Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for American Legion Post 33 Drinking Water System, Chugiak, Alaska

American Legion Post 33 #214227

DRINKING WATER PROTECTION PROGRAM REPORT # 208
Alaska Department of Environmental Conservation

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By Shannon & Wilson, Inc.

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The Drinking Water Protection Program 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. 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 American Legion Post 33 Source of Public Drinking Water, Chugiak, Alaska

By Shannon & Wilson, Inc.

Drinking Water Protection Program
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The American Legion Post 33 is a Class B (transient/non-community) water system consisting of one well located at 21426 Old Glenn Highway, in Chugiak, Alaska. Identified potential and current sources of contaminants for American Legion Post 33 public drinking water source include: large capacity and single family septic systems; residential areas; dirt/gravel and paved roads; medical facilities; and electrical component manufacturing. These identified potential and existing sources of contamination are considered sources of bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals. Overall, the public water sources for American Legion Post 33 received a vulnerability rating of **High** for volatile organic chemicals, **High** for bacteria and viruses, and **High** for nitrates and nitrites.

INTRODUCTION

The Alaska Department of Environmental Conservation (ADEC) is completing source water assessments for all public drinking water sources in the State of Alaska. The purpose of this assessment is to provide owners and/or operators, communities, and local governments with information they can use to preserve the quality of Alaska's public drinking water supplies. The results of this source water assessment can be used to decide where voluntary protection efforts are needed and feasible, and also what efforts will be most effective in reducing contaminant risks to your water system. Shannon & Wilson has been contracted to perform these assessments under the supervision of ADEC.

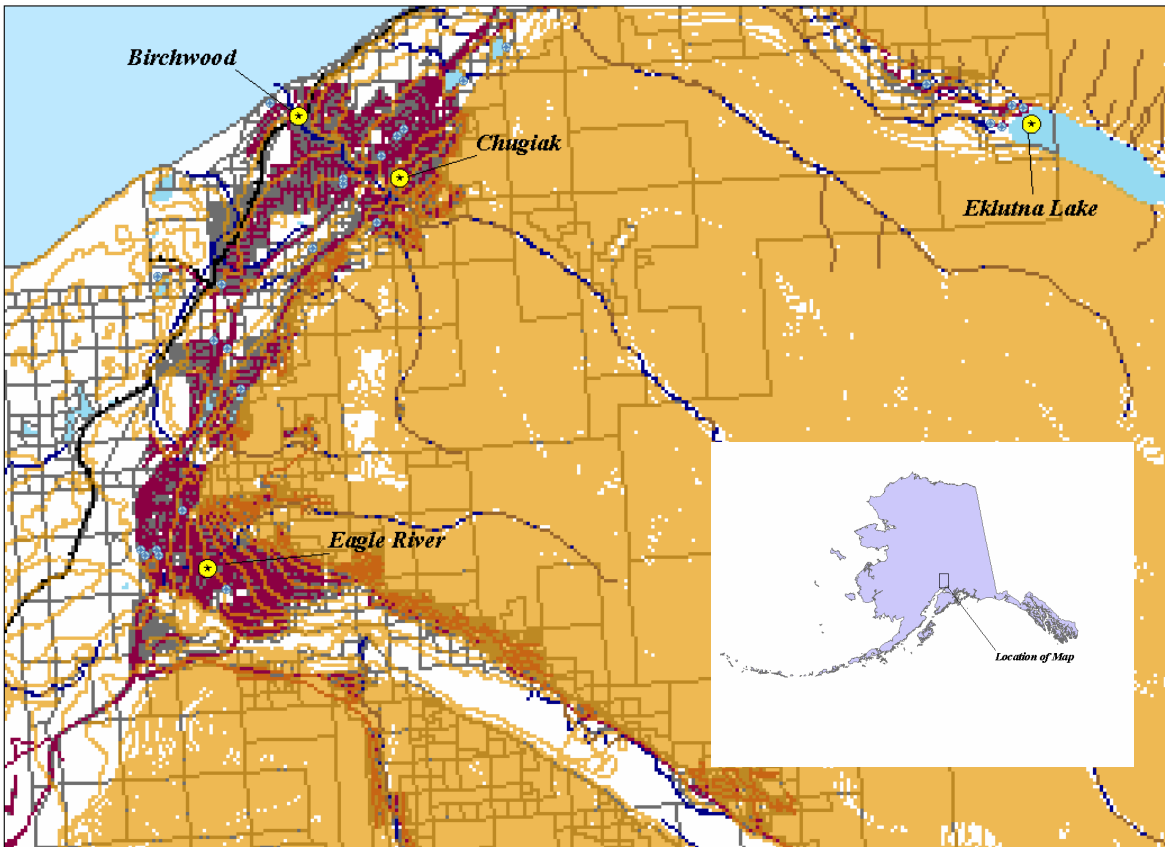


Figure 1. Index map showing the location of the Eagle River Valley and Surrounding Areas.

This source water assessment combines a review of the natural conditions at the site and the potential and existing contaminant risks. These are combined to determine the overall vulnerability of the drinking water source to contamination.

DESCRIPTION OF THE CHUGACH MOUNTAIN FRONT EAST OF ANCHORAGE

Location

Between the Chugach Mountain Front east of Anchorage and Knik Arm lie the communities of Eagle River, Chugiak, Peters Creek, and Eklutna. The Eagle River Valley is one of the largest valleys in the western Chugach Mountains. The area surrounding Eagle River is shown in Figure 1. Eagle River and the neighboring communities are located in the Municipality of Anchorage.

Glacial and alluvial forces have shaped the Eagle River Valley and Chugach Mountain front in this area. These forces have resulted in the U-shaped river valleys and moraine-mantled mountain flanks of the mountain front and lakes, streams and undulating ridges and hills of the glaciated lowlands extending to Knik Arm.

Precipitation

Eagle River averages between 20 and 25 inches of precipitation per year, including about 68 inches of snowfall.

Topography and Drainage

The area topography varies from sea level to about 400 feet in the area surrounding Knik Arm to several thousand feet on the surrounding ridges and mountain flanks.

Groundwater

Although the quality can vary significantly in a short distance, groundwater supplies are generally abundant in the area, except for some reported well failures that have occurred within the city limits of Eagle River. Groundwater occurs within both confined and unconfined aquifers and from both unconsolidated and bedrock aquifers. Many homes and businesses in the area rely on individual wells for their water supply. Most of these wells are shallow with depths of less than 100 feet to 200 feet. Static water levels in many of these wells are less than 15 feet below the surface.

Geology and Soils

Most of the soils in the area provide good sources of sand, gravel and topsoil. The deposition of silt, clay and organic muck in old lakes, oxbows and depressions means that some areas have soil conditions that vary over relatively short distances.

AMERICAN LEGION POST 33 PUBLIC DRINKING WATER SYSTEM

American Legion Post 33 is a Class B (transient/non-community) water system. The system consists of one well located at 21426 Old Glenn Highway in Chugiak, Alaska.

According to the well log completed for the water system, installation of the well occurred on 10/30/86, to a total depth of approximately 125 feet below ground surface and was completed with 6-inch well casing. The most recent Sanitary Survey 10/26/00 indicates the well was installed with a cap providing a sanitary seal. A properly installed sanitary seal may provide protection against contaminants from entering the source waters at the well casing. The land surface is also apparently sloped away from the well, and provides adequate surface water drainage. It is unknown if the well was grouted according to ADEC regulations. Proper grouting provides added protection against contaminants travelling along the well casing and into source waters.

This system operates year-round and serves 0 residents and more than 50 non-residents through one service connection.

AMERICAN LEGION POST 33 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. Some areas are more likely to allow contamination to reach the well than others. 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 a release of contaminants within the DWPA 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. 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*), and State of Alaska Department of Water Resources. Additional methods were also used to take into account any uncertainties in groundwater flow and aquifer characteristics to arrive at a meaningful DWPA (Please refer to the Guidance Manual for Class B Public Water Systems for additional information).

The DWPAs established for wells by the ADEC are separated into four zones. These zones correspond to differences in the time-of-travel (TOT) of the water moving through the aquifer to the well. The TOT 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 DWPA zones and the calculated TOT for each:

Table 1. Definition of Zones

Zone	Definition
A	¼ the distance for the 2 year TOT
B	Less than the 2 year TOT
C	Less than the 5 year TOT
D	Less than the 10 year TOT

As an example, water moving through the aquifer in Zone B will reach the well in less than 2 years from the time it crosses the outer limit of Zone B.

Zone A also incorporates the area downgradient from the well to take into account the area of the aquifer that is influenced by pumping of the well. Water within the aquifer in Zone A will reach the well in several hours to several months.

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 American Legion Post 33 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 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.

Inventoried potential sources of contamination within Zones A through Zone D were associated with residential and light industrial type activities. The sources are summarized in the tables in Appendix B.

RANKING OF CONTAMINANT RISKS

Once the potential and existing sources of contamination have been identified, they are 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. Further, contaminant risks are 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 AMERICAN LEGION POST 33 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 American Legion Post 33 is assumed to be completed in an unconfined aquifer setting. Because an unconfined aquifer is recharged by surface water and precipitation that migrates downward from the surface, contaminants at the surface have the potential to adversely impact this aquifer. Table 2 shows the Overall Susceptibility score and rating for American Legion Post 33.

Table 2. Natural Susceptibility - Susceptibility of the Wellhead and Aquifer to Contamination

	Score	Rating
Susceptibility of the Wellhead	5	Low
Susceptibility of the Aquifer	22	Very High
Natural Susceptibility	27	Medium

Contaminant risks to a drinking water source depend on the type, number or density, and distribution of contaminant sources. This data has been derived from an examination of existing or historical contamination that has been detected at the drinking water source through routine sampling. It also evaluates potential sources of contamination. 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	42	Very High

Appendix D contains eight 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 Analyses for nitrates and nitrites and volatile organic chemicals, respectively.

Table 4 contains the overall vulnerability scores (0 - 100) and ratings for each of the three categories of drinking water contaminants. Note: scores are rounded off to the nearest five.

Table 4. Overall Vulnerability of American Legion Post 33 to Contamination by Category

Category	Score	Rating
Bacteria and Viruses	75	High
Nitrates and Nitrites	75	High
Volatile Organic Chemicals	70	High

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.

The large capacity and single family septic systems, residential areas, dirt/gravel and paved roads, medical facilities, and electrical component manufacturing create a risk increase for bacteria and viruses, nitrates and nitrites, and volatile organic compounds.

Only a small amount of bacteria and viruses are required to endanger public health. Bacteria and viruses have not been detected during recent water sampling of the system at American Legion Post 33.

Nitrates and/or nitrites are found in natural background concentration at this site, as elsewhere throughout Alaska. Nitrate concentrations in uncontaminated groundwater are typically less than 2 milligrams per liter (mg/L) and are derived primarily from the decomposition of organic matter in soils, adopted from the U.S. Geological Survey (Wang, et al., 2000).

Sampling history for American Legion Post 33 well indicates that low concentrations of nitrates have been detected (see Chart 5 - Contaminant Risks for Nitrates and/or Nitrites in Appendix D). The maximum reported existing nitrate concentration is approximately 7.140 mg/L or 71% of the Maximum Contaminant Level (MCL) of 10 mg/L. The MCL is the maximum level of contaminant that is allowed to exist in drinking water and still be consumed by humans without harmful health effects. Due to the high solubility and weak retention by soil, nitrates are very mobile, moving at approximately the same rate as water. Though existing nitrate contamination was detected at the site, concentrations remain at safe levels with respect to human health.

SUMMARY

A *Source Water Assessment* has been completed for the sources of public drinking water serving American Legion Post 33. The overall vulnerability of this source to contamination is **High** for volatile organic chemicals, **High** for bacteria and viruses, and **High** for nitrates and nitrites. 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 American Legion Post 33 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 American Legion Post 33 public drinking water source.

REFERENCES CITED

Munter, J.A., and Allely, R. D., 1992, Water-Supply Aquifers at Eagle River, Alaska: State of Alaska Division of Geological & Geophysical Surveys Professional Report 108.

Patrick, L.D., Brabets, T.P., and Glass, R.L., 1989, Simulation of ground-water flow at Anchorage, Alaska: US Geological Survey Water-Resources Investigations Report 88-4139, 41p.

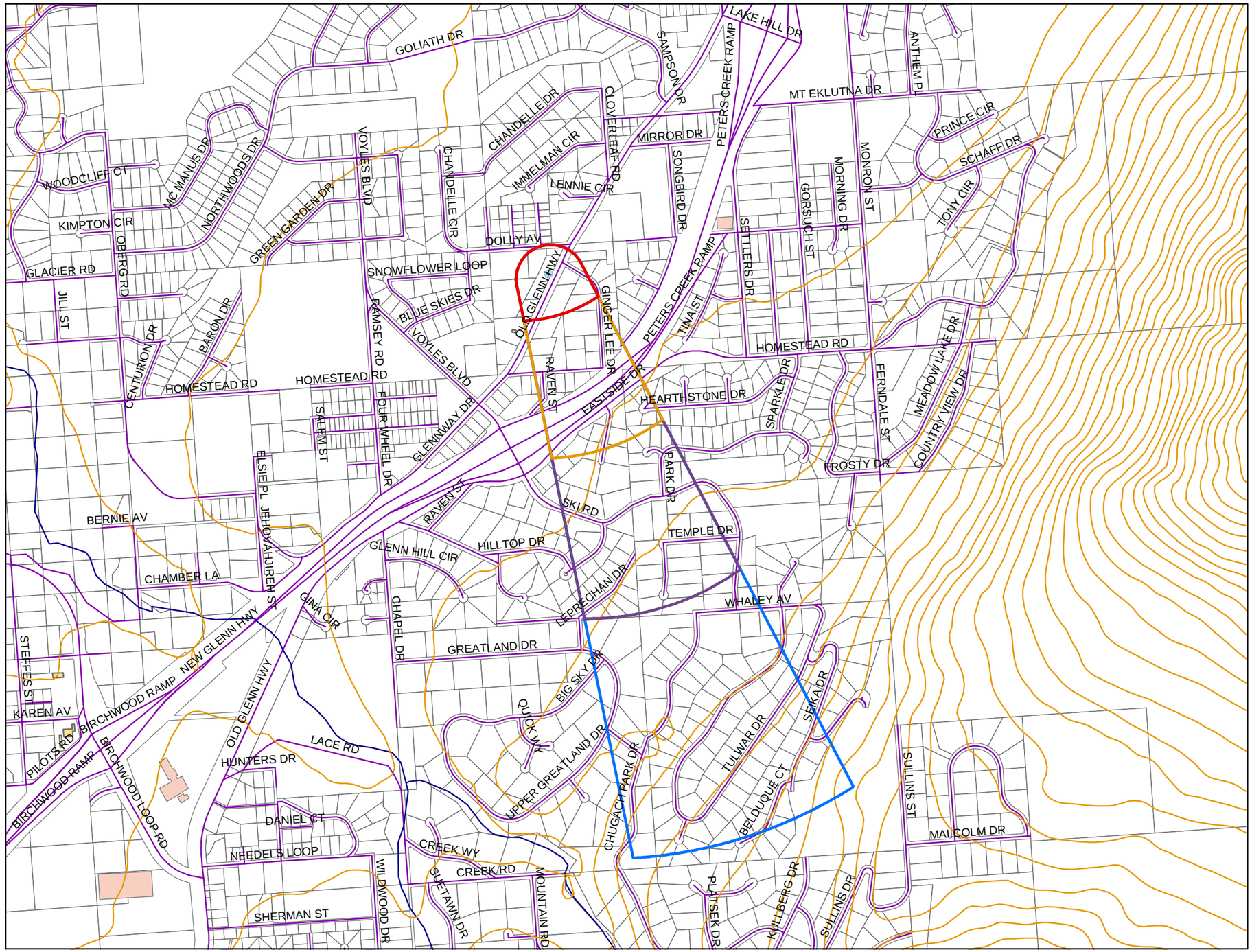
Wang, B., Strelakos, P.M., and Jokela, J.B., 2000, Nitrate source indicators in ground water of the scimitar subdivision, Peters Creek Area, Anchorage, Alaska: US Geological Survey Water-Resources Investigations Report 00-4137.

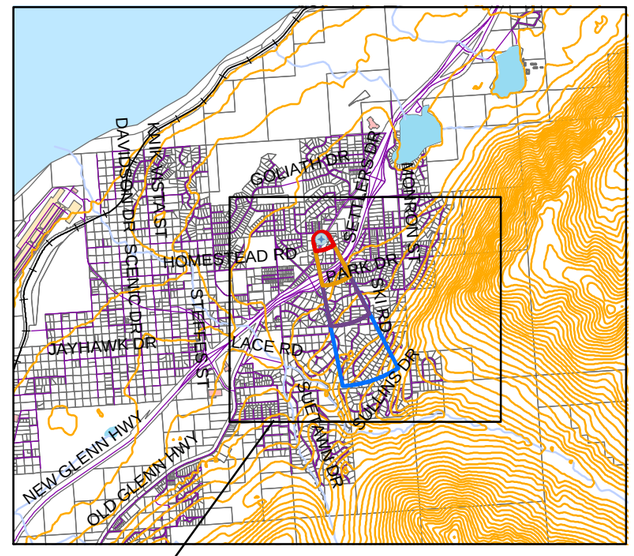
Weather Underground, June 18, 2002, Web extension to the *Western Regional Climate Center* [WWW document]. URL http://www.wunderground.com

APPENDIX A

American Legion Post 33
Drinking Water Protection Area
(Map 1)

Drinking Water Protection Areas for American Legion Post 33





Location of map

American Legion Post 33
25m Contours
Streams
Roads
MOA land parcels
Lakes

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 5-Years Travel Time

2,300 1,150 0 2,300 Feet

N W E S

PWSID 214227.001

Map 1

APPENDIX B

Contaminant Source Inventory and Risk Ranking for American Legion Post 33 (Tables 1-4)

Table 1 *Contaminant Source Inventory for* ***PWSID 214227.001***

American Legion Post 33

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Location*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	West off Old Glenn Highway, south of Dolly Avenue	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-2	A	East off Old Glenn Highway, south of Ginger Lee Drive	3	
Residential Areas	R01	R1-1	A	Residences off of Ginger Lee Drive	2	4 acres of residential area in Zone A
Septic systems (serves one single-family home)	R02	R2-1-6	A	Off Old Glenn Highway	3	
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Old Glenn Highway	2	
Highways and roads, dirt/gravel	X24	X24-1	A	Ginger Lee Drive	2	
Medical/veterinary facilities (doctor or dentist offices, hospitals, nursing homes)	X40	X40-1	A	Off Ginger Lee Drive	3	
Electrical, electronic, computer, and communications equipment/component manufacturing	I13	I13-1	B	Corner of Ginger Lee Drive and Homestead Road	3	
Residential Areas	R01	R1-2	B	Residences north and south of Glenn Highway	2	23 acres of residential area in Zone B
Septic systems (serves one single-family home)	R02	R2-7-27	B	On north and south of New Glenn Highway	3	
Highways and roads, paved (cement or asphalt)	X20	X20-2	B	Peters Creek Ramp - south	2	
Highways and roads, paved (cement or asphalt)	X20	X20-3	B	New Glenn Highway	2	
Highways and roads, paved (cement or asphalt)	X20	X20-4	B	Eastside Drive	2	
Highways and roads, paved (cement or asphalt)	X20	X20-5	B	Peters Creek Ramp - north	2	
Highways and roads, dirt/gravel	X24	X24-2	B	Homestead Road	2	
Highways and roads, dirt/gravel	X24	X24-3	B	Raven Street	2	
Highways and roads, dirt/gravel	X24	X24-4	B	Chickadee Street	2	
Highways and roads, dirt/gravel	X24	X24-5	B	Hearthstone Drive	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-3	C	South of Eastside Drive	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-4	C	NW corner of Park Drive and Ski	3	
Residential Areas	R01	R1-3	C	Residences north and south of Ski	2	44 acres of residential area in Zone C

Table 1 *Contaminant Source Inventory for* ***PWSID 214227.001***

American Legion Post 33

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Location*	*Map Number*	*Comments*
Septic systems (serves one single-family home)	R02	R2-28-68	C	Off of Ski Road	3	
Highways and roads, dirt/gravel	X24	X24-10	C	Temple Drive	2	
Highways and roads, dirt/gravel	X24	X24-11	C	Stephen Circle	2	
Highways and roads, dirt/gravel	X24	X24-12	C	Leprechan Drive	2	
Highways and roads, dirt/gravel	X24	X24-6	C	Road off of Park Drive	2	
Highways and roads, dirt/gravel	X24	X24-7	C	Park Drive	2	
Highways and roads, dirt/gravel	X24	X24-8	C	Ski Road	2	
Highways and roads, dirt/gravel	X24	X24-9	C	Road between Ski Road and Hilltop Drive	2	

Contaminant Source Inventory and Risk Ranking for

Table 2 ***PWSID 214227.001***

American Legion Post 33
Sources of Bacteria and Viruses

Contaminant Source Type	***Contaminant Source ID***	***CS ID tag***	***Zone***	***Risk Ranking for Analysis***	***Overall Rank after Analysis***	***Location***	***Map Number***	***Comments***
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	High	1	West off Old Glenn Highway, south of Dolly	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-2	A	High	2	East off Old Glenn Highway, south of	3	
Medical/veterinary facilities (doctor or dentist offices, hospitals, nursing homes)	X40	X40-1	A	Medium	3	Off Ginger Lee Drive	3	
Residential Areas	R01	R1-1	A	Low	4	Residences off of Ginger Lee Drive	2	4 acres of residential area in Zone A
Septic systems (serves one single-family home)	R02	R2-1-6	A	Low	5	Off Old Glenn Highway	3	
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	6	Old Glenn Highway	2	
Highways and roads, dirt/gravel	X24	X24-1	A	Low	7	Ginger Lee Drive	2	
Residential Areas	R01	R1-2	B	Low	8	Residences north and south of Glenn Highway	2	23 acres of residential area in Zone B
Septic systems (serves one single-family home)	R02	R2-7-27	B	Low	9	On north and south of New Glenn Highway	3	
Highways and roads, paved (cement or asphalt)	X20	X20-2	B	Low	10	Peters Creek Ramp - south	2	
Highways and roads, paved (cement or asphalt)	X20	X20-3	B	Low		New Glenn Highway	2	
Highways and roads, paved (cement or asphalt)	X20	X20-4	B	Low		Eastside Drive	2	
Highways and roads, paved (cement or asphalt)	X20	X20-5	B	Low		Peters Creek Ramp - north	2	
Highways and roads, dirt/gravel	X24	X24-2	B	Low		Homestead Road	2	
Highways and roads, dirt/gravel	X24	X24-3	B	Low		Raven Street	2	
Highways and roads, dirt/gravel	X24	X24-4	B	Low		Chickadee Street	2	
Highways and roads, dirt/gravel	X24	X24-5	B	Low		Hearthstone Drive	2	

Table 3

Contaminant Source Inventory and Risk Ranking for American Legion Post 33 Sources of Nitrates/Nitrites

PWSID 214227.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Overall Rank after Analysis*	*Location*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	High	1	West off Old Glenn Highway, south of Dolly	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-2	A	High	2	East off Old Glenn Highway, south of	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-3	C	High	3	South of Eastside Drive	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-4	C	High	4	NW corner of Park Drive and Ski Road	3	
Residential Areas	R01	R1-1	A	Low	5	Residences off of Ginger Lee Drive	2	4 acres of residential area in Zone A
Septic systems (serves one single-family home)	R02	R2-1-6	A	Low	6	Off Old Glenn Highway	3	
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	7	Old Glenn Highway	2	
Highways and roads, dirt/gravel	X24	X24-1	A	Low	8	Ginger Lee Drive	2	
Medical/veterinary facilities (doctor or dentist offices, hospitals, nursing homes)	X40	X40-1	A	Low	9	Off Ginger Lee Drive	3	
Residential Areas	R01	R1-2	B	Low	10	Residences north and south of Glenn Highway	2	23 acres of residential area in Zone B
Septic systems (serves one single-family home)	R02	R2-7-27	B	Low		On north and south of New Glenn Highway	3	
Highways and roads, paved (cement or asphalt)	X20	X20-2	B	Low		Peters Creek Ramp - south	2	
Highways and roads, paved (cement or asphalt)	X20	X20-3	B	Low		New Glenn Highway	2	
Highways and roads, paved (cement or asphalt)	X20	X20-4	B	Low		Eastside Drive	2	
Highways and roads, paved (cement or asphalt)	X20	X20-5	B	Low		Peters Creek Ramp - north	2	
Highways and roads, dirt/gravel	X24	X24-2	B	Low		Homestead Road	2	
Highways and roads, dirt/gravel	X24	X24-3	B	Low		Raven Street	2	
Highways and roads, dirt/gravel	X24	X24-4	B	Low		Chickadee Street	2	
Highways and roads, dirt/gravel	X24	X24-5	B	Low		Hearthstone Drive	2	
Residential Areas	R01	R1-3	C	Low		Residences north and south of Ski Road	2	44 acres of residential area in Zone C

Contaminant Source Inventory and Risk Ranking for

Table 3 (continued) ***PWSID 214227.001***

American Legion Post 33
Sources of Nitrates/Nitrites

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)	R02	R2-28-68	C	Low		Off of Ski Road	3	
Highways and roads, dirt/gravel	X24	X24-10	C	Low		Temple Drive	2	
Highways and roads, dirt/gravel	X24	X24-11	C	Low		Stephen Circle	2	
Highways and roads, dirt/gravel	X24	X24-12	C	Low		Leprechan Drive	2	
Highways and roads, dirt/gravel	X24	X24-6	C	Low		Road off of Park Drive	2	
Highways and roads, dirt/gravel	X24	X24-7	C	Low		Park Drive	2	
Highways and roads, dirt/gravel	X24	X24-8	C	Low		Ski Road	2	
Highways and roads, dirt/gravel	X24	X24-9	C	Low		Road between Ski Road and Hilltop Drive	2	

Contaminant Source Inventory and Risk Ranking for

Table 4 ***PWSID 214227.001***

American Legion Post 33
Sources of Volatile Organic Chemicals

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Overall Rank after Analysis*	*Location*	*Map Number*	*Comments*
Electrical, electronic, computer, and communications equipment/component	I13	I13-1	B	Very High	1	Corner of Ginger Lee Drive and Homestead	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	Low	2	West off Old Glenn Highway, south of Dolly	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-2	A	Low	3	East off Old Glenn Highway, south of	3	
Residential Areas	R01	R1-1	A	Low	4	Residences off of Ginger Lee Drive	2	4 acres of residential area in Zone A
Septic systems (serves one single-family home)	R02	R2-1-6	A	Low	5	Off Old Glenn Highway	3	
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	6	Old Glenn Highway	2	
Highways and roads, dirt/gravel	X24	X24-1	A	Low	7	Ginger Lee Drive	2	
Medical/veterinary facilities (doctor or dentist offices, hospitals, nursing homes)	X40	X40-1	A	Low	8	Off Ginger Lee Drive	3	
Residential Areas	R01	R1-2	B	Low	9	Residences north and south of Glenn Highway	2	23 acres of residential area in Zone B
Septic systems (serves one single-family home)	R02	R2-7-27	B	Low	10	On north and south of New Glenn Highway	3	
Highways and roads, paved (cement or asphalt)	X20	X20-2	B	Low		Peters Creek Ramp - south	2	
Highways and roads, paved (cement or asphalt)	X20	X20-3	B	Low		New Glenn Highway	2	
Highways and roads, paved (cement or asphalt)	X20	X20-4	B	Low		Eastside Drive	2	
Highways and roads, paved (cement or asphalt)	X20	X20-5	B	Low		Peters Creek Ramp - north	2	
Highways and roads, dirt/gravel	X24	X24-2	B	Low		Homestead Road	2	
Highways and roads, dirt/gravel	X24	X24-3	B	Low		Raven Street	2	
Highways and roads, dirt/gravel	X24	X24-3	B	Low		Raven Street	2	
Highways and roads, dirt/gravel	X24	X24-4	B	Low		Chickadee Street	2	
Highways and roads, dirt/gravel	X24	X24-4	B	Low		Chickadee Street	2	
Highways and roads, dirt/gravel	X24	X24-5	B	Low		Hearthstone Drive	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-3	C	Low		South of Eastside Drive	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-4	C	Low		NW corner of Park Drive and Ski Road	3	

Contaminant Source Inventory and Risk Ranking for

Table 4 (continued) ***PWSID 214227.001***

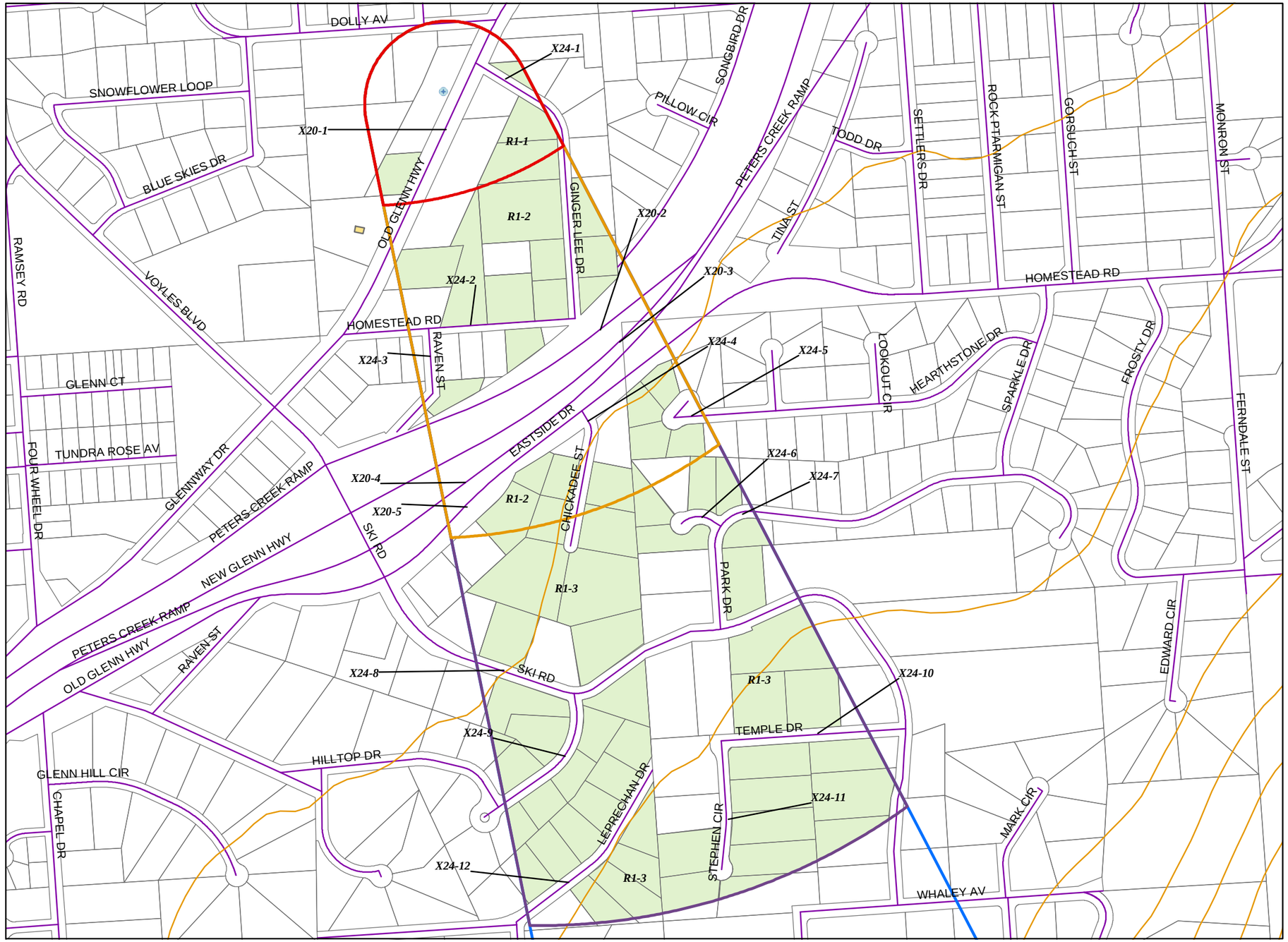
American Legion Post 33
Sources of Volatile Organic Chemicals

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Overall Rank after Analysis*	*Location*	*Map Number*	*Comments*
Residential Areas	R01	R1-3	C	Low		Residences north and south of Ski Road	2	44 acres of residential area in Zone C
Septic systems (serves one single-family home)	R02	R2-28-68	C	Low		Off of Ski Road	3	
Highways and roads, dirt/gravel	X24	X24-10	C	Low		Temple Drive	2	
Highways and roads, dirt/gravel	X24	X24-11	C	Low		Stephen Circle	2	
Highways and roads, dirt/gravel	X24	X24-12	C	Low		Leprechan Drive	2	
Highways and roads, dirt/gravel	X24	X24-6	C	Low		Road off of Park Drive	2	
Highways and roads, dirt/gravel	X24	X24-7	C	Low		Park Drive	2	
Highways and roads, dirt/gravel	X24	X24-8	C	Low		Ski Road	2	
Highways and roads, dirt/gravel	X24	X24-9	C	Low		Road between Ski Road and Hilltop Drive	2	

APPENDIX C

American Legion Post 33
Drinking Water Protection Area
and Potential and Existing Contaminant Sources
(Maps 2-3)

Drinking Water Protection Areas for American Legion Post 33 and Potential and Existing Sources of Contamination



- American Legion Post 33
- 25m Contours
- Residential Areas (R1)
- Streams
- Roads
- MOA land parcels
- Lakes

Zone A Protection Area
Several Months Travel Time

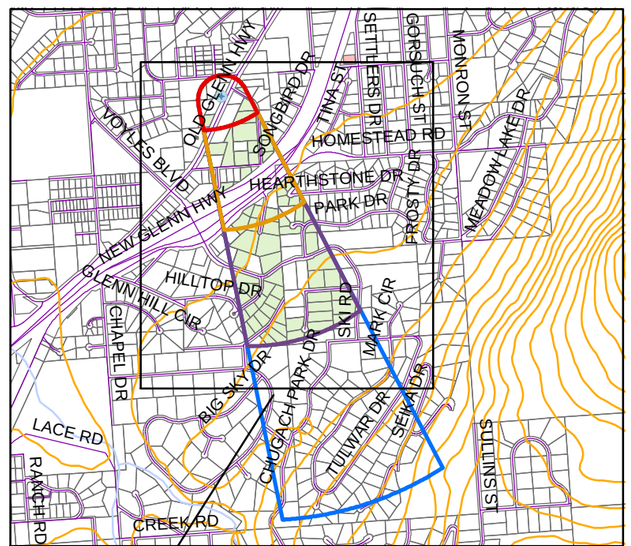
Zone B Protection Area
Less than 2-Years Travel Time

Zone C Protection Area
Less than 5-Years Travel Time

Zone D Protection Area
Less than 5-Years Travel Time

950 475 0 950 Feet

PWSID 214227.001

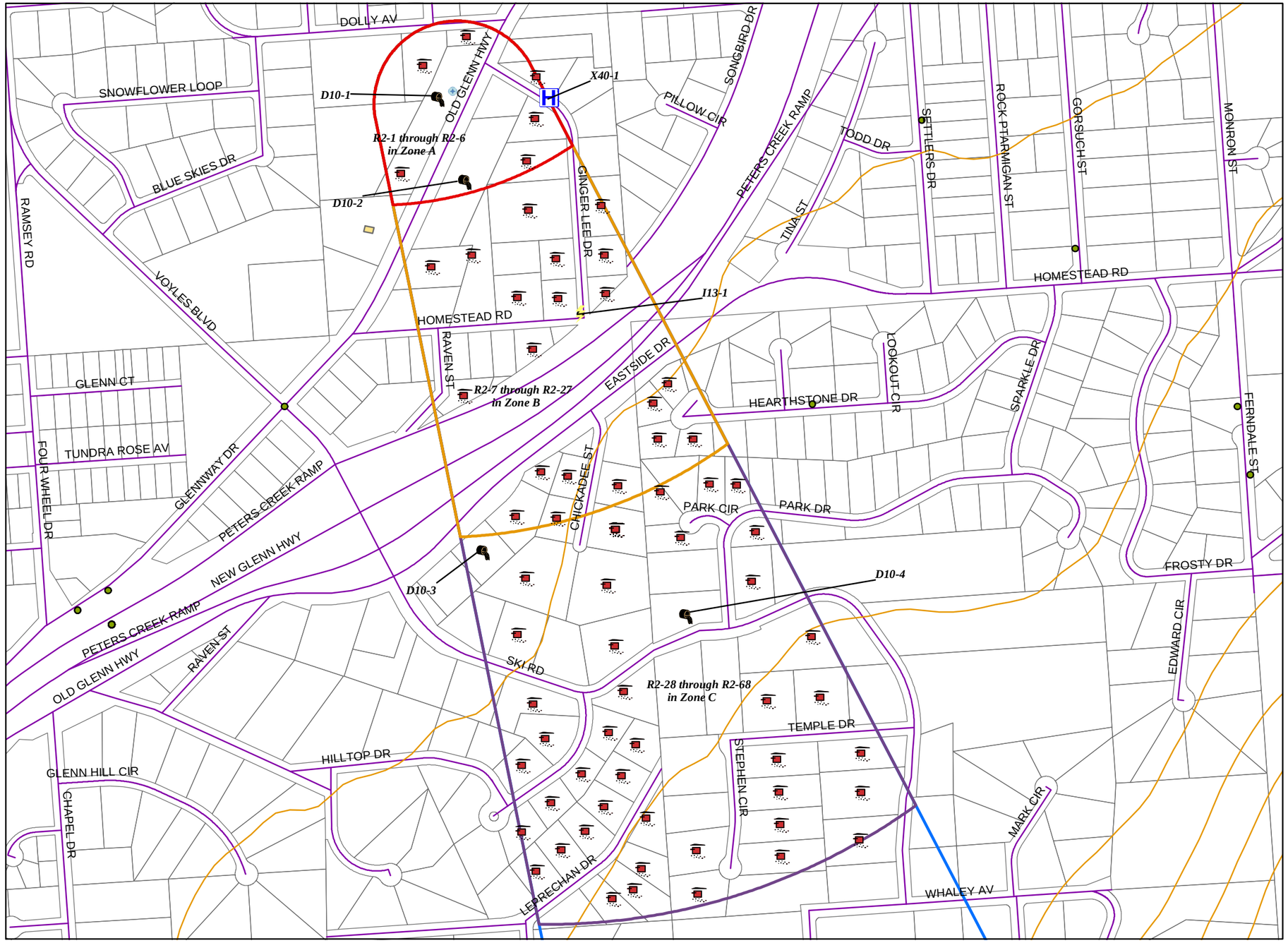


Location of map

N W E S

Map 2

Drinking Water Protection Areas for American Legion Post 33 and Potential and Existing Sources of Contamination



American Legion Post 33

Electrical, electronic, computer, and communications equipment/component manufacturing, I13

Medical/veterinary facilities (doctor or dentist offices, hospitals, nursing homes), X40

Large Capacity Septic Systems (D10)

Single Family Septic Systems (R2)

25m Contours

Streams

Roads

MOA land parcels

Lakes

Zone A Protection Area
Several Months Travel Time

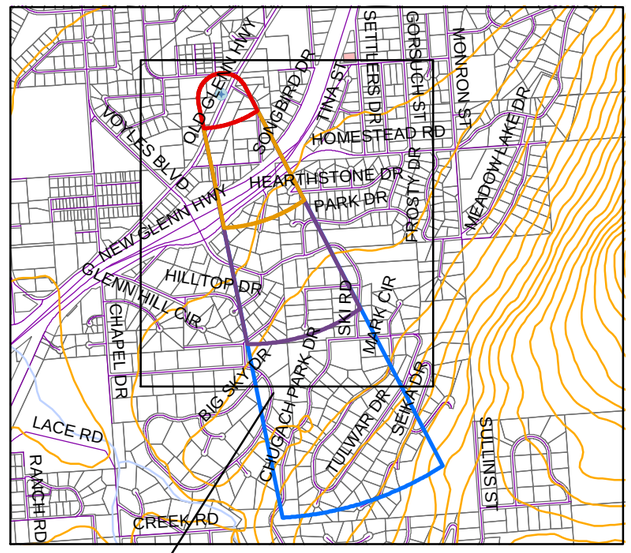
Zone B Protection Area
Less than 2-Years Travel Time

Zone C Protection Area
Less than 5-Years Travel Time

Zone D Protection Area
Less than 5-Years Travel Time

950 475 0 950 Feet

PWSID 214227.001



Location of map

Map 3

APPENDIX D

Vulnerability Analysis for American Legion Post 33 Public Drinking Water Source

(Charts 1-8)

Chart 1. Susceptibility of the Wellhead - American Legion Post 33

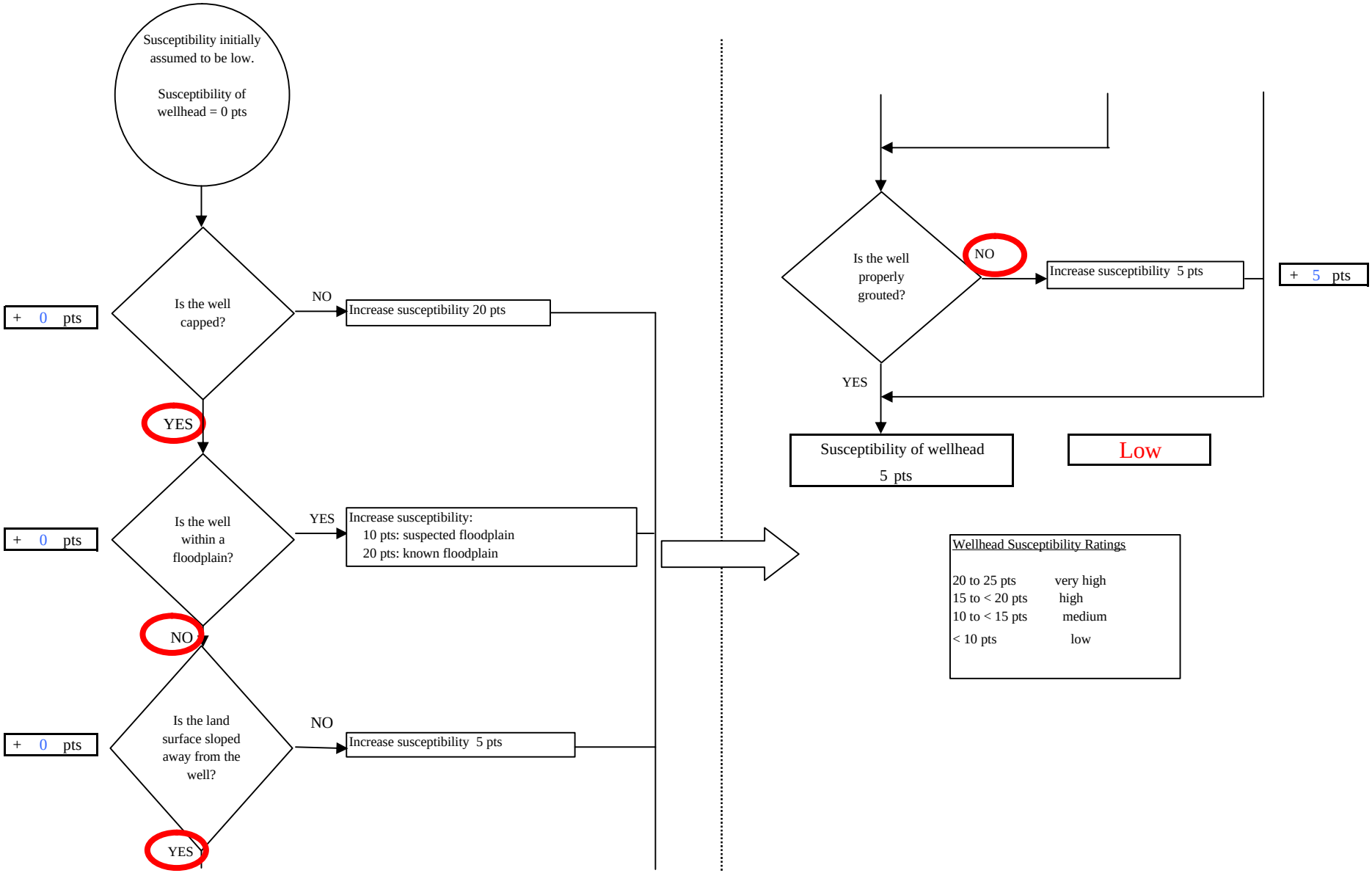


Chart 2. Susceptibility of the Aquifer - American Legion Post 33

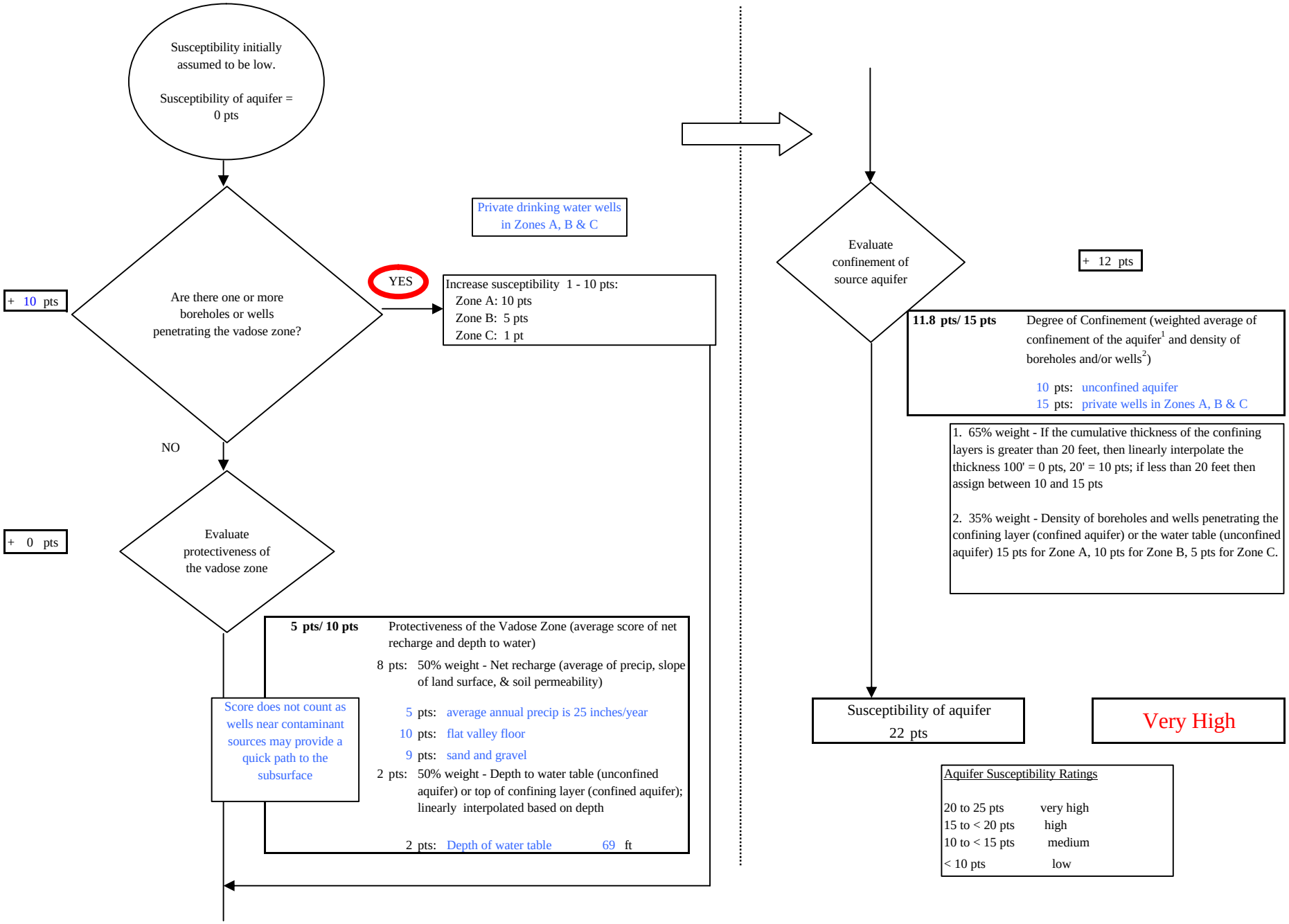
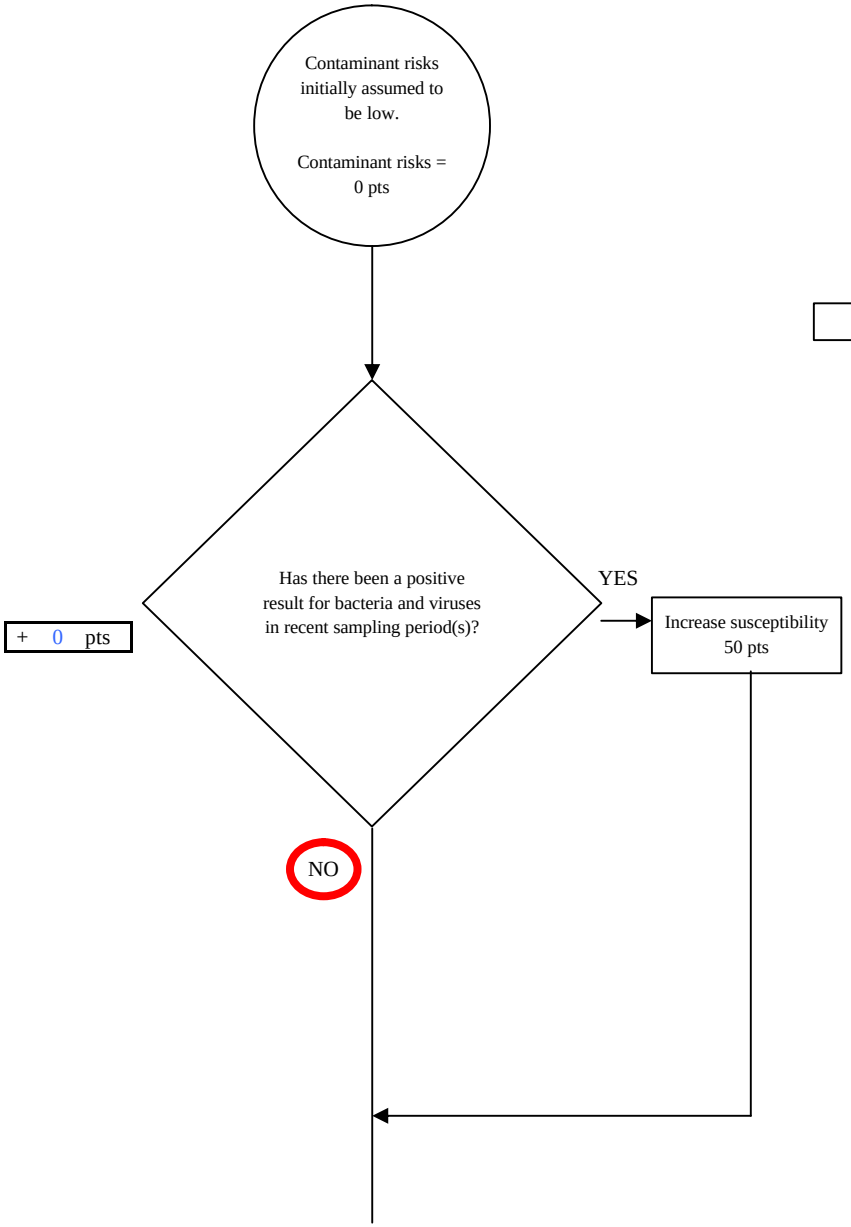
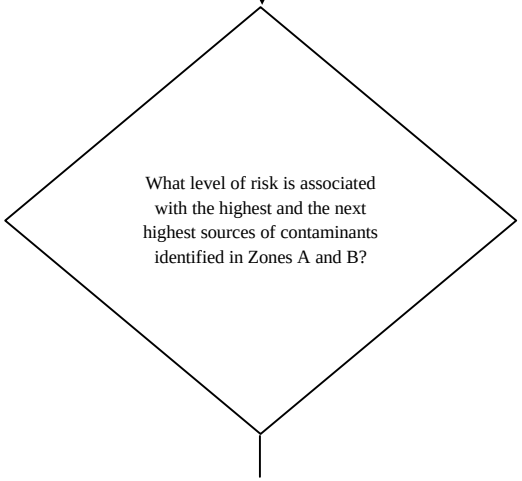


Chart 3. Contaminant Risks for American Legion Post 33 - Bacteria & Viruses





+ 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)	2	0	2
Medium(s)	1	0	1
Low(s)	3	3	6

	LOW 10 pts	**MEDIUM** 20 pts	**HIGH** 30 pts	**VERY HIGH** 40 pts
LOW	³ 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 American Legion Post 33 - Bacteria & Viruses

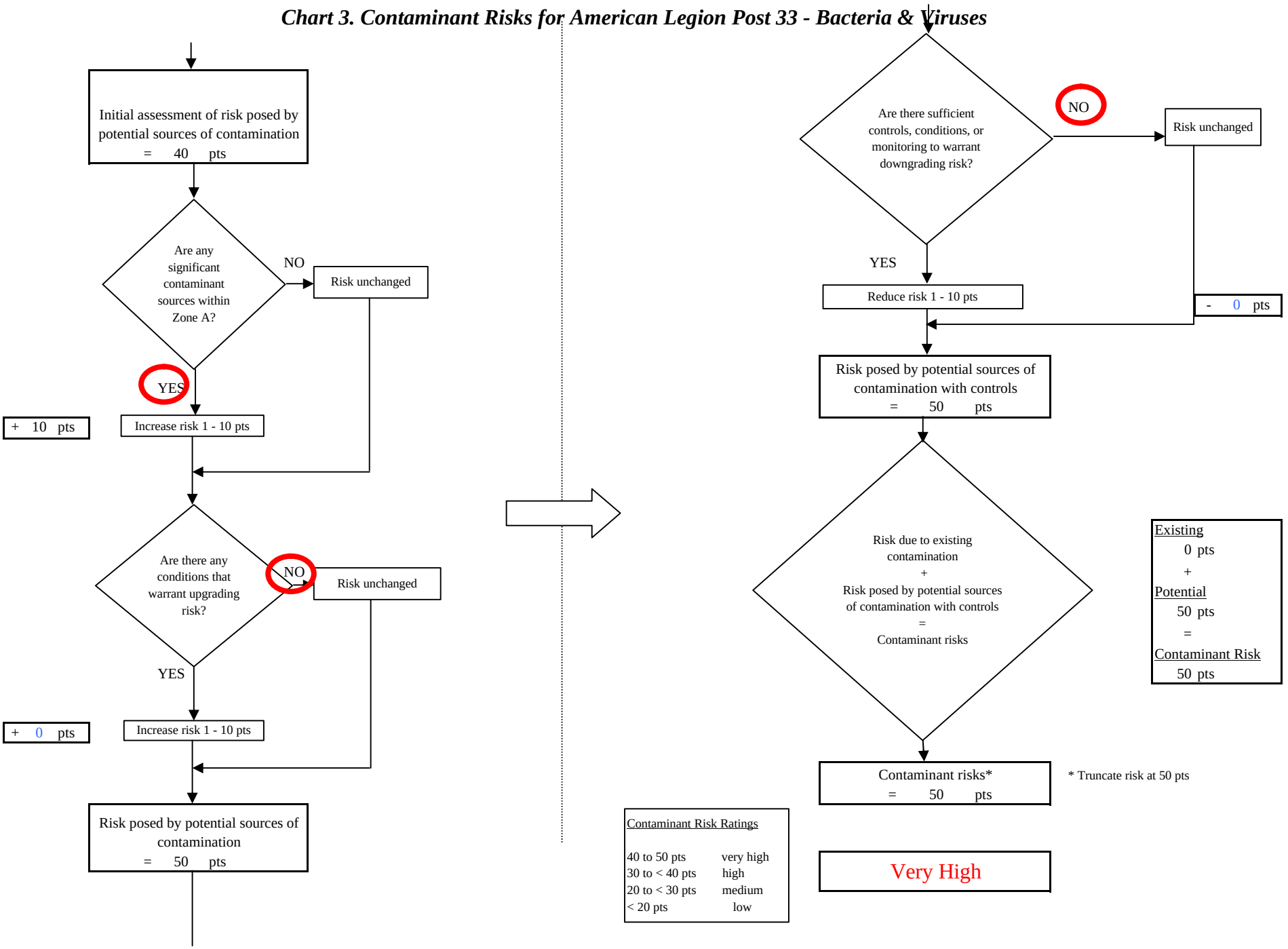


Chart 4. Vulnerability Analysis for American Legion Post 33 - Bacteria & Viruses

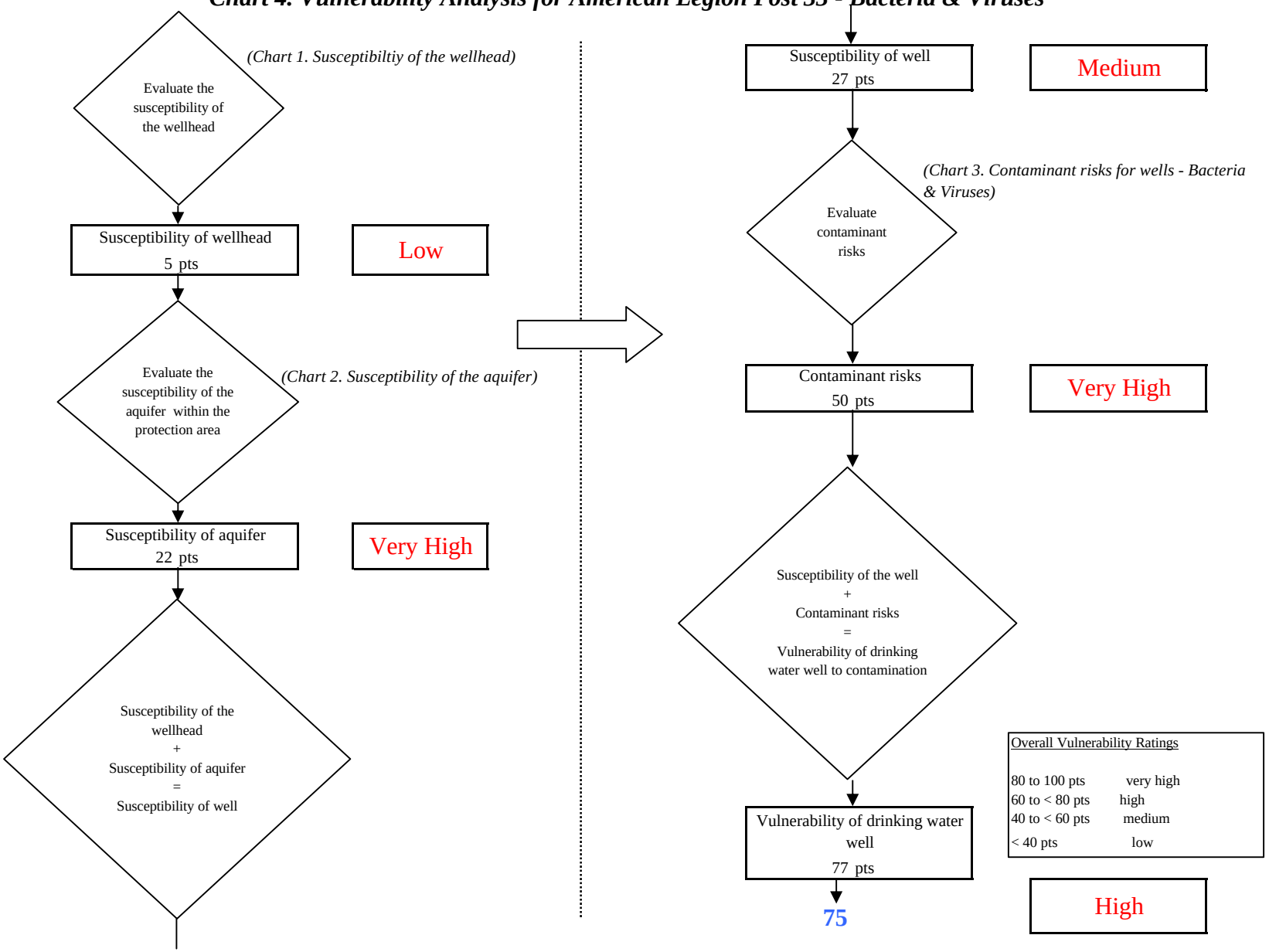


Chart 5. Contaminant Risks for American Legion Post 33 - Nitrates and Nitrites

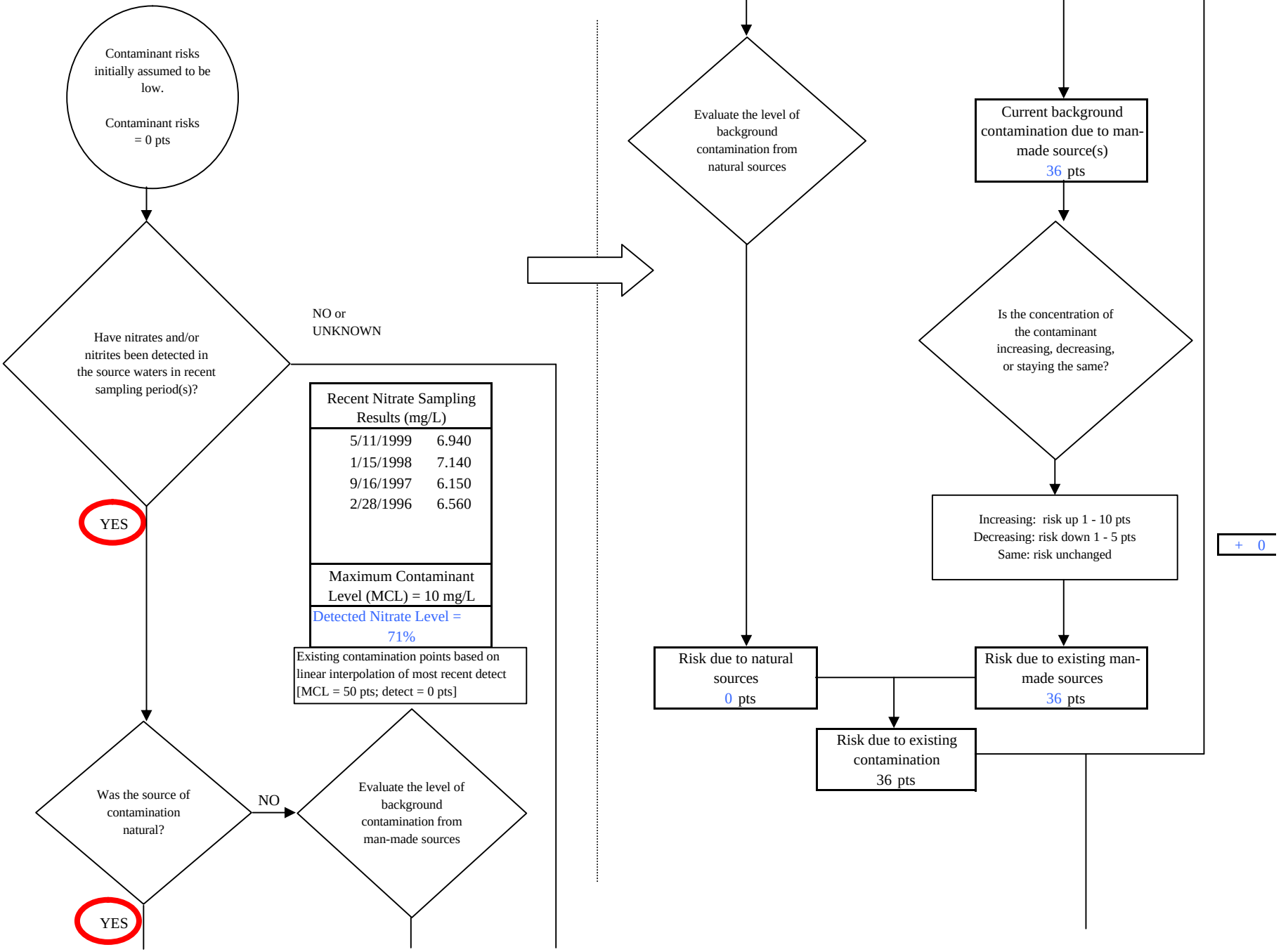
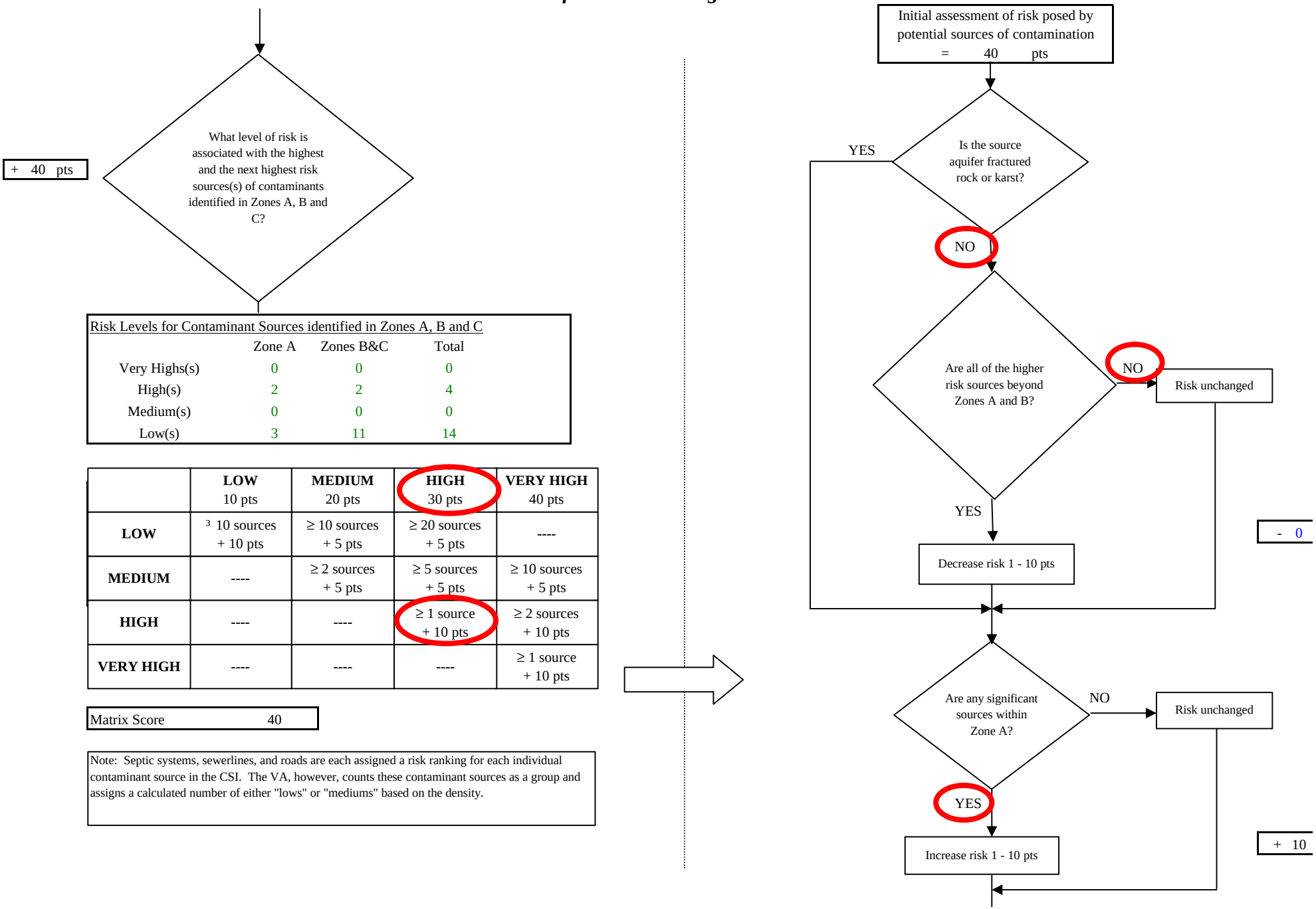


Chart 5. Contaminant Risks for American Legion Post 33 - Nitrates and Nitrites



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

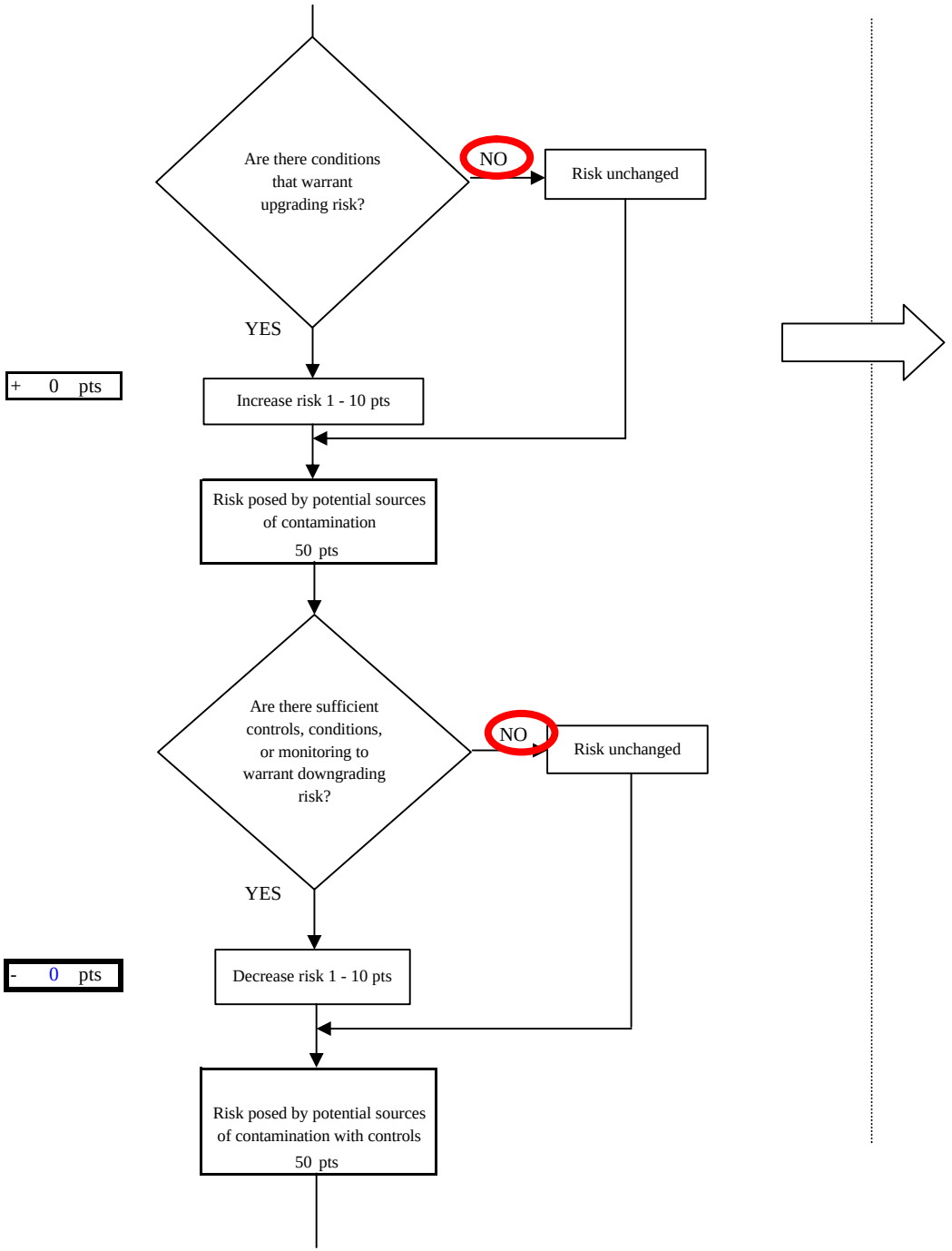
	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	2	2	4
Medium(s)	0	0	0
Low(s)	3	11	14

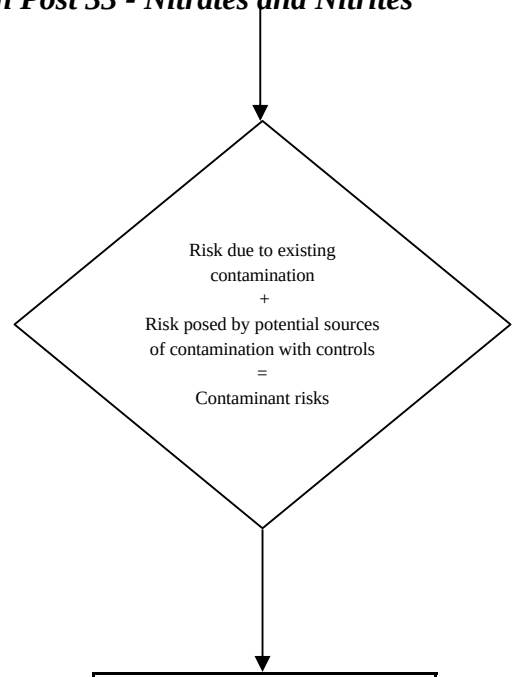
	LOW 10 pts	**MEDIUM** 20 pts	**HIGH** 30 pts	**VERY HIGH** 40 pts
LOW	[3] 10 sources + 10 pts	≥ 10 sources + 5 pts	≥ 20 sources + 5 pts	----
MEDIUM	----	≥ 2 sources + 5 pts	≥ 5 sources + 5 pts	≥ 10 sources + 5 pts
HIGH	----	----	≥ 1 source + 10 pts	≥ 2 sources + 10 pts
VERY HIGH	----	----	----	≥ 1 source + 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 5. Contaminant Risks for American Legion Post 33 - Nitrates and Nitrites





Existing
36 pts
+
Potential
50 pts
=
Contaminant Risk
86 pts

Contaminant risks*
= 50 pts

*Truncate risk at 50 pts

Very High

Contaminant Risk Ratings

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

Chart 6. Vulnerability Analysis for American Legion Post 33 - Nitrates and Nitrites

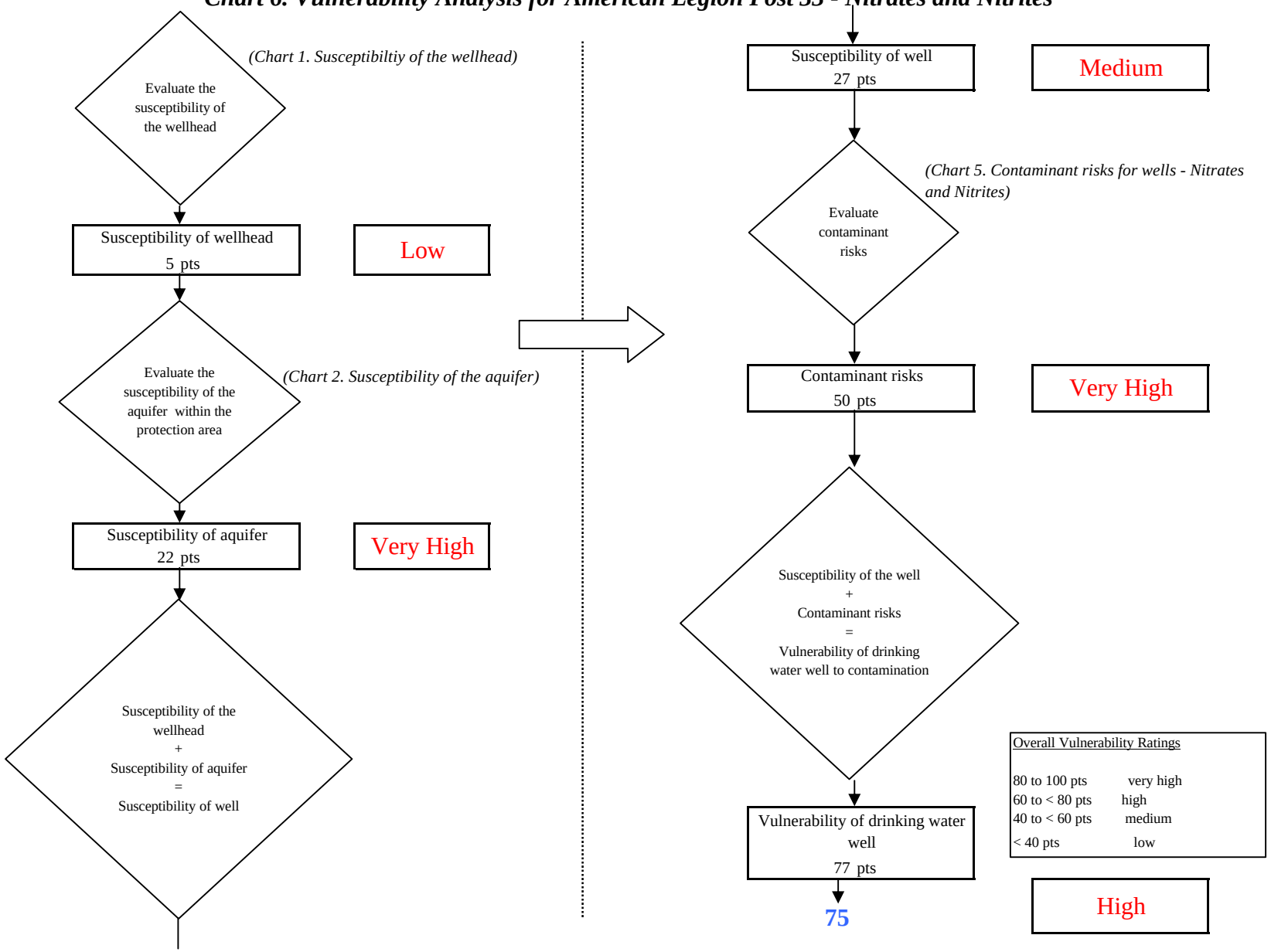


Chart 7. Contaminant Risks for American Legion Post 33 - Volatile Organic Chemicals

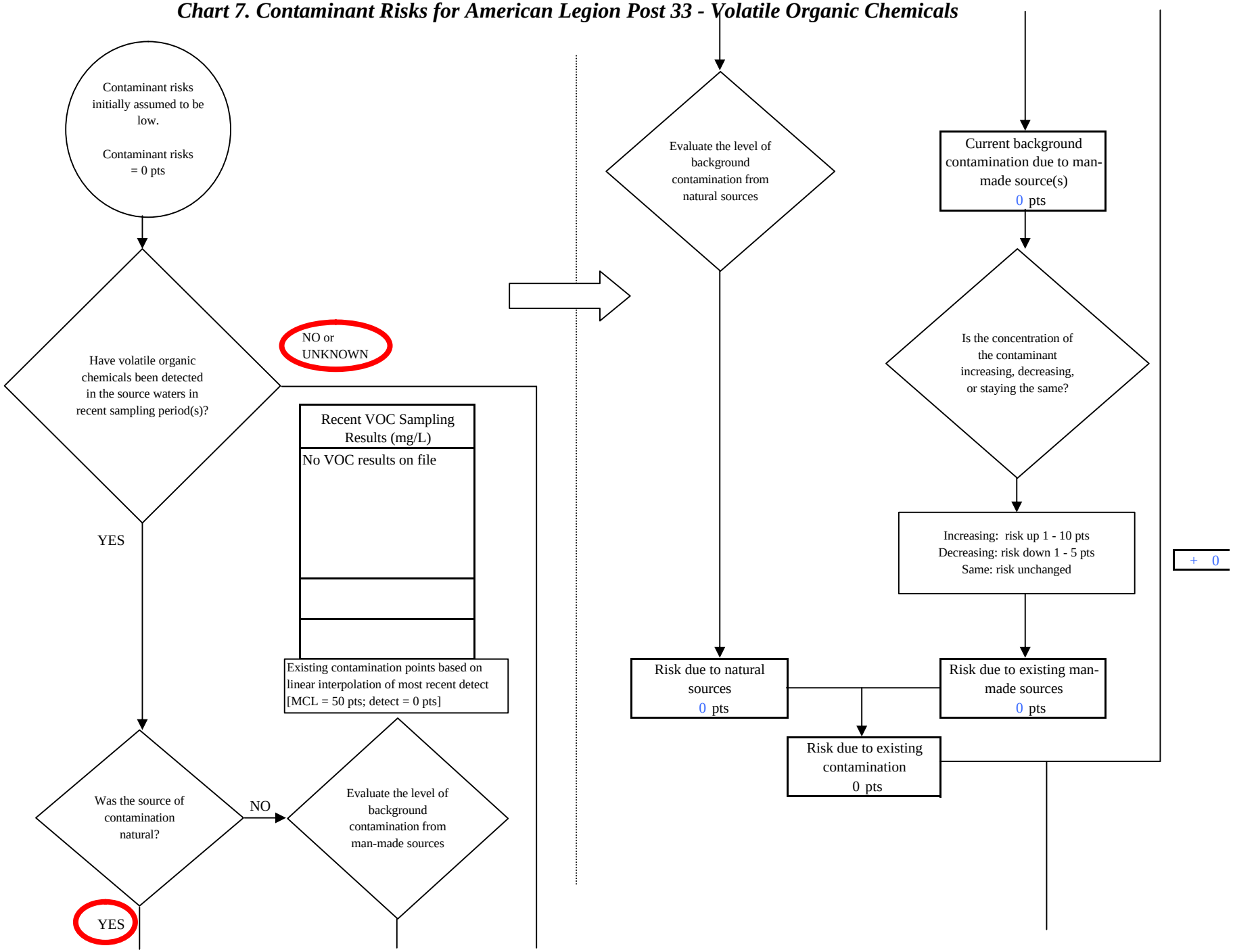


Chart 7. Contaminant Risks for American Legion Post 33 - Volatile Organic Chemicals

+ 40 pts

What level of risk is associated with the highest and the next highest risk sources(s) of contaminants identified in Zones A, B and C?

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

	Zone A	Zones B&C	Total
Very Highs(s)	0	1	1
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	6	7	13

	LOW 10 pts	**MEDIUM** 20 pts	**HIGH** 30 pts	**VERY HIGH** 40 pts
LOW	[3] 10 sources + 10 pts	≥ 10 sources + 5 pts	≥ 20 sources + 5 pts	----
MEDIUM	----	≥ 2 sources + 5 pts	≥ 5 sources + 5 pts	≥ 10 sources + 5 pts
HIGH	----	----	≥ 1 source + 10 pts	≥ 2 sources + 10 pts
VERY HIGH	----	----	----	≥ 1 source + 10 pts

Matrix Score 40

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

Initial assessment of risk posed by potential sources of contamination = 40 pts

Is the source aquifer fractured rock or karst?

YES

NO

Are all of the higher risk sources beyond Zones A and B?

NO

Risk unchanged

YES

- 0

Decrease risk 1 - 10 pts

Are any significant sources within Zone A?

NO

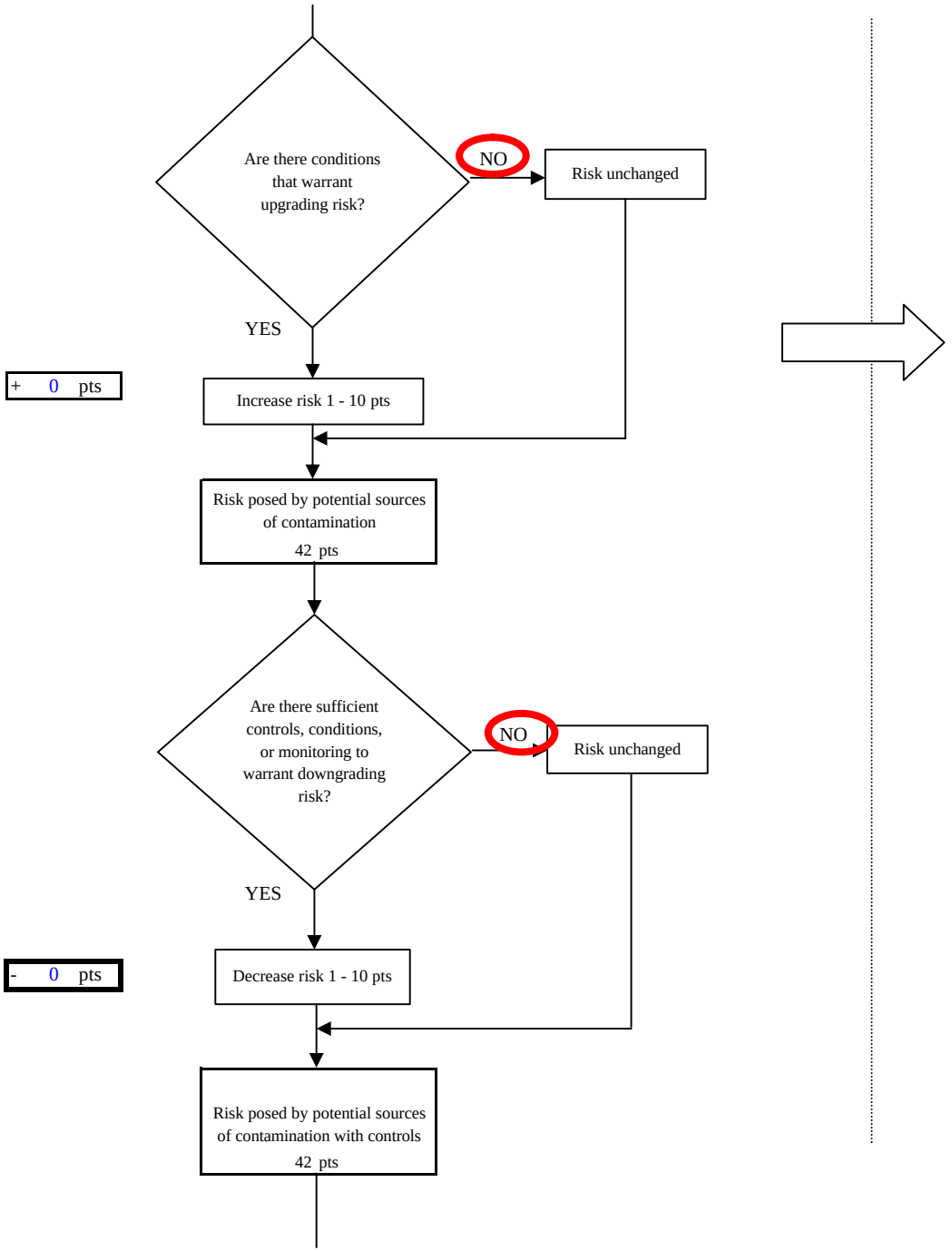
Risk unchanged

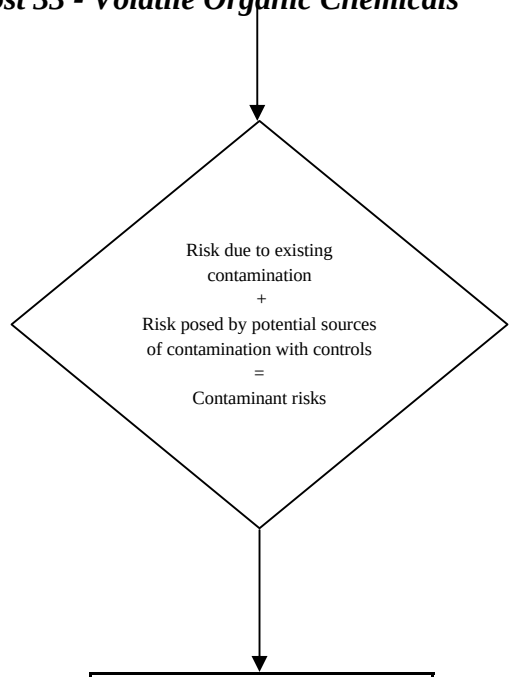
YES

+ 2

Increase risk 1 - 10 pts

Chart 7. Contaminant Risks for American Legion Post 33 - Volatile Organic Chemicals





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

Contaminant risks*
= 42 pts

*Truncate risk at 50 pts

Very High

Contaminant Risk Ratings

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

Chart 8. Vulnerability Analysis for American Legion Post 33 - Volatile Organic Chemicals