Source Water Assessment

A Susceptibility and Vulnerability Assessment for Homer, Alaska

PWSID # 240456

June 2003

Drinking Water Protection Program Report #999

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 the City of Homer, Alaska

Drinking Water Protection Program
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The Homer water system is a Class A water system (community) that obtains water from the Bridge Creek Reservoir. The overall protection area received a susceptibility rating of "**very high**". *A rating of high to very high is typical for all surface water catchment areas*. Identified potential and current sources of contaminants for the drinking water source include residential area, residential septic systems, past logging activities and roads. Potential and existing sources of the following contaminants were evaluated for this 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. Combining the natural susceptibility of the surface water source with the contaminant risk, this water system has received a vulnerability rating of **"very high"** for bacteria and viruses, nitrates and volatile organic chemicals and "**medium"** for heavy metals, cyanide, synthetic organic chemicals and other organic chemicals.

INTRODUCTION

The Alaska Department of Environmental Conservation (ADEC) is completing source water assessments for all public drinking water sources in the State of Alaska. The purpose of this assessment is to provide owners and/or operators, communities, and local governments with information they can use to preserve the quality of Alaska's public drinking water supplies. The results of this source water assessment can be used to decide where voluntary protection efforts are needed and feasible, and also what efforts will be most effective in reducing contaminant risks to your water system.

DRINKING WATER SYSTEM AND AREA OVERVIEW

The Homer water system is a Class A (community) water system that operates year round and serves approximately 4000 residents and 500 non-residents through 107 service connections.

Homer is located on the north shore of Kachemak Bay on the southwestern edge of the Kenai Peninsula (Sec. 19, T006S, R013W, Seward Meridian.).

Homer is incorporated as a First Class City. The area encompasses 10.6 sq. miles of land and 11.9 sq. miles of water and the current population is 3,946. The majority of residents are connected to the water system. Over 90% of homes are fully plumbed. City sewage is piped to a deep shaft sewer treatment plant. Homes not connected to city sewer utilize individual septic systems. Water is supplied by a dam and 35-acre reservoir at Bridge Creek, is treated, stored in a 500,000-gallon tank, and piped to the majority of homes in the City. Others residents use individual wells or have water delivered to home tanks.

Heating oil (stored in both above and below ground tanks), electricity and LP/gas are most commonly used for heating homes and buildings. Refuse is collected by and hauled to the Borough-operated landfill. Homer lies in the maritime climate zone. During the winter, temperatures range from 14 to 27; summer temperatures vary from 45 to 65. Average annual precipitation is 24 inches, including 55 inches of snow (ADCED, 2003).

Aerial photos from USGS indicate that the watershed contributed to Bridge Creek has some residential development. The watershed appears to be accessible to foot, four-wheelers and snow machines.

HOMER 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 to a surface water source. The entire drainage area is also known as the "drinking water protection area". Please refer to pages 10-11of the "Guidance Manual for Class A Public Water Systems" for additional information.

The protection area established for surface water sources by the ADEC is usually separated into three zones, limited by the watershed boundary. These zones correspond to the overland-flow distance that water travels to get to the source. 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 lakes or streams
B	Areas within 1-mile of lakes or streams
C	The watershed boundary.

The watershed boundary is less than 1-mile from the reservoir. As a result, Zone B is equivalent to the watershed boundary. (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 City of Homer's 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 City of Homer's 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 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.

Tables 2 through 5 in Appendix B contain the ranking of potential and existing sources of contamination with respect to bacteria and viruses, nitrates and/or nitrites, volatile organic chemicals, metals, synthetic organic compounds, and other organic compounds.

VULNERABILITY OF HOMER DRINKING WATER SYSTEM

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

- Surface Water Susceptibility; and
- Contaminant risks.

Appendix D contains 13 charts, which together form the 'Vulnerability Analysis' for the public drinking water Source Water Assessment. Chart 1 analyzes the 'Susceptibility of the Surface Water Source' to contamination by looking at the climate, terrain, and intake location. 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 intake area. Chart 3 contains the 'Vulnerability Analysis for Bacteria and Viruses', which is a composite score of the Vulnerability Analysis and the overall Susceptibility. Charts 4 through 13 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 Surface Water Susceptibility of the source is reached by considering the properties of the water intake and the surrounding area. The derivation of this information is presented below and the data for this source is shown in Chart 1 of Appendix D.

Susceptibility of the Surface Water Source – always considered to be "high" (30 points)

+

Adequate Construction of the Intake (0 – 5 Points)

+

Runoff Potential Within Zone B (0 – 5 Points)

+

Dilution Capacity of the Surface Water (0 – 10 Points)

=

Natural Susceptibility
(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 < 40 pts	High

Table 2. Susceptibility of the City of Homer's Water Source

	Score	Rating
Minimum Allowable Susceptibility	30	
Intake Construction Adequate	0	
Runoff Potential	5	
Dilution Capacity	10	
Overall Susceptibility	45	Very High

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. City of Homer's Contaminant Risks

Category	Score	Rating
Bacteria and Viruses	45	Very High
Nitrates and/or Nitrites	46	Very High
Volatile Organic Chemicals	35	Very High
Heavy Metals, Cyanide, and Other Inorganic Chemicals	13	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 Surface 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. Overall Vulnerability

Category	Score	Rating
Bacteria and Viruses	90	Very High
Nitrates and Nitrites	90	Very High
Volatile Organic Chemicals	80	Very High
Heavy Metals, Cyanide, and Other Inorganic Chemicals	55	Medium
Synthetic Organic Chemicals	55	Medium
Other Organic Chemicals	55	Medium

Bacteria and Viruses

The contaminant risk for bacteria and viruses is "very high". The presence of residential areas, residential septics, large capacity septic systems and roads presents risk to this source. (See Chart 2 – Contaminant Risks for Bacteria and Viruses in Appendix D).

The sampling history indicates that bacteria and viruses have not been detected.

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 is "very high".

Nitrates and Nitrites

The contaminant risk for nitrates and nitrites is "low". The presence of residential areas, residential septics, large capacity septic systems roads and low a concentration of nitrate presents risk for this source (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.

Sampling history for the Homer water source indicates that nitrates were detected at low concentrations (less than 3% of the current 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 (EPA, 2003).

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 "very high".

Volatile Organic Chemicals

The contaminant risk for volatile organic chemicals is "very high". The presence of residential septic systems, large capacity septic systems, roads and logging activities presents risk for this system (See Chart 6 – Contaminant Risks for Volatile Organic Chemicals in Appendix D).

No regulated volatile organic chemicals have been detected recently in source waters. However, volatile organic chemicals commonly associated with the disinfection process have been detected at low concentrations (Less than 5% of the MCL.).
Since it is likely that these chemicals are associated from the disinfection process, it is assumed that they do not derive from the source water.

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 "very high".

Heavy Metals, Cyanide, and Other Inorganic Chemicals

The contaminant risk for heavy metals is "low". The presence of residential septic systems, roads, logging, large capacity septic systems and the presence of existing contamination present risk to this source.

Recent sampling has detected very low levels of barium (less than 1% of the 2.0 mg/l MCL).

Low levels of lead and copper have been detected recently. Lead and Copper are commonly associated with distributions systems and are not considered to derive from source waters. (See Chart 8 – Contaminant Risks for Heavy Metals, Cyanide, and Other Inorganic Chemicals in Appendix D) The levels detected are considered safe for human consumption.

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

Synthetic Organic Chemicals

The contaminant risk for synthetic organic chemicals is "low". The presence of large capacity septic systems, residential areas and residential septic systems resents risk for this system.

Review of the historical sampling data indicates that no synthetic organic chemicals have been detected in recent years

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

Other Organic Chemicals

The contaminant risk for other organic chemicals is "low". The presence of roads, large capacity septic systems and residential area presents risk to this source. (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 detected.

After combining the contaminant risk with the natural susceptibility of the source, the overall vulnerability to other organic chemicals of the source is "medium"

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 the community of Homer 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 Homer drinking water source

REFERENCES

Alaska Department of Community and Economic Development (ADCED), 2003 [WWW document]. URL http://www.dced.state.ak.us/cbd/commdb/CF_BLOCK.cfm

United States Environmental Protection Agency (EPA), 2003 [WWW document]. URL http://www.epa.gov/safewater/mcl.html.

APPENDIX A

Homer
Drinking Water Protection Area Location Map
(Map 1)

Map 1- City of Homer Public Water System

PWSID 240456

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

0 1,125 2,250 4,500 6,750 9,000 Feet

1:27,000

Data Sources:
USGS- 1:25,000 Topographic Map
Kenai Borough-Parcels
DOT-Roads
ADEC-Intake and Protection Area

Watershed delineated from
USGS 63K topographic map

Legend

- City of Homer Public Water System
- Zone A Protection Area
- Watershed Boundary
- Lakes
- Roads
- Rivers and Streams
- Parcels

APPENDIX B

Contaminant Source Inventory and Risk Rankings (Tables 1-6)

Table 1

Contaminant Source Inventory for ***City of Homer***

PWSID 240456.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1-	A	2	
Logging (Inactive)	E02	E02-02	A	2	
Logging (Inactive)	E02	E02-1	A	2	
Logging (Inactive)	E02	E02-3	A	2	
Residential Areas	R01	R01-1	A	2	16 acres
Septic systems (serves one single-family home)	R02	R02-1-39	A	2	39 Residential Septics-Includes outhouses
Highways and roads, paved (cement or asphalt)	X20	X20-2	A	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-2	B	2	
Highways and roads, paved (cement or asphalt)	X20	X20-1	B	2	

Table 2

Contaminant Source Inventory and Risk Ranking for City of Homer Sources of Bacteria and Viruses

PWSID 240456.001

Contaminant Source Type	***Contaminant Source ID***	***CS ID tag***	***Zone***	***Risk Ranking for Analysis***	***Map Number***	***Comments***
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1-	A	High	2	
Residential Areas	R01	R01-1	A	Low	2	16 acres
Septic systems (serves one single-family home)	R02	R02-1-39	A	Low	2	39 Residential Septics-Includes outhouses
Highways and roads, paved (cement or asphalt)	X20	X20-2	A	Low	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-2	B	High	2	
Highways and roads, paved (cement or asphalt)	X20	X20-1	B	Low	2	

Table 3

Contaminant Source Inventory and Risk Ranking for City of Homer Sources of Nitrates/Nitrites

PWSID 240456.001

Contaminant Source Type	***Contaminant Source ID***	***CS ID tag***	***Zone***	***Risk Ranking for Analysis***	***Map Number***	***Comments***
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1-	A	High	2	
Logging (Inactive)	E02	E02-02	A	Low	2	
Logging (Inactive)	E02	E02-1	A	Low	2	
Logging (Inactive)	E02	E02-3	A	Low	2	
Residential Areas	R01	R01-1	A	Low	2	16 acres
Septic systems (serves one single-family home)	R02	R02-1-39	A	Low	2	39 Residential Septics-Includes outhouses
Highways and roads, paved (cement or asphalt)	X20	X20-2	A	Low	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-2	B	High	2	
Highways and roads, paved (cement or asphalt)	X20	X20-1	B	Low	2	

Table 4

Contaminant Source Inventory and Risk Ranking for City of Homer Sources of Volatile Organic Chemicals

PWSID 240456.001

Contaminant Source Type	***Contaminant Source ID***	***CS ID tag***	***Zone***	***Risk Ranking for Analysis***	***Map Number***	***Comments***
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1-	A	Low	2	
Logging (Inactive)	E02	E02-02	A	Medium	2	
Logging (Inactive)	E02	E02-1	A	Medium	2	
Logging (Inactive)	E02	E02-3	A	Medium	2	
Residential Areas	R01	R01-1	A	Low	2	16 acres
Septic systems (serves one single-family home)	R02	R02-1-39	A	Low	2	39 Residential Septics-Includes outhouses
Highways and roads, paved (cement or asphalt)	X20	X20-2	A	Low	2	
Highways and roads, paved (cement or asphalt)	X20	X20-1	B	Low	2	

Table 5

Contaminant Source Inventory and Risk Ranking for City of Homer

Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals

PWSID 240456.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1-	A	Low	2	
Logging (Inactive)	E02	E02-02	A	Low	2	
Logging (Inactive)	E02	E02-1	A	Low	2	
Logging (Inactive)	E02	E02-3	A	Low	2	
Residential Areas	R01	R01-1	A	Low	2	16 acres
Septic systems (serves one single-family home)	R02	R02-1-39	A	Low	2	39 Residential Septics-Includes outhouses
Highways and roads, paved (cement or asphalt)	X20	X20-2	A	Low	2	
Highways and roads, paved (cement or asphalt)	X20	X20-1	B	Low	2	

Table 6

Contaminant Source Inventory and Risk Ranking for City of Homer Sources of Synthetic Organic Chemicals

PWSID 240456.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1-	A	Low	2	
Residential Areas	R01	R01-1	A	Low	2	16 acres
Septic systems (serves one single-family home)	R02	R02-1-39	A	Low	2	39 Residential Septics-Includes outhouses

Table 7

Contaminant Source Inventory and Risk Ranking for City of Homer Sources of Other Organic Chemicals

PWSID 240456.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1-	A	Low	2	
Residential Areas	R01	R01-1	A	Low	2	16 acres
Septic systems (serves one single-family home)	R02	R02-1-39	A	Low	2	39 Residential Septics-Includes outhouses
Highways and roads, paved (cement or asphalt)	X20	X20-2	A	Low	2	
Highways and roads, paved (cement or asphalt)	X20	X20-1	B	Low	2	

APPENDIX C

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

E02-2

E02-3

E02-1

X20-02

Intake

X20-01

Zone A has 39-R02, 1-D10 and and approximately 16 residential acres
Zone B has 1-D10.

Map 2- Potential Contaminant Sources for the City of Homer Public Water System

PWSID240456

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

0 1,150 2,300 4,600 6,900 Feet

1:27,744

Data Sources:
USGS- 1:25,000 Topographic Map
Kenai Borough-Parcels
DOT-Roads
ADEC-Intake and Protection Area

Watershed delineated from
USGS 63,000 topograhpic map

Legend

- City of Homer Public Water System
- Zone A Protection Area
- Watershed Boundary
- Injection wells (Class V) Septic System (Drainfield Disposal Method) (D10)
- Septic systems (serves one single-family home and/or less than 20 people)(R02)
- Residential Area (R02)
- Past Logging Activities (E02)
- Parcels
- Lakes
- Roads
- Rivers and Streams

APPENDIX D

Vulnerability Analysis and Contaminant Risks
(Charts 1-13)

Chart 1. Susceptibility of the Surface Water Source - Homer

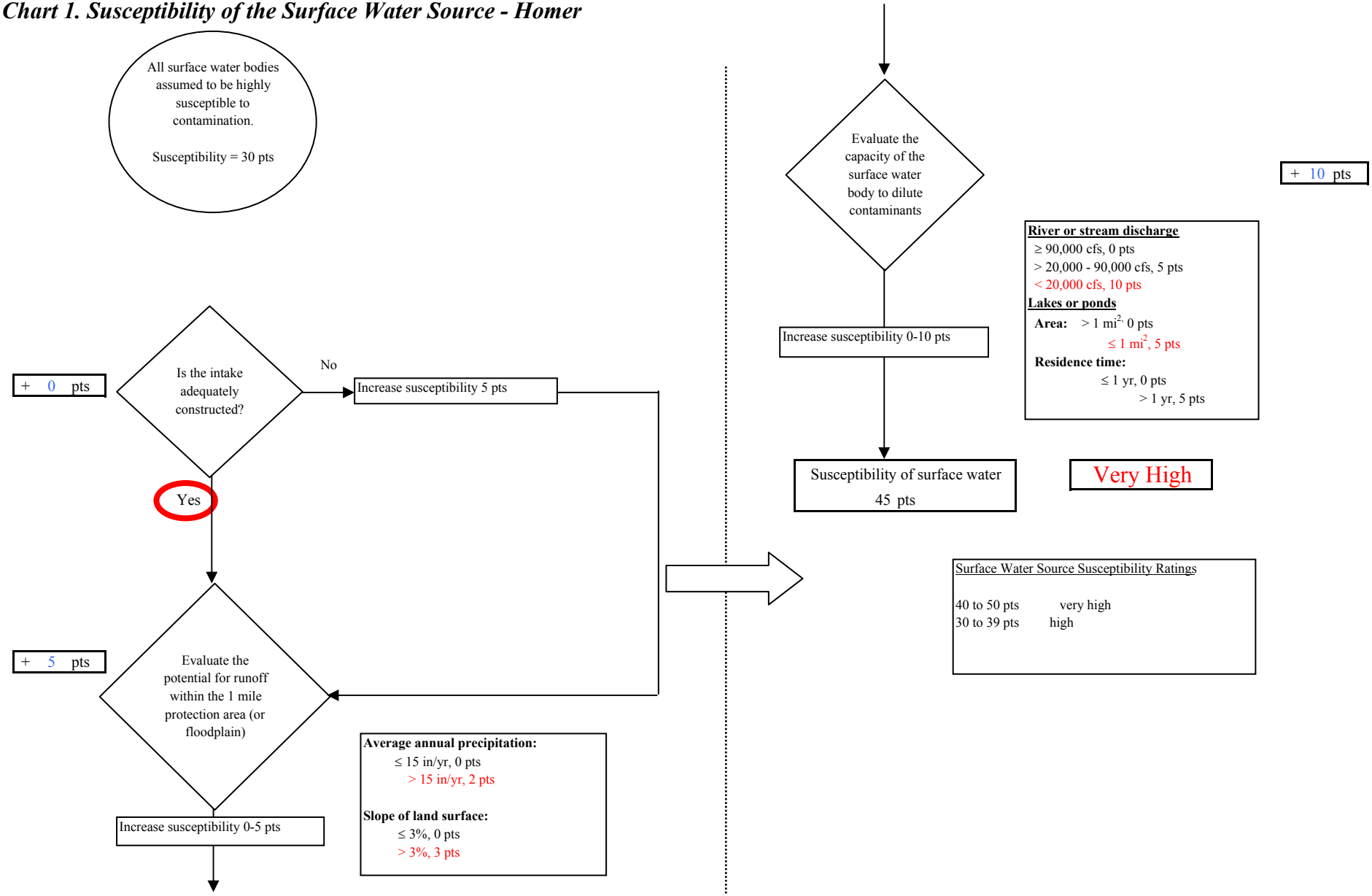
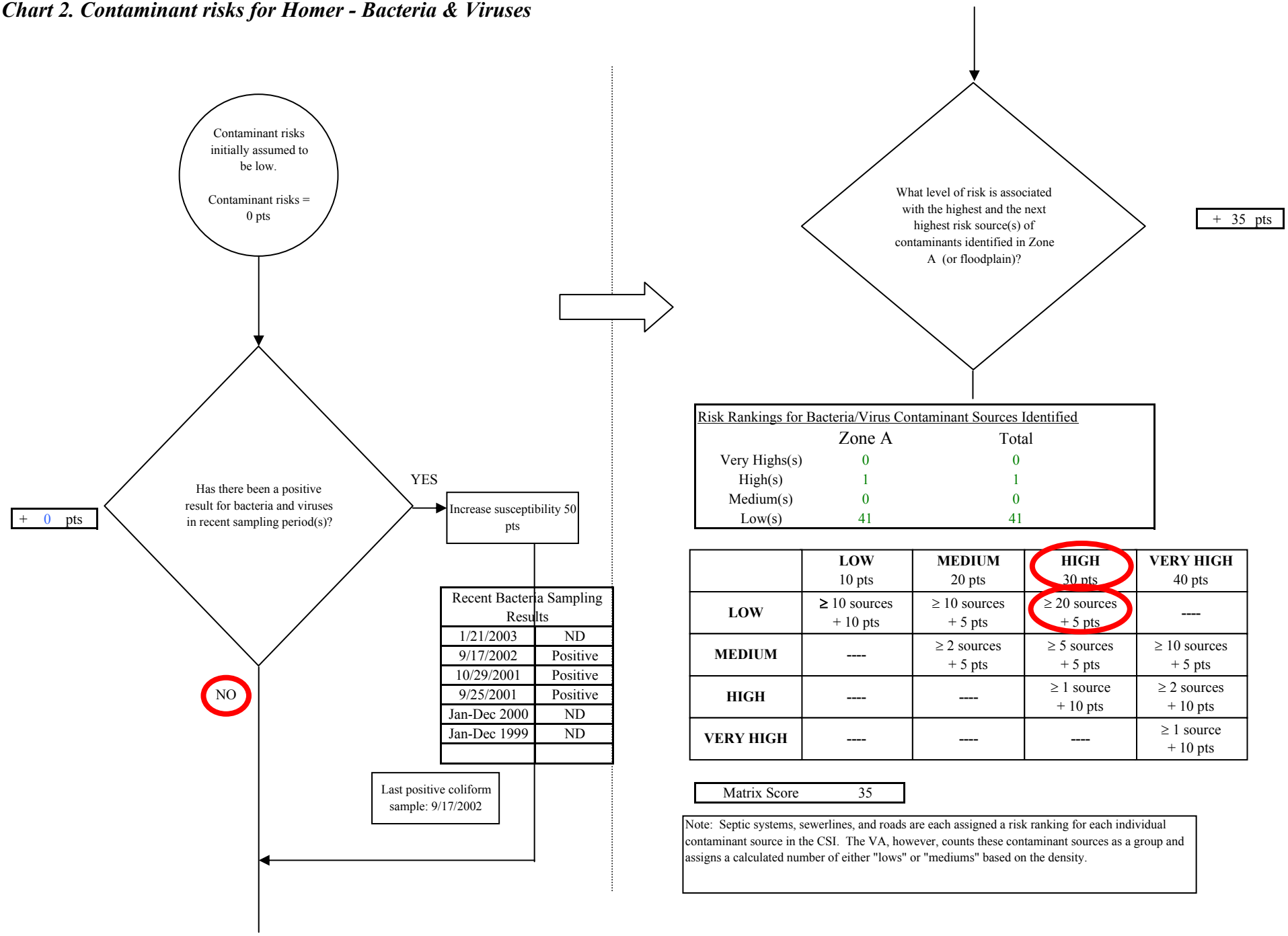


Chart 2. Contaminant risks for Homer - Bacteria & Viruses



Risk Rankings for Bacteria/Virus Contaminant Sources Identified

	Zone A	Total
Very Highs(s)	0	0
High(s)	1	1
Medium(s)	0	0
Low(s)	41	41

	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 35

Note: Septic systems, sewerlines, and roads are each assigned a risk ranking for each individual contaminant source in the CSI. The VA, however, counts these contaminant sources as a group and assigns a calculated number of either "lows" or "mediums" based on the density.

Chart 2. Contaminant risks for Homer - Bacteria & Viruses

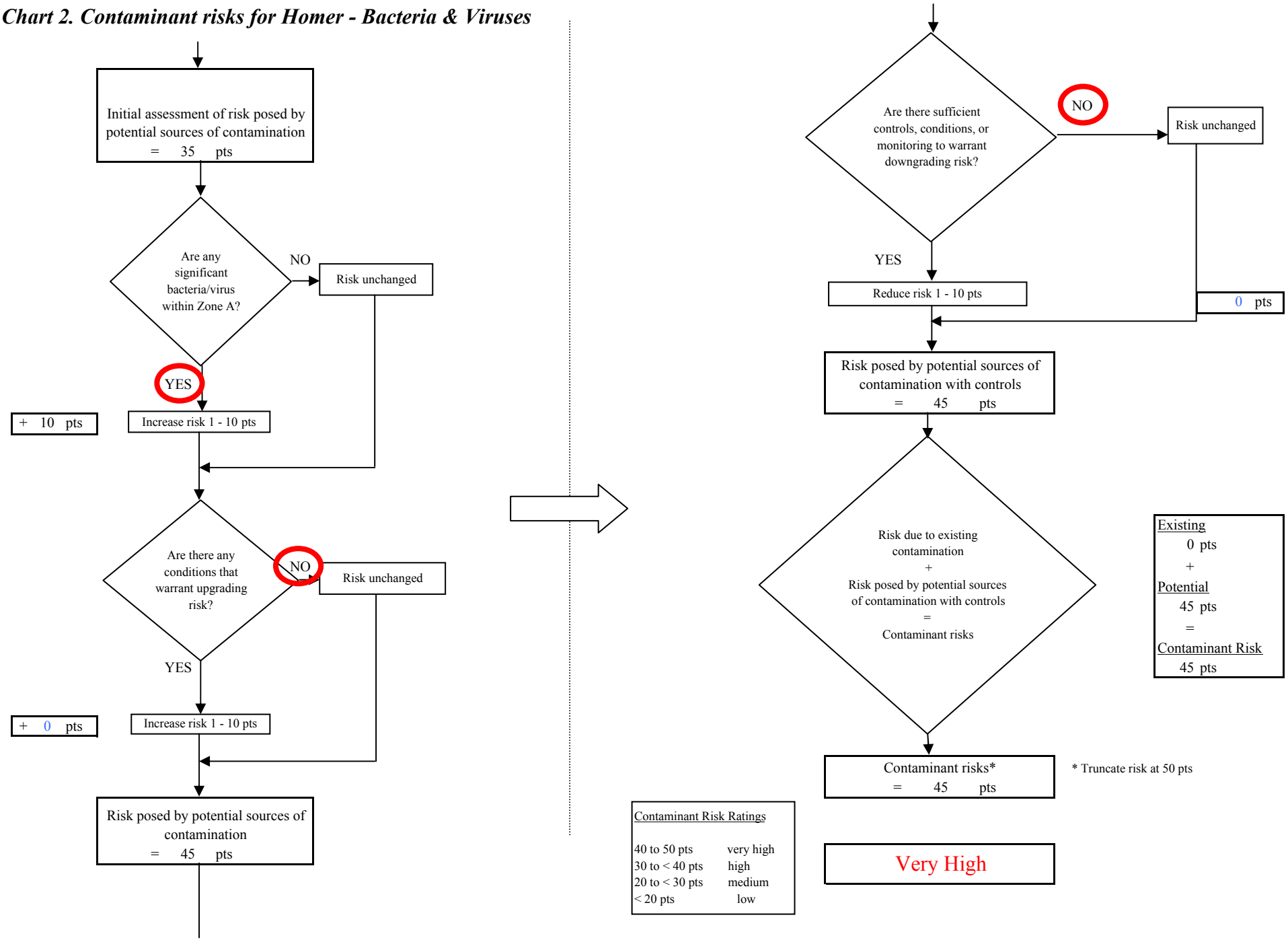


Chart 3. Vulnerability analysis for Homer - Bacteria & Viruses

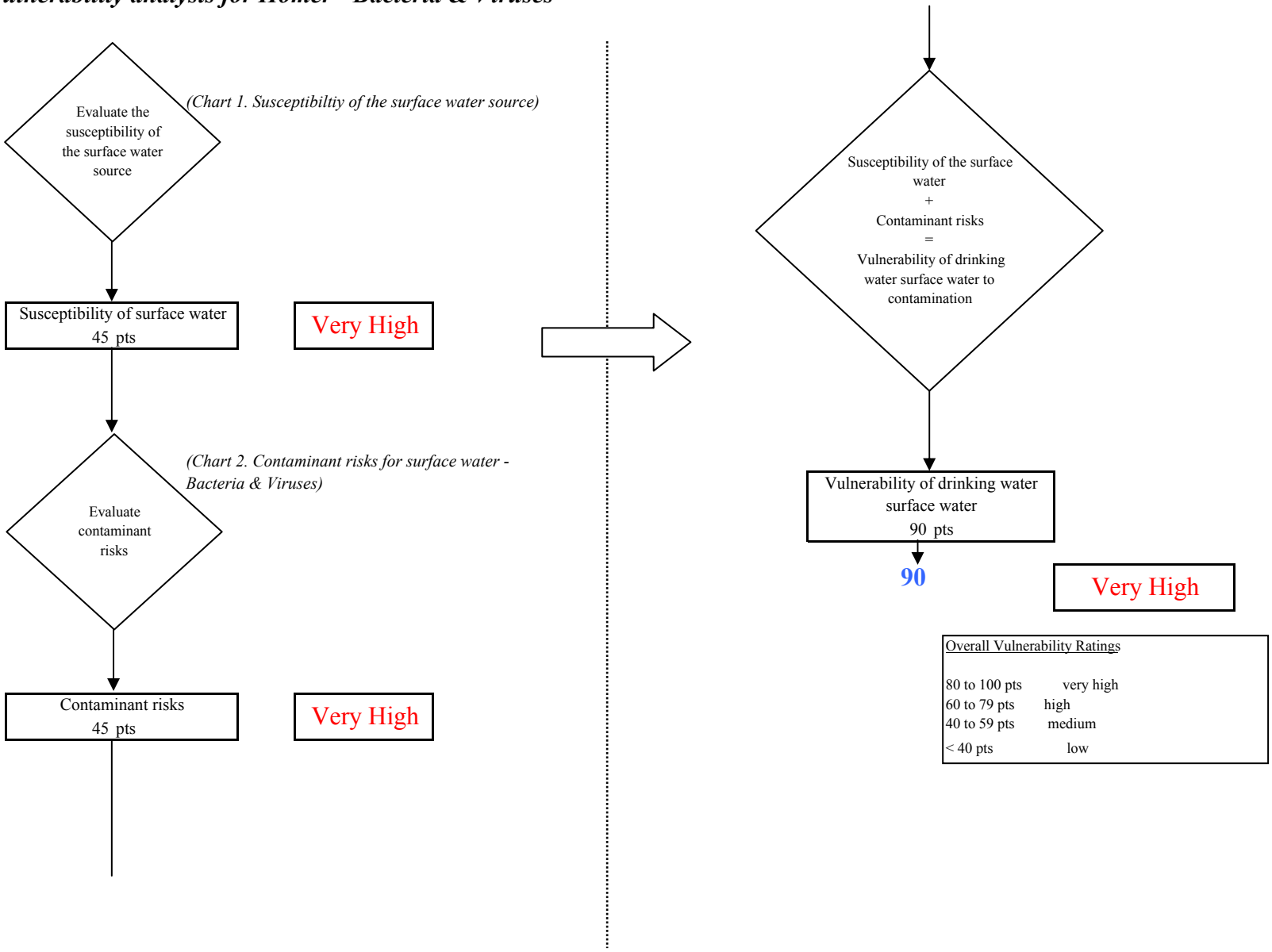


Chart 4. Contaminant risks for Homer - Nitrates and Nitrites

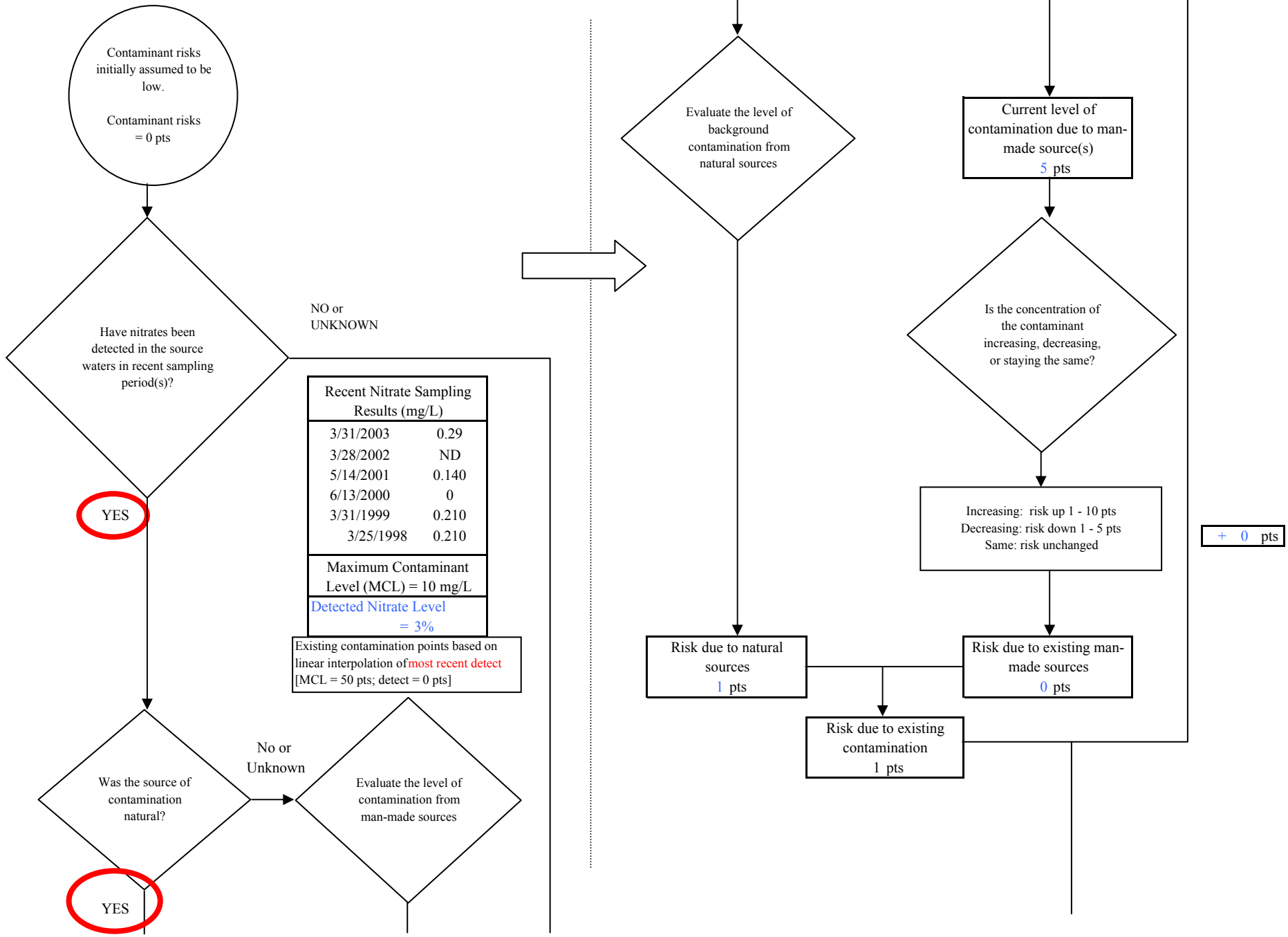


Chart 4. Contaminant risks for Homer - Nitrates and Nitrites

+ 35 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 Nitrate/Nitrite 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
Low(s)	44		44

	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 35

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 = 35 pts

Are any significant nitrate/nitrite sources in Zone A?

NO

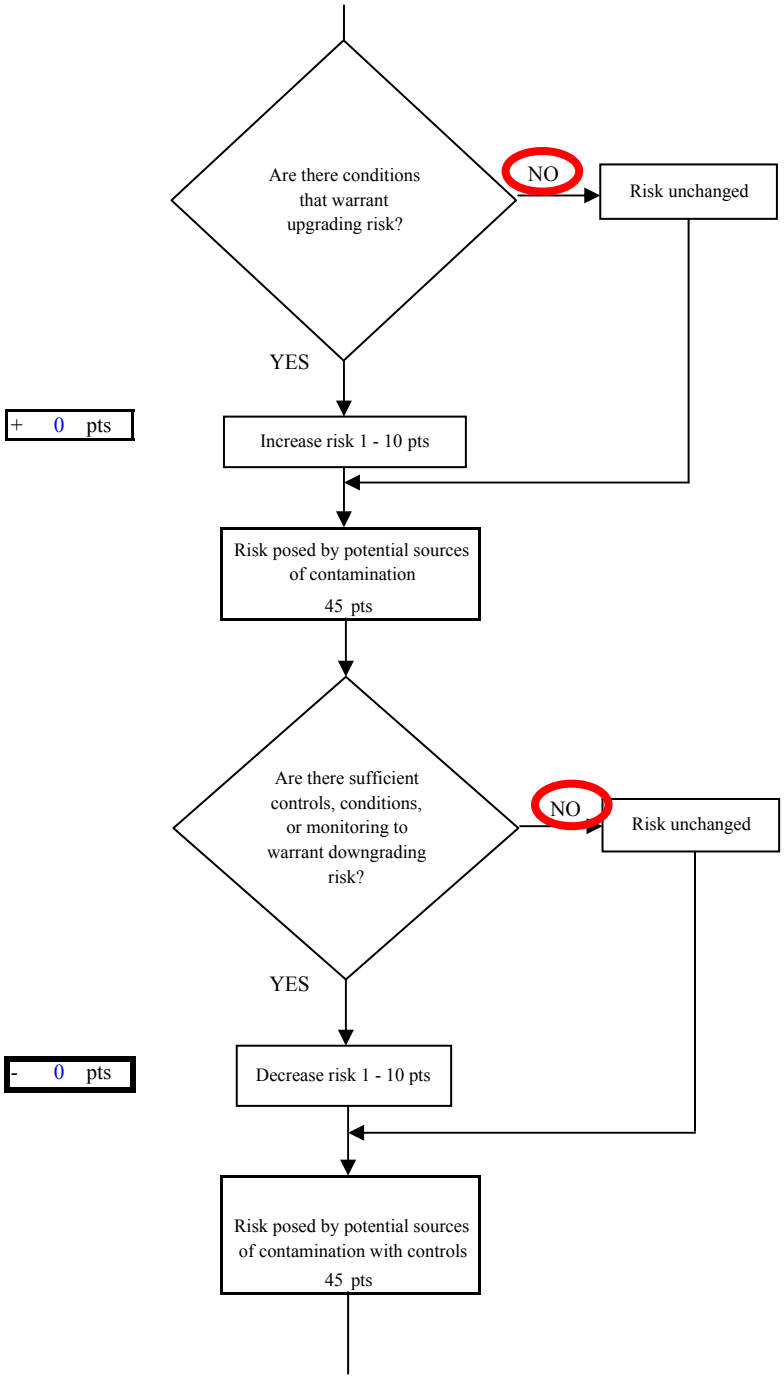
Risk unchanged

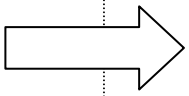
YES

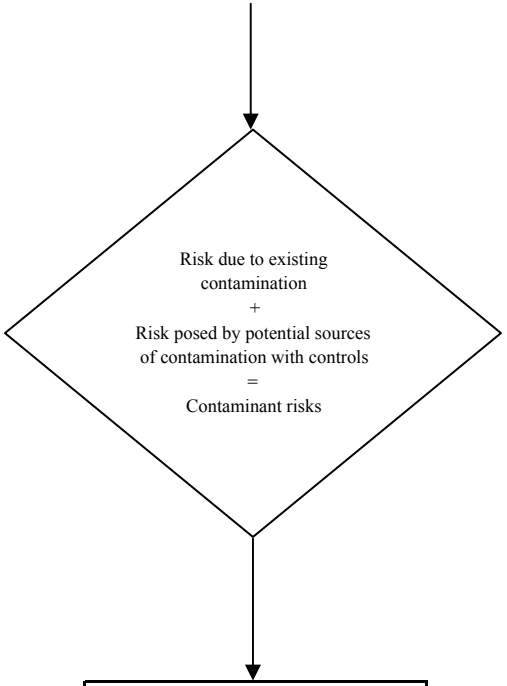
Increase risk 1 - 10 pts

+ 10 pts

Chart 4. Contaminant risks for Homer - Nitrates and Nitrites







Existing
1 pts
+
Potential
45 pts
=
Contaminant Risk
46 pts

Contaminant risks*
= 46 pts

*Truncate risk at 50 pts

Very High

Contaminant Risk Ratings

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

Chart 5. Vulnerability analysis for Homer - Nitrates and Nitrites

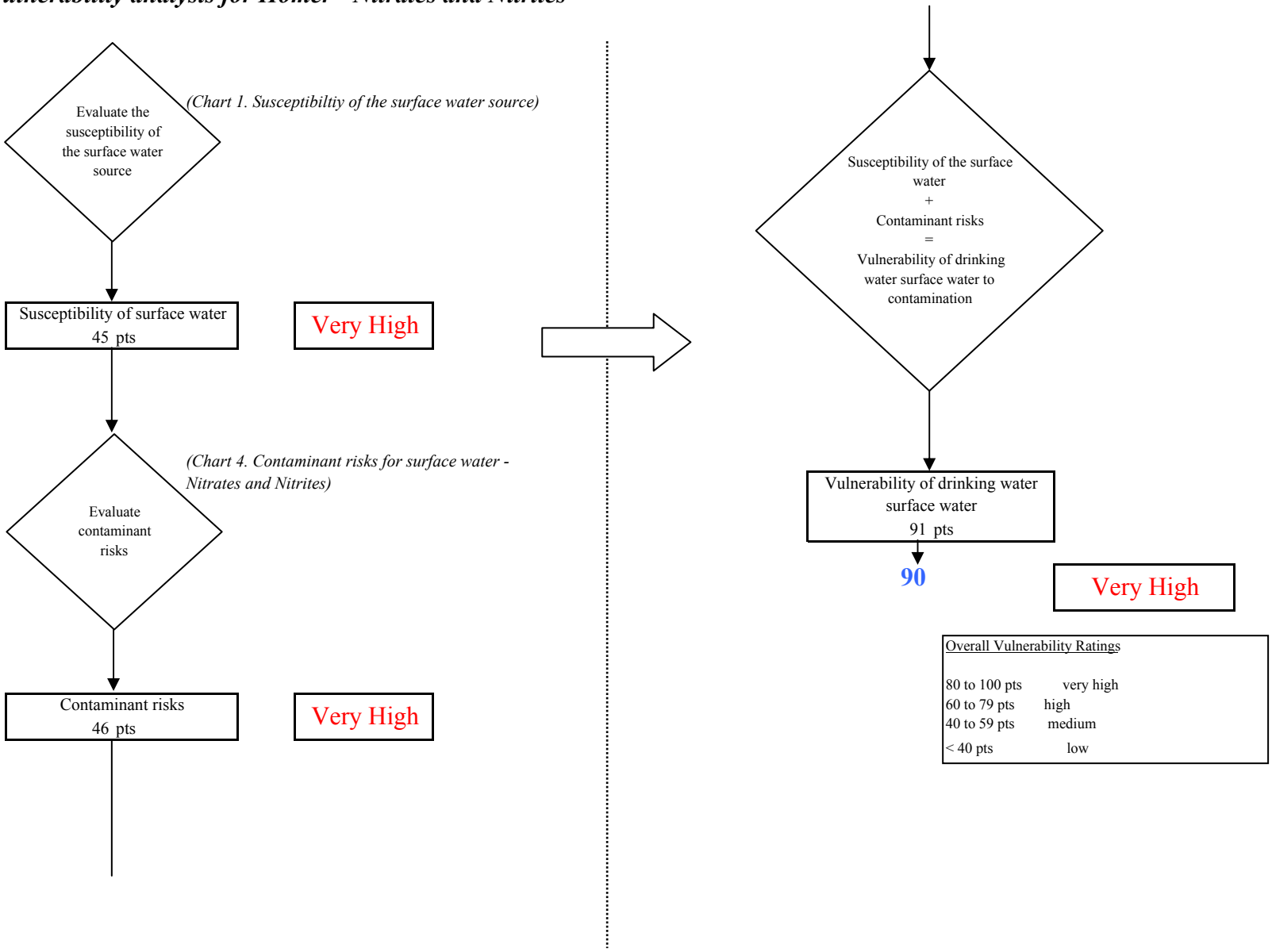


Chart 6. Contaminant risks for Homer - Volatile Organic Chemicals

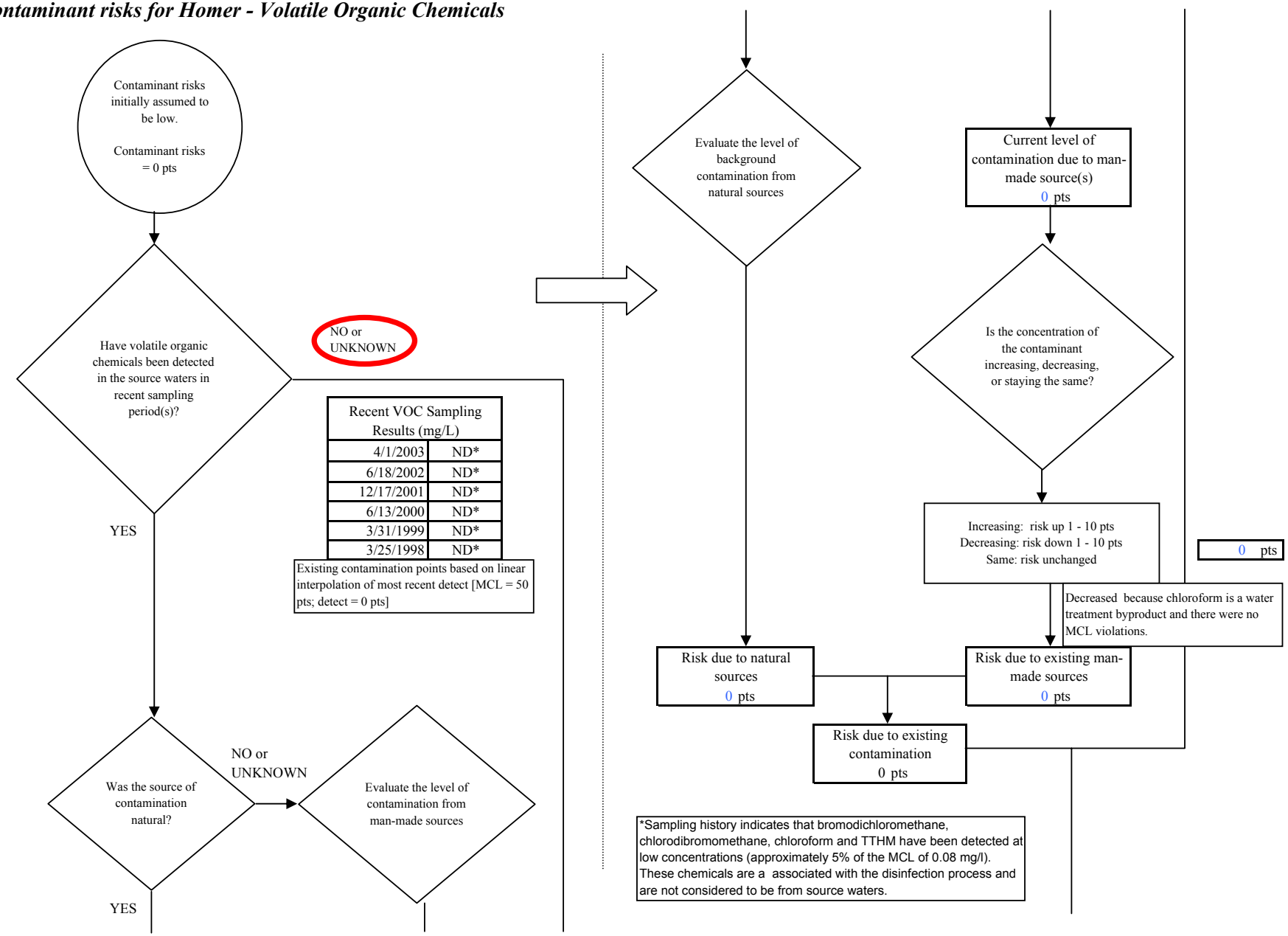
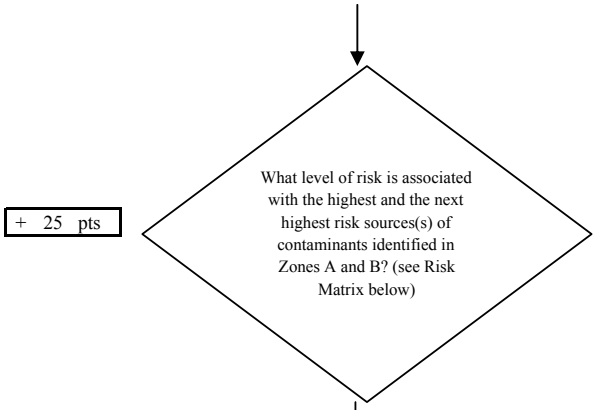


Chart 6. Contaminant risks for Homer - Volatile Organic Chemicals



+ 25 pts

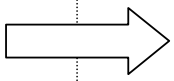
Risk Levels for VOC Sources identified in Zones A and B

	Zone A	Zone B	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	3		3
Low(s)	5		5

	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.



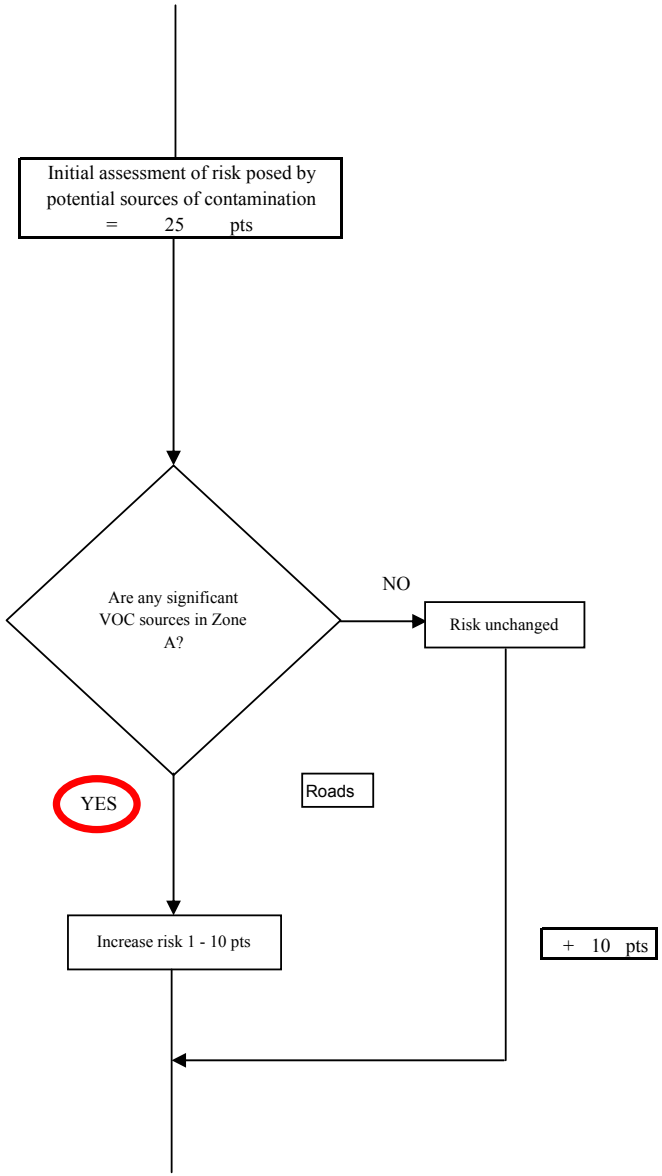


Chart 6. Contaminant risks for Homer - Volatile Organic Chemicals

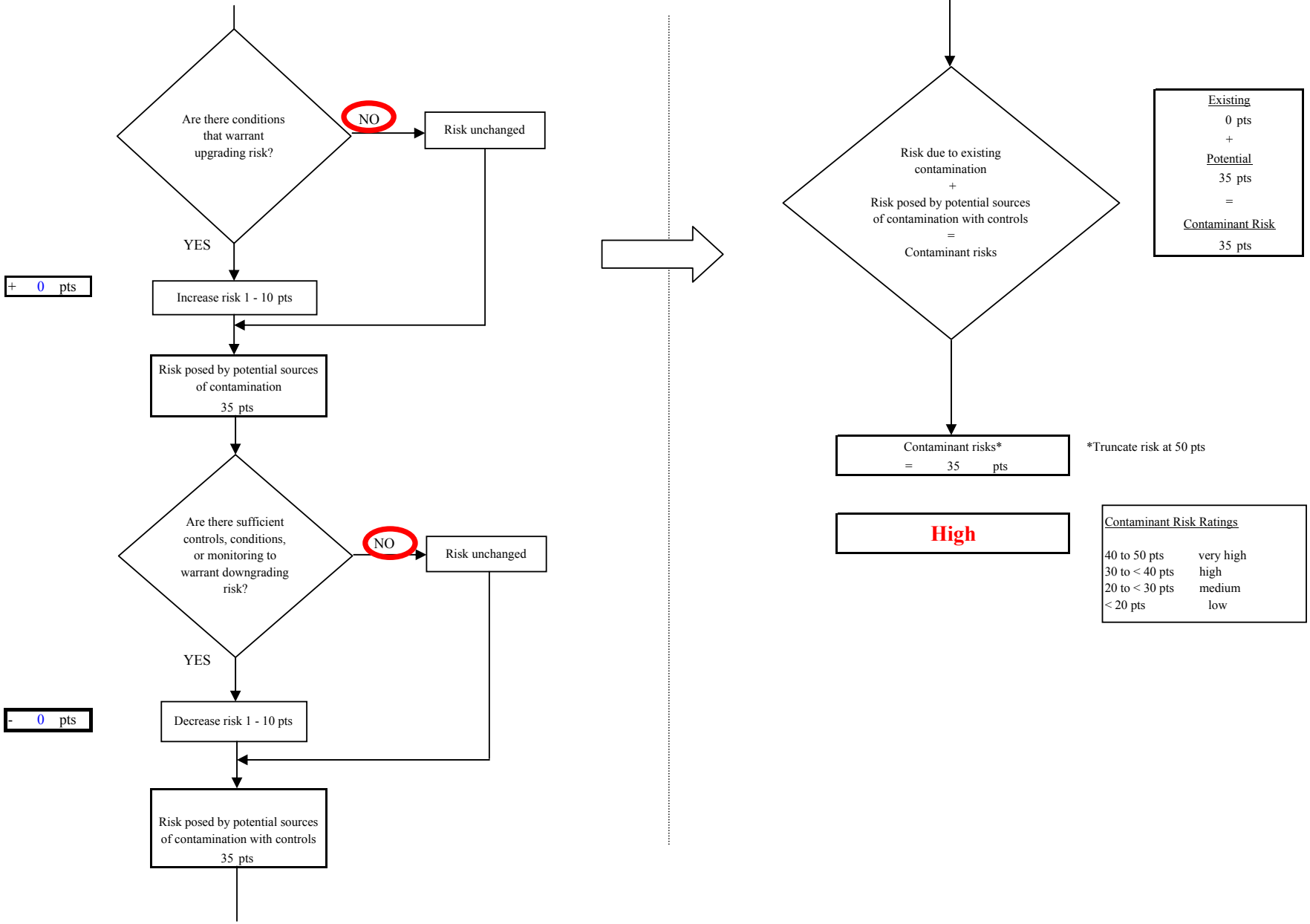


Chart 7. Vulnerability analysis for Homer - Volatile Organic Chemicals

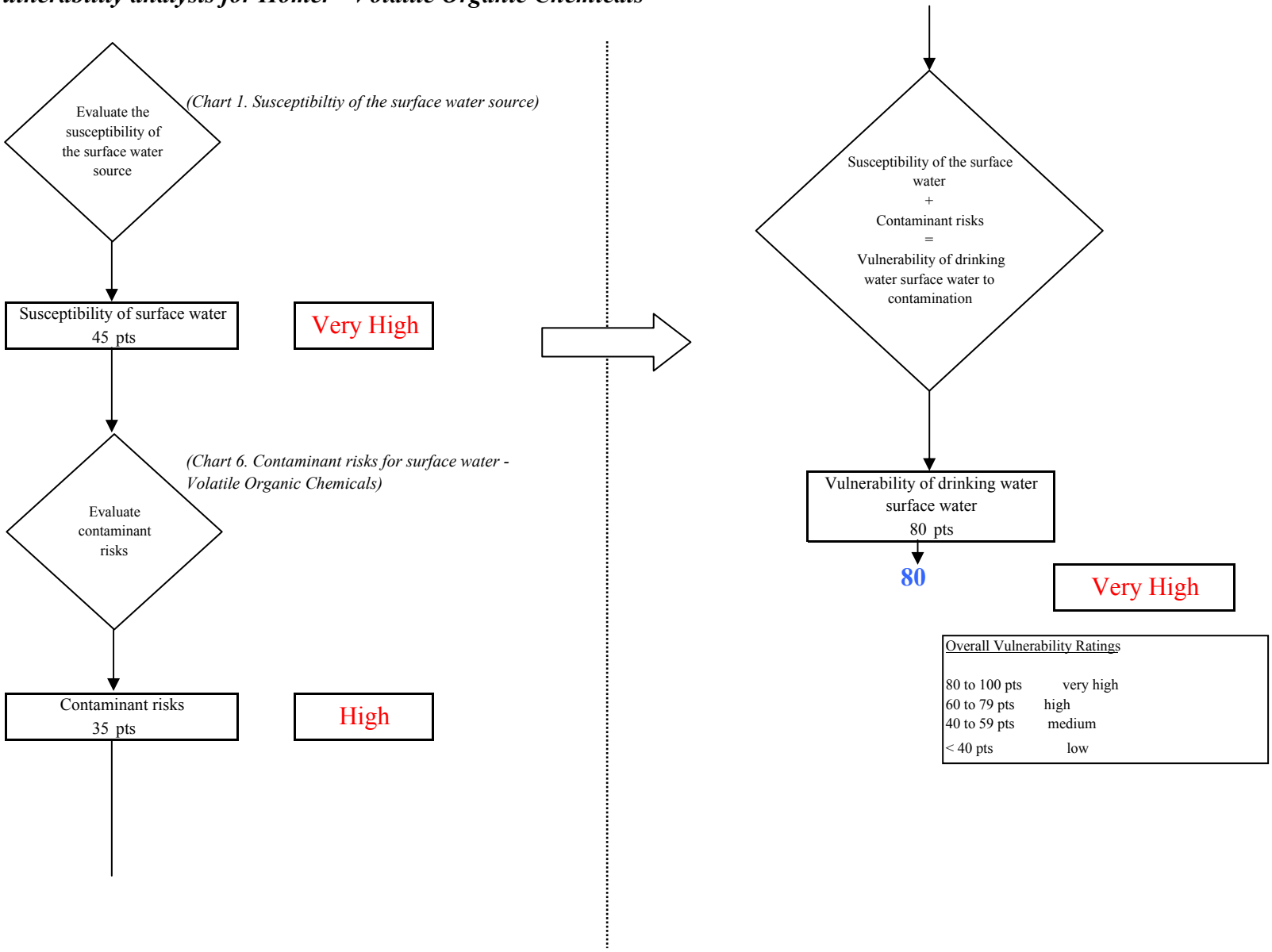


Chart 8. Contaminant risks for Homer - Heavy Metals, Cyanide and Other Inorganic Chemicals

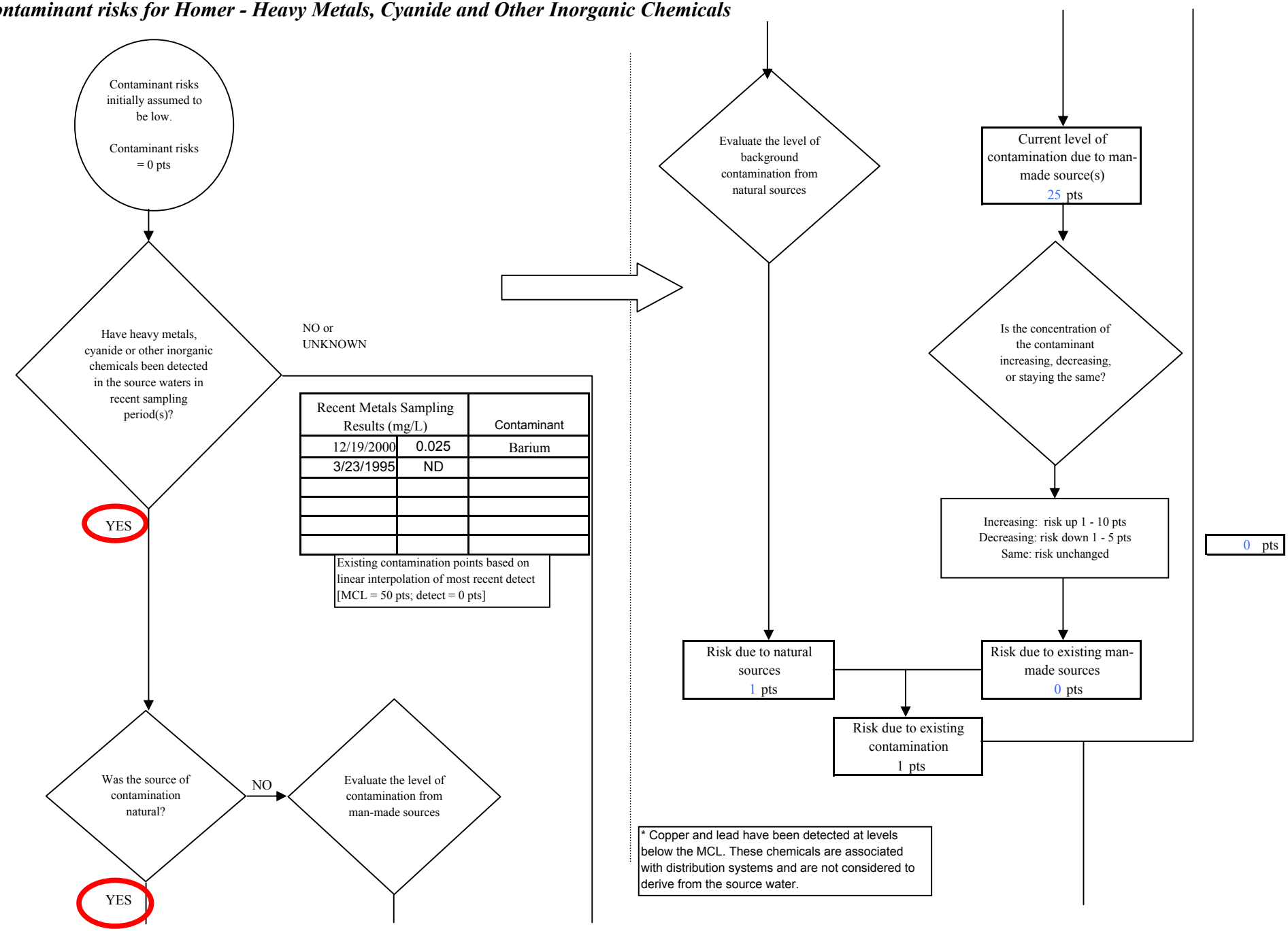
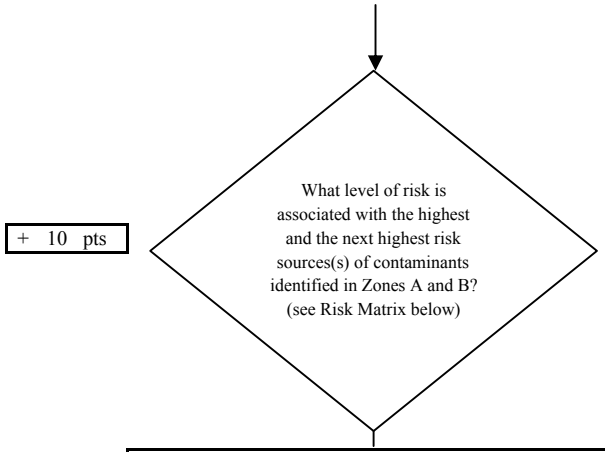


Chart 8. Contaminant risks for Homer - Heavy Metals, Cyanide and Other Inorganic Chemicals



+ 10 pts

Risk Levels for HM, Cyanide, or OIC Sources identified in Zones A and B

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

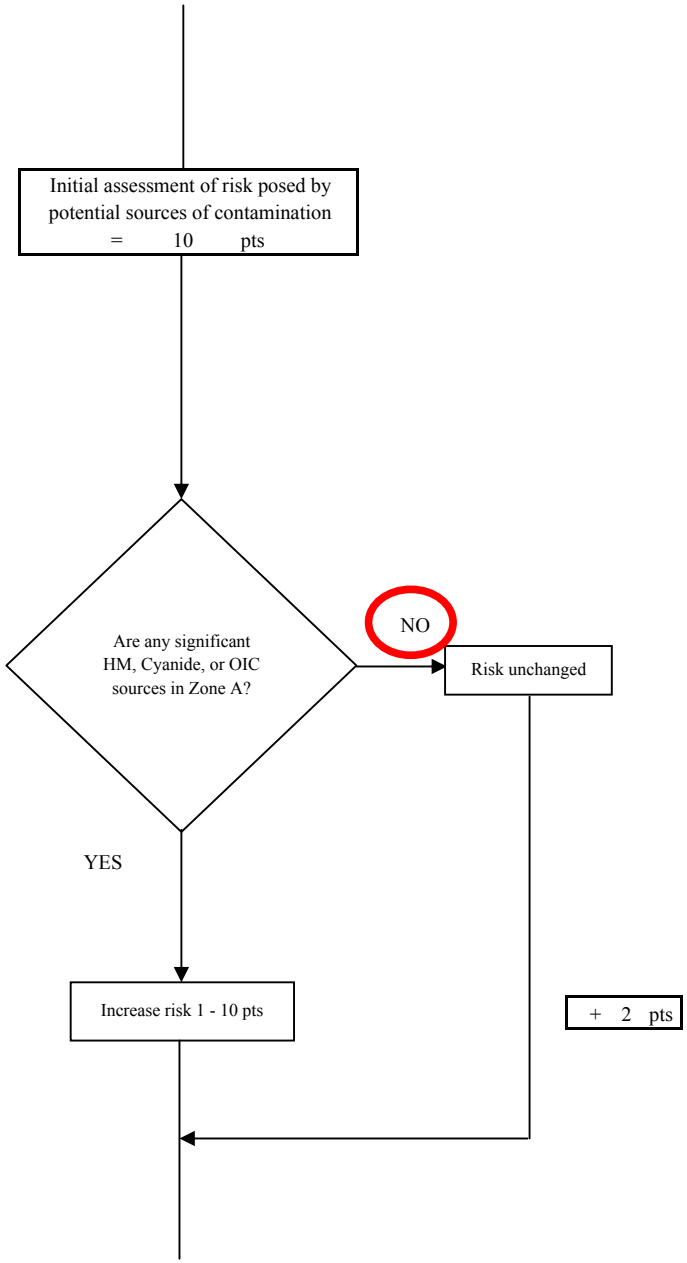


Chart 8. Contaminant risks for Homer - Heavy Metals, Cyanide and Other Inorganic Chemicals

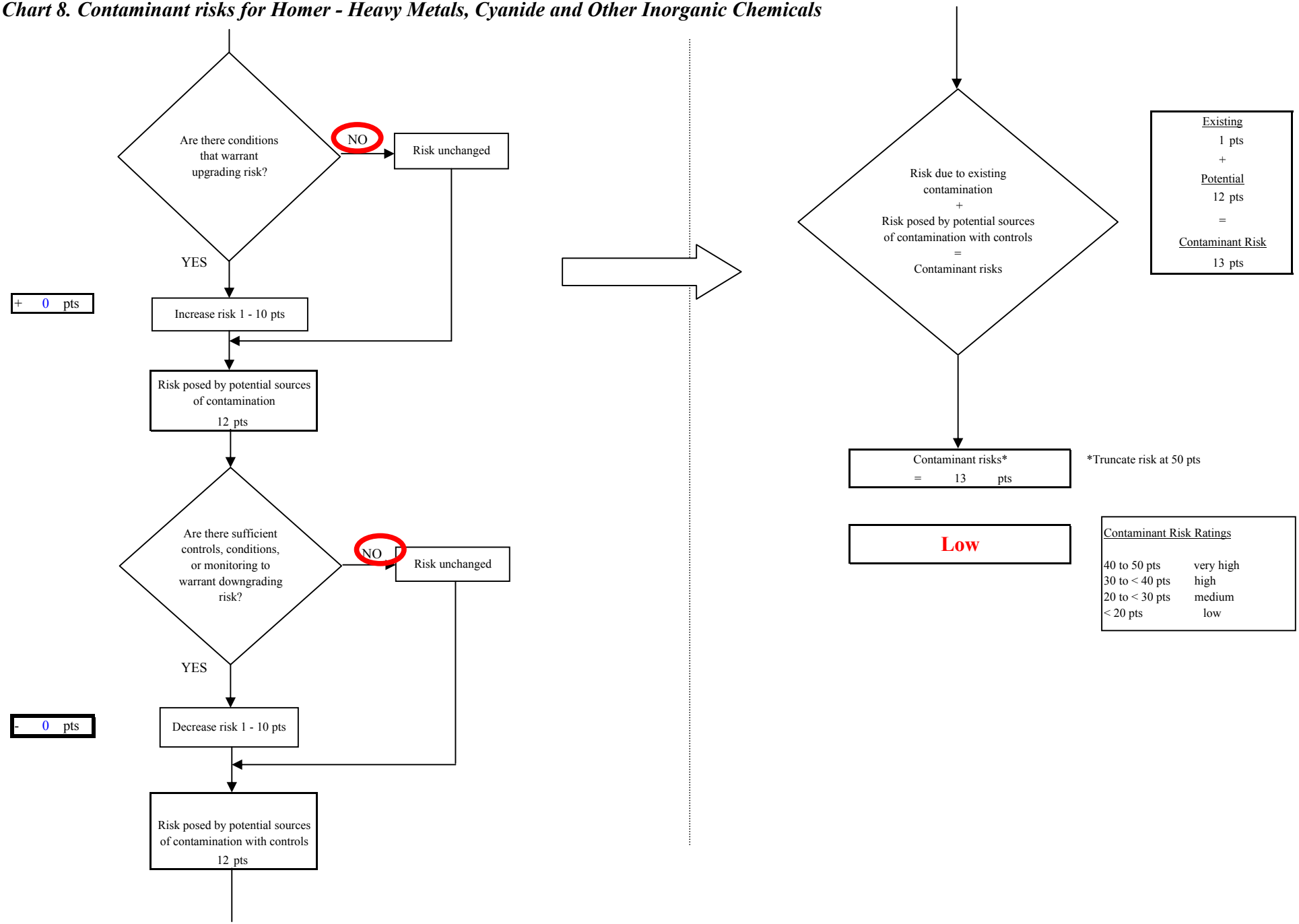


Chart 9. Vulnerability analysis for Homer - Heavy Metals, Cyanide and Other Inorganic Chemicals

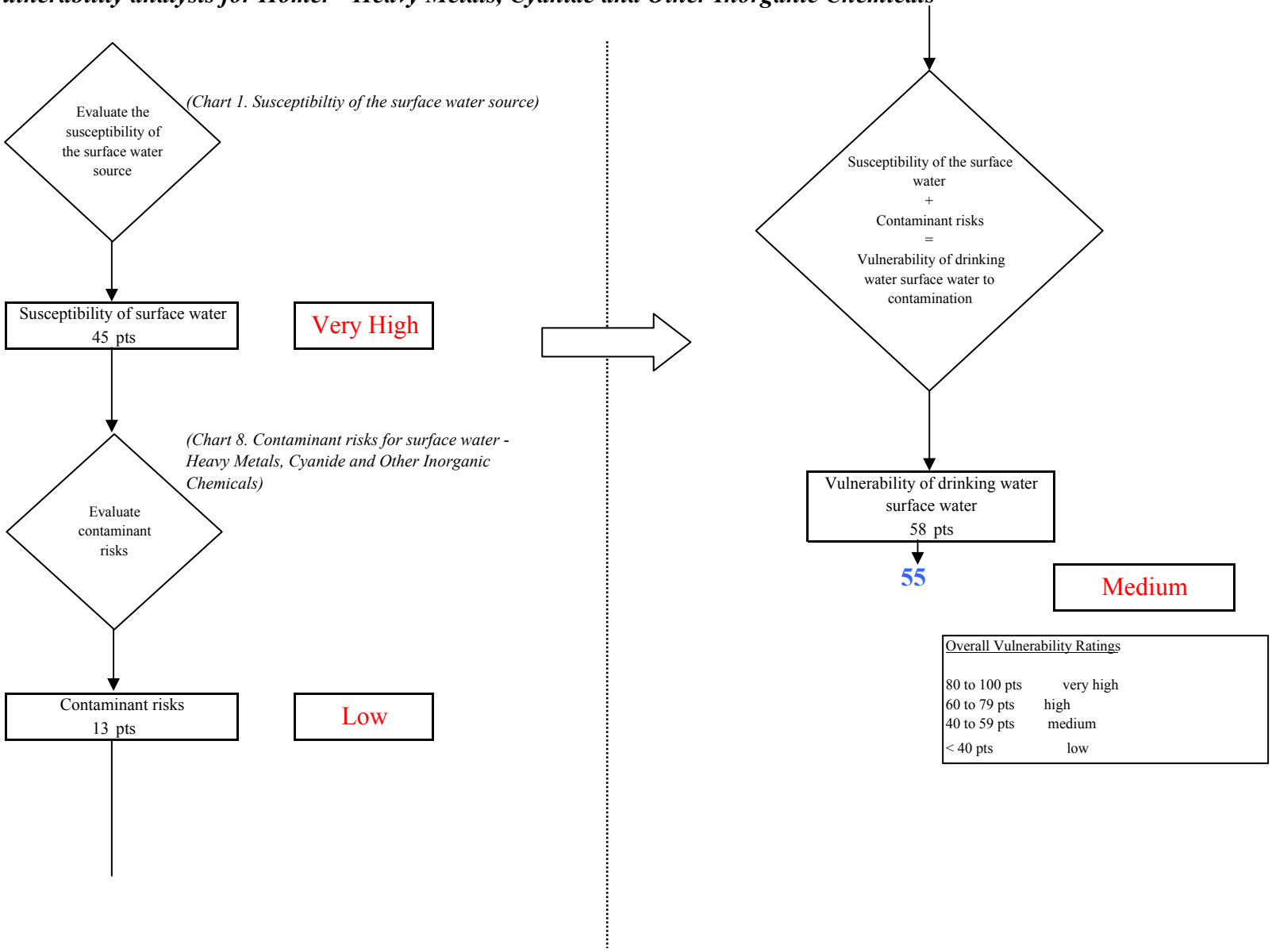


Chart 10. Contaminant risks for Homer - Synthetic Organic Chemicals

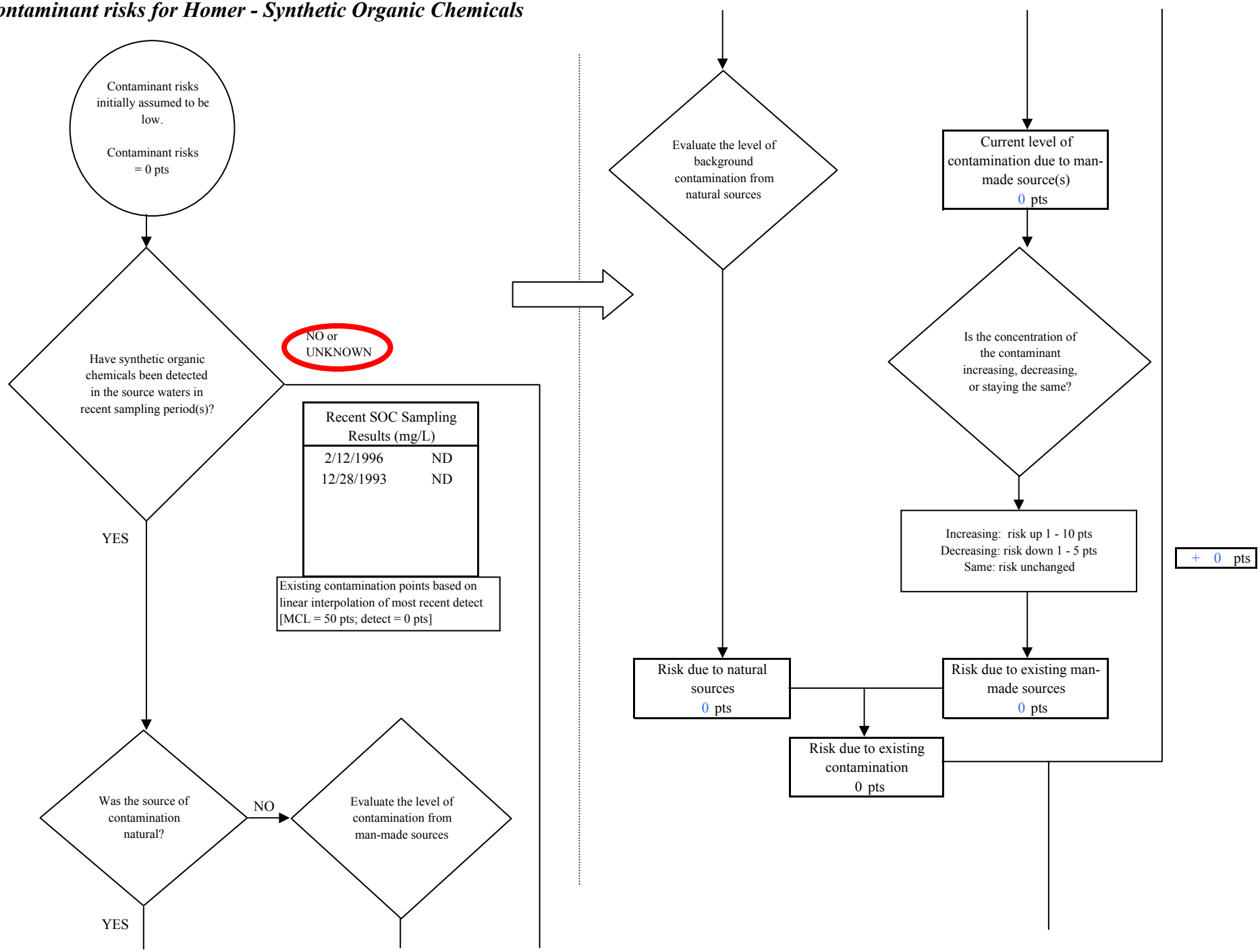
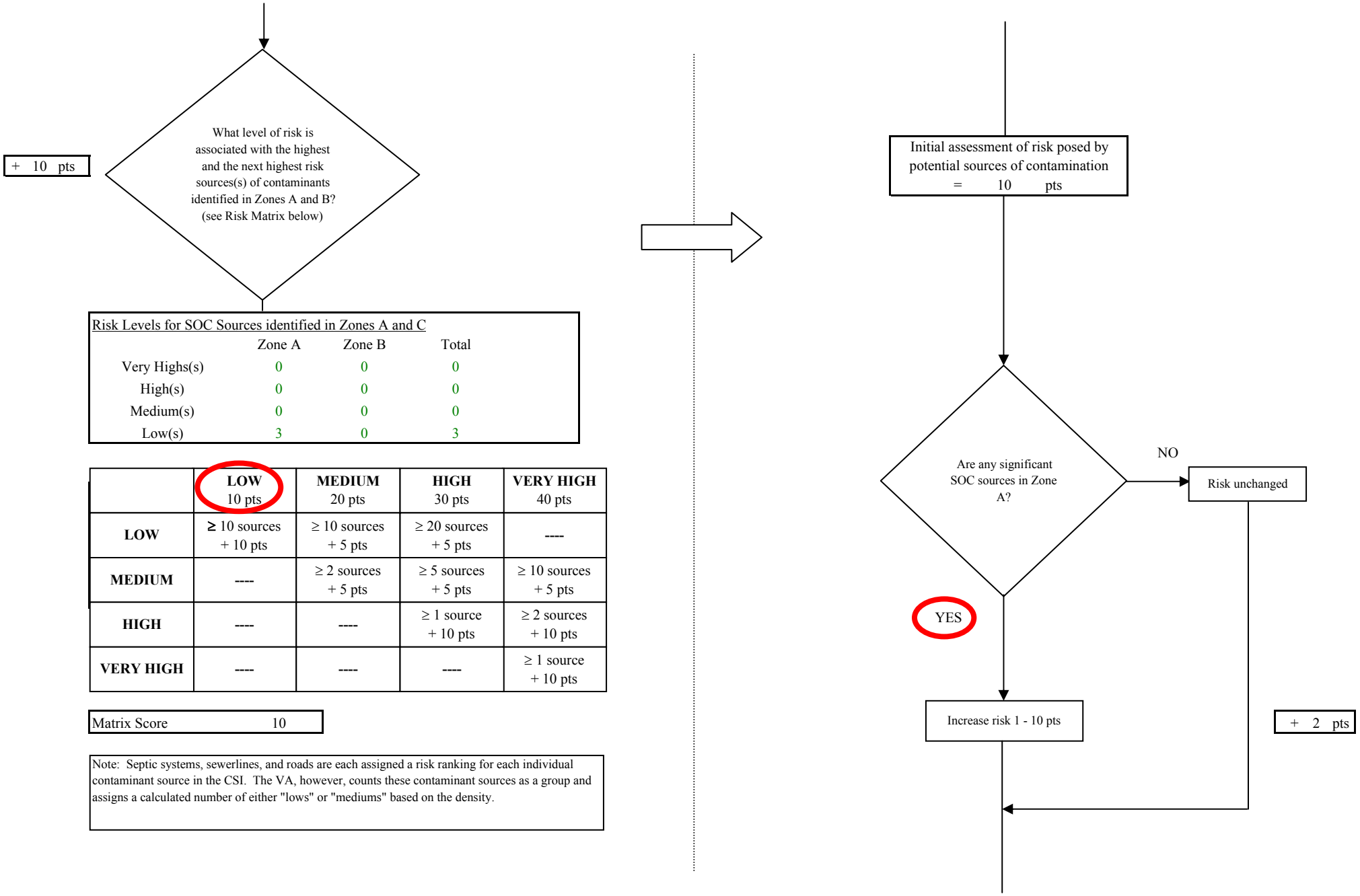


Chart 10. Contaminant risks for Homer - Synthetic Organic Chemicals



Risk Levels for SOC Sources identified in Zones A and C

	Zone A	Zone B	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	3	0	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 10. Contaminant risks for Homer - Synthetic Organic Chemicals

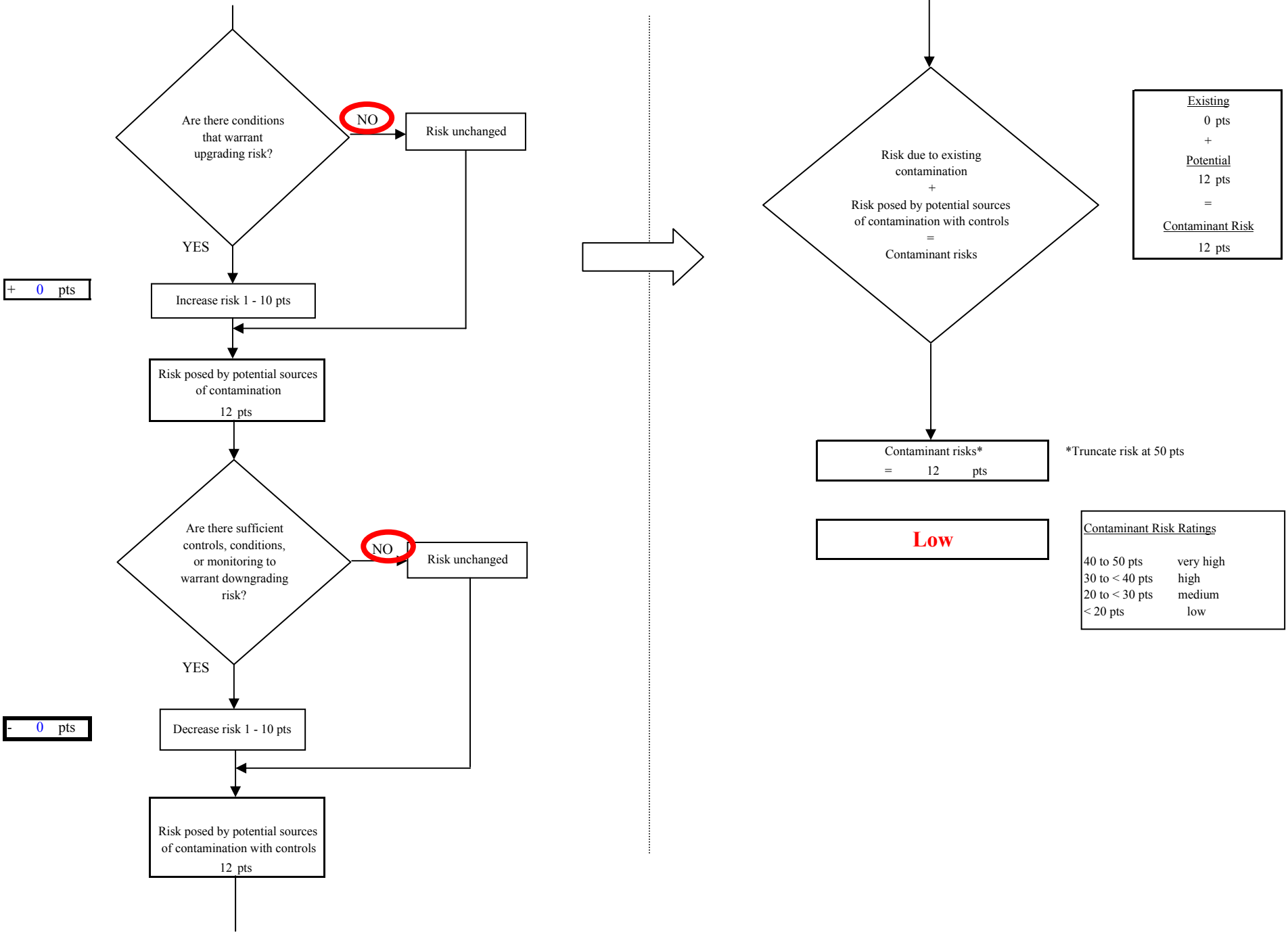


Chart 11. Vulnerability analysis for Homer - Synthetic Organic Chemicals

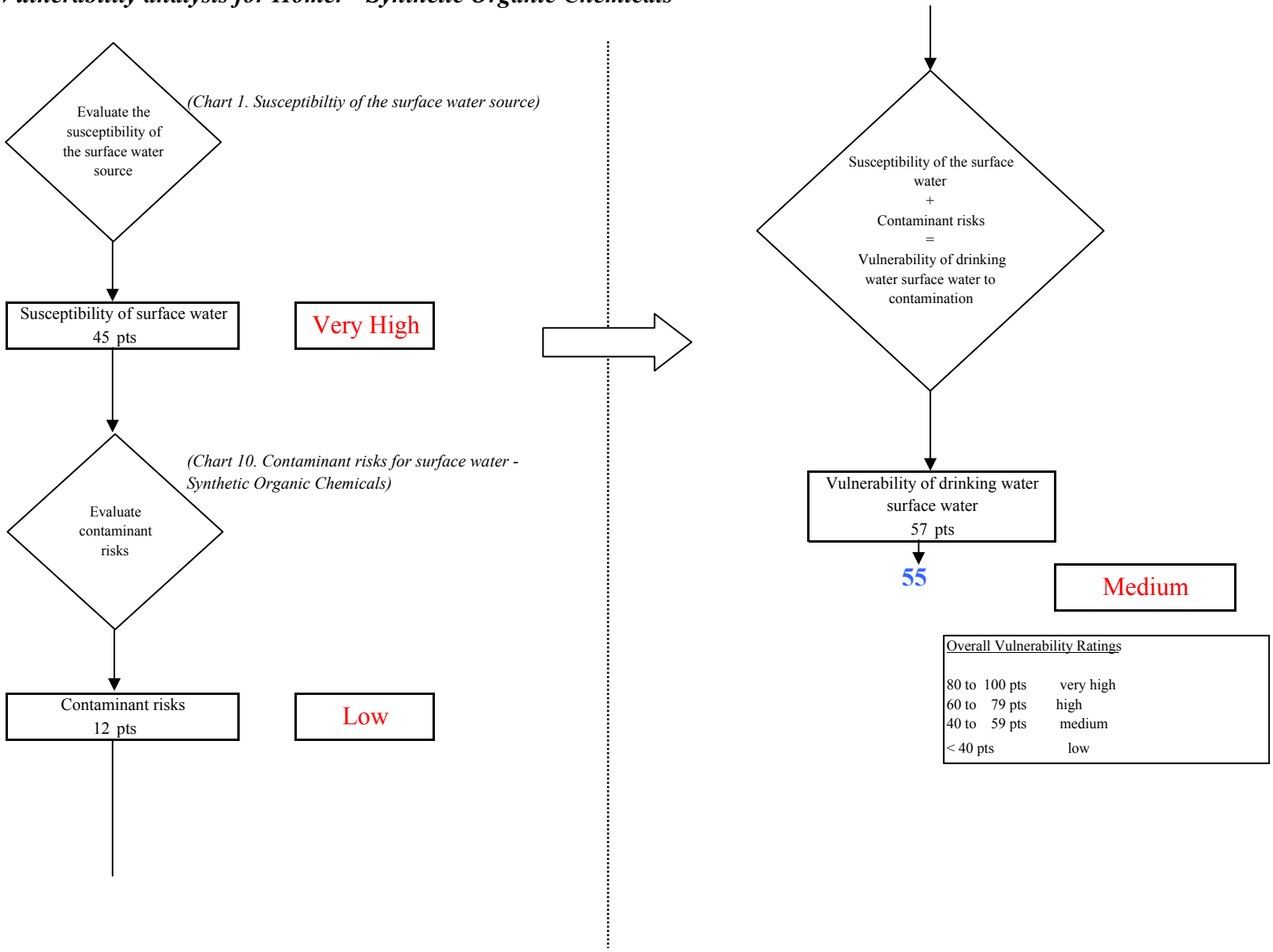


Chart 12. Contaminant risks for Homer - Other Organic Chemicals

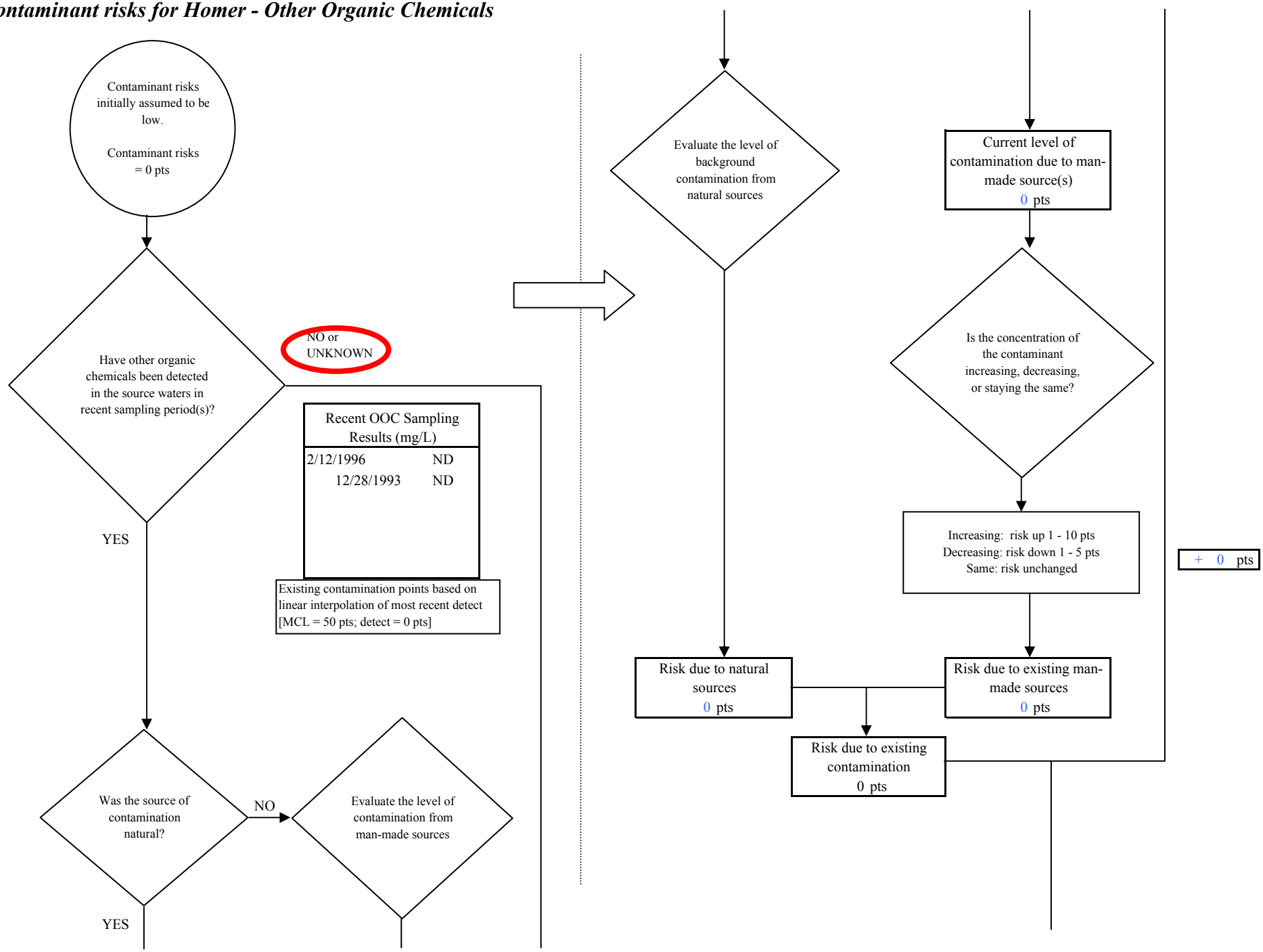
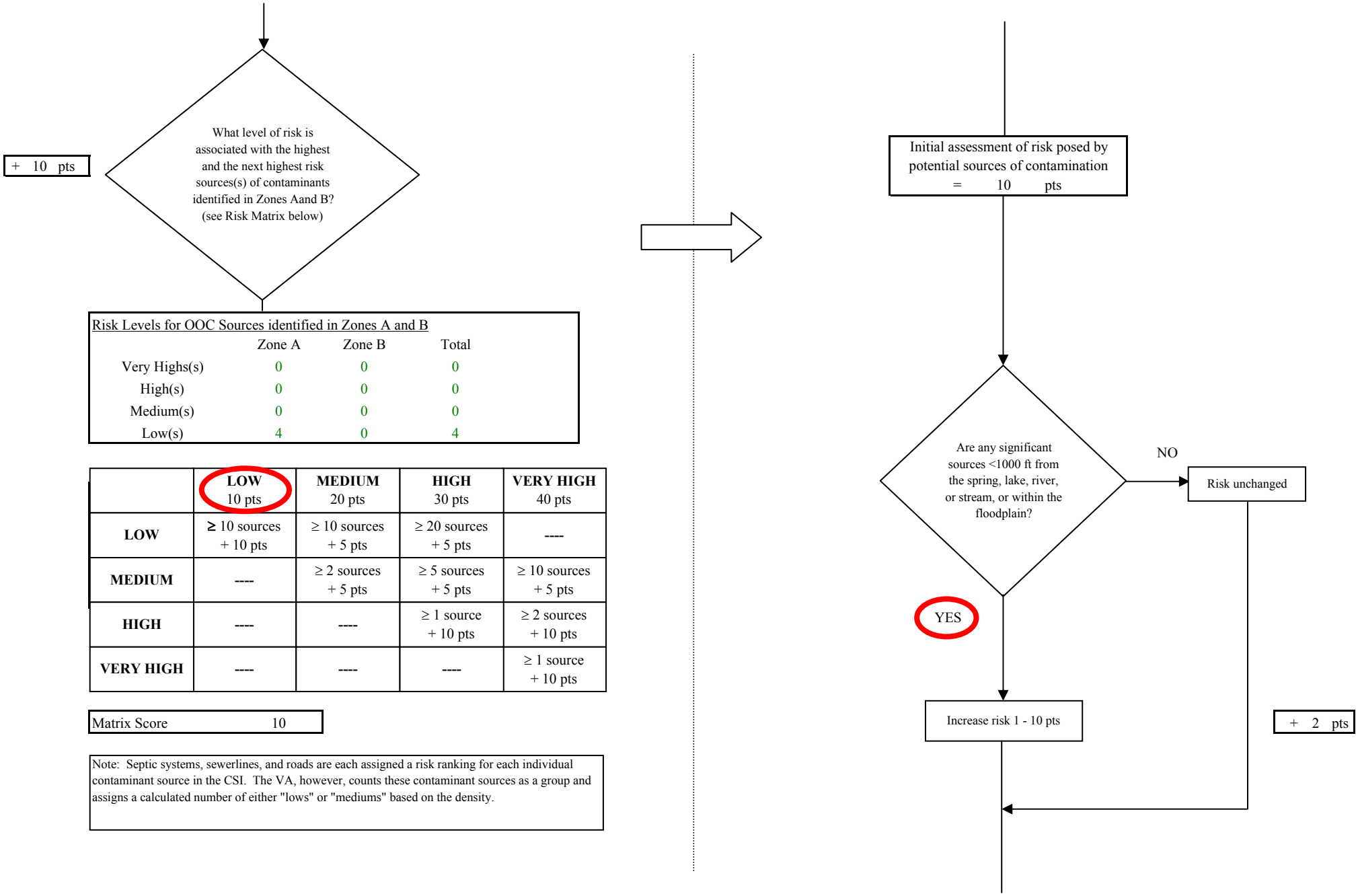


Chart 12. Contaminant risks for Homer - Other Organic Chemicals



Risk Levels for OOC 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)	4	0	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 12. Contaminant risks for Homer - Other Organic Chemicals

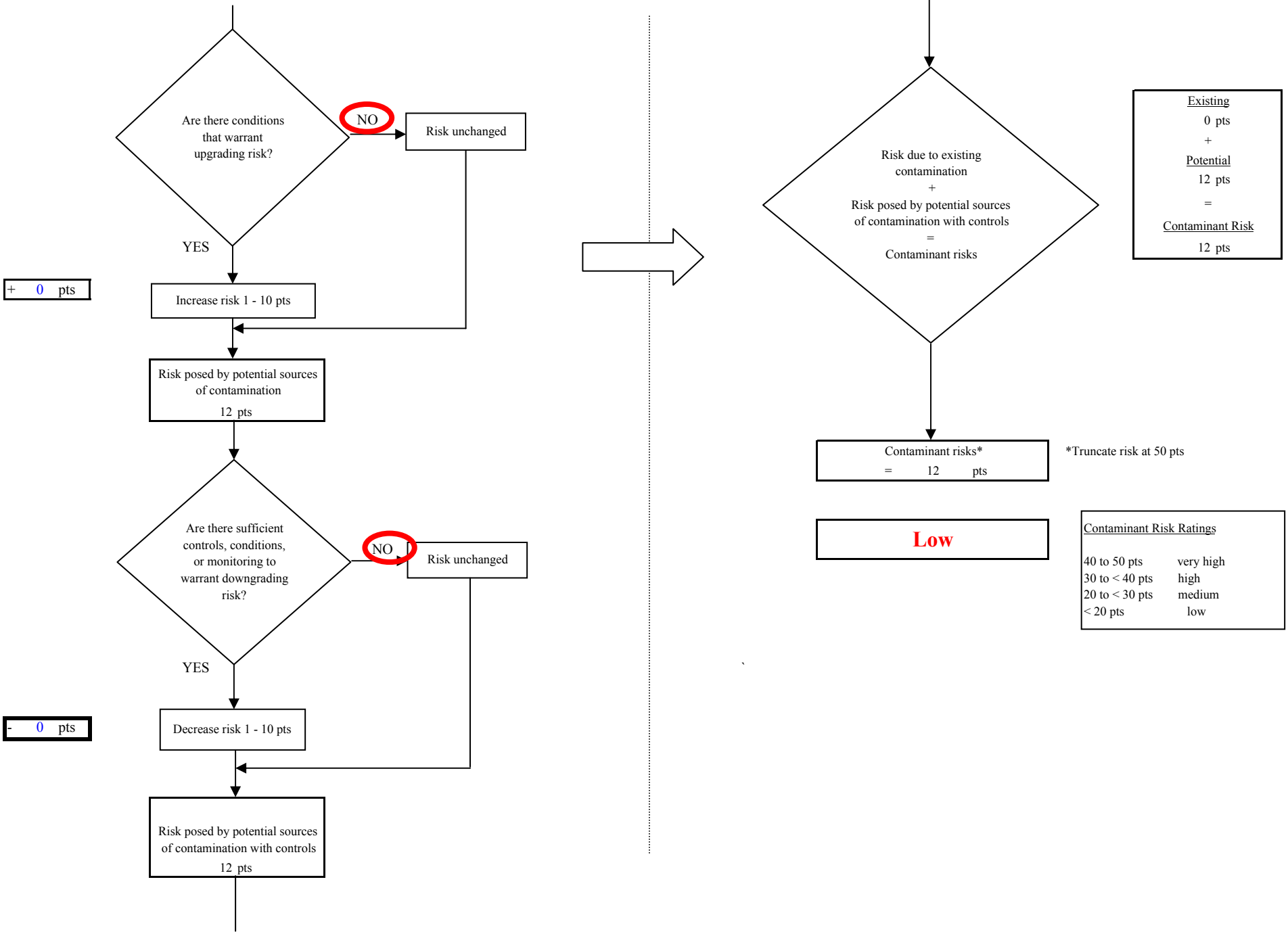


Chart 13. Vulnerability analysis for Homer - Other Organic Chemicals