Source Water Assessment -
Ikluat Gift Shop Public Water System, Eklutna, Alaska

A Hydrogeologic Susceptibility and Vulnerability Assessment

DRINKING WATER PROTECTION PROGRAM REPORT 59

September 2001

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By MICHAEL J. CROTTEAU

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ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION: 2001

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A Hydrogeologic Susceptibility and Vulnerability Assessment

By Michael J. Crotteau

Drinking Water Protection Program
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

Ikluat Gift Shop is a Class B (transient/non-community) drinking water source consisting of one well. Identified potential and current sources of contaminants for Ikluat Gift Shop includes gravel and paved highways and roads and approximately 2 acres of residential area. These identified potential and existing sources of contamination are considered sources of bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals. Overall, Ikluat Gift Shop public water source received a vulnerability rating of **Low** for bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals.

Figure 1. Index map showing the location of Eklutna, Alaska

INTRODUCTION

The purpose of this environmental assessment is to provide public water system owners/operators, communities, and local governments with information they can use to preserve the quality of Alaska's public drinking water supplies. This assessment was completed for the Ikluat Gift Shop source of public drinking water. This source consists of one well in the Eklutna-area (see Figure 1). This assessment, known under the Alaska Drinking Water Protection Program as the *Source Water Assessment*, has combined a review of the natural hydrogeologic sensitivity with potential and existing contaminant risks to arrive at an overall vulnerability of the drinking water source to contamination. This assessment has been completed as a basis for local voluntary protection efforts and to assist agencies in their efforts to reduce risk to this public drinking water supply.

DESCRIPTION OF THE EKLUTNA-AREA, ALASKA

Location

Eklutna, located in south-central Alaska, is situated at the base of the Chugach Mountains near the outlet of the Eklutna River, approximately 25 miles northeast of Anchorage, the largest city in Alaska. This area is bounded on the east by the Chugach Mountains, which rise to more than 7000 feet in elevation, and the north and west by the Knik Arm of Cook Inlet (Figure 1).

The Native Village of Eklutna lies within the boundaries of the Municipality of Anchorage and encompasses an area of approximately 12.4 square miles of land and 5.7 square miles of water [*Alaska Department of Community and Economic Development, 2001*]. The area of Eklutna has been the site of many Athabascan Indian villages for more than 800 years. Dating back to 1650, Eklutna is the oldest continually inhabited Athabascan site in the Anchorage vicinity [*Ikluat Gift Shop, 2001*]. Today's residents (approximately 400) are descendants of the Dena'ina tribe and maintain as much of a traditional lifestyle as possible in such close proximity to Anchorage.

Climate

The Eklutna-area climate is somewhat transitional in that it does not experience large daily and annual temperature fluctuations like those experienced in the interior of Alaska nor does it experience high mounts of precipitation typified by gulf coast regions. Mean annual precipitation at Eklutna is approximately 18 inches per year. On the average, Eklutna receives a total snow accumulation of 56 inches per year. Precipitation generally increased inland into the Chugach Mountains where annual precipitation may exceed 160 inches per year [*Barnwell, George, Dearborn, Weeks, and Zenone*, 1972]. Mean daily temperature ranges from 68° F during July to 17° F in January [*Western Regional Climate Center*, 2000].

Physiography and Groundwater Conditions

Surface elevations in the Eklutna-area range from sea level at the Knik Arm of Cook Inlet to well over 7000 feet in the peaks that bound the area. Glacial moraine and outwash deposits as well as slope deposits primarily mantle the surface of the Eklutna-area.

The backbone of the Chugach Mountains is composed primarily of metamorphic marine and volcanic rocks (bedrock). These high peaks that bound Eklutna's east-side are flanked with colluvium or slope deposits. These slope deposits eventually grade into the glacial and stream deposits at lower elevations near the village itself.

In the Eklutna-area, two principal groundwater flow systems or aquifers exist. The upper unconfined aquifer or water-table aquifer is separated from a lower confined aquifer system by layers of silty, clayey glacially derived sediments (confining layer). The lower confined aquifer system consists of a series of hydrologically interconnected layers and lenses of gravel, sand and silt that, collectively, form the confined aquifer. The confining layer ranges from 0 to 170 feet thick throughout the Eklutna-area and generally thins with increasing distance from Cook Inlet, thus pinching out at the mountain front. Wells in the Eklutna-area are completed in both of the above mentioned aquifer types.

Water enters or recharges these two aquifer systems in several different ways. Along the front of the Chugach Mountains, groundwater seeps from fractures in bedrock into the sediments. At these higher elevations, rain and

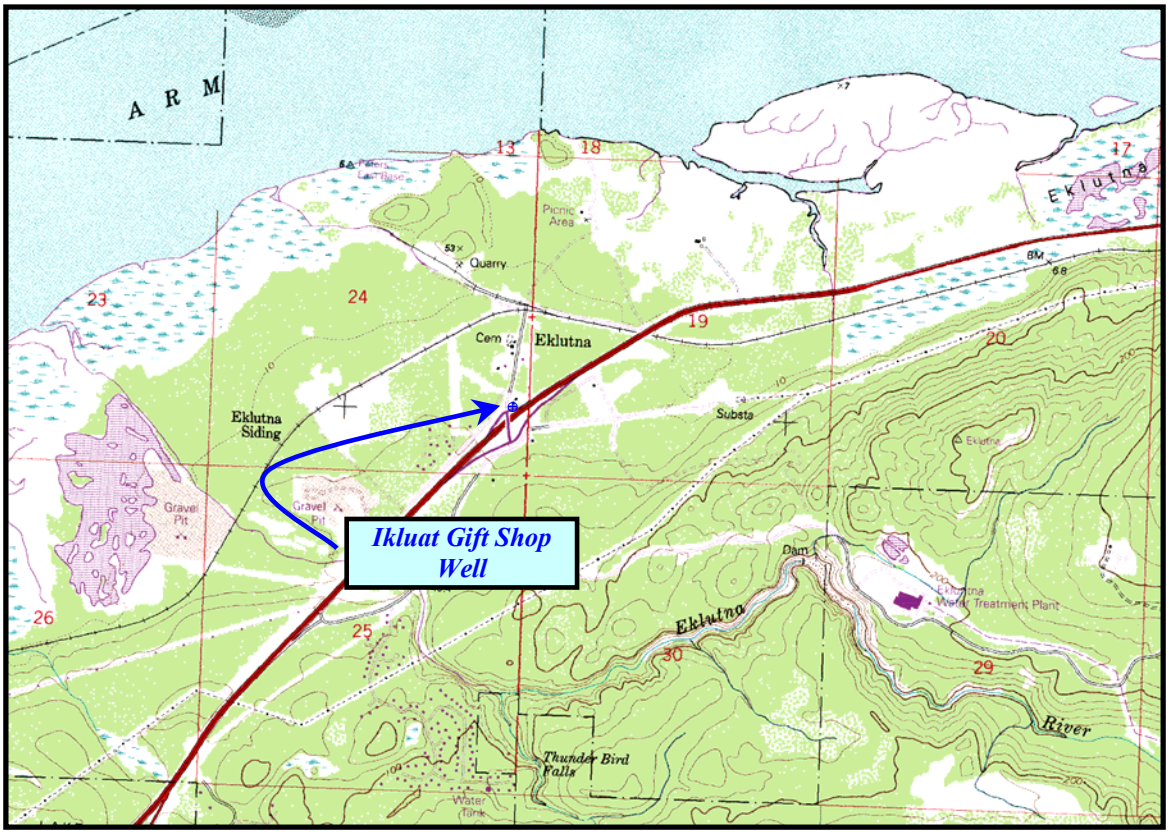

Figure 2. Map showing the location of the drinking water sources for Ikluat Gift Shop [Base: USGS Anchorage B7 NE].

snowmelt also enters the sediments. This area along the mountain front is considered the principal recharge area for wells in the Eklutna-area. Precipitation in the low lands may also percolate directly into the ground. Groundwater flow in the confined aquifer is generally southeast to northwest from the mountain front toward Cook Inlet. The direction of groundwater flow in the upper unconfined aquifer is more variable due to the influence from surfacial topography as well as its close connection with surface water bodies.

IKLUAT GIFT SHOP PUBLIC WATER SOURCE

Ikluat Gift Shop public water source is a Class B (transient/non-community) water source and is owned by Ikluat, Inc. The source consists of one well near the base of the Chugach Mountains and is at an elevation of 55 feet above sea level. The well is located approximately 50 feet north of the off ramp for the Glenn Highway in the Eklutna Village Townsite (see Figure 2). The Ikluat Gift Shop well penetrates sand and gravel, silt and clay, and gravel to a total depth of 260 feet below land surface. It is assumed that the well is screened in gravel from 249 to 260 feet below land surface. Static water level was 38 feet below land surface at the time of drilling (June 1, 1990).

The water from Ikluat Gift Shop is pumped directly into the distribution system. This water source operates year round and serves approximately 6 residents and 25 nonresidents through two service connections.

ASSESSMENT AND PROTECTION AREA FOR IKLUAT GIFT SHOP DRINKING WATER SOURCE

The Drinking Water Protection and Assessment Area that has been established for Ikluat Gift Shop is the area that is most sensitive to contamination. This area has served as a basis for assessing the risk of the drinking water source to contamination. This zone around the drinking water source is the most critical area for the preservation of the quality of the drinking water for this source. For simplicity, this area will be known as your Drinking Water Protection Area and will serve as the area of focus for voluntary protection efforts.

Conceptually, groundwater enters the aquifer systems along the front range of the Chugach Mountains and flows toward Cook Inlet. An analytical calculation was used to calculate the size and shape of the area that contributes water to the well. The input parameters describing the attributes of the aquifer in this calculation were adopted from previous studies in the Anchorage-area [*Patrick, Brabets, and Glass, 1989*] as well as published lookup tables. This analytical calculation was used as a guide as the first step in establishing the protection area for Ikluat Gift Shop. Additional methods were further employed to take into account any uncertainties in groundwater flow and aquifer characteristics to arrive at a meaningful and conservative protection area with respect to public health (Please refer to the Guidance Manual for Class B Public Water Systems for additional information).

The Drinking Water Protection Areas established for wells by the Alaska Department of Environmental Conservation are separated into zones. These zones correspond to a time-of-travel. Time-of-travel is the time required for water to move in the saturated zone of the ground from a specific point to the well. The Drinking Water Protection Area for Ikluat Gift Shop contain three zones, Zone A, Zone B, and Zone C (See Map 1 in Appendix B). Zone A corresponds to the area between the well and the distance equal to ¼ of the distance of the 2-year time-of-travel. Depending on where a contaminant source is located within Zone A, travel time for a contaminant to the well may be on the order of several days to several hours. Zone A also extends downgradient from the well to take into account the area of the aquifer that is influenced by pumping of the well.

The Zone B protection area for Ikluat Gift Shop corresponds to a time-of-travel of less than two years and extends beyond Zone A toward the Chugach Mountains. Lastly, the Zone C protection area extends from Zone B to the top of the watershed divide and envelops a portion of Eklutna Lake Road.

INVENTORY OF POTENTIAL AND EXISTING CONTAMINANT SOURCES

The Drinking Water Protection Program has completed an inventory of potential and existing sources of contamination within Ikluat Gift Shop's Drinking Water Protection Area. This survey was completed through a search of agency records and other publicly available information, and field verified (May 29, 2001) by the author, the Village Environmental Specialist and the Natural Resource Director with the Native Village of Eklutna.

Potential sources of contamination to drinking water supplies cover 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 this assessment and all Class B public water system assessments, three categories of drinking water contaminants were inventoried. They include:

- Bacteria and viruses;
- Nitrates and/or nitrites; and

- Volatile organic chemicals.

Map 2 in Appendix C depicts the Contaminant Source Inventory for Ikluat Gift Shop. Inventoried potential sources of contamination within Zones A through Zone C were associated with residential and transportation type activities (see Table 1 in Appendix B). Below is a summary of the contaminant sources inventoried within the Ikluat Gift Shop protection area:

- approximately 2 acres of residential area; and
- activities associated with paved and gravel roads;

These potential contaminant sources present risk for all three categories of drinking water contaminants for Ikluat Gift Shop drinking water source.

RANKING OF CONTAMINANT RISKS

Potential and existing sources of contamination have been identified, sorted, and ranked 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. Contaminant risks are further a function of the number and density of those types of contaminant sources as well as the proximity of those sources to the well.

VULNERABILITY OF IKLUAT GIFT SHOP DRINKING WATER SOURCE

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

- natural susceptibility; and
- contaminant risks.

Each of the three categories of drinking water contaminants has been analyzed and an overall vulnerability score of 0 to 100 is ultimately assigned:

Natural Susceptibility (0 – 50 points)

+

Contaminant Risks (0 – 50 points)

=

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

A score for the Natural Susceptibility is achieved by analyzing the properties of the well and the aquifer.

Susceptibility of the Wellhead (0 – 25 Points)
+
Susceptibility of the Aquifer (0 – 25 Points)

= Natural Susceptibility (Susceptibility of the Well)
(0 – 50 Points)

The well for Ikluat Gift Shop is completed in a confined aquifer setting. The well penetrates mostly sand and gravel as well as 169 feet of silt and clay. This silt and clay layer, encountered at 80 feet below land surface, may provide a significant protective barrier for the movement of contaminants in the subsurface near the well. However, near the base of the Chugach Mountains, these clay and silt layers tend to be discontinuous and thin toward the mountains. Therefore, contaminants that enter the subsurface near the base of the mountains may enter the confined aquifer uninhibited by the absence of any protective layer. The well log does not indicate if the well is grouted. The absence of grouting can promote the transport of contaminants along the well casing. Combining the susceptibility of the wellhead and the aquifer to contamination leads to a score (0 – 50 points) and rating of overall Susceptibility (See Appendix D). Table 1 shows the overall Susceptibility score and rating for Ikluat Gift Shop.

Table 1. Natural Susceptibility - Susceptibility of the Wellhead and Aquifer to Contamination

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

Contaminant risks to a drinking water source depend on the type, number or density, and distribution of contaminant sources. Residential areas and activities associated with highways and roads contribute the highest risk for potential contamination to the Ikluat Gift Shop's source of public drinking water.

A score (0 – 50 points) and rating of Contaminant Risks (See Appendix D) is assigned based on the findings of the Contaminant Source Inventory (Appendix B - Table 1 – Table 4). This portion of the analysis examines any

existing or historical contamination that has been detected at the drinking water source through routine sampling. It also reviews contamination that has or may have occurred but has not arrived or been detected at the well. Table 2 summarizes the Contaminant Risks for each category of drinking water contaminants.

Table 2. Contaminant Risks

Contaminant Risks	Score	Rating
Bacteria and Viruses	11	Low
Nitrates and/or Nitrites	11	Low
Volatile Organic Chemicals	11	Low

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. Lastly, Chart 4 contains the 'Vulnerability Analysis for Bacteria and Viruses'. Charts 5 through 8 contain the Contaminant Risks and Vulnerability Analysis for nitrates and nitrites, and volatile organic chemicals, respectively.

Vulnerability of the drinking water source to contamination is the combination of susceptibility of the aquifer and the well with contaminant risks. Table 3 contains the overall vulnerability scores (0 – 100) and ratings for each of the six categories of drinking water contaminants (See Appendix D). Note: scores are rounded off to the nearest five.

Table 3. Overall Vulnerability of Ikluat Gift Shop Public Drinking Water Source to Contamination by Category

Category	Score	Rating
Bacteria and Viruses	25	Low
Nitrates and Nitrites	25	Low
Volatile Organic Chemicals	25	Low

Tables 2 through 4 in Appendix A contain the ranking of potential and existing sources of contamination with respect to bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals.

Human activities and accidental spills in residential areas and roads adjacent to the well are the highest risk for contamination from all three categories of contaminants. Overall, Ikluat Gift Shop has a low vulnerability for contamination for all categories.

SUMMARY

A *Source Water Assessment* has been completed for the Ikluat Gift Shop source of public drinking water. The overall vulnerability of this source to contamination is **Low** for bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals. 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 Ikluat, Inc. 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 public drinking water source.

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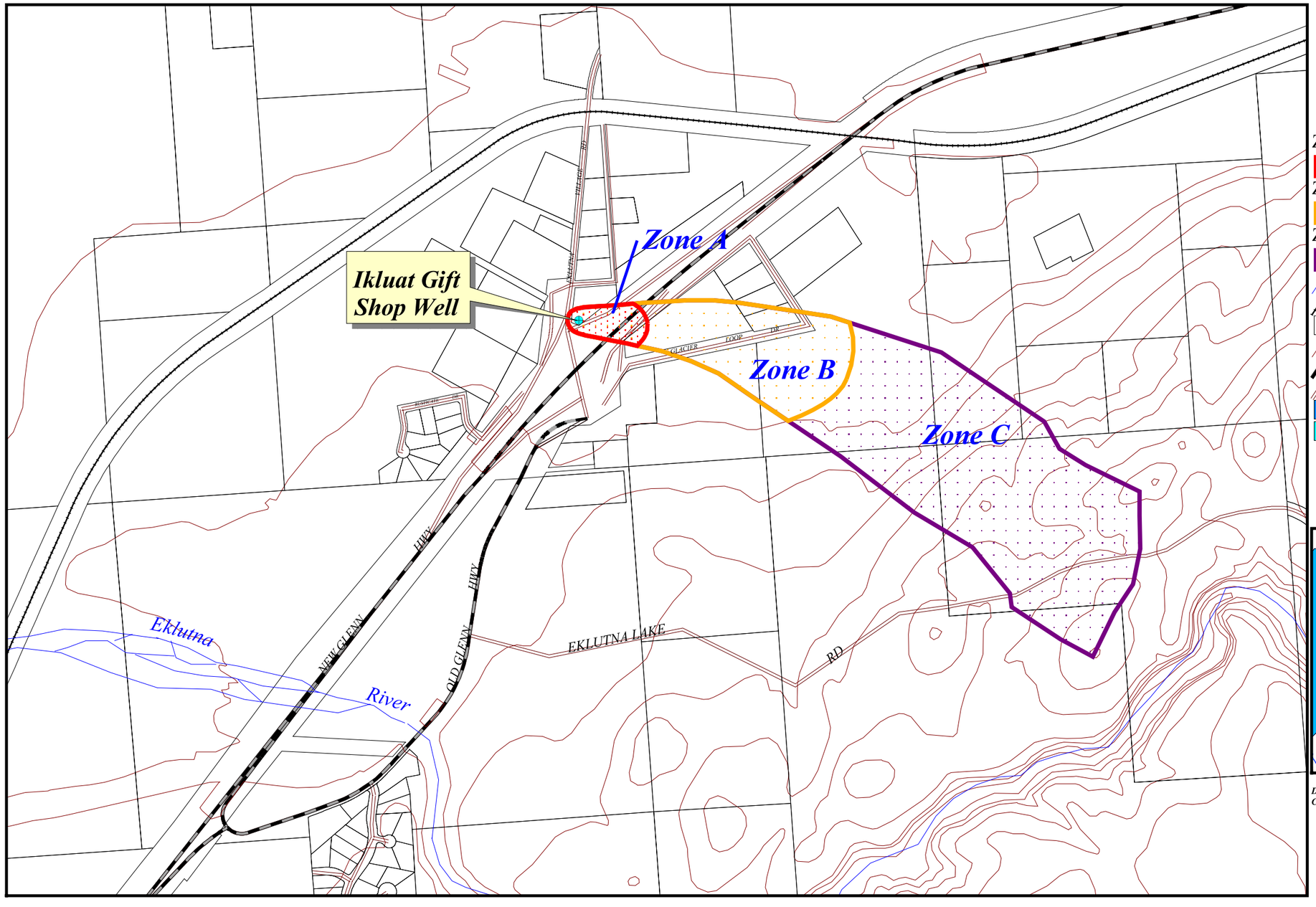
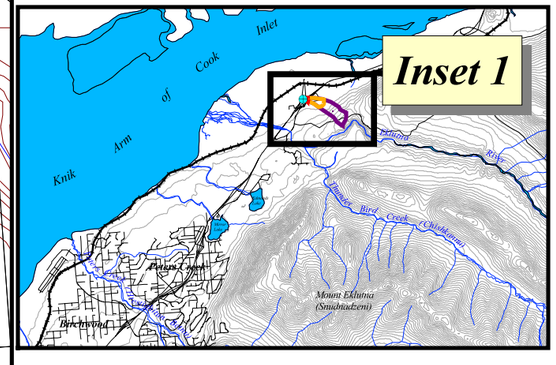
APPENDIX A

Ikluat Gift Shop
Drinking Water Protection Area

Drinking Water Protection Area for Ikluat Gift Shop



- Ikluat Gift Shop Well
- Zone A Protection Area
  - Several Months Travel Time
- Zone B Protection Area
  - Less than 2-Years Travel Time
- Zone C Protection Area
  - Less than 5-Years Travel Time
- Rivers and Streams
- Railroads
- MOA Land Pracels
- Elevation Contours
- Main Highways
- Roads
- Lakes and Ocean
- Cook Inlet



Dena'ina place names (enclosed in parentheses) provided by IMUS GEOGRAPHICS, 2000, Chugach State Park, Chugach Mountains, Alaska, 1:100,000 shaded relief map, Eugene, Oregon.

1000 0 1000 Feet

N W E S

PWSID 217267.001

Map 1

APPENDIX B

Contaminant Source Inventory and Risk Ranking for Ikluat Gift Shop

Table 1

Contaminant Source Inventory for Ikluat Gift Shop

PWSID 217267.001

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Location	Map	Comments
Residential Areas	R1	R1-1	A	Parking lot of gift shop	2	0.4 acres
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Glenn Highway	2	Includes on and off ramps
Highways and roads, dirt/gravel	X24	X24-1	A,B	Glacier Loop Road	2	
Residential Areas	R1	R1-2	B	Eklutna Acres	2	1.5 acres
Highways and roads, paved (cement or asphalt)	X20	X20-2	C	Eklutna Lake Road	2 Inset 1	

Table 2

Potential and Existing Sources of Contamination for Ikluat Gift Shop
Sources of Bacteria and Viruses

PWSID 217267.001

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Overall Rank after Analysis	Location	Map	Comments
Residential Areas	R1	R1-1	A	Low	1	Parking lot of gift shop	2	0.4 acres
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	2	Glenn Highway	2	Includes on and off ramps
Residential Areas	R1	R1-2	B	Low	3	Eklutna Acres	2	1.5 acres
Highways and roads, dirt/gravel	X24	X24-1	A,B	Very Low	4	Glacier Loop Road	2	

Table 3

Potential and Existing Sources of Contamination for Ikluat Gift Shop
Sources of Nitrates and Nitrites

PWSID 217267.001

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Overall Rank after Analysis	Location	Map	Comments
Residential Areas	R1	R1-1	A	Low	1	Parking lot of gift shop	2	0.4 acres
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	2	Glenn Highway	2	Includes on and off ramps
Residential Areas	R1	R1-2	B	Low	3	Eklutna Acres	2	1.5 acres
Highways and roads, dirt/gravel	X24	X24-1	A,B	Very Low	4	Glacier Loop Road	2	
Highways and roads, paved (cement or asphalt)	X20	X20-2	C	Very Low	5	Eklutna Lake Road	2 Inset 1	

Table 4

Potential and Existing Sources of Contamination for Ikluat Gift Shop Sources of Volatile Organic Chemicals

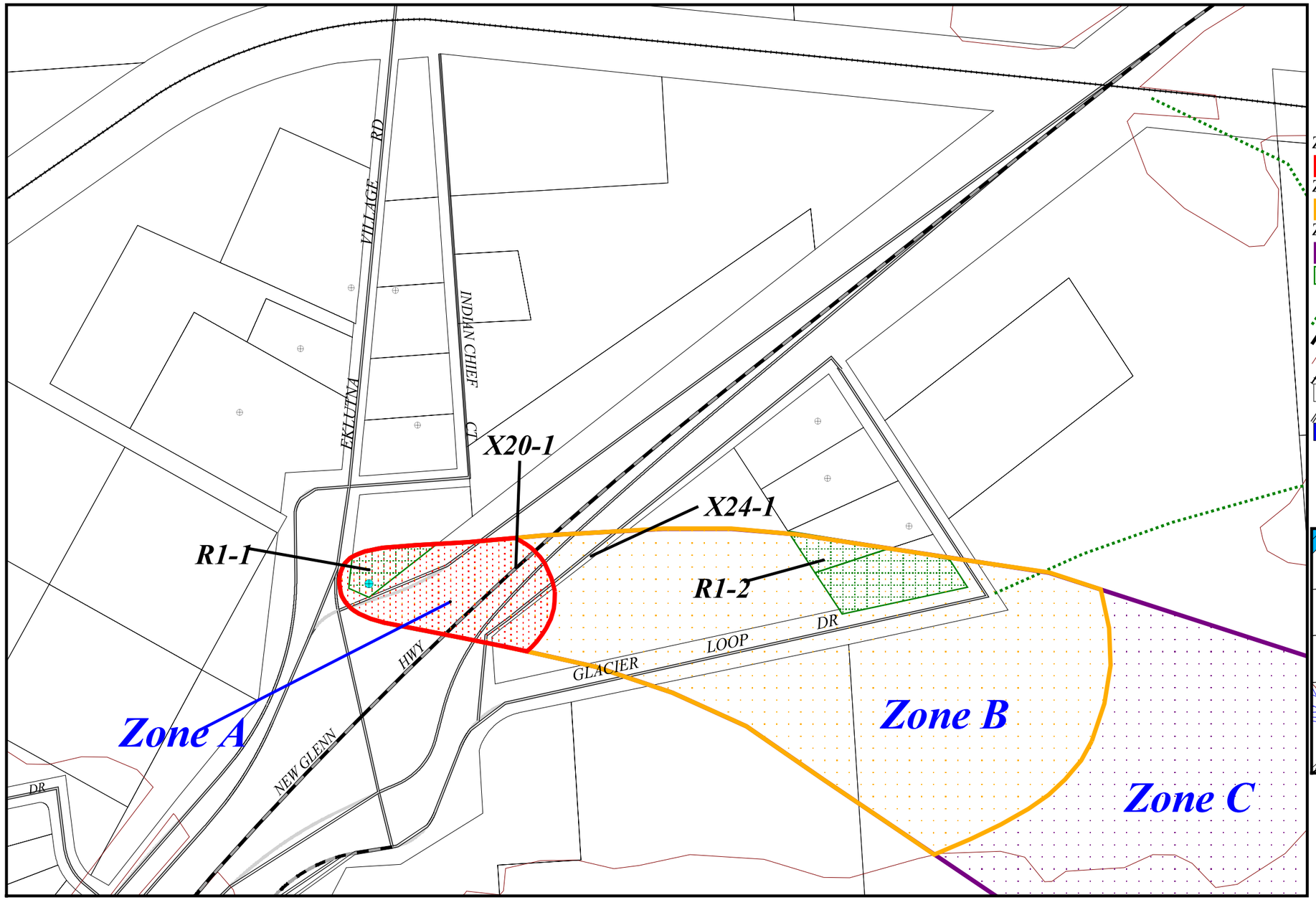
PWSID 217267.001

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Overall Rank after Analysis	Location	Map	Comments
Residential Areas	R1	R1-1	A	Low	1	Parking lot of gift shop	2	0.4 acres
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	2	Glenn Highway	2	Includes on and off ramps
Residential Areas	R1	R1-2	B	Low	3	Eklutna Acres	2	1.5 acres
Highways and roads, dirt/gravel	X24	X24-1	A,B	Very Low	4	Glacier Loop Road	2	
Highways and roads, paved (cement or asphalt)	X20	X20-2	C	Very Low	5	Eklutna Lake Road	2 Inset 1	

APPENDIX C

Ikluat Gift Shop
Drinking Water Protection Area
and Potential & Existing Contaminant Sources

Drinking Water Protection Area for Iluat Gift Shop and Potential & Existing Sources of Contamination

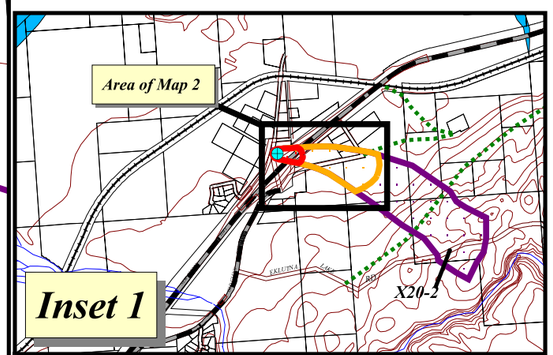


- Ikluat Gift Shop Well

Zone A Protection Area
- Several Months Travel Time

Zone B Protection Area
- Less than 2-Years Travel Time

Zone C Protection Area
- Less than 5-Years Travel Time
- Residential Area (R1)
- Private & Public Drinking Water Wells
- Trails (X33)
- Main Highways
- Elevation Contours
- Railroads
- MOA Land Parcels
- Roads
- Lakes



N W E S

500 0 500 Feet

PWSID 217267.001

Map 2

APPENDIX D

Vulnerability Analysis for Ikluat Gift Shop Public Drinking Water Source

Chart 1. Susceptibility of the wellhead – Ikluat Gift Shop

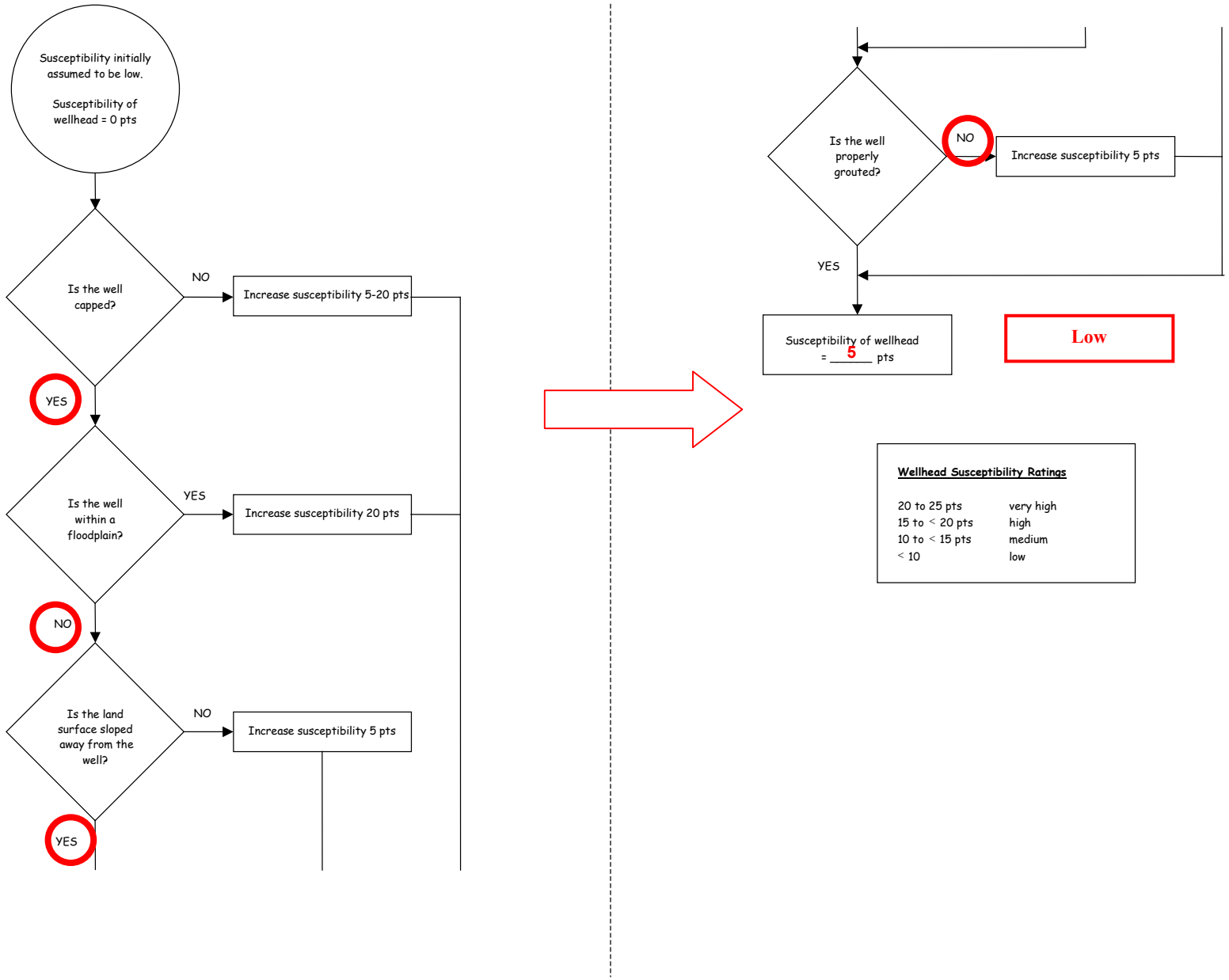
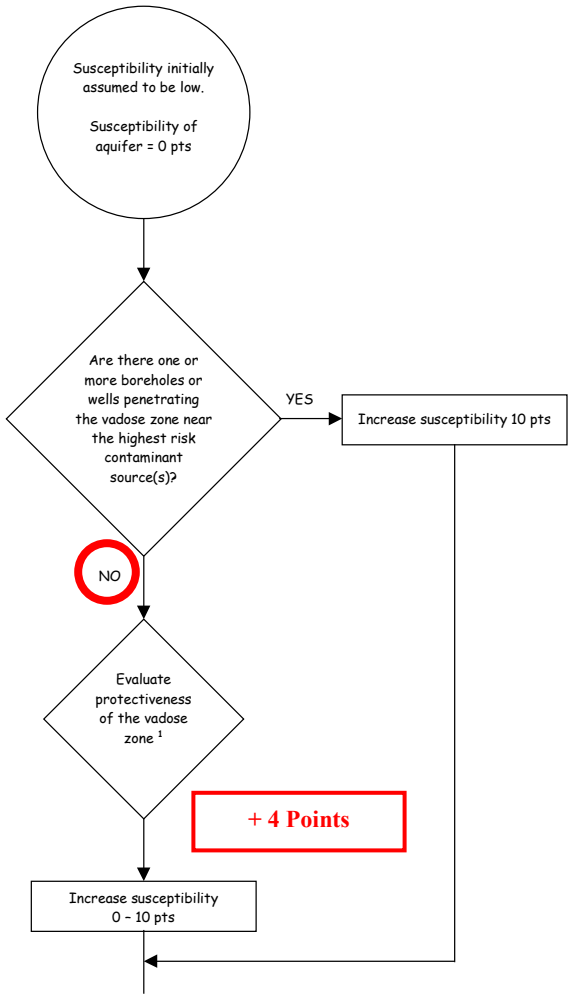
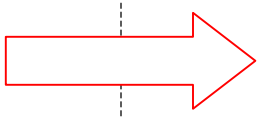
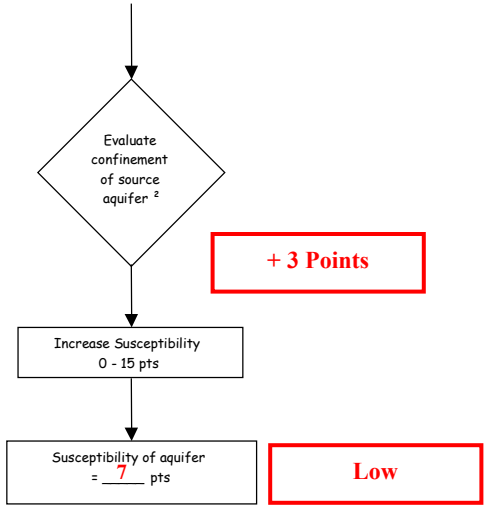


Chart 2. Susceptibility of the aquifer – Eklutna Gate







1. **Protectiveness of the Vadose Zone**

- net recharge (function of precipitation, slope of land surface, & permeability of soils)
  [0 – 10 pts; 50% weight]
- depth to water table (unconfined aquifer) or top of confining layer (confined aquifer)
  [interpolate linearly: 100' – 20', 0 – 5 pts; 20' – 0', 5 – 10 pts; 50% weight]

Recharge (20 inches per year, base of Chugach Mountains, and brown sand and gravel)
6/10 = 3 Points
Depth to top of confining unit (80 feet) 2/10 = 1 Point

Protectiveness of the Vadose Zone Total = **4/10 Points**

2. **Degree of Confinement**

- confined verses unconfined aquifer
  [confined: K ≤ 10^{-6} cm/s, minimum thickness of at least one layer = 20 ft, interpolate linearly 100' – 20', 0 – 10 pts; unconfined = 15 pts; 65% weight]
- density of boreholes and wells penetrating the confining layer (confined aquifer) or the water table (unconfined aquifer)
  [confined: 0 – 15 pts; unconfined = 15 pts; 35% weight]

Confinement (169 feet of clay and silt, but pinches in Zone C) 4/15 = 3 Points
Density of boreholes/wells 0/15 = 0 Points

Degree of Confinement Total = **3/15 Points**

Aquifer Susceptibility Ratings

20 to 25 pts	very high
15 to < 20 pts	high
10 to < 15 pts	medium
< 10	low

Low

Chart 3. Contaminant risks for Ikluat Gift Shop– Bacteria & Viruses

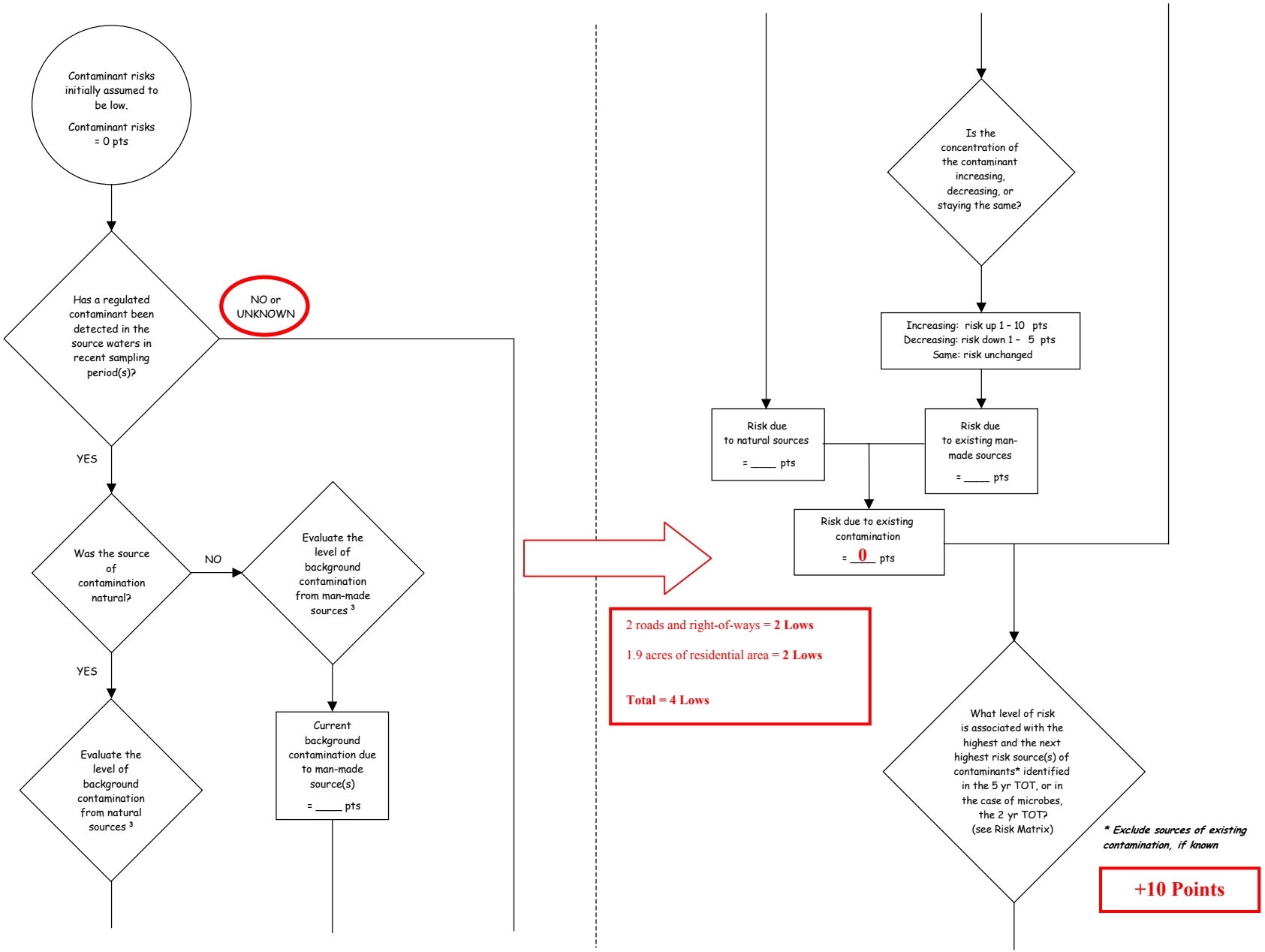


Chart 3. Contaminant risks for Ikluat Gift Shop– Bacteria & Viruses (Continued)

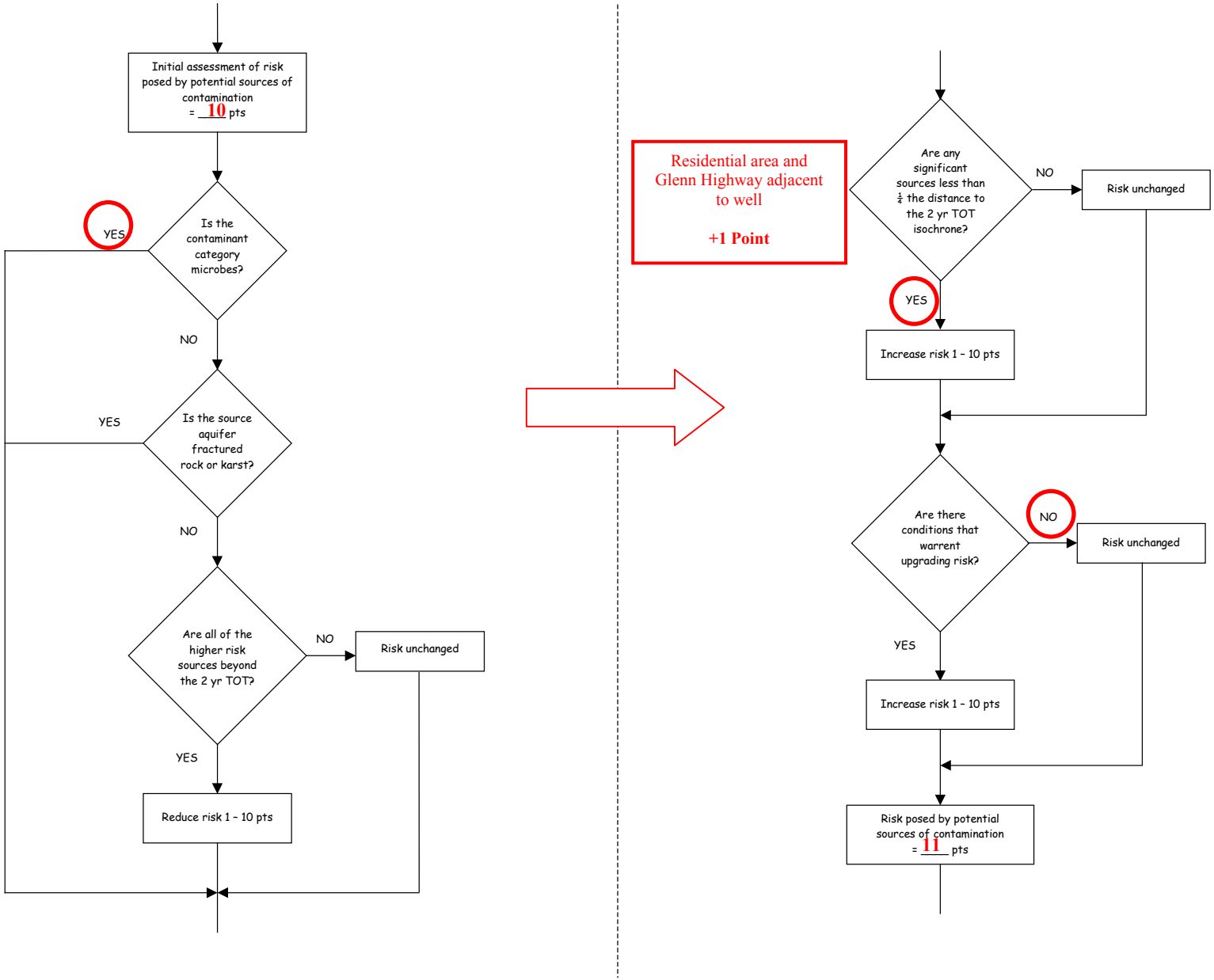
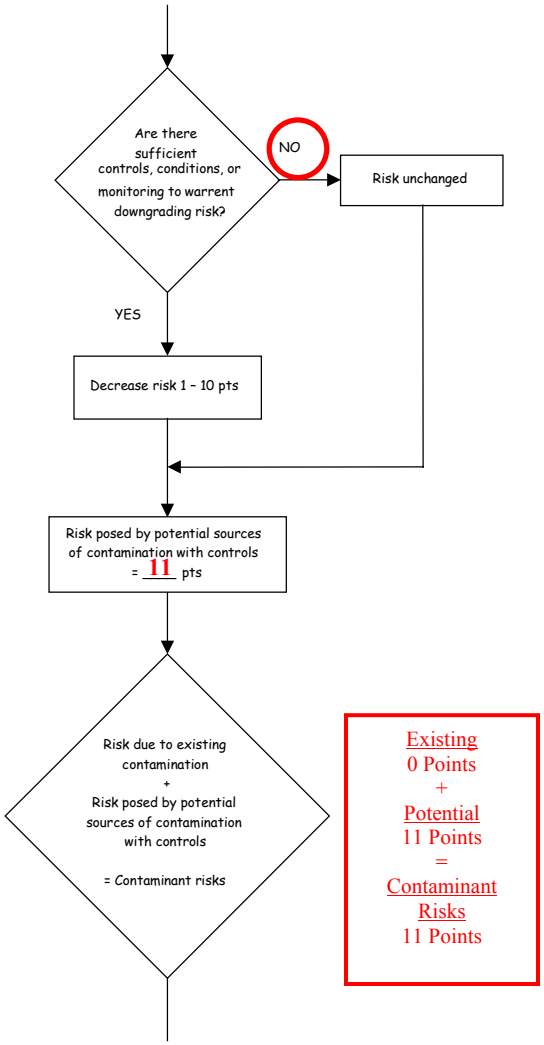
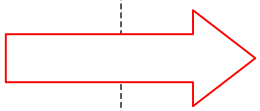
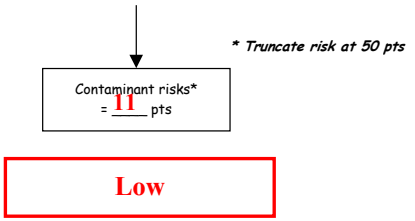


Chart 3. Contaminant risks for Ikluat Gift Shop – Bacteria & Viruses (Continued)



Existing
0 Points
+
Potential
11 Points
=
Contaminant Risks
11 Points





3. Level of Background Contamination

> MCL	50 pts
0.5 MCL to < MCL	20 pts
0.2 MCL to < 0.5 MCL	10 pts
'detect' to < 0.2 MCL	5 pts

Contaminant Risk Ratings

40 to 50 pts	very high
30 to < 40 pts	high
20 to < 30 pts	medium
< 20	low

Table 1. Risk Matrix for Contaminant Sources for Ikluat Gift Shop– Bacteria & Viruses

Level of Risk Associated with the Highest Risk Sources

Next Highest Risk Sources(s)	4 Lows	**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

Chart 4. Vulnerability analysis for Ikluat Gift Shop– Bacteria & Viruses

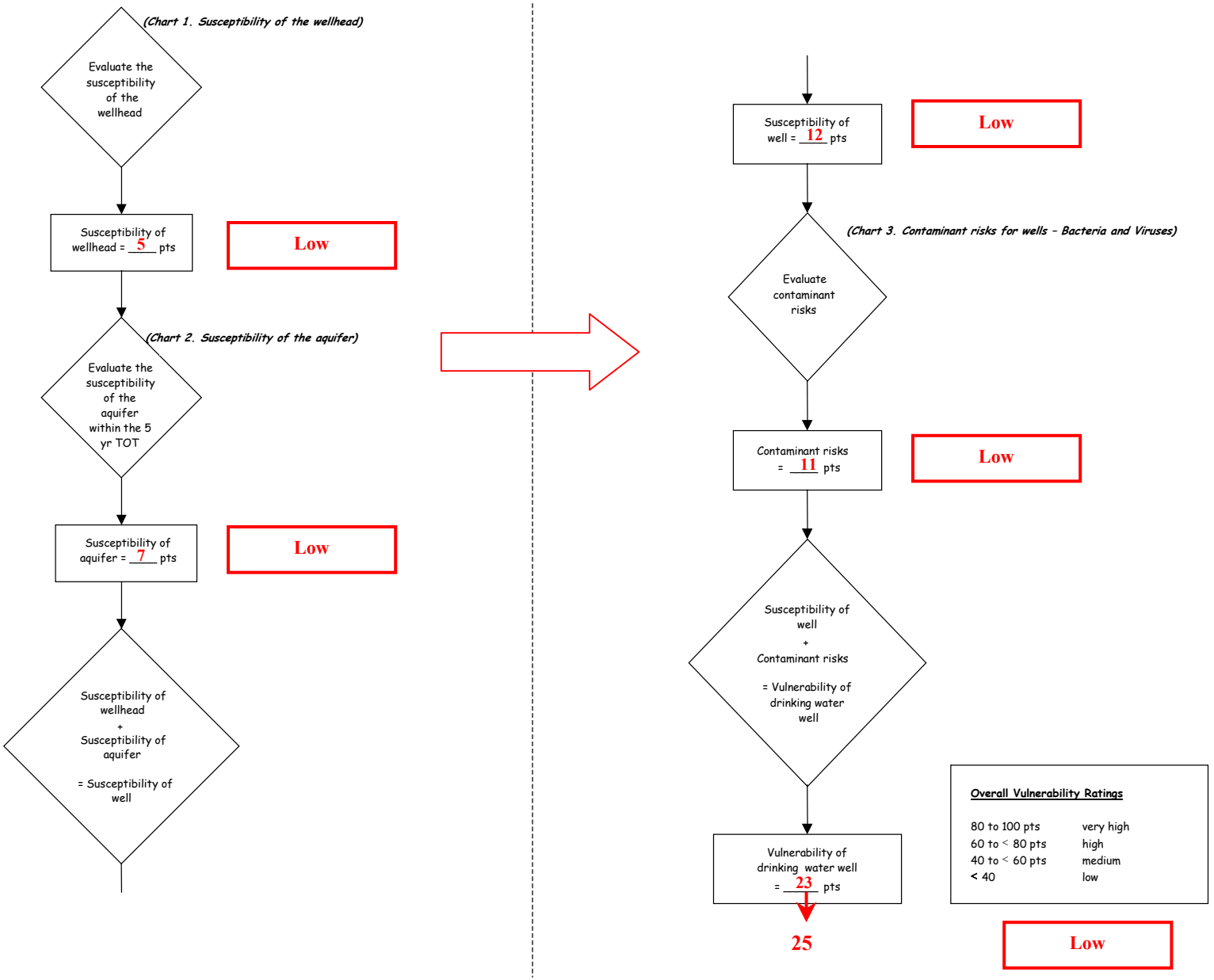


Chart 5. Contaminant risks for Ikluat Gift Shop– Nitrates and Nitrites

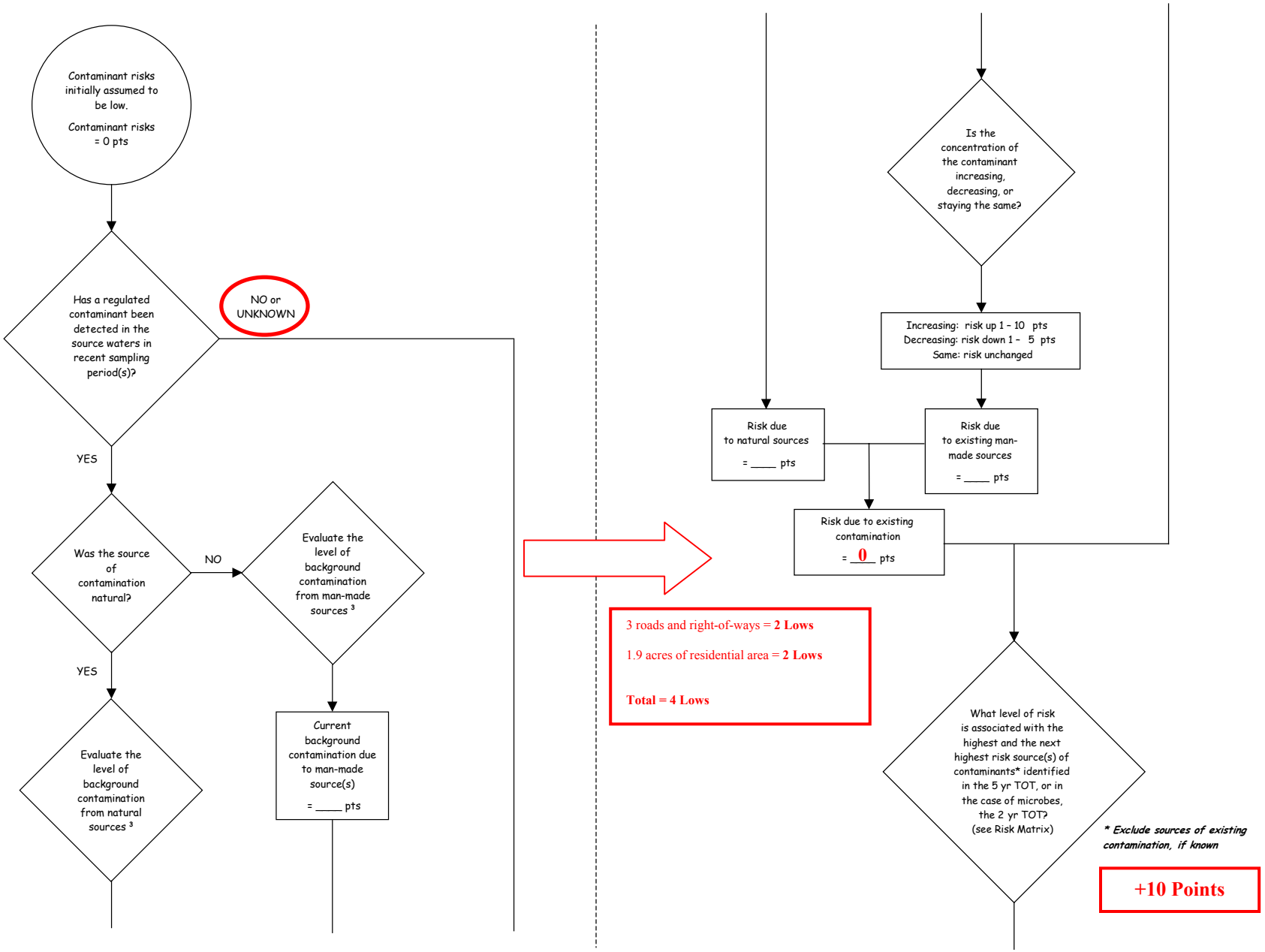


Chart 5. Contaminant risks for Ikluat Gift Shop– Nitrates and Nitrites (Continued)

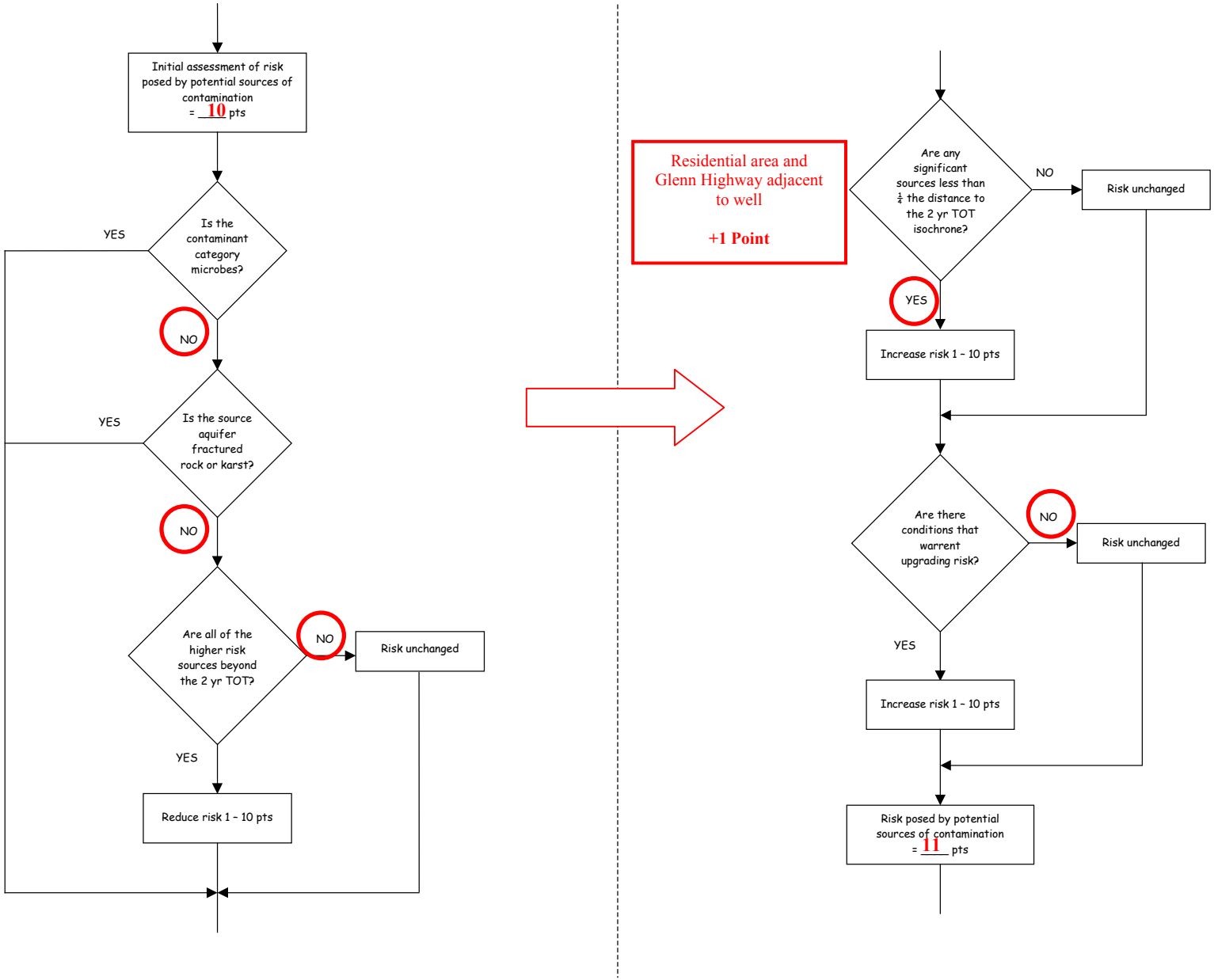
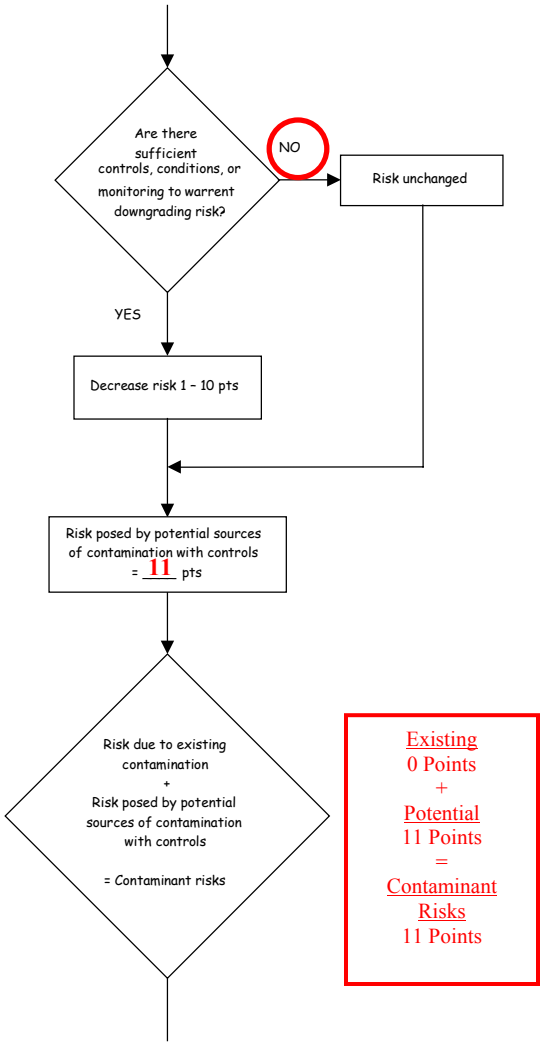
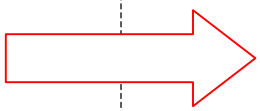


Chart 5. Contaminant risks for Ikluat Gift Shop– Nitrates and Nitrites (Continued)



Existing
0 Points
+
Potential
11 Points
=
Contaminant Risks
11 Points



** Truncate risk at 50 pts*

Contaminant risks* = 11 pts

Low

3. Level of Background Contamination

> MCL	50 pts
0.5 MCL to < MCL	20 pts
0.2 MCL to < 0.5 MCL	10 pts
'detect' to < 0.2 MCL	5 pts

Contaminant Risk Ratings

40 to 50 pts	very high
30 to < 40 pts	high
20 to < 30 pts	medium
< 20	low

Table 2. Risk Matrix for Contaminant Sources for Ikluat Gift Shop - Nitrates and Nitrites

Level of Risk Associated with the Highest Risk Sources

Next Highest Risk Sources(s)	4 Lows	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	

Chart 6. Vulnerability analysis for Eklutna Gate – Nitrates and Nitrites

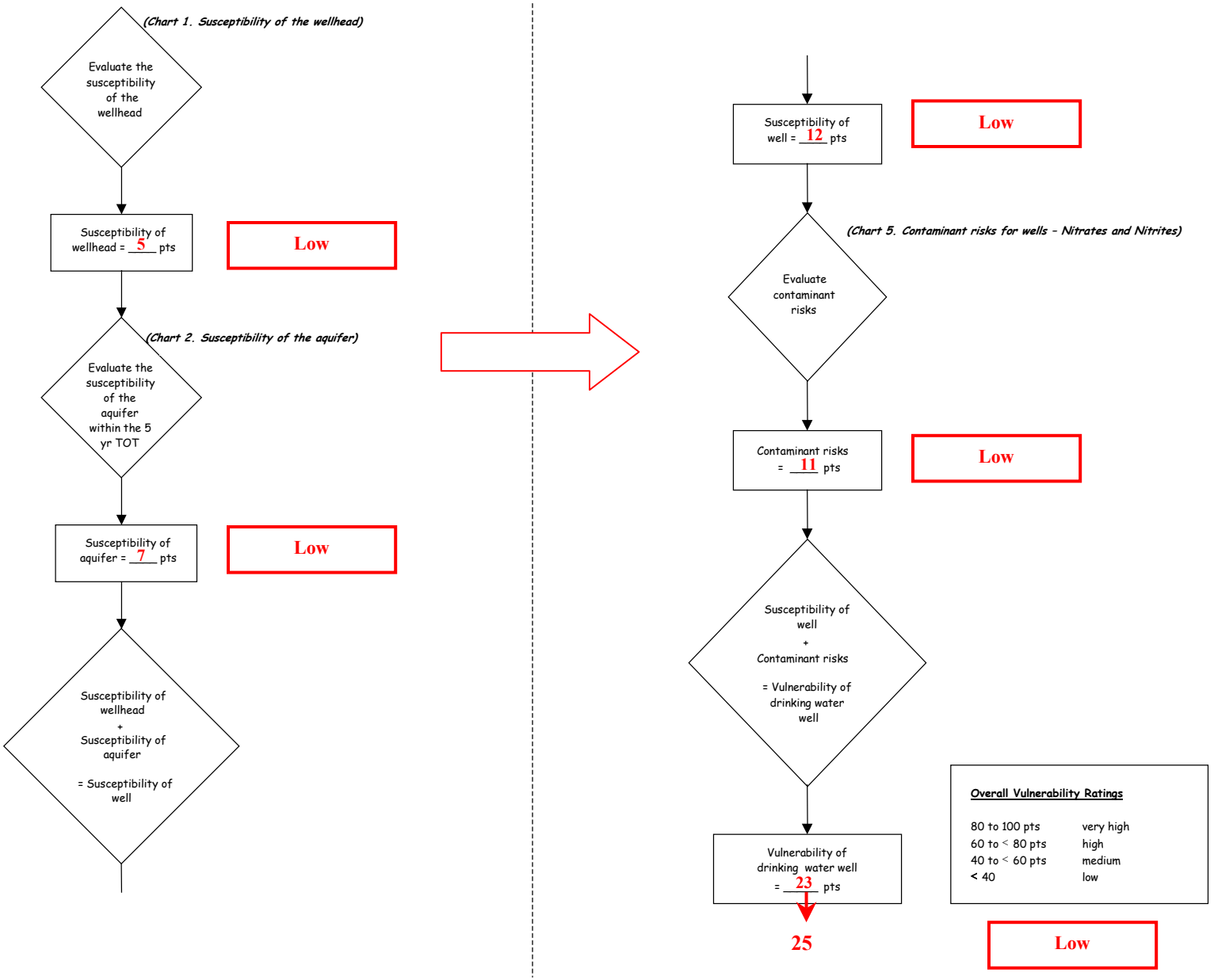


Chart 7. Contaminant risks for Ikluat Gift Shop – Volatile Organic Chemicals

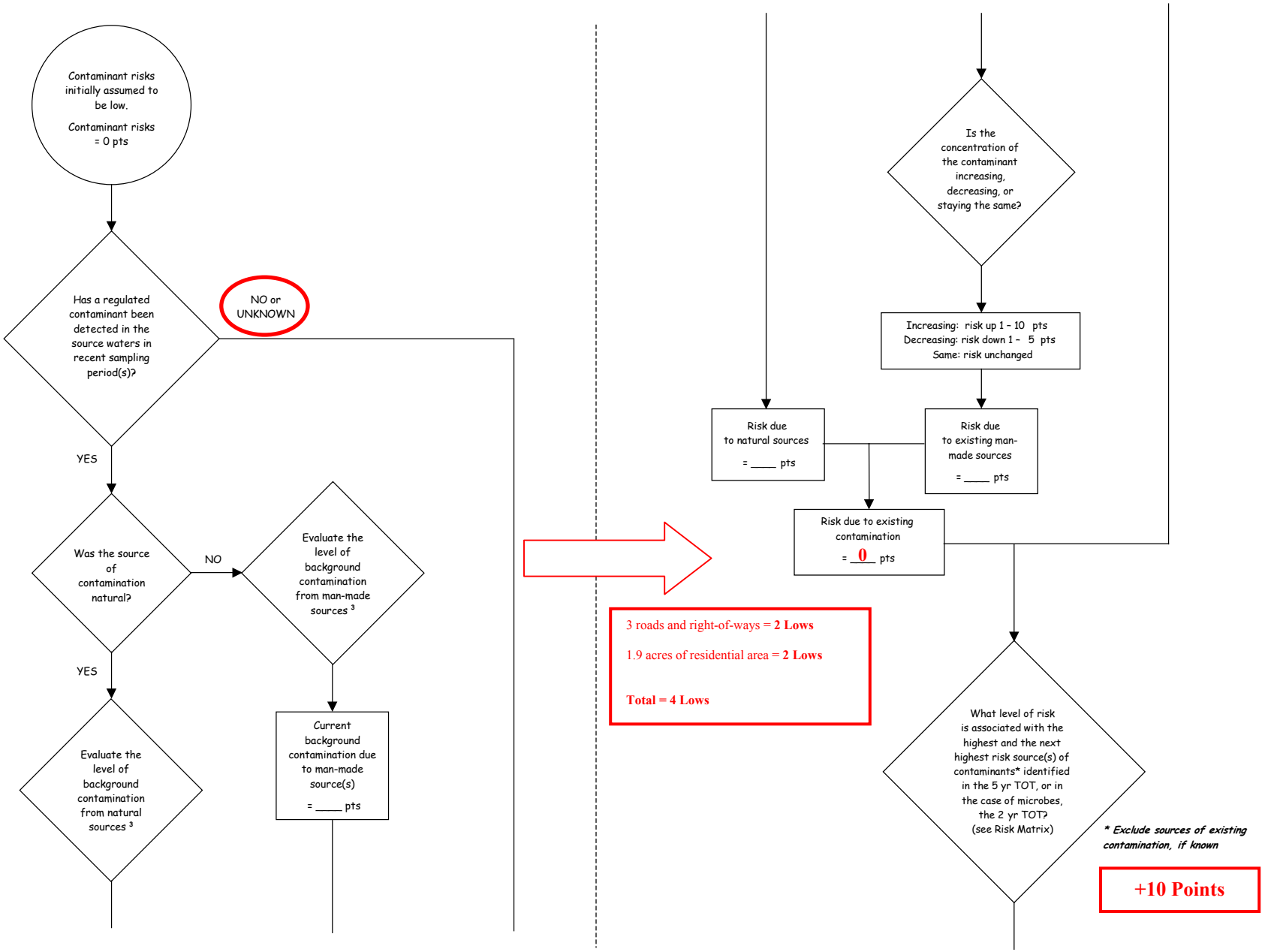


Chart 7. Contaminant risks for Ikluat Gift Shop – Volatile Organic Chemicals (Continued)

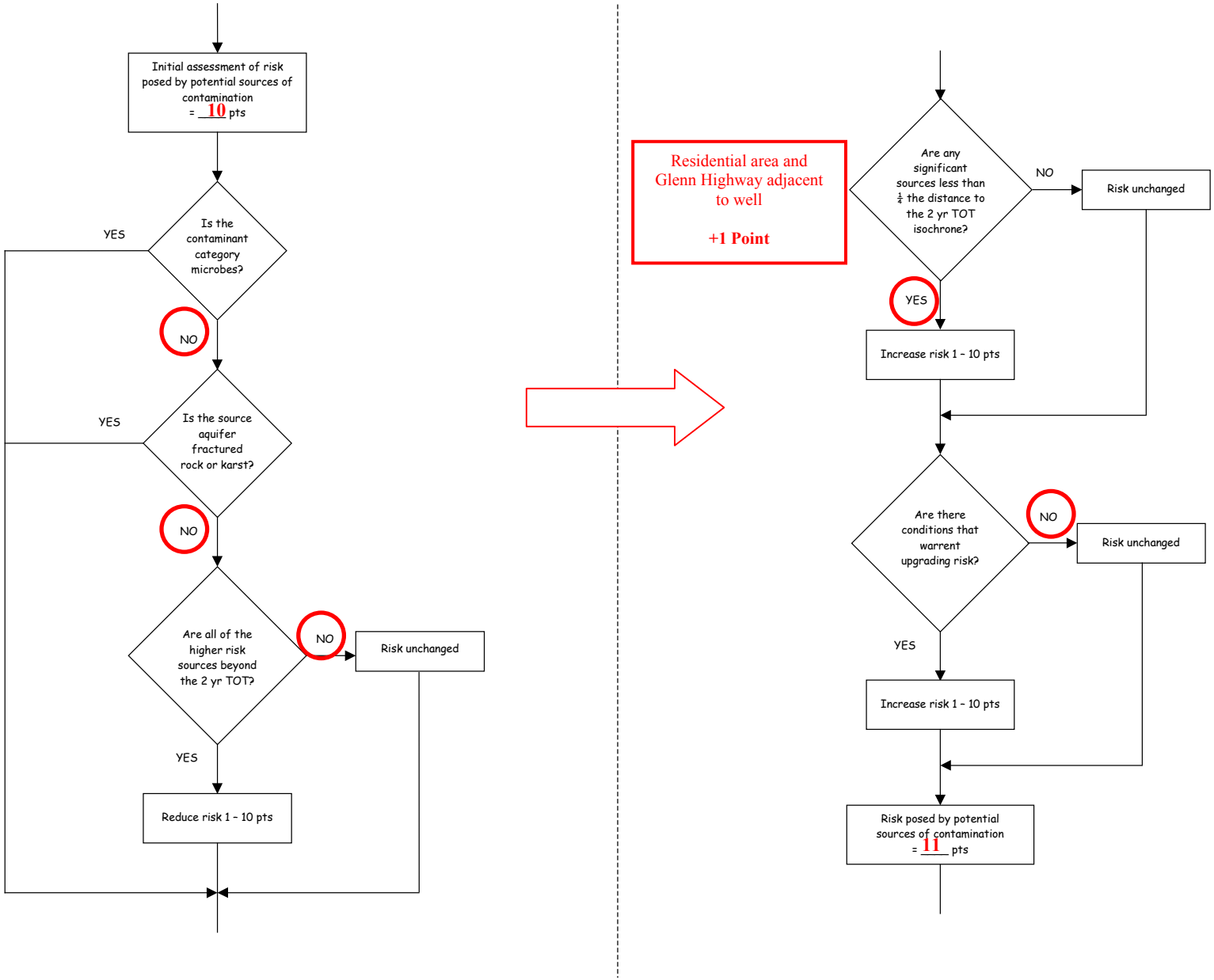
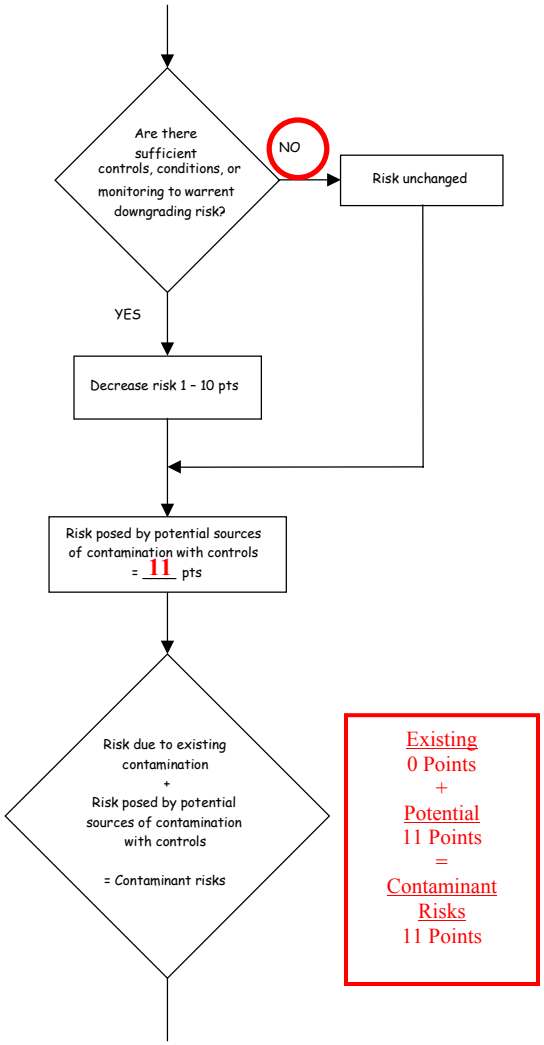
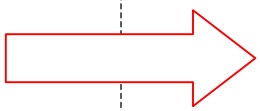
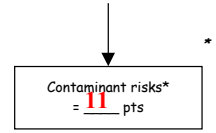


Chart 7. Contaminant risks for Ikluat Gift Shop – Volatile Organic Chemicals (Continued)



Existing
0 Points
+
Potential
11 Points
=
Contaminant Risks
11 Points





** Truncate risk at 50 pts*

Low

3. Level of Background Contamination

> MCL	50 pts
0.5 MCL to < MCL	20 pts
0.2 MCL to < 0.5 MCL	10 pts
'detect' to < 0.2 MCL	5 pts

Contaminant Risk Ratings

40 to 50 pts	very high
30 to < 40 pts	high
20 to < 30 pts	medium
< 20	low

Table 3. Risk Matrix for Contaminant Sources for Ikluat Gift Shop - Volatile Organic Chemicals

Level of Risk Associated with the Highest Risk Sources

Next Highest Risk Sources(s)	4 Lows	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	

Chart 8. Vulnerability analysis for Ikluat Gift Shop – Volatile Organic Chemicals