Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for Alaska Commercial Store Drinking Water System, Bethel, Alaska

PWSID # 270427.001

April 2004

DRINKING WATER PROTECTION PROGRAM REPORT 1092
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 Alaska Commercial Store Source of Public Drinking Water, Bethel, Alaska

Drinking Water Protection Program
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The Alaska Commercial Store has one Public Water System (PWS) well. The date of well construction is unknown; however, it is assumed that the well (PWS No. 270427.001) has been used as a drinking water source since that time.

The well is a Class A (community and non-transient/non-community) water system located off of Ridgecrest Drive in Bethel, Alaska. Available records indicate that there is water storage with a capacity of 500-gallons, and that the drinking water is treated with sodium hypochlorite. This system operates year round and serves approximately 500 non-residents through four service connections. The wellhead received a susceptibility rating of **Very High** and the aquifer received a susceptibility rating of **High**. Combining these two ratings produce a **Very High** rating for the natural susceptibility of the well.

Identified potential and current sources of contaminants for the public drinking water source include: domestic wastewater collection systems, an injection well, above ground fuel tanks, wastewater holding tanks, ADEC recognized contaminated sites and leaking underground storage tank (LUST) sites, an abandoned well, monitoring wells, water supply wells, cemeteries, glycol storage/disposal, petroleum product bulk station/terminals, pipelines, electric power generation, medical/veterinary facilities, firehouse, domestic wastewater treatment plant disposal pond/lagoon, motor vehicle/general storage yards/facilities, and landfills. These identified potential and existing sources of contamination 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 contaminant categories.

Overall, the water well received a vulnerability rating of **Very High** for bacteria and viruses, nitrates and nitrites, volatile organic chemicals, heavy metals, cyanide and other inorganic chemicals, synthetic organic chemicals, and other organic chemicals.

PUBLIC DRINKING WATER SYSTEM

The Alaska Commercial Store well is a Class A (community/non-transient/non-community) public water system. The system is located off of Ridgecrest Drive in Bethel, Alaska (Sec. 8, T8N, R71W, Seward Meridian; see Map A of Appendix A). Bethel serves as the regional center for 56 villages in the Yukon-Kuskokwim Delta. Food, fuel, transportation, medical care, and other services for the region are provided by Bethel. Bethel is located at the mouth of the Kuskokwim River, 40-miles inland from the Bering Sea, and approximately 400-air miles west of Anchorage. The community has a population of 5,736 (ADCED, 2003). Average annual precipitation for Bethel is 16 inches, including approximately 50 inches of snowfall. Temperatures range from 42 to 62°F in summer and -2 to 19°F in winter.

The community of Bethel obtains a portion of their water supply from city wells. Some households are served by the central piped water and sewage collection system; however, approximately 75% of households have water delivered and sewage hauled by truck. Several facilities have individual wells and septic tanks (ADCED, 2003). Bethel receives electrical power from the Bethel Utilities Corporation. Power generating facilities are fueled by diesel. Refuse is collected by the City of Bethel and transported to the City operated landfill (ADCED, 2003).

According to information supplied by ADEC for the Alaska Commercial Store PWS, the depth of the primary water well is 400 feet below the ground surface. Well construction details are unknown; however, it is assumed the well is screened in a confined aquifer based on available construction details for surrounding wells. The well is not located within a floodplain.

Information acquired from a June 2001 sanitary survey for the public water system indicated that the

land surface was not sloped away from the well. Generally, land surfaces that slope away from the wellhead promote surface water drainage, which reduces the potential of contaminant migration down the well casing annulus. The sanitary survey indicates that the well is not grouted according to ADEC regulations. Proper grouting provides added protection against contaminants traveling along the well casing annulus and into source waters.

The Bethel area is near the southern border of the continuous permafrost zone and the City, and most of the area west of the Kuskokwim River, appear to be underlain with permafrost. The permafrost generally extends to a depth of at least 300 feet bgs, with depths of over 600 feet bgs recorded in some areas. The geology in the area consists primarily of unconsolidated floodplain alluvium, silt deposits, and reworked silt. The Bethel area consists of poorly drained wetlands that have permanently ponded water in local depressions. Sloughs, small lakes, ponds, and marshes in meander scars surround Bethel (Dames & Moore, 1996).

DRINKING WATER PROTECTION AREA

In order to evaluate whether a drinking water source is at risk, we must first evaluate what are the most likely pathways for surface contamination to reach the groundwater. These areas are determined by looking at the characteristics of the soil, groundwater, aquifer, and well.

The most probable area for contamination to reach the drinking water well is the area that contributes water to the well, the groundwater recharge area. This area is designated as the drinking water protection area (DWPA). Because releases of contaminants within the protection area are most likely to impact the drinking water well, this area will serve as the focus for voluntary protection efforts. An analytical calculation was used to determine the size and shape of the DWPA for the Alaska Commercial Store PWS. The input parameters describing the attributes of the aquifer in this calculation were adopted from Groundwater (Freeze and Cherry, 1979). Available geology and groundwater contours were also considered to take into account any uncertainties in groundwater flow and aquifer characteristics to arrive at a meaningful protection area.

The protection areas established for wells by the ADEC are usually separated into four zones, limited by the watershed. These zones correspond to differences in the time-of-travel (TOT) of the water moving through the aquifer to the well (Please refer to the Guidance Manual for Class A Public Water Systems for additional information).

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

Table 1. Definition of Zones

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

The DWPA for the Alaska Commercial Store PWS was determined using an analytical calculation and includes Zones A, B, C, and D (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 Bethel Heights Water System DWPA. This inventory was completed through a search of agency records and other publicly available information. Potential sources of contamination to the drinking water aquifer include a wide range of categories and types. Potential drinking water contaminants are found within agricultural, residential, commercial, and industrial areas, but can also occur within areas that have little or no development.

For the basis of all Class 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,
- Other organic chemicals.

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

RANKING OF CONTAMINANT RISKS

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

- Low,
- Medium,
- High, and
- Very High.

The time-of-travel for contaminants within the water varies and is dependent on the physical and chemical characteristics of each contaminant. Bacteria and Viruses are only inventoried in Zones A and B because of their short life span. Only "Very High" and "High" rankings are inventoried within the outer Zone D due to the probability of contaminant dilution by the time the contaminants get to the well. Tables 2 through 4 in Appendix B contain the ranking of potential and existing sources of contamination with respect to bacteria and viruses, nitrates and/or nitrites, volatile organic chemicals, heavy metals, cyanide and other inorganic chemicals, synthetic organic chemicals, and other organic chemicals.

VULNERABILITY OF THE 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 naturally occurring attributes of the water source and influences on the groundwater system that might lead to contamination. Chart 3 analyzes 'Contaminant Risks' for the drinking water source with respect to bacteria and viruses. The 'Contaminant Risks' portion of the analysis considers potential sources of contaminants as well as a review of contamination that has or may have occurred, but has not arrived or been detected at the well. Chart 4 contains 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 Alaska Commercial Store's water well is in a confined aquifer. Confined aquifers are less susceptible to potential groundwater quality impacts posed by the migration of surface water contaminants downward from the surface. Table 2 shows the susceptibility scores and ratings for this PWS.

Table 2. Susceptibility

	Score	**Rating**
Susceptibility of the Wellhead	25	Very High
Susceptibility of the Aquifer	15	High
Natural Susceptibility	40	Very High

Contaminant risks to a drinking water source depend on the type, number or density, and distribution of contaminant sources. This score has been derived from an examination of existing and historical contamination that has been detected at the drinking

water source through routine sampling. It also evaluates potential sources of contamination. Flow charts are used to assign a point score, and ratings are assigned in the same way as for the natural susceptibility:

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

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

Table 3. Contaminant Risks

Category	Score	Rating
Bacteria and Viruses	50	Very High
Nitrates and/or Nitrites	50	Very High
Volatile Organic Chemicals	50	Very High
Heavy Metals, Cyanide and Other Inorganic Chemicals	50	Very High
Synthetic Organic Chemicals	45	Very High
Other Organic Chemicals	50	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	90	Very High
Nitrates and Nitrites	90	Very High
Volatile Organic Chemicals	90	Very High
Heavy Metals, Cyanide and Other Inorganic Chemicals	90	Very High
Synthetic Organic Chemicals	85	Very High
Other Organic Chemicals	90	Very High

Bacteria and Viruses

The contaminant risk for bacteria and viruses is **Very High**. The risk is primarily attributed to the presence of landfills and a domestic wastewater treatment plant disposal pond/lagoon in Zones C and D (see Table 2 – Appendix B).

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.

A positive bacteria count has been reported in recent (within five years) sampling events (See Chart 3 – Contaminant Risks for Bacteria and Viruses in Appendix D). Only a small amount of bacteria and viruses are required to endanger public health.

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 **Very High**.

Nitrates and Nitrites

The contaminant risk for nitrates and nitrites is **Very High**. The risk to this source of public drinking water is primarily attributed to the presence of abandoned wells, landfills and a domestic wastewater treatment plant disposal pond/lagoon in Zones A, C, and D (see Table 3 – Appendix B).

Nitrates are very mobile, moving at approximately

the same rate as water. The sampling history for this well indicates that nitrates have not been detected in recent sampling events. Nitrate concentrations in uncontaminated groundwater are typically less than 2 mg/L; therefore, nitrate concentrations above 2 mg/L may be indicative of man-made sources (See Chart 5 - Contaminant Risks for Nitrates and/or Nitrites in Appendix D).

Nitrate levels are often derived from the decomposition of organic matter in soils. Although the nitrate source is unknown, such occurrences may be attributed to septic systems or other sources. After combining the contaminant risk for nitrates and nitrites with the natural susceptibility of the well, the overall vulnerability of the well to nitrate and nitrite contamination is **Very High**.

Volatile Organic Chemicals

The contaminant risk for volatile organic chemicals is **Very High**. The risk is primarily attributed to the presence of an injection well, petroleum product bulk station/terminals, landfills, and ADEC recognized contaminated sites and LUST sites located in Zones A, C, and D. Numerous other potential contaminant sources are also found within the protection area (see Table 4 – Appendix B).

Detectable concentrations of trihalomethanes (TTHM) were reported in sampling events for this public water system. However, the detectible concentrations of trihalomethanes reported in 2001, were below the MCL of 0.08 mg/L. Trihalomethanes are considered byproducts of the water treatment process and are not from the source waters. Since the reported concentration of TTHM's in recent sampling events did not exceed the applicable MCL, risk points were not retained.

Aside from being byproducts of the drinking water treatment process, possible sources of volatile organic chemicals include facilities with automobiles, residential areas, fuel tanks, roads, and airports. See Table 4 in Appendix D for a complete listing.

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 **Very High**.

Heavy Metals, Cyanide and Other Inorganic Chemicals

The contaminant risk for heavy metals, cyanide and other inorganic chemicals is **Very High**. The risk is primarily attributed to the presence of an injection well, an abandoned well, landfills, and an ADEC recognized LUST site located in Zones A, C, and D. Numerous other potential contaminant sources are also found within the protection area (see Table 5 – Appendix B).

Based on review of recent sampling records for this public water system, moderate levels of copper and lead have been detected. Copper has been detected in recent sampling history, and has exceeded the MCL of 1.3 mg/L and 0.015 mg/L (see Chart 9 – Contaminant Risks for Heavy Metals, Cyanide, and Other Inorganic Chemicals in Appendix D). Risk points were assigned based on the presence of this analyte.

The reported concentrations of lead in recent sampling events is not likely to be representative of source water conditions. This analyte is likely attributed to either the water treatment process or water distribution network. Therefore, risk points were not assigned based on the presence of this analyte.

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 **Very High**.

Synthetic Organic Chemicals

The contaminant risk for synthetic organic chemicals is **Very High**. The risk is primarily attributed to the presence of an abandoned well and landfills in Zones A and D. Numerous other potential contaminant sources are also found within the protection area (see Table 6 – Appendix B).

No recent sampling data was available in ADEC records for the Alaska Commercial Store (See Chart 11 – Contaminant Risks for Synthetic Organic Chemicals in Appendix D).

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 **Very High**.

Other Organic Chemicals

The contaminant risk for other organic chemicals is **Very High**. The risk is primarily attributed to the presence of an abandoned well, petroleum product bulk stations/terminals, pipelines, electric power generation, and landfills in Zones A and D. Numerous other potential contaminant sources are also found within the protection area (see Table 7 – Appendix B).

No recent sampling data was available in ADEC records for the Alaska Commercial Store (See Chart 13 – Contaminant Risks for Other Organic Chemicals in Appendix D).

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 **Very High**.

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 Alaska Commercial Store and the community of Bethel 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.

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APPENDIX A

Drinking Water Protection Area Location Map
(Map A)

Public Water Well System for PWS #270427.001 Alaska Commercial Store - Bethel

Zone D
Zone C
Zone B
Zone A
Alaska Commercial Store - Bethel
PWS 270427.001

LEGEND

Public Water System Well

Groundwater Protection Zones

- Zone A Protection Area– Several Months Travel Time
- Zone B Protection Area– 2 Years Travel Time
- Zone C Protection Area– 5 Years Travel Time
- Zone D Protection Area– 10 Years Travel Time or Watershed Boundary

Hydrography/Physical

- Parcels
- Stream
- Lake or Pond
- Contours

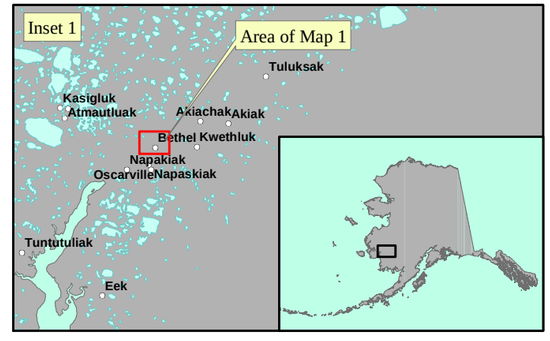
Transportation

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

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 "Alaska Drinking Water Protection Program - Guidance Manual for Class A Public Water Systems" published by ADEC

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



0 0.3 0.6 1.2 1.8 2.4 Miles

Alaska Commercial Store - Bethel
PWS 270427.001
Appendix A Map A

APPENDIX B

Contaminant Source Inventory and Risk Ranking (Tables 1-7)

Table 1

Contaminant Source Inventory for ***Alaska Commercial Store***

PWSID 270427.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-01	A	C	
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-01	A	C	The Shop
Tanks, diesel (above ground)	T06	T06-01	A	C	AC Store
Tanks, heating oil, nonresidential (aboveground)	T14	T14-01	A	C	
Tanks, heating oil, nonresidential (aboveground)	T14	T14-02	A	C	
Tanks, heating oil, nonresidential (aboveground)	T14	T14-03	A	C	AC Store
Wastewater Holding Tank	T22	T22-01	A	C	
Wastewater Holding Tank	T22	T22-02	A	C	
Wastewater Holding Tank	T22	T22-03	A	C	Veterinary Clinic
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-01	A	C	Bethel OMS, ADEC RecKey #1998250103002, Status: Inactive, petroleum contamination in soil near fuel tank and former ASTs.
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-02	A	C	Kuskokwim Inn, ADEC RecKey #1999250120001, Status: Active, diesel contaminated soils discovered during a 1,000-gallon storage tank removal.
Open Leaking Underground Fuel Storage Tank (LUST) Sites	U07	U07-01	A	C	Bethel OMS, ADEC RecKey #1993250002151, Event ID 1341, Facility ID 3133, release from a 1,000-gallon gasoline tank.
Abandoned wells	W01	W01-01	A	C	
Monitoring wells	W06	W06-01	A	C	
Water supply wells	W09	W09-01	A	C	5 water supply wells in Zone A
Cemeteries	X01	X01-01	A	C	
Glycol (disposal or storage)	X07	X07-01	A	C	
Glycol (disposal or storage)	X07	X07-02	A	C	AC Store
Petroleum product bulk station/terminals	X11	X11-01	A	C	North Star Gas, Inc.
Pipelines (oil and gas)	X28	X28-01	A	C	AC Store
Electric power generation (fossil fuels)	X36	X36-01	A	C	AC Store

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Medical/veterinary facilities (doctor or dentist offices, hospitals, nursing homes)	X40	X40-01	A	C	Veterinary Clinic
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-02	B	C	
Water supply wells	W09	W09-02	B	C	3 water supply wells in Zone B
Firehouses	X38	X38-01	B	C	
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-03	C	C	
Domestic wastewater treatment plant disposal ponds/lagoons	D02	D02-01	C	C	
Tanks, heating oil, nonresidential (aboveground)	T14	T14-04	C	C	344 Owl Street
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-03	C	C	344 Owl Street, ADEC RecKey #1992250124701, Status: Closed, diesel contaminated soils due to an undetermined amount of heating oil released from a storage tank.
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-04	C	C	Owl Street Residence, ADEC RecKey #1992250124701, Status: Closed, diesel contamianted soils due to an undetermined amount of heating oil released from a storage tank.
Closed leaking fuel storage tank (LUST) (aviation)	U12	U12-01	C	C	Bethel Dump
Motor vehicle/general storage yards/facilities	X27	X27-01	C	C	Arctic Moving & Delivery
Landfills (municipal; Class II)	D50	D50-01	D	C	Municipal
Landfills (municipal; Class II)	D50	D50-02	D	C	Municipal
Landfills (industrial; type of industrial waste?)	D52	D52-01	D	C	RACM, NonRACM

Table 2

Contaminant Source Inventory and Risk Ranking for Alaska Commercial Store Sources of Bacteria and Viruses

PWSID 270427.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-01	A	Medium	C	
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-01	A	Low	C	The Shop
Wastewater Holding Tank	T22	T22-01	A	Low	C	
Wastewater Holding Tank	T22	T22-02	A	Low	C	
Wastewater Holding Tank	T22	T22-03	A	Low	C	Veterinary Clinic
Abandoned wells	W01	W01-01	A	Medium	C	
Medical/veterinary facilities (doctor or dentist offices, hospitals, nursing homes)	X40	X40-01	A	Medium	C	Veterinary Clinic
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-02	B	Medium	C	
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-03	C	Medium	C	
Domestic wastewater treatment plant disposal ponds/lagoons	D02	D02-01	C	High	C	
Closed leaking fuel storage tank (LUST) (aviation)	U12	U12-01	C	Low	C	Bethel Dump
Landfills (municipal; Class II)	D50	D50-01	D	High	C	Municipal
Landfills (municipal; Class II)	D50	D50-02	D	High	C	Municipal

Table 3

Contaminant Source Inventory and Risk Ranking for Alaska Commercial Store Sources of Nitrates/Nitrites

PWSID 270427.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-01	A	Medium	C	
Wastewater Holding Tank	T22	T22-01	A	Low	C	
Wastewater Holding Tank	T22	T22-02	A	Low	C	
Wastewater Holding Tank	T22	T22-03	A	Low	C	Veterinary Clinic
Abandoned wells	W01	W01-01	A	High	C	
Cemeteries	X01	X01-01	A	Medium	C	
Medical/veterinary facilities (doctor or dentist offices, hospitals, nursing homes)	X40	X40-01	A	Low	C	Veterinary Clinic
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-02	B	Medium	C	
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-03	C	Medium	C	
Domestic wastewater treatment plant disposal ponds/lagoons	D02	D02-01	C	High	C	
Closed leaking fuel storage tank (LUST) (aviation)	U12	U12-01	C	Low	C	Bethel Dump
Landfills (municipal; Class II)	D50	D50-01	D	Very High	C	Municipal
Landfills (municipal; Class II)	D50	D50-02	D	Very High	C	Municipal

Table 4

Contaminant Source Inventory and Risk Ranking for Alaska Commercial Store
Sources of Volatile Organic Chemicals

PWSID 270427.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-01	A	Low	C	
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-01	A	High	C	The Shop
Tanks, diesel (above ground)	T06	T06-01	A	Medium	C	AC Store
Tanks, heating oil, nonresidential (aboveground)	T14	T14-01	A	Low	C	
Tanks, heating oil, nonresidential (aboveground)	T14	T14-02	A	Low	C	
Tanks, heating oil, nonresidential (aboveground)	T14	T14-03	A	Low	C	AC Store
Wastewater Holding Tank	T22	T22-01	A	Medium	C	
Wastewater Holding Tank	T22	T22-02	A	Medium	C	
Wastewater Holding Tank	T22	T22-03	A	Medium	C	Veterinary Clinic
Contaminated sites, DEC recognized, non-Superfun non-RCRA	U04	U04-01	A	High	C	Bethel OMS, ADEC RecKey #1998250103002, Status: Inactive, petroleum contamination in soil near fuel tank and former ASTs.
Contaminated sites, DEC recognized, non-Superfun non-RCRA	U04	U04-02	A	High	C	Kuskokwim Inn, ADEC RecKey #1999250120001, Status: Active, diesel contaminated soils discovered during a 1,000-gallon storage tank removal.
Open Leaking Underground Fuel Storage Tank (LUST) Sites	U07	U07-01	A	High	C	Bethel OMS, ADEC RecKey #1993250002151, Event ID 1341, Facility II 3133, release from a 1,000-gallon gasoline tank.
Abandoned wells	W01	W01-01	A	High	C	
Petroleum product bulk station/terminals	X11	X11-01	A	Very High	C	North Star Gas, Inc.
Pipelines (oil and gas)	X28	X28-01	A	Medium	C	AC Store
Electric power generation (fossil fuels)	X36	X36-01	A	Medium	C	AC Store
Medical/veterinary facilities (doctor or dentist offices, hospitals, nursing homes)	X40	X40-01	A	Low	C	Veterinary Clinic
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-02	B	Low	C	
Firehouses	X38	X38-01	B	Low	C	
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-03	C	Low	C	

Contaminant Source Inventory and Risk Ranking for Alaska Commercial Store

Sources of Volatile Organic Chemicals

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Domestic wastewater treatment plant disposal ponds/lagoons	D02	D02-01	C	Low	C	
Tanks, heating oil, nonresidential (aboveground)	T14	T14-04	C	Low	C	344 Owl Street
Contaminated sites, DEC recognized, non-Superfun non-RCRA	U04	U04-03	C	High	C	344 Owl Street, ADEC RecKey #1992250124701, Status: Closed, diesel contaminated soils due to an undetermined amount of heating oil released f a storage tank.
Contaminated sites, DEC recognized, non-Superfun non-RCRA	U04	U04-04	C	High	C	Owl Street Residence, ADEC RecKey #1992250124701, Status: Closed, die contamianted soils due to an undetermined amount of heating oil released f a storage tank.
Closed leaking fuel storage tank (LUST) (aviation)	U12	U12-01	C	High	C	Bethel Dump
Motor vehicle/general storage yards/facilities	X27	X27-01	C	Low	C	Arctic Moving & Delivery
Landfills (municipal; Class II)	D50	D50-01	D	High	C	Municipal
Landfills (municipal; Class II)	D50	D50-02	D	High	C	Municipal

Table 5

Contaminant Source Inventory and Risk Ranking for Alaska Commercial Store

Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals

PWSID 270427.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-01	A	Low	C	
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-01	A	High	C	The Shop
Tanks, heating oil, nonresidential (aboveground)	T14	T14-01	A	Low	C	
Tanks, heating oil, nonresidential (aboveground)	T14	T14-02	A	Low	C	
Tanks, heating oil, nonresidential (aboveground)	T14	T14-03	A	Low	C	AC Store
Wastewater Holding Tank	T22	T22-01	A	Medium	C	
Wastewater Holding Tank	T22	T22-02	A	Medium	C	
Wastewater Holding Tank	T22	T22-03	A	Medium	C	Veterinary Clinic
Contaminated sites, DEC recognized, non-Superfun non-RCRA	U04	U04-01	A	Low	C	Bethel OMS, ADEC RecKey #1998250103002, Status: Inactive, petroleum contamination in soil near fuel tank and former ASTs.
Contaminated sites, DEC recognized, non-Superfun non-RCRA	U04	U04-02	A	Low	C	Kuskokwim Inn, ADEC RecKey #1999250120001, Status: Active, diesel contaminated soils discovered during a 1,000-gallon storage tank removal.
Abandoned wells	W01	W01-01	A	Very High	C	
Cemeteries	X01	X01-01	A	Low	C	
Glycol (disposal or storage)	X07	X07-01	A	Low	C	
Glycol (disposal or storage)	X07	X07-02	A	Low	C	AC Store
Petroleum product bulk station/terminals	X11	X11-01	A	Low	C	North Star Gas, Inc.
Pipelines (oil and gas)	X28	X28-01	A	Low	C	AC Store
Electric power generation (fossil fuels)	X36	X36-01	A	Medium	C	AC Store
Medical/veterinary facilities (doctor or dentist offices, hospitals, nursing homes)	X40	X40-01	A	Low	C	Veterinary Clinic
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-02	B	Low	C	
Firehouses	X38	X38-01	B	Low	C	
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-03	C	Low	C	

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Map Number	Comments
Domestic wastewater treatment plant disposal ponds/lagoons	D02	D02-01	C	Low	C	
Tanks, heating oil, nonresidential (aboveground)	T14	T14-04	C	Low	C	344 Owl Street
Contaminated sites, DEC recognized, non-Superfun non-RCRA	U04	U04-03	C	Low	C	344 Owl Street, ADEC RecKey #1992250124701, Status: Closed, diesel contaminated soils due to an undetermined amount of heating oil released f a storage tank.
Contaminated sites, DEC recognized, non-Superfun non-RCRA	U04	U04-04	C	Low	C	Owl Street Residence, ADEC RecKey #1992250124701, Status: Closed, die contamianted soils due to an undetermined amount of heating oil released f a storage tank.
Closed leaking fuel storage tank (LUST) (aviation)	U12	U12-01	C	Very High	C	Bethel Dump
Landfills (municipal; Class II)	D50	D50-01	D	High	C	Municipal
Landfills (municipal; Class II)	D50	D50-02	D	High	C	Municipal

Table 6

Contaminant Source Inventory and Risk Ranking for Alaska Commercial Store
Sources of Synthetic Organic Chemicals

PWSID 270427.001

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Map Number	Comments
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-01	A	Low	C	
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-01	A	Low	C	The Shop
Contaminated sites, DEC recognized, non-Superfun non-RCRA	U04	U04-01	A	Low	C	Bethel OMS, ADEC RecKey #1998250103002, Status: Inactive, petroleum contamination in soil near fuel tank and former ASTs.
Contaminated sites, DEC recognized, non-Superfun non-RCRA	U04	U04-02	A	Low	C	Kuskokwim Inn, ADEC RecKey #1999250120001, Status: Active, diesel contaminated soils discovered during a 1,000-gallon storage tank removal.
Open Leaking Underground Fuel Storage Tank (LUST) Sites	U07	U07-01	A	Low	C	Bethel OMS, ADEC RecKey #1993250002151, Event ID 1341, Facility II 3133, release from a 1,000-gallon gasoline tank.
Abandoned wells	W01	W01-01	A	High	C	
Cemeteries	X01	X01-01	A	Medium	C	
Petroleum product bulk station/terminals	X11	X11-01	A	Low	C	North Star Gas, Inc.
Medical/veterinary facilities (doctor or dentist offices, hospitals, nursing homes)	X40	X40-01	A	Low	C	Veterinary Clinic
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-02	B	Low	C	
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-03	C	Low	C	
Domestic wastewater treatment plant disposal ponds/lagoons	D02	D02-01	C	Low	C	
Contaminated sites, DEC recognized, non-Superfun non-RCRA	U04	U04-03	C	Low	C	344 Owl Street, ADEC RecKey #1992250124701, Status: Closed, diesel contaminated soils due to an undetermined amount of heating oil released f a storage tank.
Contaminated sites, DEC recognized, non-Superfun non-RCRA	U04	U04-04	C	Low	C	Owl Street Residence, ADEC RecKey #1992250124701, Status: Closed, die contamianted soils due to an undetermined amount of heating oil released f a storage tank.
Closed leaking fuel storage tank (LUST) (aviation)	U12	U12-01	C	Low	C	Bethel Dump
Landfills (municipal; Class II)	D50	D50-01	D	Very High	C	Municipal
Landfills (municipal; Class II)	D50	D50-02	D	Very High	C	Municipal

Table 7

Contaminant Source Inventory and Risk Ranking for Alaska Commercial Store
Sources of Other Organic Chemicals

PWSID 270427.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-01	A	Low	C	
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-01	A	Medium	C	The Shop
Wastewater Holding Tank	T22	T22-01	A	Medium	C	
Wastewater Holding Tank	T22	T22-02	A	Medium	C	
Wastewater Holding Tank	T22	T22-03	A	Medium	C	Veterinary Clinic
Contaminated sites, DEC recognized, non-Superfun non-RCRA	U04	U04-01	A	Low	C	Bethel OMS, ADEC RecKey #1998250103002, Status: Inactive, petroleum contamination in soil near fuel tank and former ASTs.
Contaminated sites, DEC recognized, non-Superfun non-RCRA	U04	U04-02	A	Low	C	Kuskokwim Inn, ADEC RecKey #1999250120001, Status: Active, diesel contaminated soils discovered during a 1,000-gallon storage tank removal.
Open Leaking Underground Fuel Storage Tank (LUST) Sites	U07	U07-01	A	Low	C	Bethel OMS, ADEC RecKey #1993250002151, Event ID 1341, Facility II 3133, release from a 1,000-gallon gasoline tank.
Abandoned wells	W01	W01-01	A	High	C	
Petroleum product bulk station/terminals	X11	X11-01	A	High	C	North Star Gas, Inc.
Pipelines (oil and gas)	X28	X28-01	A	High	C	AC Store
Electric power generation (fossil fuels)	X36	X36-01	A	High	C	AC Store
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-02	B	Low	C	
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-03	C	Low	C	
Domestic wastewater treatment plant disposal ponds/lagoons	D02	D02-01	C	Low	C	
Contaminated sites, DEC recognized, non-Superfun non-RCRA	U04	U04-03	C	Low	C	344 Owl Street, ADEC RecKey #1992250124701, Status: Closed, diesel contaminated soils due to an undetermined amount of heating oil released f a storage tank.
Contaminated sites, DEC recognized, non-Superfun non-RCRA	U04	U04-04	C	Low	C	Owl Street Residence, ADEC RecKey #1992250124701, Status: Closed, die contamianted soils due to an undetermined amount of heating oil released f a storage tank.
Closed leaking fuel storage tank (LUST) (aviation)	U12	U12-01	C	Low	C	Bethel Dump

Sources of Other Organic Chemicals

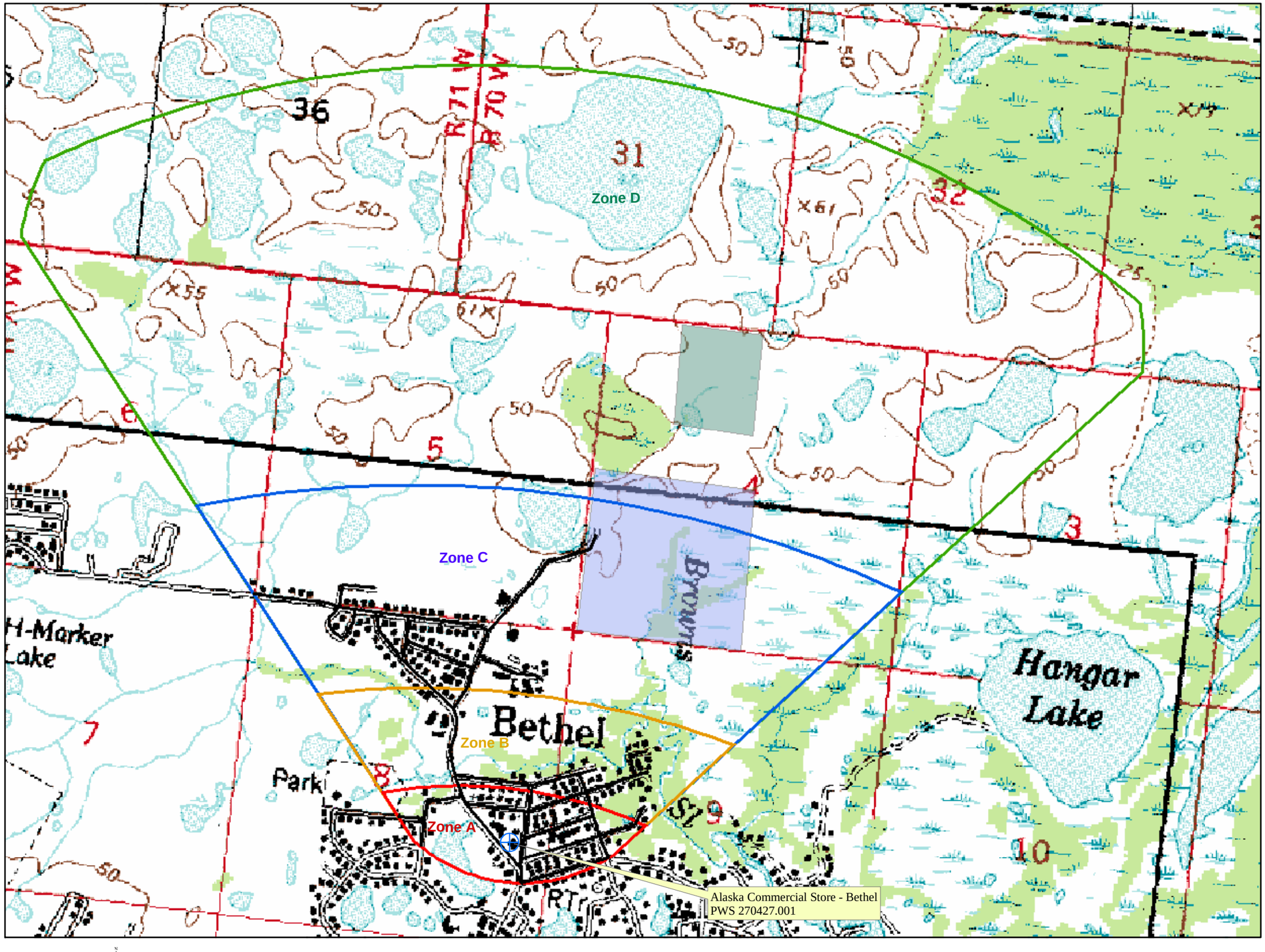
Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Motor vehicle/general storage yards/facilities	X27	X27-01	C	Low	C	Arctic Moving & Delivery
Landfills (municipal; Class II)	D50	D50-01	D	Very High	C	Municipal
Landfills (municipal; Class II)	D50	D50-02	D	Very High	C	Municipal
Landfills (industrial; type of industrial waste?)	D52	D52-01	D	Very High	C	RACM, NonRACM

APPENDIX C

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

Public Water Well System for PWS #270427.001 Alaska Commercial Store - Bethel

Showing Potential and Existing Sources of Contamination



0 0.15 0.3 0.6 0.9 1.2 Miles

LEGEND

Public Water System Well

Groundwater Protection Zones

- Zone A Protection Area– Several Months Travel Time
- Zone B Protection Area– 2 Years Travel Time
- Zone C Protection Area– 5 Years Travel Time
- Zone D Protection Area– 10 Years Travel Time or Watershed Boundary

Hydrography/Physical

- Parcels
- Stream
- Lake or Pond
- Contours

Transportation

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

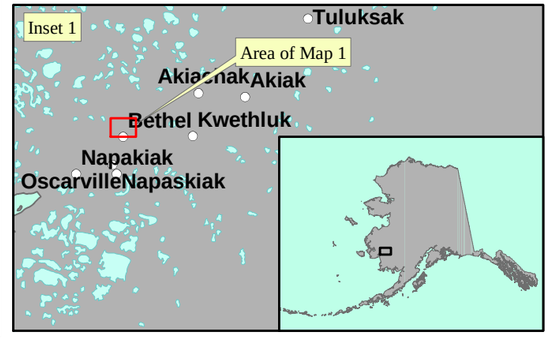
Existing or Potential Contaminant Sources

- Landfill, Municipal, Class II (D50)
- Landfill, Industrial (D52)

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 "Alaska Drinking Water Protection Program - Guidance Manual for Class A Public Water Systems" published by ADEC

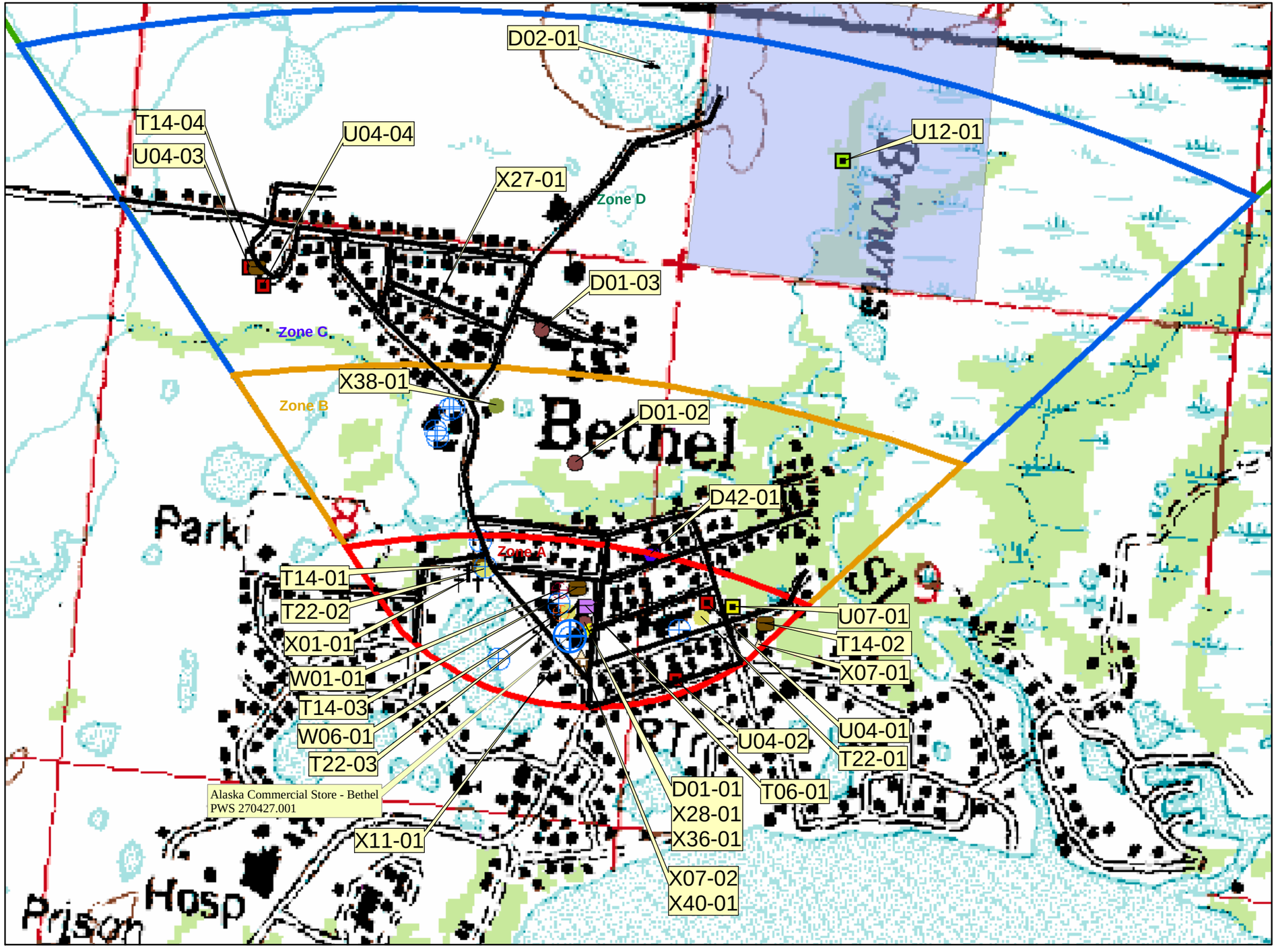
URS Corporation does not guarantee the accuracy or validity of the data provided.



Alaska Commercial Store - Bethel
PWS 270427.001
Appendix C Map C1 of 2

Public Water Well System for PWS #270427.001 Alaska Commercial Store - Bethel

Showing Potential and Existing Sources of Contamination



LEGEND

- Public Water System Well

Groundwater Protection Zones

- Zone A Protection Area– Several Months Travel Time
- Zone B Protection Area– 2 Years Travel Time
- Zone C Protection Area– 5 Years Travel Time
- Zone D Protection Area– 10 Years Travel Time or Watershed Boundary

Hydrography/Physical

- Parcels
- Stream
- Lake or Pond
- Contours

Transportation

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

Existing or Potential Contaminant Sources

- Domestic wastewater collection systems (sewer lines or lift stations) (D01)
- Domestic wastewater treatment plant disposal ponds/lagoons (D02)
- Injection wells (Class V) Industrial Process Water and Water Disposal Wells (D40)
- Injection wells (Class V) Motor Vehicle Waste Disposal Wells (D42)
- Tanks, diesel (above ground) (T06)
- Tanks, heating oil, non-residential, aboveground (T14)
- Wastewater Holding Tank (T22)
- Contaminated sites, DEC recognized, non-Superfund, non-RCRA (U04)
- Open Leaking Underground Fuel Storage Tank (LUST) (lubricants or other petroluem products) (U07)
- Closed Leaking Underground Fuel Storage Tank (LUST) (aviation) (U12)
- Abondoned wells (W01)
- Monitoring wells (W06)
- Cemetery (X01)
- Glycol (X07)
- Motor vehicle/general storage yards/facilities (X27)
- Pipelines (X28)
- Electric power generation (fossil fuels) (X36)
- Firehouses (X38)
- Medical/veterinary facilities (X40)
- Landfill, Municipal, Class II (D50)

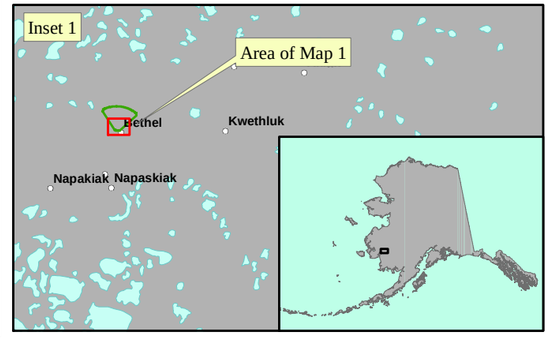
Data Sources:

- 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 "Alaska Drinking Water Protection Program - Guidance Manual for Class A Public Water Systems" published by ADEC

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



Alaska Commercial Store - Bethel
PWS 270427.001
Appendix C Map C2 of 2

APPENDIX D

Vulnerability Analysis for Public Drinking Water Source (Charts 1-14)

Chart 1. Susceptibility of the wellhead - Alaska Commercial Store (PWS No. 270427.001)

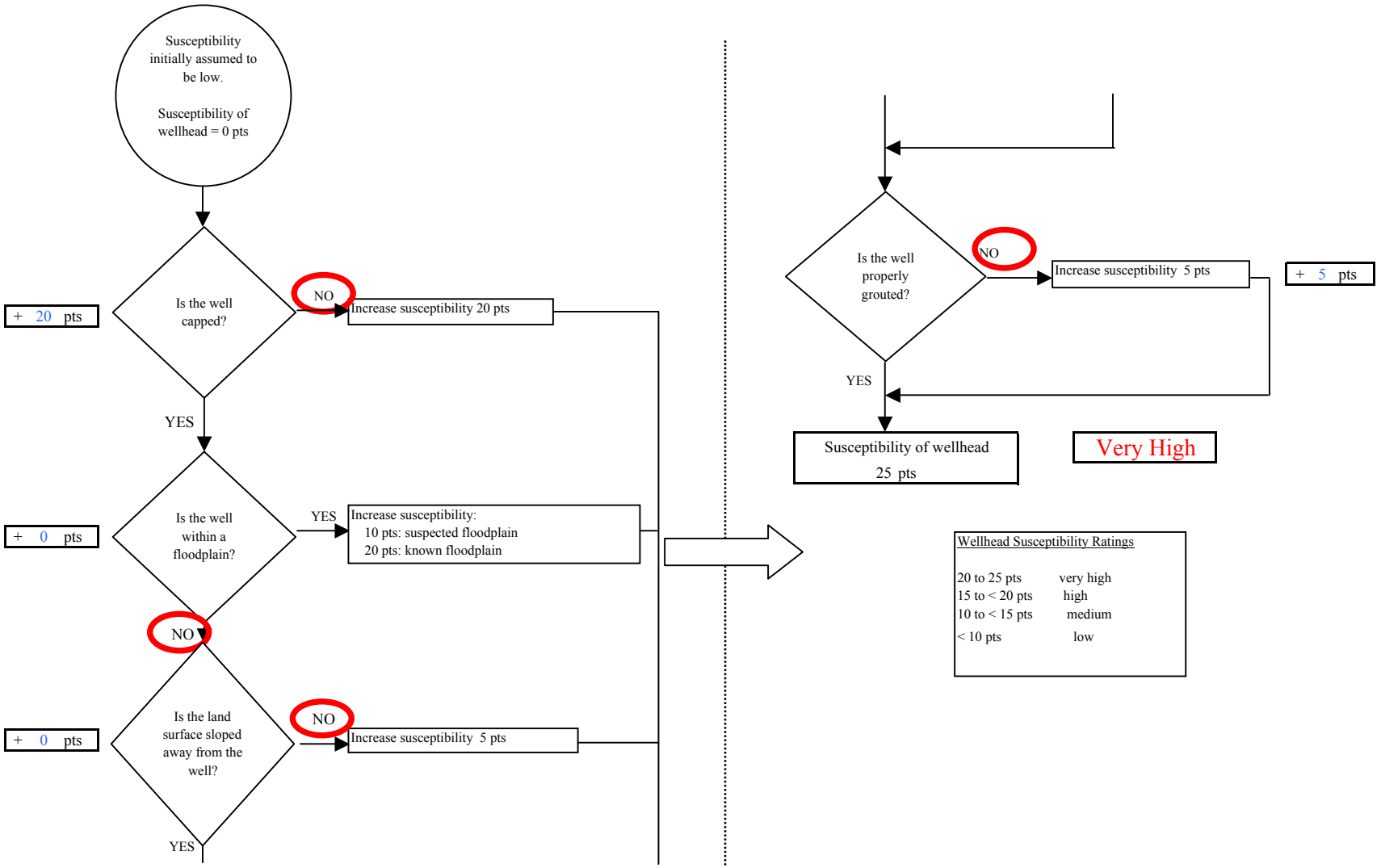


Chart 2. Susceptibility of the aquifer Alaska Commercial Store (PWS No. 270427.001)

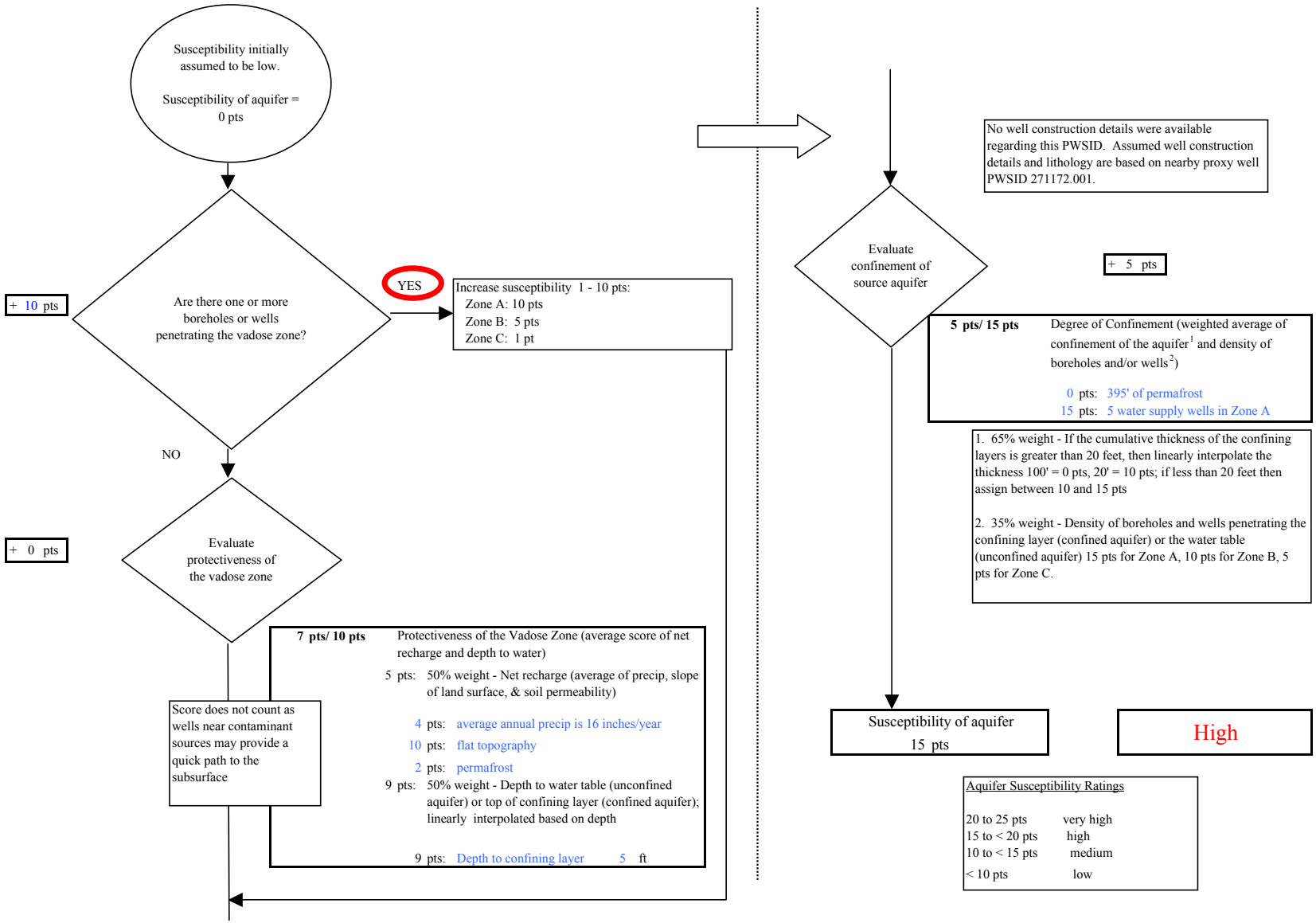
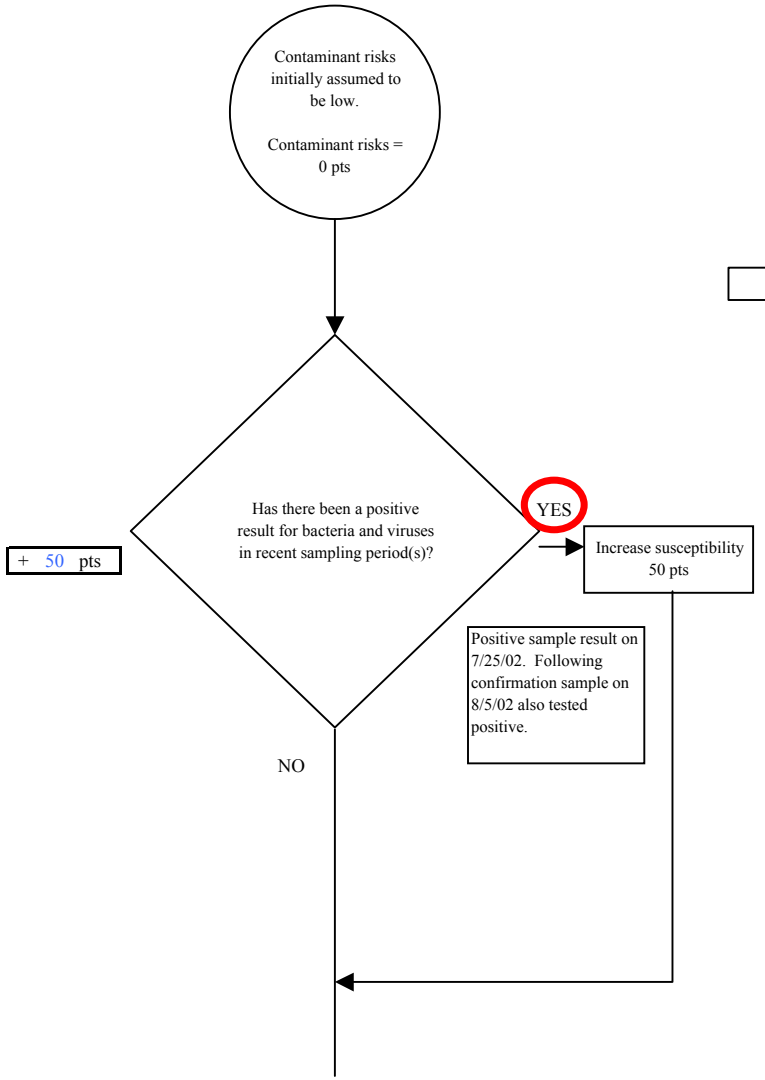
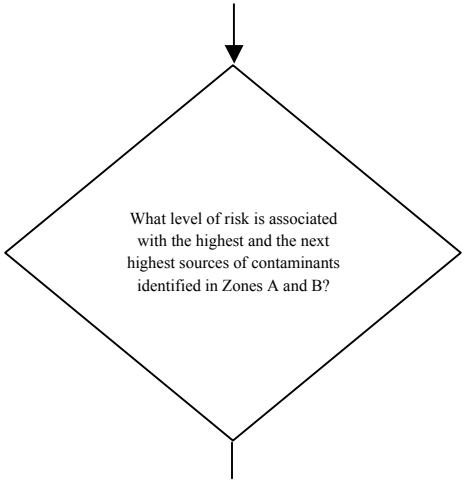


Chart 3. Contaminant risks for Alaska Commercial Store (PWS No. 270427.001) - Bacteria & Viruses





+ 40 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)	3	3	6
Medium(s)	3	0	3
Low(s)	4	1	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 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 3. Contaminant risks for Alaska Commercial Store (PWS No. 270427.001) - Bacteria & Viruses

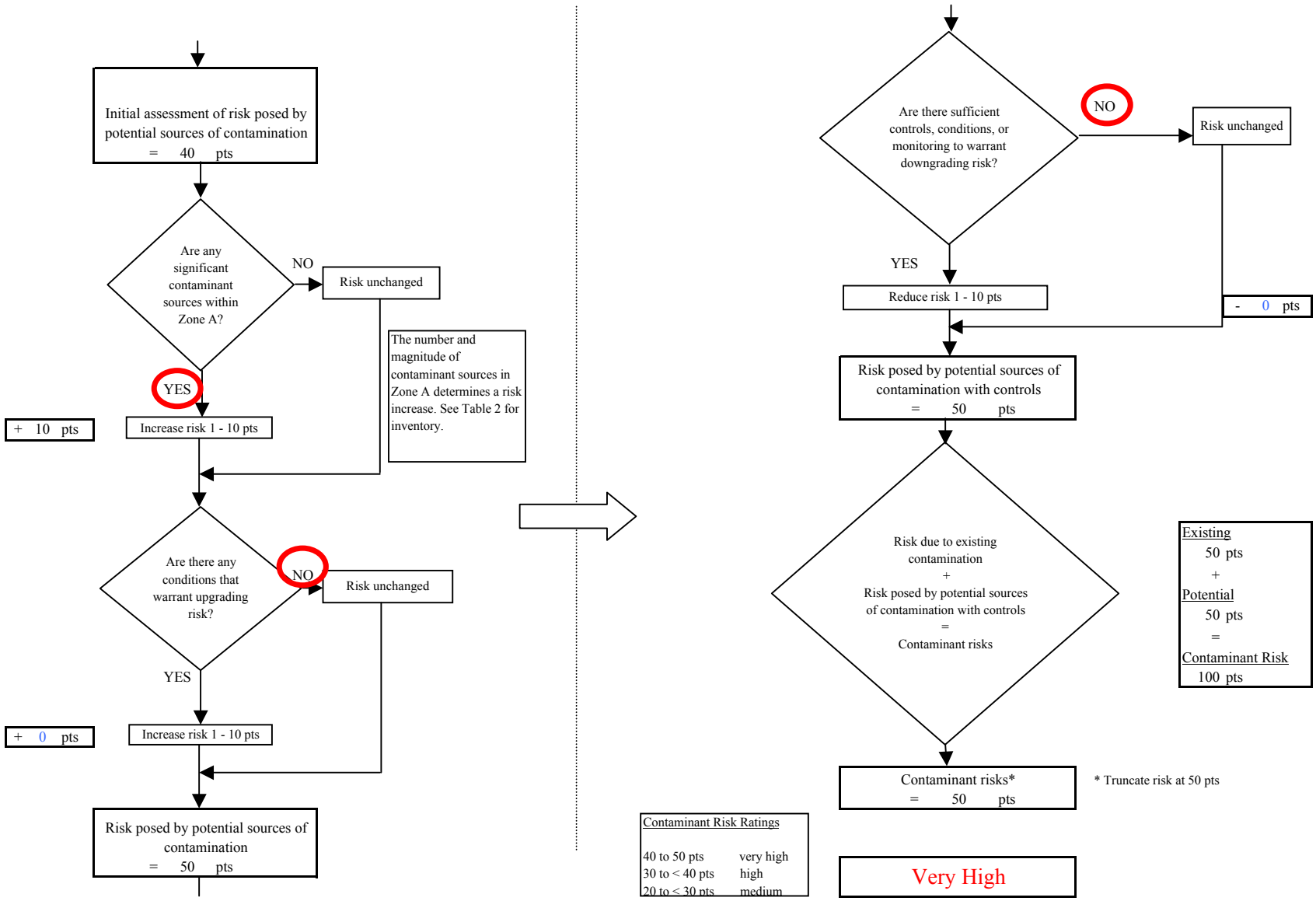


Chart 4. Vulnerability analysis for Alaska Commercial Store (PWS No. 270427.001) - Bacteria & Viruses

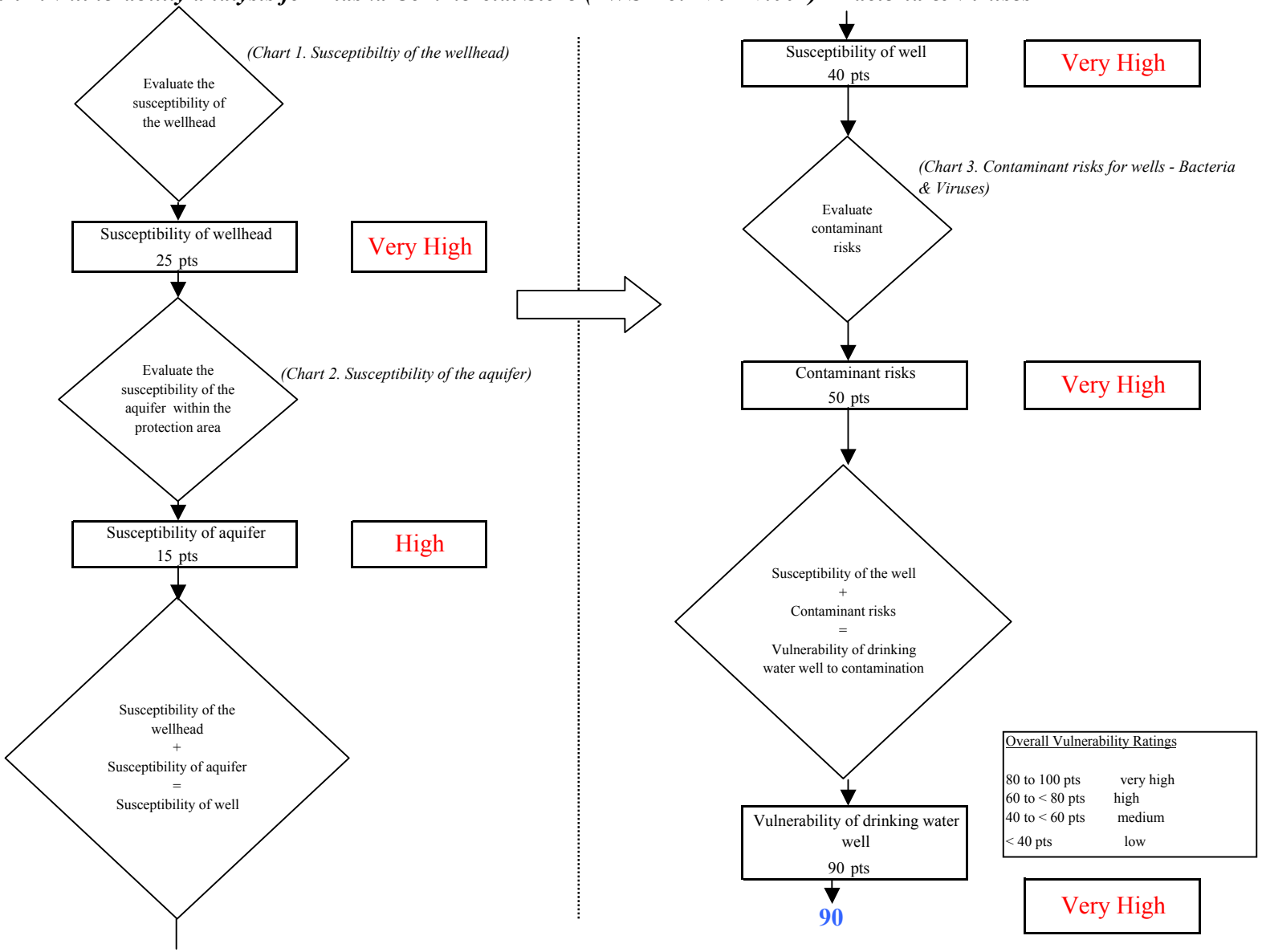


Chart 5. Contaminant risks for Alaska Commercial Store (PWS No. 270427.001) - Nitrates and Nitrites

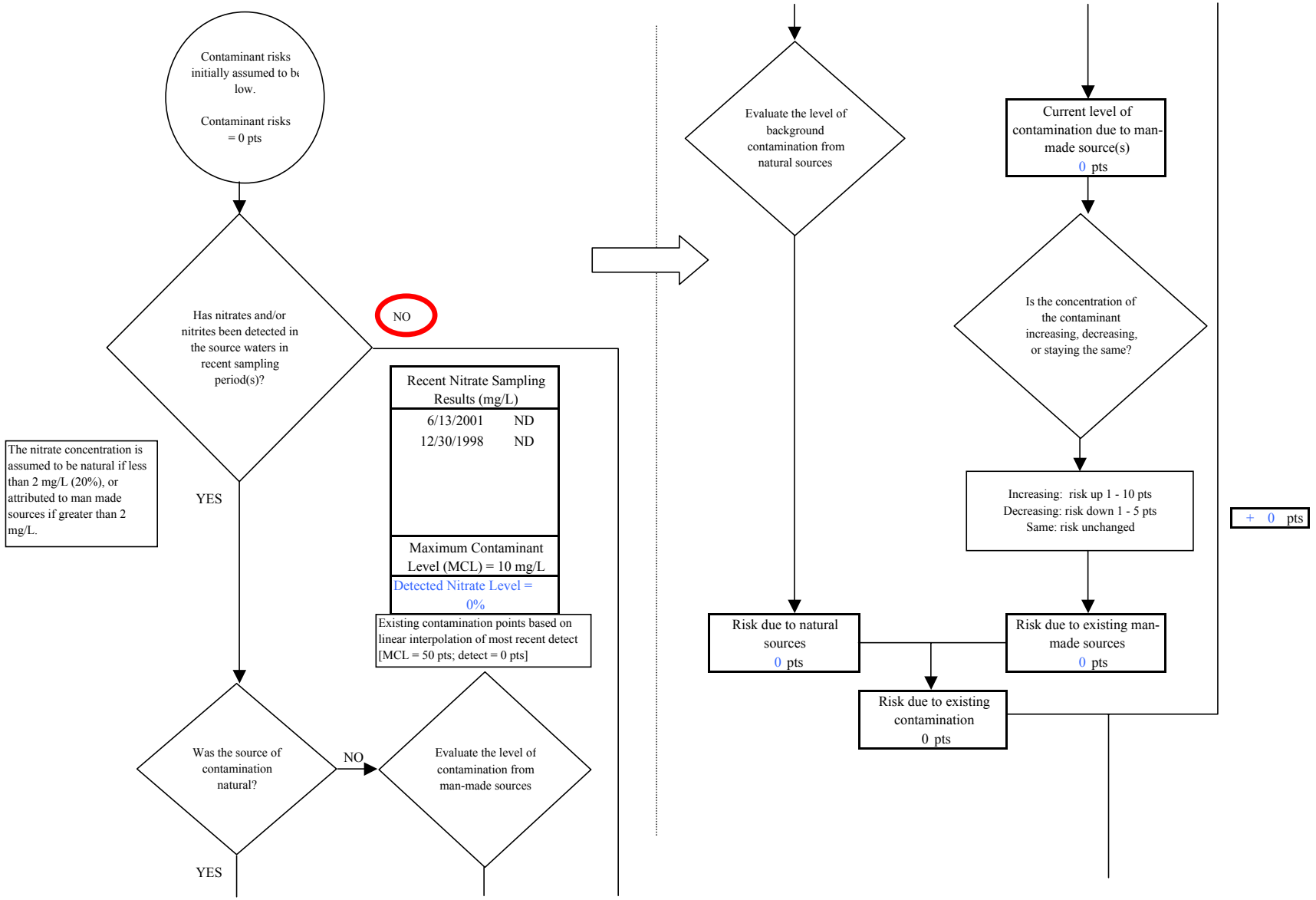
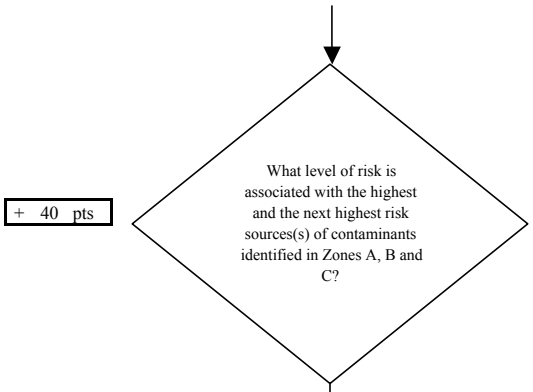


Chart 5. Contaminant risks for Alaska Commercial Store (PWS No. 270427.001) - Nitrates and Nitrites



+ 40 pts

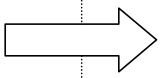
Risk Levels for Contaminant Sources identified in Zones A, B and C

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	4	1	5
Medium(s)	2	0	2
Low(s)	4	2	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 40

Note: Septic systems, sewerlines, and roads are each assigned a risk ranking for each individua 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.



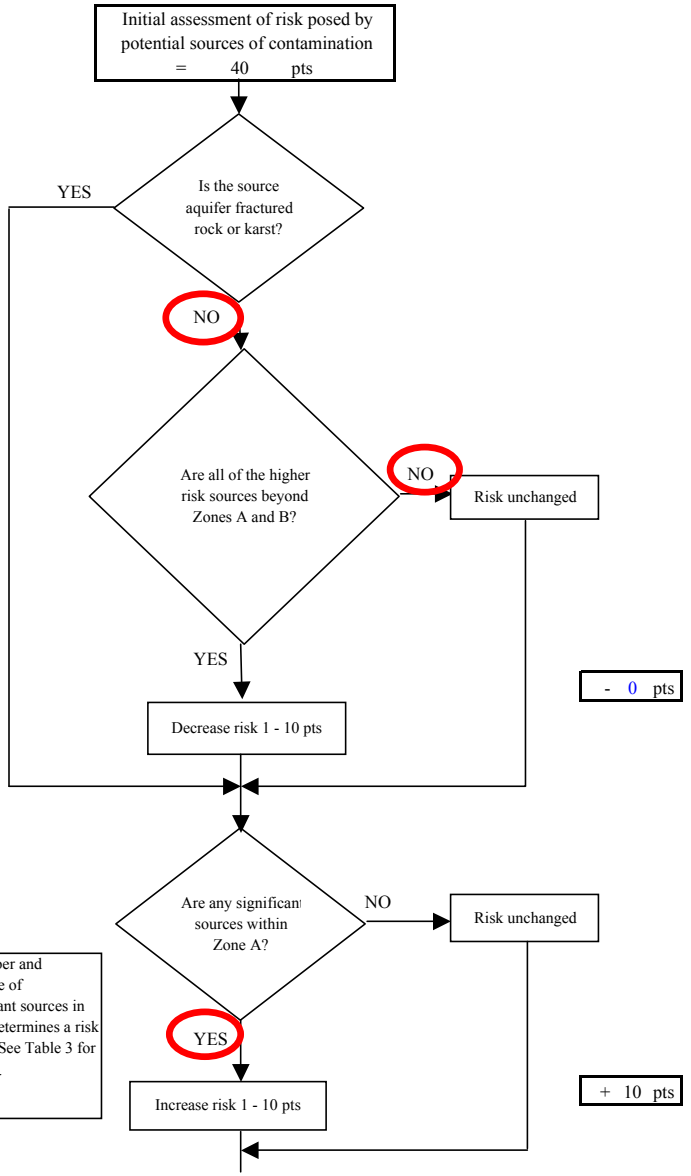


Chart 5. Contaminant risks for Alaska Commercial Store (PWS No. 270427.001) - Nitrates and Nitrites

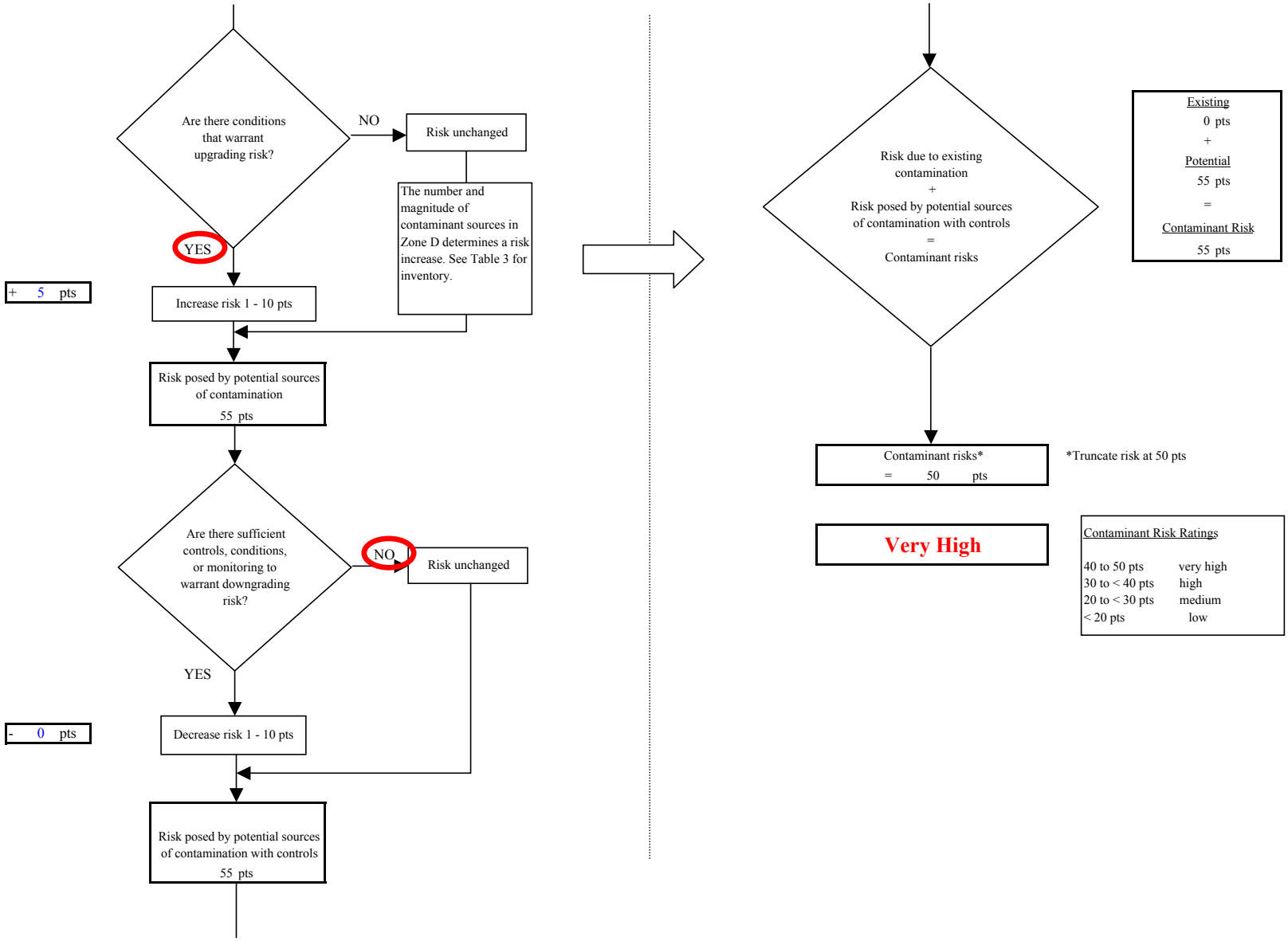


Chart 6. Vulnerability analysis for Alaska Commercial Store (PWS No. 270427.001) - Nitrates and Nitrites

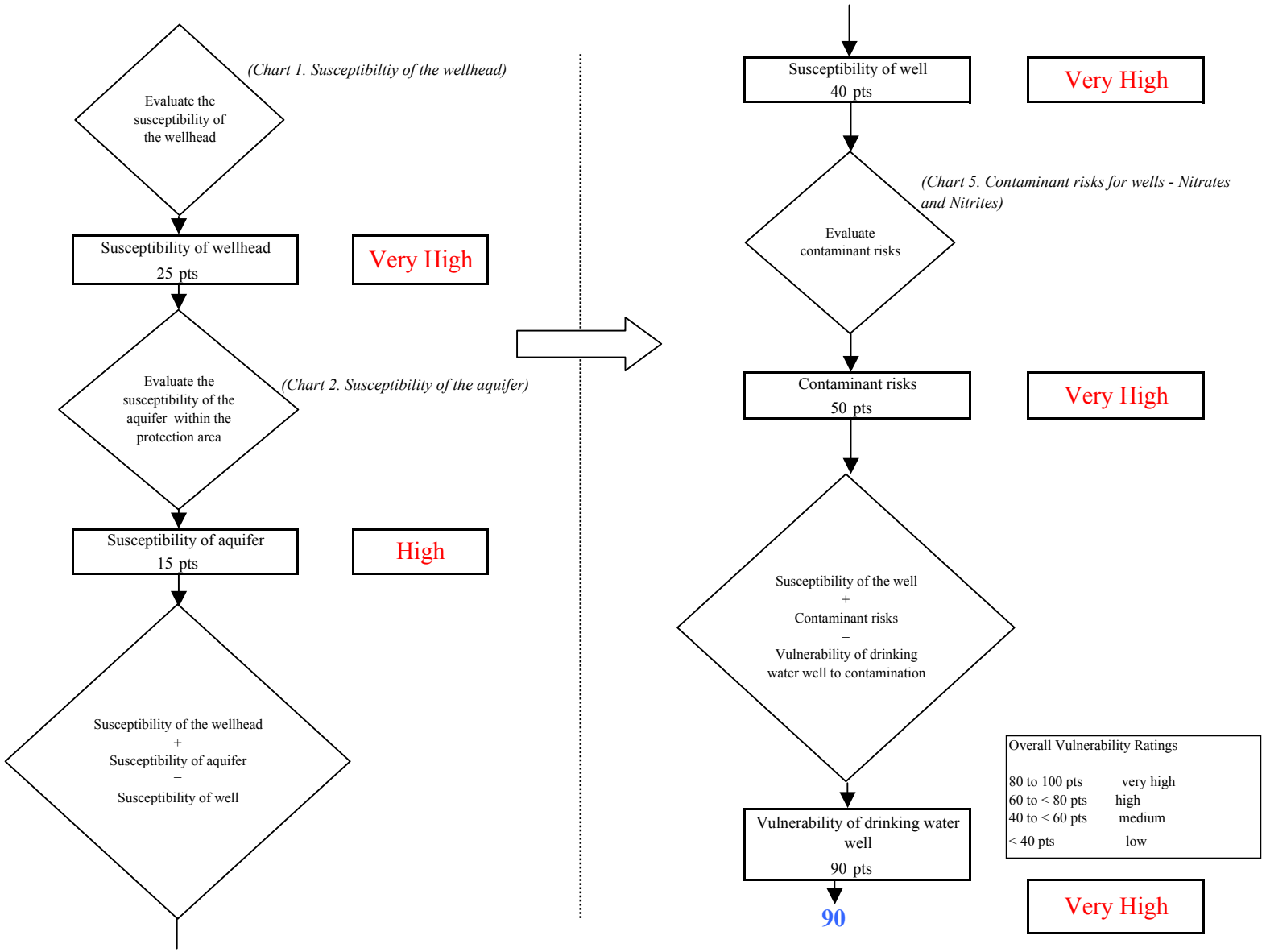


Chart 7. Contaminant risks for Alaska Commercial Store (PWS No. 270427.001) - Volatile Organic Chemicals

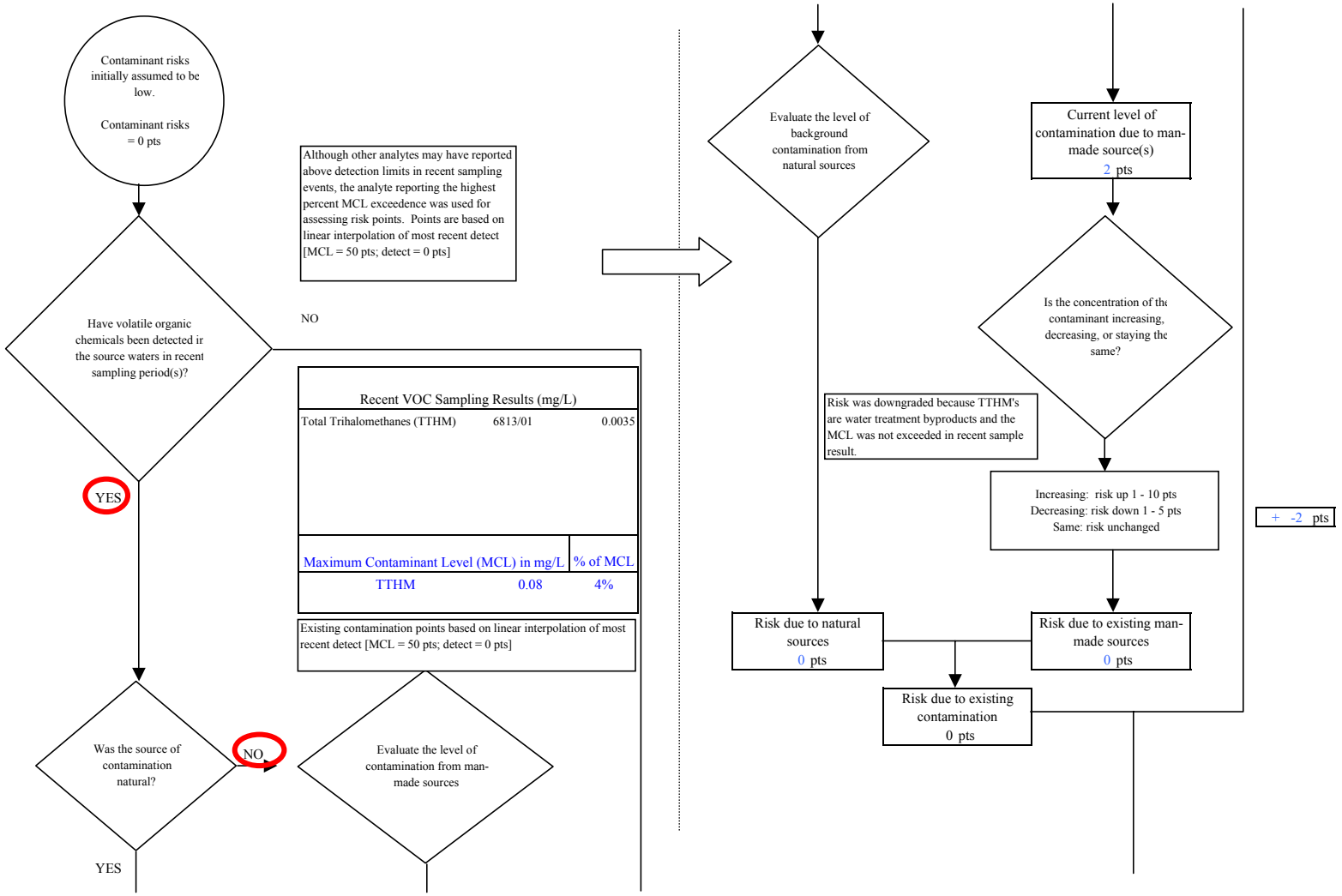
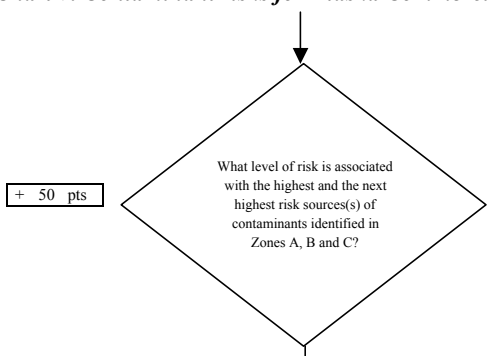


Chart 7. Contaminant risks for Alaska Commercial Store (PWS No. 270427.001) - Volatile Organic Chemicals



+ 50 pts

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

	Zone A	Zones B&C	Total
Very Highs(s)	1	0	1
High(s)	5	3	8
Medium(s)	6	0	6
Low(s)	5	5	10

	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 50

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

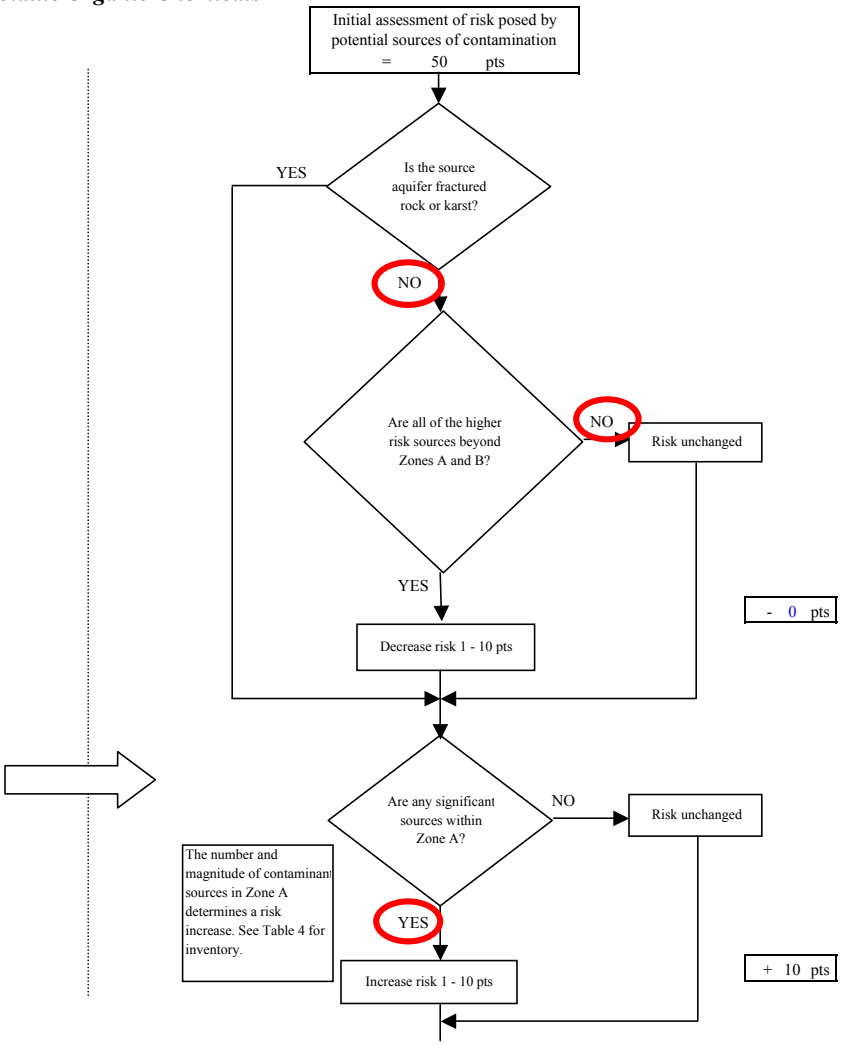


Chart 7. Contaminant risks for Alaska Commercial Store (PWS No. 270427.001) - Volatile Organic Chemicals

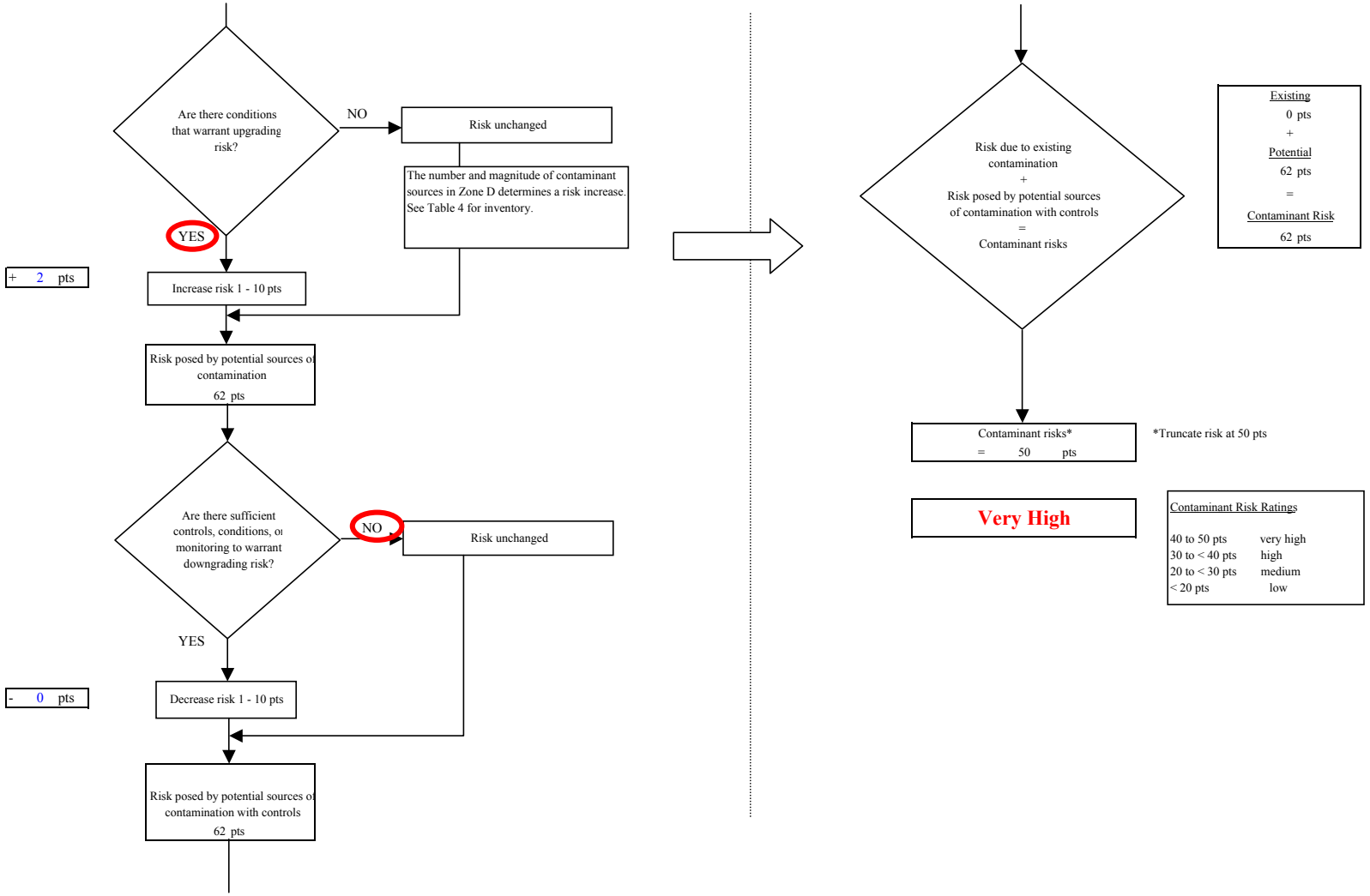


Chart 8. Vulnerability analysis for Alaska Commercial Store (PWS No. 270427.001) - Volatile Organic Chemicals

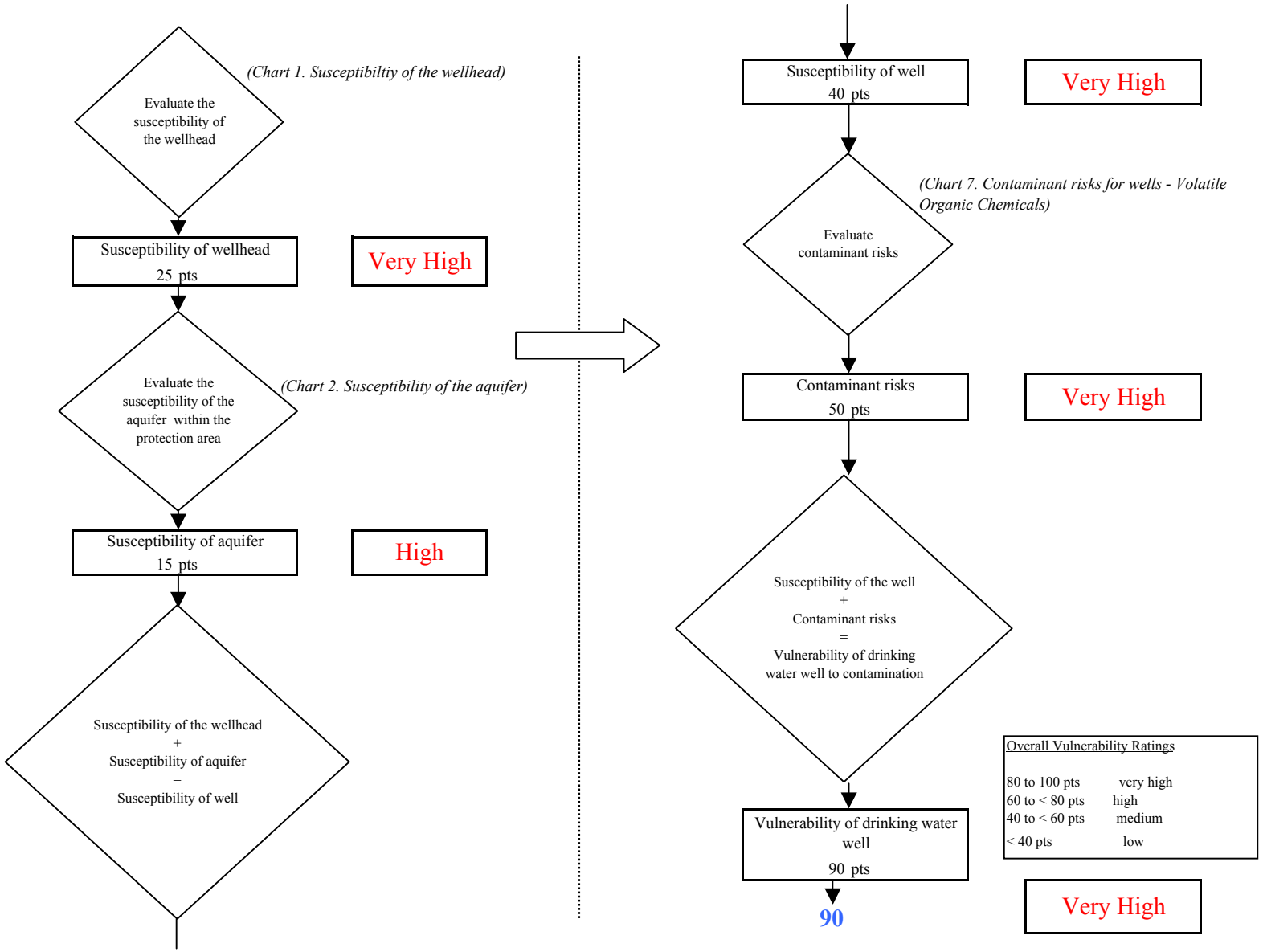


Chart 9. Contaminant risks for Alaska Commercial Store (PWS No. 270427.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

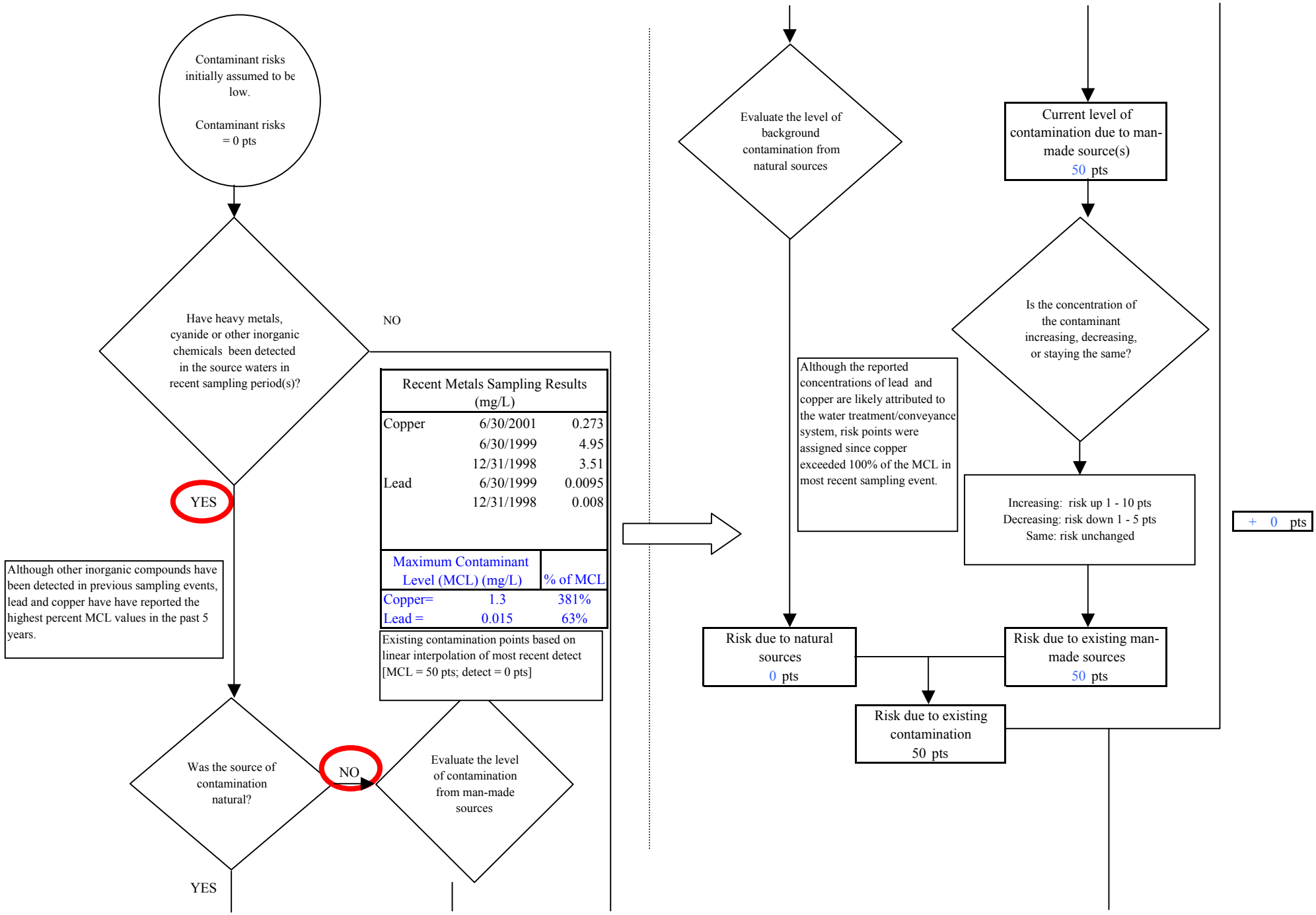


Chart 9. Contaminant risks for Alaska Commercial Store (PWS No. 270427.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

+ 50 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)	1	1	2
High(s)	1	0	1
Medium(s)	4	0	4
Low(s)	12	6	18

	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 50

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 = 50 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

The number and magnitude of contaminant sources in Zone A determines a risk increase. See Table 5 for inventory.

YES

Increase risk 1 - 10 pts

+ 10 pts

Chart 9. Contaminant risks for Alaska Commercial Store (PWS No. 270427.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

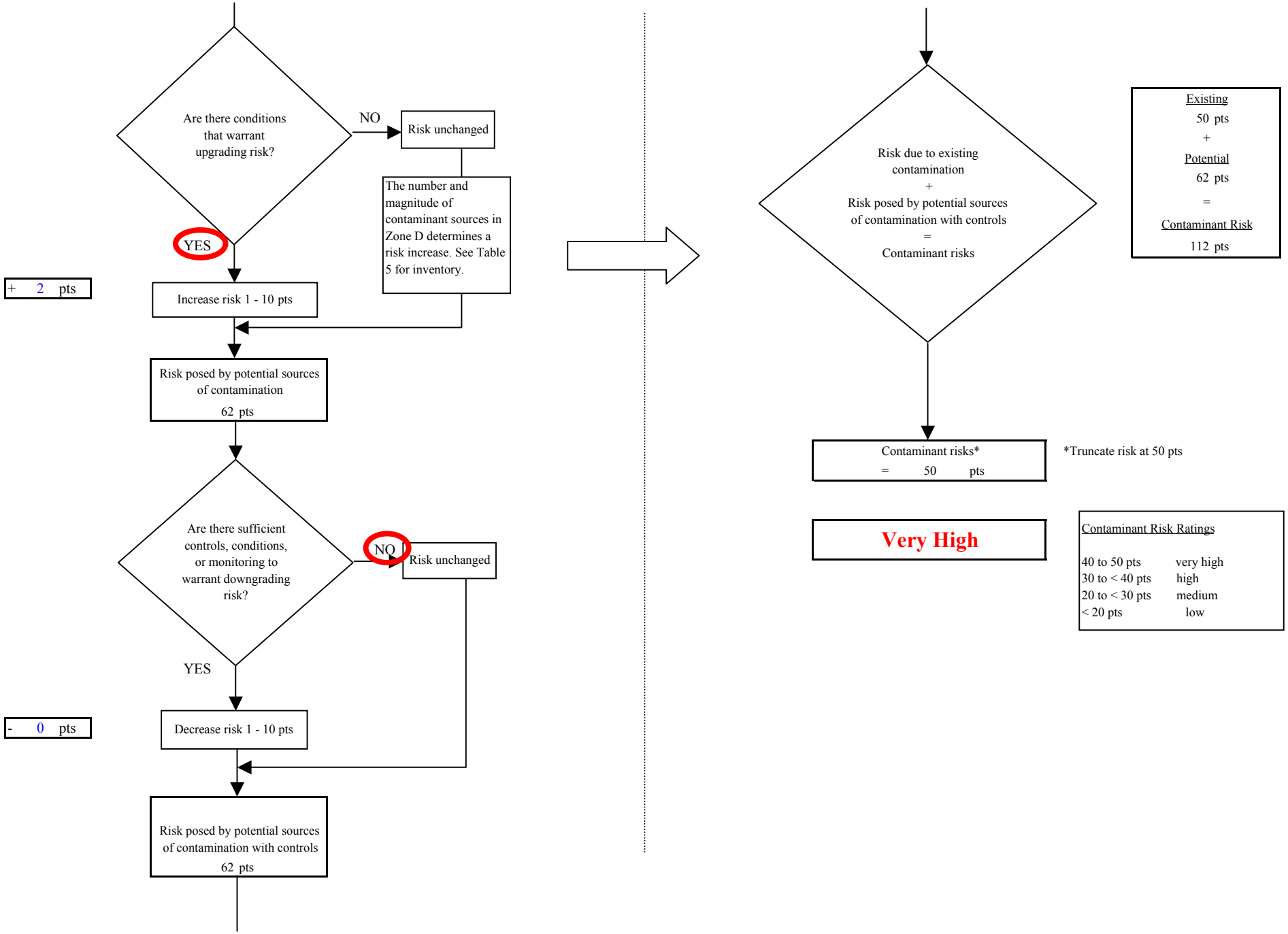


Chart 10. Vulnerability analysis for Alaska Commercial Store (PWS No. 270427.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

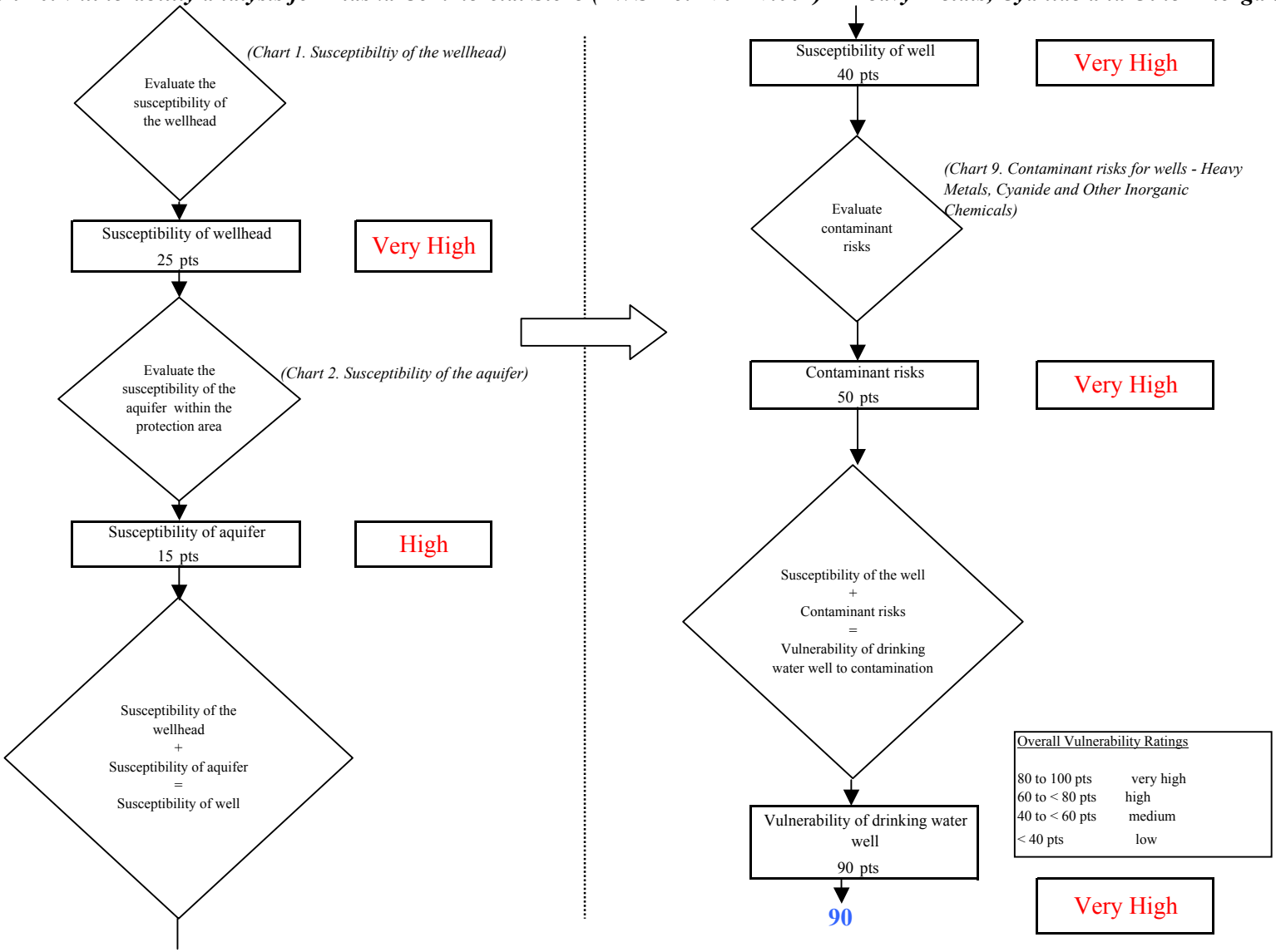


Chart 11. Contaminant risks for Alaska Commercial Store (PWS No. 270427.001) - Synthetic Organic Chemicals

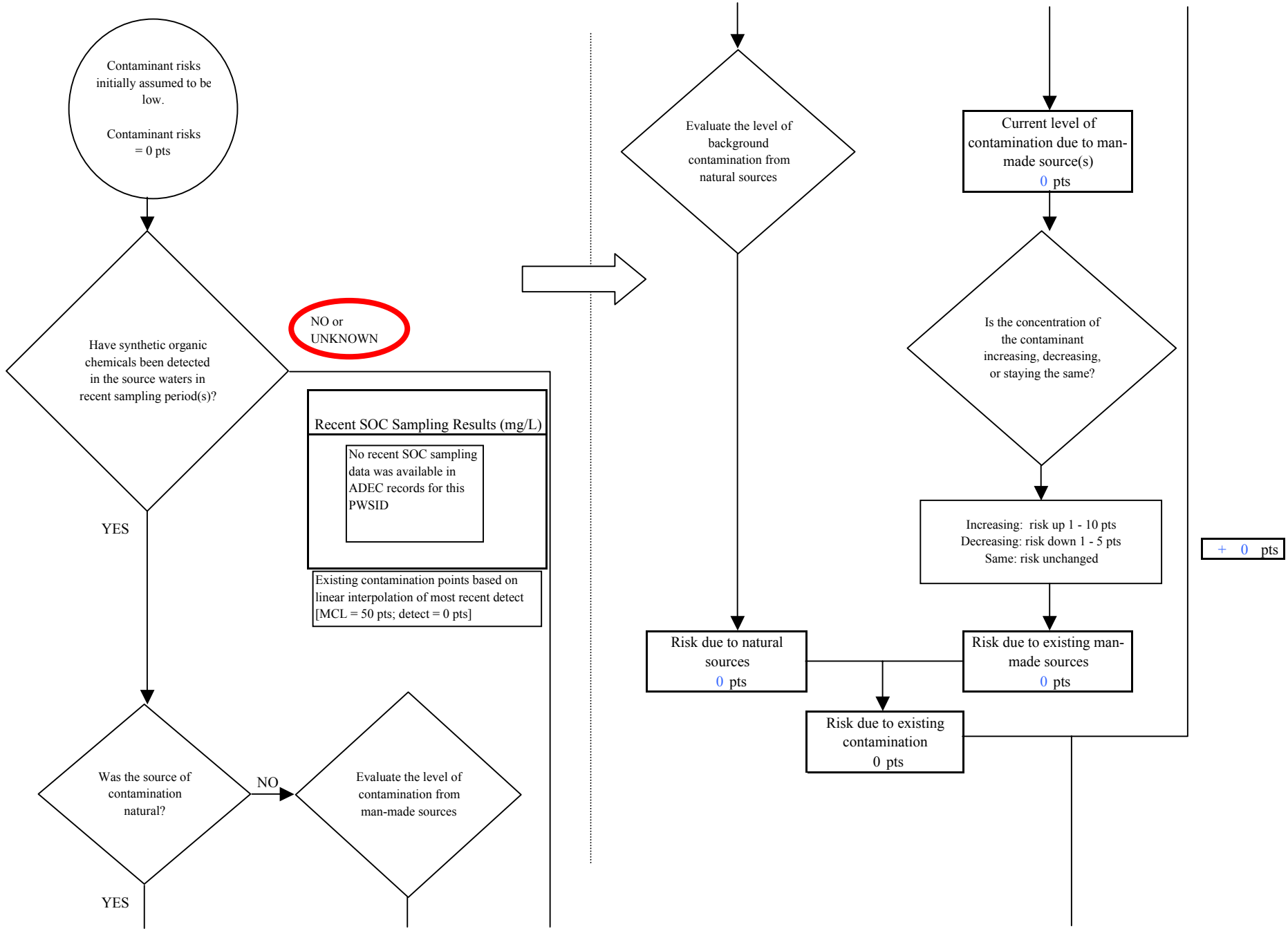
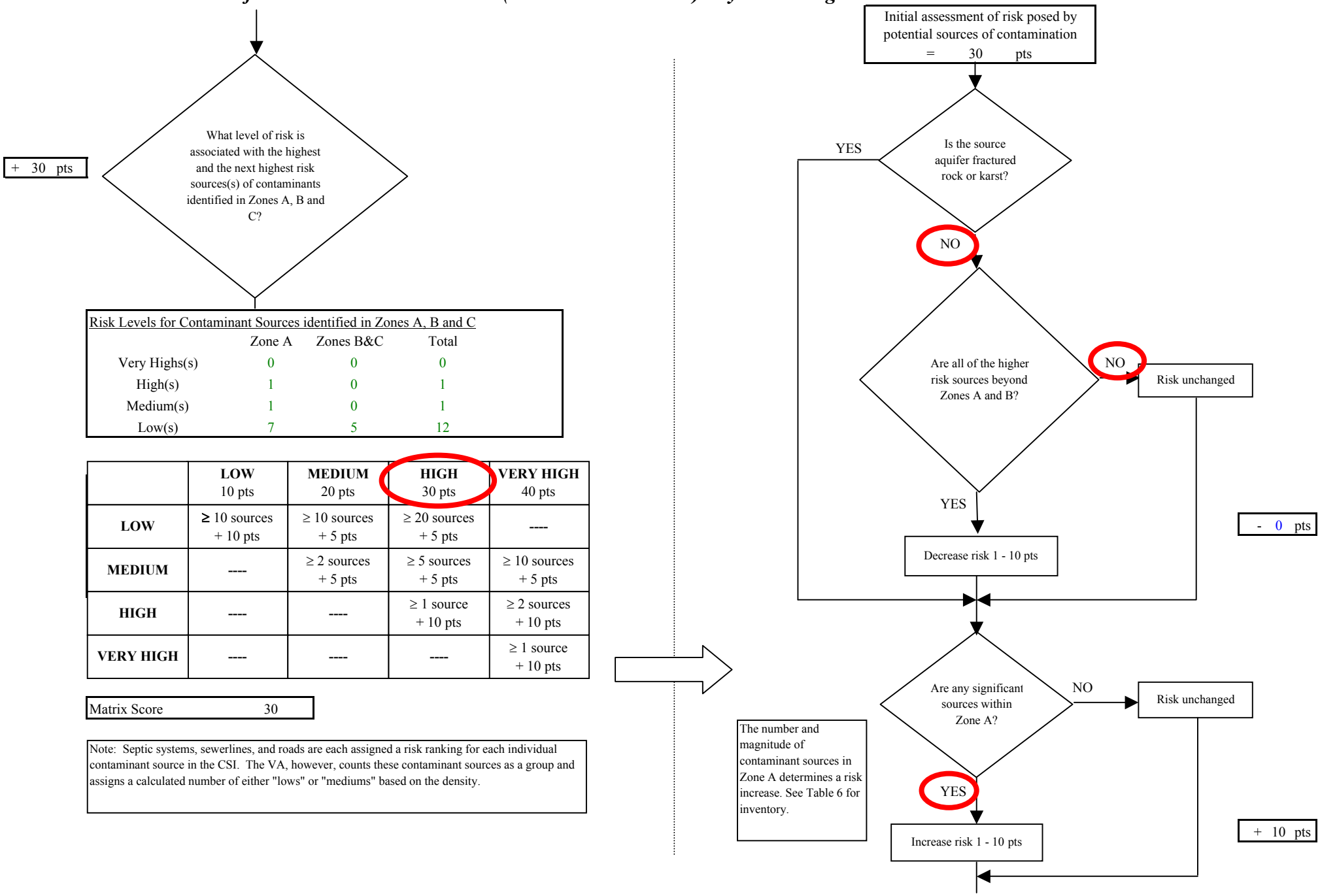


Chart 11. Contaminant risks for Alaska Commercial Store (PWS No. 270427.001) - Synthetic Organic Chemicals



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

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	1	0	1
Medium(s)	1	0	1
Low(s)	7	5	12

	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 11. Contaminant risks for Alaska Commercial Store (PWS No. 270427.001) - Synthetic Organic Chemicals

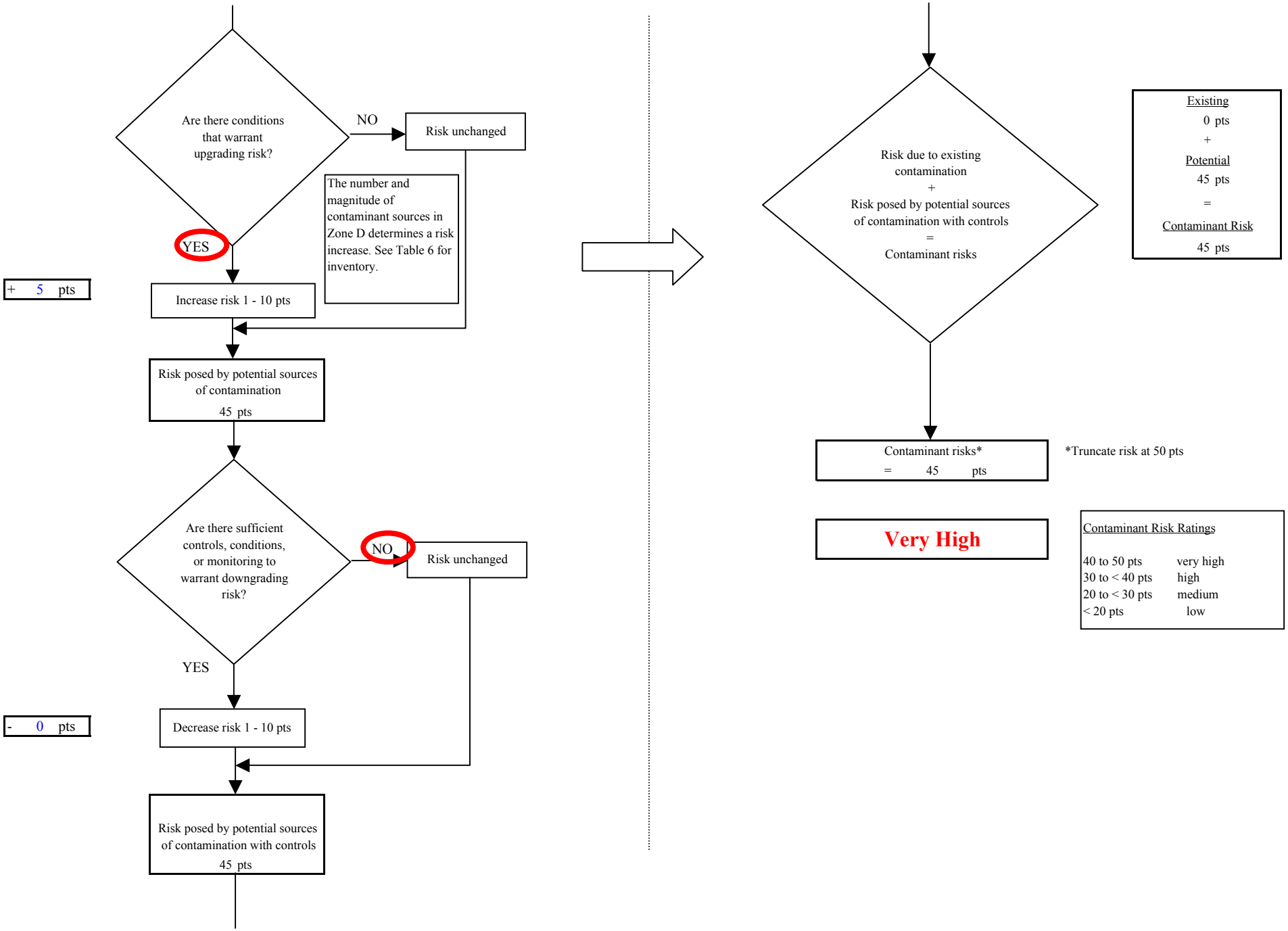


Chart 12. Vulnerability analysis for Alaska Commercial Store (PWS No. 270427.001) - Synthetic Organic Chemicals

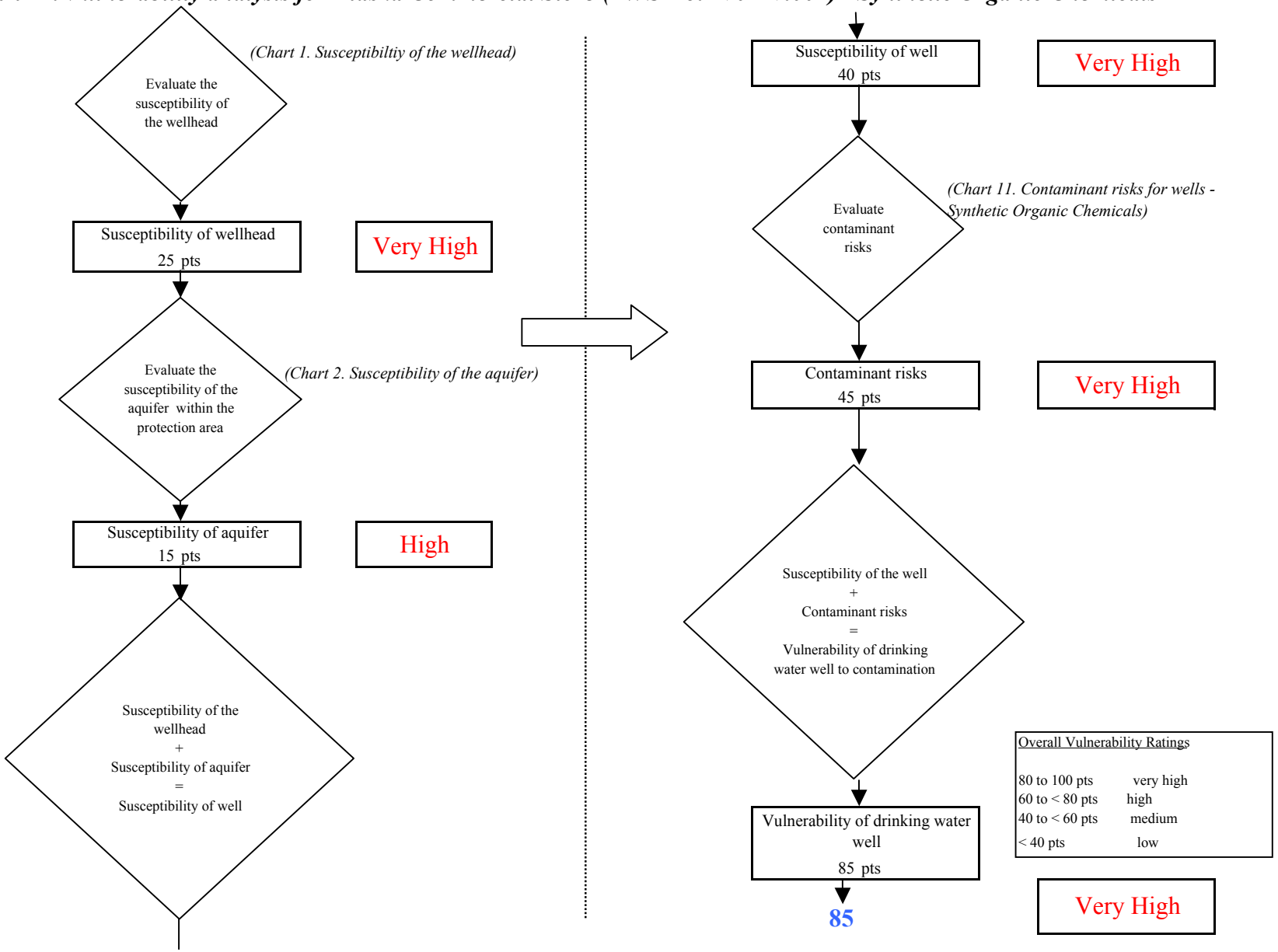


Chart 13. Contaminant risks for Alaska Commercial Store (PWS No. 270427.001) - Other Organic Chemicals

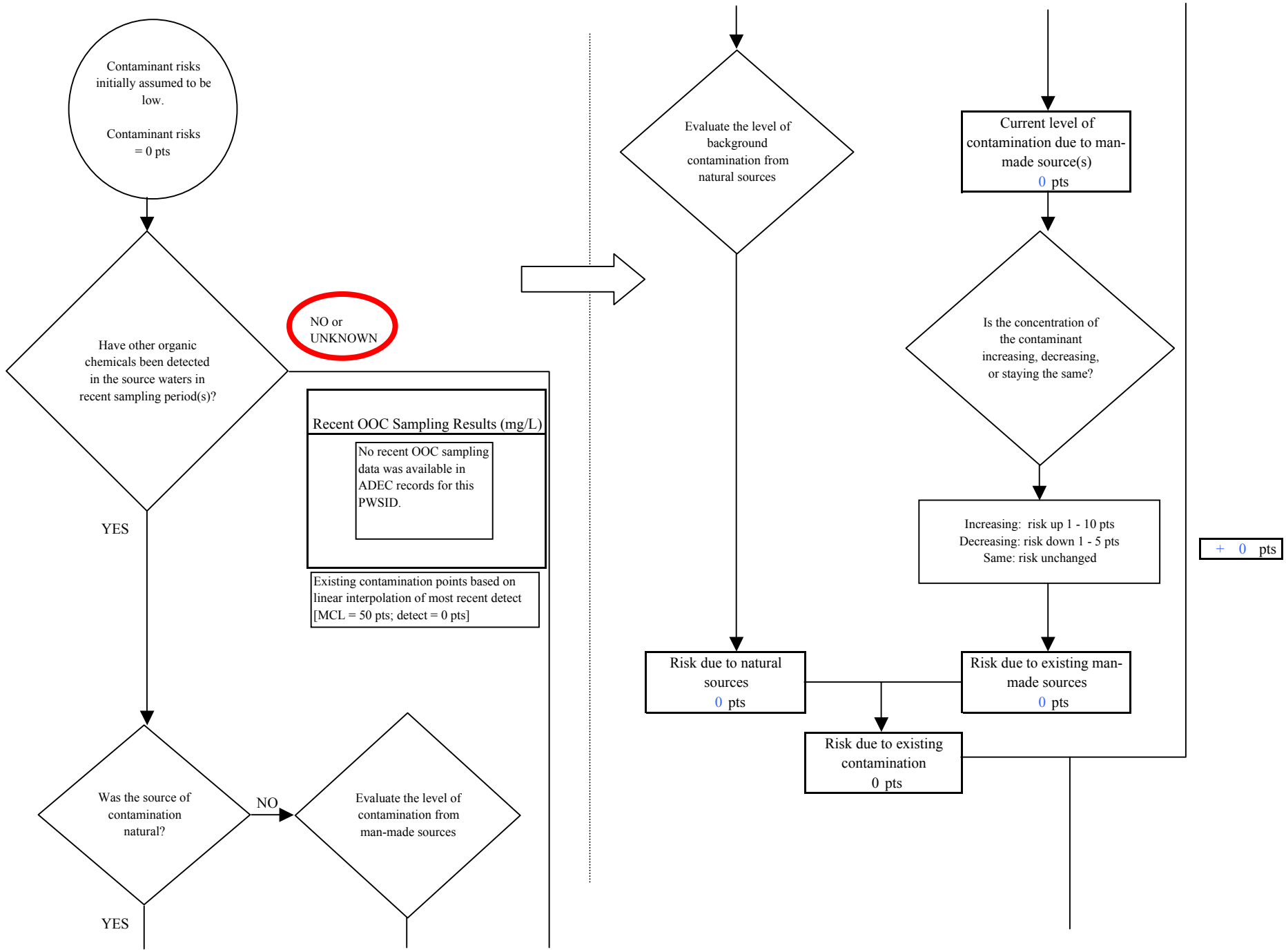
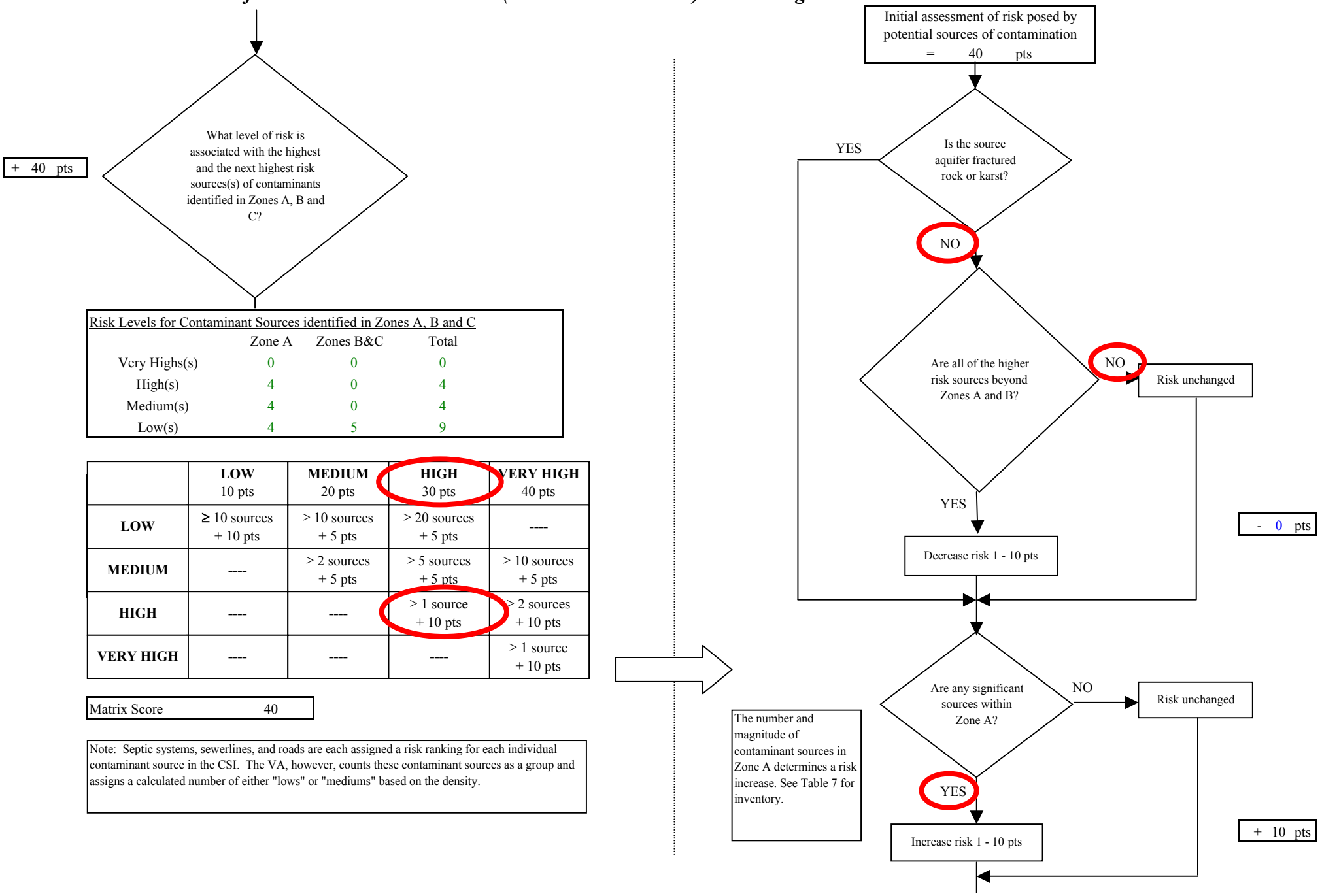


Chart 13. Contaminant risks for Alaska Commercial Store (PWS No. 270427.001) - Other Organic Chemicals



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

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	4	0	4
Medium(s)	4	0	4
Low(s)	4	5	9

	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 13. Contaminant risks for Alaska Commercial Store (PWS No. 270427.001) - Other Organic Chemicals

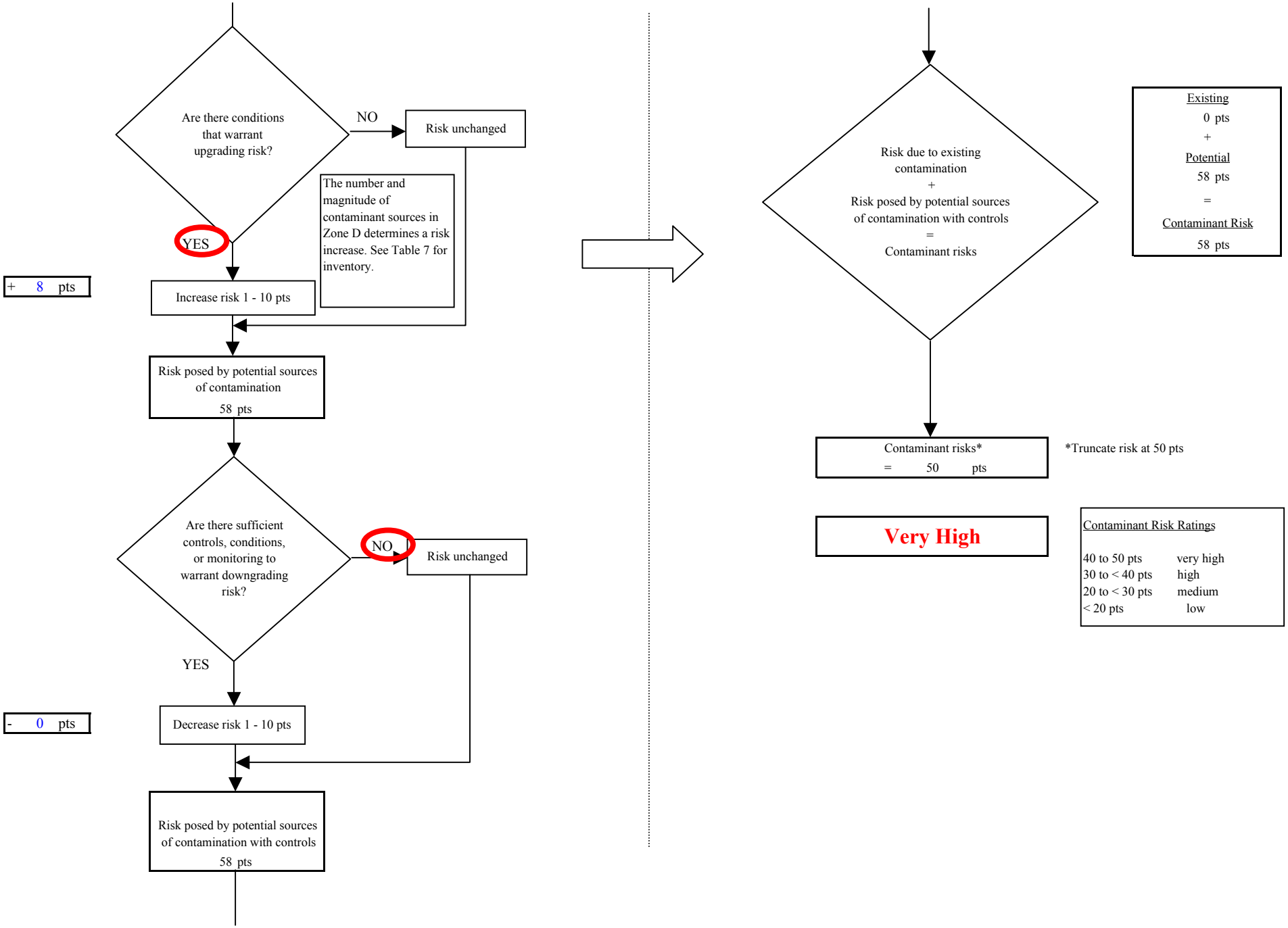


Chart 14. Vulnerability analysis for Alaska Commercial Store (PWS No. 270427.001) - Other Organic Chemicals