Source Water Assessment -
Rabbit Creek Rifle Range
Anchorage, Alaska

Hydrogeologic Susceptibility and Vulnerability Analysis

DRINKING WATER PROTECTION PROGRAM REPORT 22

August 2001

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ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION: 2001

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Source Water Assessment for Rabbit Creek Rifle Range's Source of Public Drinking Water, Anchorage, Alaska

Hydrogeologic Susceptibility and Vulnerability Analysis

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EXECUTIVE SUMMARY

Rabbit Creek Rifle Range's Public Water System is a Class B (transient/non-community) drinking water source consisting of one well. Identified potential and current sources of contaminants for Rabbit Creek Rifle Range include: activities associated with highways and roads, activities along recreation trails, septic systems and domestic wastewater collection systems, 118 acres of residential areas, and a public utility easement corridor containing a natural gas pipeline. These identified potential and existing sources of contamination are considered sources of bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals. Overall, Rabbit Creek Rifle Range's public water source received a vulnerability rating of **Low** for bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals.

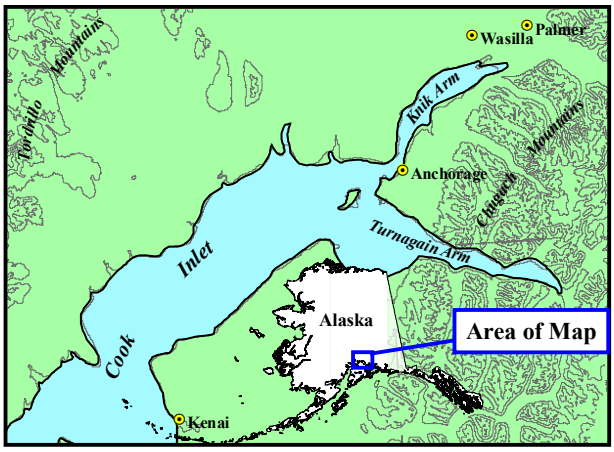

Figure 1. Index map showing the location of Anchorage, Alaska

INTRODUCTION

The purpose of this environmental assessment is to provide public water system owners and/or 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 Rabbit Creek Rifle Range's source of public drinking water. This source consists of one well in the Anchorage 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 ANCHORAGE AREA, ALASKA

Location

Anchorage, located in southcentral Alaska, encompasses 1,698 square miles of land and 264 square miles of water. The area containing a majority of the urban development, commonly referred to as the Anchorage Bowl, encompasses approximately 180 square miles (*Partick, Brabets, and Glass, 1989*) and envelopes the low lands of the area. This area is bounded on the east by the Chugach Mountains and the north, west, and south by the Knik and Turnagain Arms of Cook Inlet (Figure 1). In recent times, urban development has extended eastward along the flanks of the Chugach Mountains. This area, known locally as the Anchorage Hillside, contains development at elevations exceeding 3,700 feet in elevation above sea level.

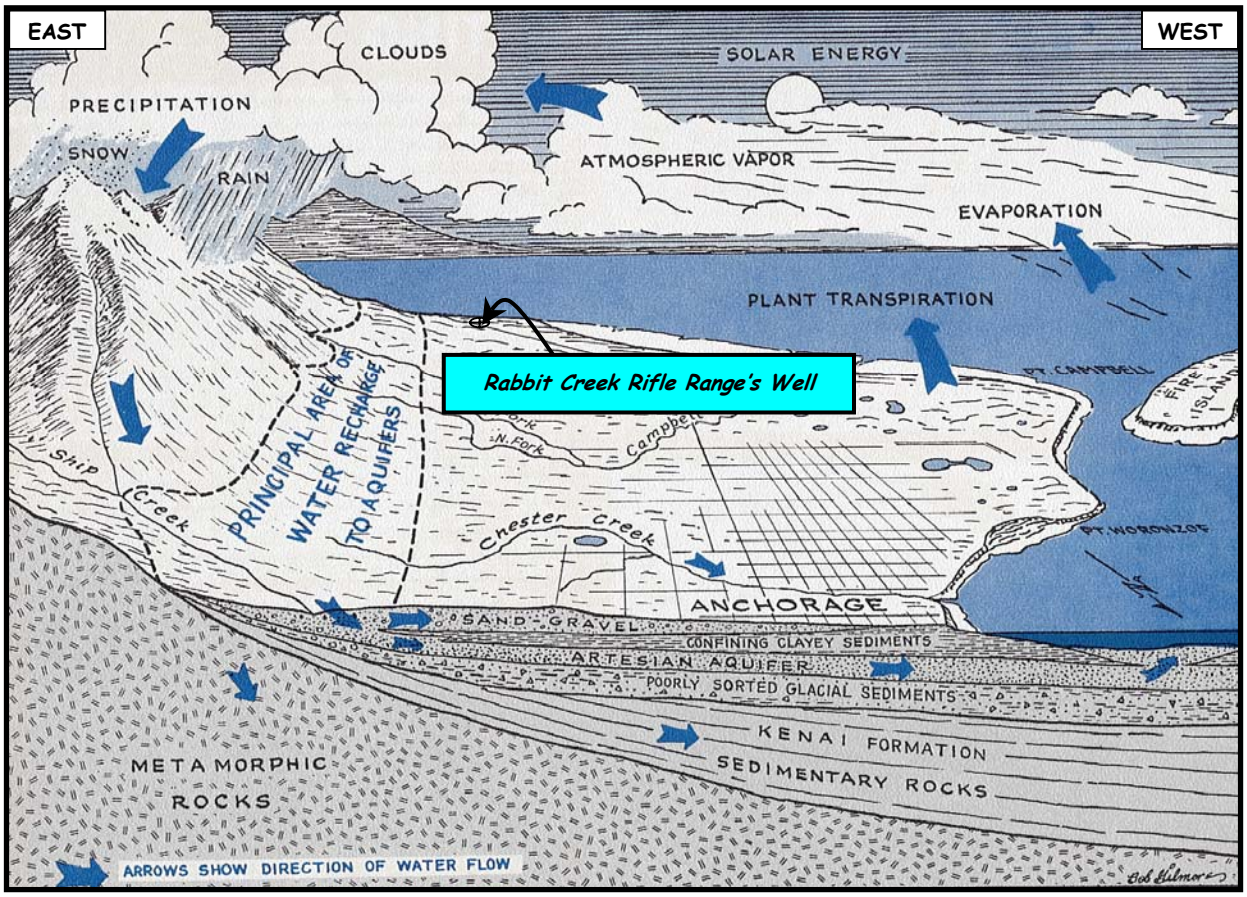

Figure 2. Generalized hydrologic cycle in the Anchorage area [*Barnwell, George, Dearborn,Weeks, and Zenone*, 1972].

Climate

The Anchorage 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 amounts of precipitation typified by gulf coast regions. Mean annual precipitation at the Anchorage International Airport is approximately 16 inches per year. On the average, Anchorage receives a total snow accumulation of 69 inches per year. Precipitation generally increases inland toward the Chugach Mountains where annual precipitation may exceed 160 inches per year [*Barnwell, George, Dearborn, Weeks, and Zenone*, 1972]. Mean daily temperature ranges from 65^{o} F during July to 8^{o} F in January [*Western Regional Climate Center*, 2000].

Physiography and Groundwater Conditions

Surface elevations in the Anchorage area range from sea level at the Knik and Turnagain Arms to well over 5,000 feet in the peaks that bound the area. Glacial moraine and outwash deposits primarily mantle the surface of the Anchorage Bowl.

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

In the Anchorage area, two principal groundwater flow systems or aquifers exist (see Figure 2). 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) [*Ulery and Updike*, 1983]. 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 270 feet thick throughout the Anchorage area and generally thins with increasing distance from Cook Inlet, thus pinching out at the mountain front [*Patrick, Brabets, and Glass*, 1989].

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 snowmelt also enters the sediments. This area along the mountain front is considered the principal recharge area

for wells in the Anchorage area. Precipitation in the low lands may also percolate directly into the ground. Lastly, aquifers may also be recharged by streams where surface water percolates into surrounding permeable sediments (losing reaches of streams). Groundwater flow in the confined aquifer is generally east to west from the mountain front toward Cook Inlet, except in areas where the direction of flow is influenced by large municipal or industrial production wells. 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.

RABBIT CREEK RIFLE RANGE'S PUBLIC DRINKING WATER SOURCE

Rabbit Creek Rifle Range's public water source is a Class B (transient/non-community) water system, which is owned by and operated by Rabbit Creek Rifle Range. The source consists of one well near the base of the Chugach Mountains and is less than 100 feet above sea level. The well is located approximately 280 feet west of the Seward Highway (see Figure 3). According to the well log, Rabbit Creek Rifle Range's well is grouted. However, the depth of grouting is not indicated on the well log. The well penetrates gravelly silt and cobbles, to a total depth of 60 feet below land surface. The well is screened from 56 to 60 feet below land surface and had a static water level at the land surface at the time of drilling (8/2/97).

Rabbit Creek Rifle Range's water system operates year round and serves approximately 25 transients and non-residents through one service connection.

ASSESSMENT AND PROTECTION AREA FOR RABBIT CREEK RIFLE RANGE'S DRINKING WATER SOURCE

The Drinking Water Protection and Assessment Area that has been established for Rabbit Creek Rifle Range 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. The 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.

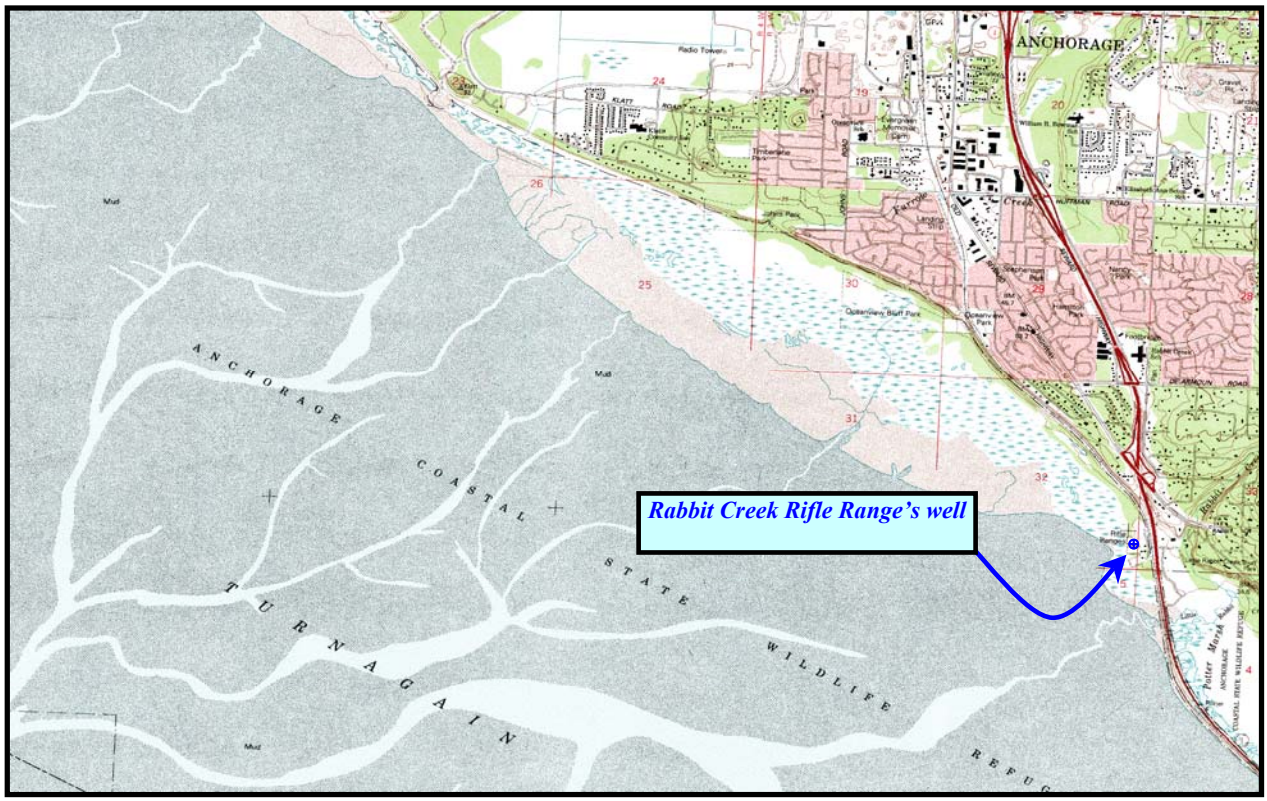

Figure 3. Map showing the location of the drinking water source for Rabbit Creek Rifle Range [Base: USGS Anchorage A8 SW].

Conceptually, groundwater enters the aquifer systems along the front range of the Chugach Mountains (Figure 2) and flows toward Turnagain Arm. 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 the U.S. Geological Survey (*Patrick, Brabets, and Glass, 1989*). This analytical calculation was used as a guide as the first step in establishing the protection area for Rabbit Creek Rifle Range's drinking water source. 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 Rabbit Creek Rifle Range contains four zones, Zone A through Zone D (See Map 1 in Appendix A). 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.

Zone B corresponds to a time-of-travel of less than two years. Zones C through D correspond to those areas between 5 years and 10 years time-of-travel, respectively.

INVENTORY OF POTENTIAL AND EXISTING CONTAMINANT SOURCES

The Drinking Water Protection Program has completed an inventory of potential and existing sources of contamination within Rabbit Creek Rifle Range's Drinking Water Protection Area. This survey was completed through a search of agency records and other publicly available information.

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.

Maps 2 through 5 in Appendix C depicts the Contaminant Source Inventory for Rabbit Creek Rifle Range. Inventoried potential sources of contamination within Zones A through D were activities associated with railroad corridors, highways and roads, motor vehicle storage areas, septic systems and sewer lines, residential areas, and recreational type activities along trails and Rabbit Creek Rifle Range (see Table 1 in Appendix B). Below is a summary of the contaminant sources inventoried within Rabbit Creek Rifle Range's protection area:

- Railroad corridors;
- highways and roads
- motor vehicle storage areas;
- septic systems and sewer lines;
- residential areas;
- recreation trails and parks (Rabbit Creek Rifle Range).

These potential contaminant sources present risk for all three categories of drinking water contaminants for Rabbit Creek Rifle Range's 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 RABBIT CREEK RIFLE RANGE'S 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 have been analyzed and an overall vulnerability score of 0 to 100 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)

Rabbit Creek Rifle Range's well penetrates layers of silt (confining unit) mixed with some sand and gravel, which may provide a protective barrier against the movement of contaminants in the subsurface. However, near the base of the Chugach Mountains, these 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 appears to be grouted although the depth of grouting is not indicated on the well log. However, static water level was at the land surface at the time of drilling, suggesting a strong component of upward flow in the aquifer as ground water discharges to Turnagain Arm. Therefore, both grouting coupled with the groundwater conditions may be sufficient in preventing contaminants from entering the source aquifer close to the well and 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 of the well to contamination (See Appendix D). Table 1 shows the overall Susceptibility score and rating for Rabbit Creek Rifle Range.

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

	Score	Rating
Susceptibility of the Wellhead	0	Low
Susceptibility of the Aquifer	14	Medium
Natural Susceptibility	14	Low

Contaminant risks to a drinking water source depend on the type, number or density, and distribution of contaminant sources. The railroad corridor sewer lines and septic systems, highways and roads and motor vehicle storage facilities contribute the highest risk for potential contamination to Rabbit Creek Rifle Range'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 through Table 4 summarizes the Contaminant Risks for each category of drinking water contaminants.

Table 2. Contaminant Risks

Contaminant Risks	Score	Rating
Bacteria and Viruses	22	Medium
Nitrates and/or Nitrites	22	Medium
Volatile Organic Chemicals	25	Medium

Appendix D contains eight charts, which together form the 'Vulnerability Analysis' for a source water assessment for a Class B 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 three categories of drinking water contaminants (See Appendix D). Note: scores are rounded off to the nearest five.

Table 3. Overall Vulnerability of Rabbit Creek Rifle Range's Public Drinking Water Source to Contamination by Category

Category	Score	Rating
Bacteria and Viruses	35	Low
Nitrates and Nitrites	35	Low
Volatile Organic Chemicals	35	Low

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, and volatile organic chemicals, respectively.

The overall score for bacteria and viruses and nitrates and/or nitrites for Rabbit Creek Rifle Range's source water is low. Septic systems within the protection area drive the score for these contaminant categories.

Other low potential and existing sources of bacteria and viruses and nitrates and/or nitrites for Rabbit Creek Rifle Range's source waters include activities associated with recreation trails, highways and roads, sewer lines and residential areas.

The overall score for volatile organic chemicals for Rabbit Creek Rifle Range's drinking water source is low. Activities associated with the railroad corridor drive the score for volatile organic chemicals.

The railroad corridor intersects Zone A and is approximately 230 feet east of the well. An accidental release of fuel could enter the aquifer through the land surface and flow toward the well. The railroad corridor ranked as posing medium potential contaminant risks for volatile organic chemicals due to the potential of an accidental release of fuel along the railroad right-of-way.

Other low potential and existing sources of volatile organic chemicals for Rabbit Creek Rifle Range's source waters include the motor vehicle storage area intersecting Zones A and B, highways and roads, and the public utility easement/corridor intersecting Zone C

Other potential and existing contaminant sources for Rabbit Creek Rifle Range's source waters include activities associated with highways and roads within the protection area. Because roads do pose potential for fuel spills to occur, dirt and/or gravel roads are ranked as a very low potential sources of volatile organic chemicals along with bacteria and viruses and nitrates and/or nitrites. Rabbit Creek Rifle Range is also considered a potential source of contamination and ranked as a low potential contaminant source.

SUMMARY

A *Source Water Assessment* has been completed for Rabbit Creek Rifle Range's 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 Rabbit Creek Rifle Range 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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Barnwell, W.W., George, R.S., Dearborn, L.L., Weeks, J.B., and Zenone, C., 1972, Water for Anchorage: an atlas of the water resources of the Anchorage area, Alaska: U.S. Geological Survey Open-File Report, 76 p.

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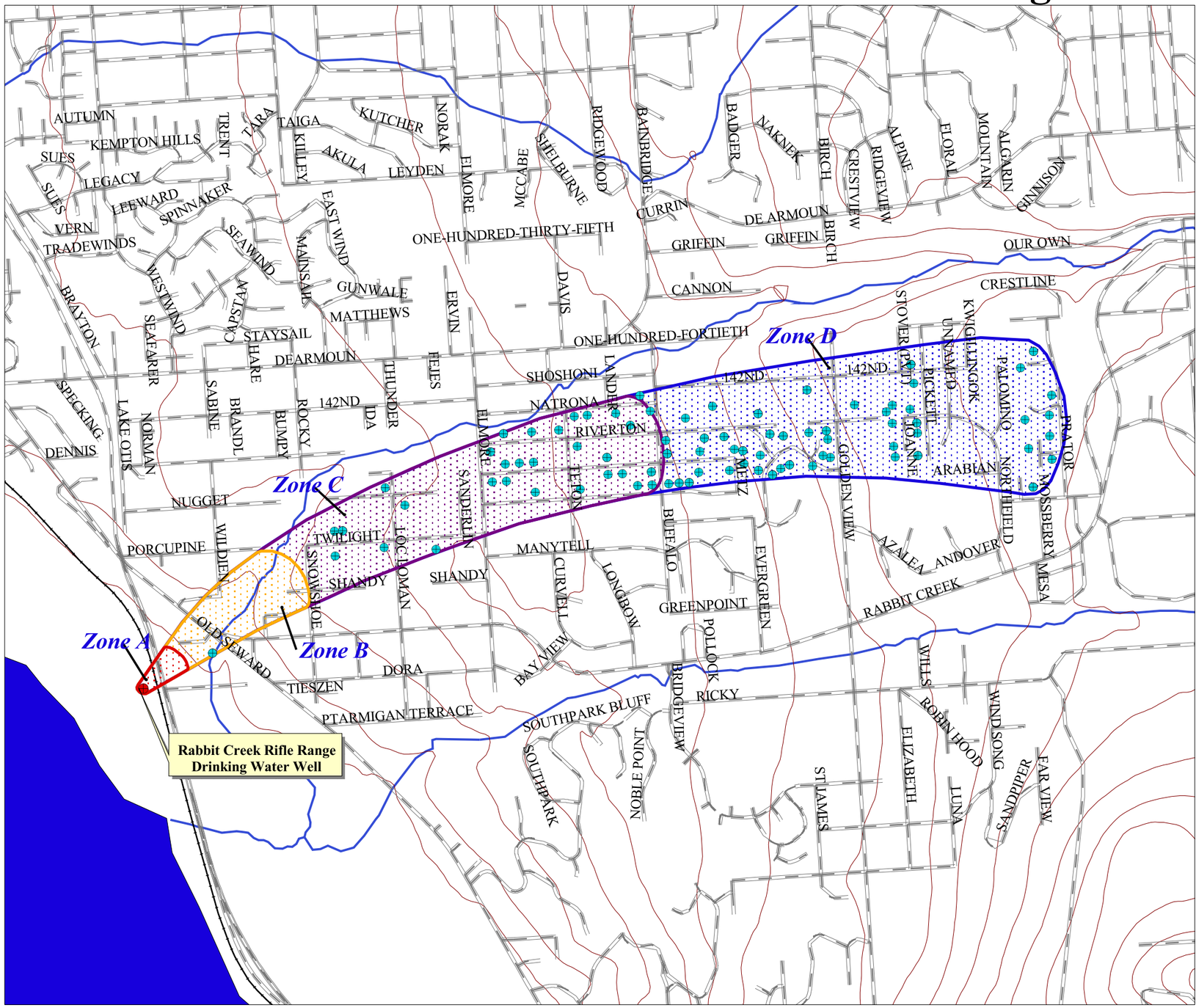
APPENDIX A

Rabbit Creek Rifle Range's
Drinking Water Protection Area

Drinking Water Protection Areas for Rabbit Creek Rifle Range



- Drinking Water Well
- Public and Private Wells

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

Zone D Protection Area
- Less Than 10 Years Travel Time

- Anchorage Roads
- Anchorage Railroad
- Elevation Contours
- Anchorage Streams
- Turnagain Arm

3000 0 3000 6000 Feet

N W E S

PWSID 218554.001

Map 1

APPENDIX B

Contaminant Source Inventory and Risk Ranking for Rabbit Creek Rifle Range

Table 1

Contaminant Source Inventory for Rabbit Creek Rifle Range

PWSID 218554.001

Contaminant Source Type	Contaminant Source ID	CS ID Tag	Zone	Location	Map Number	Notes/Comments
Residential Areas	R1	R1-1	A	All residential areas located within Zone A	3	
Septic systems (serves one single-family home)	R2	R2-1	A	Off of New seward Highway	3	
Septic systems (serves one single-family home)	R2	R2-2	A	Off of New seward Highway	3	
Septic systems (serves one single-family home)	R2	R2-3	A	Off of New seward Highway	3	
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	New Seward Highways	2	
Motor vehicle/general storage yards/facilities	X27	X27-1	A	Off of New Seward Highways	2	
Rail corridors	X30	X30-1	A	Alaska Railroad intersecting Zone A	2	
Municipal or city parks (with green areas)	X4	X4-1	A	Rabbit Creek Rifle Range	2	
Dog walking areas/foot trails	X46	X46-1	A	Trail intersecting Zone A	2	
Domestic wastewater collection systems (sewer lines or lift stations)	D1	D1-1	B	Sewer lines along Rabbit Creek Road	2	
Domestic wastewater collection systems (sewer lines or lift stations)	D1	D1-2	B	Sewer lines along Rabbit Creek Road	2	
Domestic wastewater collection systems (sewer lines or lift stations)	D1	D1-3	B	between Rabbit Creek Road and Davidson	2	
Domestic wastewater collection systems (sewer lines or lift stations)	D1	D1-4	B	Sewer line along Davidson Drive	2	
Residential Areas	R1	R1-2	B	All residentail areas located within Zone B	3	
Septic systems (serves one single-family home)	R2	R2-10	B	Off of One-Hundred-Fifty-First Ave.	3	
Septic systems (serves one single-family home)	R2	R2-11	B	Off of One-Hundred-Fifty-First Ave.	3	
Septic systems (serves one single-family home)	R2	R2-12	B	Off of One-Hundred-Fifty-First Ave.	3	
Septic systems (serves one single-family home)	R2	R2-13	B	Off of One-Hundred-Fifthieth Ave.	3	
Septic systems (serves one single-family home)	R2	R2-14	B	Off of One-Hundred-Fifthieth Ave.	3	

Septic systems (serves one single-family home)	R2	R2-15	B	Off of One-Hundred-Fifty-First Ave.	3	
Septic systems (serves one single-family home)	R2	R2-16	B	Off of Weldien Drive	3	
Septic systems (serves one single-family home)	R2	R2-17	B	Off of Porcupine Trail	3	
Septic systems (serves one single-family home)	R2	R2-18	B	Off of Porcupine Trail	3	
Septic systems (serves one single-family home)	R2	R2-19	B	Off of Snowshoe Lane	3	
Septic systems (serves one single-family home)	R2	R2-20	B	Off of Snowshoe Lane	3	
Septic systems (serves one single-family home)	R2	R2-21	B	Off of Snowshoe Lane	3	
Septic systems (serves one single-family home)	R2	R2-4	B	Off of Chenoweth Street	3	
Septic systems (serves one single-family home)	R2	R2-5	B	Off of Chenoweth Street	3	
Septic systems (serves one single-family home)	R2	R2-6	B	Off of Chenoweth Street	3	
Septic systems (serves one single-family home)	R2	R2-7	B	Off of Weldien Drive	3	
Septic systems (serves one single-family home)	R2	R2-8	B	Off of Weldien Drive	3	
Septic systems (serves one single-family home)	R2	R2-9	B	Off of Weldien Drive	3	
Highways and roads, paved (cement or asphalt)	X20	X20-2	B	Chenoweth Street	2	
Highways and roads, paved (cement or asphalt)	X20	X20-3	B	Old Seward Highway	2	
Highways and roads, paved (cement or asphalt)	X20	X20-4	B	Trail along Rabbit Creek Road	2	
Highways and roads, paved (cement or asphalt)	X20	X20-5	B	Wildien Drive	2	
Highways and roads, paved (cement or asphalt)	X20	X20-6	B	Wildien Drive	2	
Highways and roads, paved (cement or asphalt)	X20	X20-7	B	Davidson Drive	2	
Highways and roads, paved (cement or asphalt)	X20	X20-8	B	One-Hundred-Fifty-First Ave.	2	

Highways and roads, paved (cement or asphalt)	X20	X20-9	B	One-Hundred-Fiftieth Ave.	2	
Dog walking areas/foot trails	X46	X46-2	B	Trail intersecting Zone B	2	
Dog walking areas/foot trails	X46	X46-3	B	Trail along Old Seward Highway	2	
Dog walking areas/foot trails	X46	X46-4	B	Trail along Rabbit Creek	2	
Dog walking areas/foot trails	X46	X46-5	B	Trail intersecting Zone B	2	
Residential Areas	R1	R1-3	C	All residential areas located withiin Zone C	4	
Septic systems (serves one single-family home)	R2	R2-22-158	C	All septic systems located within Zone C	4	
Highways and roads, paved (cement or asphalt)	X20	X20-10-21	C	All roads located within Zone C	4	
Municipal or city parks (with green areas)	X4	X4-2	C	Near Rabbit Creek	4	
Public utility easements/corridors	X42	X42-1	C	Along natural gas pipeline	4	
Dog walking areas/foot trails	X46	X46-6-10	C	All trails located within Zone C	4	

Table 2

Contaminant Source Inventory and Risk Ranking for Rabbit Creek Rifle Range Sources of Bacteria and Viruses

PWSID 218554.001

Contaminant Source Type	Contaminant Source ID	CS ID Tag	Zone	Risk Ranking for Analysis	Overall Rank After Analysis	Location	Map Number	Comments
Septic systems (serves one single-family home)	R2	R2-1	A	Very Low	1	Off of New seward Highway	3	
Septic systems (serves one single-family home)	R2	R2-2	A	Very Low	2	Off of New seward Highway	3	
Septic systems (serves one single-family home)	R2	R2-3	A	Very Low	3	Off of New seward Highway	3	
Septic systems (serves one single-family home)	R2	R2-4	B	Very Low	4	Off of Chenoweth Street	3	
Septic systems (serves one single-family home)	R2	R2-5	B	Very Low	5	Off of Chenoweth Street	3	
Septic systems (serves one single-family home)	R2	R2-6	B	Very Low	6	Off of Chenoweth Street	3	
Domestic wastewater collection systems (sewer lines or lift stations)	D1	D1-1	B	Medium	7	Sewer lines along Rabbit Creek Road	2	
Domestic wastewater collection systems (sewer lines or lift stations)	D1	D1-2	B	Medium	8	Sewer lines along Rabbit Creek Road	2	
Domestic wastewater collection systems (sewer lines or lift stations)	D1	D1-3	B	Medium	9	between Rabbit Creek Road and Davidson	2	
Domestic wastewater collection systems (sewer lines or lift stations)	D1	D1-4	B	Medium	10	Sewer line along Davidson Drive	2	
Residential Areas	R1	R1-1	A	Low		All residential areas located within Zone A	3	
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Very Low		New Seward Highways	2	
Municipal or city parks (with green areas)	X4	X4-1	A	Low		Rabbit Creek Rifle Range	2	
Dog walking areas/foot trails	X46	X46-1	A	Low		Trail intersecting Zone A	2	
Residential Areas	R1	R1-2	B	Low		All residentail areas located within Zone B	3	
Septic systems (serves one single-family home)	R2	R2-10	B	Very Low		Off of One-Hundred-Fifty-First Ave.	3	
Septic systems (serves one single-family home)	R2	R2-11	B	Very Low		Off of One-Hundred-Fifty-First Ave.	3	
Septic systems (serves one single-family home)	R2	R2-12	B	Very Low		Off of One-Hundred-Fifty-First Ave.	3	
Septic systems (serves one single-family home)	R2	R2-13	B	Very Low		Off of One-Hundred-Fifthieth Ave.	3	
Septic systems (serves one single-family home)	R2	R2-14	B	Very Low		Off of One-Hundred-Fifthieth Ave.	3	

Septic systems (serves one single-family home)	R2	R2-15	B	Very Low		Off of One-Hundred-Fifty-First Ave.	3	
Septic systems (serves one single-family home)	R2	R2-16	B	Very Low		Off of Weldien Drive	3	
Septic systems (serves one single-family home)	R2	R2-17	B	Very Low		Off of Porcupine Trail	3	
Septic systems (serves one single-family home)	R2	R2-18	B	Very Low		Off of Porcupine Trail	3	
Septic systems (serves one single-family home)	R2	R2-19	B	Very Low		Off of Snowshoe Lane	3	
Septic systems (serves one single-family home)	R2	R2-20	B	Very Low		Off of Snowshoe Lane	3	
Septic systems (serves one single-family home)	R2	R2-21	B	Very Low		Off of Snowshoe Lane	3	
Septic systems (serves one single-family home)	R2	R2-7	B	Very Low		Off of Weldien Drive	3	
Septic systems (serves one single-family home)	R2	R2-8	B	Very Low		Off of Weldien Drive	3	
Septic systems (serves one single-family home)	R2	R2-9	B	Very Low		Off of Weldien Drive	3	
Highways and roads, paved (cement or asphalt)	X20	X20-2	B	Very Low		Chenoweth Street	2	
Highways and roads, paved (cement or asphalt)	X20	X20-3	B	Very Low		Old Seward Highway	2	
Highways and roads, paved (cement or asphalt)	X20	X20-4	B	Very Low		Trail along Rabbit Creek Road	2	
Highways and roads, paved (cement or asphalt)	X20	X20-5	B	Very Low		Wildien Drive	2	
Highways and roads, paved (cement or asphalt)	X20	X20-6	B	Very Low		Wildien Drive	2	
Highways and roads, paved (cement or asphalt)	X20	X20-7	B	Very Low		Davidson Drive	2	
Highways and roads, paved (cement or asphalt)	X20	X20-8	B	Very Low		One-Hundred-Fifty-First Ave.	2	
Highways and roads, paved (cement or asphalt)	X20	X20-9	B	Very Low		One-Hundred-Fiftieth Ave.	2	
Dog walking areas/foot trails	X46	X46-2	B	Low		Trail intersecting Zone B	2	
Dog walking areas/foot trails	X46	X46-3	B	Very Low		Trail along Old Seward Highway	2	
Dog walking areas/foot trails	X46	X46-4	B	Low		Trail along Rabbit Creek	2	
Dog walking areas/foot trails	X46	X46-5	B	Low		Trail intersecting Zone B	2	

Residential Areas	R1	R1-3	C	Low		All residential areas located withiin Zone C	4	
Septic systems (serves one single-family home)	R2	R2-22-158	C	Very Low		All septic systems located within Zone C	4	
Highways and roads, paved (cement or asphalt)	X20	X20-10-21	C	Very Low		All roads located within Zone C	4	
Municipal or city parks (with green areas)	X4	X4-2	C	Low		Near Rabbit Creek	4	
Dog walking areas/foot trails	X46	X46-6-10	C	Low		All trails located within Zone C	4	

Table 3

Contaminant Source Inventory and Risk Ranking for
Rabbit Creek Science Center
Sources of Nitrates/Nitrites

PWSID 218554.001

Contaminant Source Type	Contaminant Source ID	CS ID Tag	Zone	Risk Ranking for Analysis	Overall Rank After Analysis	Location	Map Number	Comments
Septic systems (serves one single-family home)	R2	R2-1	A	Very Low	1	Off of New seward Highway	3	
Septic systems (serves one single-family home)	R2	R2-2	A	Very Low	2	Off of New seward Highway	3	
Septic systems (serves one single-family home)	R2	R2-3	A	Very Low	3	Off of New seward Highway	3	
Septic systems (serves one single-family home)	R2	R2-4	B	Very Low	4	Off of Chenoweth Street	3	
Septic systems (serves one single-family home)	R2	R2-5	B	Very Low	5	Off of Chenoweth Street	3	
Septic systems (serves one single-family home)	R2	R2-6	B	Very Low	6	Off of Chenoweth Street	3	
Domestic wastewater collection systems (sewer lines or lift stations)	D1	D1-1	B	Medium	7	Sewer lines along Rabbit Creek Road	2	
Domestic wastewater collection systems (sewer lines or lift stations)	D1	D1-2	B	Medium	8	Sewer lines along Rabbit Creek Road	2	
Domestic wastewater collection systems (sewer lines or lift stations)	D1	D1-3	B	Medium	9	between Rabbit Creek Road and Davidson	2	
Domestic wastewater collection systems (sewer lines or lift stations)	D1	D1-4	B	Medium	10	Sewer line along Davidson Drive	2	
Residential Areas	R1	R1-1	A	Low		All residential areas located within Zone A	3	
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Very Low		New Seward Highways	2	
Municipal or city parks (with green areas)	X4	X4-1	A	Low		Rabbit Creek Rifle Range	2	
Dog walking areas/foot trails	X46	X46-1	A	Low		Trail intersecting Zone A	2	
Residential Areas	R1	R1-2	B	Low		All residentail areas located within Zone B	3	
Septic systems (serves one single-family home)	R2	R2-21	B	Very Low		Off of Snowshoe Lane	3	
Septic systems (serves one single-family home)	R2	R2-17	B	Very Low		Off of Porcupine Trail	3	
Septic systems (serves one single-family home)	R2	R2-18	B	Very Low		Off of Porcupine Trail	3	
Septic systems (serves one single-family home)	R2	R2-13	B	Very Low		Off of One-Hundred-Fifthieth Ave.	3	
Septic systems (serves one single-family home)	R2	R2-16	B	Very Low		Off of Weldien Drive	3	

Septic systems (serves one single-family home)	R2	R2-15	B	Very Low		Off of One-Hundred-Fifty-First Ave.	3	
Septic systems (serves one single-family home)	R2	R2-19	B	Very Low		Off of Snowshoe Lane	3	
Septic systems (serves one single-family home)	R2	R2-11	B	Very Low		Off of One-Hundred-Fifty-First Ave.	3	
Septic systems (serves one single-family home)	R2	R2-10	B	Very Low		Off of One-Hundred-Fifty-First Ave.	3	
Septic systems (serves one single-family home)	R2	R2-8	B	Very Low		Off of Weldien Drive	3	
Septic systems (serves one single-family home)	R2	R2-9	B	Very Low		Off of Weldien Drive	3	
Septic systems (serves one single-family home)	R2	R2-7	B	Very Low		Off of Weldien Drive	3	
Septic systems (serves one single-family home)	R2	R2-14	B	Very Low		Off of One-Hundred-Fifthieth Ave.	3	
Septic systems (serves one single-family home)	R2	R2-12	B	Very Low		Off of One-Hundred-Fifty-First Ave.	3	
Septic systems (serves one single-family home)	R2	R2-20	B	Very Low		Off of Snowshoe Lane	3	
Highways and roads, paved (cement or asphalt)	X20	X20-7	B	Very Low		Davidson Drive	2	
Highways and roads, paved (cement or asphalt)	X20	X20-9	B	Very Low		One-Hundred-Fiftieth Ave.	2	
Highways and roads, paved (cement or asphalt)	X20	X20-8	B	Very Low		One-Hundred-Fifty-First Ave.	2	
Highways and roads, paved (cement or asphalt)	X20	X20-4	B	Very Low		Trail along Rabbit Creek Road	2	
Highways and roads, paved (cement or asphalt)	X20	X20-2	B	Very Low		Chenoweth Street	2	
Highways and roads, paved (cement or asphalt)	X20	X20-6	B	Very Low		Wildien Drive	2	
Highways and roads, paved (cement or asphalt)	X20	X20-5	B	Very Low		Wildien Drive	2	
Highways and roads, paved (cement or asphalt)	X20	X20-3	B	Very Low		Old Seward Highway	2	
Dog walking areas/foot trails	X46	X46-3	B	Very Low		Trail along Old Seward Highway	2	
Dog walking areas/foot trails	X46	X46-2	B	Low		Trail intersecting Zone B	2	
Dog walking areas/foot trails	X46	X46-5	B	Low		Trail intersecting Zone B	2	
Dog walking areas/foot trails	X46	X46-4	B	Low		Trail along Rabbit Creek	2	

Residential Areas	R1	R1-3	C	Low		All residential areas located withiin Zone C	4	
Septic systems (serves one single-family home)	R2	R2-22-158	C	Very Low		All septic systems located within Zone C	4	
Highways and roads, paved (cement or asphalt)	X20	X20-10-21	C	Very Low		All roads located within Zone C	4	
Municipal or city parks (with green areas)	X4	X4-2	C	Low		Near Rabbit Creek	4	
Dog walking areas/foot trails	X46	X46-6-10	C	Low		All trails located within Zone C	4	

Table 4

Contaminant Source Inventory and Risk Ranking for
Rabbit Creek Rifle Range
Sources of Volatile Organic Chemicals

PWSID 218554.001

Contaminant Source Type	Contaminant Source ID	CS ID Tag	Zone	Risk Ranking for Analysis	Overall Rank After Analysis	Location	Map Number	Comments
Rail corridors	X30	X30-1	A	Medium	1	Alaska Railroad intersecting Zone A	2	
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Very Low	2	New Seward Highways	2	
Motor vehicle/general storage yards/facilities	X27	X27-1	A	Low	3	Off of New Seward Highways	2	
Septic systems (serves one single-family home)	R2	R2-1	A	Very Low	4	Off of New seward Highway	3	
Septic systems (serves one single-family home)	R2	R2-2	A	Very Low	5	Off of New seward Highway	3	
Septic systems (serves one single-family home)	R2	R2-3	A	Very Low	6	Off of New seward Highway	3	
Septic systems (serves one single-family home)	R2	R2-4	B	Very Low	7	Off of Chenoweth Street	3	
Septic systems (serves one single-family home)	R2	R2-5	B	Very Low	8	Off of Chenoweth Street	3	
Septic systems (serves one single-family home)	R2	R2-6	B	Very Low	9	Off of Chenoweth Street	3	
Highways and roads, paved (cement or asphalt)	X20	X20-2	B	Very Low	10	Chenoweth Street	2	
Residential Areas	R1	R1-1	A	Low		All residential areas located within Zone A	3	
Domestic wastewater collection systems (sewer lines or lift stations)	D1	D1-4	B	Low		Sewer line along Davidson Drive	2	
Domestic wastewater collection systems (sewer lines or lift stations)	D1	D1-1	B	Low		Sewer lines along Rabbit Creek Road	2	
Domestic wastewater collection systems (sewer lines or lift stations)	D1	D1-3	B	Low		between Rabbit Creek Road and Davidson	2	
Domestic wastewater collection systems (sewer lines or lift stations)	D1	D1-2	B	Low		Sewer lines along Rabbit Creek Road	2	
Residential Areas	R1	R1-2	B	Low		All residentail areas located within Zone B	3	
Septic systems (serves one single-family home)	R2	R2-13	B	Very Low		Off of One-Hundred-Fifthieth Ave.	3	
Septic systems (serves one single-family home)	R2	R2-9	B	Very Low		Off of Weldien Drive	3	
Septic systems (serves one single-family home)	R2	R2-21	B	Very Low		Off of Snowshoe Lane	3	
Septic systems (serves one single-family home)	R2	R2-19	B	Very Low		Off of Snowshoe Lane	3	

Contaminant Source Inventory and Risk Ranking for
Rabbit Creek Rifle Range
Sources of Volatile Organic Chemicals

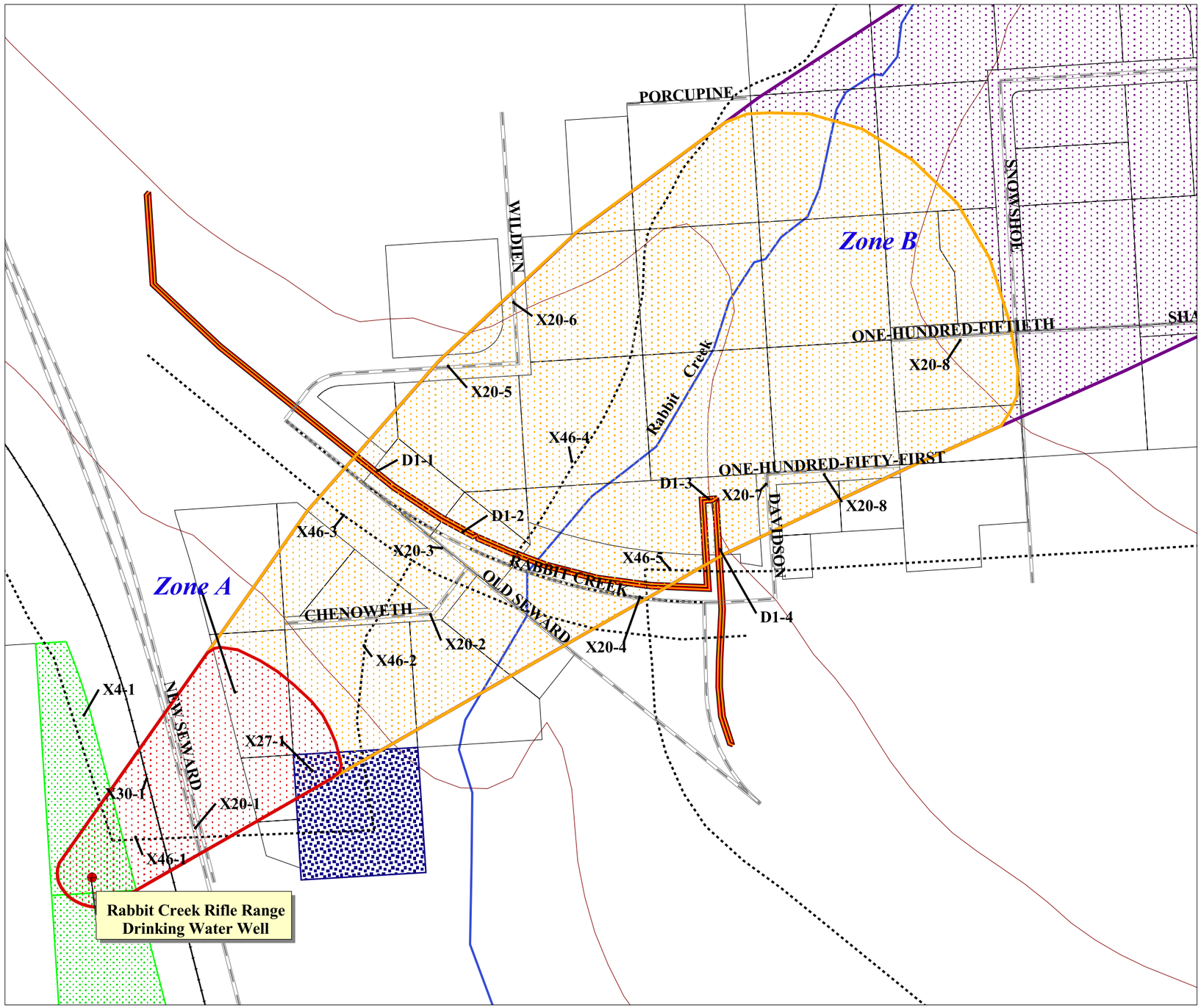
Septic systems (serves one single-family home)	R2	R2-7	B	Very Low		Off of Weldien Drive	3	
Septic systems (serves one single-family home)	R2	R2-8	B	Very Low		Off of Weldien Drive	3	
Septic systems (serves one single-family home)	R2	R2-15	B	Very Low		Off of One-Hundred-Fifty-First Ave.	3	
Septic systems (serves one single-family home)	R2	R2-20	B	Very Low		Off of Snowshoe Lane	3	
Septic systems (serves one single-family home)	R2	R2-16	B	Very Low		Off of Weldien Drive	3	
Septic systems (serves one single-family home)	R2	R2-12	B	Very Low		Off of One-Hundred-Fifty-First Ave.	3	
Septic systems (serves one single-family home)	R2	R2-17	B	Very Low		Off of Porcupine Trail	3	
Septic systems (serves one single-family home)	R2	R2-11	B	Very Low		Off of One-Hundred-Fifty-First Ave.	3	
Septic systems (serves one single-family home)	R2	R2-18	B	Very Low		Off of Porcupine Trail	3	
Septic systems (serves one single-family home)	R2	R2-10	B	Very Low		Off of One-Hundred-Fifty-First Ave.	3	
Septic systems (serves one single-family home)	R2	R2-14	B	Very Low		Off of One-Hundred-Fifthieth Ave.	3	
Highways and roads, paved (cement or asphalt)	X20	X20-3	B	Very Low		Old Seward Highway	2	
Highways and roads, paved (cement or asphalt)	X20	X20-4	B	Very Low		Trail along Rabbit Creek Road	2	
Highways and roads, paved (cement or asphalt)	X20	X20-9	B	Very Low		One-Hundred-Fiftieth Ave.	2	
Highways and roads, paved (cement or asphalt)	X20	X20-7	B	Very Low		Davidson Drive	2	
Highways and roads, paved (cement or asphalt)	X20	X20-5	B	Very Low		Wildien Drive	2	
Highways and roads, paved (cement or asphalt)	X20	X20-8	B	Very Low		One-Hundred-Fifty-First Ave.	2	
Highways and roads, paved (cement or asphalt)	X20	X20-6	B	Very Low		Wildien Drive	2	
Dog walking areas/foot trails	X46	X46-3	B	Very Low		Trail along Old Seward Highway	2	
Residential Areas	R1	R1-3	C	Low		All residential areas located withiin Zone C	4	
Septic systems (serves one single-family home)	R2	R2-22-158	C	Very Low		All septic systems located within Zone C	4	
Highways and roads, paved (cement or asphalt)	X20	X20-10-21	C	Very Low		All roads located within Zone C	4	

Public utility easements/corridors	X42	X42-1	C	Low		Dual purpose pipeline intersecting Zone C	4	transporting natural gas but has transported oil in the past.

APPENDIX C

Rabbit Creek Rifle Range's
Drinking Water Protection Area
and Potential & Existing Contaminant Sources

Drinking Water Protection Area for Rabbit Creek Rifle Range and Potential & Existing Contaminant Sources



- Drinking Water 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

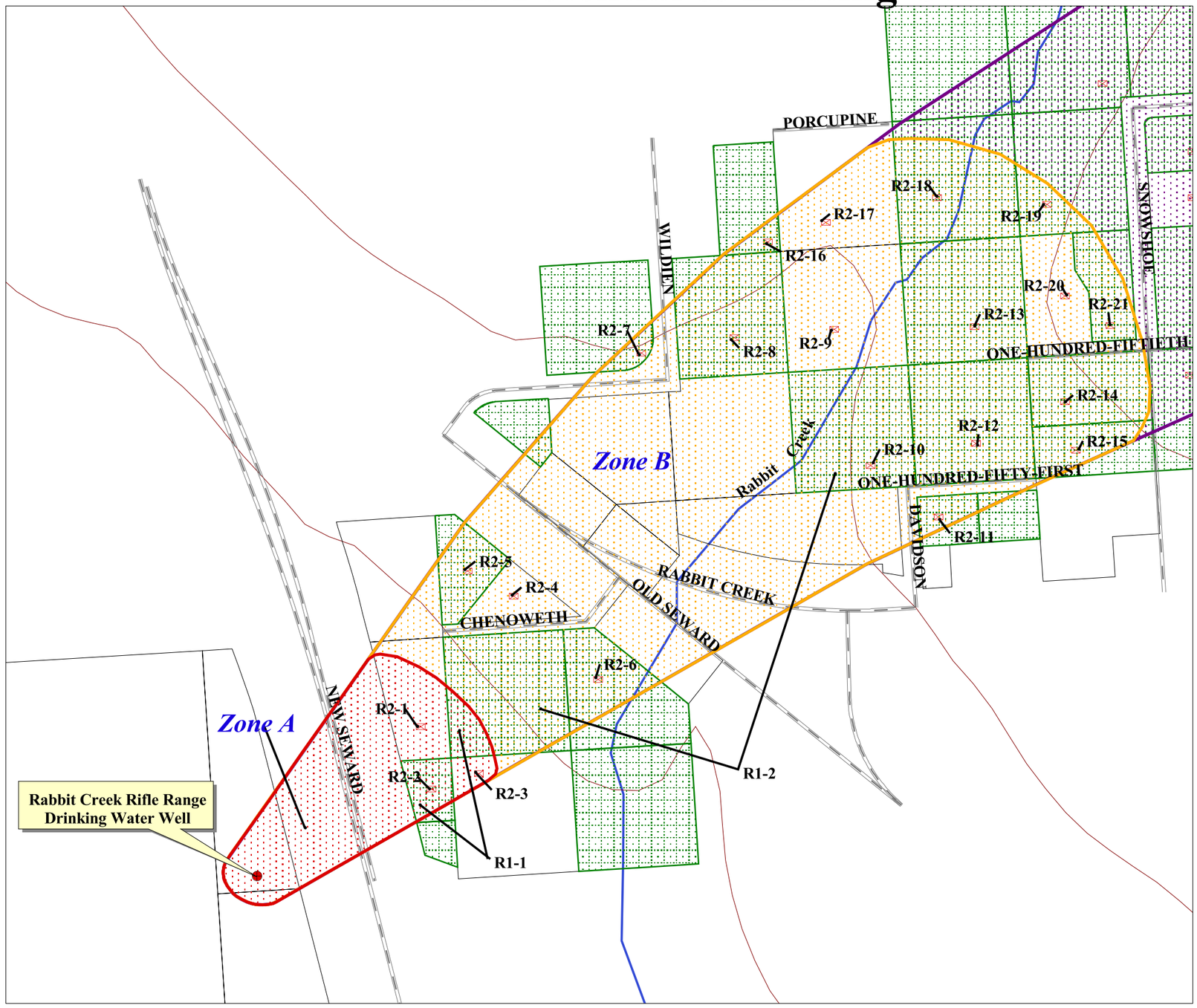
Zone D Protection Area
- Less Than 10 Years Travel Time
- Roads (X20)
- Trails (X46)
- Sewer Lines (D1)
- Anchorage Railroad (X30)
- Motor vehicle/general storage (X27)
- Anchorage Parks (X4)
- Anchorage Land Parcels
- Elevation Contours
- Anchorage Streams

N
W E
S

Map 2

PWSID 218554.001

Drinking Water Protection Area for Rabbit Creek Rifle Range and Potential & Existing Contaminant Sources



- Drinking Water 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

Zone D Protection Area
- Less Than 10 Years Travel Time
- Roads (X20)
- Lawns and gardens (R1)
- Septic Systems (R2)
- Anchorage Land Parcels
- Elevation Contours
- Anchorage Streams

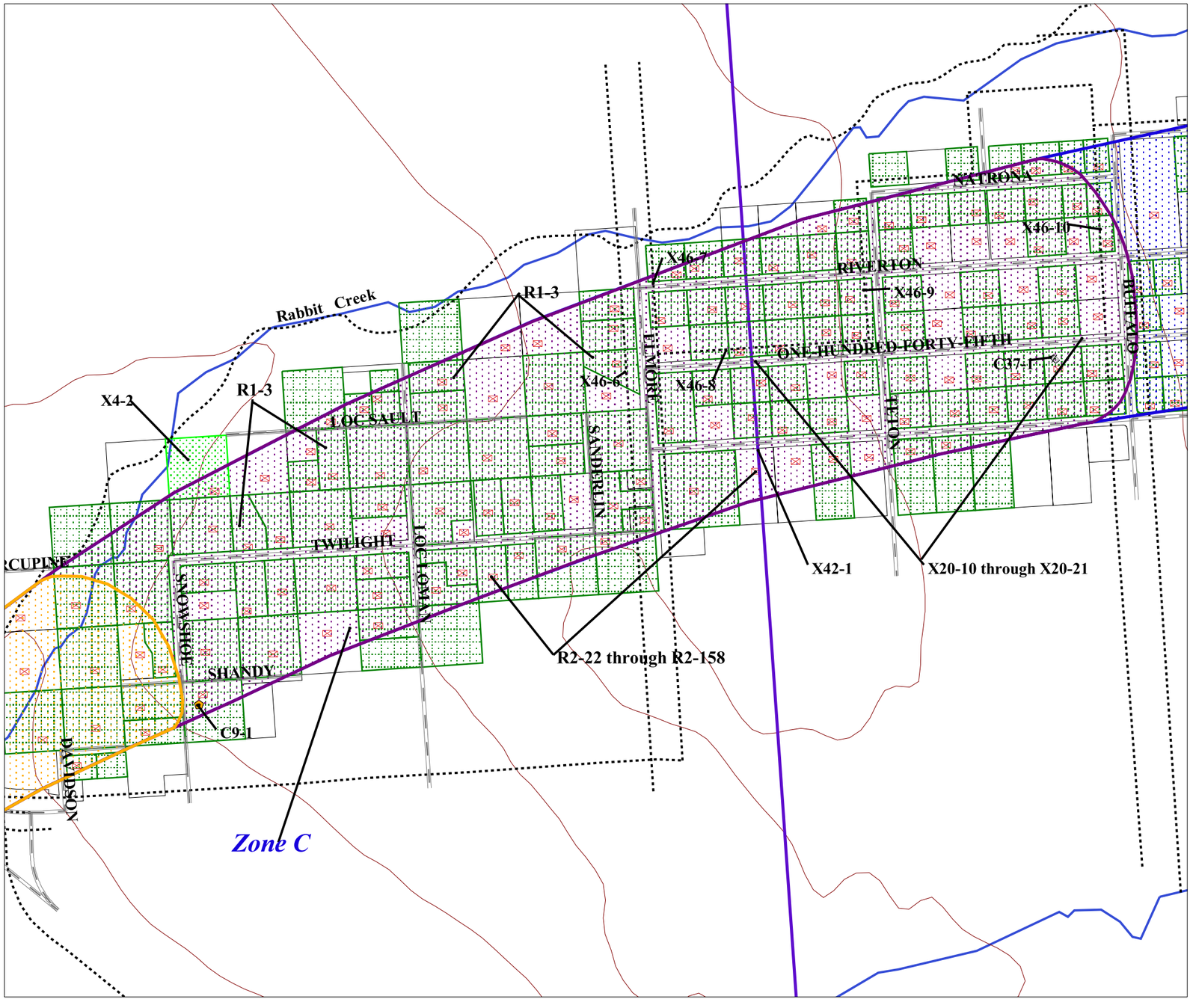
N
W E
S

500 0 500 1000 Feet

PWSID 218554.001

Map 3

Drinking Water Protection Area for Rabbit Creek Rifle Range and Potential & Existing Contaminant Sources



- Drinking Water 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

Zone D Protection Area
- Less Than 10 Years Travel Time
- Roads (X20)

Potential and Existing Contaminant Sources
- Printers, publishers, copiers (C37)
- Construction trade areas (C9)
- Lawns and gardens (R1)
- Public Utility Easements/Corridors (X42)
- Trails (X46)
- Septic Systems (R2)
- Anchorage Parks (X4)
- Anchorage Land Parcels
- Elevation Contours
- Anchorage Streams

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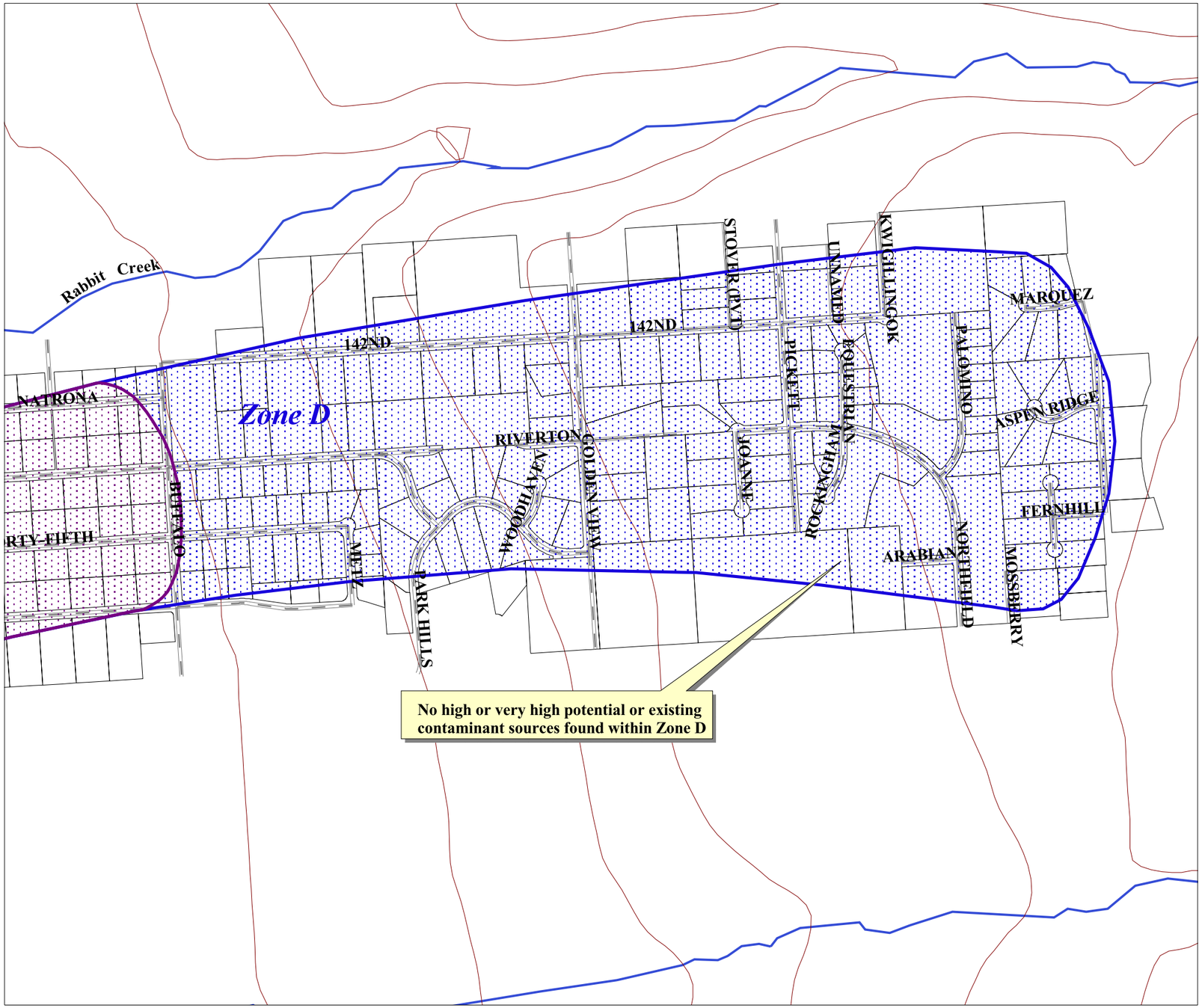
PWSID 218554.001

Map 4

Drinking Water Protection Area for Rabbit Creek Rifle Range and Potential & Existing Contaminant Sources



- Drinking Water 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

Zone D Protection Area
- Less Than 10 Years Travel Time
- Roads (X20)
- Anchorage Land Parcels
- Elevation Contours
- Anchorage Streams

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W E
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Map 5

PWSID 218554.001

APPENDIX D

Vulnerability Analysis for Rabbit Creek Rifle Range's Public Drinking Water Source

Chart 1. Susceptibility of the wellhead – Rabbit Creek Rifle Range

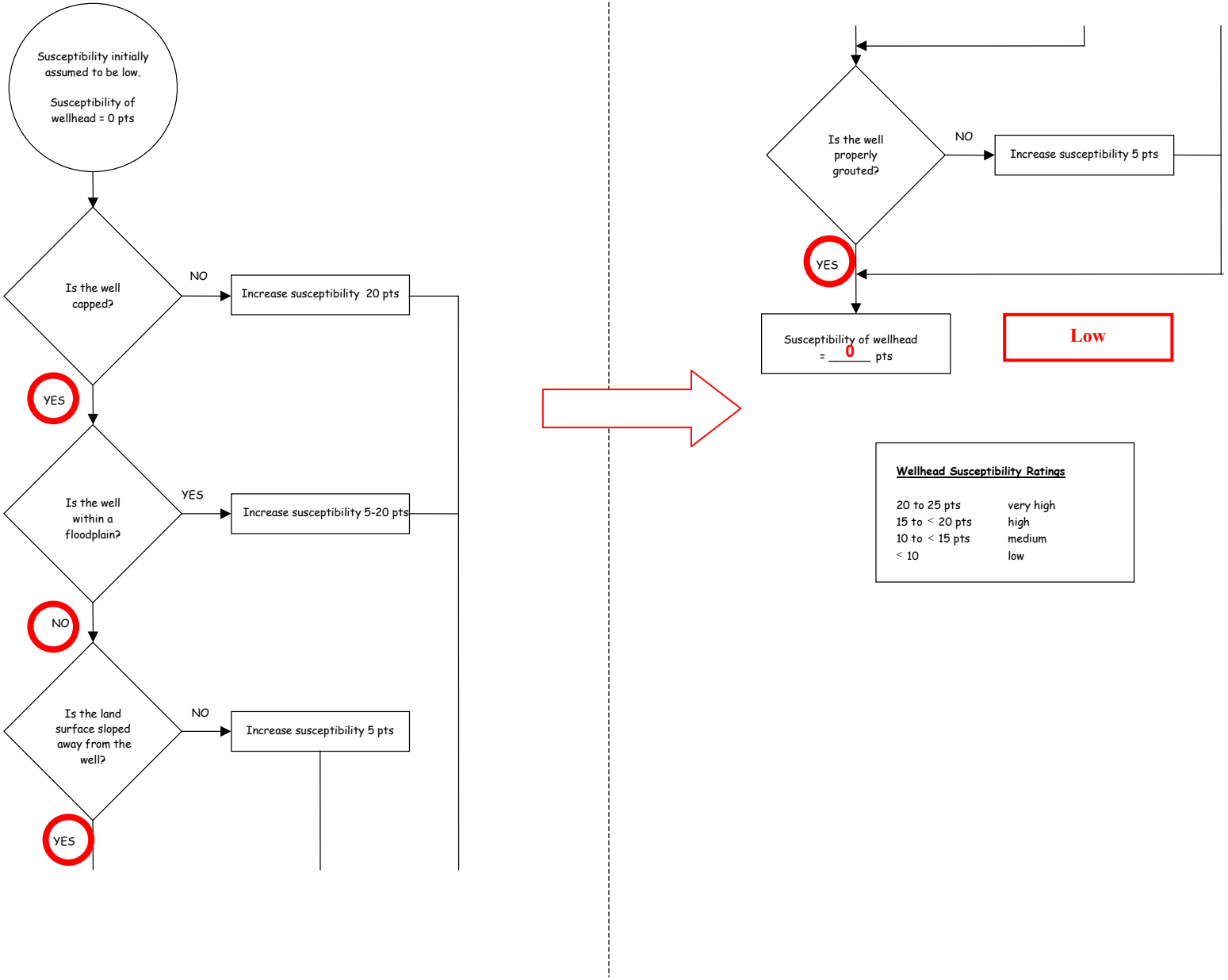
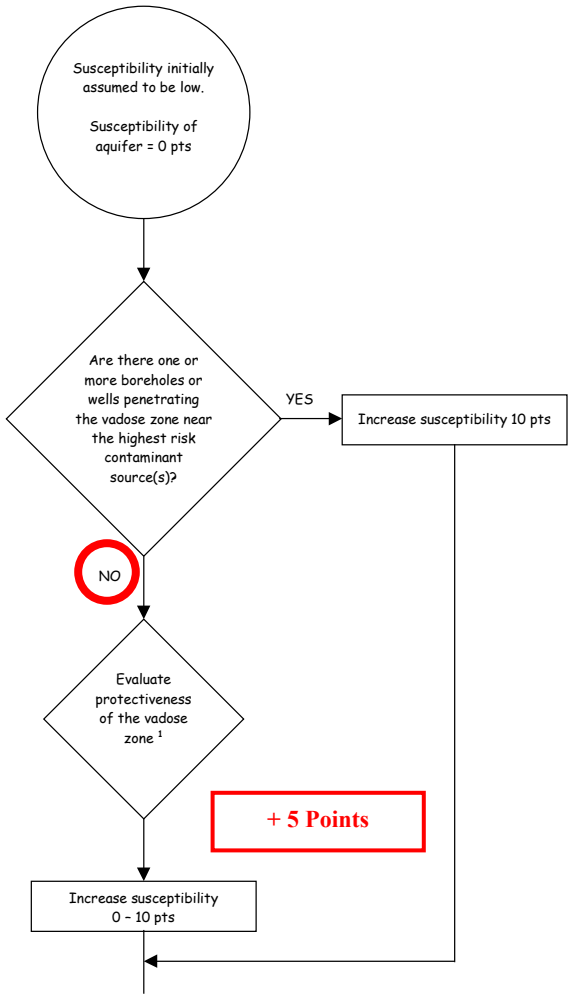
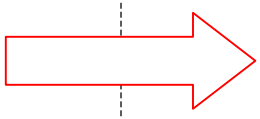
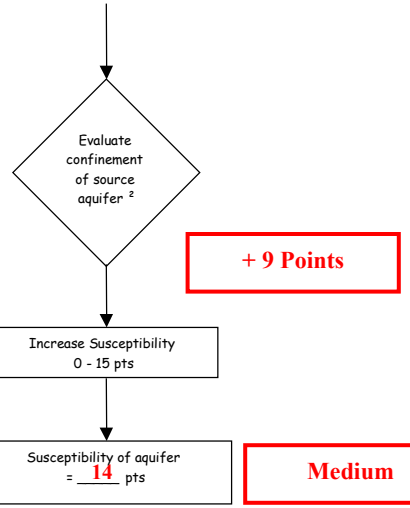


Chart 2. Susceptibility of the aquifer – Rabbit Creek Rifle Range







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 (20-30 inches per year, base of Chugach Mountains, and confining layer of silt – 16 feet)
6/10 =
3 Points

Depth to top of confining unit (52 feet) 3/10 =
2 Points

Protectiveness of the Vadose Zone Total = **5/10 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 (16 feet of silt)
10/15 =

7 Points

Density of boreholes/wells
4/15 = 2 Points

Degree of Confinement Total = **9/15 Points**

Aquifer Susceptibility Ratings

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

Medium

Chart 3. Contaminant risks for Rabbit Creek Rifle Range – Bacteria & Viruses

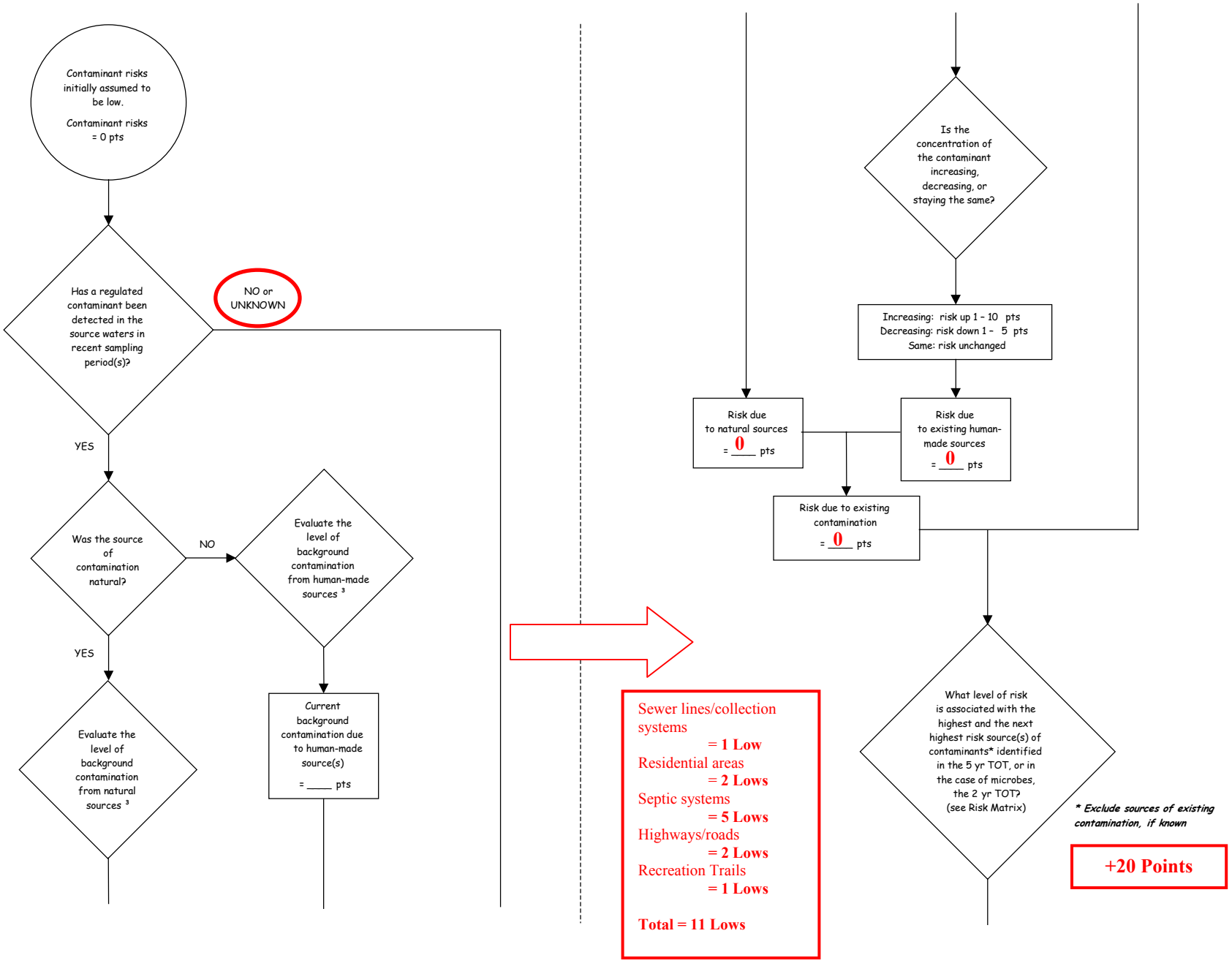


Chart 3. Contaminant risks for Rabbit Creek Rifle Range – Bacteria & Viruses (Continued)

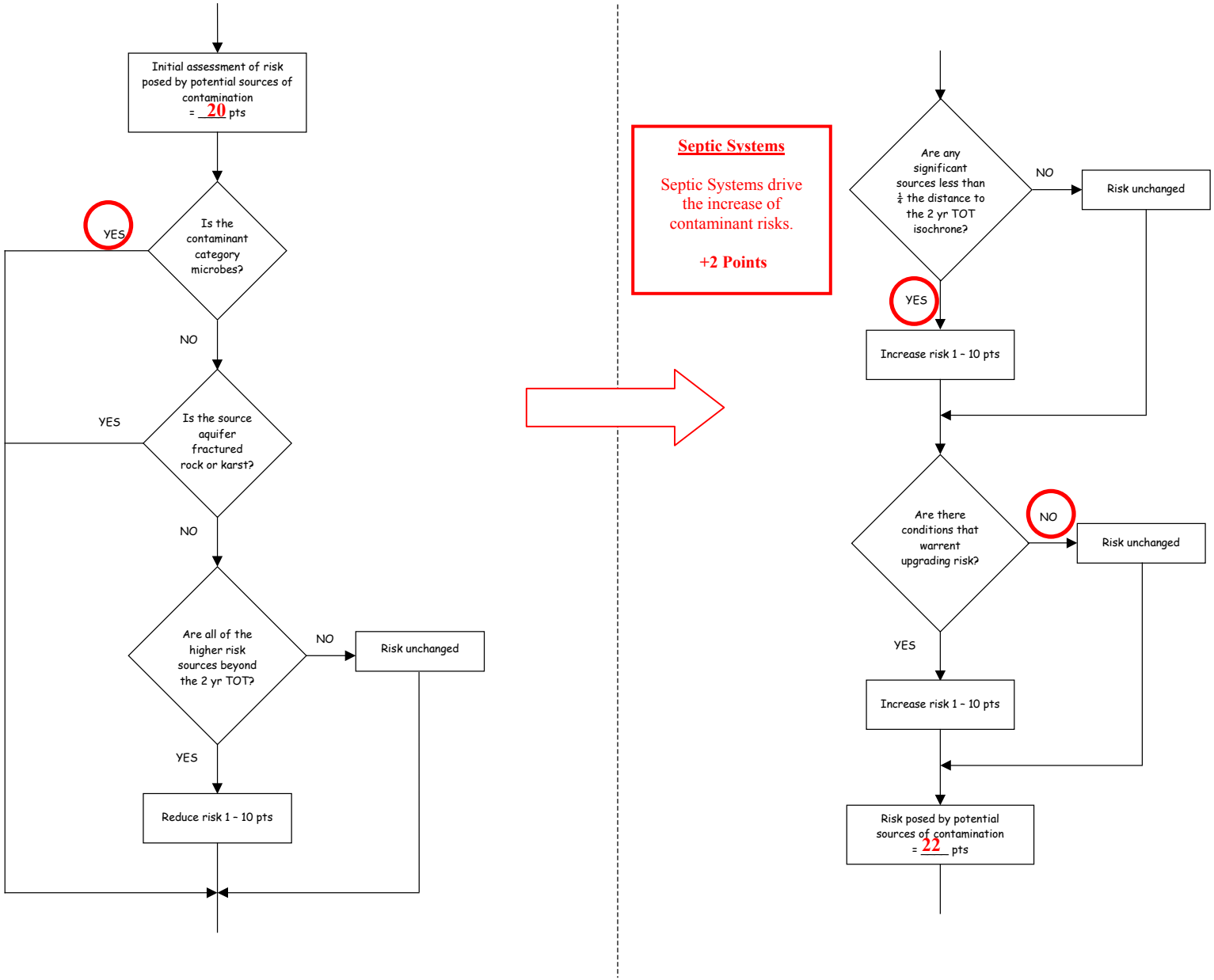
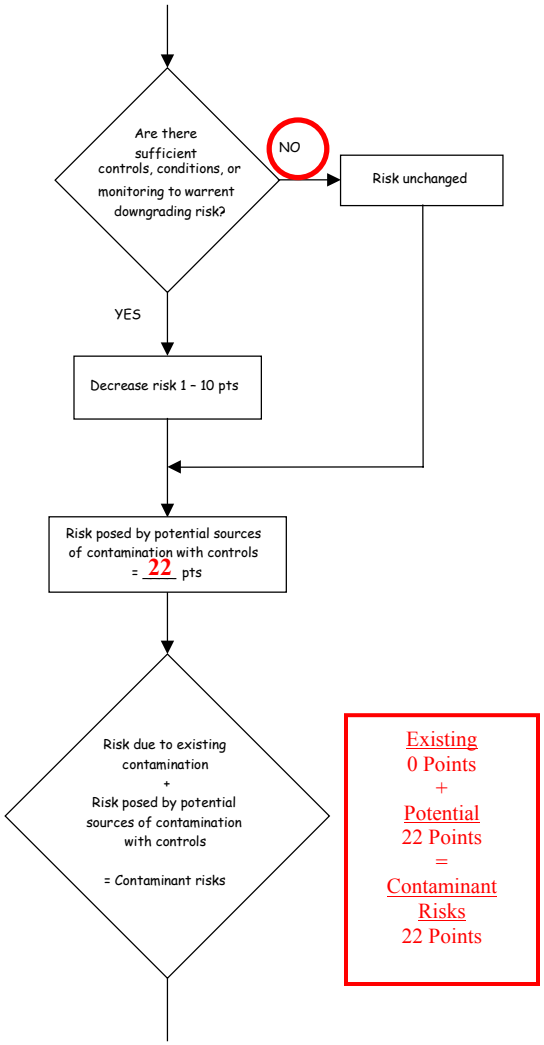


Chart 3. Contaminant risks for Rabbit Creek Rifle Range – Bacteria & Viruses (Continued)



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

** Truncate risk at 50 pts*

Contaminant risks* = 22 pts

Medium

3. Level of Background Contamination

> MCL	21 - 50 pts
0.5 MCL to < MCL	11 - 20 pts
0.2 MCL to < 0.5 MCL	6 - 10 pts
'detect' to < 0.2 MCL	0 - 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 Rabbit Creek Rifle Range – Bacteria & Viruses

Level of Risk Associated with the Highest Risk Sources

Sewer lines, residential areas, septic systems, highways/roads, and trails	**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 Rabbit Creek Rifle Range – Bacteria & Viruses

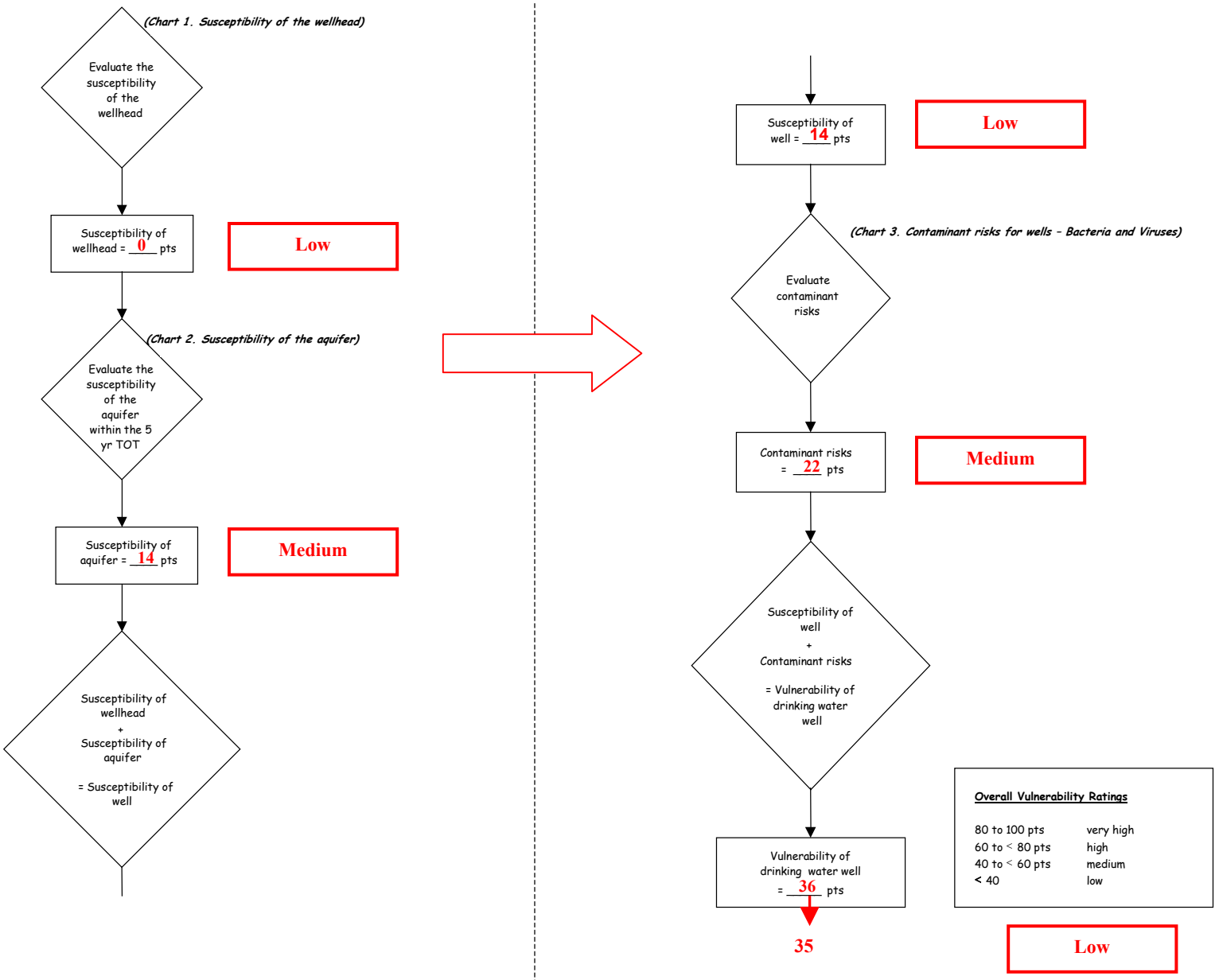


Chart 5. Contaminant risks for Rabbit Creek Rifle Range - Nitrates and Nitrites

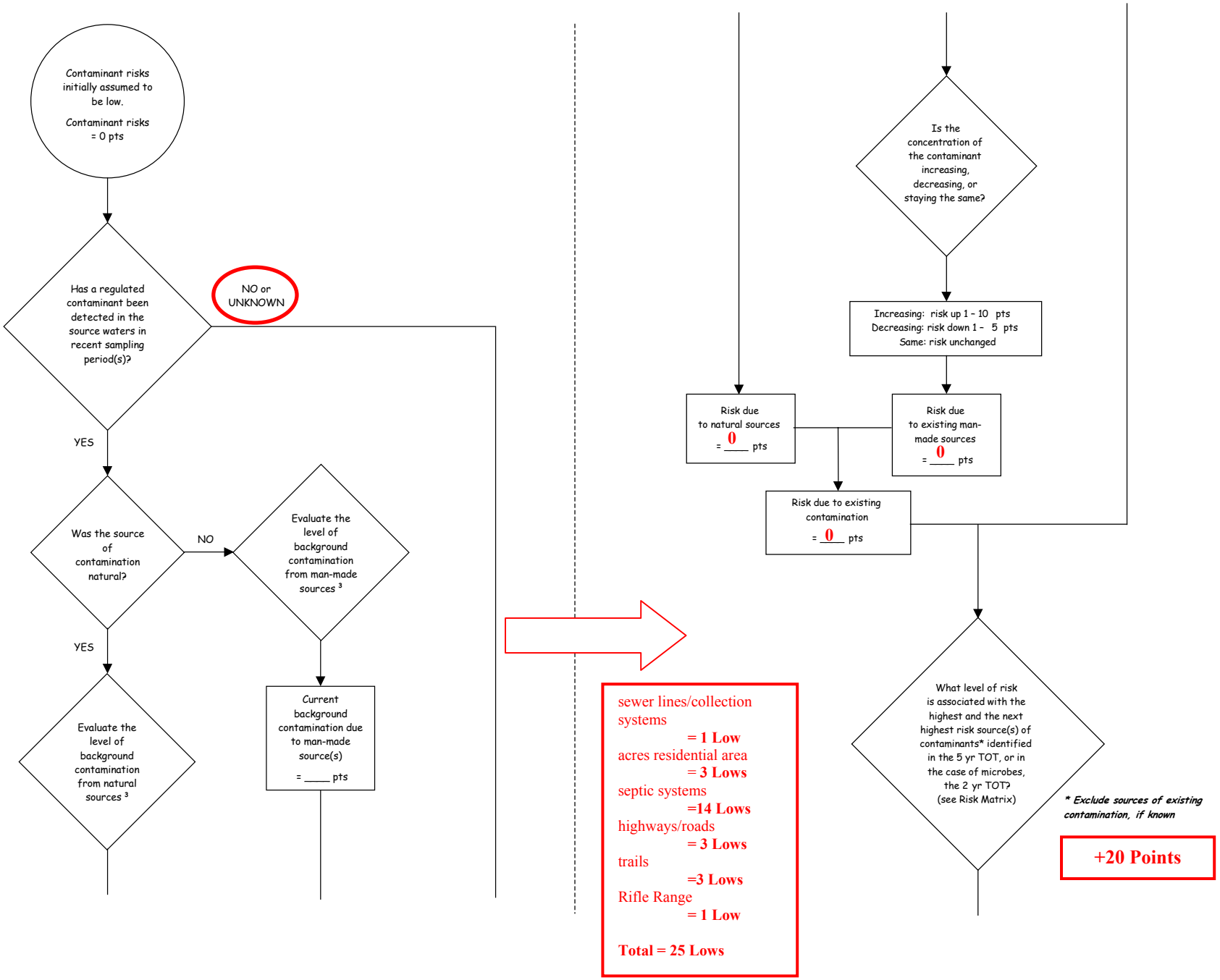


Chart 5. Contaminant risks for Rabbit Creek Rifle Range – Nitrates and Nitrites (Continued)

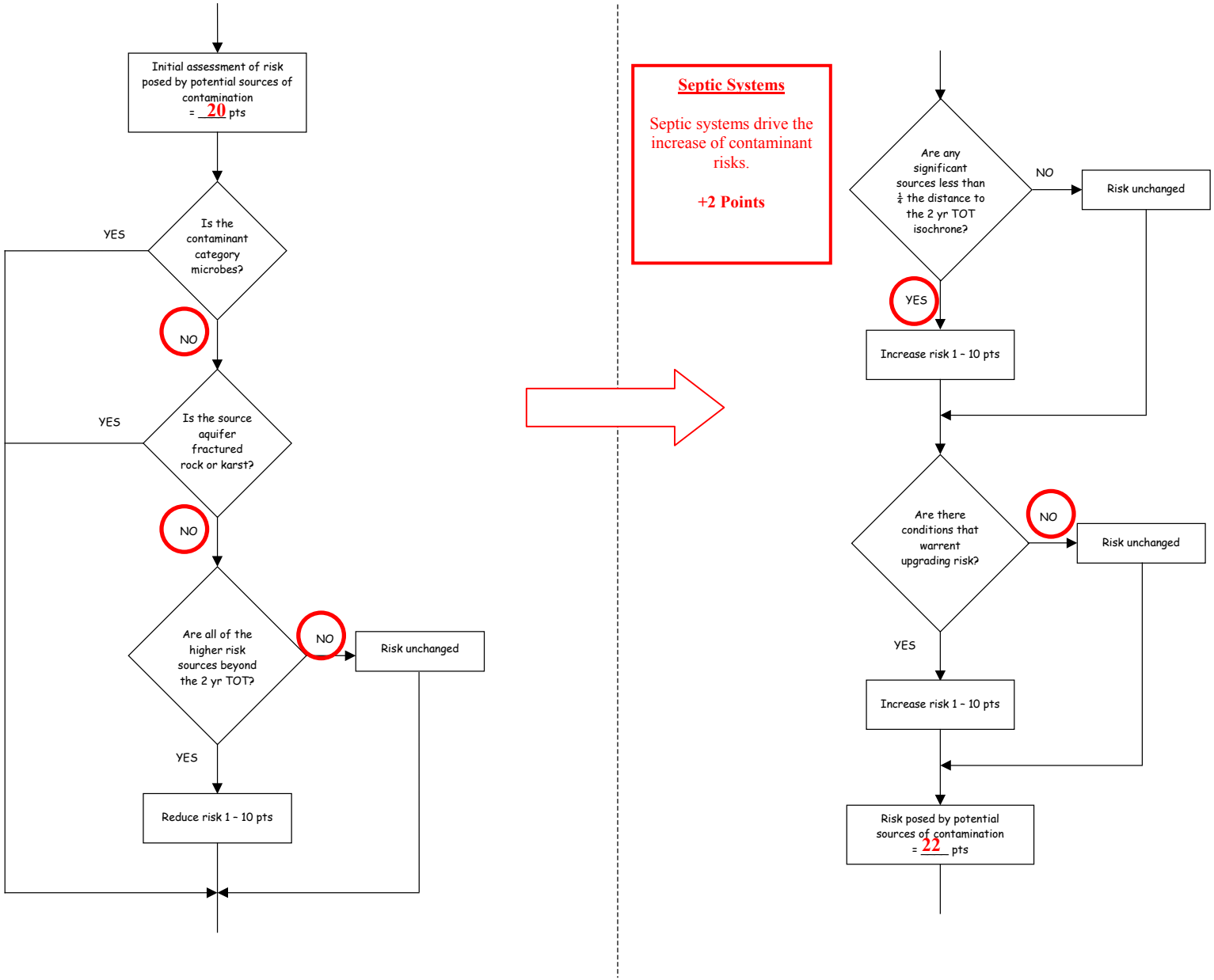
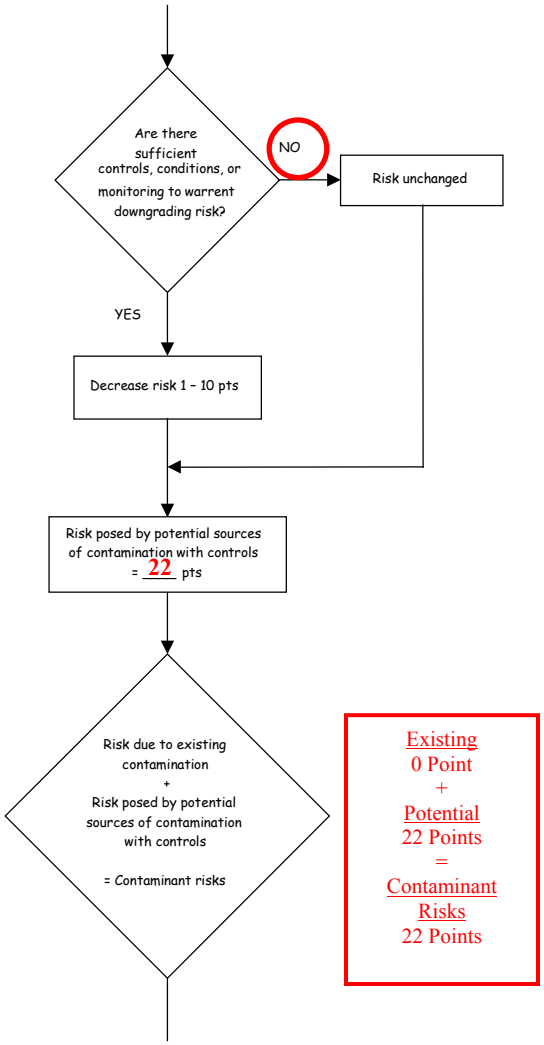
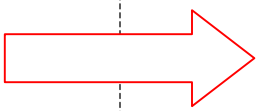
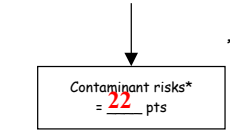


Chart 5. Contaminant risks for Rabbit Creek Rifle Range – Nitrates and Nitrites (Continued)



Existing
0 Point
+
Potential
22 Points
=
Contaminant Risks
22 Points





** Truncate risk at 50 pts*

Medium

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

Nitrate Sampling History

Nitrates/Nitrites were not detected throughout sampling history.

Maximum Contaminant Level (MCL) = 10mg/L

Table 2. Risk Matrix for Contaminant Sources for Rabbit Creek Rifle Range – Nitrates and Nitrites

Level of Risk Associated with the Highest Risk Sources

Sewer lines, residential areas, septic systems, highways/roads, trails, rifle range	**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 Rabbit Creek Rifle Range – Nitrates and Nitrites

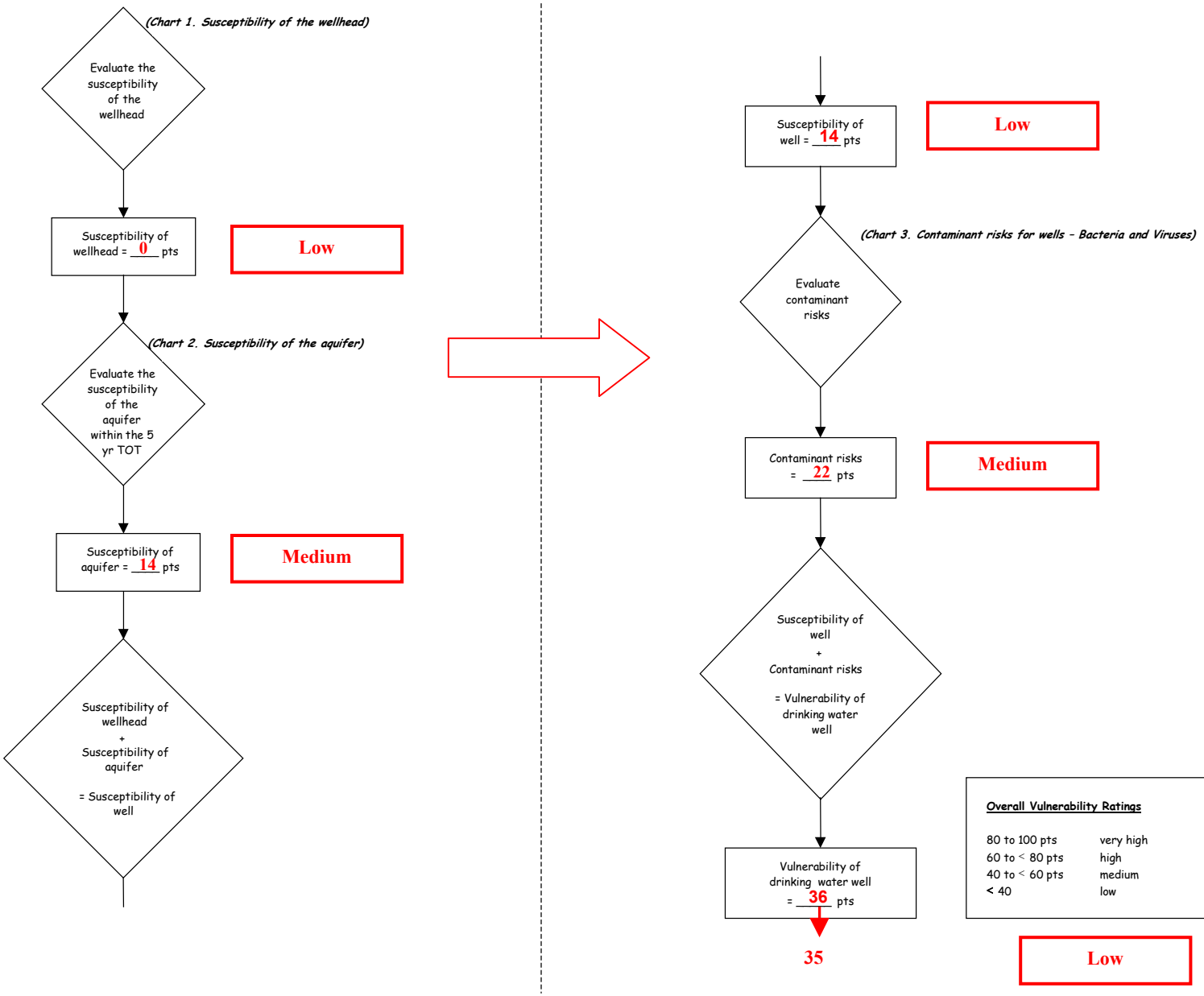


Chart 7. Contaminant risks for Rabbit Creek Rifle Range – Volatile Organic Chemicals

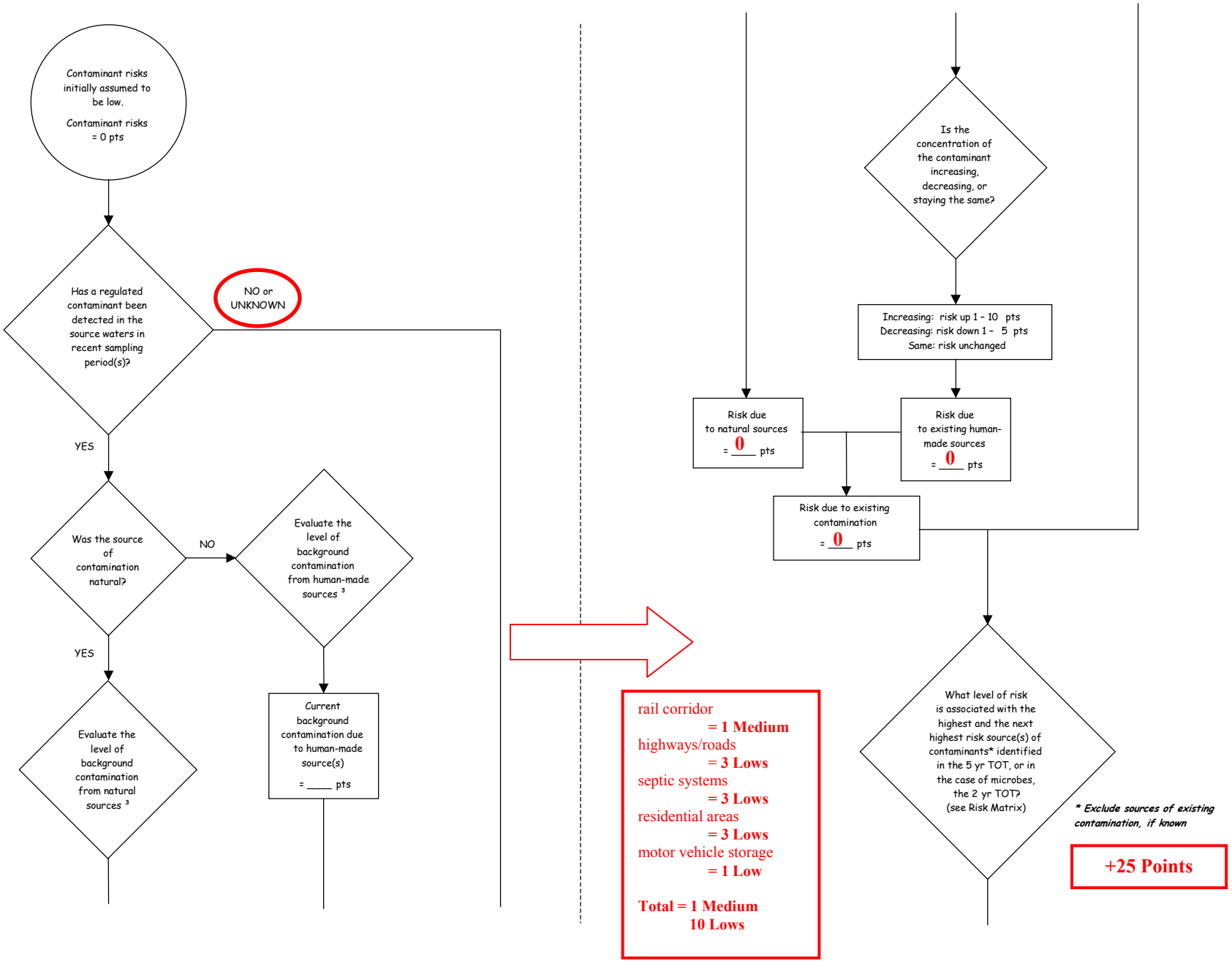


Chart 7. Contaminant risks for Rabbit Creek Rifle Range – Volatile Organic Chemicals (Continued)

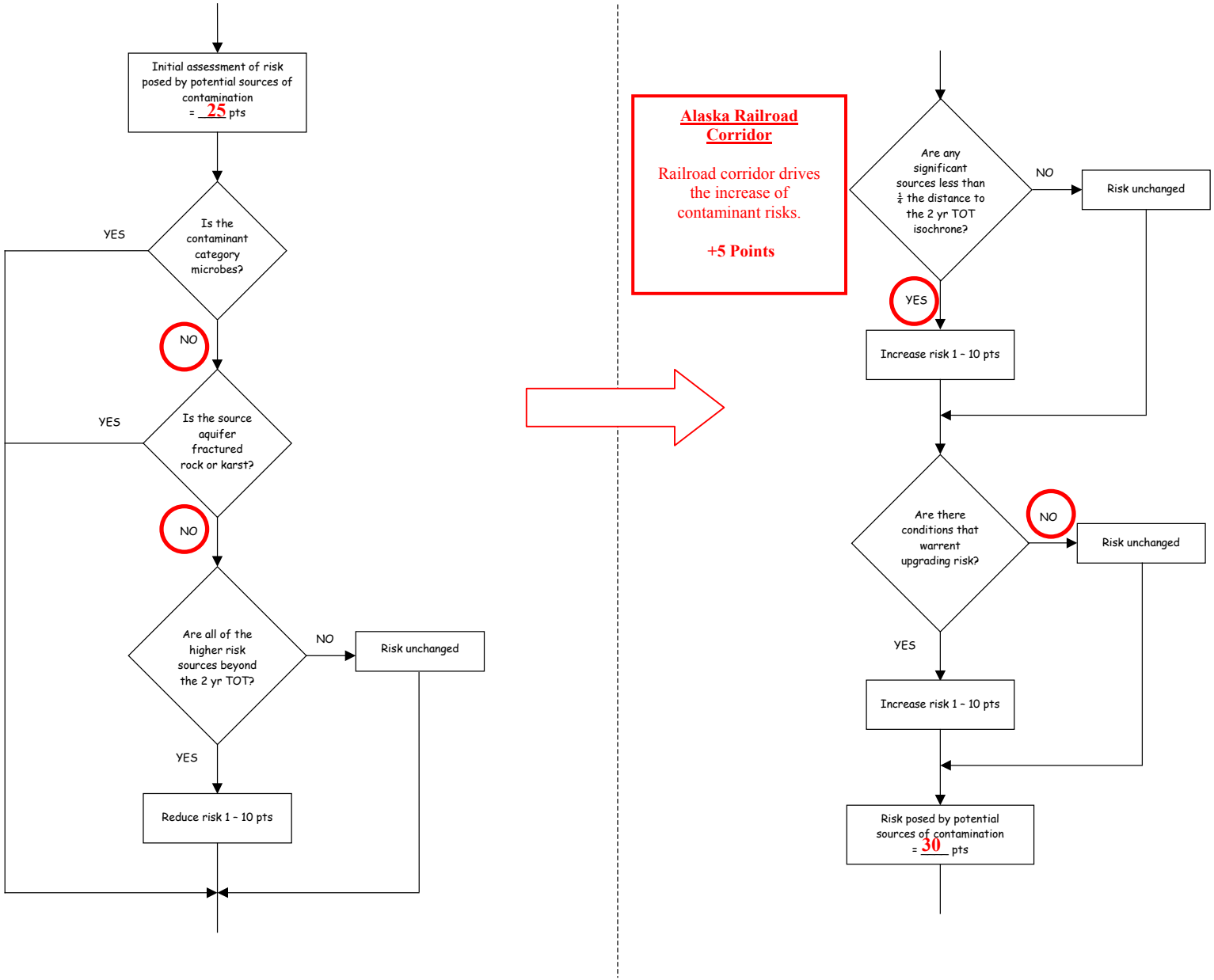
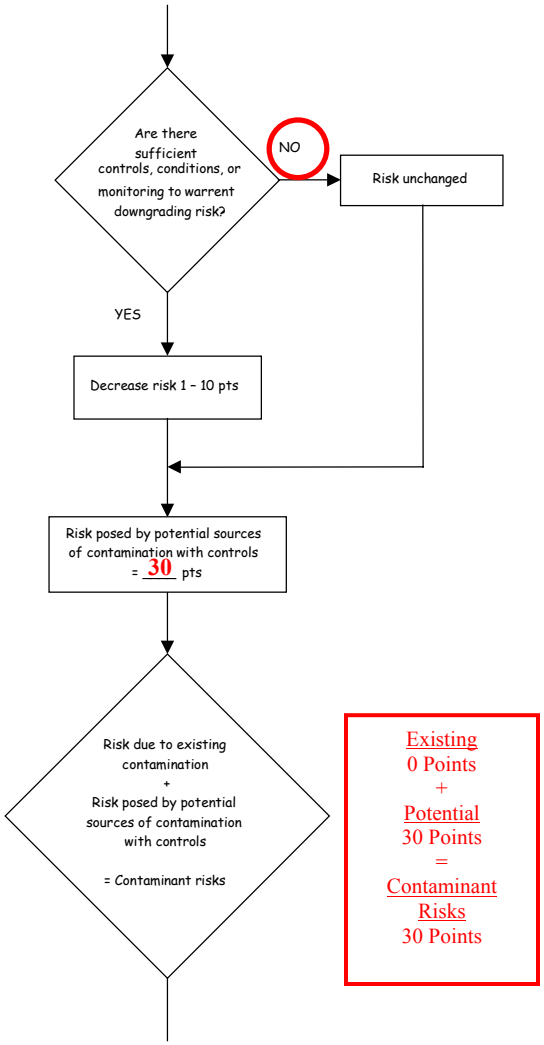


Chart 7. Contaminant risks for Rabbit Creek Rifle Range – Volatile Organic Chemicals (Continued)



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

** Truncate risk at 50 pts*

Contaminant risks*
= 30 pts

Medium

3. Level of Background Contamination

> MCL	21 - 50 pts
0.5 MCL to < MCL	11 - 20 pts
0.2 MCL to < 0.5 MCL	6 - 10 pts
'detect' to < 0.2 MCL	0 - 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 Rabbit Creek Rifle Range – Volatile Organic Chemicals

Level of Risk Associated with the Highest Risk Sources

Next Highest Risk Sources(s)	Railroad corridor, highways/roads, septic systems, residential area, motor vehicle storage	**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 Rabbit Creek Rifle Range – Volatile Organic Chemicals