Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for Chitina Fire Well No. 2, Chitina, Alaska PWSID #292738

DRINKING WATER PROTECTION PROGRAM REPORT NO. 879

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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APPENDICES

Source Water Assessment for Chitina Fire Well No. 2, Chitina, Alaska

Drinking Water Protection Program
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The public water system for Chitina Fire Well No. 2 is a Class B (transient/non-community) water system consisting of one well. Chitina Fire Well No. 2 is located in Chitina, Alaska. The wellhead received a susceptibility rating of **Low** and the aquifer received a susceptibility rating of **Low**. Combining these two ratings produces a **Low** rating for the natural susceptibility of the well. Identified potential and current sources of contaminants for Chitina Fire Well No. 2 public drinking water source include single-family septic systems; aboveground heating oil and diesel tanks; paved highways and roads; and a firehouse. These 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 Chitina Fire Well No. 2 received a vulnerability rating of **Low** for bacteria and viruses and nitrates and nitrites; and **Medium** for volatile organic chemicals.

CHITINA FIRE WELL NO. 2 PUBLIC DRINKING WATER SYSTEM

Chitina Fire Well No. 2 public water system is a Class B (transient/non-community) water system. The system consists of one well located in Chitina, Alaska (See Map 1 of Appendix A). Chitina is located on the west bank of the Copper River at its confluence with the Chitina River, at Mile 34 of the Edgerton Highway, 53 miles southeast of Copper Center. It lies outside the western boundary of the Wrangell-St. Elias National Park and Preserve, 66 miles southeast of Glennallen. The population of Chitina is approximately 130.

Snowfall averages 52 inches, with a total annual precipitation of 12 inches. Although the quality of the groundwater can vary significantly in a short distance, groundwater supplies are generally abundant in the area. Residents haul water from Chitina Spring, Trout and Suzie Lakes, or have individual wells. Many of the homes are occupied only seasonally, and less than 20% are completely plumbed.

The elevation for Chitina is 1,000 feet. Drainages in this area generally flow east toward the Copper River.

According to a Sanitary Survey dated August 6, 1999, the existing well was installed in 1991 with 6-inch diameter casing to a depth of 284 feet below ground surface. It is assumed that the length of the well screen is 10 feet. The Survey indicates that the land surface is sloped away from the well, providing adequate surface water drainage. The well is grouted according to ADEC standards. Proper grouting provides added protection against contaminants traveling along the well casing and into source waters.

This system operates year round and serves approximately 80 residents and 25 non-residents through one service connection.

CHITINA FIRE WELL NO. 2 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 groundwater. These areas are determined by looking at the characteristics of the soil, groundwater, aquifer, and well.

The most probable area for contamination to reach the drinking water well is the area that contributes water to the well, the groundwater recharge 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 well, this area will serve as the focus for voluntary protection efforts.

An analytical calculation was used to determine the size and shape of the DWPA. The input parameters describing the attributes of the aquifer in this calculation were estimated from information contained in the well logs and/or the Sanitary Survey. Additional methods were also used to take into account any uncertainties in groundwater flow and aquifer characteristics to arrive at a meaningful DWPA (Please refer to the Guidance Manual for Class B Public Water Systems for additional information).

The DWPAs established for wells by the ADEC are usually separated into four zones. These zones correspond to differences in the time-of-travel (TOT) of the water moving through the aquifer to the well.

The TOT for contaminants within the water varies and is dependent on the physical and chemical characteristics of each contaminant. The following is a summary of the four protection area zones for wells and the calculated time-of-travel for each:

Table 1. Definition of Zones

Zone	Definition
A	¼ the distance for the 2-yr. time-of-travel
B	Less than the 2 year time-of-travel
C	Less Than the 5 year time-of-travel
D	Less than the 10 year time-of-travel

The DWPA for Chitina Fire Well No. 2 extends over 2 miles to the west of the well, and includes only Zones A. The well is completed in fractured rock. Because the groundwater system includes fractured bedrock, the TOT may be more rapid than predicted. For this reason, the zones related to TOT have been expanded to include only Zone A. Development in the vicinity of the well is limited to only Zone A (See Map 1 of Appendix A).

INVENTORY OF POTENTIAL AND EXISTING CONTAMINANT SOURCES

The Drinking Water Protection Program has completed an inventory of potential and existing sources of contamination within the Chitina Fire Well No. 2 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

The sources are displayed on Map 2 of Appendix C and summarized in Table 1 of Appendix B.

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. Only "Very High" and "High" rankings are inventoried within the outer Zone D due to the probability of contaminant dilution by the time the contaminants get to the well.

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 CHITINA FIRE WELL NO. 2 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 Wellhead' to contamination by looking at the construction of the well 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 well. 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 well and the aquifer.

Susceptibility of the Wellhead (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 Well)
(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 well for Chitina Fire Well No. 2 is reportedly completed in a confined aquifer. Because aquifers are recharged by 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 Chitina Fire Well No. 2.

Table 2. Susceptibility

	Score	Rating
Susceptibility of the Wellhead	5	Low
Susceptibility of the Aquifer	7	Low
Natural Susceptibility	12	Low

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	12	Low
Nitrates and/or Nitrites	13	Low
Volatile Organic Chemicals	35	High

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	25	Low
Nitrates and Nitrites	25	Low
Volatile Organic Chemicals	45	Medium

Bacteria and Viruses

The contaminant risk for bacteria and viruses is **Low** with single-family septic systems and paved highways and roads representing the risks to the drinking water well (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. Recent sampling events indicated no recent positive results were detected for bacteria and viruses. However, after combining the contaminant risks with the overall natural susceptibility of the well, the vulnerability of the well to contamination by bacteria and viruses is **Low**.

Nitrates and Nitrites

The contaminant risk for nitrates and nitrites is **Low** with single-family septic systems and paved highways and roads representing the risks to this source of public drinking water (See Chart 5 - Contaminant Risks for Nitrates and/or Nitrites in Appendix D).

Sampling history for Chitina Fire Well No. 2 indicates that nitrates have been detected in the water, but only in very low concentrations (at 0.665 mg/L on 5/19/97) or 7% of the Maximum Contaminant Level (MCL). The MCL is the maximum level of contaminant that is allowed to exist in drinking water and still be consumed by humans without harmful health effects. Due to the high solubility and weak retention by soil, nitrates are very mobile, moving at approximately the same rate as water.

After combining the contaminant risk for nitrates and nitrites with the natural susceptibility of the well, the overall vulnerability of the well to contamination by nitrates and nitrites is **Low**.

Volatile Organic Chemicals

The contaminant risk for volatile organic chemicals is **High** with single-family septic systems; aboveground heating oil and diesel tanks; paved highways and roads; and a firehouse the only known risks for volatile organic chemicals (See Chart 7 – Contaminant Risks for Volatile Organic Chemicals in Appendix D).

Recent sample data for the drinking water at Chitina Fire Well No. 2 indicates that volatile organic chemicals have not been detected in the water. However, after combining the contaminant risk for volatile organic chemicals with the natural susceptibility of the well, the overall vulnerability of the well to contamination by volatile organic chemicals is **Medium**.

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APPENDIX A

Chitina Fire Well No. 2
Drinking Water Protection Area Location Map
(Map 1)

Chitina Fire Well #2

Location of Map

August 13, 2003

Map 1: Chitina Fire Well #2 Drinking Water Protection Areas

PWSID: 292738.001

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

0 500 1,000 2,000 3,000 4,000 Feet

1:13,928

Data Sources:

Background image - USGS 1:250,000 mapping

Legend

- Public Drinking Water Systems
- **DWPA Zone A**: Several Months Travel Time
- **DWPA Zone B**: Less than 2 Years Travel Time
- **DWPA Zone C**: Less than 5 Years Travel Time
- **DWPA Zone D**: Less than 10 Years Travel Time

0 0.5 1 2 Miles

APPENDIX B

Contaminant Source Inventory and Risk Ranking for Chitina Fire Well No. 2 (Tables 1-4)

Table 1

Contaminant Source Inventory for Chitina Fire Well #2 (CIAC)

PWSID 292738.001

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Map Number	Comments
Septic systems (serves one single-family home)	R02	R02-1	A	2	Residence Northeast of Firehouse
Septic systems (serves one single-family home)	R02	R02-2	A	2	Residence North of Firehouse
Septic systems (serves one single-family home)	R02	R02-3	A	2	Residence North of Firehouse
Septic systems (serves one single-family home)	R02	R02-4	A	2	Residence Northwest of Firehouse
Septic systems (serves one single-family home)	R02	R02-5	A	2	Residence Northwest of Firehouse
Septic systems (serves one single-family home)	R02	R02-6	A	2	Residence North of Firehouse
Septic systems (serves one single-family home)	R02	R02-7	A	2	Residence Northwest of Firehouse
Tanks, heating oil, residential (above ground)	R08	R08-1	A	2	Residence Northeast of Firehouse
Tanks, heating oil, residential (above ground)	R08	R08-2	A	2	Residence North of Firehouse
Tanks, heating oil, residential (above ground)	R08	R08-3	A	2	Residence North of Firehouse
Tanks, heating oil, residential (above ground)	R08	R08-4	A	2	Residence Northwest of Firehouse
Tanks, heating oil, residential (above ground)	R08	R08-5	A	2	Residence Northwest of Firehouse
Tanks, heating oil, residential (above ground)	R08	R08-6	A	2	Residence North of Firehouse
Tanks, heating oil, residential (above ground)	R08	R08-7	A	2	Residence Northwest of Firehouse
Tanks, diesel (above ground)	T06	T06-1	A	2	Chitina Firehouse Diesel Storage Tank
Tanks, heating oil, nonresidential (aboveground)	T14	T14-1	A	2	Chitina Firehouse Heating Oil Tank
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	2	Road North of Firehouse
Highways and roads, paved (cement or asphalt)	X20	X20-2	A	2	Road North of Firehouse
Highways and roads, paved (cement or asphalt)	X20	X20-3	A	2	Road South of Firehouse
Firehouses	X38	X38-1	A	2	Chitina Firehouse

Table 2

Contaminant Source Inventory and Risk Ranking for Chitina Fire Well #2 (CIAC) Sources of Bacteria and Viruses

PWSID 292738.001

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 Northeast of Firehouse
Septic systems (serves one single-family home)	R02	R02-2	A	Low	2	Residence North of Firehouse
Septic systems (serves one single-family home)	R02	R02-3	A	Low	2	Residence North of Firehouse
Septic systems (serves one single-family home)	R02	R02-4	A	Low	2	Residence Northwest of Firehouse
Septic systems (serves one single-family home)	R02	R02-5	A	Low	2	Residence Northwest of Firehouse
Septic systems (serves one single-family home)	R02	R02-6	A	Low	2	Residence North of Firehouse
Septic systems (serves one single-family home)	R02	R02-7	A	Low	2	Residence Northwest of Firehouse
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	2	Road North of Firehouse
Highways and roads, paved (cement or asphalt)	X20	X20-2	A	Low	2	Road North of Firehouse
Highways and roads, paved (cement or asphalt)	X20	X20-3	A	Low	2	Road South of Firehouse

Table 3

Contaminant Source Inventory and Risk Ranking for Chitina Fire Well #2 (CIAC) Sources of Nitrates/Nitrites

PWSID 292738.001

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 Northeast of Firehouse
Septic systems (serves one single-family home)	R02	R02-2	A	Low	2	Residence North of Firehouse
Septic systems (serves one single-family home)	R02	R02-3	A	Low	2	Residence North of Firehouse
Septic systems (serves one single-family home)	R02	R02-4	A	Low	2	Residence Northwest of Firehouse
Septic systems (serves one single-family home)	R02	R02-5	A	Low	2	Residence Northwest of Firehouse
Septic systems (serves one single-family home)	R02	R02-6	A	Low	2	Residence North of Firehouse
Septic systems (serves one single-family home)	R02	R02-7	A	Low	2	Residence Northwest of Firehouse
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	2	Road North of Firehouse
Highways and roads, paved (cement or asphalt)	X20	X20-2	A	Low	2	Road North of Firehouse
Highways and roads, paved (cement or asphalt)	X20	X20-3	A	Low	2	Road South of Firehouse

Table 4

Contaminant Source Inventory and Risk Ranking for Chitina Fire Well #2 (CIAC) Sources of Volatile Organic Chemicals

PWSID 292738.001

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 Northeast of Firehouse
Septic systems (serves one single-family home)	R02	R02-2	A	Low	2	Residence North of Firehouse
Septic systems (serves one single-family home)	R02	R02-3	A	Low	2	Residence North of Firehouse
Septic systems (serves one single-family home)	R02	R02-4	A	Low	2	Residence Northwest of Firehouse
Septic systems (serves one single-family home)	R02	R02-5	A	Low	2	Residence Northwest of Firehouse
Septic systems (serves one single-family home)	R02	R02-6	A	Low	2	Residence North of Firehouse
Septic systems (serves one single-family home)	R02	R02-7	A	Low	2	Residence Northwest of Firehouse
Tanks, heating oil, residential (above ground)	R08	R08-1	A	Medium	2	Residence Northeast of Firehouse
Tanks, heating oil, residential (above ground)	R08	R08-2	A	Medium	2	Residence North of Firehouse
Tanks, heating oil, residential (above ground)	R08	R08-3	A	Medium	2	Residence North of Firehouse
Tanks, heating oil, residential (above ground)	R08	R08-4	A	Medium	2	Residence Northwest of Firehouse
Tanks, heating oil, residential (above ground)	R08	R08-5	A	Medium	2	Residence Northwest of Firehouse
Tanks, heating oil, residential (above ground)	R08	R08-6	A	Medium	2	Residence North of Firehouse
Tanks, heating oil, residential (above ground)	R08	R08-7	A	Medium	2	Residence Northwest of Firehouse
Tanks, diesel (above ground)	T06	T06-1	A	Medium	2	Chitina Firehouse Diesel Storage Tank
Tanks, heating oil, nonresidential (aboveground)	T14	T14-1	A	Low	2	Chitina Firehouse Heating Oil Tank
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	2	Road North of Firehouse
Highways and roads, paved (cement or asphalt)	X20	X20-2	A	Low	2	Road North of Firehouse
Highways and roads, paved (cement or asphalt)	X20	X20-3	A	Low	2	Road South of Firehouse
Firehouses	X38	X38-1	A	Low	2	Chitina Firehouse

APPENDIX C

Chitina Fire Well No. 2
Drinking Water Protection Area
and Potential and Existing Contaminant Sources
(Map 2)

There are Single Family Septic Systems (R02), and Residential Heating Oil Tanks (R08) in Zone A

X20-1
X20-2
T14-1
T06-1
Chitina Fire Well #2
X20-3
X38-1
E04

Location of Map

Map 2: Drinking Water Protection Areas for Chitina Fire Well #2 and Potential and Existing Sources of Contamination

PWSID: 292738.001

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

0 700 1,400 2,800 4,200 5,600 Feet

1:18,249

Data Sources:

Background image - USGS 1:250,000 mapping

Legend

- Public Drinking Water Systems
- Single Family Septic System (R02)
- Residential Heating Oil Tank (R08)
- Diesel Storage Tank (T06)
- Nonresidential Heating Oil System (T14)
- Firehouse (X38)
- Placer Mining Claim

DWPA Zone A
Several Months Travel Time

DWPA Zone B
Less than 2 Years Travel Time

DWPA Zone C
Less than 5 Years Travel Time

DWPA Zone D
Less than 10 Years Travel Time

N W E S

0 0.5 1 2 Miles

August 14, 2003

APPENDIX D

Vulnerability Analysis for Chitina Fire Well No. 2
Public Drinking Water Source
(Charts 1-8)

Chart 1. Susceptibility of the wellhead - Chitina Fire Well #2

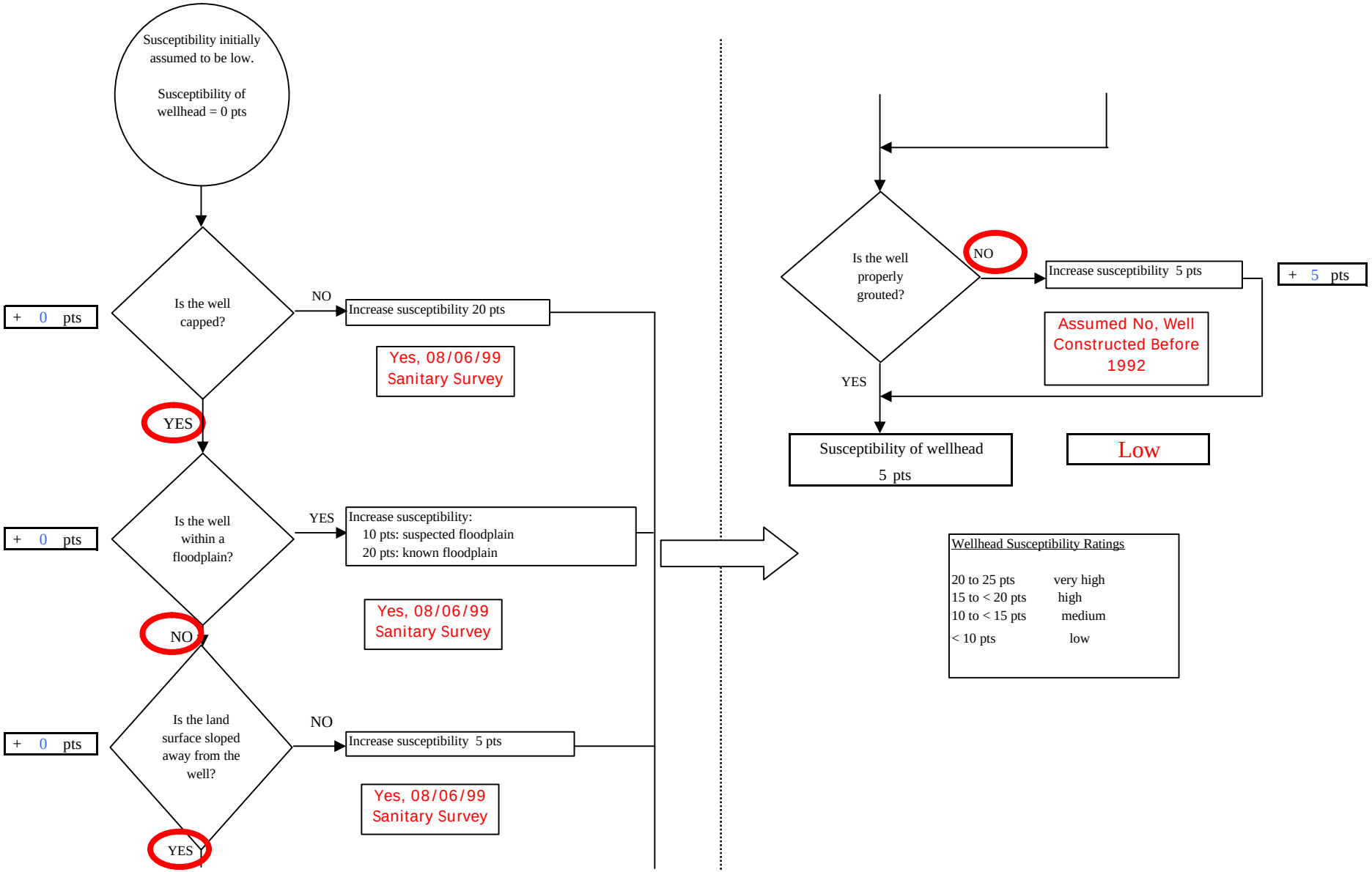


Chart 2. Susceptibility of the aquifer - Chitina Fire Well #2

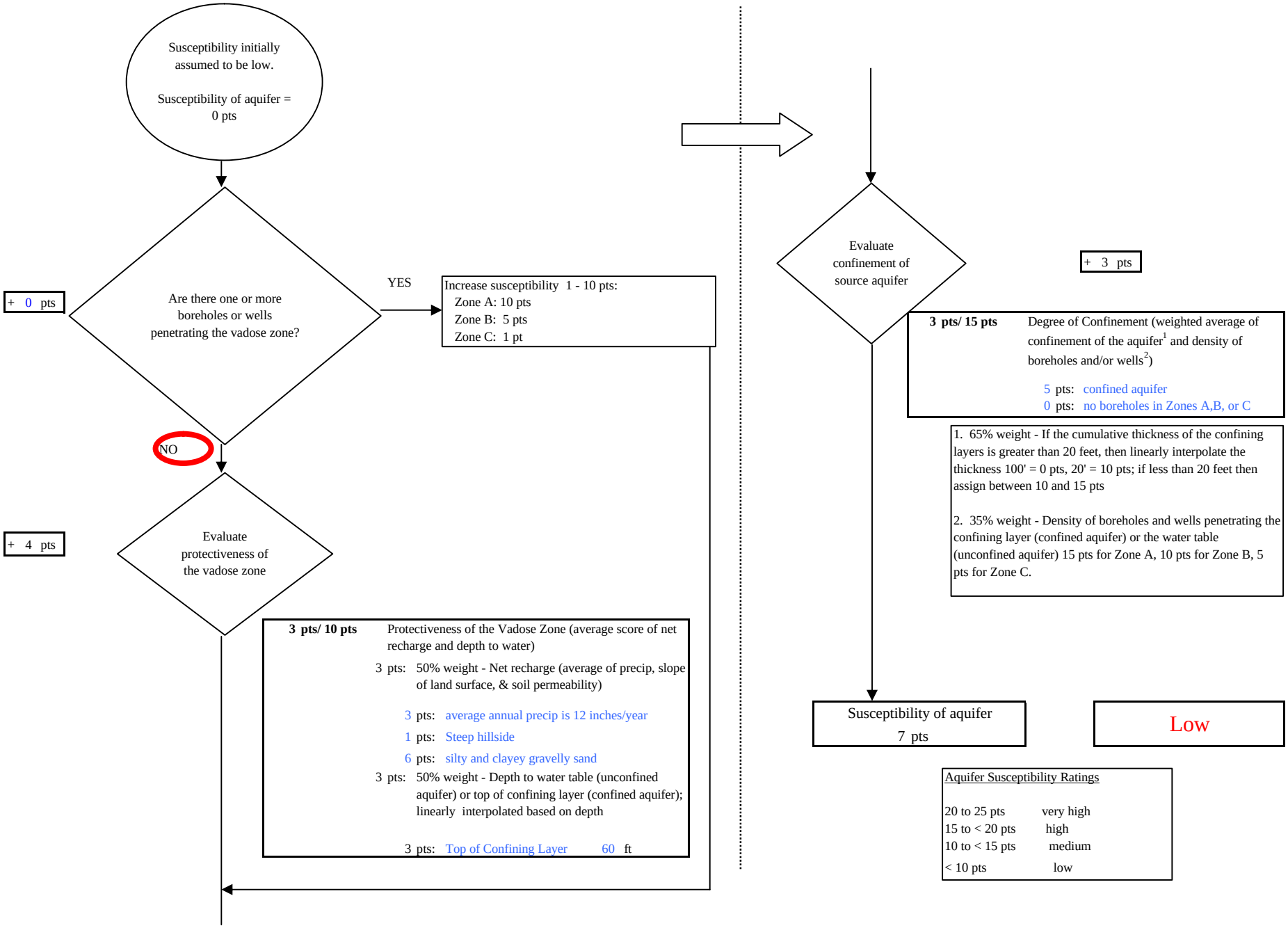
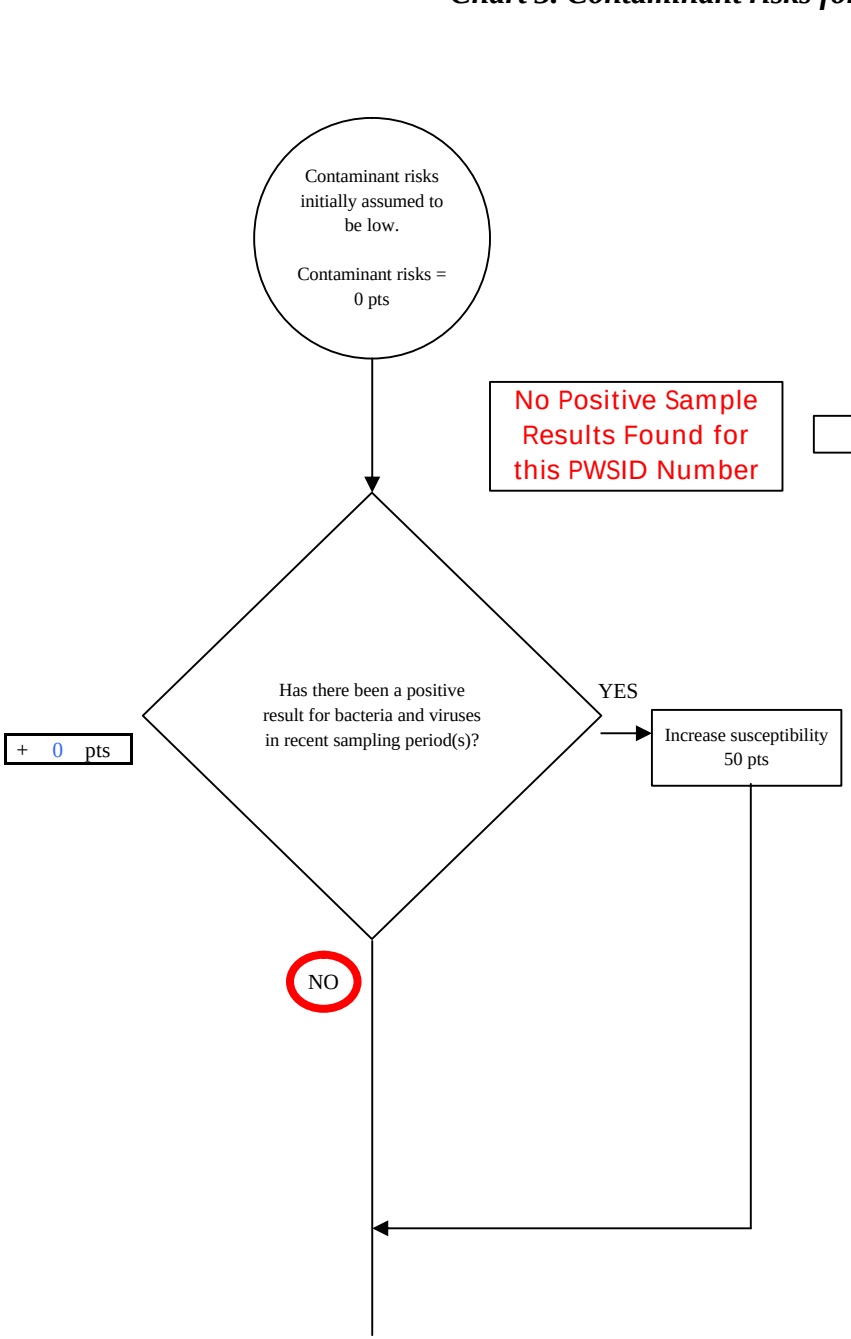
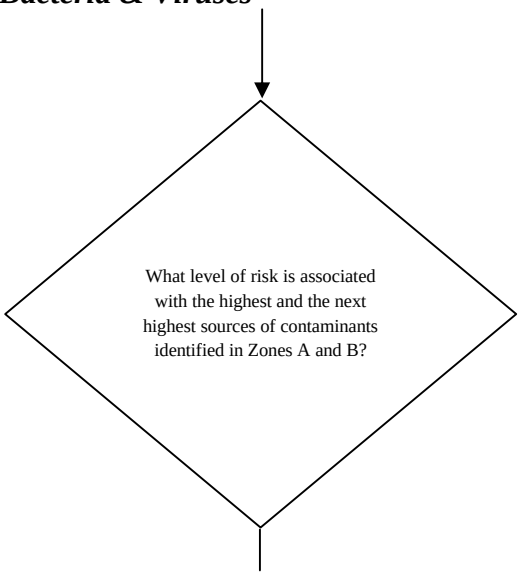


Chart 3. Contaminant risks for Chitina Fire Well #2 - Bacteria & Viruses



No Positive Sample Results Found for this PWSID Number



+ 10 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)	8	0	8

	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 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 3. Contaminant risks for Chitina Fire Well #2 - Bacteria & Viruses

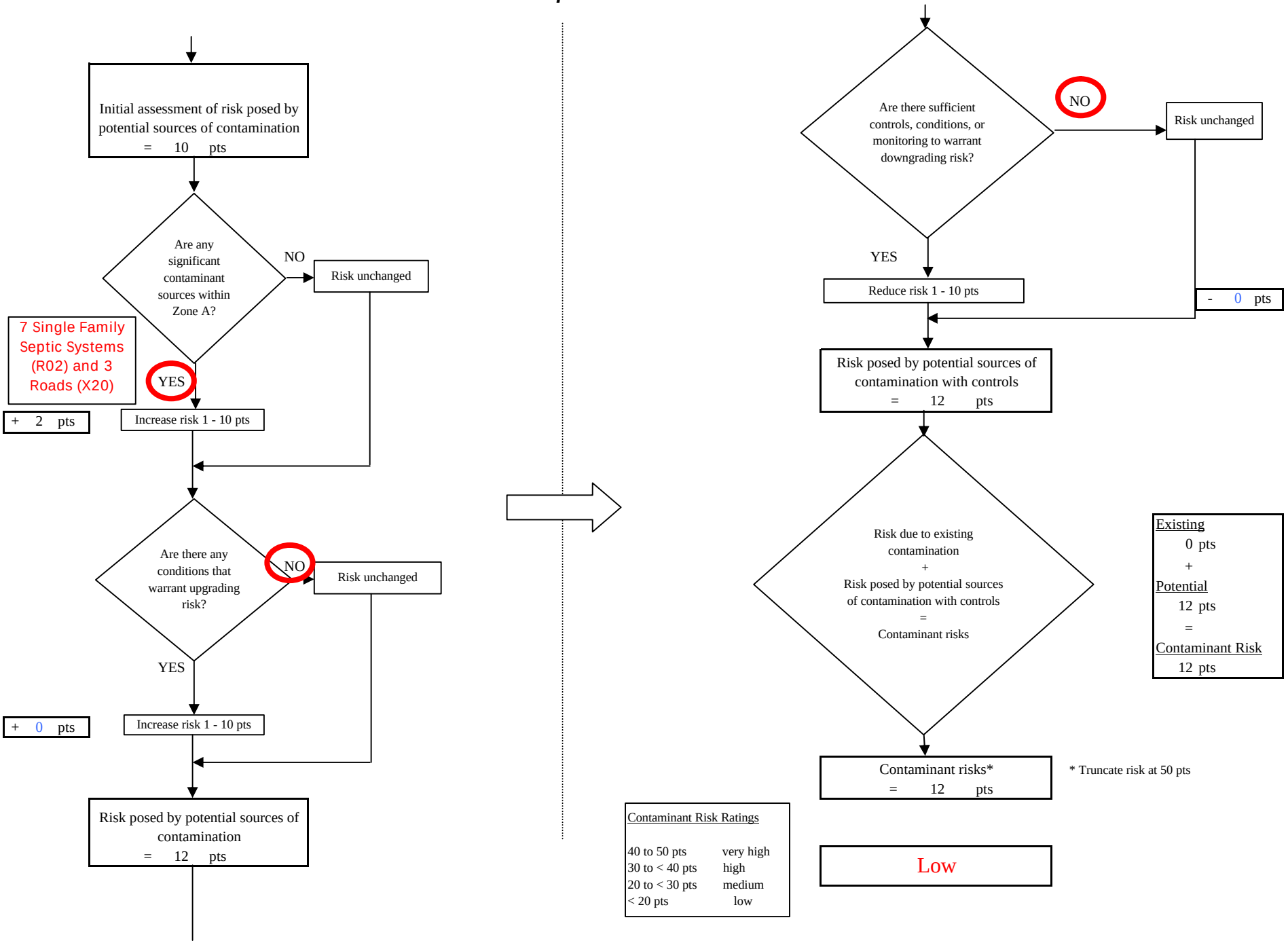


Chart 4. Vulnerability analysis for Chitina Fire Well #2 - Bacteria & Viruses

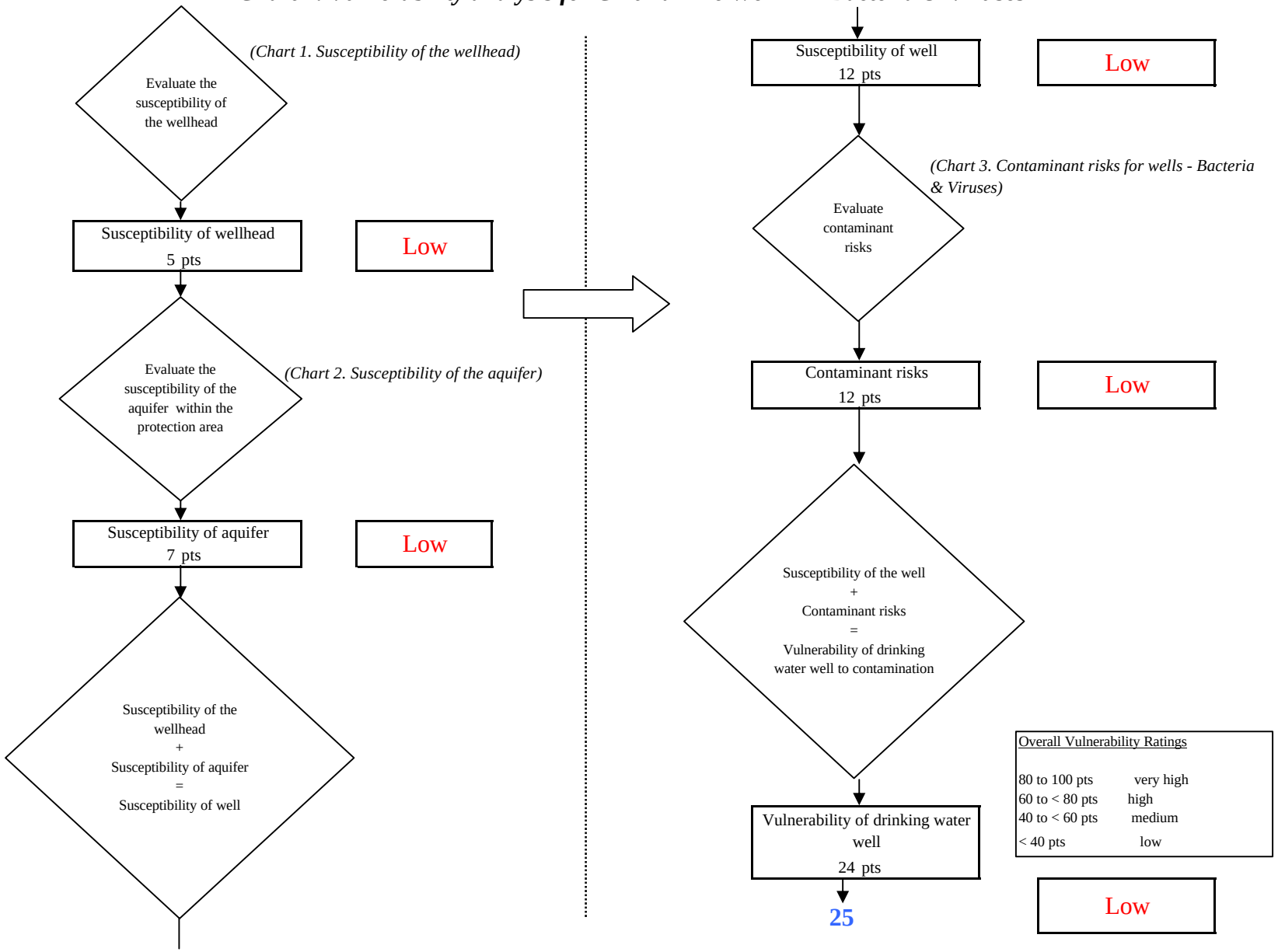


Chart 5. Contaminant risks for Chitina Fire Well #2 - Nitrates and Nitrites

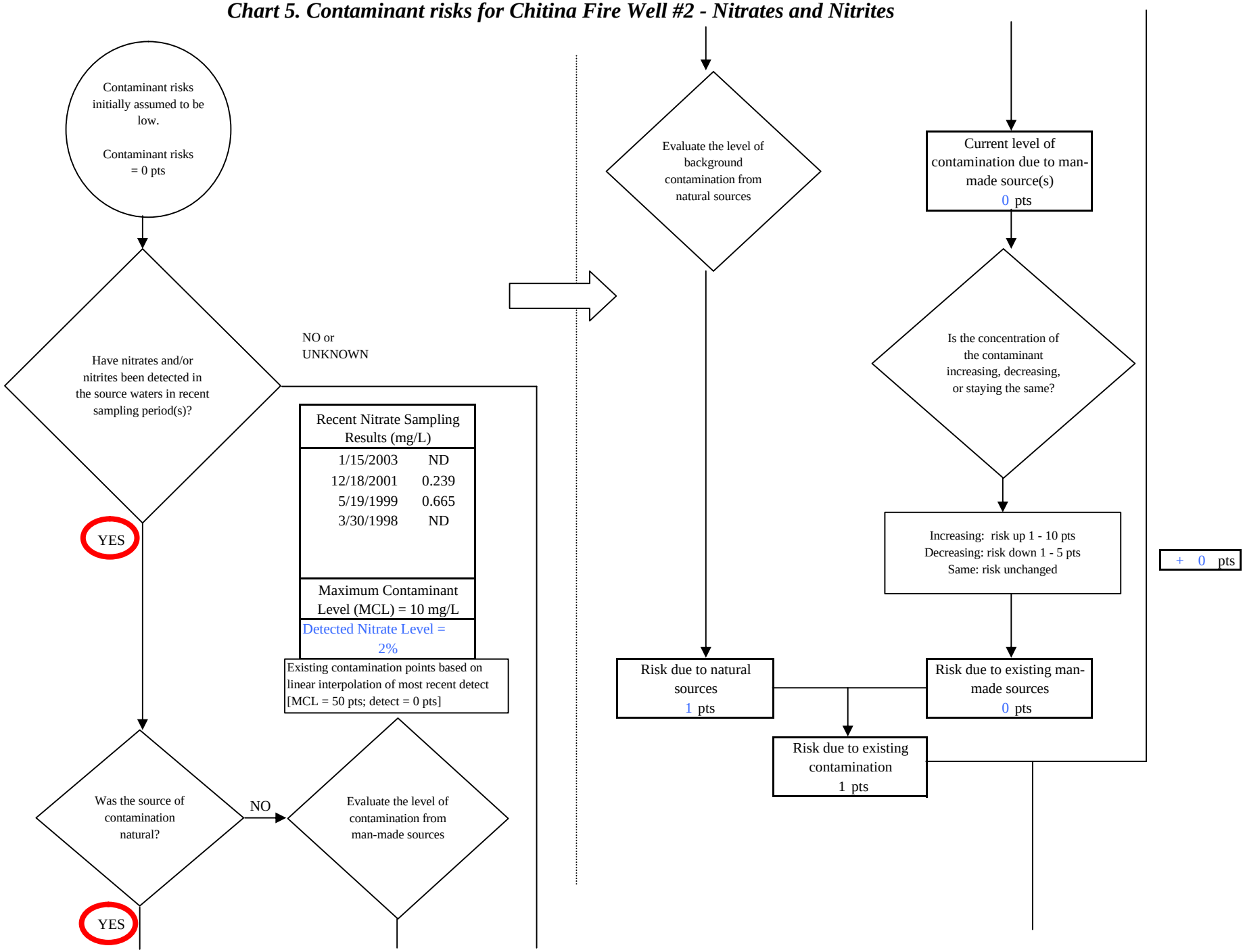


Chart 5. Contaminant risks for Chitina Fire Well #2 - Nitrates and Nitrites

+ 10 pts

What level of risk is associated with the highest and the next highest risk sources(s) of contaminants identified in Zones A, B and C?

Risk Levels for Contaminant Sources identified in Zones A, B and C

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	8	0	8

	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 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.

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

YES

Is the source aquifer fractured rock or karst?

NO

Are all of the higher risk sources beyond Zones A and B?

NO

Risk unchanged

YES

Decrease risk 1 - 10 pts

- 0 pts

Are any significant sources within Zone A?

NO

Risk unchanged

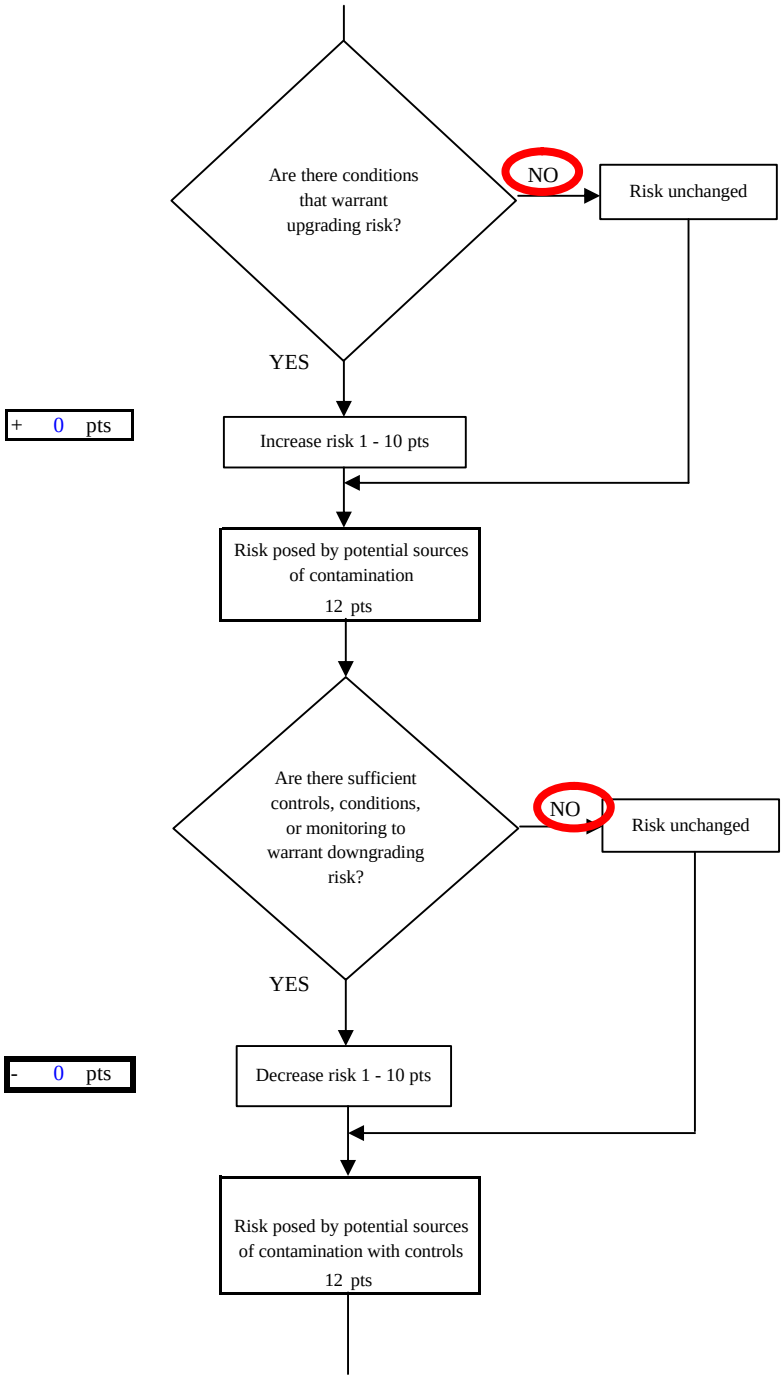
7 Single Family Septic Systems (R02) and 3 Roads (X20)

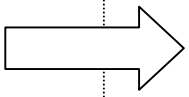
YES

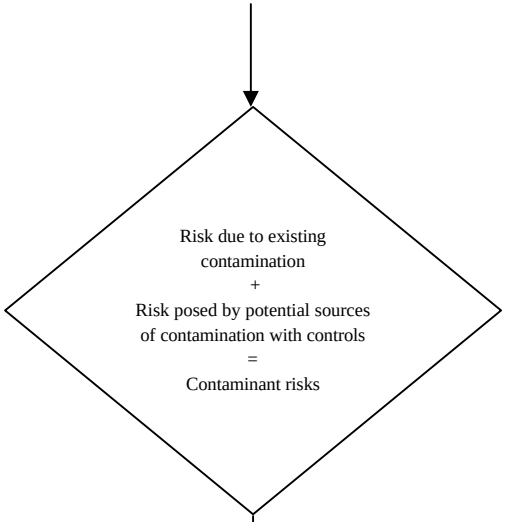
Increase risk 1 - 10 pts

+ 2 pts

Chart 5. Contaminant risks for Chitina Fire Well #2 - Nitrates and Nitrites







Existing
1 pts
+
Potential
12 pts
=
Contaminant Risk
13 pts

Contaminant risks*
= 13 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 6. Vulnerability analysis for Chitina Fire Well #2 - Nitrates and Nitrites

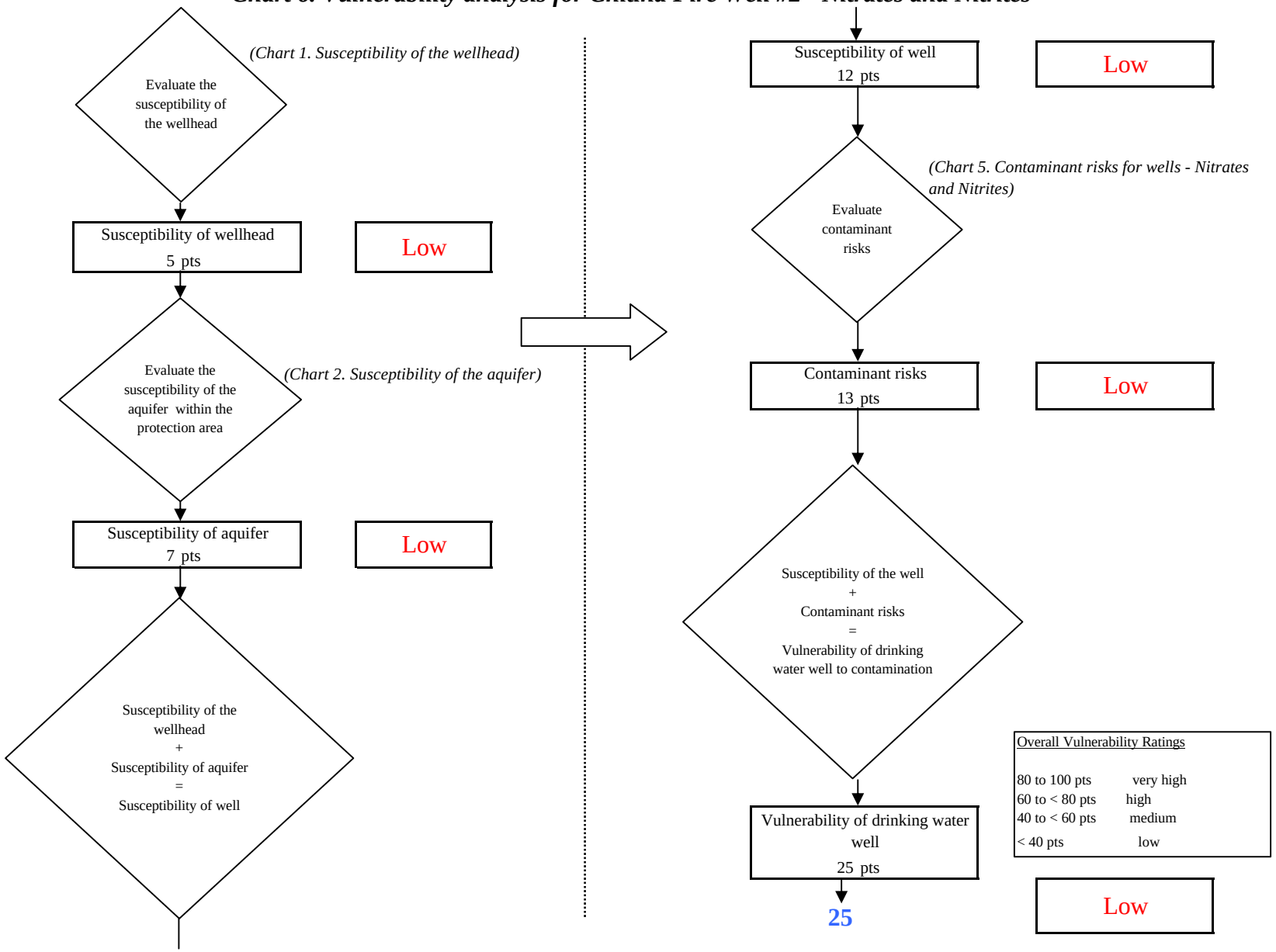


Chart 7. Contaminant risks for Chitina Fire Well No. 2 - Volatile Organic Chemicals

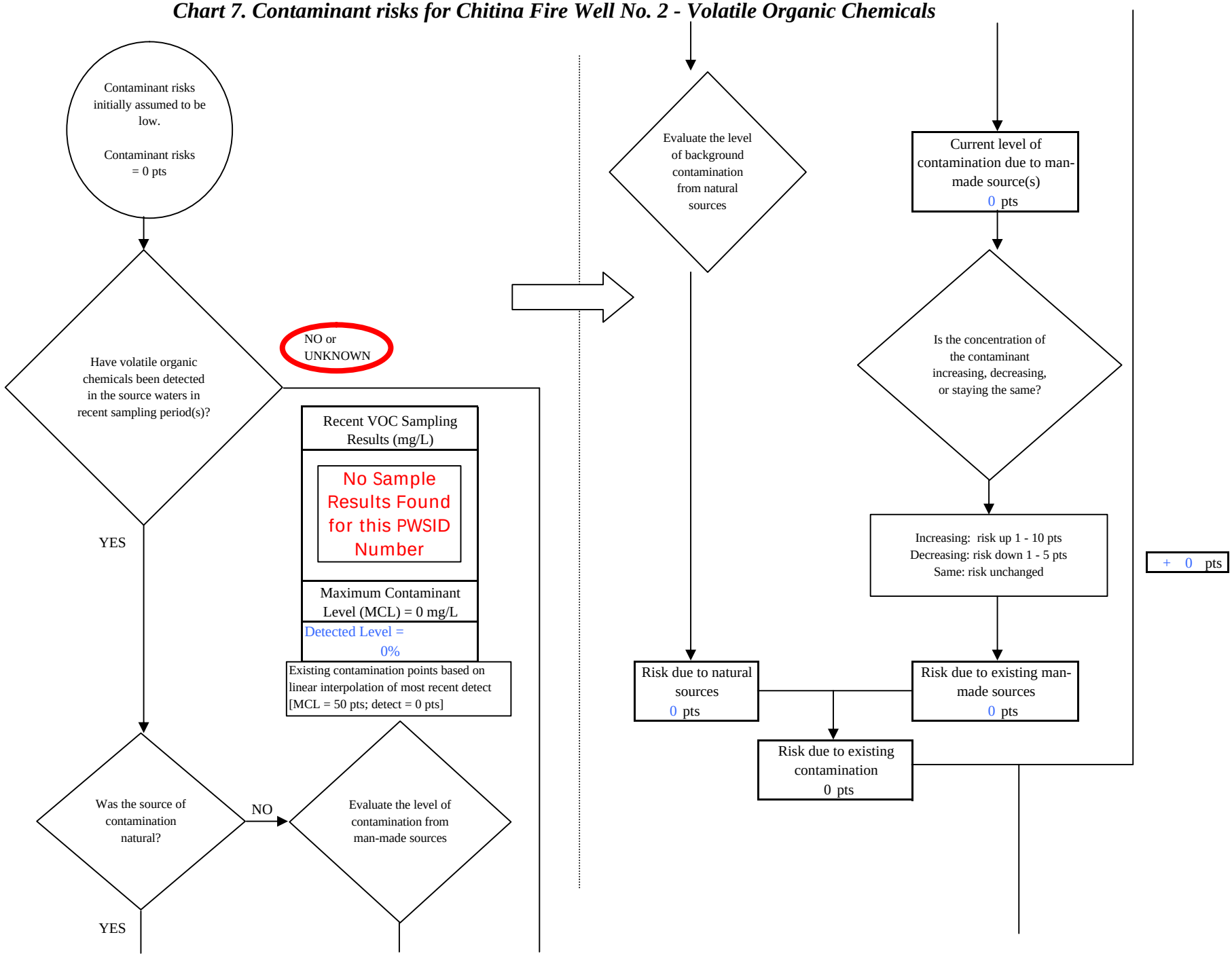
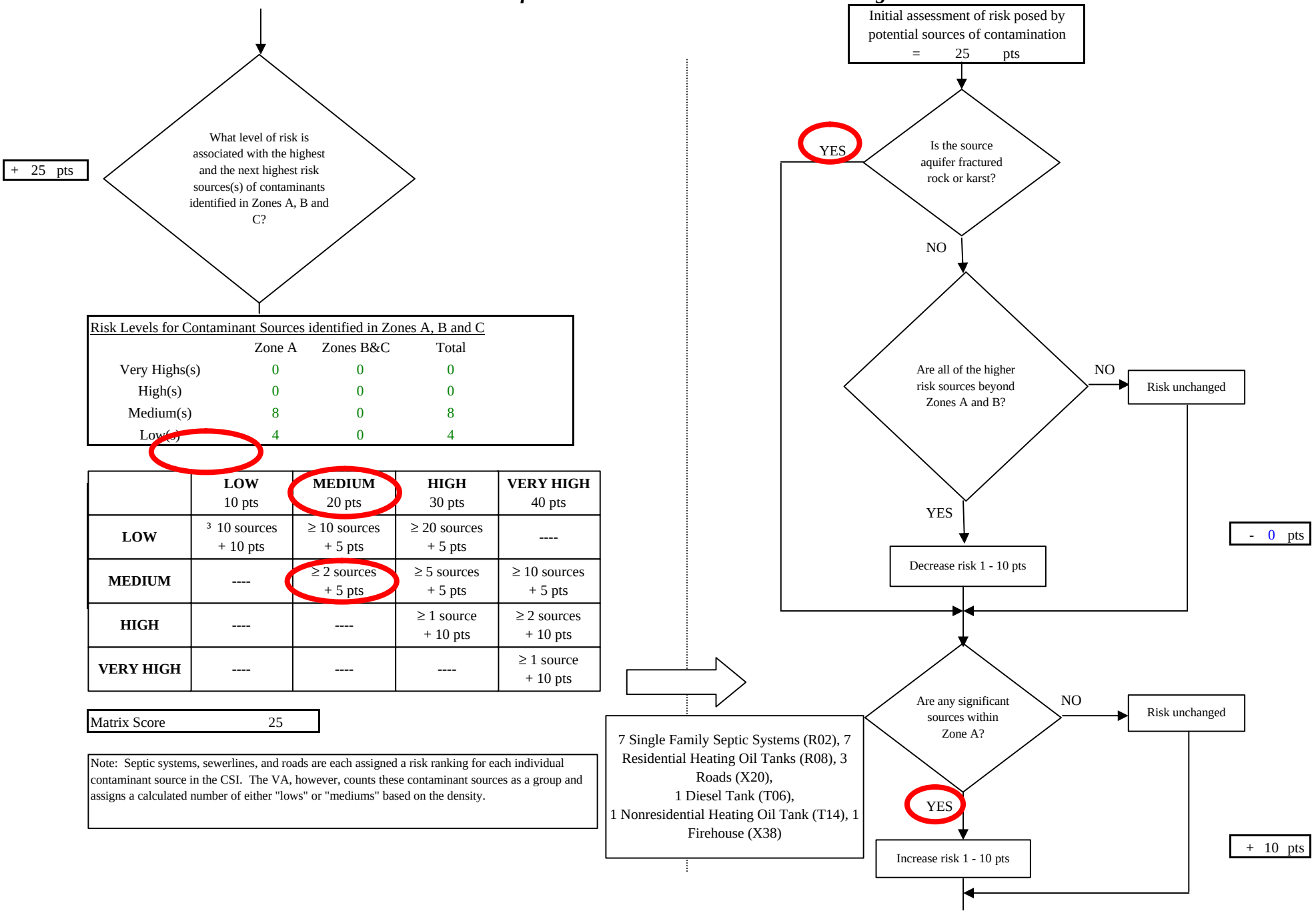


Chart 7. Contaminant risks for Chitina Fire Well No. 2 - Volatile Organic Chemicals



Risk Levels for Contaminant Sources identified in Zones A, B and C

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	8	0	8
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 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 7. Contaminant risks for Chitina Fire Well No. 2 - Volatile Organic Chemicals

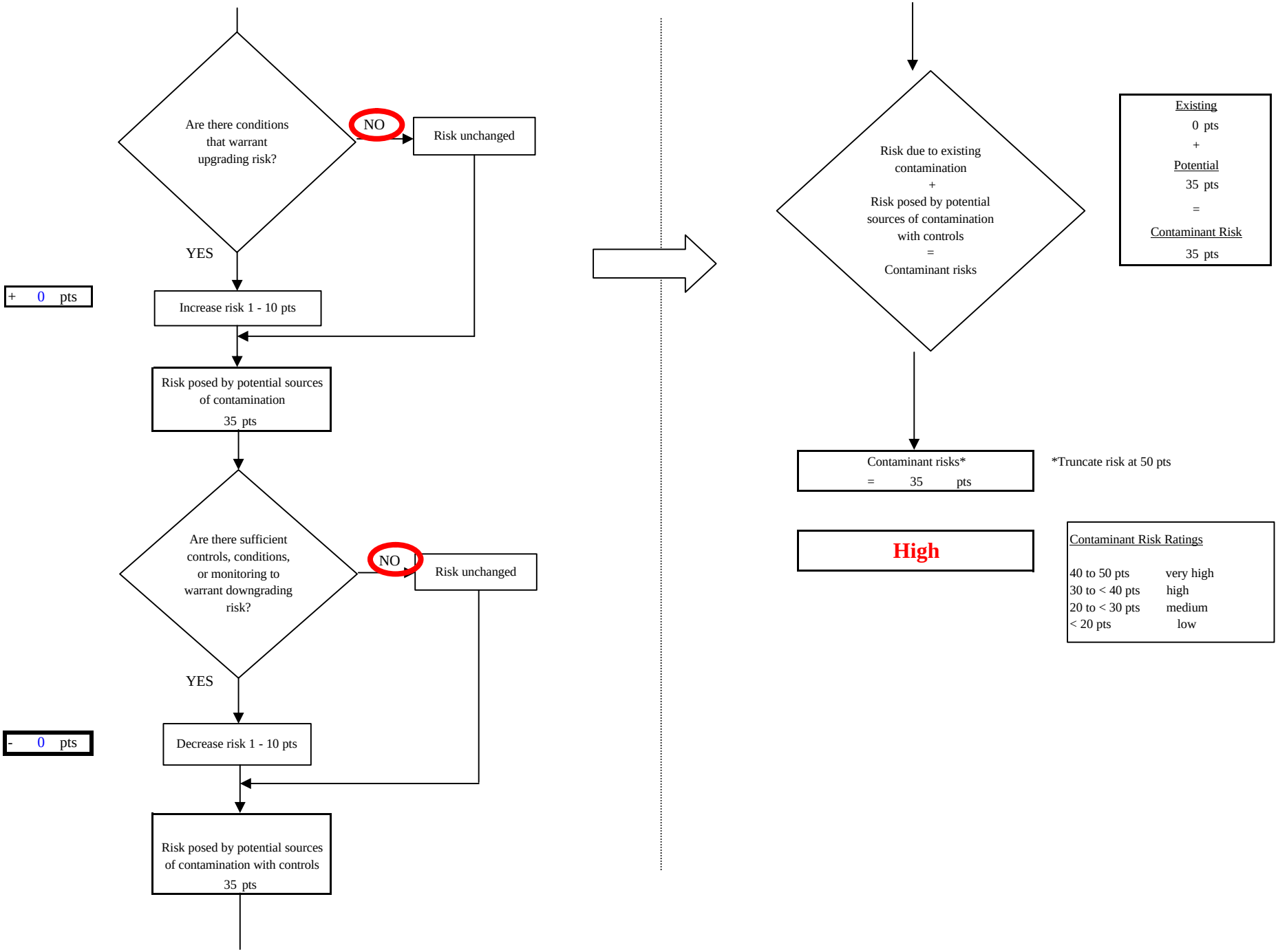


Chart 8. Vulnerability analysis for Chitina Fire Well #2 - Volatile Organic Chemicals