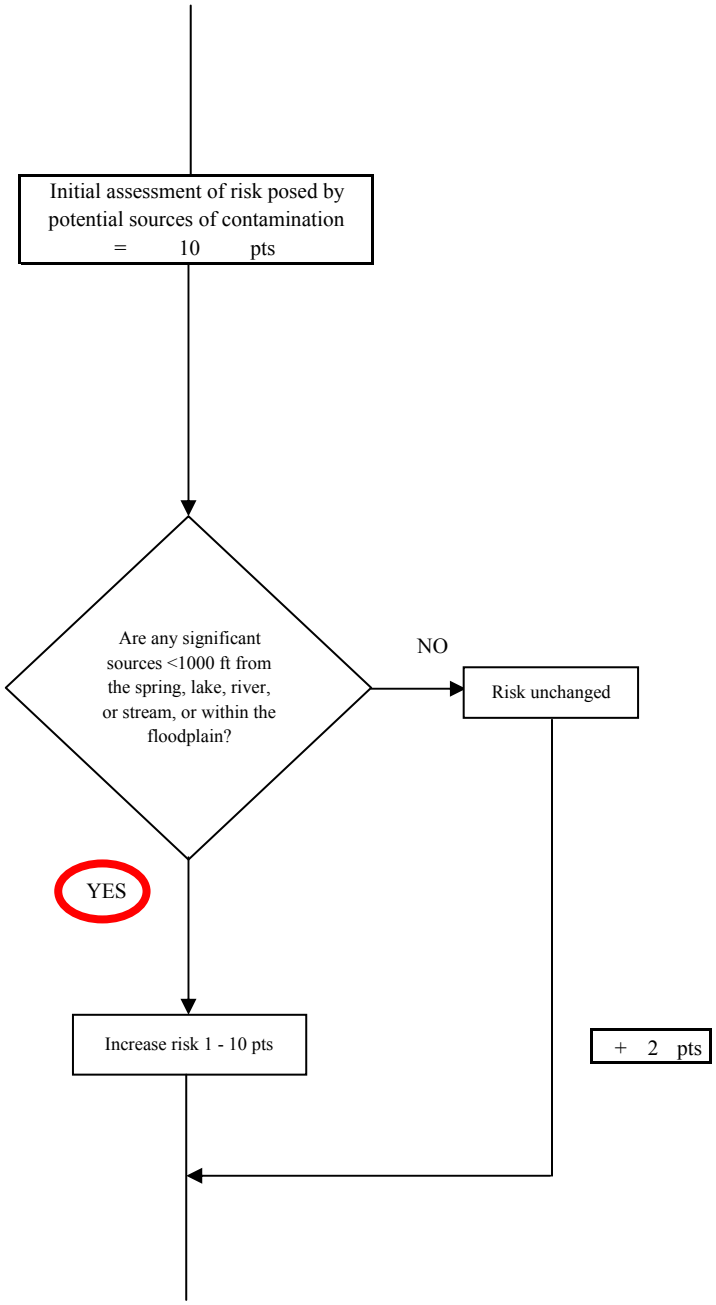
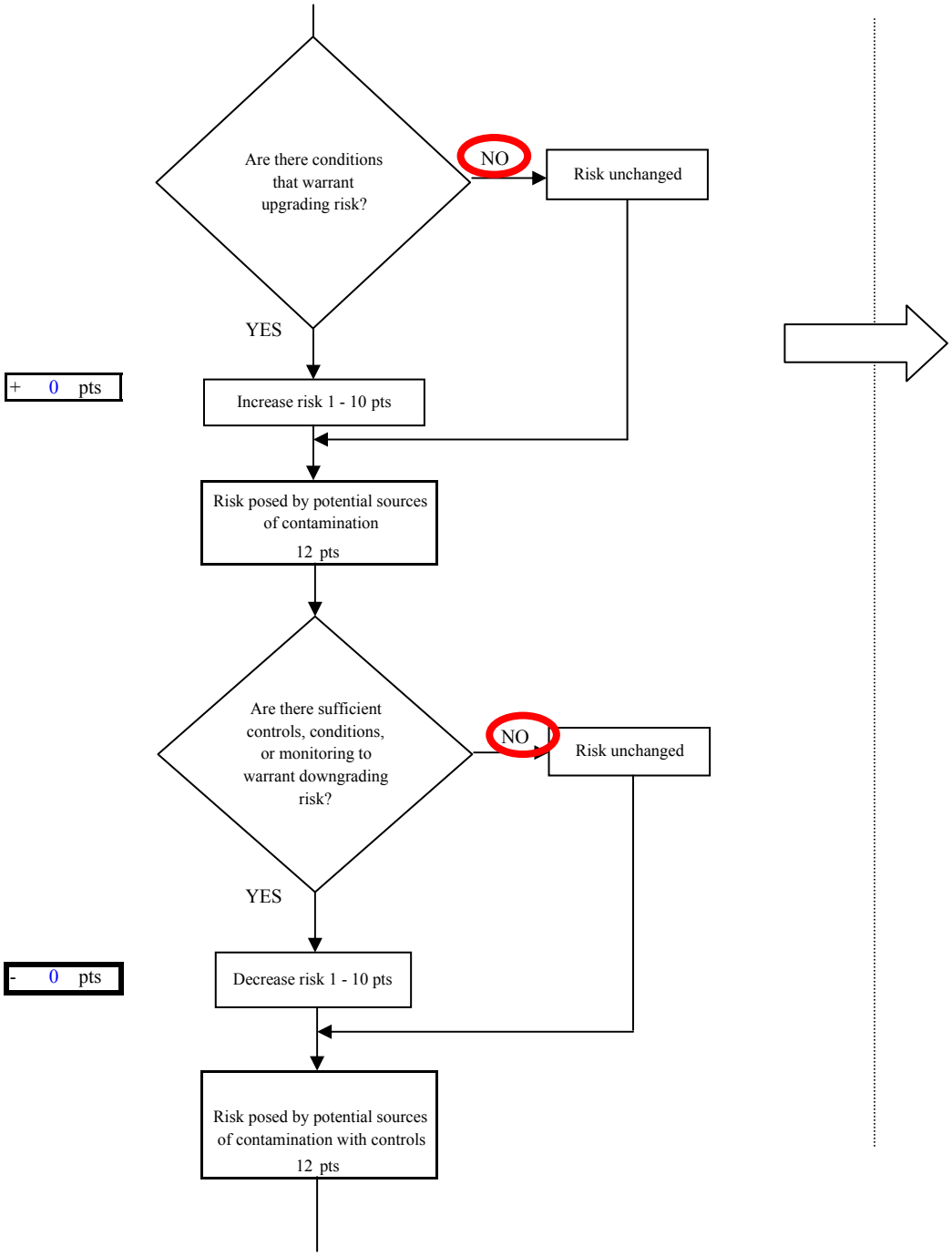
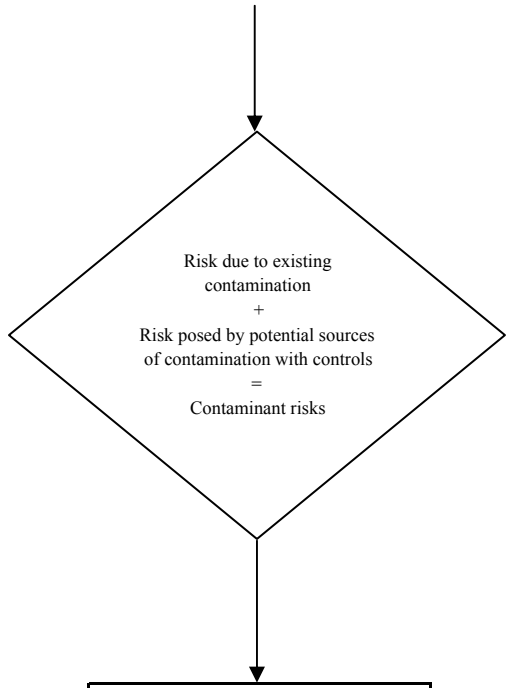


Chart 11. Contaminant risks for Port Protection - Synthetic Organic Chemicals





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

Contaminant risks*
= 12 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 12. Vulnerability analysis for Port Protection - Synthetic Organic Chemicals

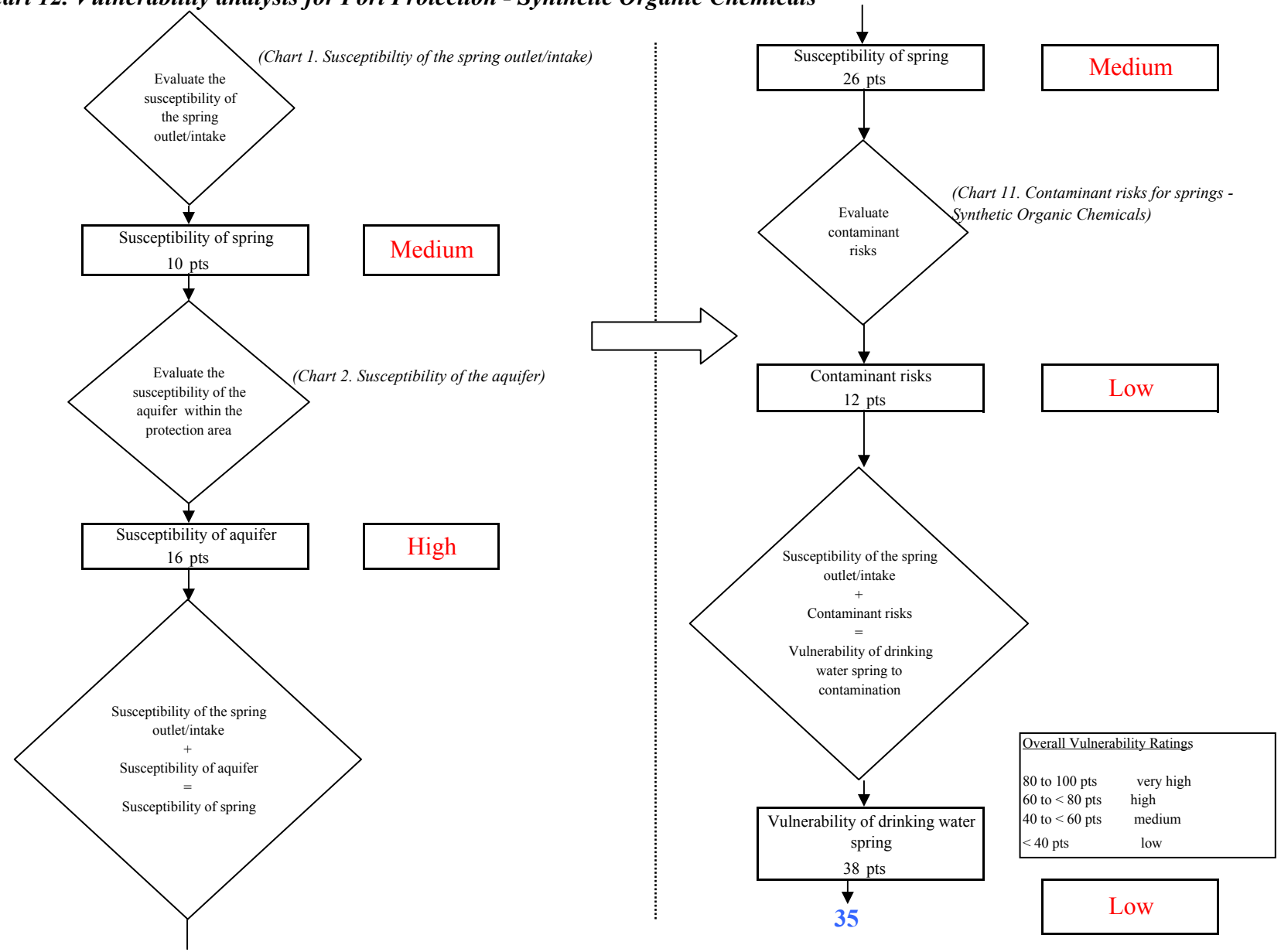


Chart 13. Contaminant risks for Port Protection - Other Organic Chemicals

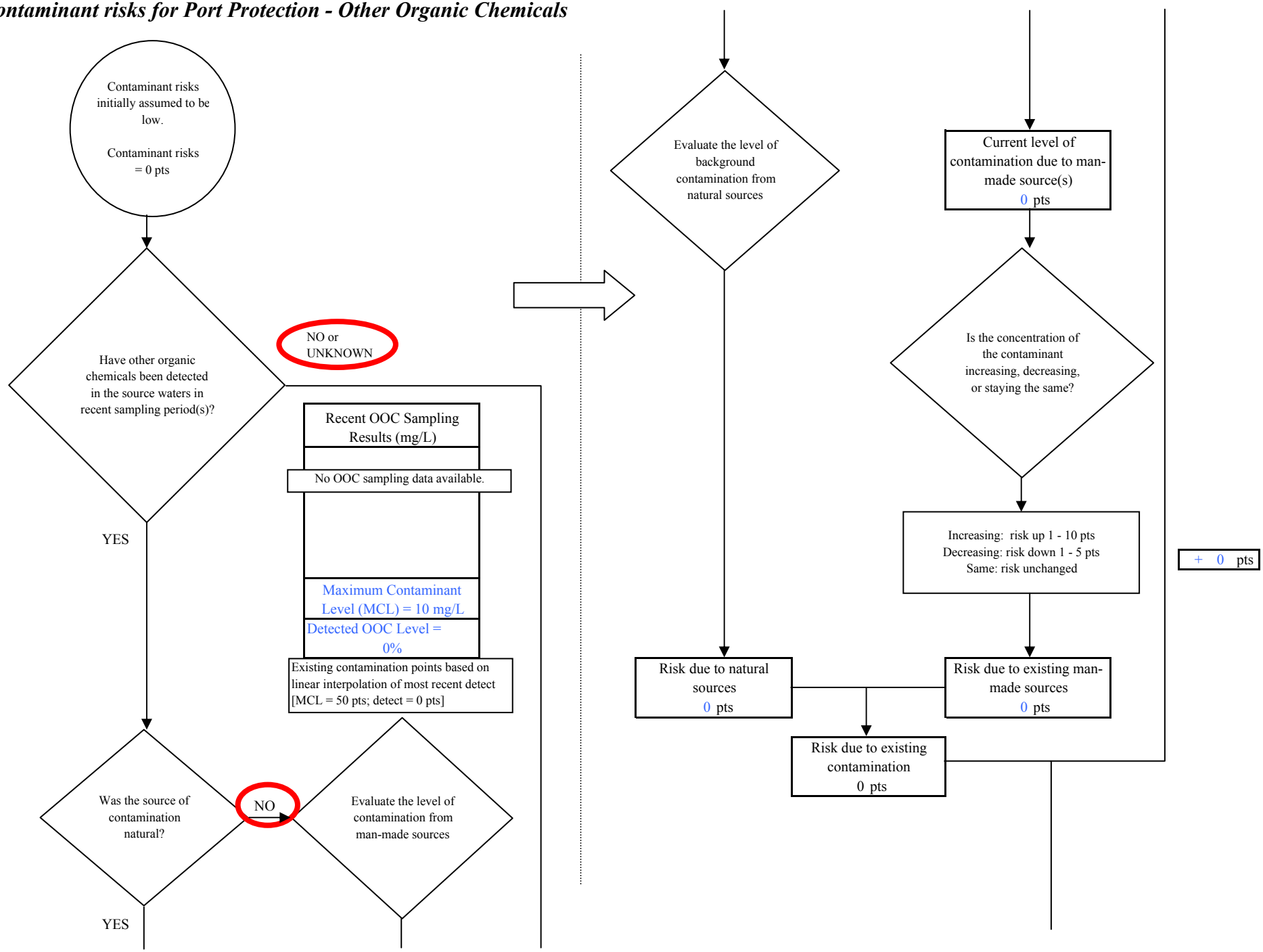


Chart 13. Contaminant risks for Port Protection - Other Organic Chemicals

+ 10 pts

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

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

Are any significant sources in Zone A?

NO → Risk unchanged → + 2 pts

YES → Increase risk 1 - 10 pts

Risk Levels for Contaminant Sources identified in Zones A and B

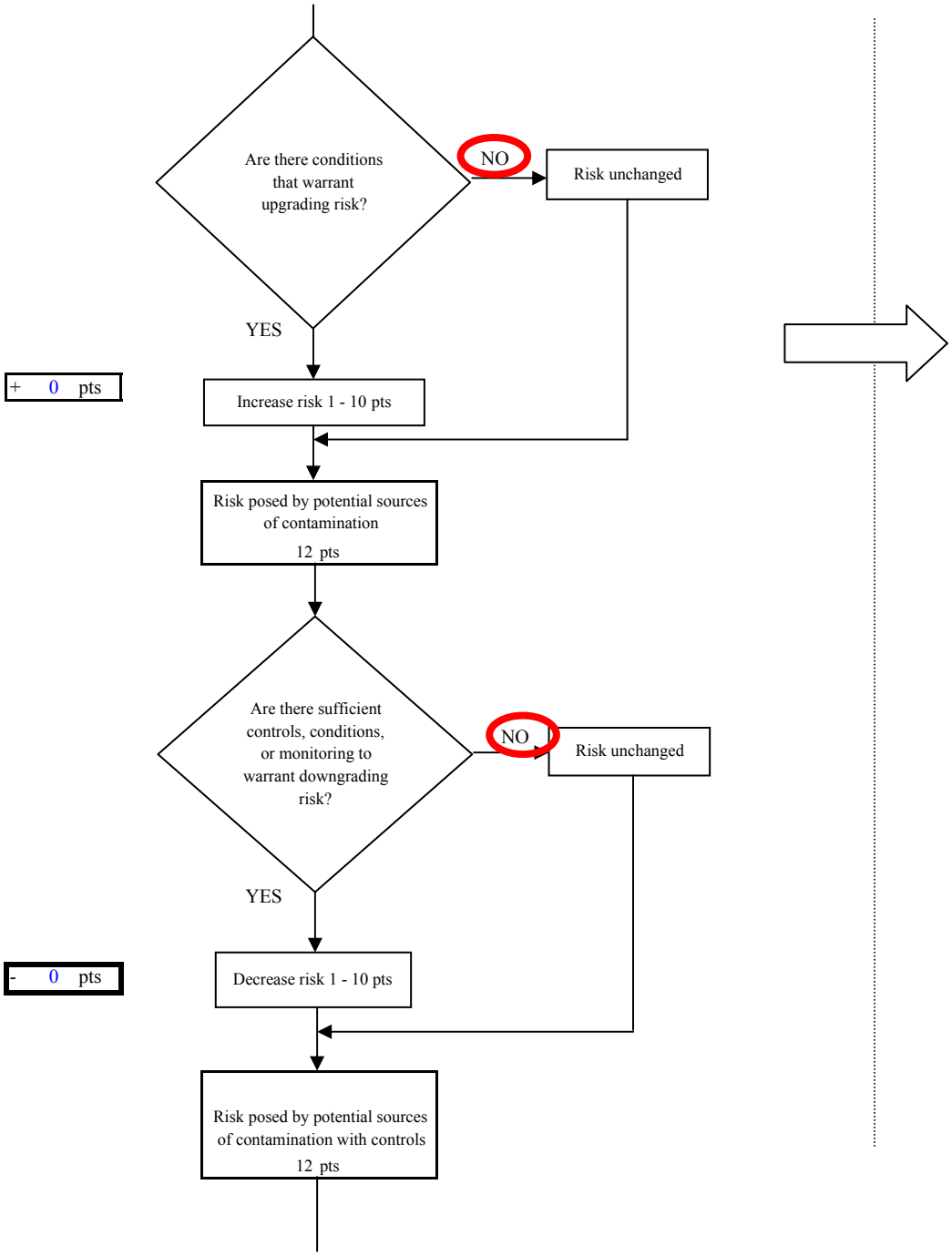
	Zone A	Zone B	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	2	1	3

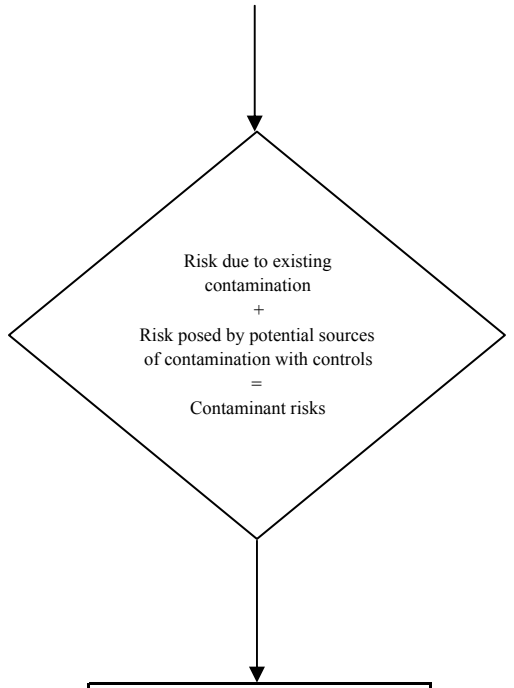
	LOW 10 pts	**MEDIUM** 20 pts	**HIGH** 30 pts	**VERY HIGH** 40 pts
LOW	≥ 10 sources + 10 pts	≥ 10 sources + 5 pts	≥ 20 sources + 5 pts	----
MEDIUM	----	≥ 2 sources + 5 pts	≥ 5 sources + 5 pts	≥ 10 sources + 5 pts
HIGH	----	----	≥ 1 source + 10 pts	≥ 2 sources + 10 pts
VERY HIGH	----	----	----	≥ 1 source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

Matrix Score 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 13. Contaminant risks for Port Protection - Other Organic Chemicals





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

Contaminant risks*
= 12 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 14. Vulnerability analysis for Port Protection - Other Organic Chemicals