Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for the Clear Air Station Clear, Alaska PWSID 390756

June 2004

DRINKING WATER PROTECTION PROGRAM REPORT Report 1531
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 Clear Air Station
Clear, 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 Clear Air Station. This Class A (community) water system consists of two wells near Building 005 of Clear Air Station in Clear, Alaska. The wells received a natural susceptibility rating of **Medium**. This rating is a combination of a susceptibility rating of **Low** for the actual wellhead and a **Very High** rating for the aquifer from which the well is drawing water. Identified potential and current sources of contamination for the Clear Air Station public water system include: heavy equipment storage, pest extermination services/pesticide sales, a welding shop, a Class III Municipal landfill, a RCRA Hazardous Waste Generator, septic systems, fuel storage tanks, DEC-recognized contaminated sites, roads, a rail corridor, and a Leaking Underground Storage Tank (LUST) site. These are considered as sources of 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 Clear Air Station received an overall vulnerability rating of **Medium** for bacteria and viruses, and a **Low** for nitrates and/or nitrites, volatile organic chemicals, heavy metals, cyanide, and other inorganic chemicals, synthetic organic chemicals, and other organic chemicals.

CLEAR AIR STATION PUBLIC DRINKING WATER SYSTEM

The Clear Air Station public water system is a Class A (community) water system. The systems consists of two wells located near Building 005 of Clear Air Station in Clear, Alaska (Fairbanks Meridian, T7S, R8W, Section 20) (See Map 1 of Appendix A). Clear is located 76 miles southwest of Fairbanks and 6 miles west off of the George Parks Highway.

Clear Air Station provides a piped sewer and water system to all base facilities (ADCED, 2002). Electricity is produced using a coal-fired power plant.

The Clear Air Station public water system lies in the alluvial plain of the Nenana River at an elevation of approximately 550 feet above sea level.

The depths of the wells are about 150 feet below the ground surface. Most of the wells in this area are screened in sand and gravel, and it is assumed this one is also. The static water levels in the wells are about 60 feet below ground surface. The coarse, alluvial, sandy gravel in the floodplains of the areas streams and rivers provides a large aquifer even in the winter when infiltration is low. Discontinuous permafrost (perennially frozen areas) may also be present in the alluvial plain. Areas with discontinuous permafrost may locally affect the ground water flow directions. Both the Nenana River as well as surface infiltration contribute water to this alluvial aquifer.

The Clear Air Station public drinking water system serves approximately 307 residents through about sixteen service connections.

CLEAR AIR STATION 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 the whole alluvial plain 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 Clear Air Station's public water system well 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 Clear Air Station 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 Clear Air Station 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.

Tables 2 through 7 in Appendix B contain the ranking of inventoried potential and existing sources of contamination with respect to the six contaminant categories.

VULNERABILITY OF CLEAR AIR STATION 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

The wellheads for the Clear Air Station received a Low Susceptibility rating. The 2/21/01 Sanitary Survey indicates both wells are capped with a sanitary seal, and the land surface is sloped away from each of the wells; however neither well is 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 the Clear Air Station well is completed in received a Very High Susceptibility rating. The highly transmissive aquifer material (sand and gravel) in the area allows contaminants to travel quickly through it. Private or monitoring wells in the area can also provide a quick pathway for contaminants to travel down into the aquifer if the wells are not grouted correctly. The depth of the water table does create some protection from contaminants, however. The material above the aquifer creates natural filtering of potential contaminants before coming into contact with the water table where they can disperse quickly. Table 2 summarizes the Susceptibility scores and ratings for Clear Air Station.

Table 2. Susceptibility

	Score	Rating
Susceptibility of the Wellhead	5	Low
Susceptibility of the Aquifer	20	Very High
Natural Susceptibility	25	Medium

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	30	High
Nitrates and/or Nitrites	42	Very High
Volatile Organic Chemicals	40	Very High
Heavy Metals, Cyanide, and Other Inorganic Chemicals	50	Very High
Synthetic Organic Chemicals	40	Very High
Other Organic Chemicals	40	Very 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 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	55	Medium
Nitrates and/or Nitrites	65	High
Volatile Organic Chemicals	65	High
Heavy Metals, Cyanide, and Other Inorganic Chemicals	75	High
Synthetic Organic Chemicals	65	High
Other Organic Chemicals	65	High

Bacteria and Viruses

The landfill represents the greatest 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 landfill also represents the greatest risk of nitrates and nitrites for this source of public drinking water.

Nitrates are very mobile, moving at approximately the same rate as water. Nitrates have been not detected in significant concentrations in recent sampling history for the Clear Air Station well.

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 high.

Volatile Organic Chemicals

The landfill as well as the fuel storage tanks and, heavy equipment storage, and welding shop in Zone A represent the greatest 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 high.

Heavy Metals, Cyanide, and Other Inorganic Chemicals

Again, the landfill represents the greatest risk to heavy metals for this source of public drinking water.

Barium, Cadmium, Chromium, Cyanide, Fluoride, and Thallium have all been detected but in concentrations below their respective MCLs. A MCL is the concentration of a contaminant allowed in the drinking water by the Environmental Protection Area (EPA).

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 high.

Synthetic Organic Chemicals

The landfill and the rail corridor represent the most significant risk of Synthetic Organic Chemical to this public water system.

Synthetic Organic Chemicals have not been detected during sampling of 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 high.

Other Organic Chemicals

The landfill and the heavy equipment storage represent the greatest risks of Other Organic Chemicals for this source of public drinking water.

Other Organic Chemicals have not been detected during sampling of 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 high.

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

Clear Air Station
Drinking Water Protection Area Location Map
(Map 1)

Clear Air Station Main wells

Map 1: Clear Air Station Drinking Water Protection Area

PWSID: 390756.001

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

0 2,200 4,400 8,800 13,200 Feet

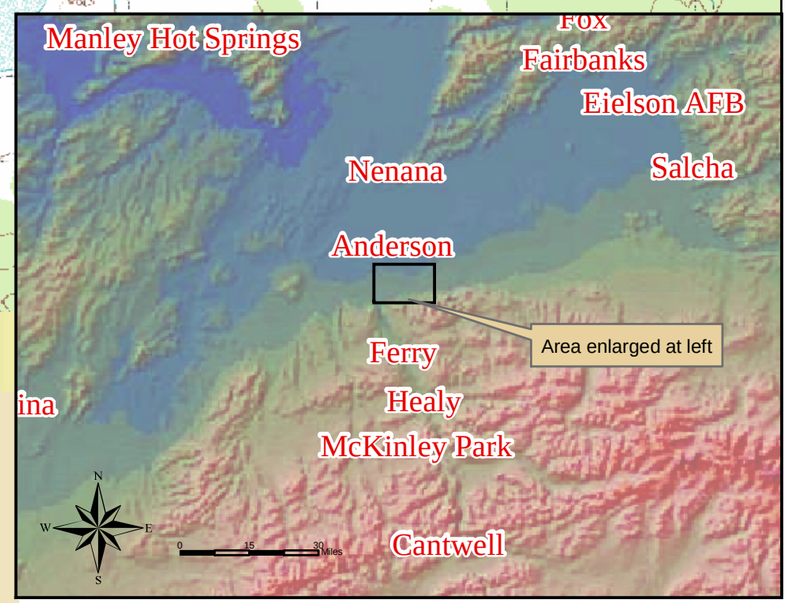
1:50,926

Data Sources:

Background image
- USGS 1:63,000 mapping

Legend

- Clear Air Station wells
- Zone A
- Zone B
- Zone C
- Zone D



APPENDIX B

Contaminant Source Inventory and Risk Ranking for Clear Air Station (Tables 1-7)

Table 1

Contaminant Source Inventory for ***Clear Air Station - Main***

PWSID 390756.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Heavy equipment rental/storage	C18	C18-1	A	2	Exact location unknown
Pest extermination services/pesticide sales	C33	C33-1	A	2	Exact location unknown
Welding shops	C43	C43-1	A	2	Exact location unknown
RCRA Hazardous Waste Generators (RCRA #?)	D54	D54-1	A	2	Exact location unknown
Septic systems (serves one single-family home)	R02		A	2	Exact locations unknown
Tanks, heating oil, residential (above ground)	R08		A	2	Exact locations unknown
Tanks, diesel (above ground)	T06		A	2	Exact location unknown
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-1	A	2	Exact location unknown
Highways and roads, dirt/gravel	X24		A	2	5 roads in Zone A
Landfills (municipal; Class III)	D51	D51-1	B	2	
Rail corridors	X30	X30-1	B	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10		D	2	
Open Leaking Underground Fuel Storage Tank (LUST) Sites	U07	U07-1	D	2	Mile 280 Parks Highway; Clear Sky Lodge; File Number 150.26.018

Table 2

Contaminant Source Inventory and Risk Ranking for Clear Air Station - Main Sources of Bacteria and Viruses

PWSID 390756.001

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		A	Low	2	Exact locations unknown
Highways and roads, dirt/gravel	X24		A	Low	2	5 roads in Zone A
Landfills (municipal; Class III)	D51	D51-1	B	High	2	

Table 3

Contaminant Source Inventory and Risk Ranking for Clear Air Station - Main Sources of Nitrates/Nitrites

PWSID 390756.001

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		A	Low	2	Exact locations unknown
Highways and roads, dirt/gravel	X24		A	Low	2	5 roads in Zone A
Landfills (municipal; Class III)	D51	D51-1	B	Very High	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10		D	High	2	

Table 4

Contaminant Source Inventory and Risk Ranking for Clear Air Station - Main Sources of Volatile Organic Chemicals

PWSID 390756.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Tanks, heating oil, residential (above ground)	R08		A	Medium	2	Exact locations unknown
Tanks, diesel (above ground)	T06		A	Medium	2	Exact location unknown
Highways and roads, dirt/gravel	X24		A	Low	2	5 roads in Zone A
Septic systems (serves one single-family home)	R02		A	Low	2	Exact locations unknown
Heavy equipment rental/storage	C18	C18-1	A	Medium	2	Exact location unknown
Pest extermination services/pesticide sales	C33	C33-1	A	Low	2	Exact location unknown
Welding shops	C43	C43-1	A	Medium	2	Exact location unknown
Landfills (municipal; Class III)	D51	D51-1	B	High	2	
Rail corridors	X30	X30-1	B	Medium	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10		D	Low	2	
Open Leaking Underground Fuel Storage Tank (LUST) Sites	U07	U07-1	D	Low	2	Mile 280 Parks Highway; Clear Sky Lodge; File Number 150.26.018

Table 5

Contaminant Source Inventory and Risk Ranking for Clear Air Station - Main

Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals

PWSID 390756.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Highways and roads, dirt/gravel	X24		A	Low	2	5 roads in Zone A
Septic systems (serves one single-family home)	R02		A	Low	2	Exact locations unknown
Heavy equipment rental/storage	C18	C18-1	A	Low	2	Exact location unknown
Pest extermination services/pesticide sales	C33	C33-1	A	Low	2	Exact location unknown
Welding shops	C43	C43-1	A	Low	2	Exact location unknown
Landfills (municipal; Class III)	D51	D51-1	B	High	2	
Rail corridors	X30	X30-1	B	Low	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10		D	Low	2	

Table 6

Contaminant Source Inventory and Risk Ranking for Clear Air Station - Main Sources of Synthetic Organic Chemicals

PWSID 390756.001

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		A	Low	2	Exact locations unknown
Pest extermination services/pesticide sales	C33	C33-1	A	Low	2	Exact location unknown
Landfills (municipal; Class III)	D51	D51-1	B	Very High	2	
Rail corridors	X30	X30-1	B	Medium	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10		D	Low	2	

Table 7

Contaminant Source Inventory and Risk Ranking for Clear Air Station - Main
Sources of Other Organic Chemicals

PWSID 390756.001

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		A	Low	2	Exact locations unknown
Highways and roads, dirt/gravel	X24		A	Low	2	5 roads in Zone A
Heavy equipment rental/storage	C18	C18-1	A	Medium	2	Exact location unknown
Welding shops	C43	C43-1	A	Low	2	Exact location unknown
Landfills (municipal; Class III)	D51	D51-1	B	Very High	2	
Rail corridors	X30	X30-1	B	Low	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10		D	Low	2	

APPENDIX C

Clear Air Station
Potential Contaminant Sources
(Map 2)

Clear Air Station wells

Exact locations unknown; within Zone A:
Heavy equipment storage
Pest extermination services/pesticide sales
Welding shop
RCRA Hazardous Waste Generator
Septic Systems
Residential heating oil tanks
Diesel tanks
DEC-recognized contaminated site

X30-1

D51-2

D51-1

Area enlarged at left

D10-1
U07-1

Map 2: Clear Air Station Potential Contaminant Sources

PWSID: 390756.001

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

0 350 700 1,400 2,100 Feet

1:8,400

Data Sources:

Background image
- USGS 1:63,000 mapping

Legend

- Clear Air Station wells
- Zone A
- Zone B
- Zone C
- Zone D
- D51, Class III Municipal Landfill
- X30, Railroad
- D10, Large capacity septic system
- U07, LUST site

0 0.5 1 3 Miles

APPENDIX D

Vulnerability Analysis for Clear Air Station Public Drinking Water Source

(Charts 1-14)

Chart 1. Susceptibility of the wellhead - Clear Air Station

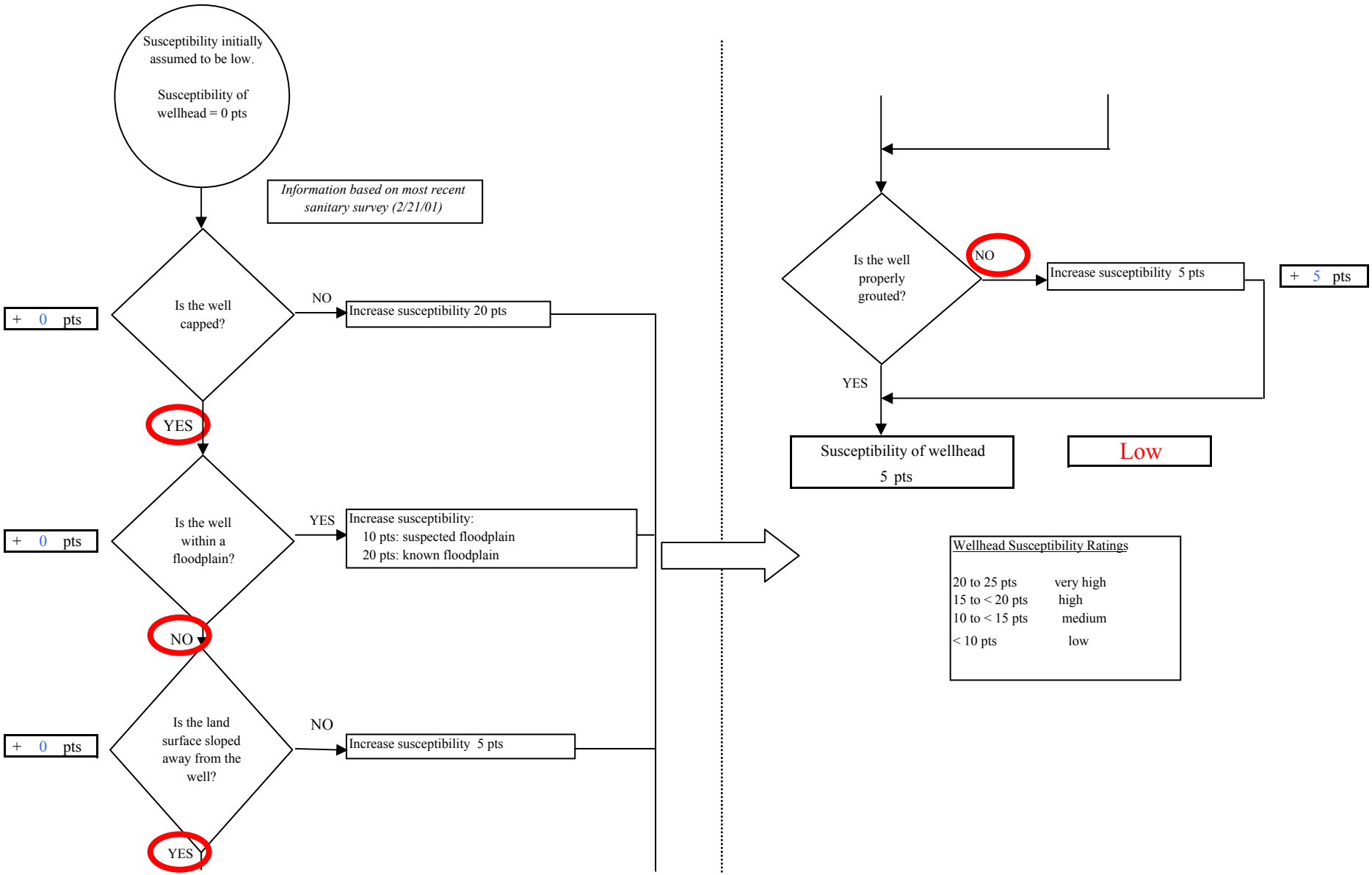


Chart 2. Susceptibility of the aquifer - Clear Air Station

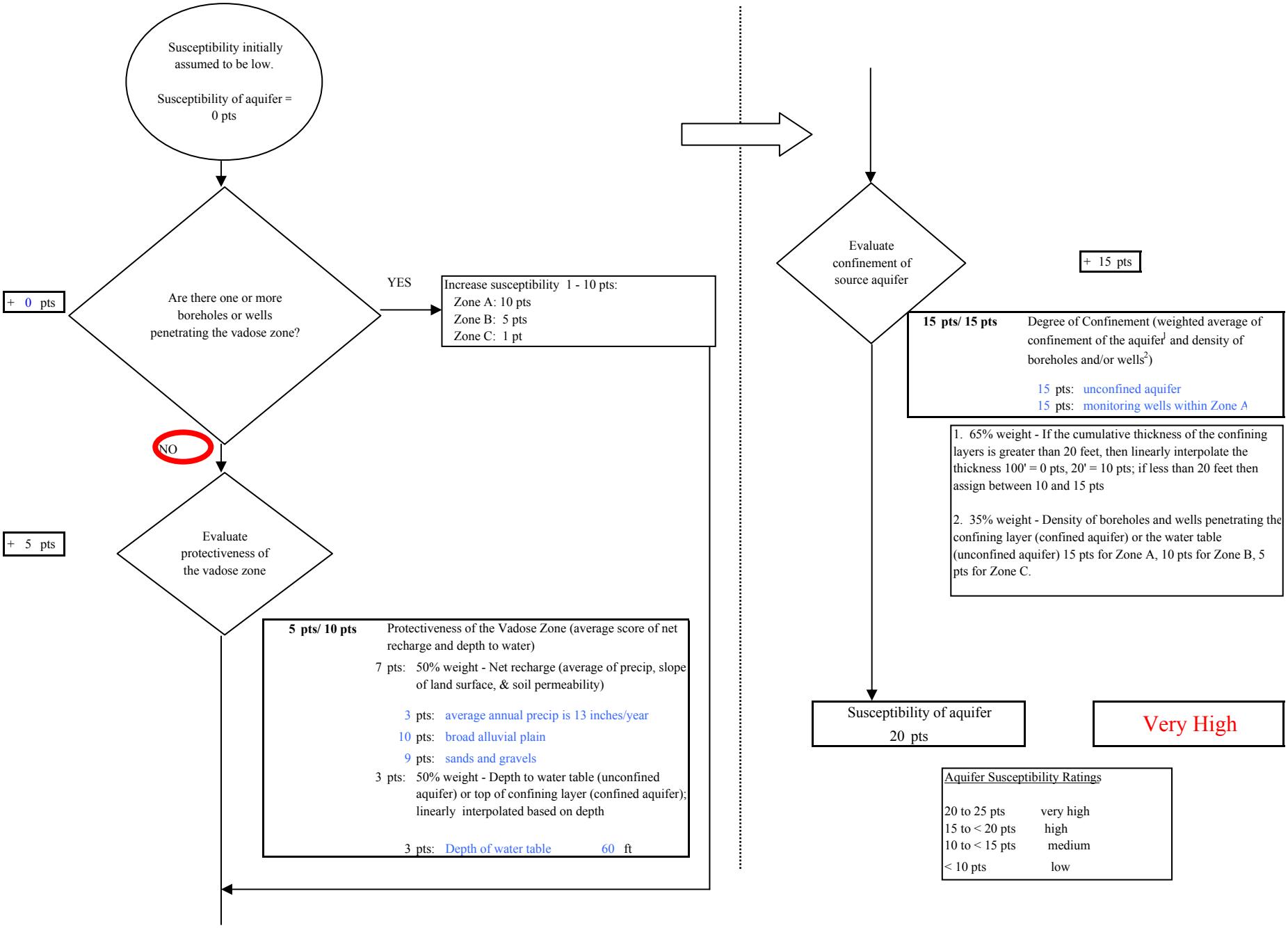
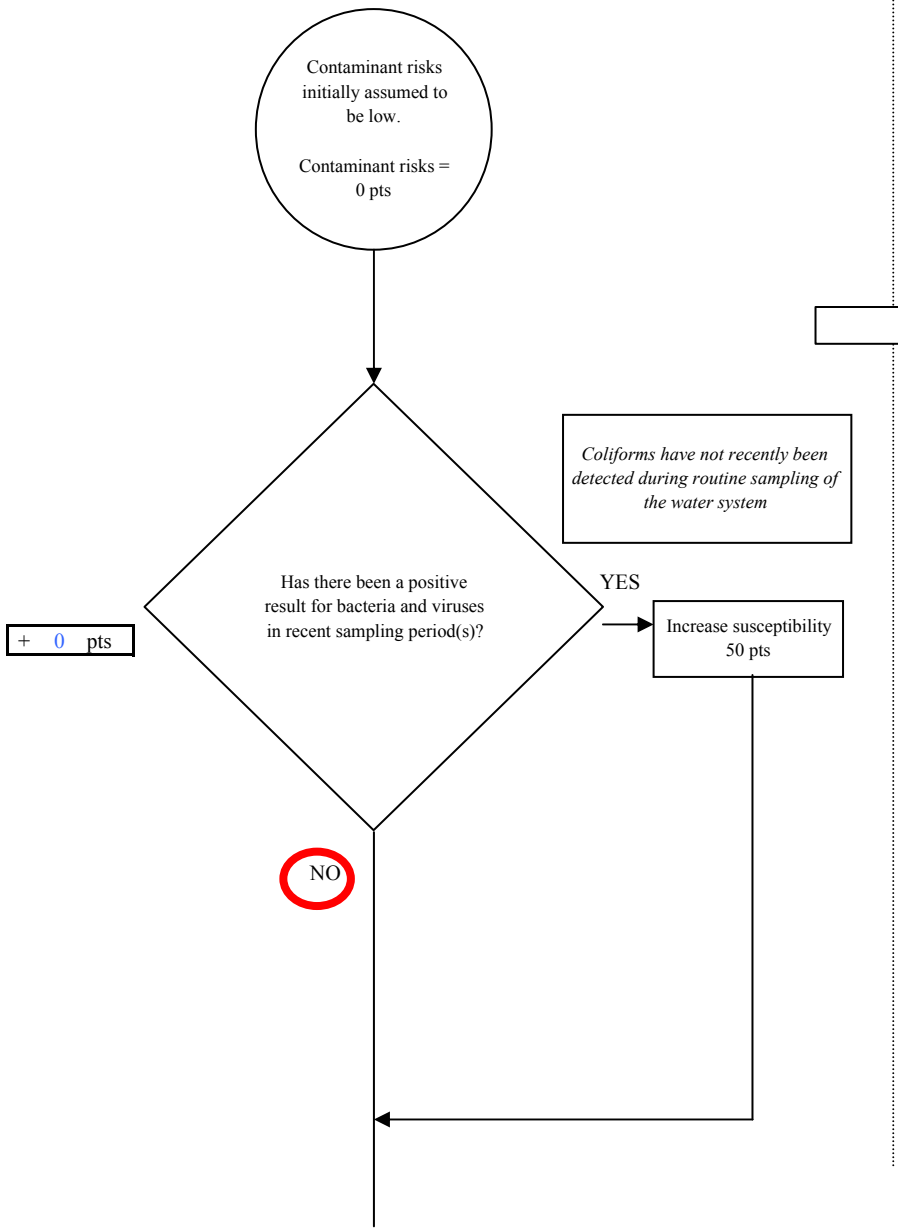
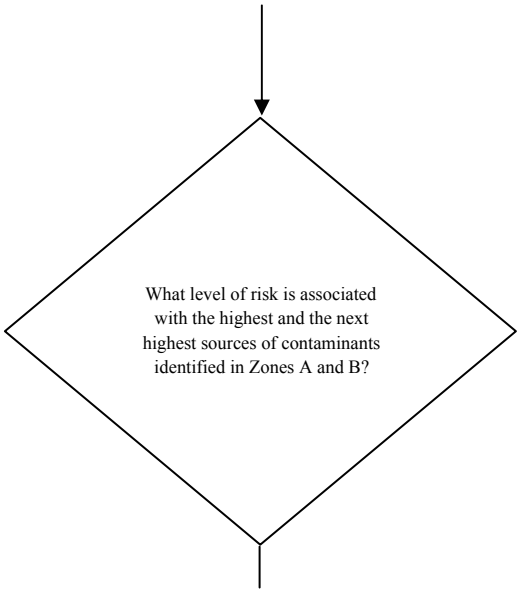


Chart 3. Contaminant risks for Clear Air Station - Bacteria & Viruses





+ 30 pts

Risk Rankings for Contaminant Sources Identified in Zones A and B

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

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

Matrix Score 30

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

Chart 3. Contaminant risks for Clear Air Station - Bacteria & Viruses

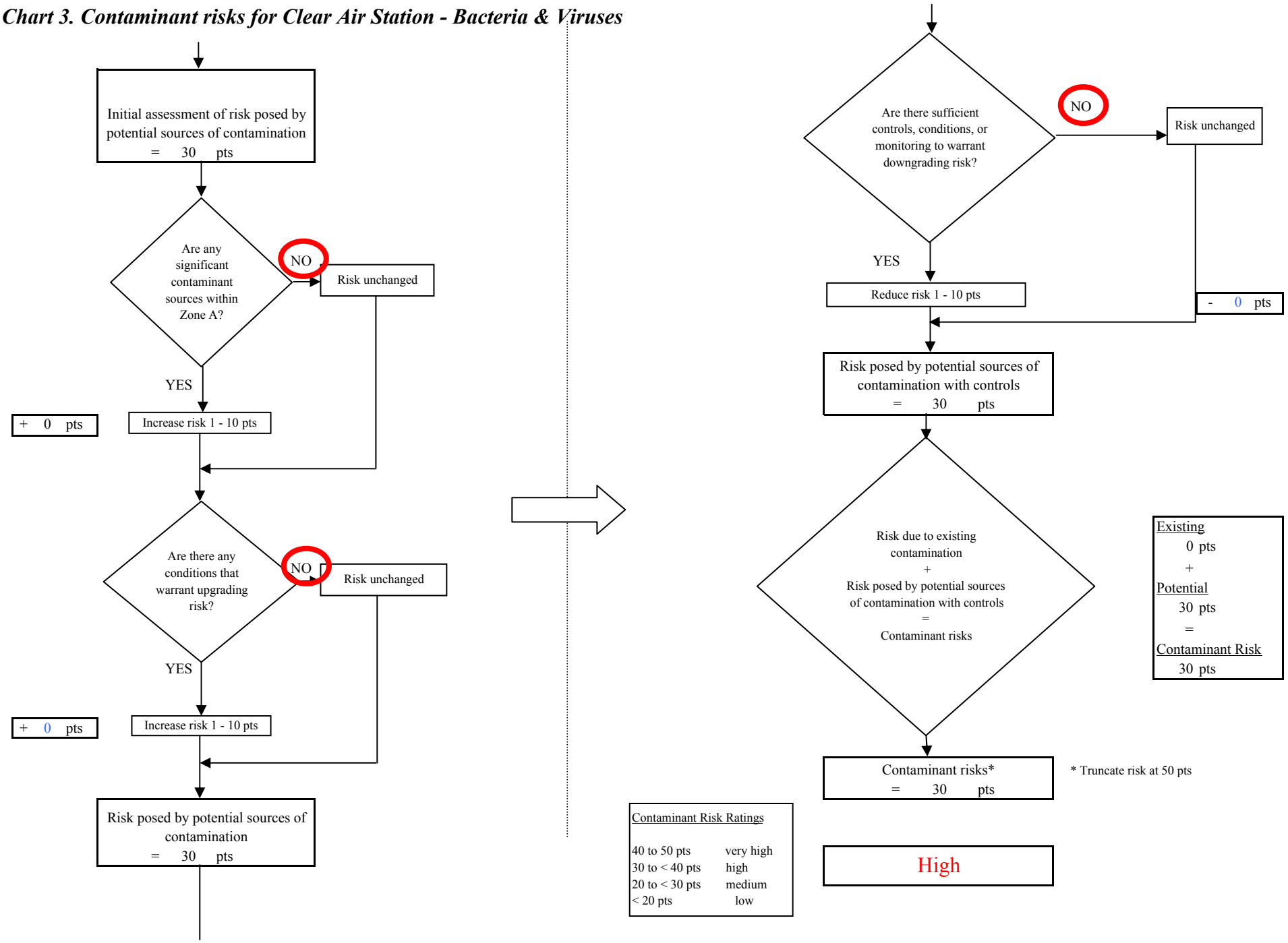


Chart 4. Vulnerability analysis for Clear Air Station - Bacteria & Viruses

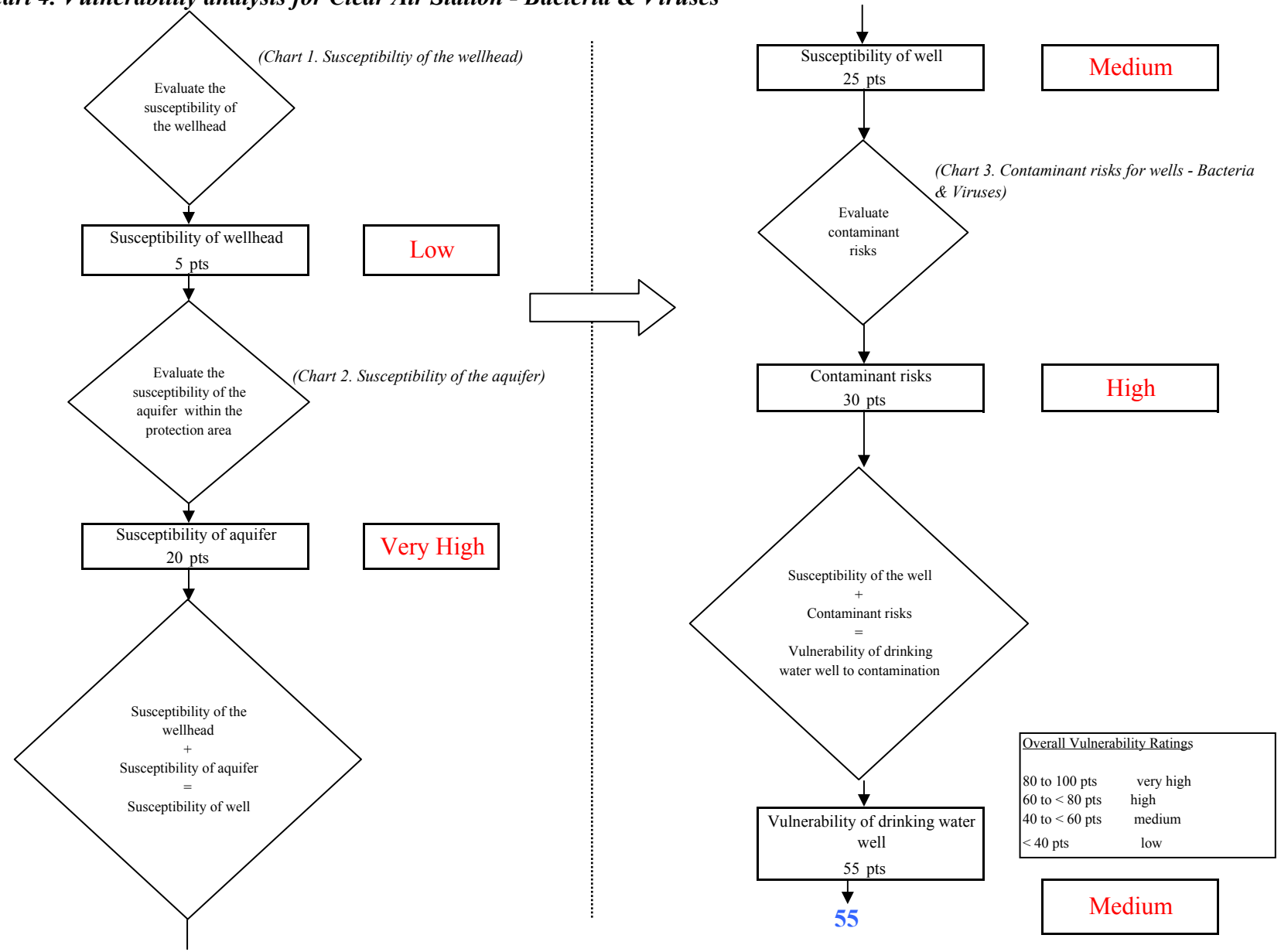


Chart 5. Contaminant risks for Clear Air Station - Nitrates and Nitrites

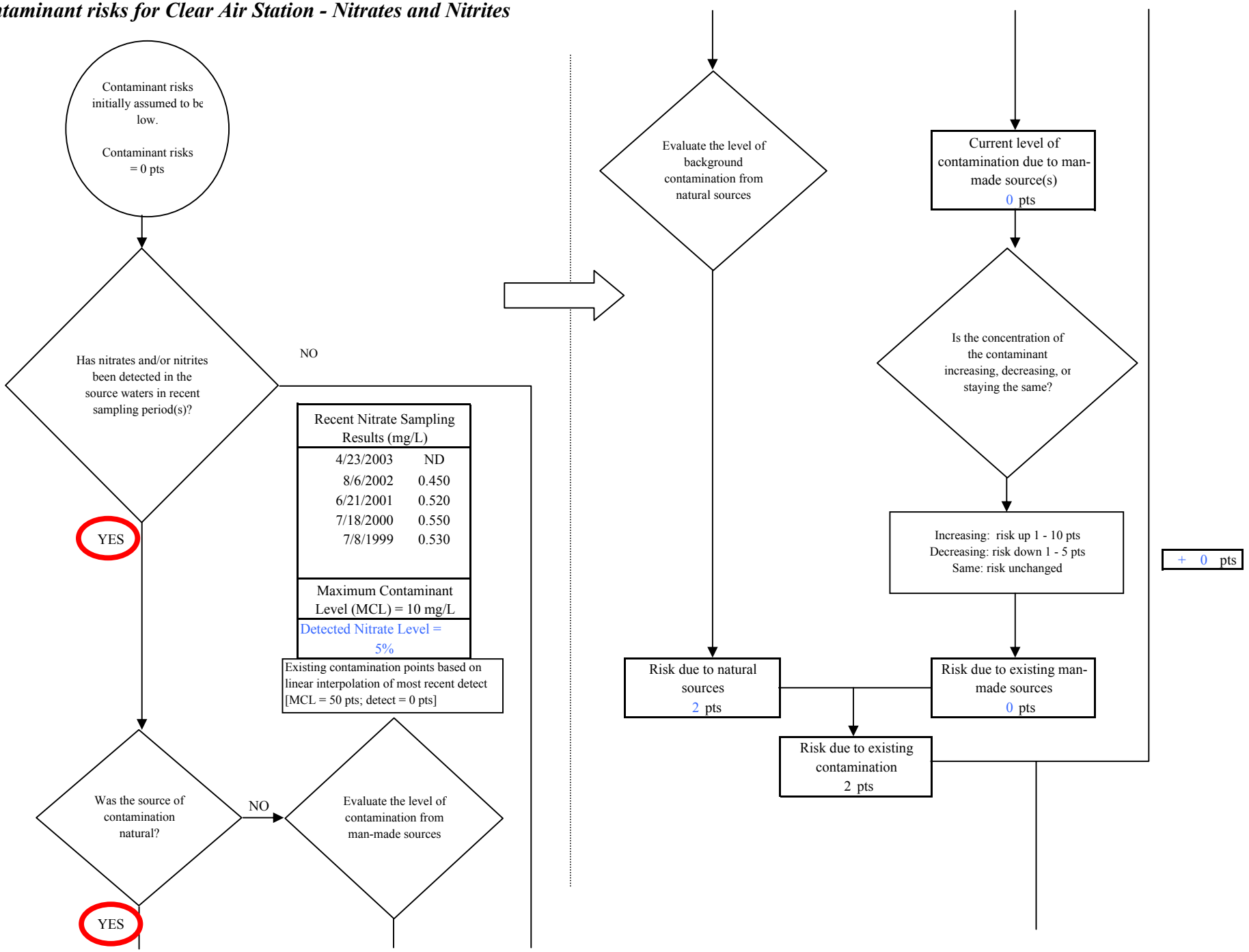


Chart 5. Contaminant risks for Clear Air Station - Nitrates and Nitrites

+ 40 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	1	1
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	2	0	2

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

Matrix Score 40

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 = 40 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 5. Contaminant risks for Clear Air Station - Nitrates and Nitrites

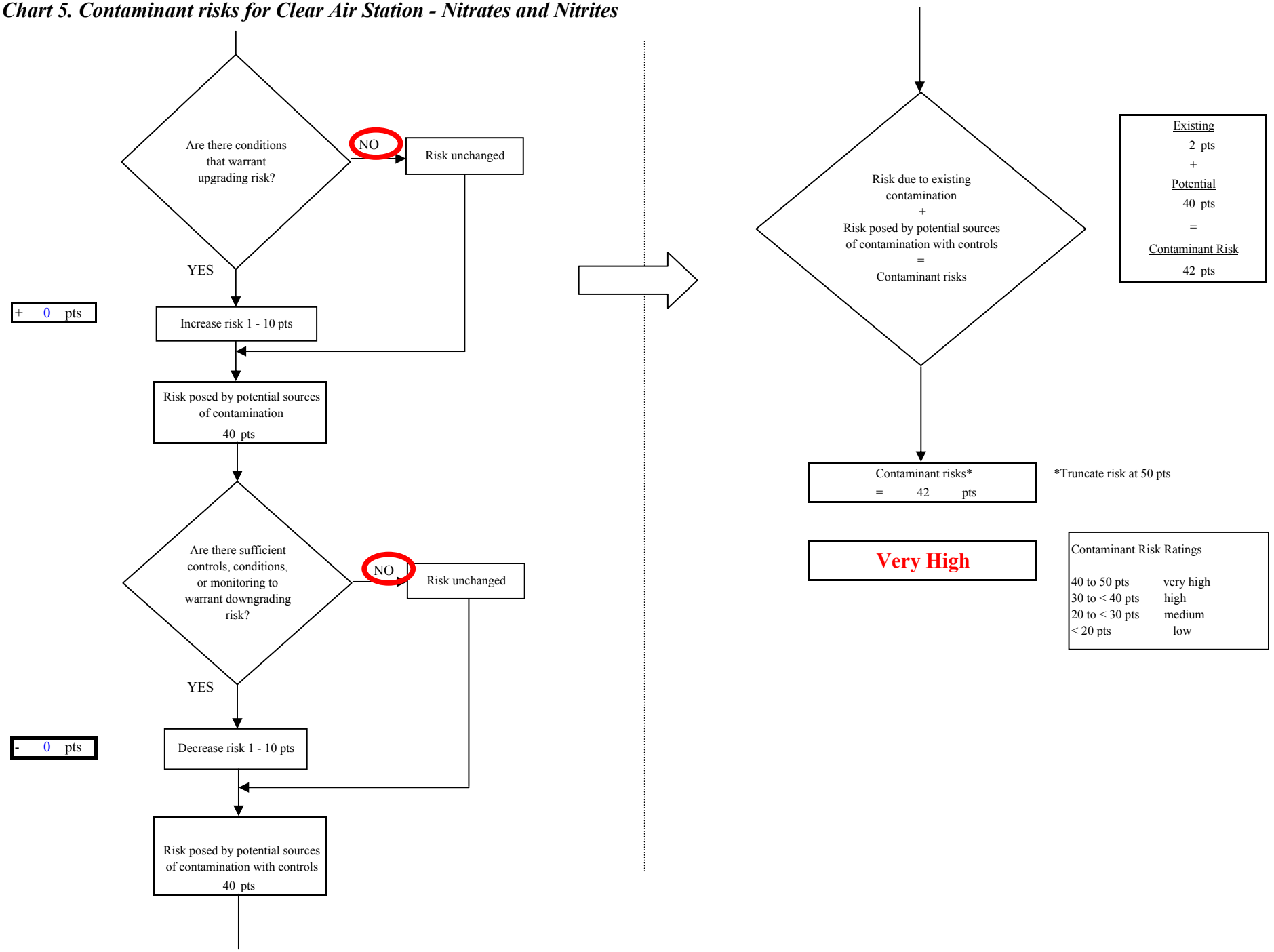


Chart 6. Vulnerability analysis for Clear Air Station - Nitrates and Nitrites

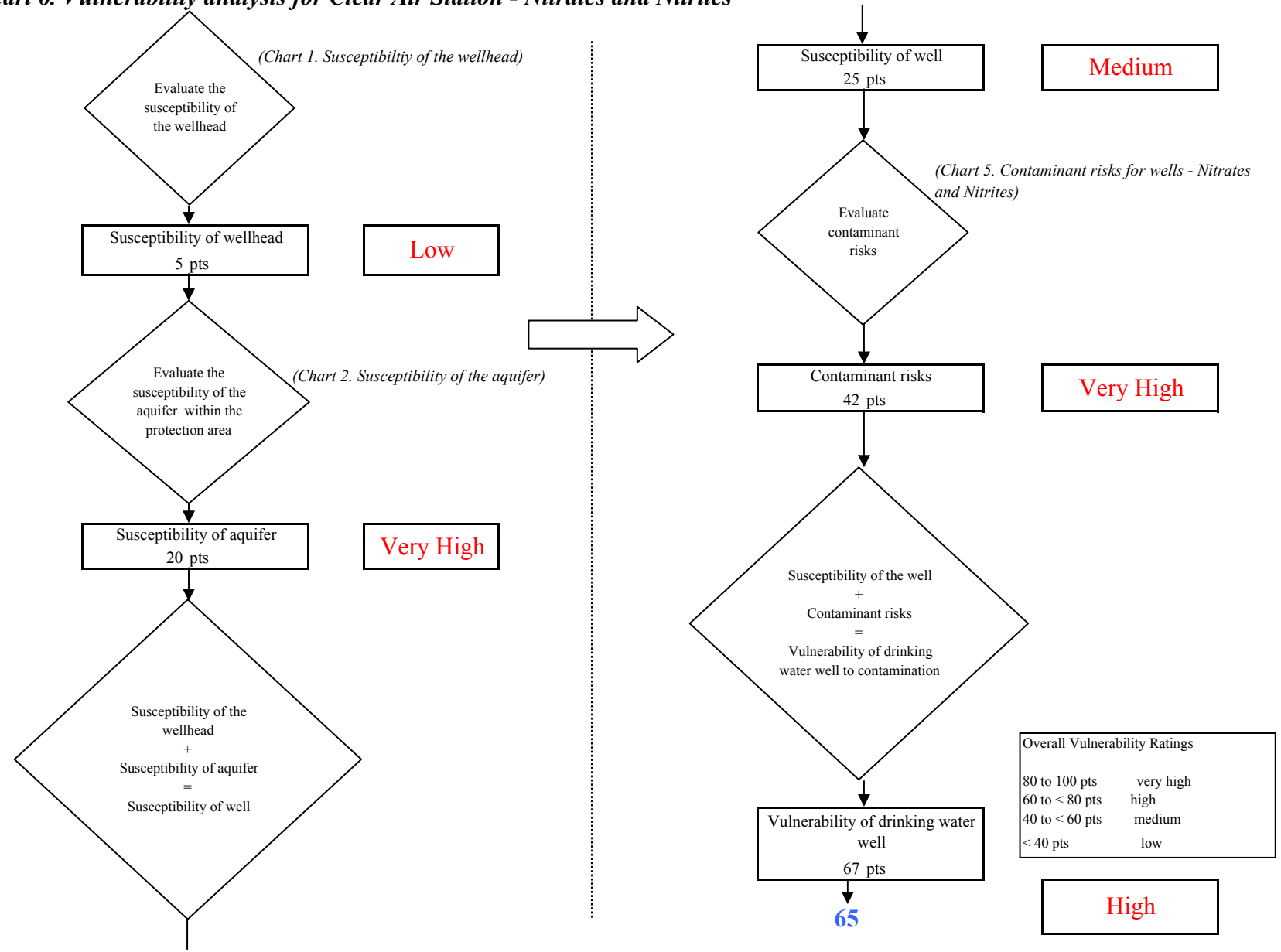


Chart 7. Contaminant risks for Clear Air Station - Volatile Organic Chemicals

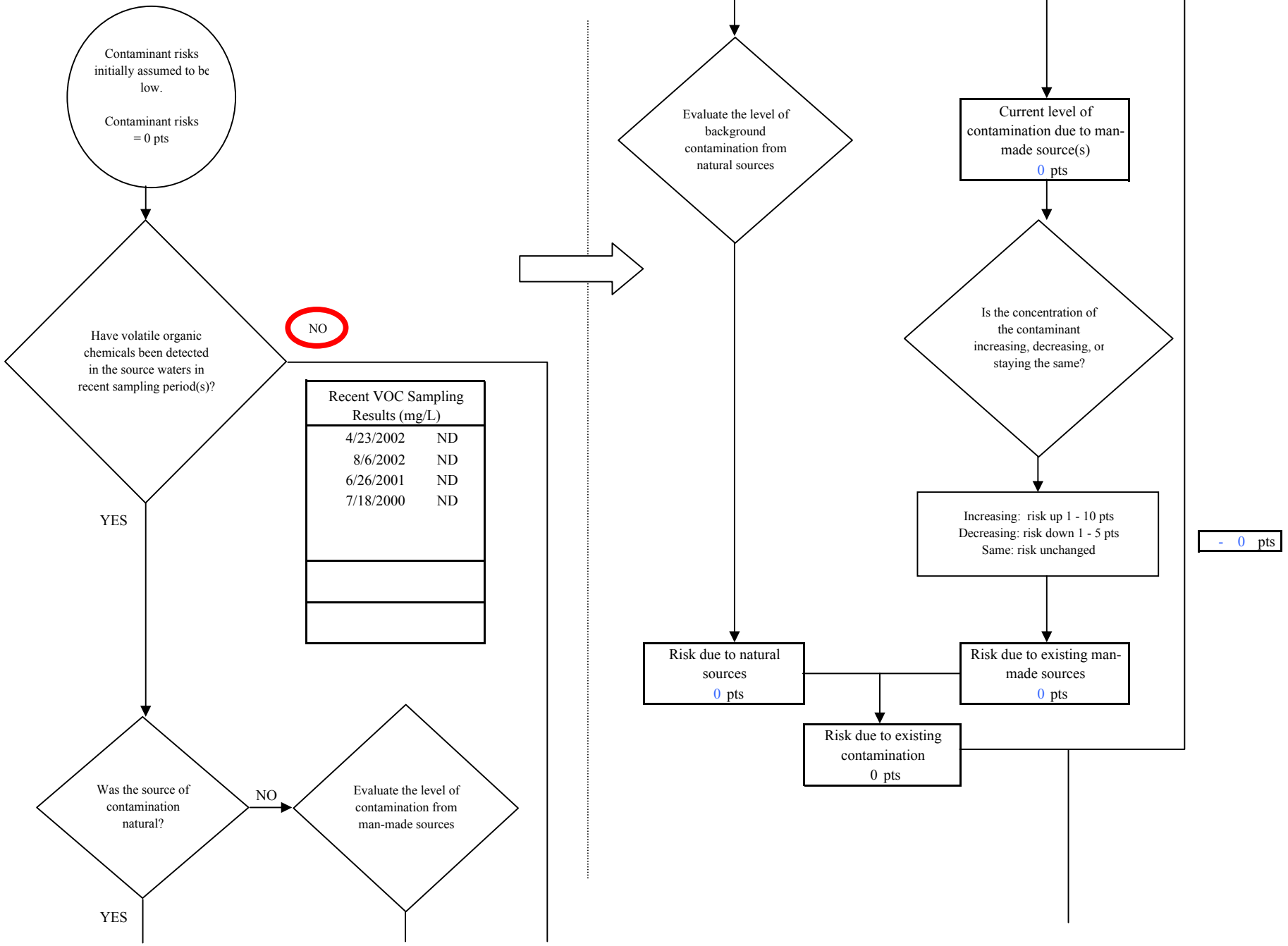


Chart 7. Contaminant risks for Clear Air Station - Volatile Organic Chemicals

+ 35 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	1	1
Medium(s)	4	1	5
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 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

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

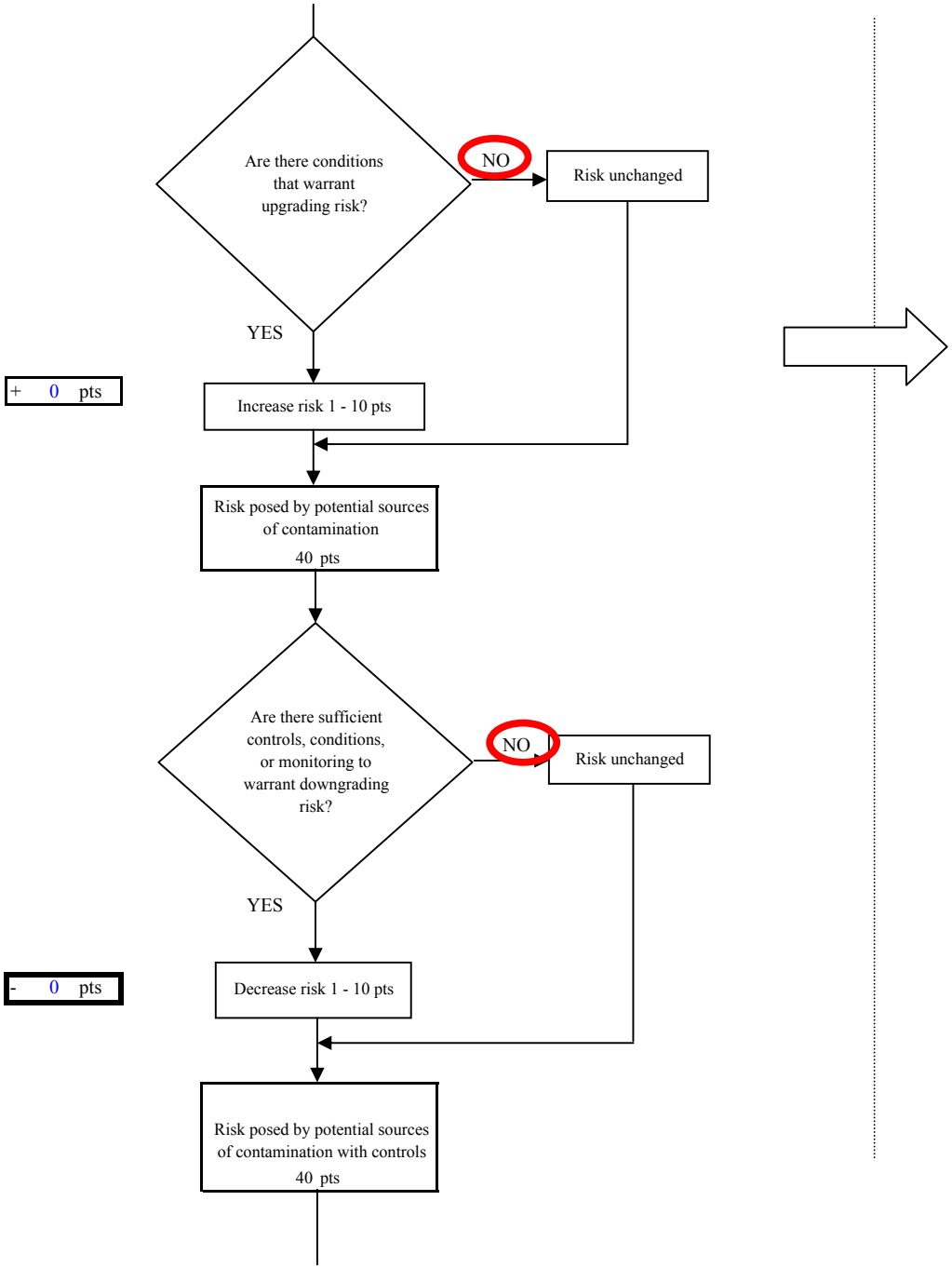
Risk unchanged

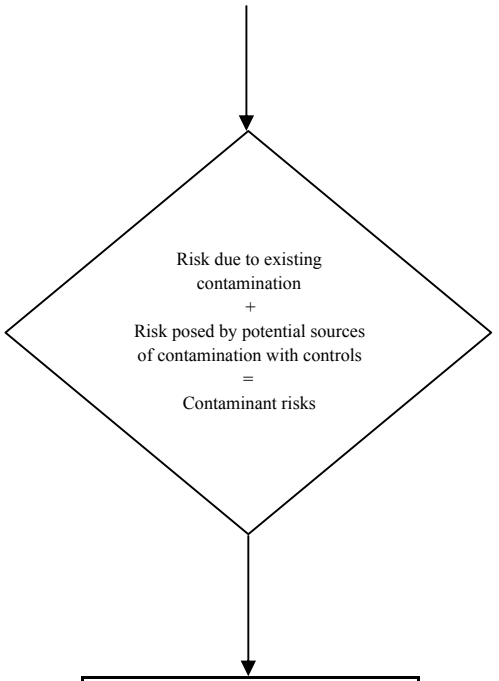
YES

Increase risk 1 - 10 pts

+ 5 pts

Chart 7. Contaminant risks for Clear Air Station - Volatile Organic Chemicals





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

Contaminant risks*
= 40 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 8. Vulnerability analysis for Clear Air Station - Volatile Organic Chemicals

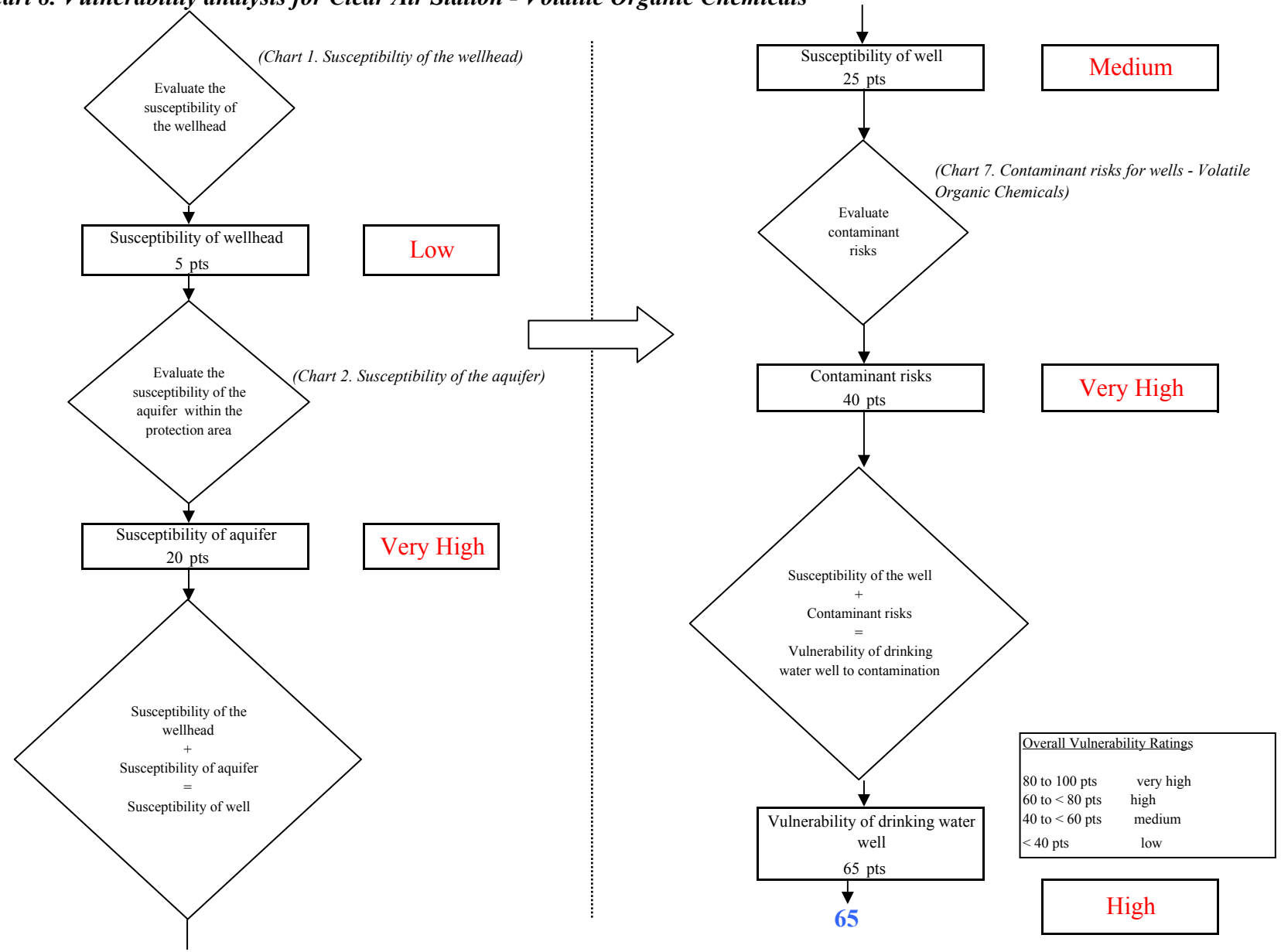


Chart 9. Contaminant risks for Clear Air Station - Heavy Metals, Cyanide and Other Inorganic Chemicals

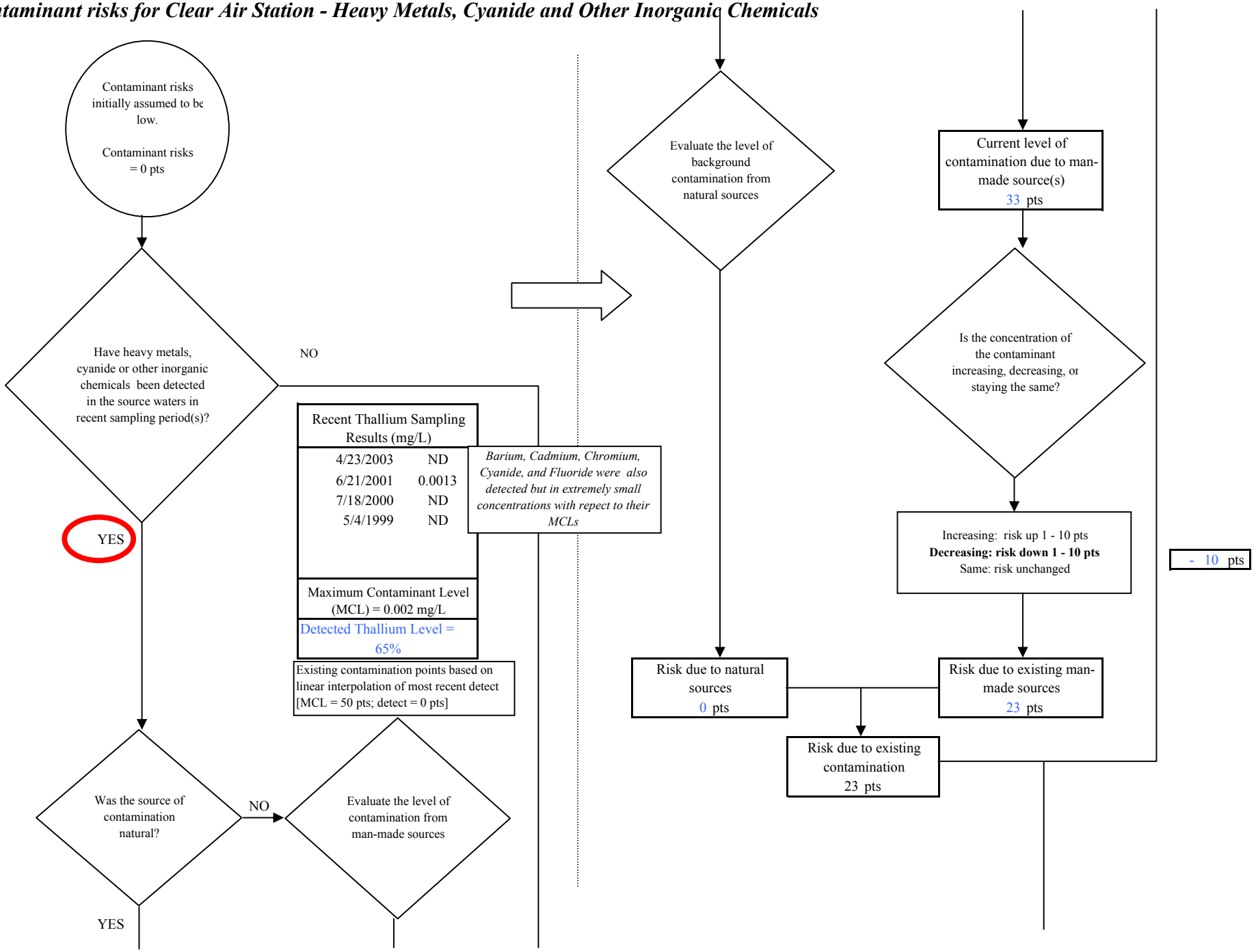


Chart 9. Contaminant risks for Clear Air Station - Heavy Metals, Cyanide and Other Inorganic Chemicals

+ 30 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	1	1
Medium(s)	0	0	0
Low(s)	5	1	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 30

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

Initial assessment of risk posed by potential sources of contamination = 30 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 Clear Air Station - Heavy Metals, Cyanide and Other Inorganic Chemicals

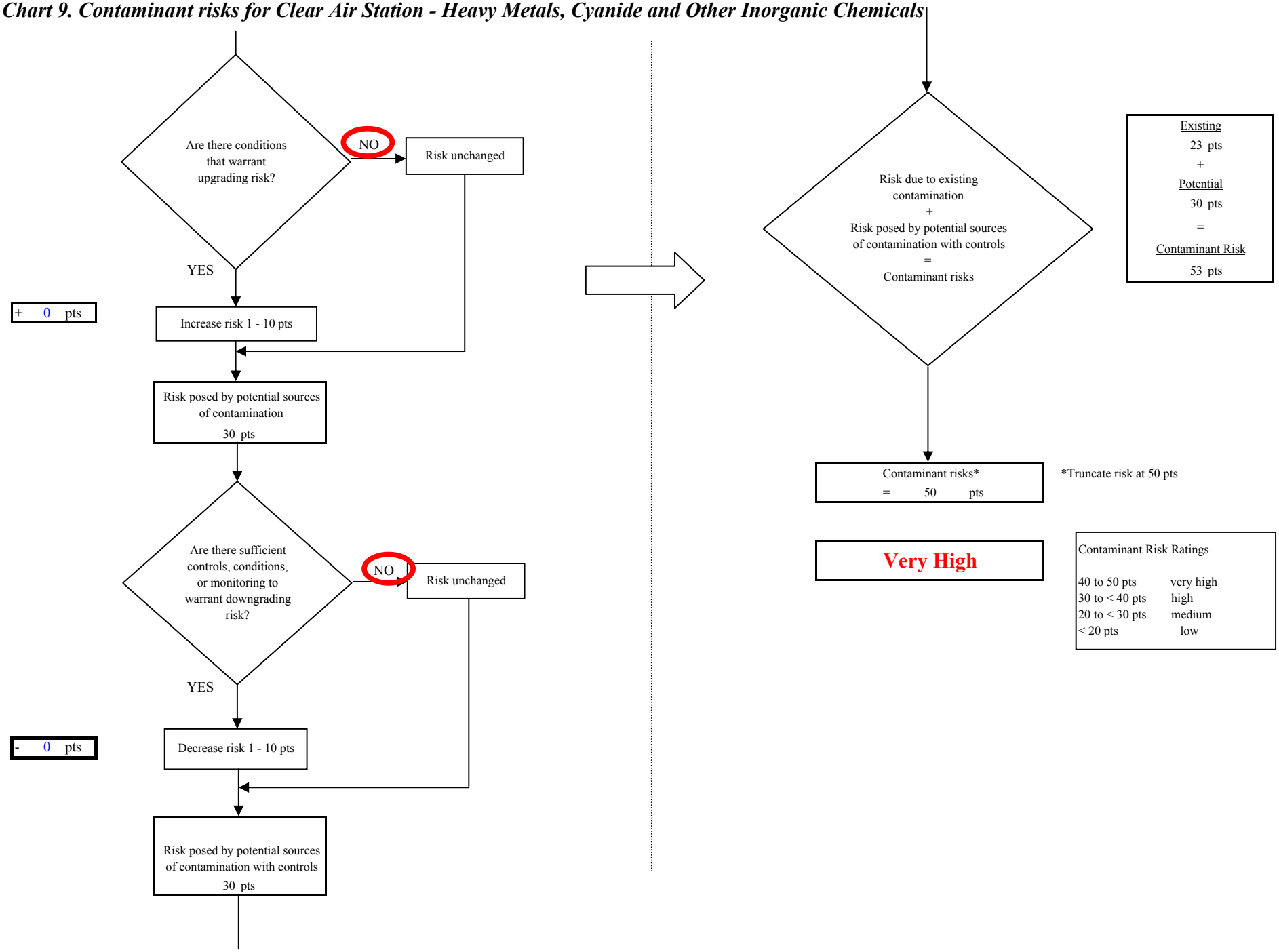


Chart 10. Vulnerability analysis for Clear Air Station - Heavy Metals, Cyanide and Other Inorganic Chemicals

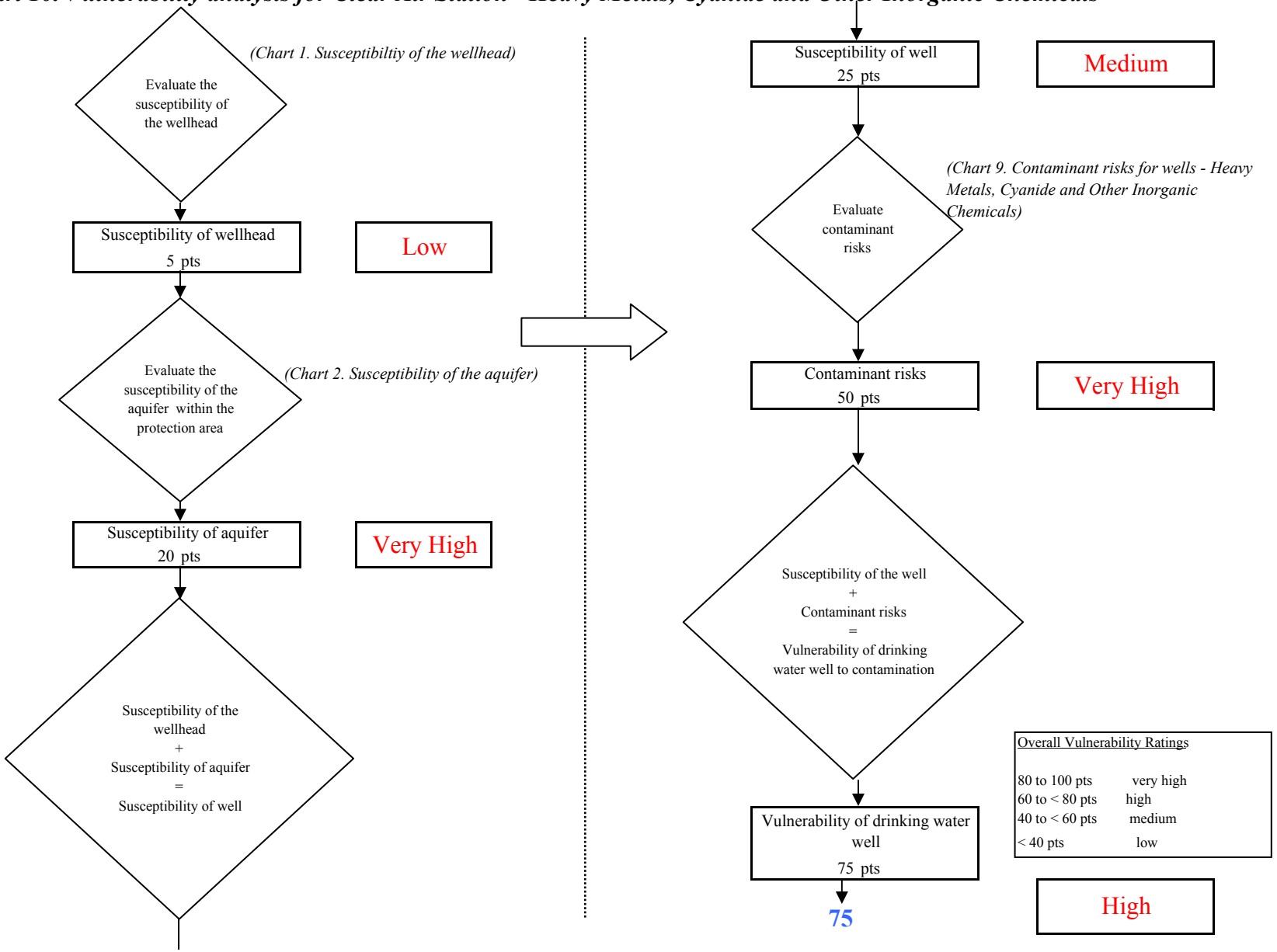


Chart 11. Contaminant risks for Clear Air Station - Synthetic Organic Chemicals

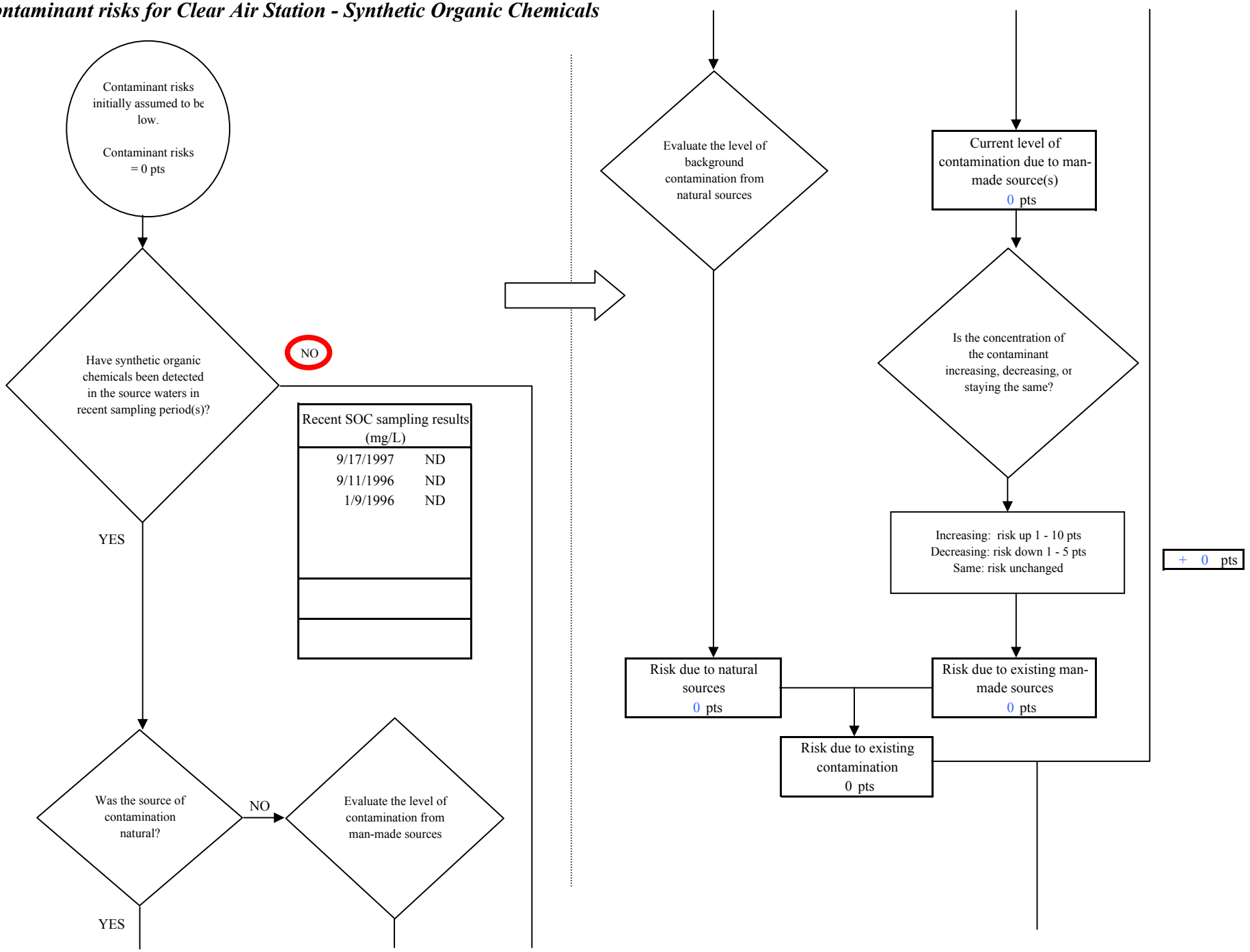


Chart 11. Contaminant risks for Clear Air Station - Synthetic Organic Chemicals

+ 40 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	1	1
High(s)	0	0	0
Medium(s)	0	1	1
Low(s)	2	0	2

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

Matrix Score 40

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.

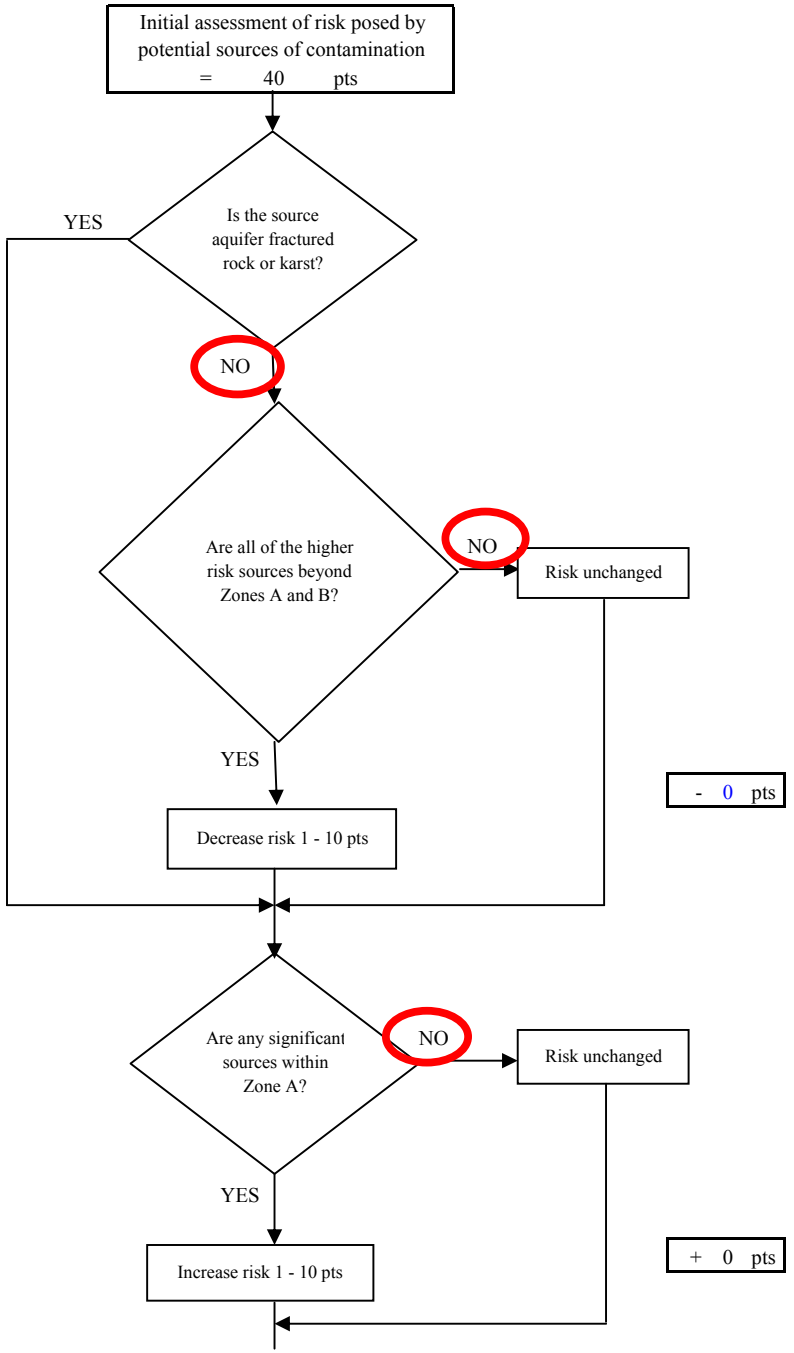


Chart 11. Contaminant risks for Clear Air Station - Synthetic Organic Chemicals

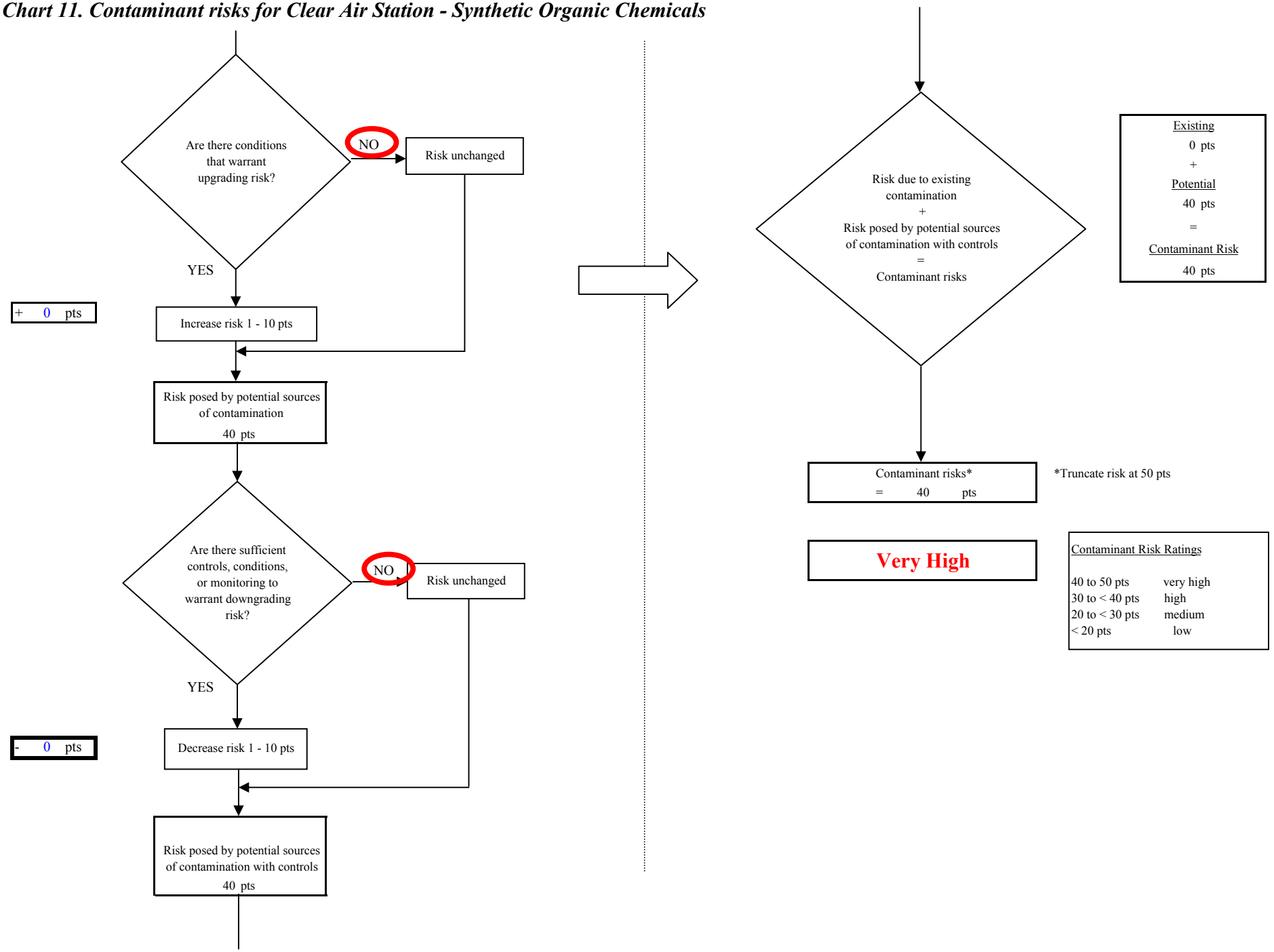


Chart 12. Vulnerability analysis for Clear Air Station - Synthetic Organic Chemicals

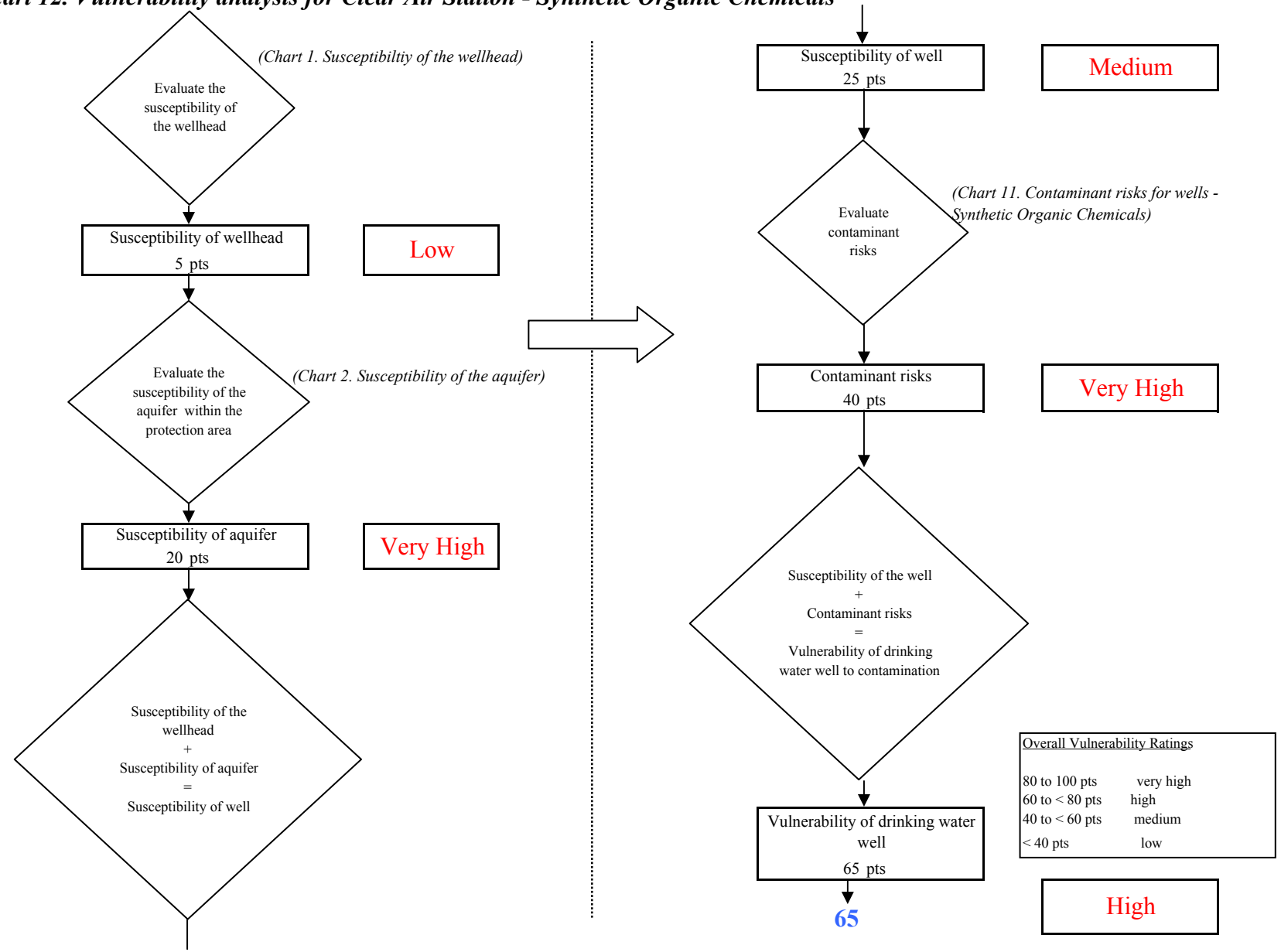


Chart 13. Contaminant risks for Clear Air Station - Other Organic Chemicals

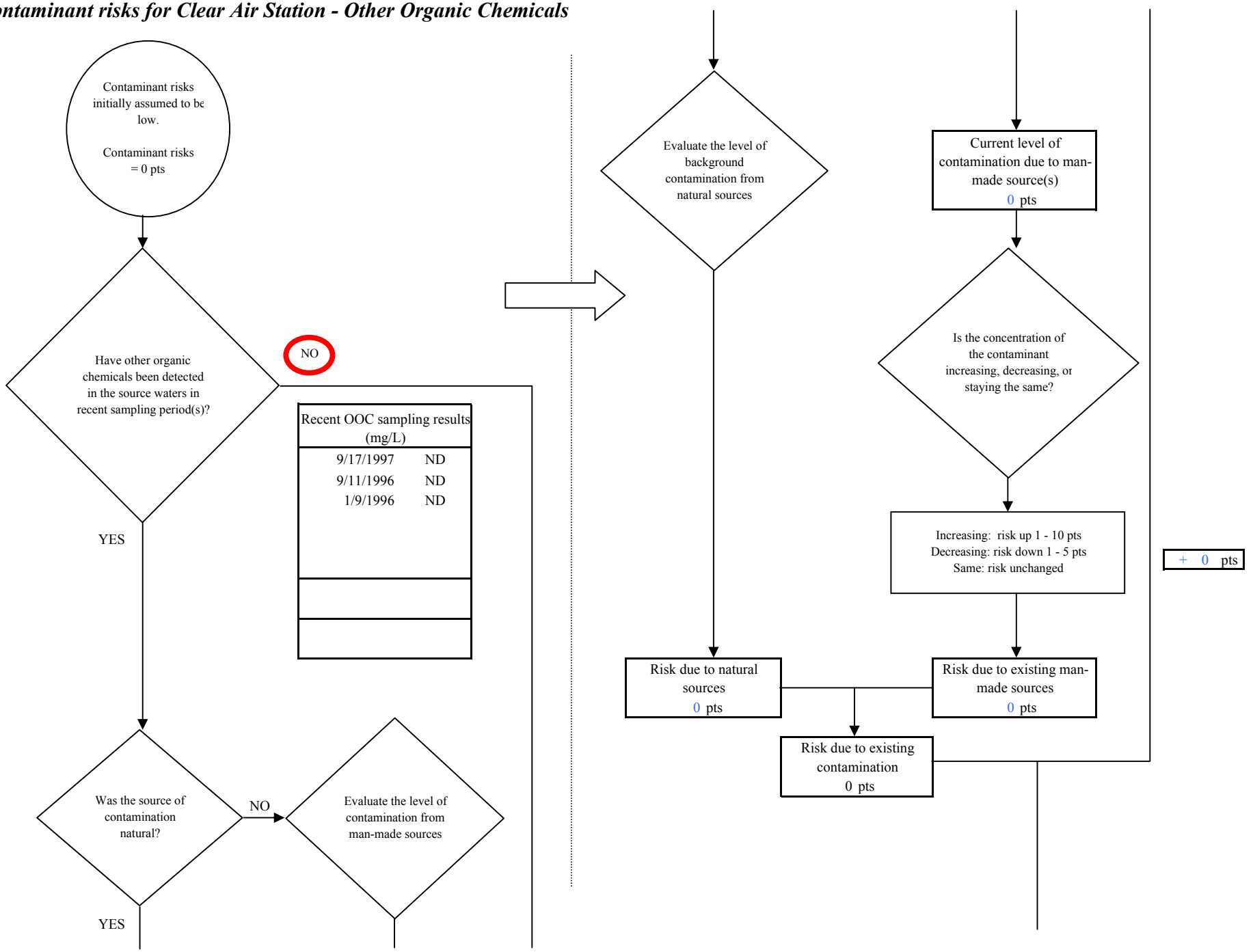


Chart 13. Contaminant risks for Clear Air Station - Other Organic Chemicals

+ 40 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	1	1
High(s)	0	0	0
Medium(s)	1	0	1
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 40

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 = 40 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 Clear Air Station - Other Organic Chemicals

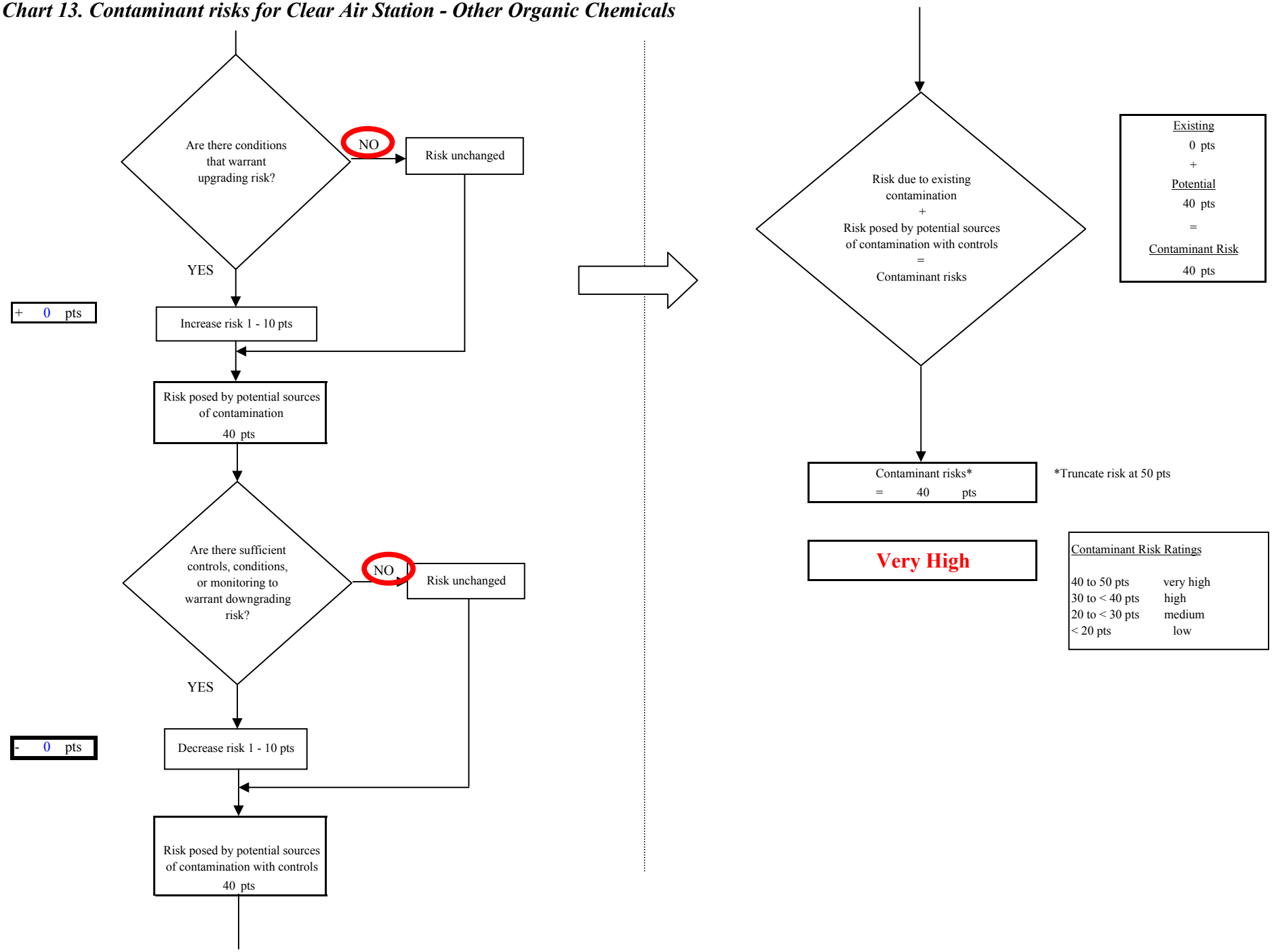


Chart 14. Vulnerability analysis for Clear Air Station - Other Organic Chemicals