Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for Mekoryuk Washeteria

Mekoryuk, Alaska

PWSID # 271562.001

August 2004

Drinking Water Protection Program Report #1137

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 (EPA), the 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 that 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 Mekoryuk Washeteria Drinking Water System, Mekoryuk, Alaska

Drinking Water Protection Program
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The public water system for the Mekoryuk Washeteria, is a Class A surface water system that obtains water from the Mekoryuk River. Water from the river is piped for approximately five miles through 4" PVC pipe to a 9,000,000 gallon open, lined reservoir directly north of the community (CRW, 2004). There it is treated with direct filtration, inject polymer, and chlorinated, and then piped to the local washeteria for public use.

The Mekoryuk Washeteria protection area is approximately 130 square miles in size and has received a susceptibility rating of **Very High**. *A rating of High to Very High is typical for all systems with surface water intakes*. Potential and existing sources of the following contaminants were evaluated for the Source Water Assessment: bacteria and viruses, nitrates and/or nitrites, heavy metals, cyanide, and other inorganic chemicals, synthetic organic chemicals, volatile organic chemicals, and other organic chemicals. No contaminant risk sources were identified in the protection area for this public water system.

This evaluation included all available water sampling data submitted to the Alaska Department of Environmental Conservation (ADEC) by the system operator. As stated previously, the samples were collected from post-treated water. Vulnerability ratings for the water system have been determined by combining the susceptibility of the surface water source with the contaminant risks. The system received a vulnerability rating of **Medium** for five of the six contaminant categories: bacteria and viruses, nitrates and/or nitrites, heavy metals, cyanide, and other inorganic chemicals, synthetic organic chemicals, and other organic chemicals. For volatile organic chemicals, the system received a vulnerability rating of **Very High**.

This assessment can be used as a foundation for local voluntary protection efforts as well as a basis for the continuous efforts on the part of the City of Mekoryuk to protect public health.

DRINKING WATER SYSTEM AND AREA OVERVIEW

Mekoryuk (Sec. 31, T004N, R097W, Seward Meridian) is located on the north shore of Nunivak Island, approximately 155 miles west of Bethel, and 553 air miles west of Anchorage. Mekoryuk is considered part of the lower Yukon-Kuskokwim (Y-K) delta area.

Mekoryuk has a current population of 204 (ADCED, 2003). Average annual precipitation in Mekoryuk is 15 inches, including approximately 57 inches of annual snowfall. Temperatures range from -48 to 77°F. Average summer highs range from 48 to 54°F. Winter highs average 37 to 44°F.

The public water system is a Class A surface water system that operates year-round and obtains water from the Mekoryuk River, approximately five miles south of the community. The river water is piped through 5 miles of PVC pipe to an open, lined reservoir, treated, and then stored in a tank at the community washeteria (CRW, 2004).

The City operates the water and sewer systems. Most homes are served by a flush/haul system, but roughly 10 percent of the homes use honeybuckets for sewage disposal. The washeteria has piped sewage disposal to a lagoon (ADCED, 2003).

REA Cooperative and the City operate the local electric utility. The facility is fueled by diesel, and aboveground heating oil storage tanks are located onsite. The City of Mekoryuk provides refuse collection services. (ADCED, 2003)

Information acquired from a July 2003 sanitary survey for the public water system indicated that the surface water intake is adequately constructed. The surface water intake is screened and protected from ice buildup and siltation. A lid covers the infiltration gallery, but it is not watertight or locked. Average production for the system is estimated to be approximately 3,000 gallons per day.

Nunivak Island is situated across Etolin Strait, approximately 23 miles from the mainland. The village lies on top of 20- to 30-foot sea bluffs overlooking the Bering Sea to the north and Shoal Bay, a shallow lagoon, to the east. The Mekoryuk River flows into the lagoon and bounds Mekoryuk to the south. The topography to the west is relatively flat. Organic tundra vegetation is generally underlain by 16 to 20 feet of poorly drained, frozen fine-grained materials (silt, clay and sand). These frozen soils overlie porous, fractured volcanic rock (R&M, 1979a).

The Y-K Delta is located on the southwest coast of Alaska and primarily consists of lowlands formed by the deposition of fluvial sediment from the Yukon and Kuskokwim Rivers.

The Y-K Delta topography is relatively flat and approximately 40% to 50% of the delta surface is wet (Alaska Geographic Society). The lower delta area generally receives about 20 inches of precipitation annually. Areas of both discontinuous and continuous permafrost are present on the Y-K Delta. Permafrost is often present within 10 feet of ground surface and varies in thickness from 15 feet to 600 feet thick (R&M, 1979b). Thaw bulbs generally persist around areas of standing and flowing water.

MEKORYUK DRINKING WATER PROTECTION AREA

Identifying the pathways most likely for surface contamination to reach water intake areas is the first step in determining the water system's risk. These pathways are initially determined by looking at the drainage area contributing overland water flow to a surface water source intake. The entire drainage area is also known as the "drinking water protection area." Please refer to pages 10-11 of the "Guidance Manual for Class A Public Water Systems" for additional information.

The protection area established for surface water sources by the ADEC is usually separated into three zones. These zones correspond to the overland-flow distance that water travels to get to the source. The ADEC Drinking Water Protection Program's Technical Advisory Committee developed guidelines for derivation of these zones in 1998. The following is a summary of the three protection area zones:

Table 1. Definition of Zones

Zone	Definition
A	Areas within 1000-ft of lakes or streams
B	Areas within 1-mile of lakes or streams
C	The watershed boundary

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

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

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

No potential contaminant sources were identified in the Mekoryuk Washeteria protection area as displayed on Map C of Appendix C and in Table 1 of Appendix B.

RANKING OF CONTAMINANT RISKS

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

- Low;
- Medium;
- High; and

- Very High.

The time-of-travel for contaminants within the water is dependent on the physical and chemical characteristics of each contaminant. Bacteria and Viruses are only inventoried in Zone A because of their short life span. Only "Very High" and "High" rankings are inventoried within Zones B and C due to the probability of contaminant dilution by the time the contaminants reach the water intake.

As stated earlier, no potential contaminant sources were identified within the drinking water protection area for this public water system (Table 1 of Appendix B). Due to the lack of potential contaminant sources, no additional Tables were included in Appendix B detailing potential contaminant sources for each of the six categories of drinking water contaminants.

VULNERABILITY OF THE DRINKING WATER SYSTEM

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

- Surface Water Susceptibility and
- Contaminant risks.

Appendix D contains 13 charts, which together form the 'Vulnerability Analysis' for the public drinking water Source Water Assessment. Chart 1 analyzes the 'Susceptibility of the Surface Water Source' to contamination by looking at the climate, terrain, and intake location. Chart 2 analyzes 'Contaminant Risks' for the drinking water source with respect to bacteria and viruses. The 'Contaminant Risks' portion of the analysis considers potential sources of contaminants as well as a review of contamination that has or may have occurred, but has not arrived or been detected at the intake area. Chart 3 contains the 'Vulnerability Analysis for Bacteria and Viruses,' which is a composite score of the Vulnerability Analysis and the overall Susceptibility. Charts 4 through 13 repeat the Contaminant Risks and Vulnerability Analyses for nitrates and nitrites, volatile organic chemicals, heavy metals, cyanide, and other inorganic chemicals, synthetic organic chemicals, and other organic chemicals, respectively.

A score for the Surface Water Susceptibility of the source is reached by considering the properties of the water intake and the surrounding area. The derivation of this information is presented below and the data for this source is shown in Chart 1 of Appendix D.

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

+

Adequate Construction of the Intake (0 – 5 Points)

+

Runoff Potential Within Zone B (0 – 5 Points)

+

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

=

Natural Susceptibility
(0 – 50 Points)

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

Surface Water Source Susceptibility Ratings	
40 to 50 pts	Very High
30 to < 40 pts	High

Table 2. Susceptibility of the Water Source

	Score	**Rating**
Minimum Allowable Susceptibility	30	
Intake Construction Adequate	0	
Runoff Potential	0	
Dilution Capacity	10	
Overall Susceptibility	***40***	***Very High***

For contaminants, risks to a drinking water source depend on the type, number or density, and distribution of the contaminant sources. The Contaminant Risk score has been derived from an examination of existing, and historical contamination sources that have been detected in the protection area through routine sampling. It also evaluates potential sources of contamination. Flow charts are used to assign a point score, and ratings are assigned in the same way as the susceptibility:

Contaminant Risk Ratings	
40 to 50 pts	Very High
30 to < 40 pts	High
20 to < 30 pts	Medium
< 20 pts	Low

Table 3 summarizes the Contaminant Risks for each category of drinking water contaminants.

Table 3. Mekoryuk Contaminant Risks

Category	Score	Rating
Bacteria and Viruses	0	Low
Nitrates and/or Nitrites	1	Low
Volatile Organic Chemicals	49	Very High
Heavy Metals, Cyanide, and Other Inorganic Chemicals	7	Low
Synthetic Organic Chemicals	0	Low
Other Organic Chemicals	0	Low

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

Susceptibility of the Surface Water Source

(0 – 50 points)

+

Contaminant Risks (0 – 50 points)

=

Vulnerability of the
Drinking Water Source to Contamination (0 – 100).

Again, rankings are assigned according to a point score:

Overall Vulnerability Ratings	
80 to 100 pts	Very High
60 to < 80 pts	High
40 to < 60 pts	Medium
< 40 pts	Low

Table 4 contains the overall vulnerability scores and ratings for each of the six categories of drinking water contaminants. Note: scores are rounded off to the nearest five.

Table 4. Mekoryuk Washeteria Overall Vulnerability

Category	Score	Rating
Bacteria and Viruses	40	Medium
Nitrates and Nitrites	40	Medium
Volatile Organic Chemicals	90	Very High
Heavy Metals, Cyanide, and Other Inorganic Chemicals	45	Medium
Synthetic Organic Chemicals	40	Medium
Other Organic Chemicals	40	Medium

Bacteria and Viruses

The contaminant risk for bacteria and viruses is **Low**. No contaminant risks sources for bacteria and viruses were identified in the protection area for this public water system.

Coliforms (a bacteria) are found naturally in the environment and although they aren't necessarily a health threat, they are an indicator of other potentially harmful bacteria in the water, more specifically, fecal coliforms and E. coli, which only come from human and animal fecal waste. Harmful bacteria can cause diarrhea, cramps, nausea, headaches, or other symptoms (EPA, 2003). Positive samples increase the overall vulnerability of the drinking water source, indicating that the source is susceptible to bacteria and virus contamination. Typically, coliform detection in raw water samples collected from surface water sources is normal. (See Chart 2 – Contaminant Risks for Bacteria and Viruses in Appendix D).

No positive bacteria counts were detected during sampling conducted in 1999, 2001, 2002, and 2003.

After combining the contaminant risk for bacteria and viruses with the natural susceptibility of the source, the overall vulnerability of the source to bacteria and virus contamination is considered **Medium**.

Nitrates and Nitrites

The contaminant risk for nitrates and nitrites is **Low** (See Chart 4 - Contaminant Risks for Nitrates and/or Nitrites in Appendix D). No contaminant risks sources for nitrates were identified in the protection area for this public water system. Nitrates are very mobile, moving at approximately the same rate as water.

The Maximum Contaminant Level (MCL) for nitrates is 10 milligrams per liter (mg/L). The MCL is the maximum level of contaminant that is allowed to exist in drinking water and still be consumed by humans without harmful health effects (EPA, 2003).

Sampling history for the water source indicates that low concentrations of nitrates (below the MCL) were detected in a 1999 sampling event. The low nitrate concentration is likely attributed to natural sources. No nitrates were detected in the most recent 2002 sampling event.

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

Volatile Organic Chemicals

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

No contaminant sources for volatile organic chemicals were identified in the protection area for this public water system; however, detectable concentrations of trihalomethanes were reported in sampling events for this public water system. Trihalomethanes were detected at levels above the MCL during sampling in 1997 and 2001, and 99% of the MCL in 2002. Trihalomethanes are considered byproducts of the water treatment process and are not from the source waters. Although the presence of trihalomethanes are not attributed to the source waters, contaminant risk points were retained due to potential health risks associated with the recent exceedence of the MCL. The MCL for total trihalomethanes is 0.08 mg/L.

After combining the contaminant risk for volatile organic chemicals with the natural susceptibility of the source, the overall vulnerability of the source to contamination remains **Very High**.

Heavy Metals, Cyanide, and Other Inorganic Chemicals

The contaminant risk for heavy metals is **Low**.

No contaminant risks sources for heavy metals, cyanide, and other inorganic chemicals were identified in the protection area for this public water system; however, low levels of copper, lead, fluoride, and arsenic were detected in recent samples. None of these analytes have exceeded their respective MCLs in recent sampling events (See Chart 8 – Contaminant Risks for Heavy Metals, Cyanide, and Other Inorganic Chemicals in Appendix D).

The reported concentrations of copper, lead, and fluoride in recent sampling events are not likely to be representative of source water conditions. These three analytes are likely attributed to either the water treatment process or water distribution network. Fluoride, as well as arsenic, may be due to the erosion of natural deposits.

Since arsenic is most likely associated with source water conditions, the reported concentration was used to assess contaminant risks due to natural sources. An arsenic concentration of 0.0071 mg/L was detected in a sample collected in 2003. The MCL for arsenic is 0.05 mg/L.

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

Synthetic Organic Chemicals

The contaminant risk for synthetic organic chemicals is **Low**. No contaminant sources for synthetic organic chemicals were identified in the protection area for this public water system. After combining the contaminant risk with the natural susceptibility of the source, the overall vulnerability to synthetic organic chemicals of the source is **Medium** (See Chart 11 – Contaminant Risks for Synthetic Organic Chemicals in Appendix D).

Review of historical sampling data found no recent sampling results for synthetic organic chemical contaminants.

Other Organic Chemicals

The contaminant risk for other organic chemicals is **Low**. No contaminant risks sources for other organic chemicals were identified in the protection area for this PWSID. After combining the contaminant risk with the natural susceptibility of the source, the overall vulnerability to other organic chemicals of the source is **Medium** (See Chart 13 – Contaminant Risks for Other Organic Chemicals in Appendix D).

Review of the historical sampling data found no recent sampling results for other organic chemicals.

Using the Source Water Assessment

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

REFERENCES

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

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R&M Consultants, Inc., 1979b, Lower Kuskokwim School District School Site Investigation for Tununak, Alaska.

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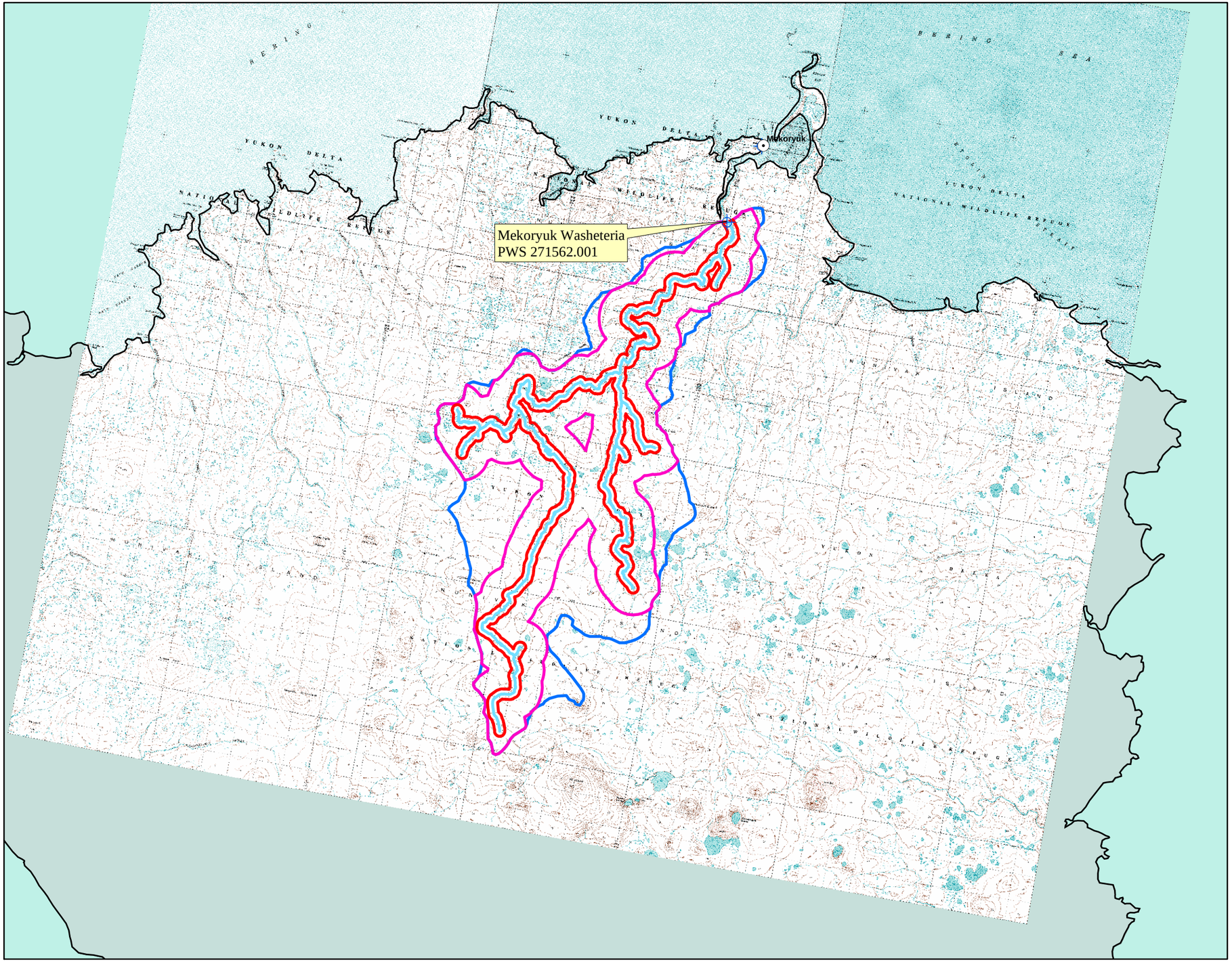
APPENDIX A

Drinking Water Protection Area Location Map
(Map A)

Public Water Well System for PWS #271562.001 Mekoryuk Washeteria



LEGEND

Public Water System Well

Hydrography/Physical

- Parcels
- Stream
- Lake or Pond
- Contours (approx. 50 ft. or as indicated)

Transportation

- Primary Route (Class 1)
- Secondary Route (Class 2)
- Road (Class 3)
- Road (Class 4)
- Road (Class 5, Four-wheel drive)
- Road Ferry Crossing

Surface Water Protection Zones

- Zone A – 1000 Feet from Surface Water
- Zone B – 1 Mile from Surface Water
- Zone C – 30 Miles from Surface Water or Watershed Boundary

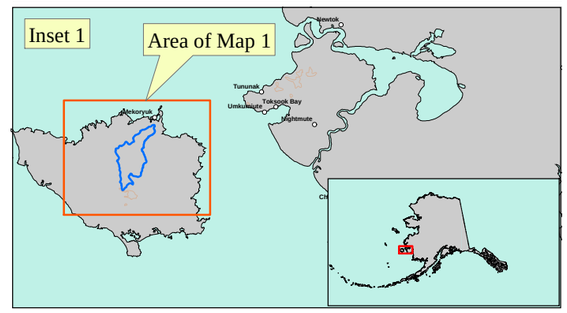
Data Sources:
Contaminant Sources, Public Water System Wells, Contours
Alaska Department of Environmental Conservation (ADEC)

Critical Facilities
Federal Emergency Management Agency (FEMA)

All other data
United States Geological Survey (USGS)

Drinking Water Protection Areas based on ADEC published document:
"Alaska Drinking Water Protection Progarm - Guidance Manual for Class A Public Water Systems"

URS Corporation does not guarantee the accuracy or validity of the data provided.



N
W E
S

0 2.5 5 10 15 20 Miles

Mekoryuk Washeteria PWS 271562.001
Appendix A Map A

APPENDIX B

Contaminant Source Inventory and Risk Rankings (Table 1)

Table 1

Contaminant Source Inventory for

Mekoryuk Washeteria Resevoir

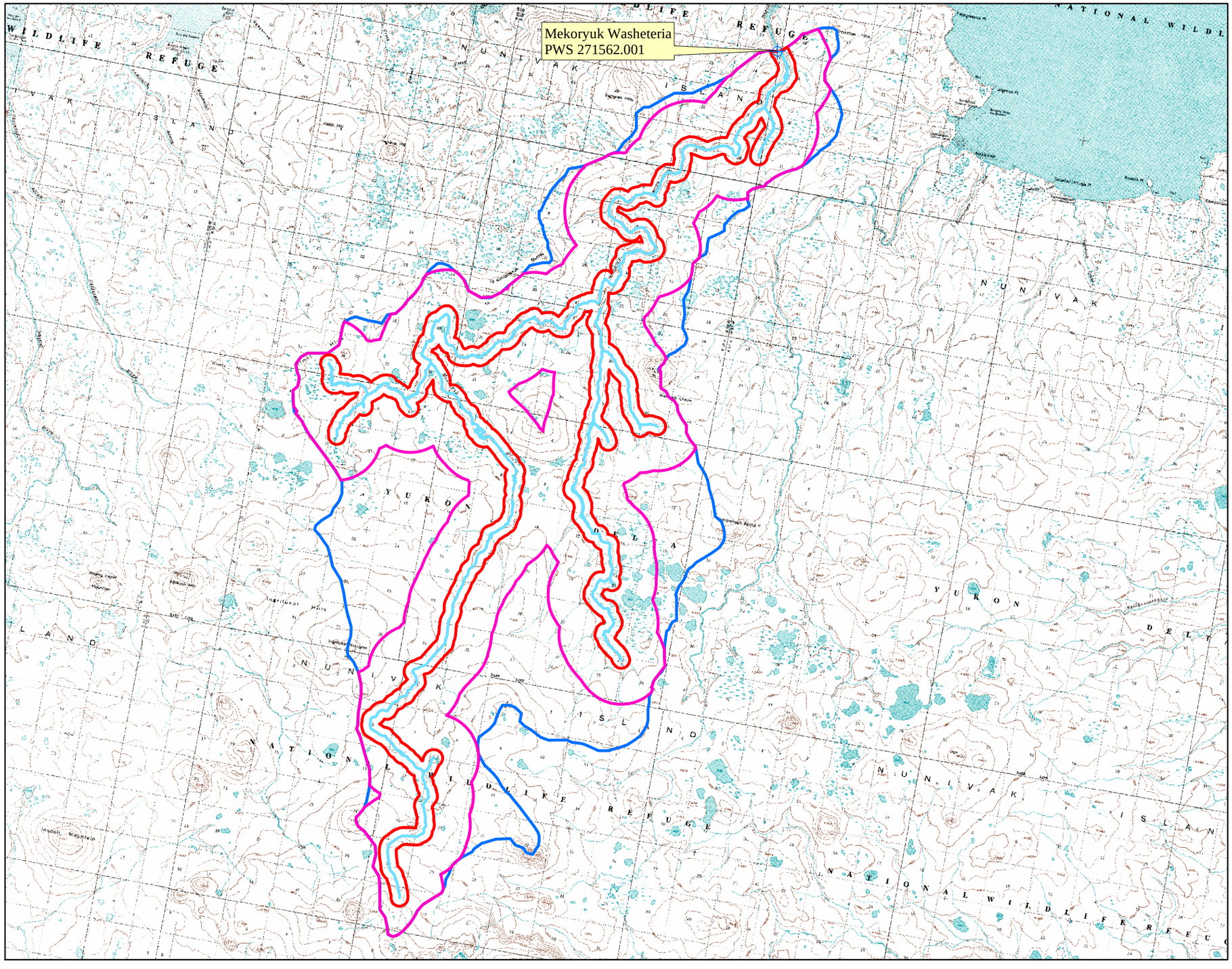
PWSID 271562.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
				C	No Sources Identified

APPENDIX C

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

Public Water Well System for PWS #271562.001 Mekoryuk Washeteria
Showing Potential and Existing Sources of Contamination



LEGEND

Public Water System Well

Hydrography/Physical

- Parcels
- Stream
- Lake or Pond
- Contours (approx. 50 ft. or as indicated)

Transportation

- Primary Route (Class 1)
- Secondary Route (Class 2)
- Road (Class 3)
- Road (Class 4)
- Road (Class 5, Four-wheel drive)
- Road Ferry Crossing

Surface Water Protection Zones

- Zone A – 1000 Feet from Surface Water
- Zone B – 1 Mile from Surface Water
- Zone C – 30 Miles from Surface Water or Watershed Boundary

Existing or Potential Contaminant Sources

There are no reported existing or potential contaminant sources within the Protection Zone.

Data Sources:
Contaminant Sources, Public Water System Wells, Contours
Alaska Department of Environmental Conservation (ADEC)

Critical Facilities
Federal Emergency Management Agency (FEMA)

All other data
United States Geological Survey (USGS)

Drinking Water Protection Areas based on ADEC published document:
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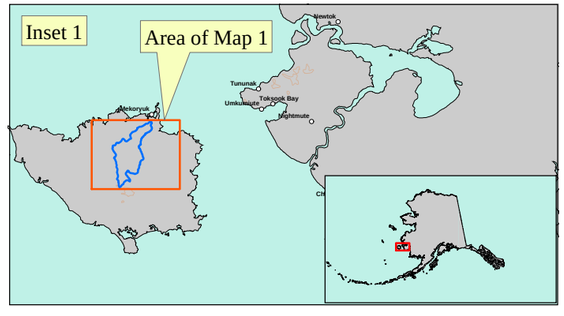


0 1.5 3 6 9 12 Miles

Mekoryuk Washeteria PWS 271562.001
Appendix C Map C

APPENDIX D

Vulnerability Analysis and Contaminant Risks
(Charts 1-13)

Chart 1. Susceptibility of the Surface Water Source - Mekoryuk Washeteria Water System (PWS No. 271562.001)

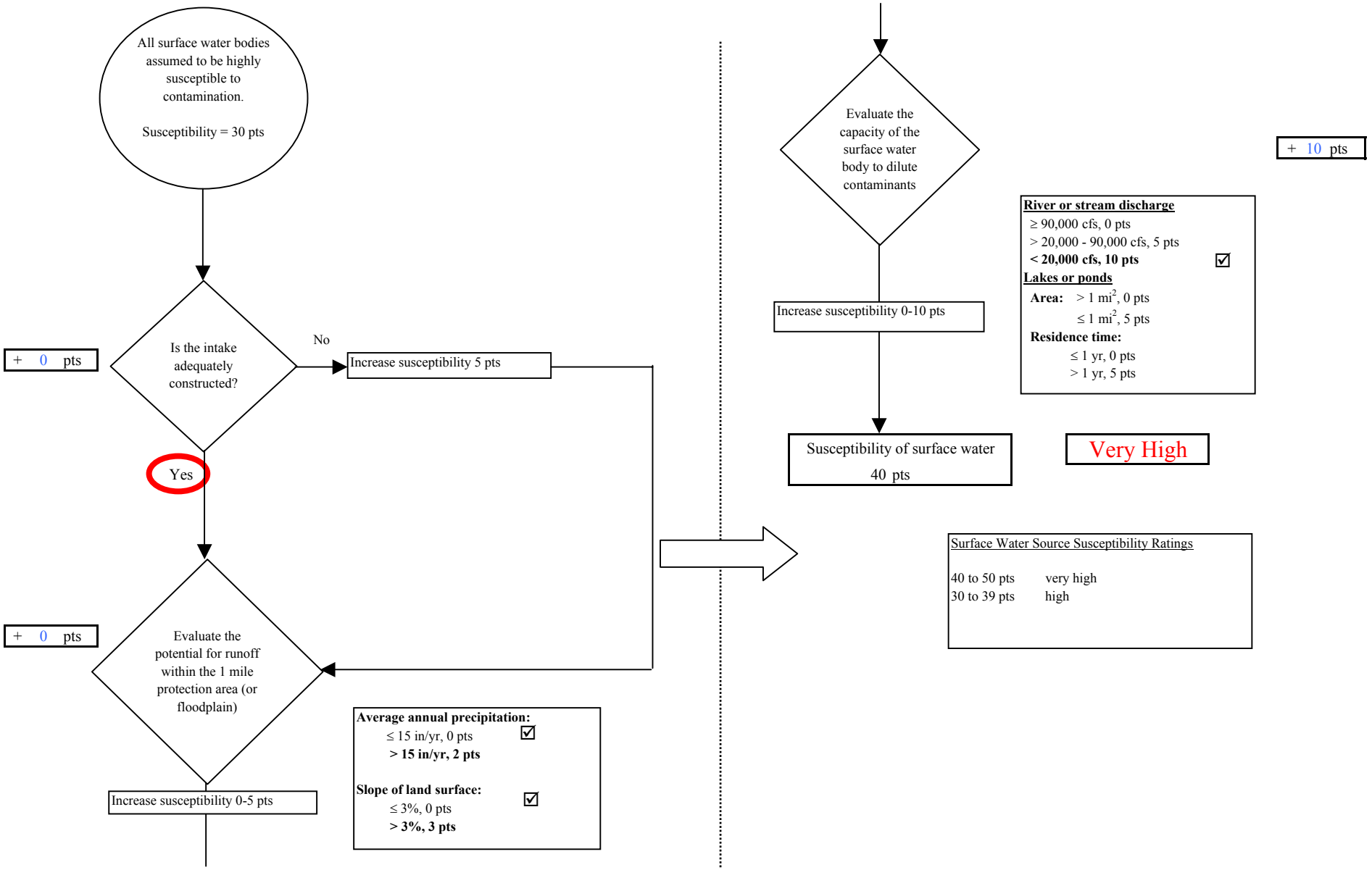
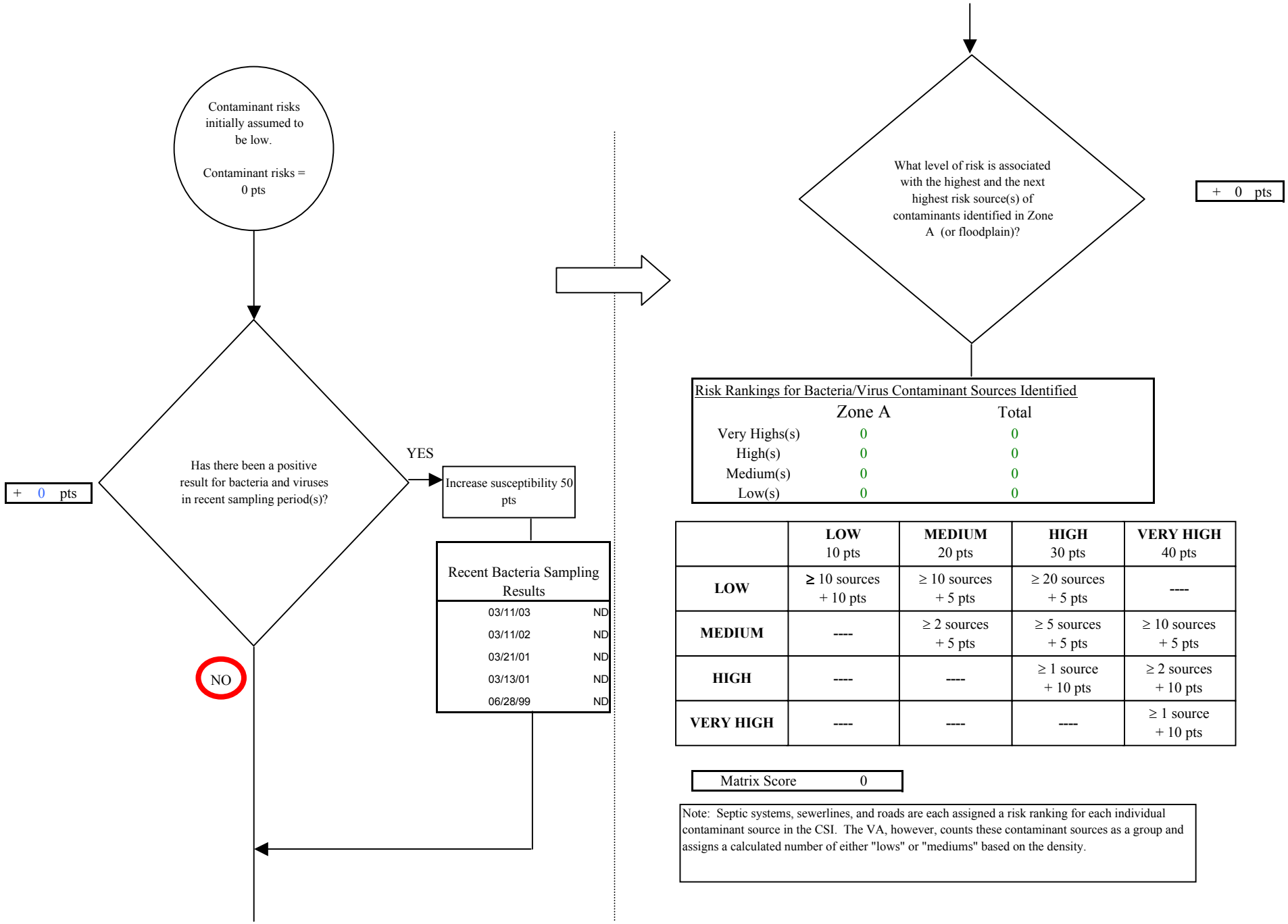


Chart 2. Contaminant risks for Mekoryuk Washeteria Water System (PWS No. 271562.001) - Bacteria & Viruses



Risk Rankings for Bacteria/Virus Contaminant Sources Identified

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

	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 0

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

Chart 2. Contaminant risks for Mekoryuk Washeteria Water System (PWS No. 271562.001) - Bacteria & Viruses

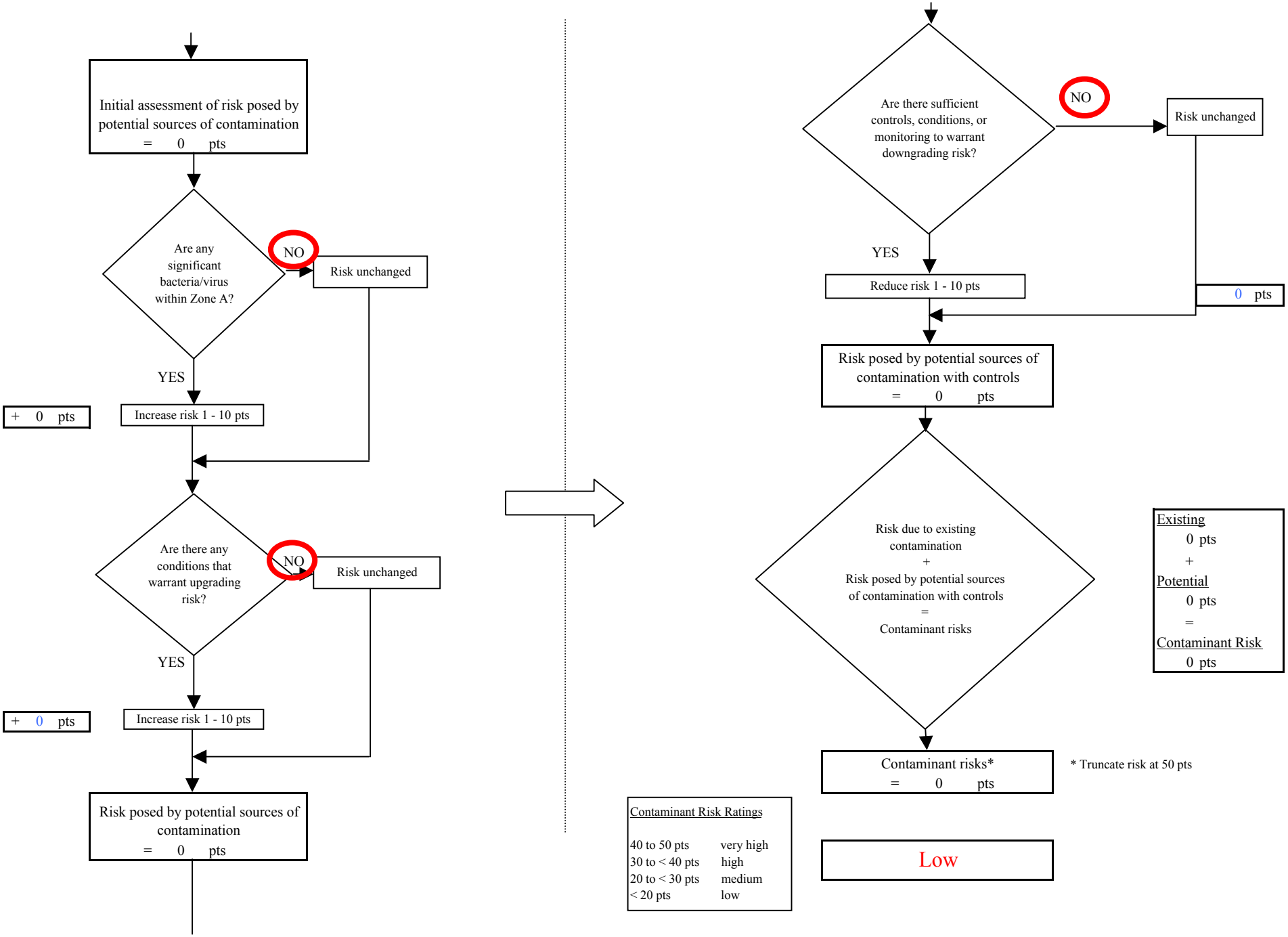


Chart 3. Vulnerability analysis for Mekoryuk Washeteria Water System (PWS No. 271562.001) - Bacteria & Viruses

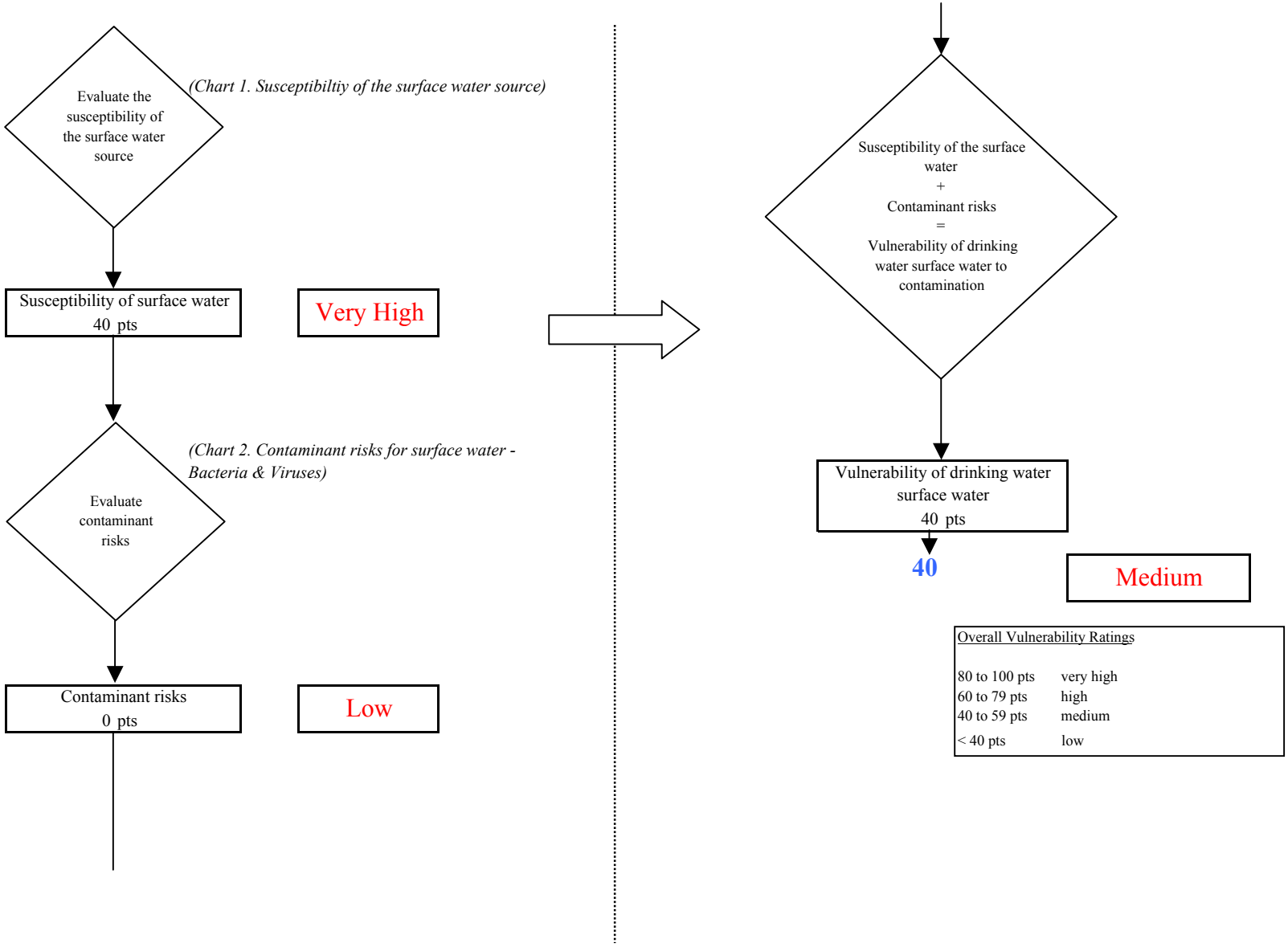


Chart 4. Contaminant risks for Mekoryuk Washeteria Water System (PWS No. 271562.001) - Nitrates and Nitrites

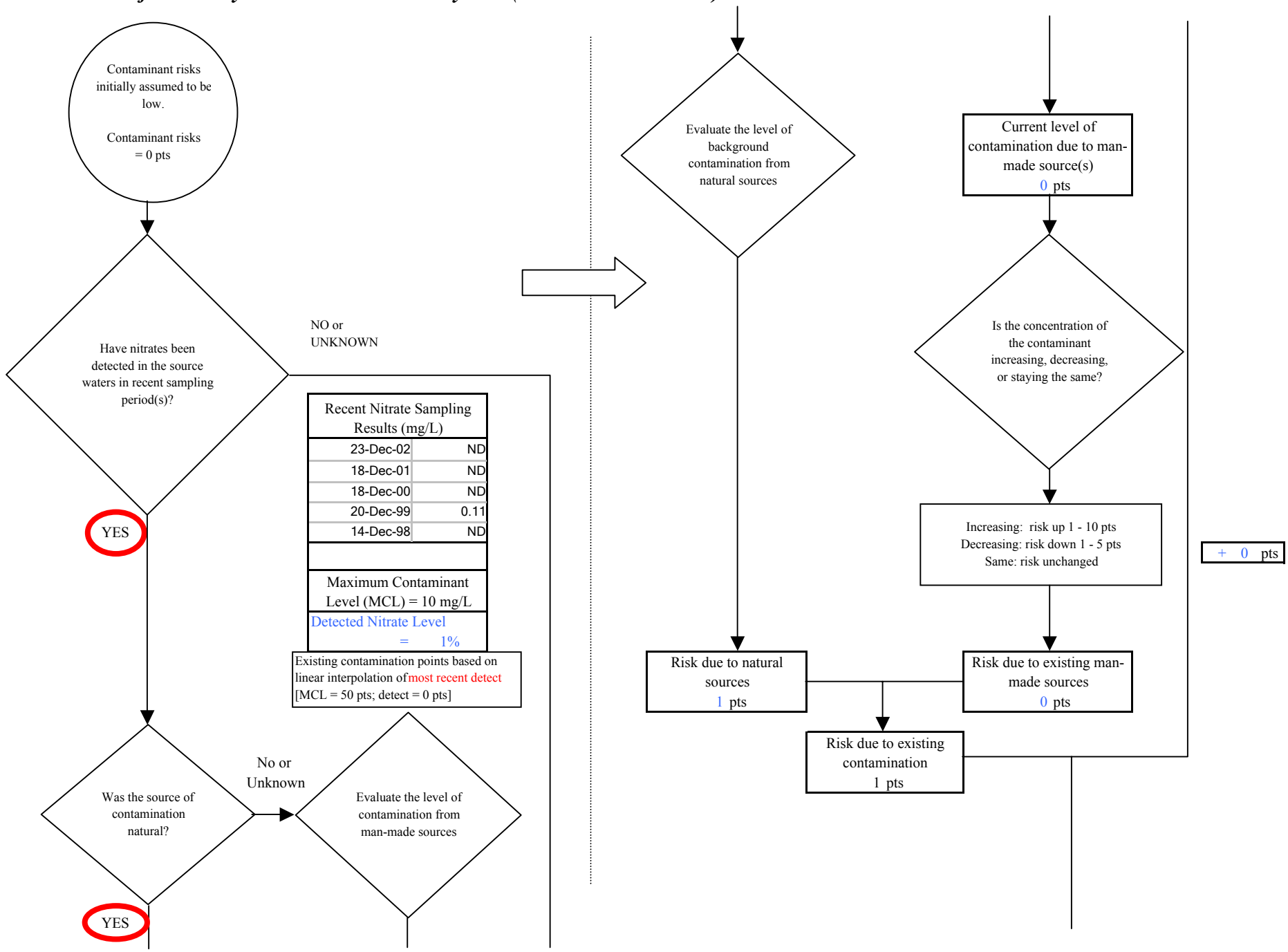


Chart 4. Contaminant risks for Mekoryuk Washeteria Water System (PWS No. 271562.001) - Nitrates and Nitrites

+ 0 pts

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

Risk Levels for Nitrate/Nitrite Sources identified in Zones A and B

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

	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 0

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 = 0 pts

Are any significant nitrate/nitrite sources in Zone A?

NO

Risk unchanged

YES

Increase risk 1 - 10 pts

+ 0 pts

Chart 4. Contaminant risks for Mekoryuk Washeteria Water System (PWS No. 271562.001) - Nitrates and Nitrites

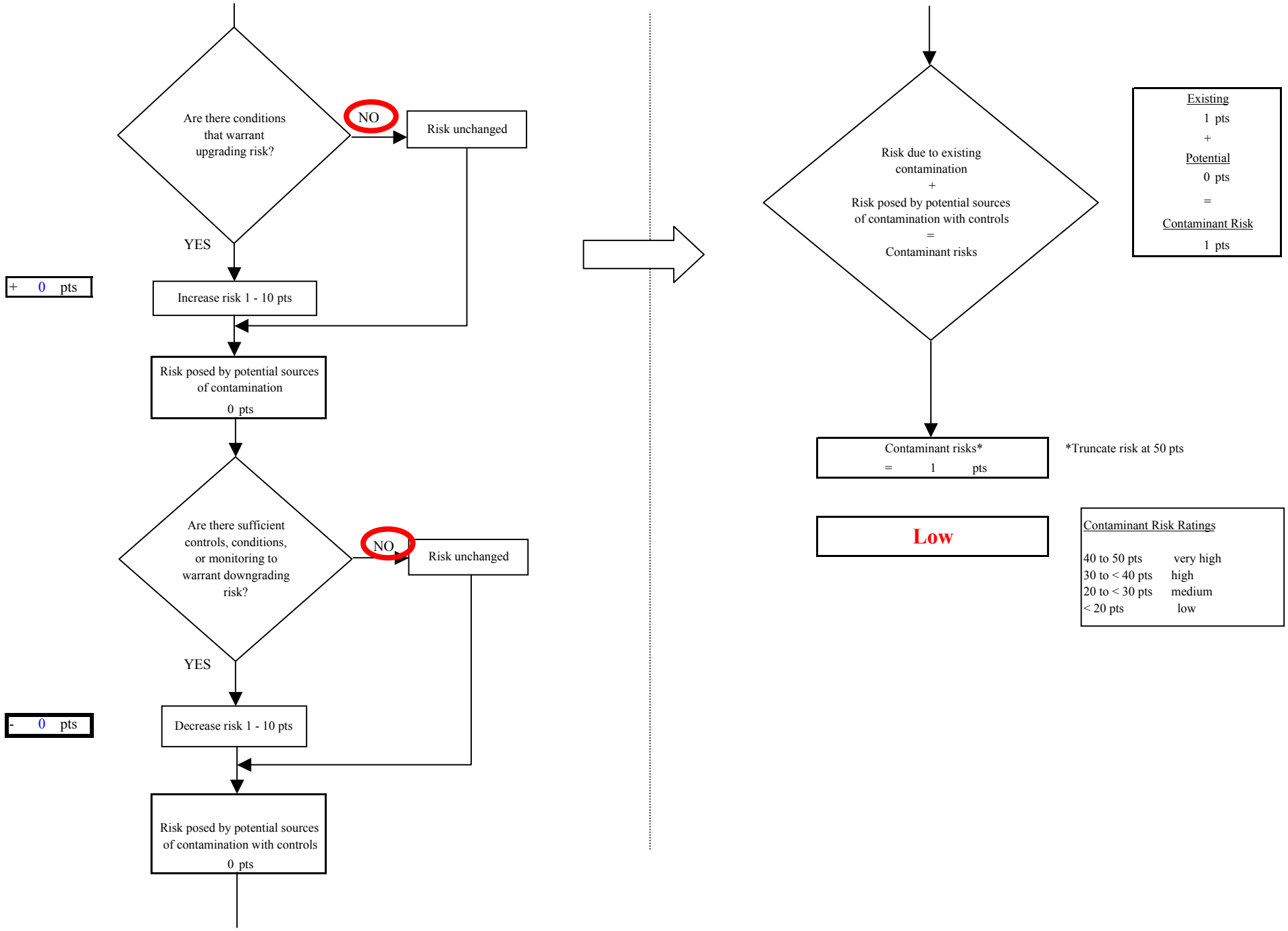


Chart 5. Vulnerability analysis for Mekoryuk Washeteria Water System (PWS No. 271562.001) - Nitrates and Nitrites

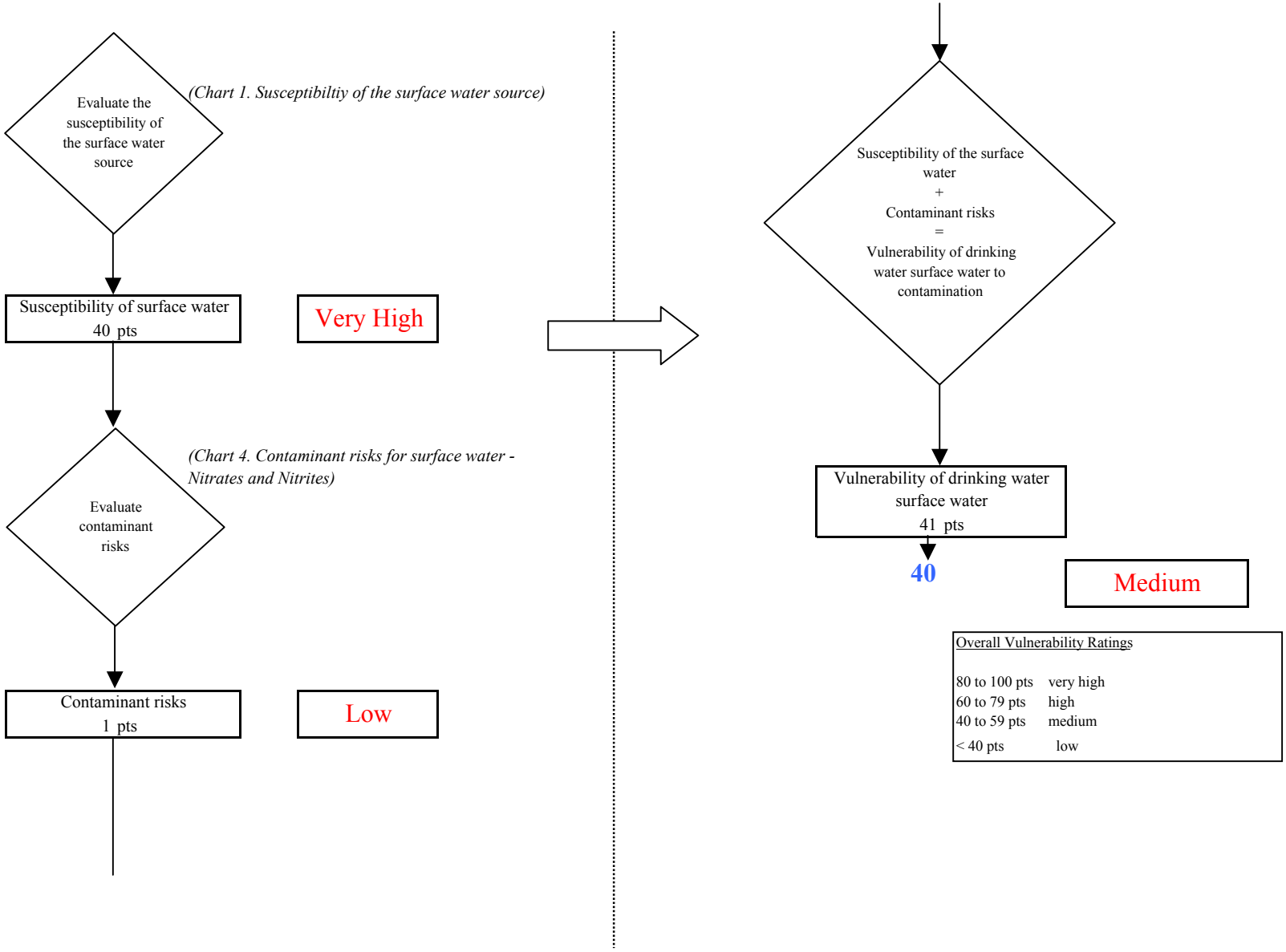


Chart 6. Contaminant risks for Mekoryuk Washeteria Water System (PWS No. 271562.001) - Volatile Organic Chemicals

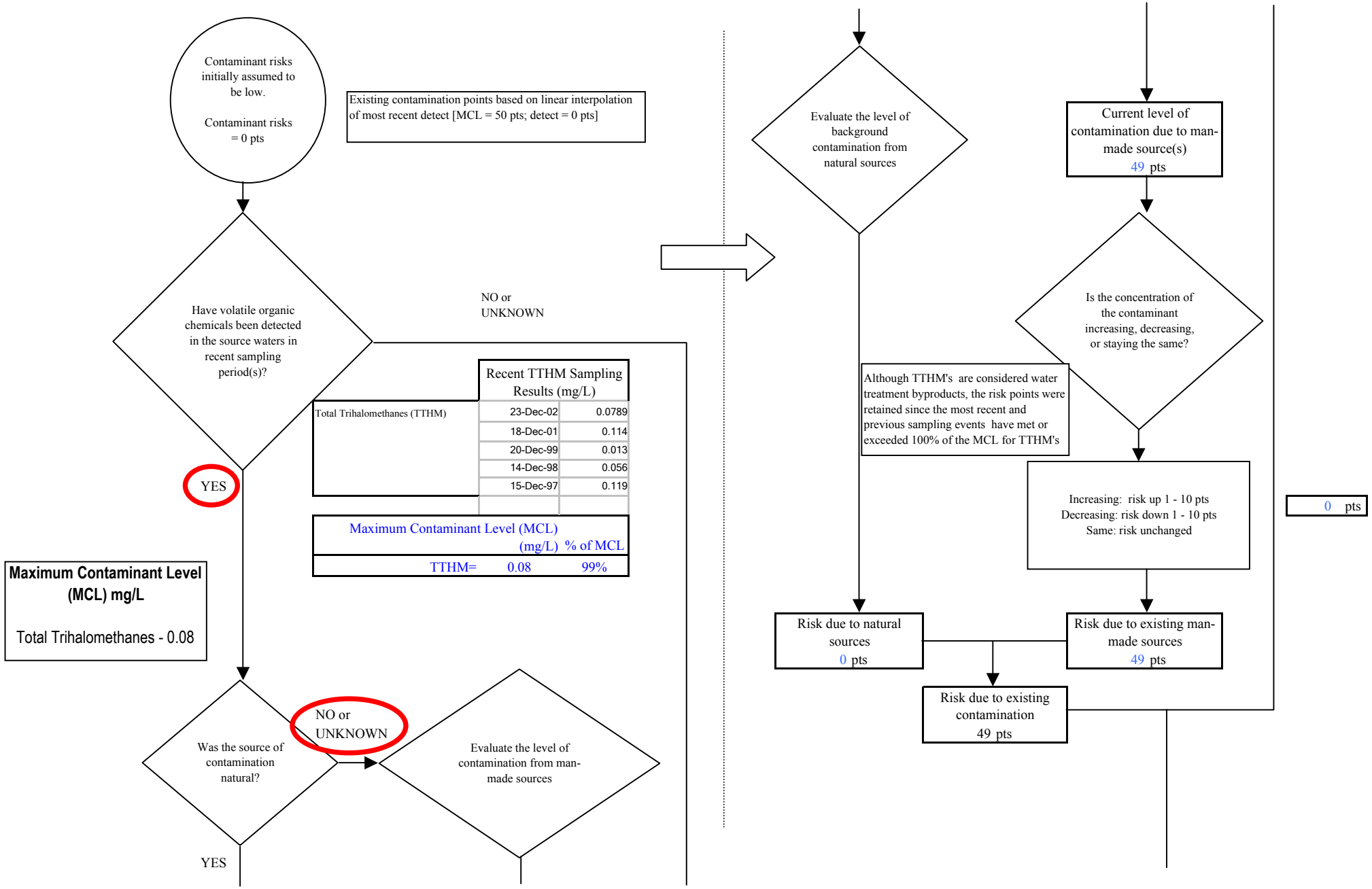


Chart 6. Contaminant risks for Mekoryuk Washeteria Water System (PWS No. 271562.001) - Volatile Organic Chemicals

+ 0 pts

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

Risk Levels for VOC Sources identified in Zones A and B			
	Zone A	Zone B	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	0		0
Low(s)	0		0

	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	0

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 = 0 pts

Are any significant VOC sources in Zone A?

NO

Risk unchanged

YES

Increase risk 1 - 10 pts

+ 0 pts

Chart 6. Contaminant risks for Mekoryuk Washeteria Water System (PWS No. 271562.001) - Volatile Organic Chemicals

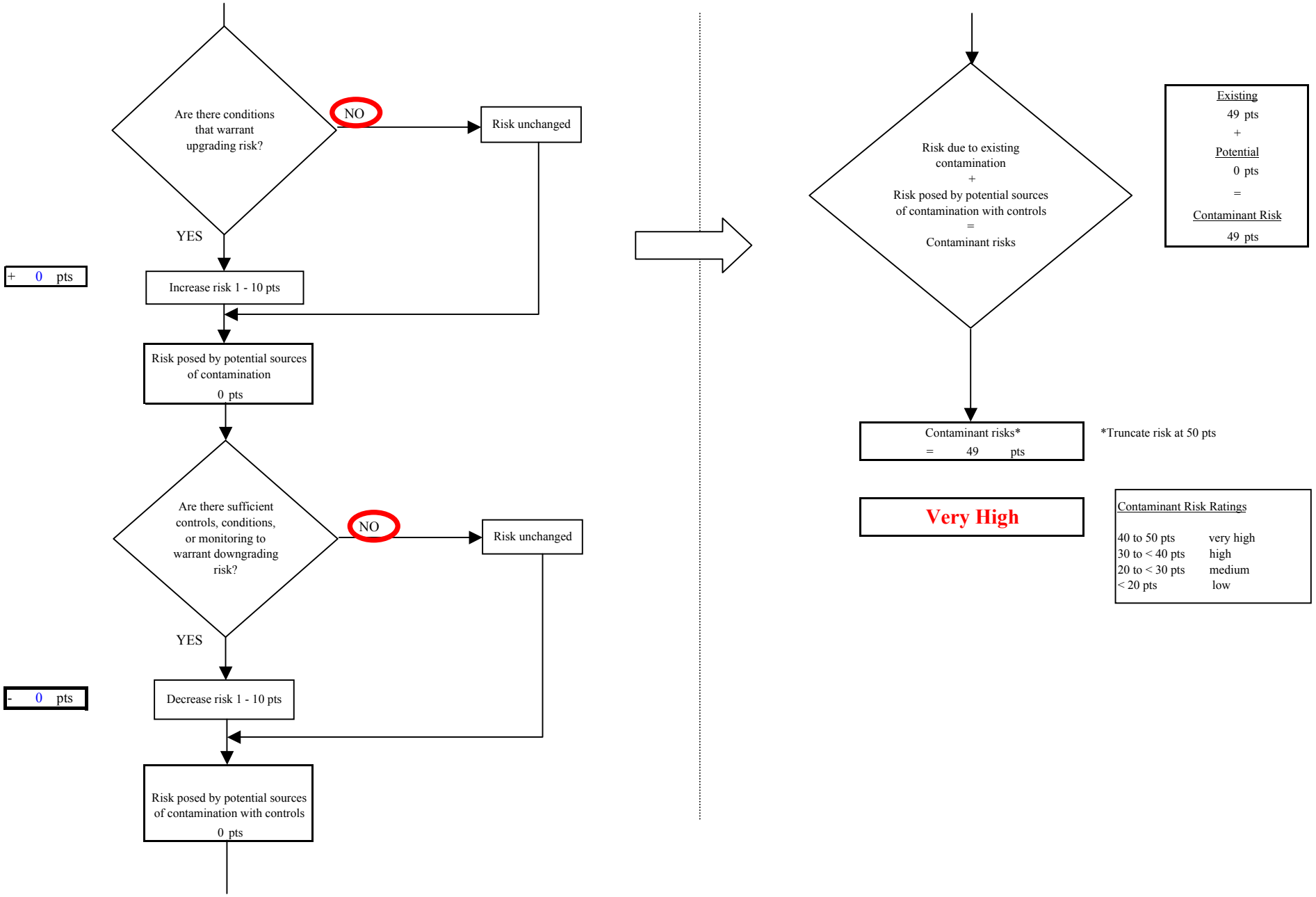


Chart 7. Vulnerability analysis for Mekoryuk Washeteria Water System (PWS No. 271562.001) - Volatile Organic Chemicals

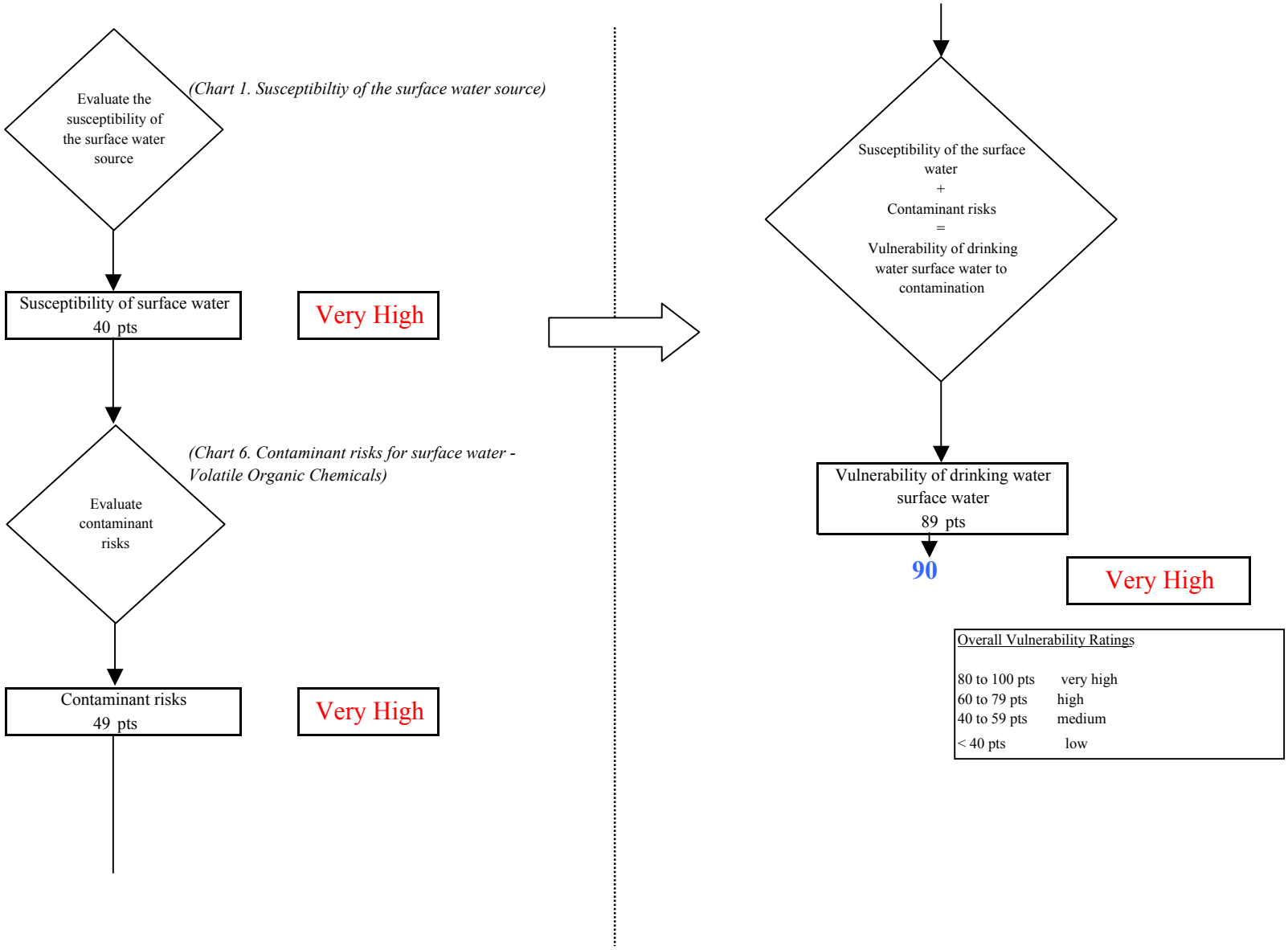


Chart 8. Contaminant risks for Mekoryuk Washeteria Water System (PWS No. 271562.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

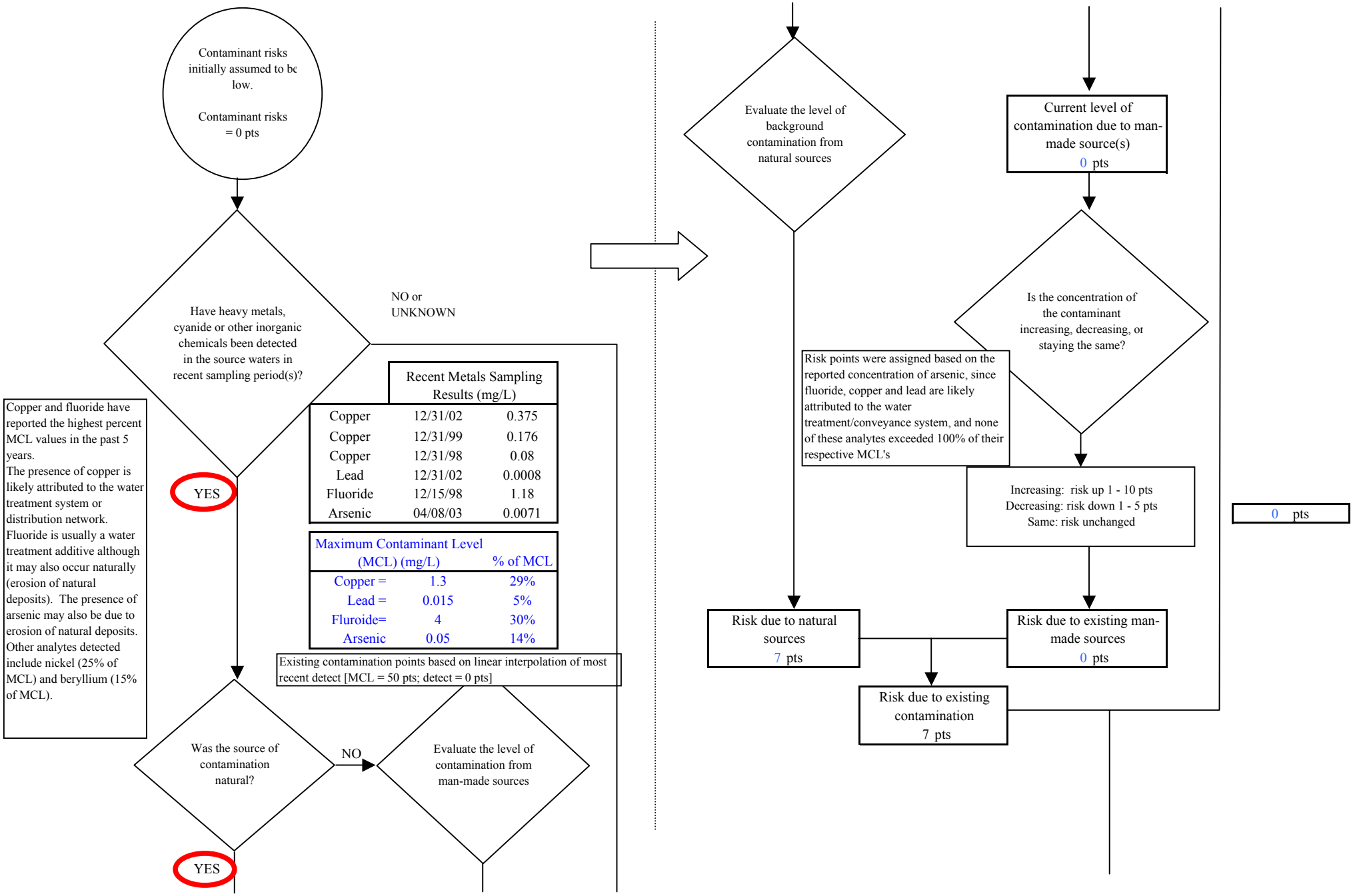


Chart 8. Contaminant risks for Mekoryuk Washeteria Water System (PWS No. 271562.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

+ 0 pts

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

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

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

	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 0

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 = 0 pts

Are any significant HM, Cyanide, or OIC sources in Zone A?

NO

Risk unchanged

YES

Increase risk 1 - 10 pts

+ 0 pts

Chart 8. Contaminant risks for Mekoryuk Washeteria Water System (PWS No. 271562.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

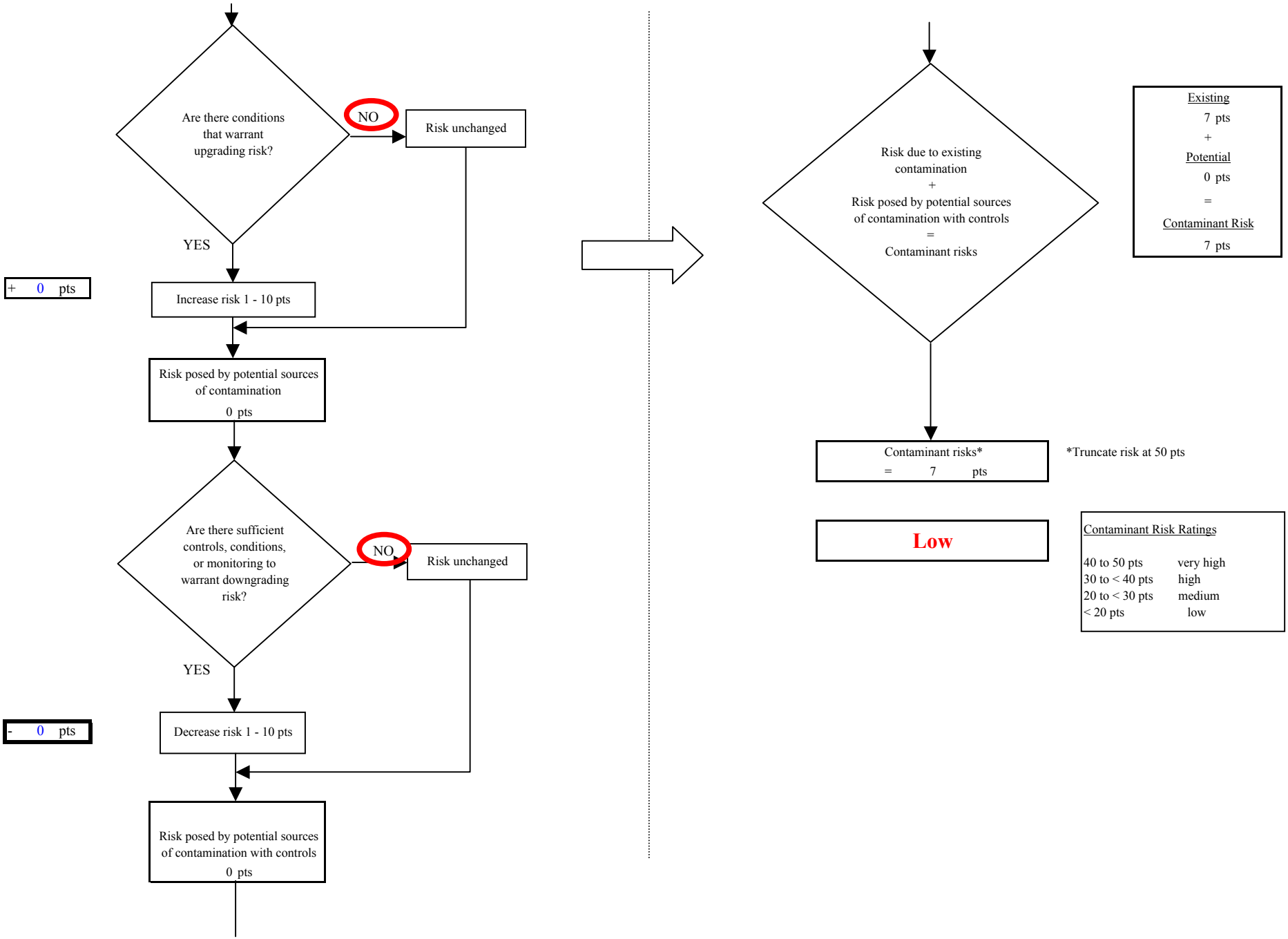


Chart 9. Vulnerability analysis for Mekoryuk Washeteria Water System (PWS No. 271562.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

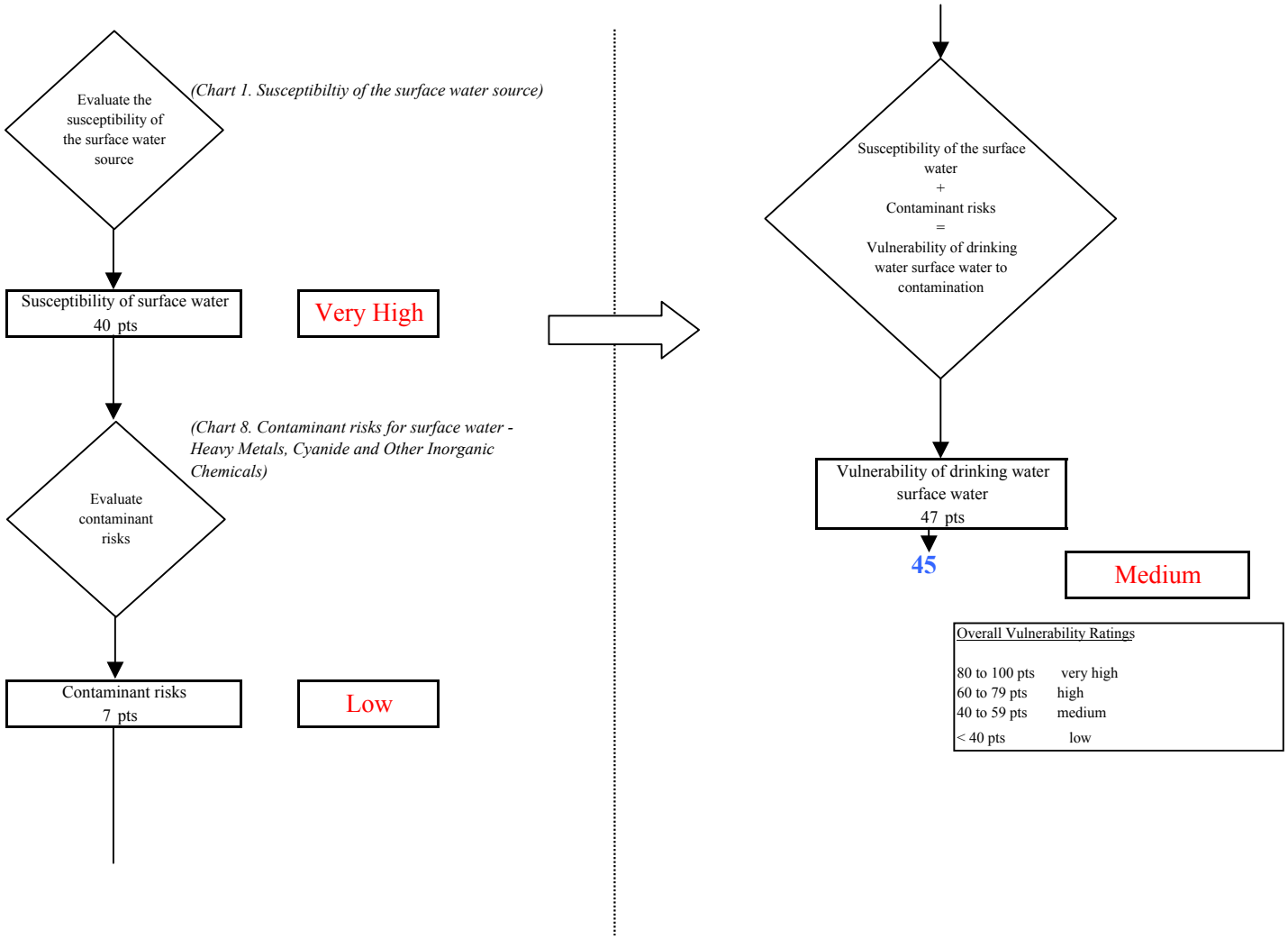


Chart 10. Contaminant risks for Mekoryuk Washeteria Water System (PWS No. 271562.001) - Synthetic Organic Chemicals

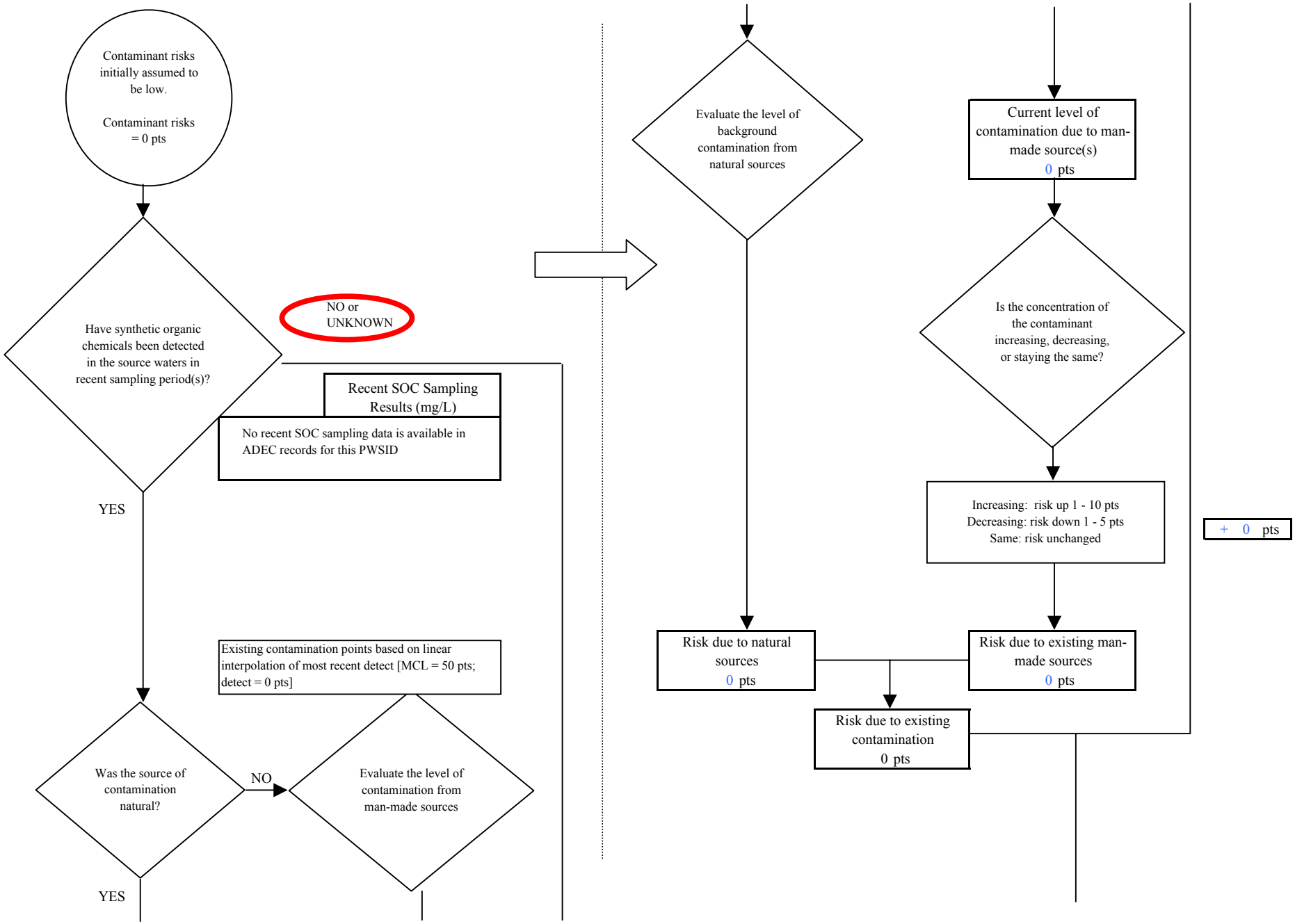
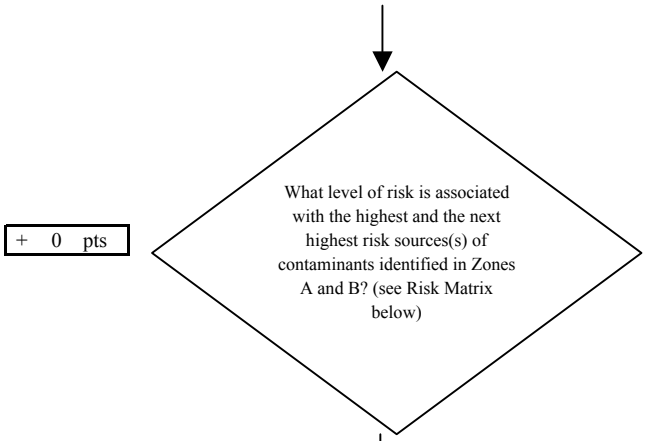


Chart 10. Contaminant risks for Mekoryuk Washeteria Water System (PWS No. 271562.001) - Synthetic Organic Chemicals



+ 0 pts

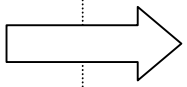
Risk Levels for SOC Sources identified in Zones A and C

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

	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 0

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



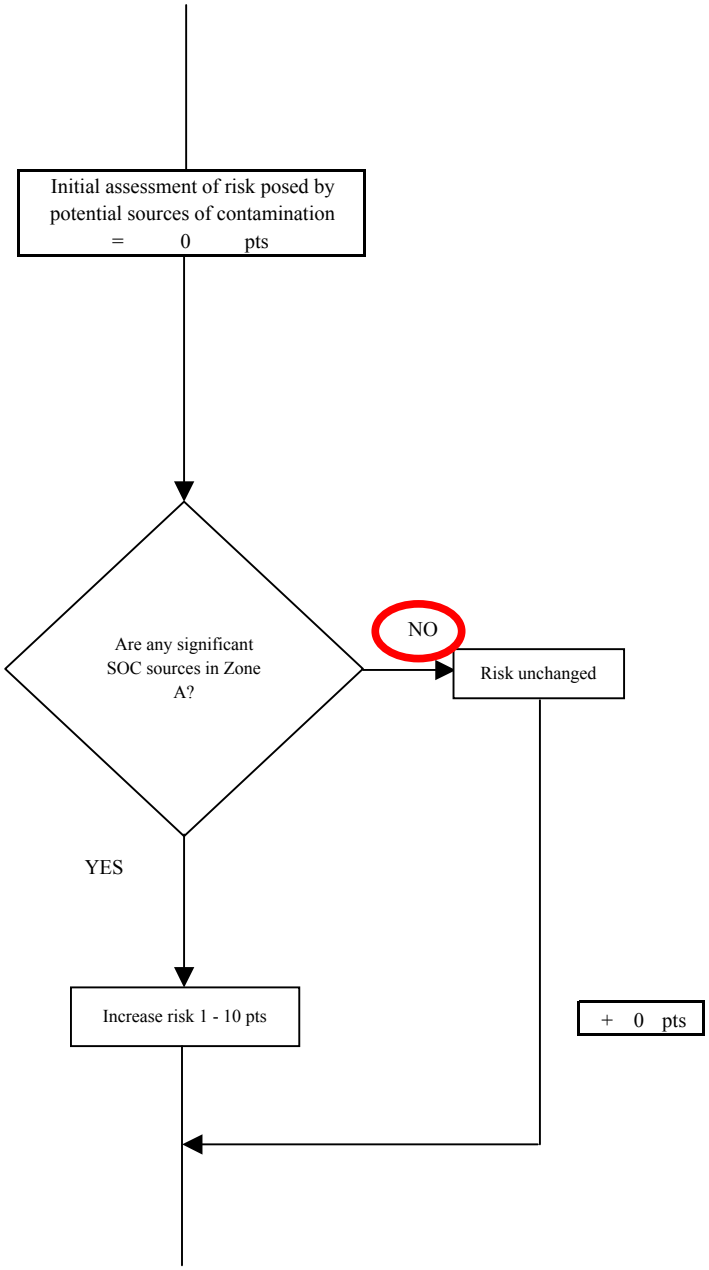


Chart 10. Contaminant risks for Mekoryuk Washeteria Water System (PWS No. 271562.001) - Synthetic Organic Chemicals

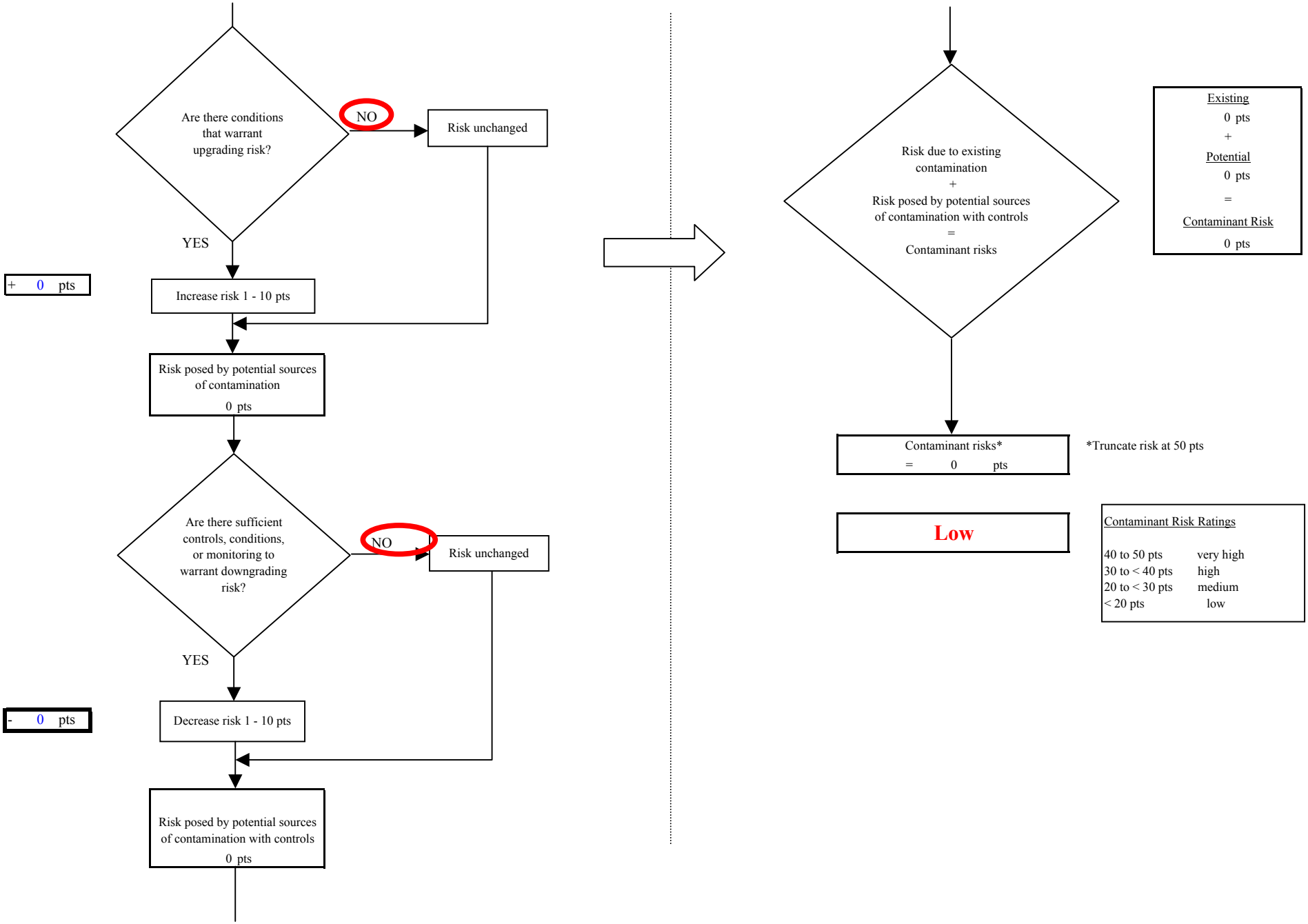


Chart 11. Vulnerability analysis for Mekoryuk Washeteria Water System (PWS No. 271562.001) - Synthetic Organic Chemicals

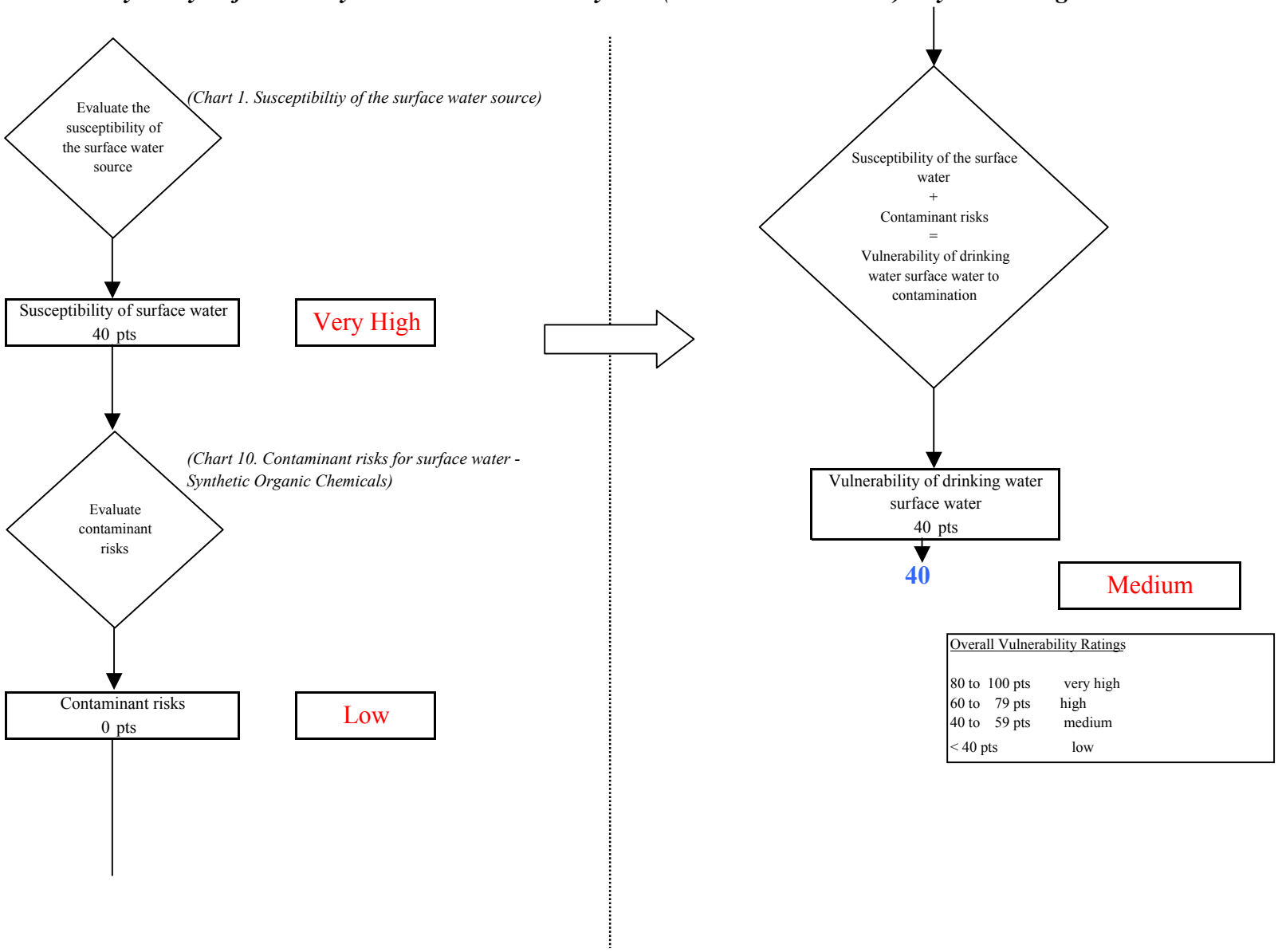


Chart 12. Contaminant risks for Mekoryuk Washeteria Water System (PWS No. 271562.001) - Other Organic Chemicals

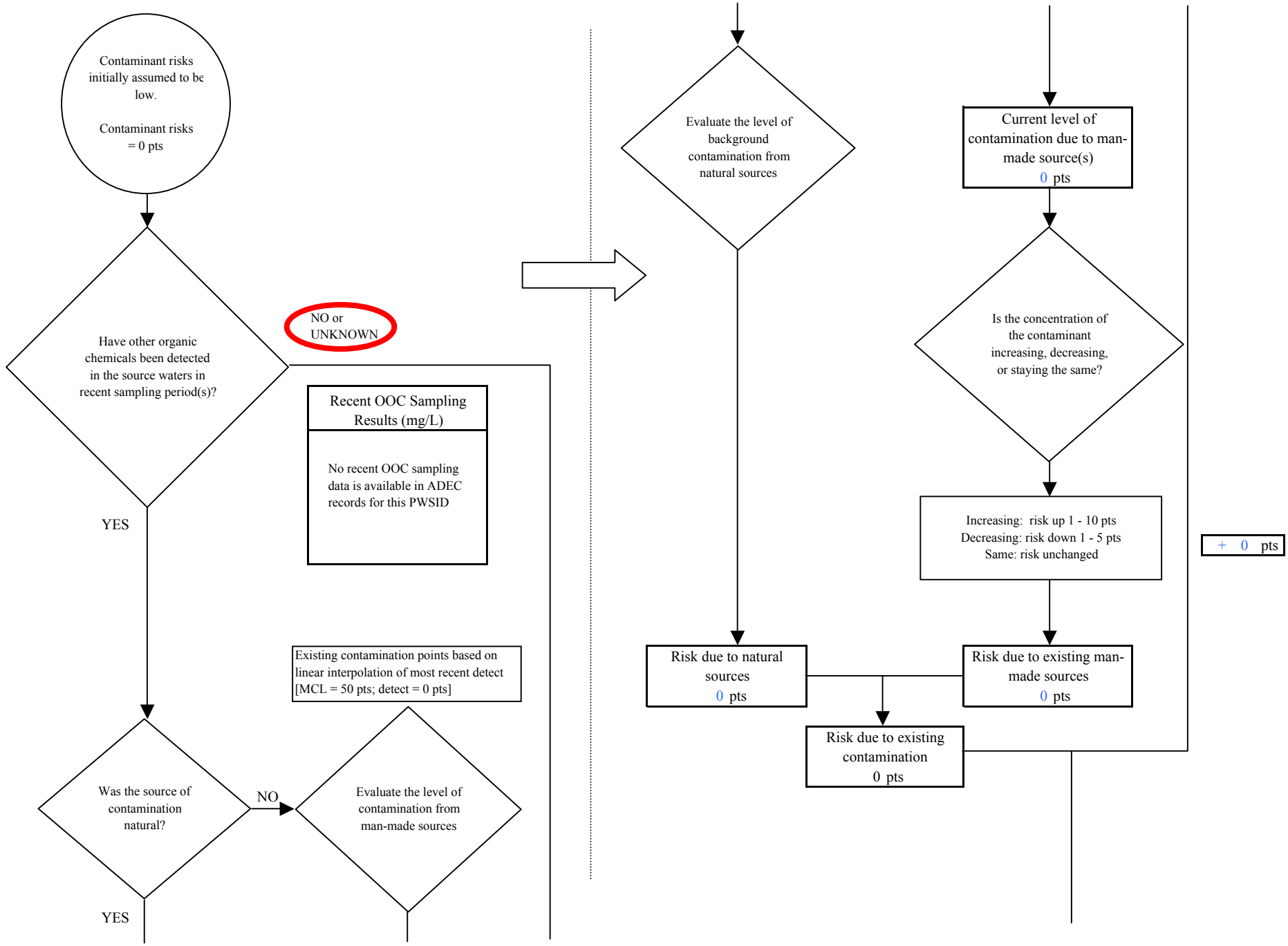
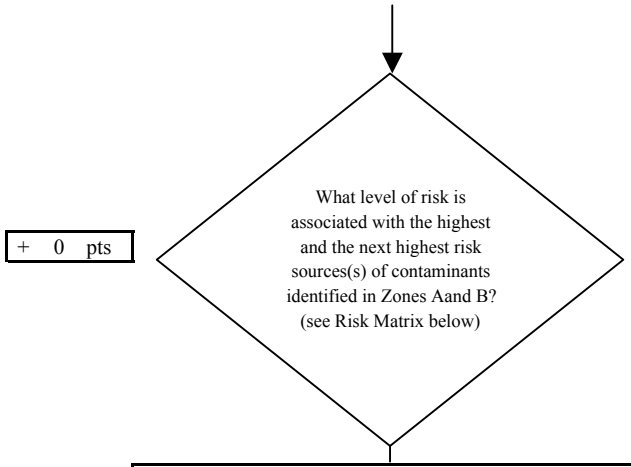


Chart 12. Contaminant risks for Mekoryuk Washeteria Water System (PWS No. 271562.001) - Other Organic Chemicals



+ 0 pts

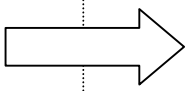
Risk Levels for OOC Sources identified in Zones A and B

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

	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 0

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



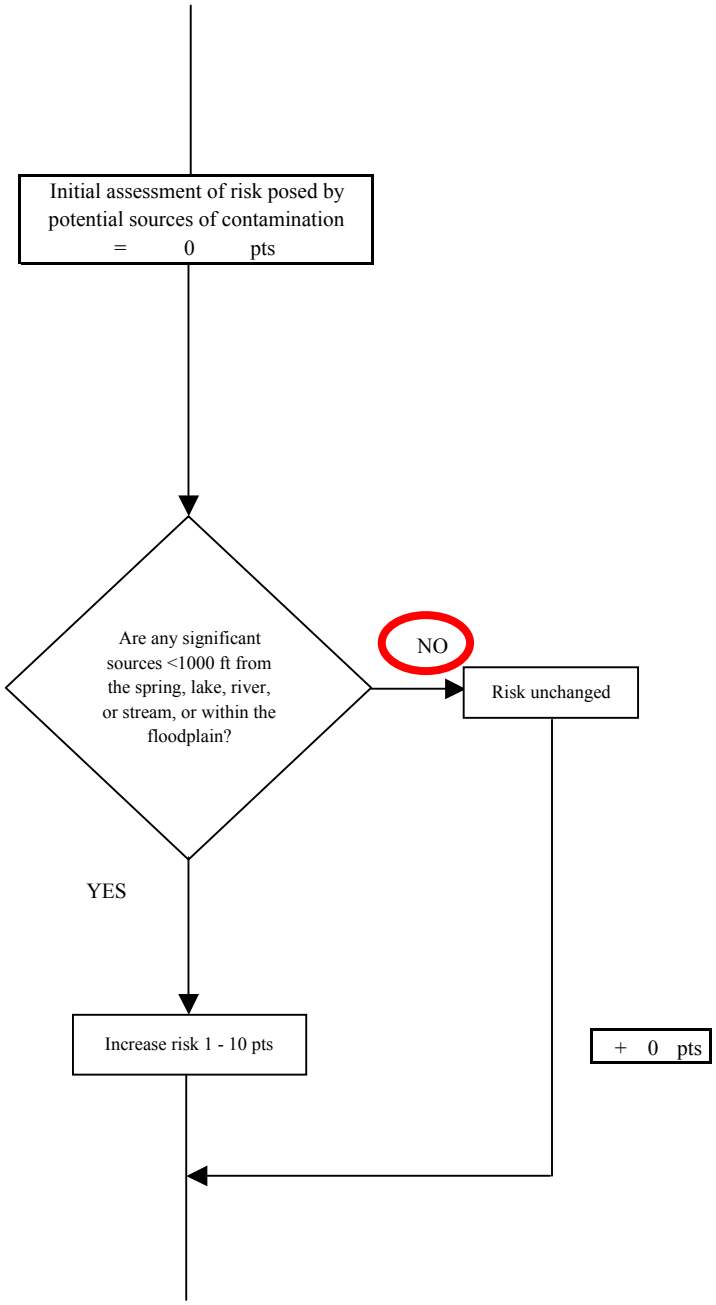


Chart 12. Contaminant risks for Mekoryuk Washeteria Water System (PWS No. 271562.001) - Other Organic Chemicals

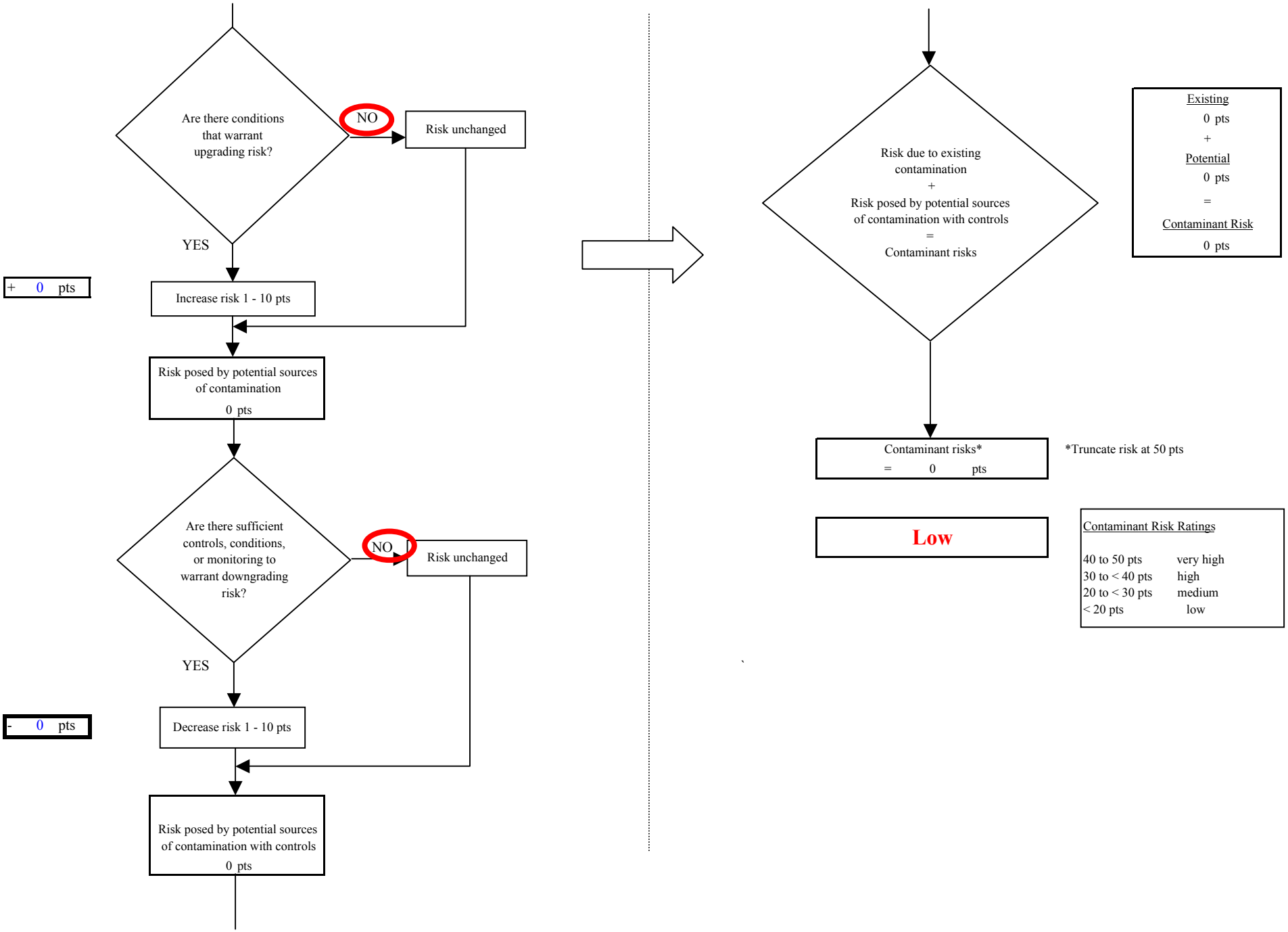


Chart 13. Vulnerability analysis for Mekoryuk Washeteria Water System (PWS No. 271562.001) - Other Organic Chemicals