Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for the Dawn Water Company Well 2 Eagle River/Chugiak area, Alaska PWSID 211431.002

June 2004

DRINKING WATER PROTECTION PROGRAM REPORT Report 1541
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.

Source Water Assessment for the Dawn Water Company Well 2
Eagle River/Chugiak area, Alaska

Drinking Water Protection Program
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

This source water assessment provides an evaluation of the vulnerability to potential contamination of the public water system serving Dawn Water Company. This Class A (community) water system consists of two wells along the Old Glenn Highway about 7 miles northeast of Eagle River, Alaska. This is an assessment of well 2 located on the east side of Morning Drive near the community of Peters Creek. The well received a natural susceptibility rating of **Low**. This rating is a combination of a susceptibility rating of **Low** for the actual wellhead and a **Low** rating for the aquifer in which the well is drawing water from. Identified potential sources of contamination to this well include: residential areas, septic systems, a city park, and roads. Six groups of potential contaminants are considered in this assessment: bacteria and viruses, nitrates and/or nitrites, volatile organic chemicals, heavy metals, cyanide and other inorganic chemicals, synthetic organic chemicals, and other organic chemicals. Combining the natural susceptibility of the well with the contaminant risk, the public water system for Dawn Water Company Well 2 received an overall vulnerability rating of **Medium** for bacteria and viruses, and nitrates and/or nitrites, and a **Low** for heavy metals, cyanide, and other inorganic chemicals, volatile organic chemicals, synthetic organic chemicals, and other organic chemicals.

DAWN WATER COMPANY WELL 2 PUBLIC DRINKING WATER SYSTEM

The Dawn Water Company Well 2 public water system is a Class A (community) water system. The system consists of two wells along the Old Glenn Highway about 7 miles northeast of Eagle River, Alaska. This is an assessment of Well 2 located on the east side of Morning Drive near the community of Peters Creek (Seward Meridian, T15N, R1W, Section 10) (See Map 1 of Appendix A). Eagle River/Chugiak is located within the Municipality of Anchorage about 20 miles northeast of the town of Anchorage.

Residents in the area north of Eagle River primarily use individual wells and septic tanks (ADCEC, 2002). Electricity is provided by Matanuska Electric Association. Waste Management Co. offers refuse collection services for disposal in the Anchorage regional landfill on Hiland Road (ADCEC, 2002).

The Well 1 of the Dawn Water Company public water system lies at the base of the Chugach Mountains in the Knik River glacier valley at an elevation of approximately 450 feet above sea level.

According to the 1/7/02 Sanitary Survey for the water system, the depth of the well is 120 feet below the ground surface. Other wells at this depth in the area are screened in a water-bearing sand and gravel layer, and it is assumed this one is also. The ground above the aquifer consists of inconsistent layers of sands, gravels, silts, and clays. The static water level in this well is about 25 feet below land surface. This water level may be influenced by pressure of a possible clay confining layer above the aquifer. Primarily surface infiltration from the Chugach Mountains contributes water to this alluvial aquifer in the area of this well.

The Dawn Water Company public drinking water system serves approximately over 500 residents and between 1 to 10 non-residents through 140 service connections.

DAWN WATER COMPANY WELL 2 DRINKING WATER PROTECTION AREA

The pathways most likely for surface contamination to reach the groundwater are identified as the first step in determining a drinking water system's risk. 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 wells is the area that contributes water to the well, the groundwater capture zone. The groundwater capture zone is located in the area circling the well (the area influenced by pumping) and also the area of the water table upgradient of the well, usually forming a parabola shape.

There are many different ways of calculating the size of capture zones. This assessment uses a combination of two simple groundwater flow equations, the Thiem and uniform flow equations for all groundwater wells screened in unconsolidated material. The orientation of the capture zone is then drawn using a water table elevation map (if available) or a land surface elevation map of the area. The capture zone calculated in this assessment is only a best guess using the information

and resources available to us, and may differ slightly from the actual capture zone.

The parameters used to calculate the shape of this capture zone are general for area and were obtained from area well logs in the area and the Groundwater textbook by Freeze and Cherry (Freeze and Cherry, 1979).

Only limited information is available for the aquifer Dawn Water Company Well 2 draws its water from. The orientation of the capture zone was drawn based on the assumption that groundwater flow direction is generally the same direction as the topography.

Because of uncertainties and changing site conditions, a factor of safety is added to the groundwater capture zone to form the drinking water protection area for the well.

The protection areas established for wells are usually separated into four zones, limited by the watershed. These zones correspond to times-of-travel (TOT) of the water moving through the aquifer to the well (plus the factor of safety).

The following is a summary of the four 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 2 years time-of-travel
C	Less than 5 years time-of-travel
D	Less than 10 years time-of-travel

The time of travel for *contaminants* within the water varies with their unique physical and chemical characteristics.

The drinking water protection area outlined for the Dawn Water Company Well 2 on Map 1 of Appendix A will serve as the focus for voluntary protection efforts.

INVENTORY OF POTENTIAL AND EXISTING CONTAMINANT SOURCES

The Drinking Water Protection Program (DWPP) has completed an inventory of potential and existing sources of contamination within the Dawn Water Company Well 2 protection area. This inventory was completed through a search of agency records and other publicly available information. 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 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 inorganic 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 each 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 combination of toxicity and volume associated with that source. Rankings include:

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

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.

VULNERABILITY OF DAWN WATER COMPANY WELL 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 fourteen 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 properties of the aquifer and the presence of other wells or boreholes in the area. 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

the water system's contaminant sample results. Lastly, Chart 4 combines the results of the first three charts to produce the 'Vulnerability Analysis for Bacteria and Viruses'. Charts 5 through 14 contain 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 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

Dawn Water Company Well 2 received a Low Wellhead Susceptibility rating. The 1/7/02 Sanitary Survey indicates the well is capped with a sanitary seal, and the land surface is sloped away from each of the wells; however, the well is not grouted. A sanitary seal prevents potential contaminants from entering the well from the inside while sloping the land surface away from the well and grouting help to prevent potential contaminants from traveling down the outside of the well casing.

The aquifer Well 2 is completed in received a Low Susceptibility rating. The low permeability of the material above the aquifer (sandy silty clay) in the area prevents contaminants from traveling down through it. Table 2 summarizes the Susceptibility scores and ratings for Dawn Water Company Well 2.

Table 2. Susceptibility

	Score	Rating
Susceptibility of the Wellhead	5	Low
Susceptibility of the Aquifer	5	Low
Natural Susceptibility	10	Low

The Contaminant Risk has been derived from an evaluation of the routine sampling results of the water system and the presence of potential sources of contamination. Contaminant risks to a drinking water source depend on the type and distribution of contaminant sources. 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	33	High
Nitrates and/or Nitrites	41	Very High
Volatile Organic Chemicals	10	Low
Heavy Metals, Cyanide, and Other Inorganic Chemicals	10	Low
Synthetic Organic Chemicals	10	Low
Other Organic Chemicals	10	Low

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 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	45	Medium
Nitrates and/or Nitrites	50	Medium
Volatile Organic Chemicals	20	Low
Heavy Metals, Cyanide, and Other Inorganic Chemicals	20	Low
Synthetic Organic Chemicals	20	Low
Other Organic Chemicals	20	Low

Bacteria and Viruses

The city park and the residential septic systems represent the greatist risk of Bacteria and Viruses to this water system.

Only a small amount of bacteria and viruses are required to endanger public health. Coliforms (a bacteria) are found naturally in the environment and although they aren't necessarily a health threat, it is 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 (EPA, 2002). Harmful bacteria can cause diarrhea, cramps, nausea, headaches, or other symptoms (EPA, 2002). Routine sampling has not detected coliforms in the water.

After combining the contaminant risk for bacteria and viruses with the natural susceptibility of the well, the overall vulnerability of the well to contamination is medium.

Nitrates and Nitrites

The city park and the residential septic systems also represent the greatest risk to nitrates and nitrites for this source of public drinking water.

Nitrates are very mobile, moving at approximately the same rate as water. Nitrates have previously consistently been detected at a concentration of about 5 mg/L in this well, or about 50% of the Maximum Contaminant Level (MCL) for nitrates of 10 mg/L. An MCL is is the highest concentration of a contaminant allowed in drinking water by the Environmental Protection Agency. Nitrates were not detected in the sample collected most recently (5/12/04). High concentrations of nitrates (concentrations above the MCL) in drinking water pose the greatest risk to infants. The nitrates in the water can reduce the ability of the infant's blood to absorb oxygen, the cause of "blue baby syndrome" (EPA, 2002). Blue baby syndrome is a serious medical condition requiring immediate medical treatment. The EPA also lists the long term effects of high nitrate concentrations as diuresis, increased starchy deposits and hemorrhaging of the spleen (EPA, 2002).

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

Volatile Organic Chemicals

The septic systems, residential area, and roads combine to represent the risk of volatile organic chemical contamination to the well.

Volatile Organic Chemicals have not been detected during routine sampling of this water system.

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

Heavy Metals, Cyanide, and Other Inorganic Chemicals

The septic systems, residential area, and roads also combine to represent the risk of heavy metals, cyanide, and other inorganic chemicals contamination to the well.

Heavy metals have not been detected in significant concentrations during routine sampling of this water system.

After combining the contaminant risk for heavy metals, cyanide and other inorganic chemicals with the natural susceptibility of the well, the overall vulnerability of the well to contamination is low.

Synthetic Organic Chemicals

The septic systems, residential area, and city park combine to represent the risk of synthetic organic chemicals contamination to the well.

Synthetic Organic Chemicals have not been sampled for in this water system.

After combining the contaminant risk for synthetic organic chemicals with the natural susceptibility of the

well, the overall vulnerability of the well to contamination is low.

Other Organic Chemicals

The septic systems, residential area, and roads combine to represent the risk of other organic chemicals contamination to the well.

Other Organic Chemicals have not been sampled for in this water system.

After combining the contaminant risk for other organic chemicals with the natural susceptibility of the well, the overall vulnerability of the well to contamination is low.

REFERENCES

Alaska Department of Community and Economic Development (ADCED), 2002 [WWW document]. URL http://www.dced.state.ak.us/mra/CF_BLOCK.cfm.

Freeze, R.A. and Cherry, J.A., 1979. Groundwater. Prentice-Hall, Englewood Cliffs, NJ.

United States Environmental Protection Agency (EPA), 2002 [WWW document]. URL http://www.epa.gov/safewater/mcl.html.

APPENDIX A

Dawn Water Company Well 2
Drinking Water Protection Area Location Map
(Map 1)

Dawn Water Company Well 2

Dawn Water Company Well 1

Map 1: Dawn Water Company Drinking Water Protection Areas

PWSID: 211431

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

0 550 1,100 2,200 3,300 Feet

1:13,200

Data Sources:

Parcels, roads - Municipality of Anchorage
Background - USGS 63K mapping

Legend

- Zone A
- Zone B
- Zone C
- Zone D
- Dawn Water Company wells
- X20, Roads

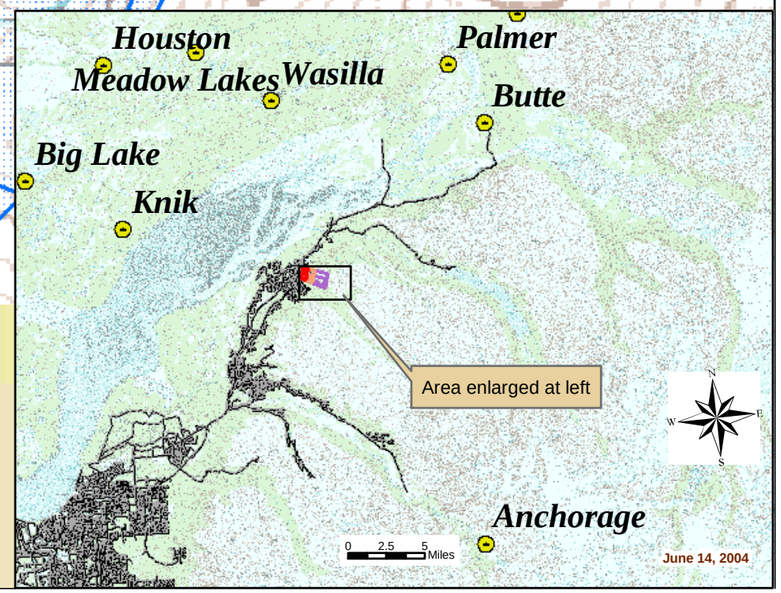


Table 1

Contaminant Source Inventory for ***Dawn Water Company Well 2***

PWSID 211431.002

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Residential Areas	R01		A	2	16 Acres
Septic systems (serves one single-family home)	R02		A	2	31 septic systems located within Zone A
Municipal or city parks (with green areas)	X04	X04-1	A	2	Tonjess Park
Highways and roads, paved (cement or asphalt)	X20		A	2	6 roads within Zone A
Residential Areas	R01		B	2	29 Acres
Septic systems (serves one single-family home)	R02		B	2	53 septic systems located within Zone B
Highways and roads, paved (cement or asphalt)	X20		B	2	5 roads within Zone B

Table 2

Contaminant Source Inventory and Risk Ranking for Dawn Water Company Well 2 Sources of Bacteria and Viruses

PWSID 211431.002

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Residential Areas	R01		A	Low	2	16 Acres
Septic systems (serves one single-family home)	R02		A	Low	2	31 septic systems located within Zone A
Highways and roads, paved (cement or asphalt)	X20		A	Low	2	6 roads within Zone A
Municipal or city parks (with green areas)	X04	X04-1	A	Medium	2	Tonjess Park
Residential Areas	R01		B	Low	2	29 Acres
Highways and roads, paved (cement or asphalt)	X20		B	Low	2	5 roads within Zone B
Septic systems (serves one single-family home)	R02		B	Low	2	53 septic systems located within Zone B

Table 3

Contaminant Source Inventory and Risk Ranking for Dawn Water Company Well 2 Sources of Nitrates/Nitrites

PWSID 211431.002

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Highways and roads, paved (cement or asphalt)	X20		A	Low	2	6 roads within Zone A
Residential Areas	R01		A	Low	2	16 Acres
Septic systems (serves one single-family home)	R02		A	Low	2	31 septic systems located within Zone A
Municipal or city parks (with green areas)	X04	X04-1	A	Medium	2	Tonjess Park
Highways and roads, paved (cement or asphalt)	X20		B	Low	2	5 roads within Zone B
Residential Areas	R01		B	Low	2	29 Acres
Septic systems (serves one single-family home)	R02		B	Low	2	53 septic systems located within Zone B

Table 4

Contaminant Source Inventory and Risk Ranking for Dawn Water Company Well 2 Sources of Volatile Organic Chemicals

PWSID 211431.002

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		A	Low	2	31 septic systems located within Zone A
Highways and roads, paved (cement or asphalt)	X20		A	Low	2	6 roads within Zone A
Residential Areas	R01		A	Low	2	16 Acres
Residential Areas	R01		B	Low	2	29 Acres
Highways and roads, paved (cement or asphalt)	X20		B	Low	2	5 roads within Zone B
Septic systems (serves one single-family home)	R02		B	Low	2	53 septic systems located within Zone B

Table 5

Contaminant Source Inventory and Risk Ranking for Dawn Water Company Well 2 Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals

PWSID 211431.002

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		A	Low	2	31 septic systems located within Zone A
Highways and roads, paved (cement or asphalt)	X20		A	Low	2	6 roads within Zone A
Residential Areas	R01		A	Low	2	16 Acres
Municipal or city parks (with green areas)	X04	X04-1	A	Low	2	Tonjess Park
Residential Areas	R01		B	Low	2	29 Acres
Septic systems (serves one single-family home)	R02		B	Low	2	53 septic systems located within Zone B
Highways and roads, paved (cement or asphalt)	X20		B	Low	2	5 roads within Zone B

Table 6

Contaminant Source Inventory and Risk Ranking for Dawn Water Company Well 2 Sources of Synthetic Organic Chemicals

PWSID 211431.002

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		A	Low	2	31 septic systems located within Zone A
Residential Areas	R01		A	Low	2	16 Acres
Municipal or city parks (with green areas)	X04	X04-1	A	Low	2	Tonjess Park
Residential Areas	R01		B	Low	2	29 Acres
Septic systems (serves one single-family home)	R02		B	Low	2	53 septic systems located within Zone B

Table 7

Contaminant Source Inventory and Risk Ranking for Dawn Water Company Well 2 Sources of Other Organic Chemicals

PWSID 211431.002

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Highways and roads, paved (cement or asphalt)	X20		A	Low	2	6 roads within Zone A
Septic systems (serves one single-family home)	R02		A	Low	2	31 septic systems located within Zone A
Residential Areas	R01		A	Low	2	16 Acres
Residential Areas	R01		B	Low	2	29 Acres
Septic systems (serves one single-family home)	R02		B	Low	2	53 septic systems located within Zone B
Highways and roads, paved (cement or asphalt)	X20		B	Low	2	5 roads within Zone B

APPENDIX C

Dawn Water Company Well 2
Potential Contaminant Sources
(Map 2)

Dawn Water Company well 2

X04-1

32 R02s in Zone A

53 R02s in Zone B

Zone A

Zone B

Zone C

PETERS CREEK RAMP

NEW GLENN HWY

MT EKLUTNA DR

ANTHEM PL

PRINCE CIR

SCHAFF DR

JESSE LEE CT

MORNING DR

MONRON ST

TONY CIR

DAWN LA

CHUGIAK DR

GORSUCH ST

SETTLERS DR

ROCK PTARMIGAN ST

TODD DR

MEADOW RIDGE CT

Map 2: Dawn Water Company Well 2 Potential Contaminant Sources

PWSID: 211431.002

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

0 175 350 700 Feet

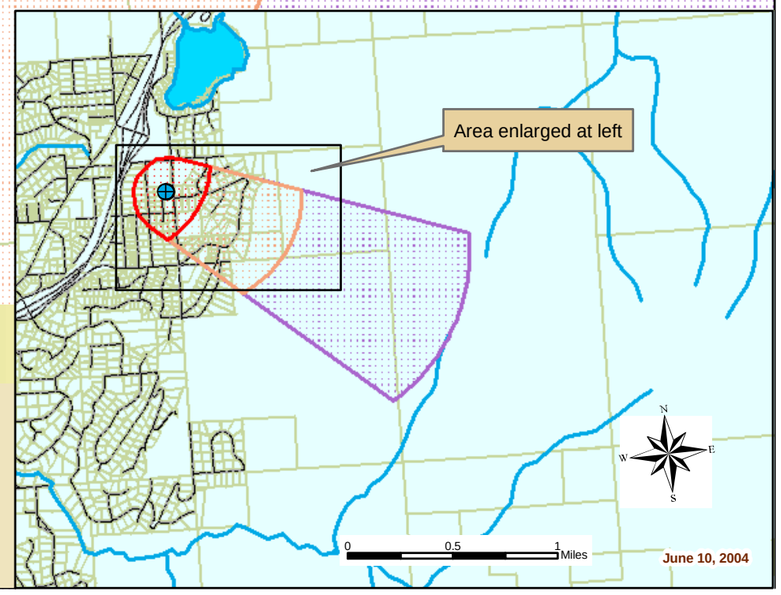
1:4,200

Data Sources:

Parcels, roads - Municipality of Anchorage

Legend

- Dawn Water Company wells
- Zone A
- Zone B
- Zone C
- Zone D
- X20, Roads
- Land parcels
- R02, Septic systems
- R01, Residential area
- X04, Park (with green area)



APPENDIX D

Vulnerability Analysis for Dawn Water Company Well 2
Public Drinking Water Source
(Charts 1-14)

Chart 1. Susceptibility of the wellhead - Dawn Water Company Well 2

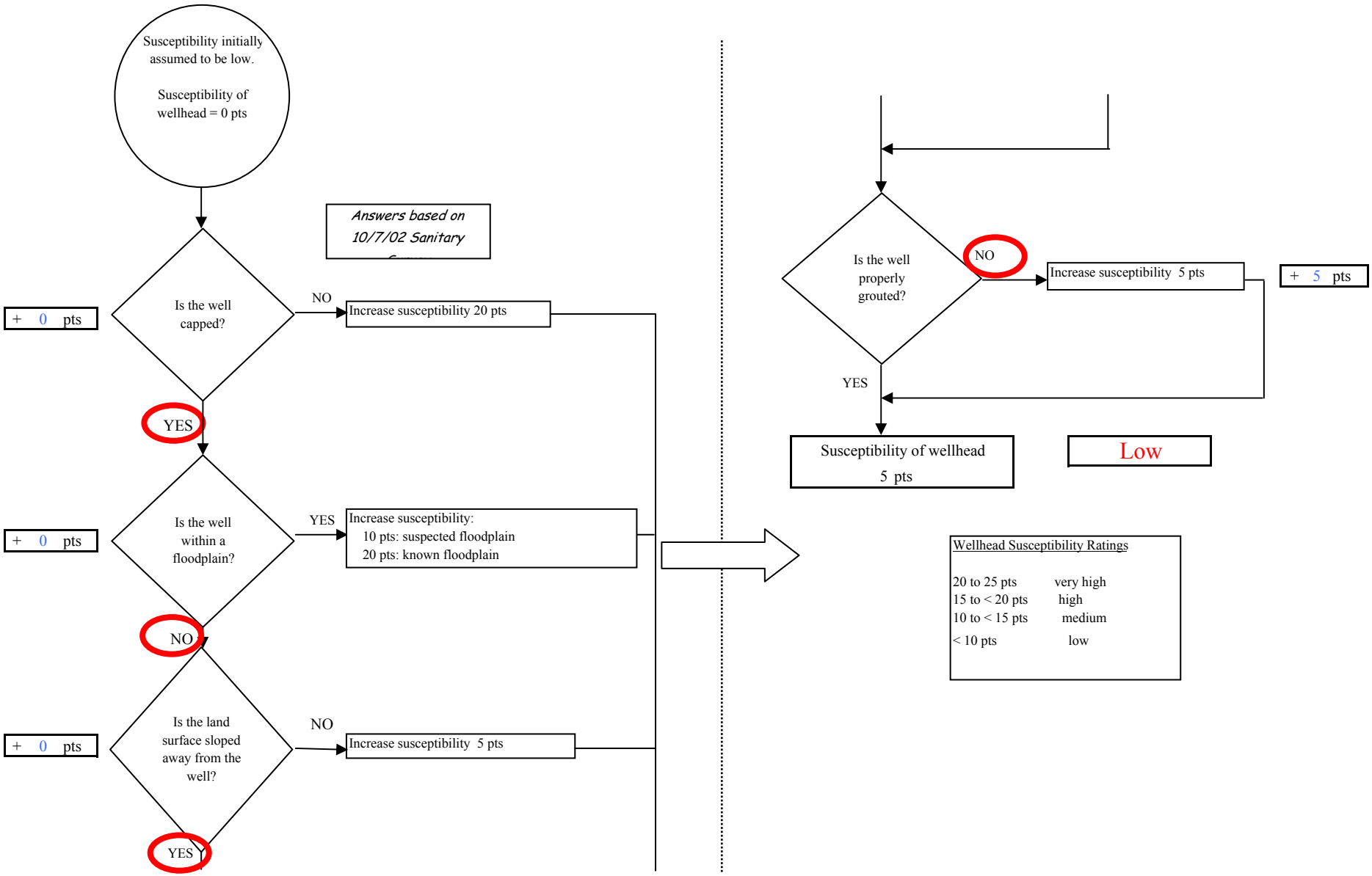


Chart 2. Susceptibility of the aquifer - Dawn Water Company Well 2

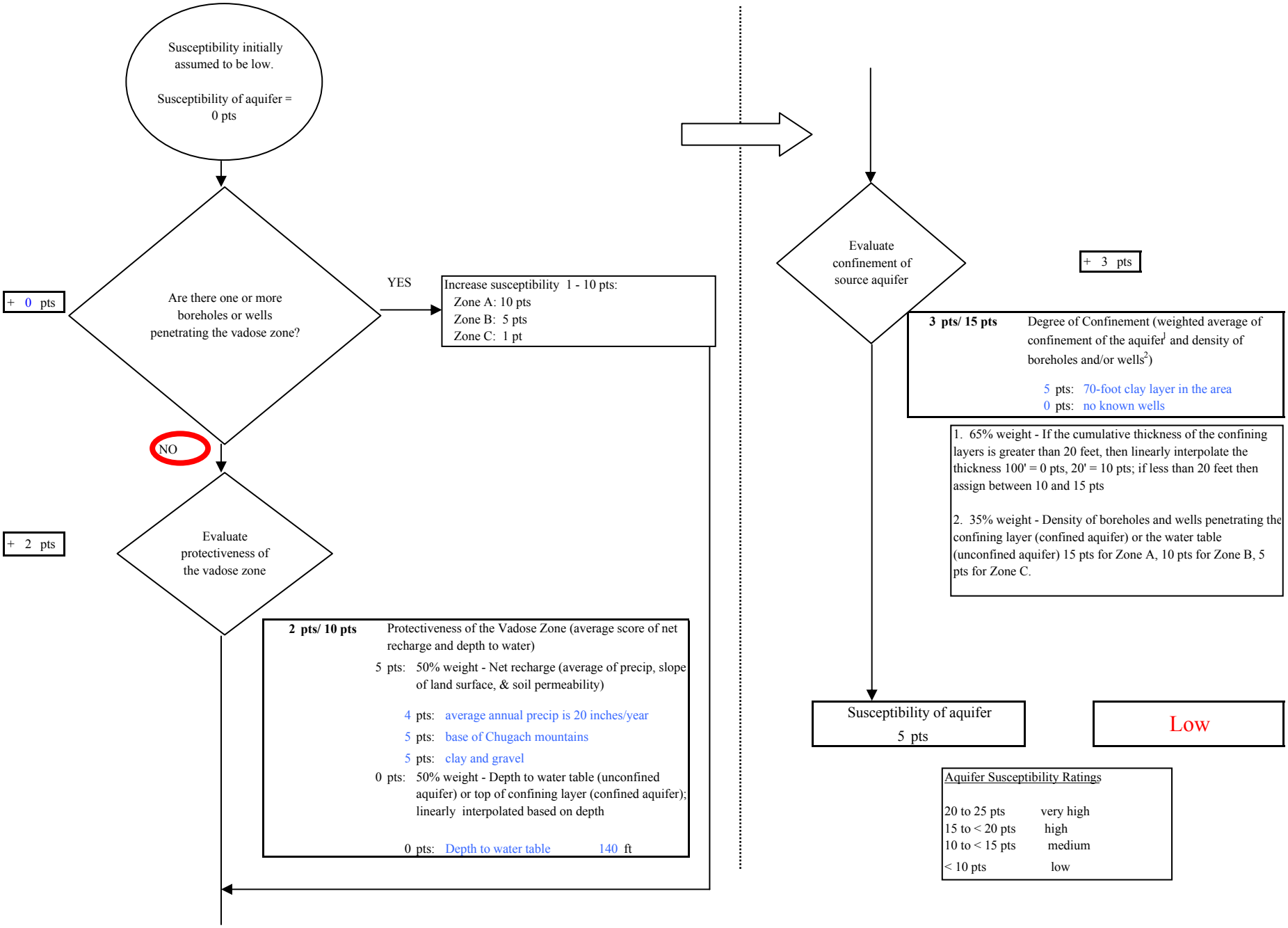
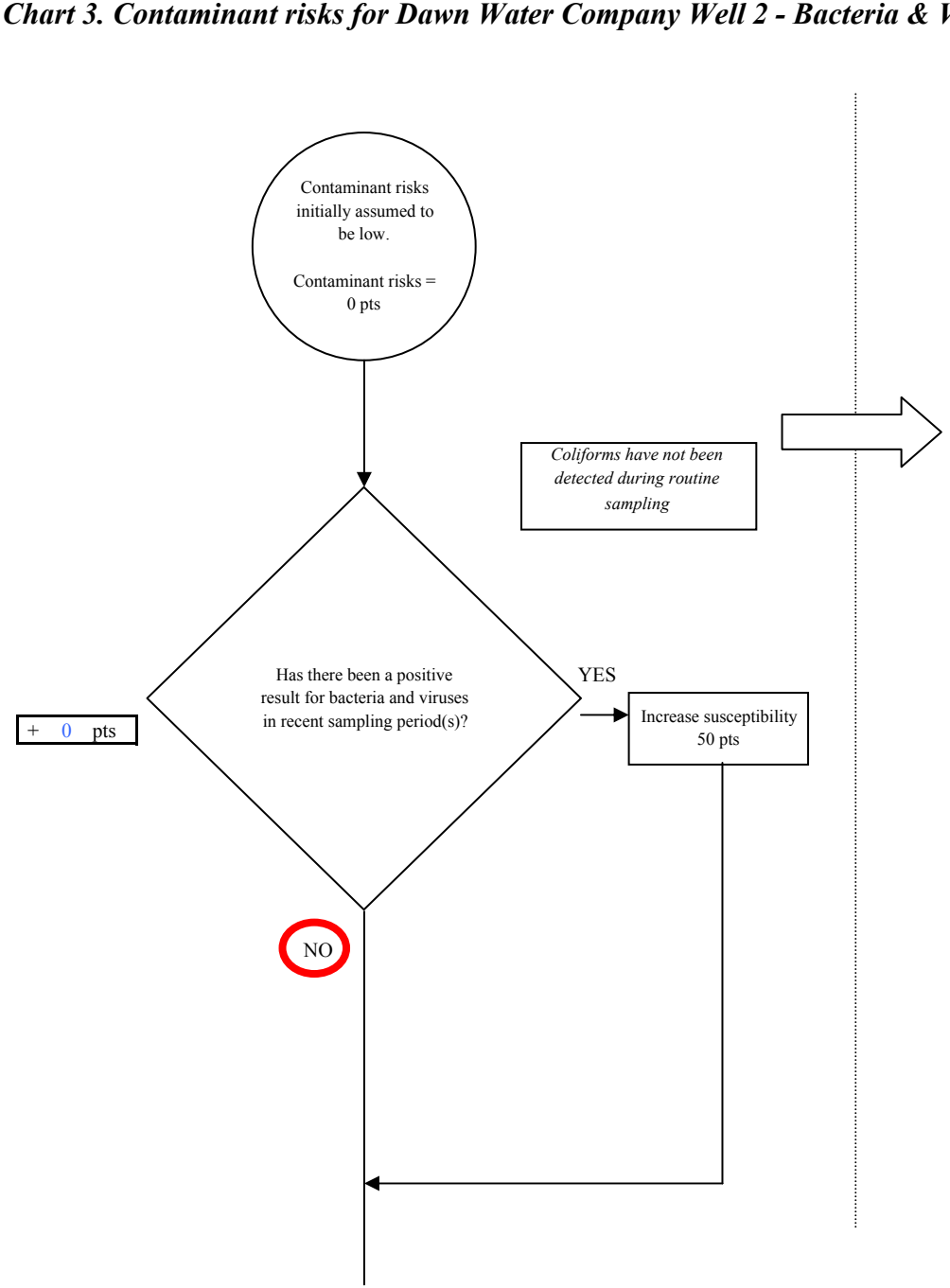
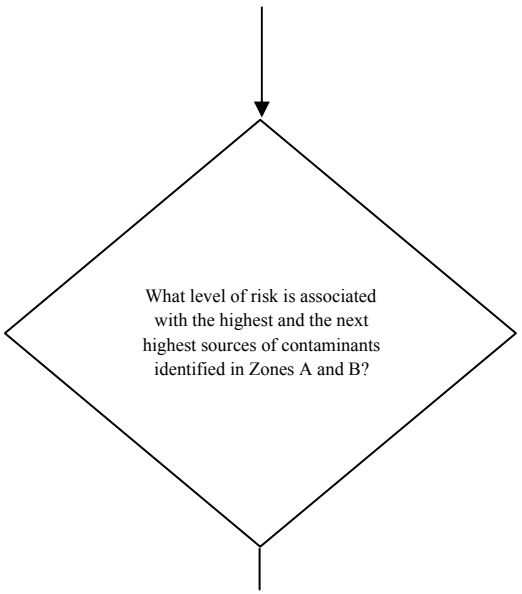


Chart 3. Contaminant risks for Dawn Water Company Well 2 - Bacteria & Viruses





+ 25 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)	1	0	1
Low(s)	33	8	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 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 3. Contaminant risks for Dawn Water Company Well 2 - Bacteria & Viruses

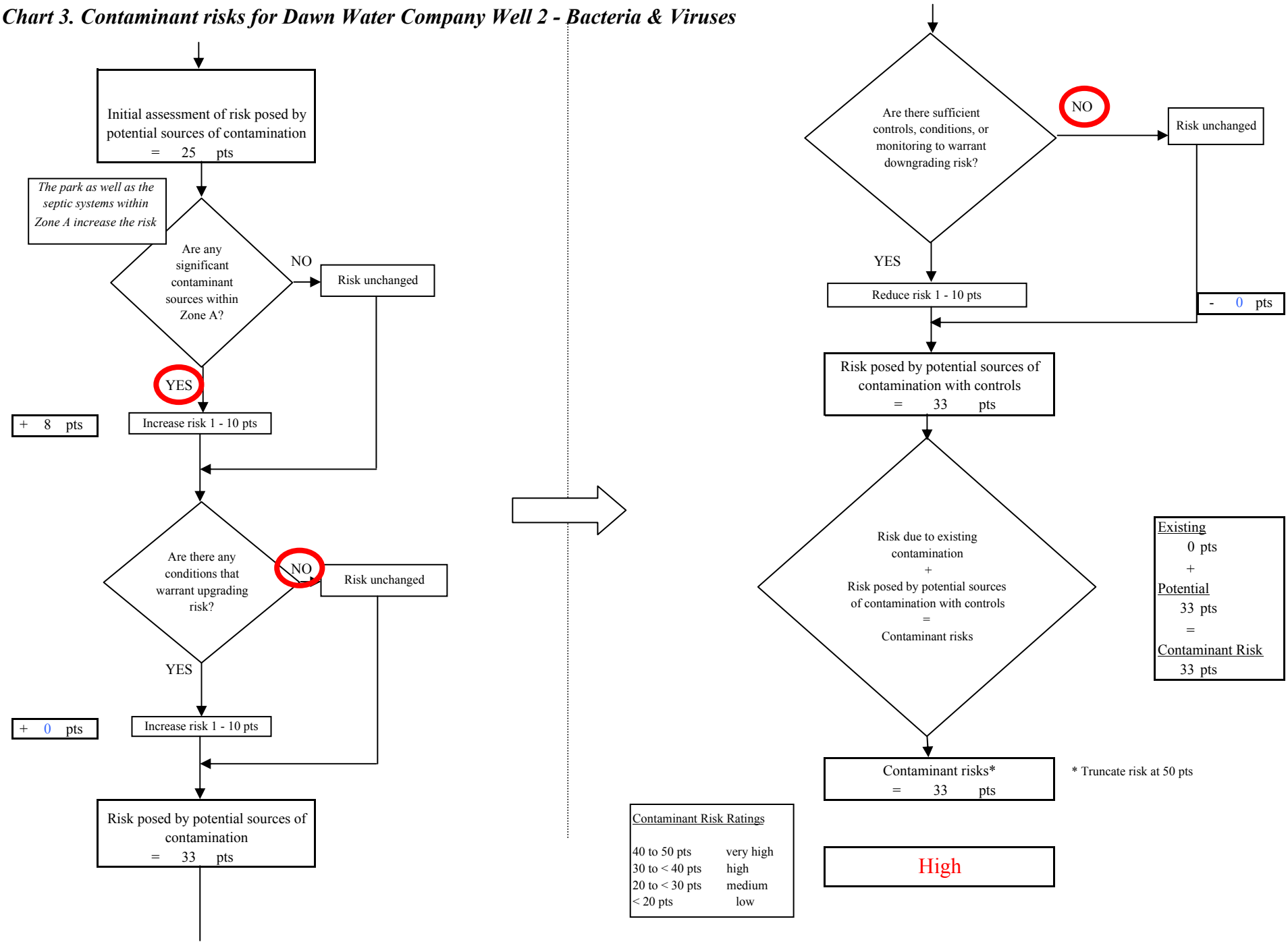


Chart 4. Vulnerability analysis for Dawn Water Company Well 2 - Bacteria & Viruses

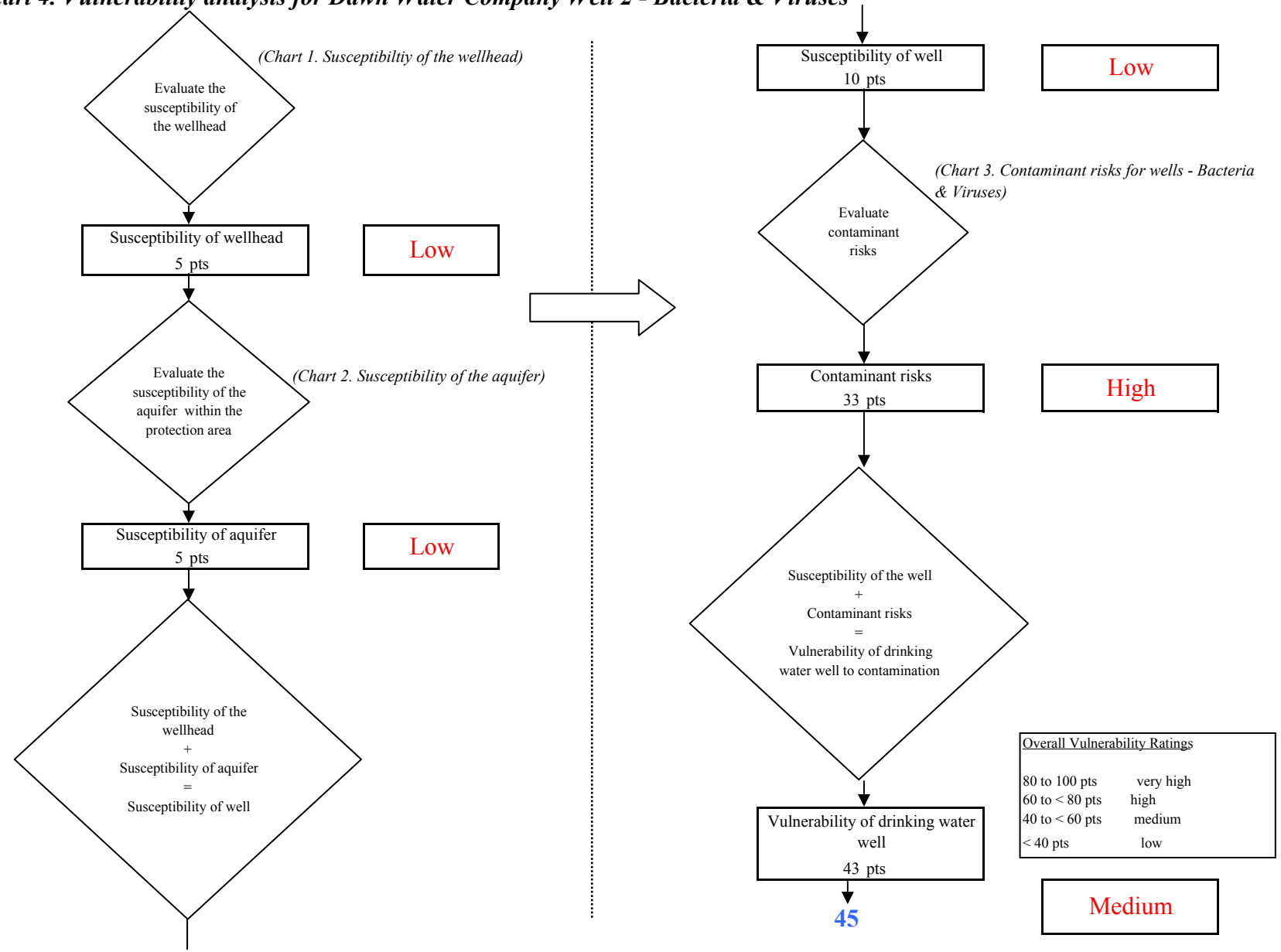


Chart 5. Contaminant risks for Dawn Water Company Well 2 - Nitrates and Nitrites

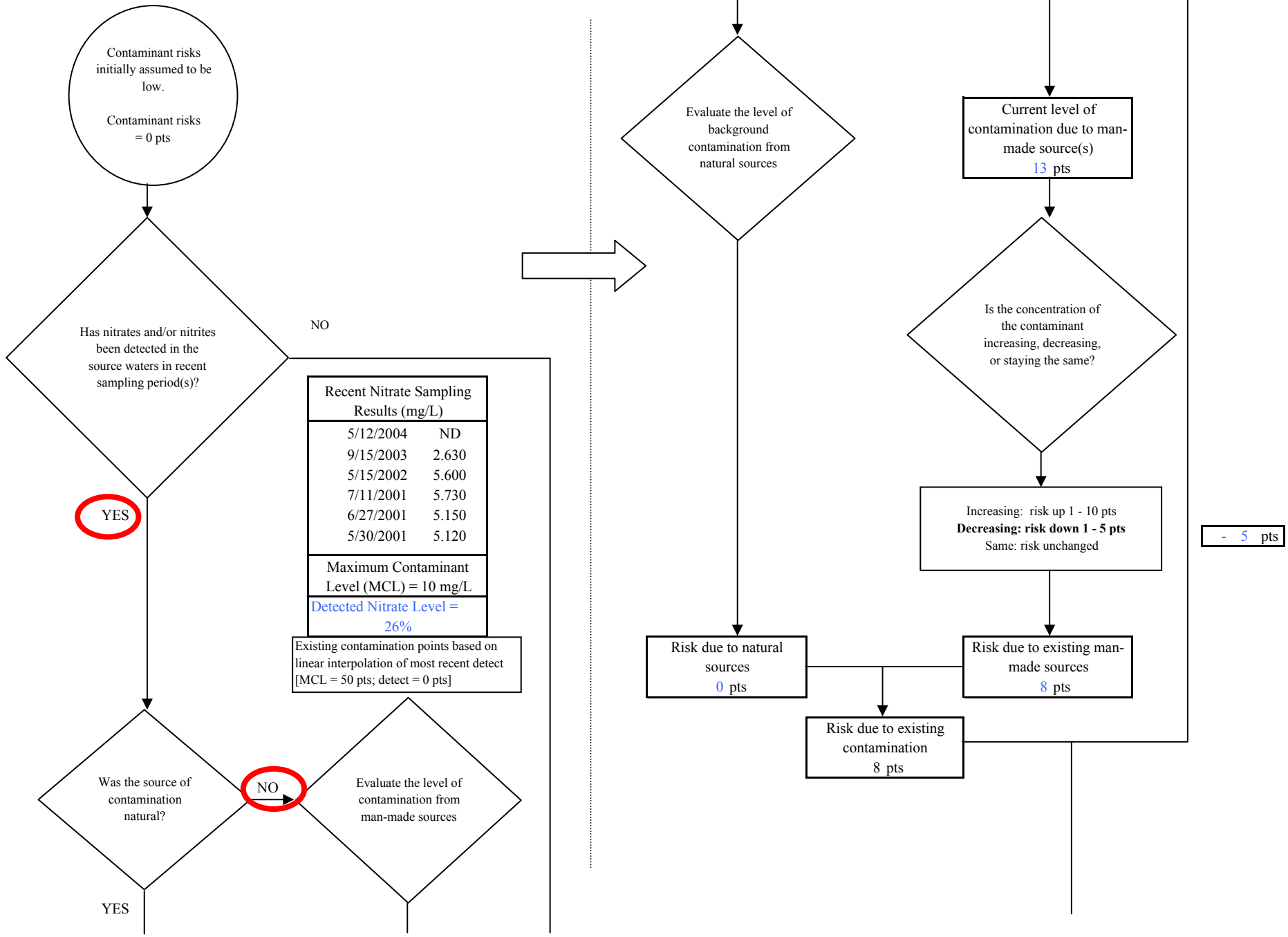
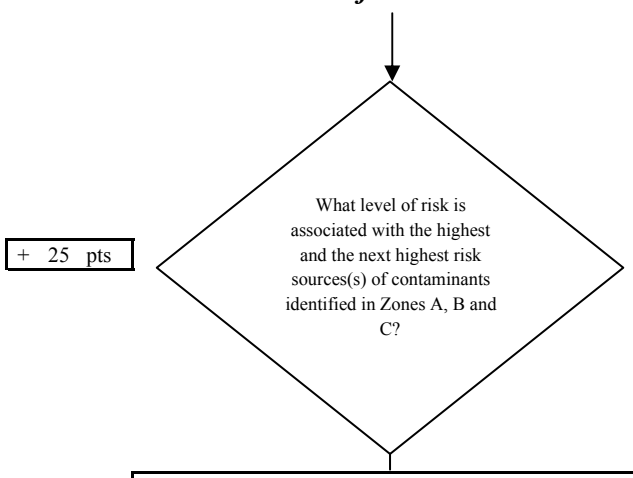


Chart 5. Contaminant risks for Dawn Water Company Well 2 - Nitrates and Nitrites



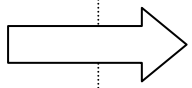
Risk Levels for Contaminant Sources identified in Zones A, B and C

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	1	0	1
Low(s)	33	8	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 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.



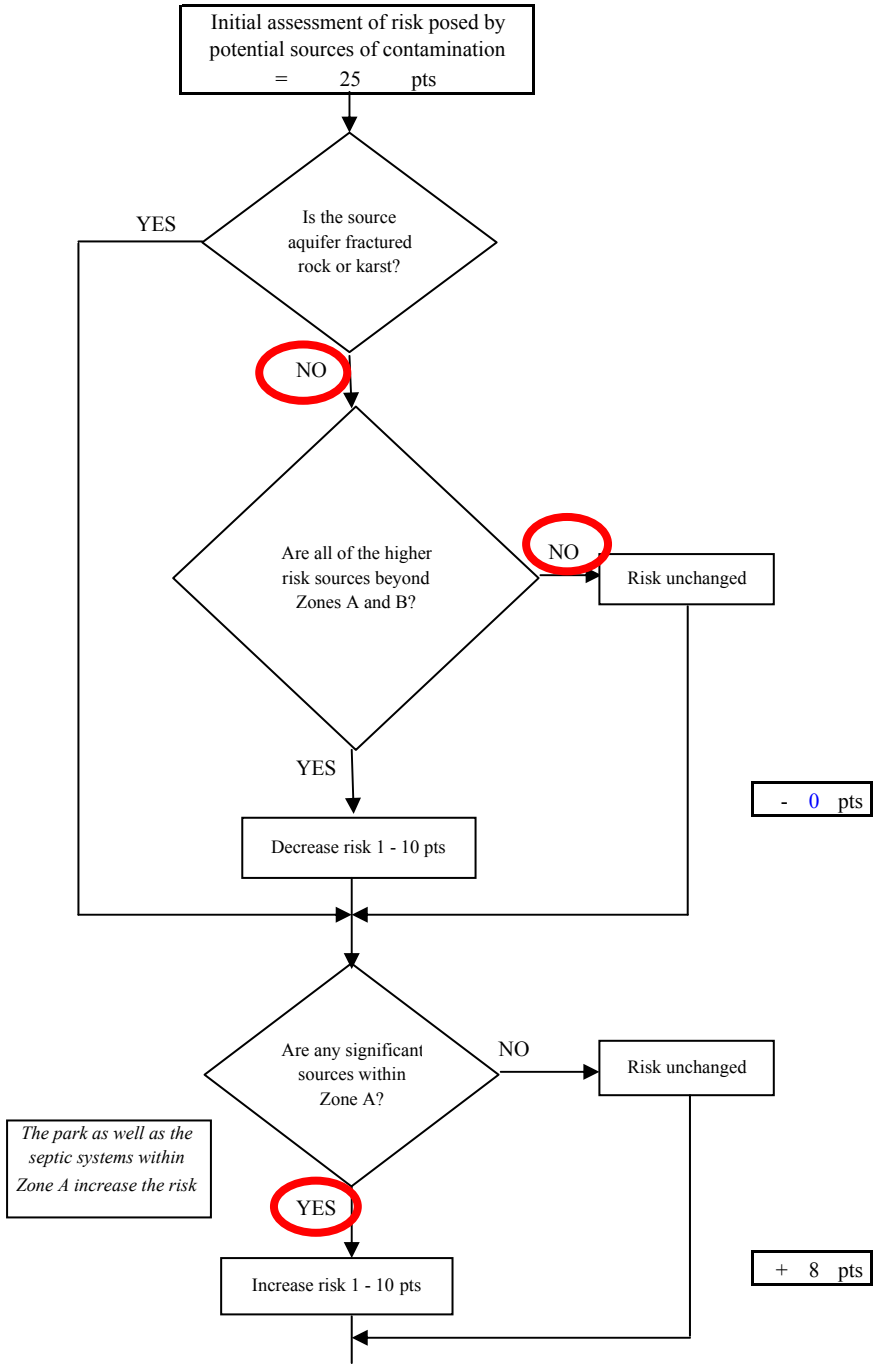


Chart 5. Contaminant risks for Dawn Water Company Well 2 - Nitrates and Nitrites

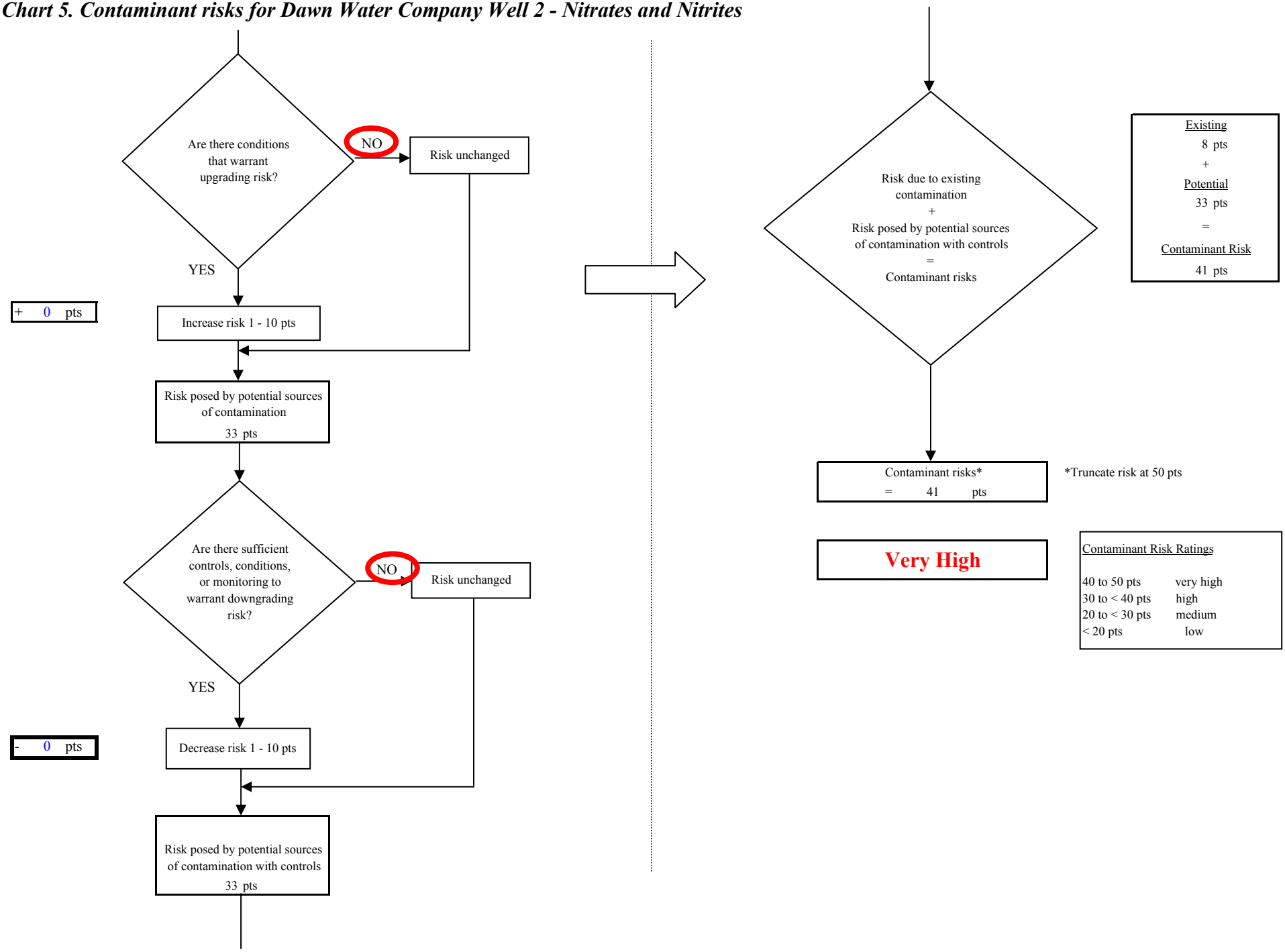


Chart 6. Vulnerability analysis for Dawn Water Company Well 2 - Nitrates and Nitrites

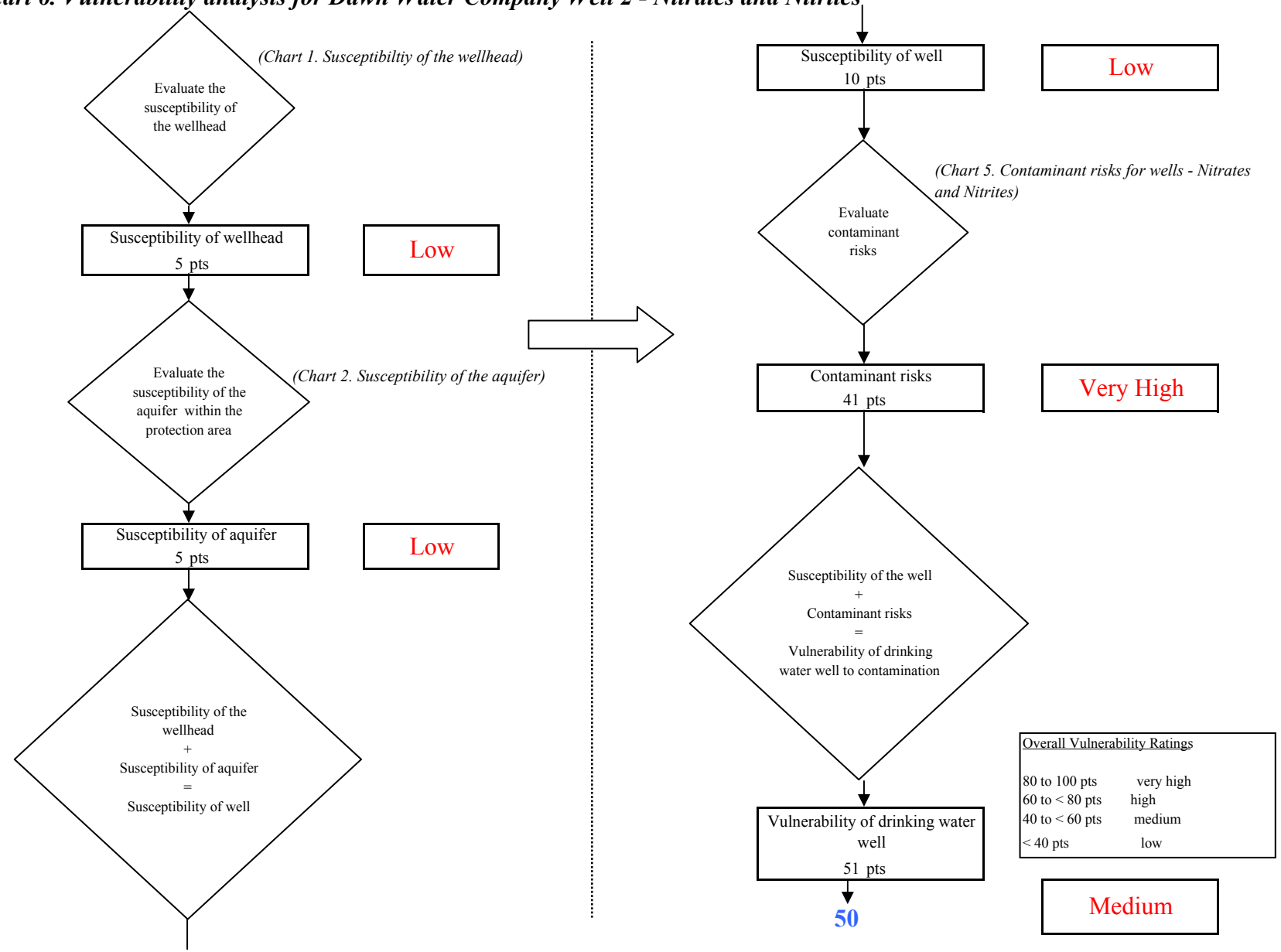


Chart 7. Contaminant risks for Dawn Water Company Well 2 - Volatile Organic Chemicals

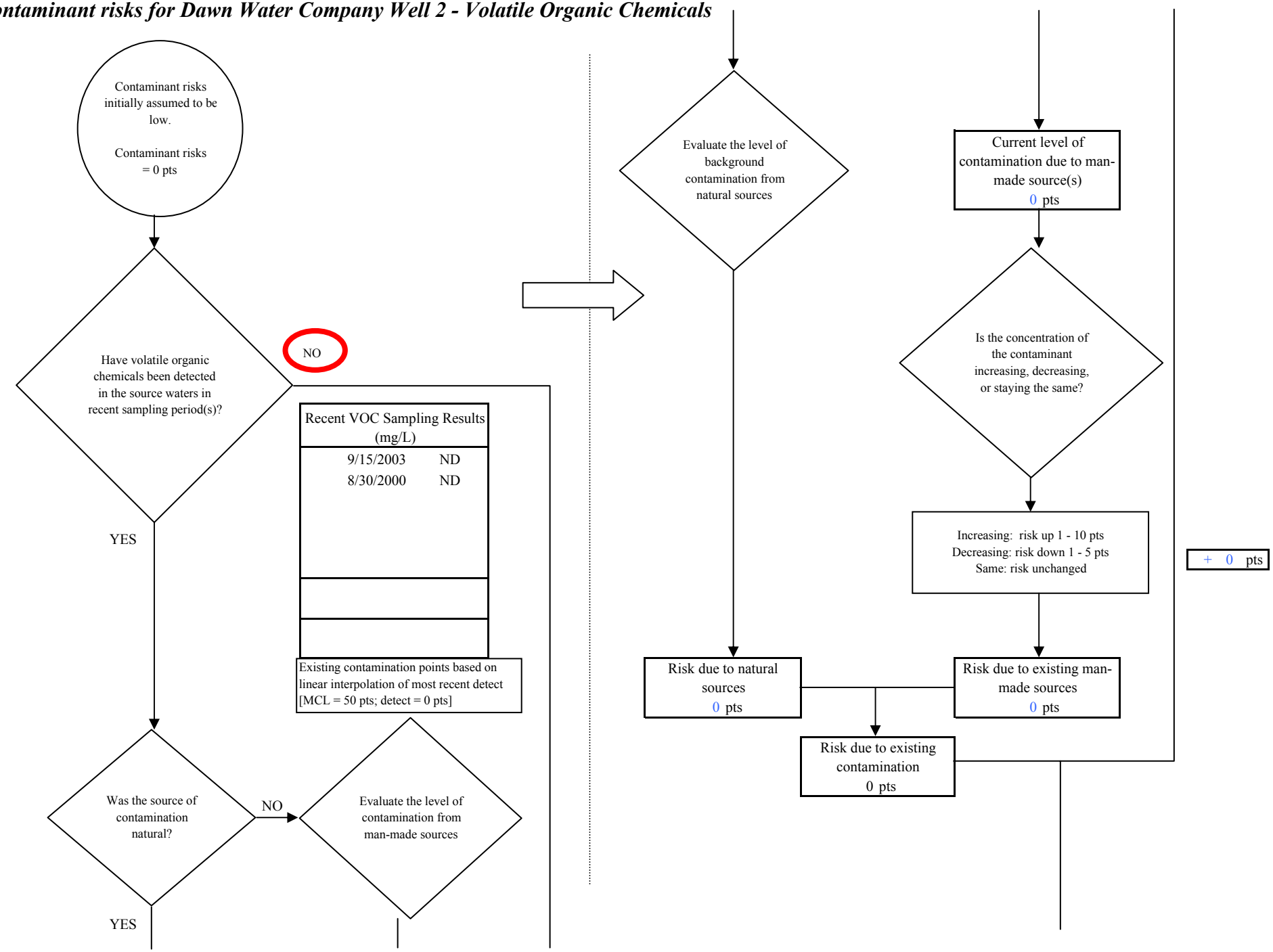


Chart 7. Contaminant risks for Dawn Water Company Well 2 - Volatile Organic Chemicals

+ 10 pts

What level of risk is associated with the highest and the next highest risk sources(s) of contaminants identified in Zones A, 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)	4	3	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.

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

Is the source aquifer fractured rock or karst?

YES

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

YES

Increase risk 1 - 10 pts

+ 0 pts

Chart 7. Contaminant risks for Dawn Water Company Well 2 - Volatile Organic Chemicals

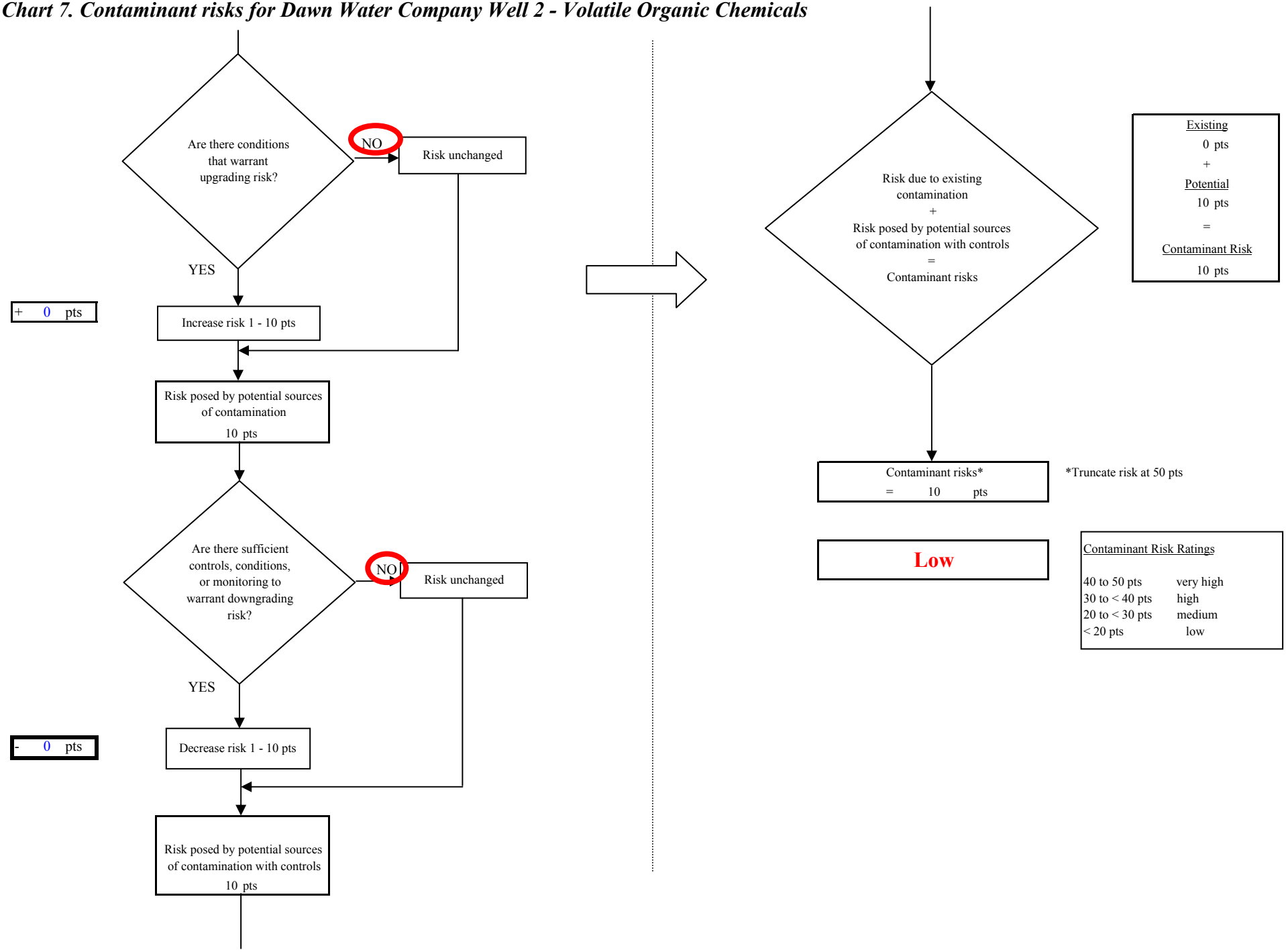


Chart 8. Vulnerability analysis for Dawn Water Company Well 2 - Volatile Organic Chemicals

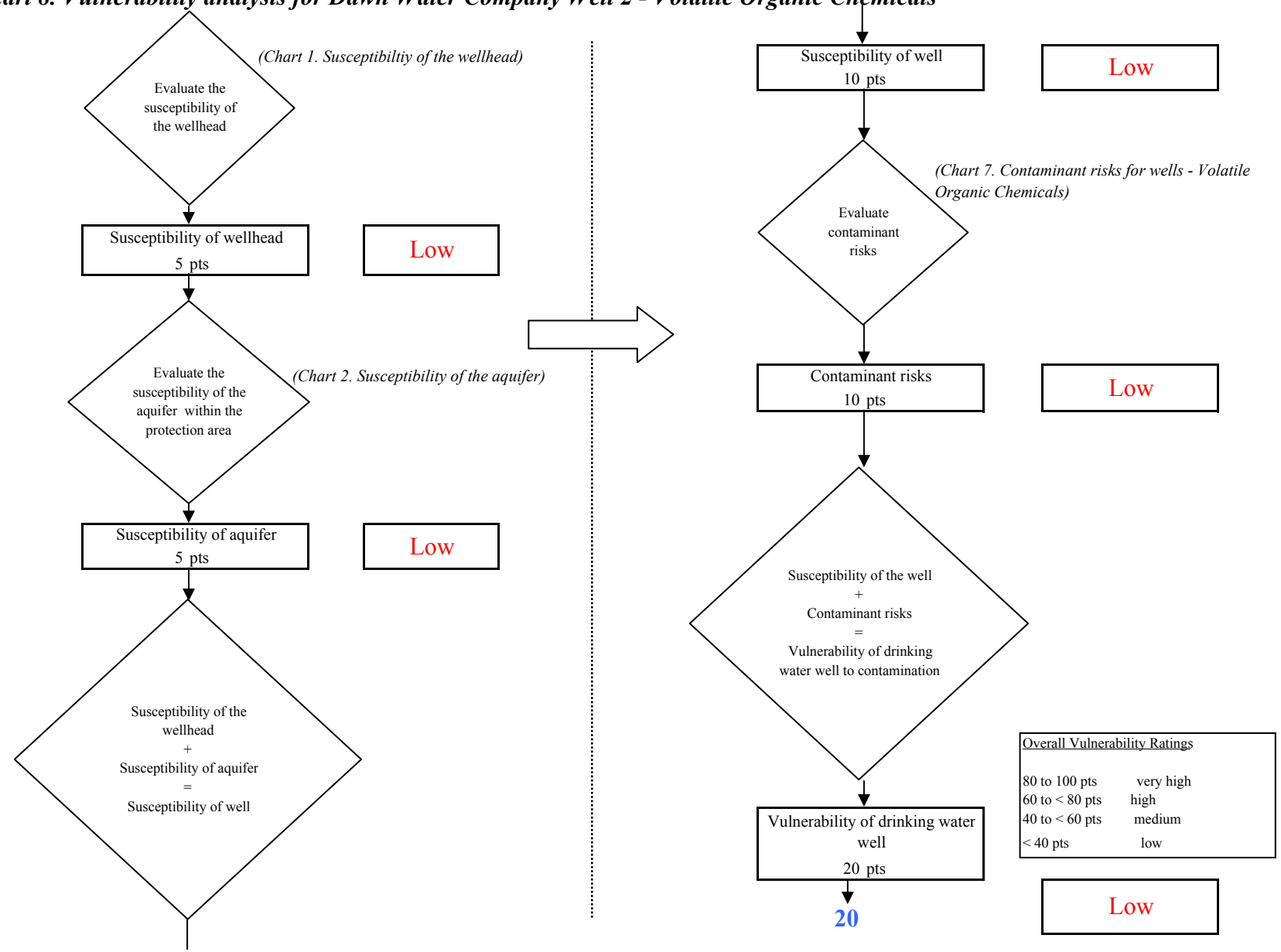


Chart 9. Contaminant risks for Dawn Water Company Well 2 - Heavy Metals, Cyanide and Other Inorganic Chemicals

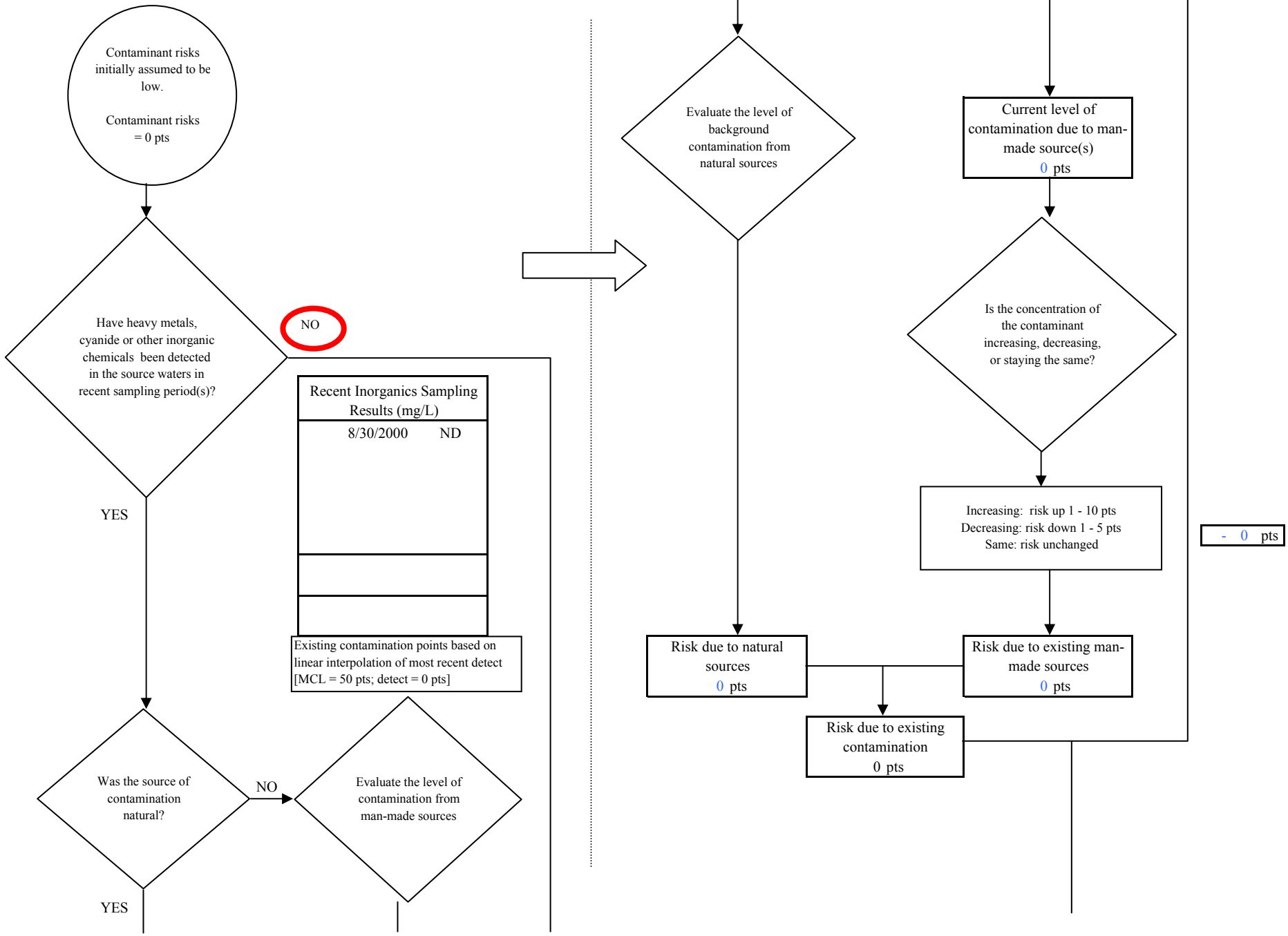


Chart 9. Contaminant risks for Dawn Water Company Well 2 - Heavy Metals, Cyanide and Other Inorganic Chemicals

+ 10 pts

What level of risk is associated with the highest and the next highest risk sources(s) of contaminants identified in Zones A, 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)	4	3	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.

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

Is the source aquifer fractured rock or karst?

YES

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

YES

Increase risk 1 - 10 pts

+ 0 pts

Chart 9. Contaminant risks for Dawn Water Company Well 2 - Heavy Metals, Cyanide and Other Inorganic Chemicals

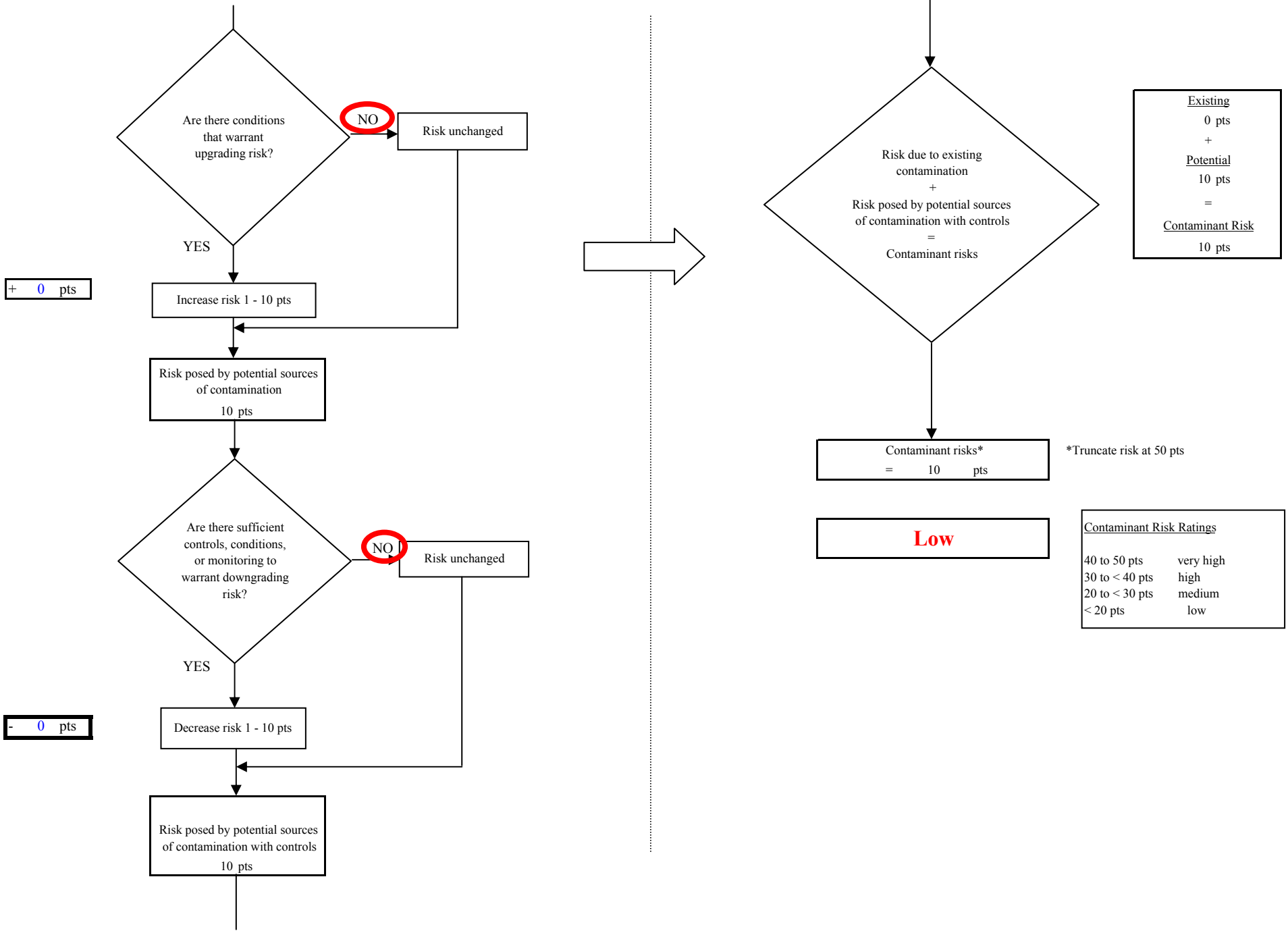


Chart 10. Vulnerability analysis for Dawn Water Company Well 2 - Heavy Metals, Cyanide and Other Inorganic Chemicals

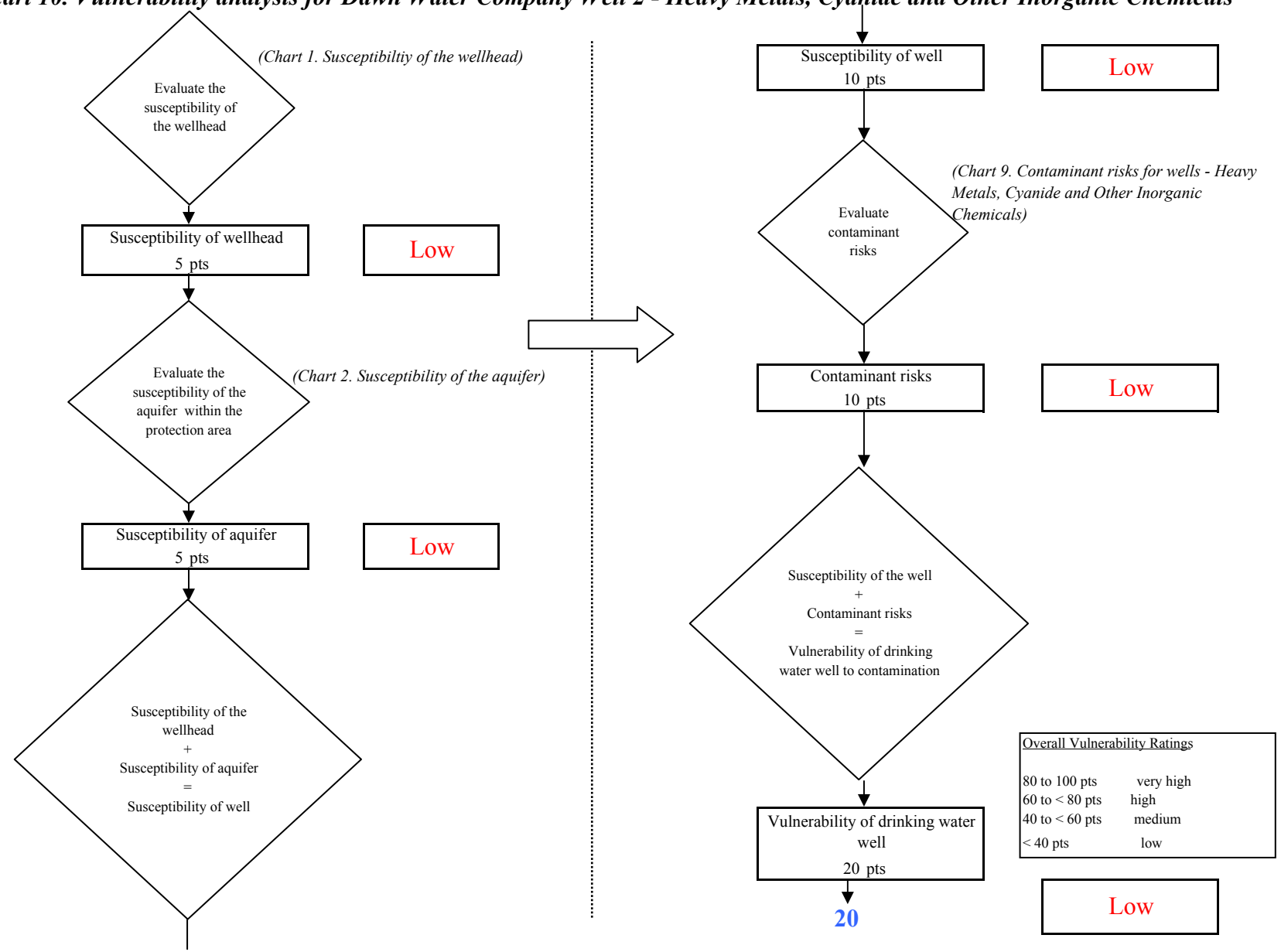


Chart 11. Contaminant risks for Dawn Water Company Well 2 - Synthetic Organic Chemicals

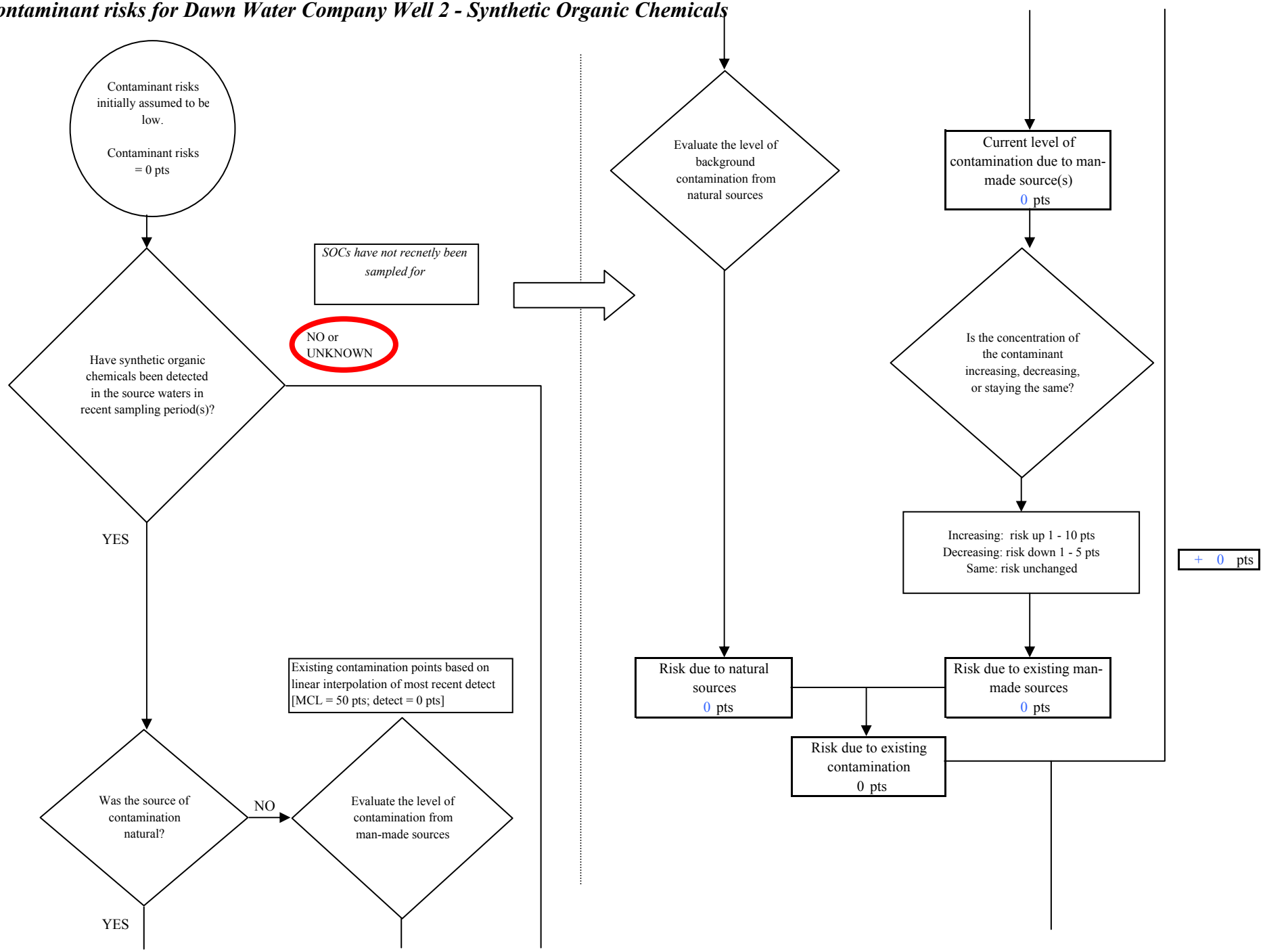
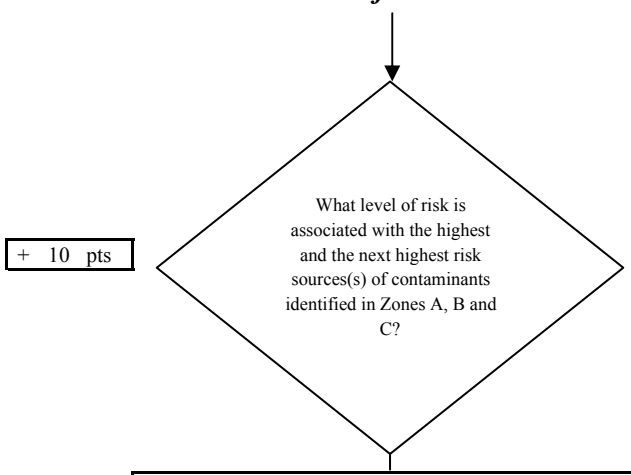


Chart 11. Contaminant risks for Dawn Water Company Well 2 - Synthetic Organic Chemicals



+ 10 pts

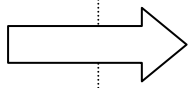
Risk Levels for Contaminant Sources identified in Zones A, B and C

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	3	2	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 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.



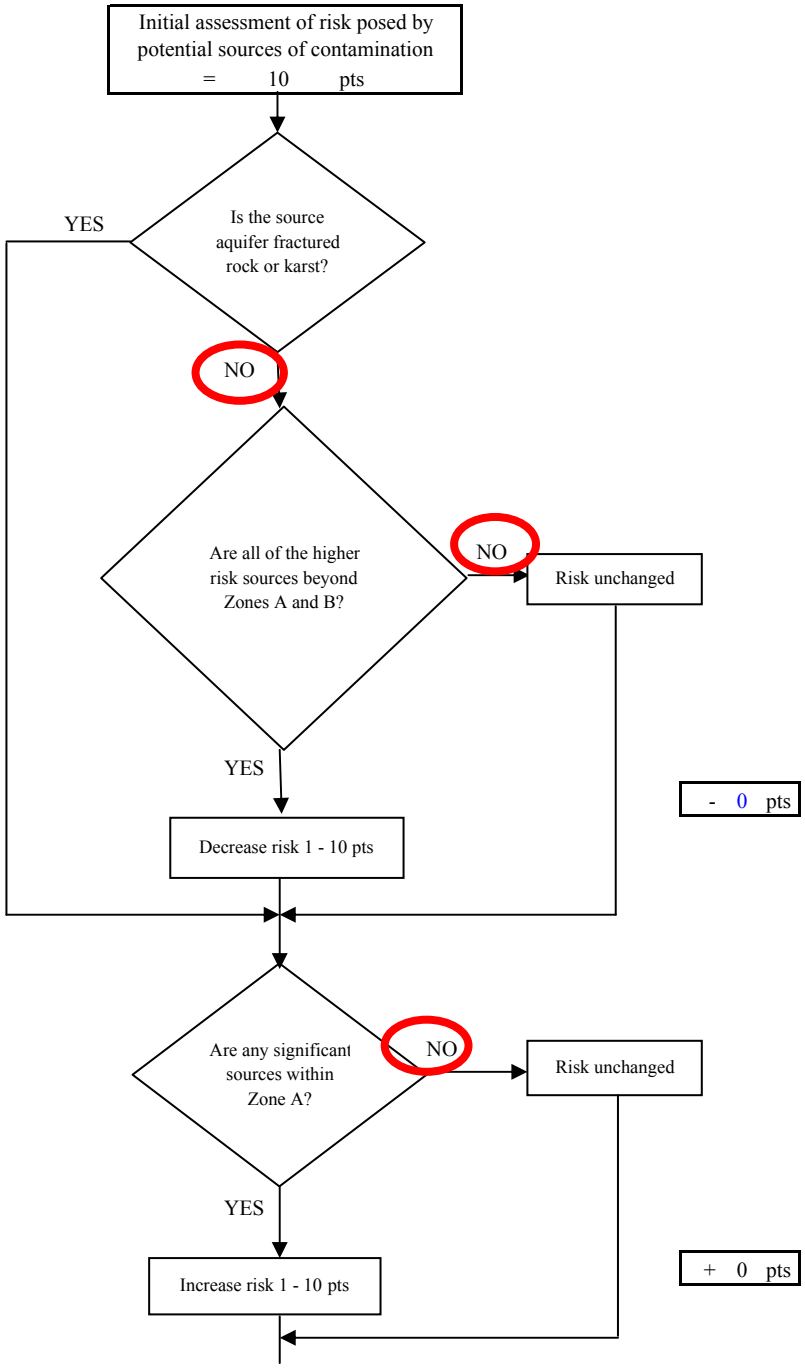


Chart 11. Contaminant risks for Dawn Water Company Well 2 - Synthetic Organic Chemicals

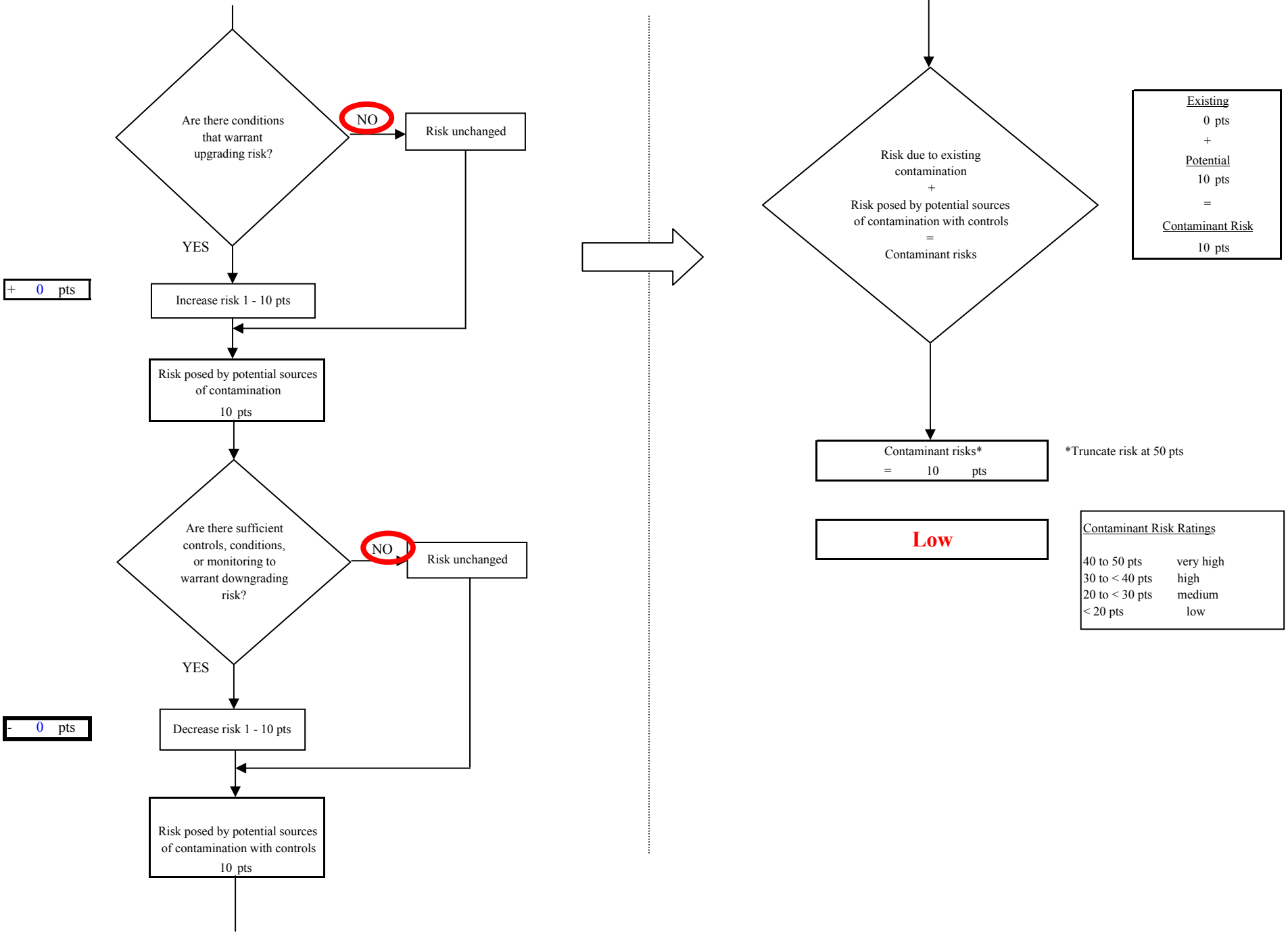


Chart 12. Vulnerability analysis for Dawn Water Company Well 2 - Synthetic Organic Chemicals

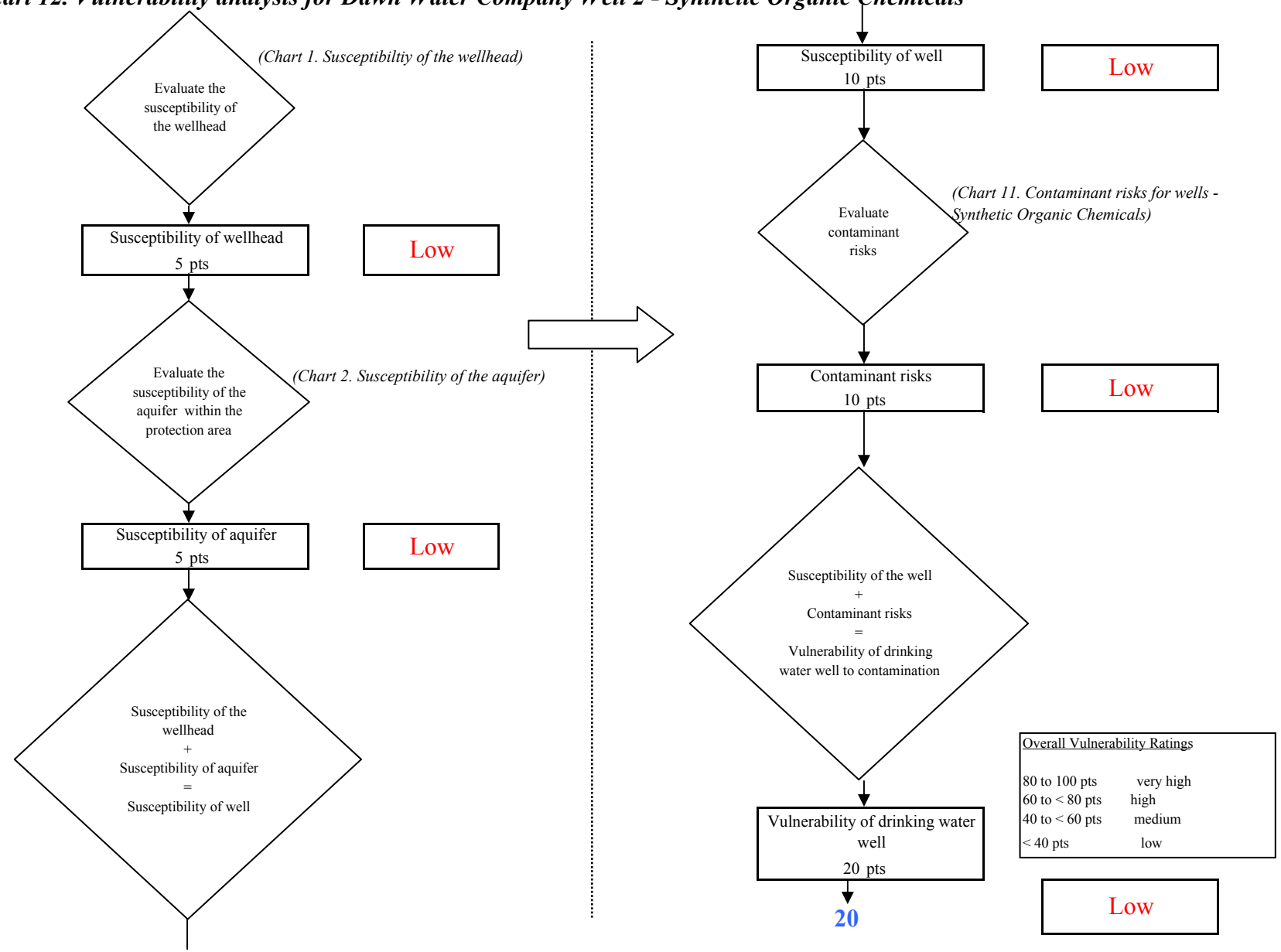


Chart 13. Contaminant risks for Dawn Water Company Well 2 - Other Organic Chemicals

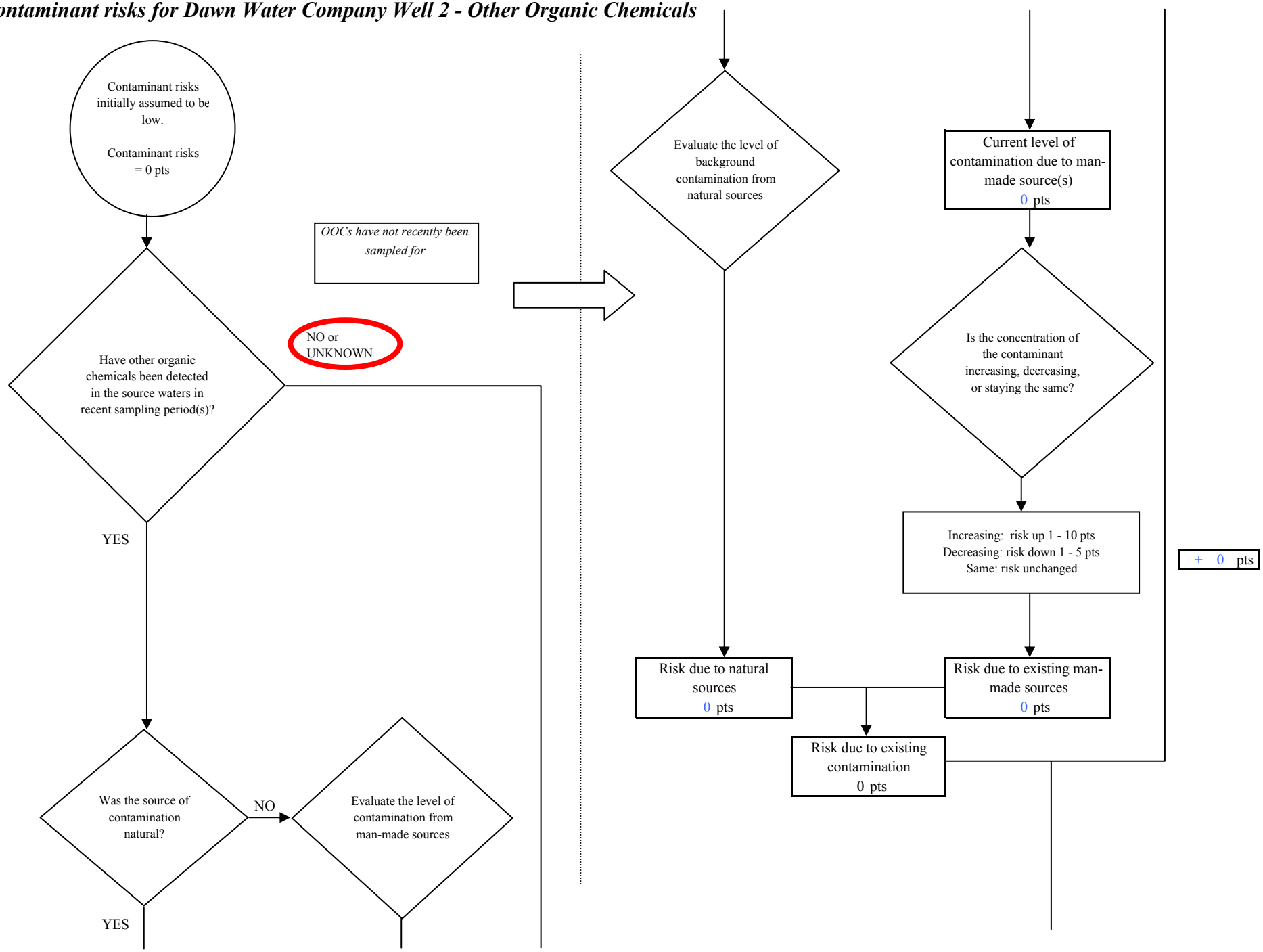


Chart 13. Contaminant risks for Dawn Water Company Well 2 - Other Organic Chemicals

+ 10 pts

What level of risk is associated with the highest and the next highest risk sources(s) of contaminants identified in Zones A, 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)	3	3	6

	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.

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

Is the source aquifer fractured rock or karst?

YES

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

YES

Increase risk 1 - 10 pts

+ 0 pts

Chart 13. Contaminant risks for Dawn Water Company Well 2 - Other Organic Chemicals

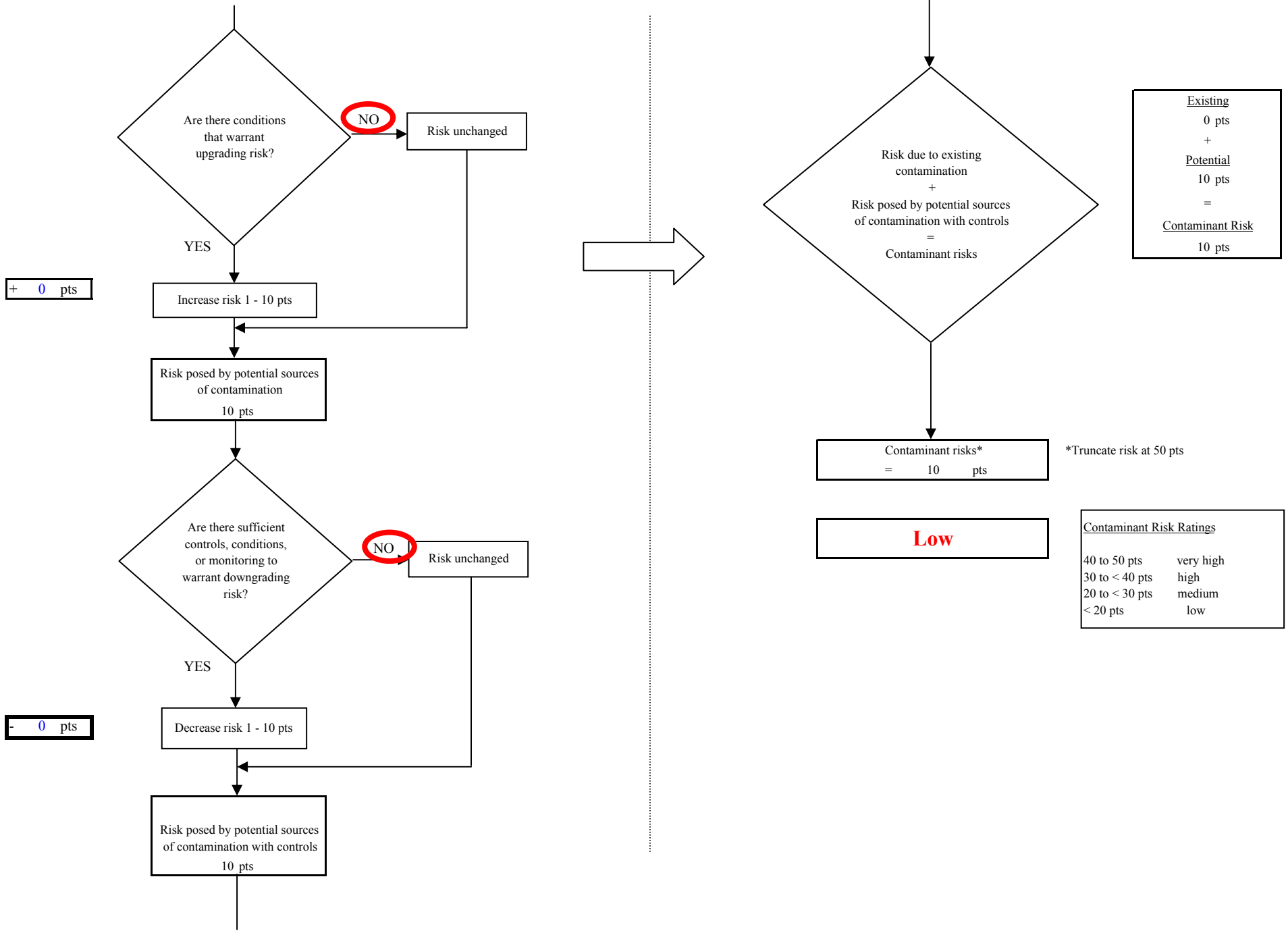


Chart 14. Vulnerability analysis for Dawn Water Company Well 2 - Other Organic Chemicals