Source Water Assessment for Forty Niner Homeowner's Association Wasilla Area, Alaska

A Hydrogeologic Susceptibility and Vulnerability Assessment

DRINKING WATER PROTECTION PROGRAM REPORT 187
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ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION: 2002

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Source Water Assessment for Forty Niner Homeowner's Association Source of Public Drinking Water, Wasilla Area, Alaska

By Sarah A. Bendewald

Drinking Water Protection Program
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EXECUTIVE SUMMARY

The Public Water System for Forty Niner Homeowner's Association is a Class A (non-transient/non-community) water system consisting of one well west of the town of Wasilla, Alaska. Identified potential and current sources of contaminants for Forty Niner Homeowner's Association public drinking water source include: large capacity and residential septic systems, a rail corridor, underground fuel storage tanks, highways and roads, and residential areas. These identified potential and existing sources of contamination are considered sources of bacteria and viruses, nitrates and/or nitrites, volatile organic chemicals, heavy metals, synthetic organic chemicals, and other organic chemicals. Overall, the public water sources for Forty Niner Homeowner's Association received a vulnerability rating of **Low** for all six contaminant categories: bacteria and viruses, nitrates and nitrites, volatile organic chemicals, heavy metals, synthetic organic chemicals, and other organic chemicals.

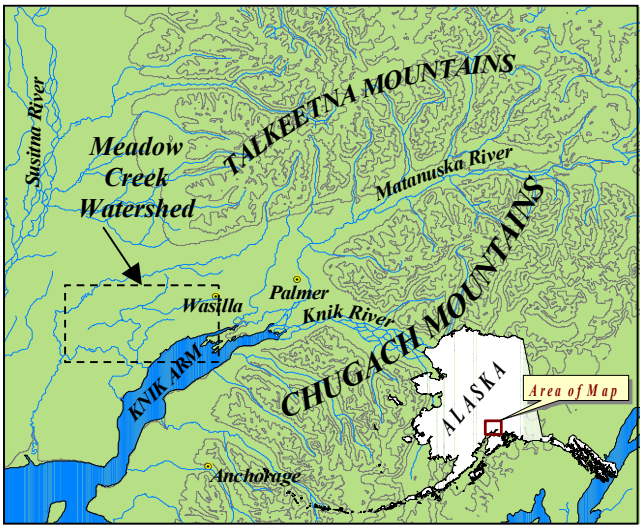

Figure 1. Index Map showing the location of the Matanuska-Susitna Valley and the Meadow Creek Watershed.

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 the source of public drinking water serving Forty Niner Homeowner's Association. This water system consists of one well seven miles west of Wasilla, Alaska. 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 MEADOW CREEK WATERSHED, ALASKA

Location

The Meadow Creek watershed is located within the Matanuska-Susitna Borough in southcentral Alaska. The Borough encompasses a total of 24,694 square miles supporting a population of approximately 60,000. It is contained within the watersheds of the Matanuska and Susitna Rivers which flow from the glacier melt waters in the Alaska Range, Talkeetna Mountains, and the Chugach Mountains to tidewater in the Knik Arm of Upper Cook Inlet *(Jokela, Munter and Evans, 1991)*. This area between the Matanuska and Susitna Valleys is commonly referred to as the Mat-Su Valley. The Meadow Creek watershed extends from an area northwest of Wasilla to the west end of Big Lake, and contains 115 lakes, including Big Lake *(Jokela, Munter and Evans, 1991)* (see Figure 1). The towns of Wasilla, Big Lake, and Houston lie on the outskirts of its boundaries.

Climate

The climate in the Mat-Su Valley is considered transitional between the extreme temperature fluctuations of Interior Alaska and the wet conditions of the coastal areas.

The Meadow Creek watershed is less than 15 miles from Knik Arm and less than 75 miles from Prince William Sound. Summer temperatures are more moderate than those in the Interior due to the proximity to the coast. The Chugach and Talkeetna Mountains and the Alaska Range also protect the area from the frigid cold of the Interior Alaska winter and act to break up strong storm fronts *(Brabets, 1997), (Western Regional Climate Center, 2000)*.

The Mat-Su Valley area averages about 18 inches of precipitation per year, including about 59 inches of snowfall. Winter thaws can decrease snow cover to a few inches. Mean monthly high temperatures range from about 22 degrees Farenheight in December and January to 69 degrees in July. The frost-free period in spring and summer averages 115 days, with the first frost usually arriving by September 1.

The record low for Wasilla was –50 degrees in January 1947. The highest recorded temperature was 90 degrees in 1969 *(Wickersham Alaska Corporation, 1986)*.

Physiography and Groundwater Conditions

Glacial forces during the end of the last ice age shaped the Mat-Su Valley. Several glacial advances and retreats left a complex system of hills, ridges, lakes, and lowlands that define the topography of today. Surface elevations in the Mat-Su Valley range from sea level where the Knik and Matanuska Rivers enter the Cook Inlet to well over 6,000 feet in the peaks that bound the area. Landforms in the area consist of undulating ridges of glacial till and flat benches of sand and gravel outwash *(Matanuska-Susitna Borough)*. The Meadow Creek watershed lies in relatively flat area of the Matanuska River valley.

The regional geology and ground water conditions of the Mat-Su Valley vary greatly by location. Glacial advances and retreats also formed a fluctuating subsurface system of unconsolidated layers comprised of fine- to coarse-grained particles (clay to boulders) and consolidated confining layers. The majority of wells in the Mat-Su Valley are located in unconsolidated layers consisting of relatively well-sorted sands and gravels. These unconsolidated layers vary substantially in size and distribution throughout the Valley. In general, the unconsolidated layers increase in thickness moving towards Cook Inlet *(Jokela, Munter and Evans, 1991)*. The numerous confining layers in the area, ranging in thickness from

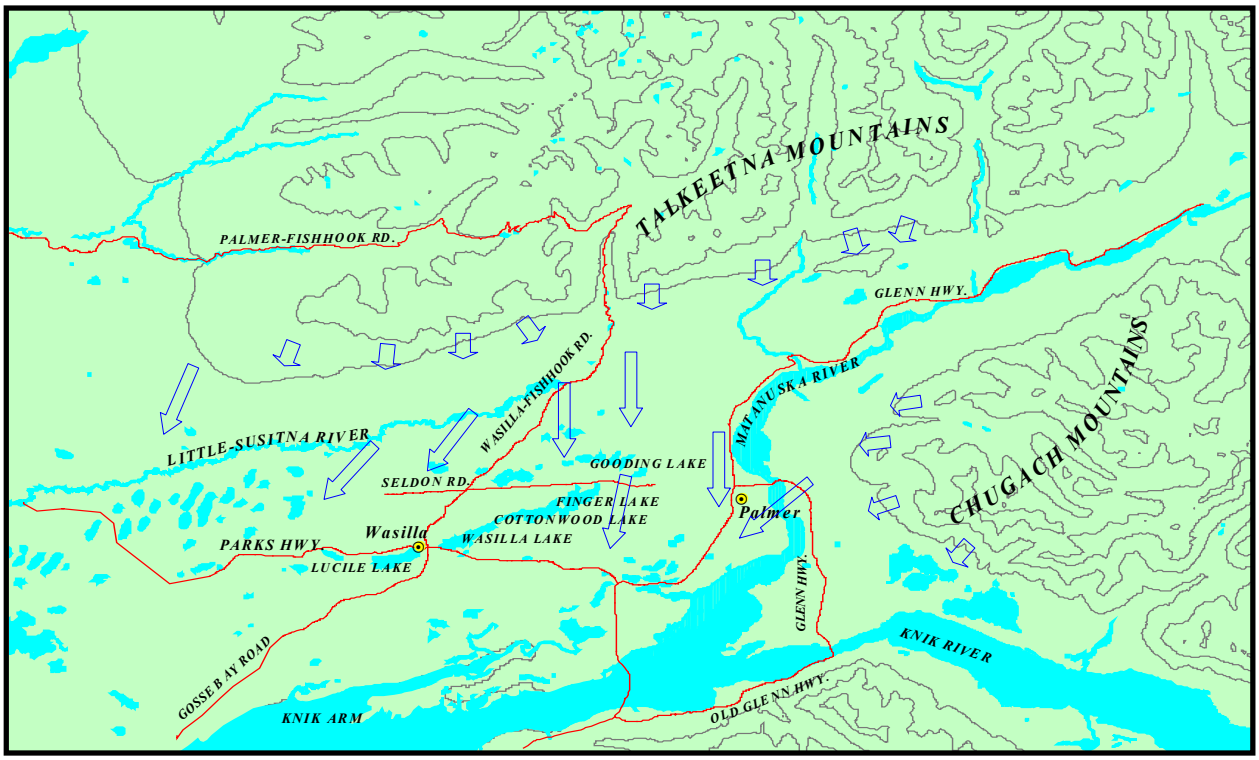

Figure 2. Map showing groundwater flow in the Matanuska-Susitna Valley (Jokela, Munter and Evans, 1991).

less than 1 foot to 60 feet, divide the unconsolidated layers.

Groundwater flow in the deeper confined aquifers of the Mat-Su Valley is generally north to south in the central region of the valley flowing toward the Matanuska River and gradually becoming more northeast to southwest in the western region. The direction of groundwater flow in the upper unconfined aquifers are more variable due to the influence from surficial topography as well as its close connection with surface water bodies *(Jokela, Munter and Evans, 1991)* (Figure 2). The groundwater flow direction of the Meadow Creek watershed was generally found to be northeast to southwest in both the unconfined and confined aquifers.

In the Mat-Su Valley, groundwater is primarily recharged by snowmelt and precipitation infiltrating both directly and also from the infiltration into the foothill slopes of the Talkeetna and Chugach Mountains.

FORTY NINER HOMEOWNER'S ASSOCIATION PUBLIC DRINKING WATER SYSTEM

Forty Niner Homeowner's Association public water system is a Class A (non-transient/non-community) water system. The system consists of one well 7 miles west of Wasilla, Alaska near the intersection of the Parks Highway and Sylvan Road (T17N, R2W, Section 10). This area is at an elevation of approximately 300 feet above sea level.

According to the well log completed for the water system, installation of the well occurred on June 20, 1979 to a total depth of approximately 118 feet below ground surface and was completed in 6-inch well casing. 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 well is not properly grouted. Proper grouting provides added protection against contaminants travelling along the well casing and into source waters.

According to the 1998 SOC Waiver Application, this system operates year-round and serves approximately 40 residents with 12 service connections.

ASSESSMENT AND PROTECTION AREA FOR FORTY NINER HOMEOWNER'S ASSOCIATION DRINKING WATER SOURCE

The Drinking Water Protection and Assessment Area that has been established for Forty Niner Homeowner's Association source of drinking water 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 zones around the drinking water source outline the most critical area for the preservation of the quality of the drinking water for this system. For simplicity, this area will be known as your Drinking Water Protection Area and will serve as the focus for voluntary protection efforts.

Conceptually, groundwater enters the aquifer systems through infiltration of direct precipitation within the area and also from the infiltration into the foothill slopes of the Talkeetna Mountains. An analytical calculation was used to determine 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 each public drinking water source in Anchorage. Additional methods were further employed to take into account any uncertainties in groundwater flow and aquifer characteristics to arrive at meaningful and conservative protection areas with respect to public health (Please refer to the Guidance Manual for Class A 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 Forty Niner Homeowner's Association 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 wells may be on the order of several days to several hours. Zone A also extends downgradient from the wells to take into account the area of the aquifer that is influenced by pumping of the wells.

Zone B corresponds to a time-of-travel of less than two years. Zones C and 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 the Drinking Water Protection

Area for Forty Niner Homeowner's Association. 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 A public water system assessments, six categories of drinking water contaminants were inventoried. They include:

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

Maps 2 and 3 in Appendix C depict the Contaminant Source Inventory for Forty-Niner Homeowner's Association. Table 1 in Appendix B lists the inventoried potential sources of contamination within Zones A through D. Below is a summary of the contaminant sources inventoried within the Drinking Water Protection Area for Forty Niner Homeowner's Association:

- A rail corridor;
- a large capacity septic system;
- residential septic systems;
- underground fuel storage tanks;
- highway and roads; and
- residential areas.

These potential and existing contaminant sources present risk for all six categories of drinking water contaminants for Forty Niner Homeowner's Association source of public drinking water.

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 public drinking water wells.

VULNERABILITY OF FORTY NINER HOMEOWNER'S ASSOCIATION'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 six 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)

The well serving Forty Niner Homeowner's Association was completed in a confined aquifer. The depth to the confining layer is approximately 74 feet below land surface. Two layers of "hardpan" (usually a mixture of silt, clay, and/or sand), one of approximately 11 feet and the other of approximately 50 feet, confine the aquifer in this area. The saturated thickness of the aquifer in which the well is screened in is approximately 65 feet and composed of gravel. The presence of a confining layer inhibits contaminants that enter the subsurface within the vicinity of the well and Drinking Water Protection Area to migrate to the screened portion of the well.

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 depicts the overall Susceptibility score and rating for the sources of

public drinking water serving Forty Niner Homeowner's Association.

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

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

Contaminant risks to a drinking water source depend on the type, number or density, and distribution of contaminant sources. A score (0 – 50 points) and rating of Contaminant Risks (See Appendix D) is assigned based on the findings of the Contaminant Source Inventory (See Appendix B - Table 1 – Table 7). This portion of the analysis examines recent existing or historical contamination that has been detected at the drinking water sources through routine sampling. It also reviews contamination that has or may have occurred but has not arrived or been detected at the either well. Table 2 summarizes the Contaminant Risks for each category of drinking water contaminants.

Table 2. Contaminant Risks of Forty Niner Homeowner's Association's Public Drinking Water Source to Contamination by Category

Contaminant Risks	Score	Rating
Bacteria and Viruses	22	Medium
Nitrates and/or Nitrites	26	Medium
Volatile Organic Chemicals	19	Low
Heavy Metals, Cyanide, And Other Inorganic Chemicals	12	Low
Synthetic Organic Chemicals	17	Low
Other Organic Chemicals	12	Low

Appendix D contains fourteen charts, which together form the 'Vulnerability Analysis' for a Class A public drinking water system. 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 14 contain the Contaminant Risks and Vulnerability Analysis for nitrates and nitrites, volatile organic chemicals, heavy metals, synthetic organic chemicals, and other organic chemicals, respectively.

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

Table 3. Overall Vulnerability of Forty Niner Homeowner's Association'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	30	Low
Heavy Metals, Cyanide, and Other Inorganic Chemicals	25	Low
Synthetic Organic Chemicals	30	Low
Other Organic Chemicals	25	Low

Tables 2 through 7 in Appendix B contain the ranking of potential and existing sources of contamination with respect to bacteria and viruses, nitrates and/or nitrites, heavy metals, synthetic organic chemicals, and other organic chemicals, respectively.

The density of residential septic systems significantly increases the risk for bacteria and viruses and nitrates and nitrites. Septic systems are designed to leach domestic wastewater in the subsurface. If engineered and operating properly, leach fields for septic systems should filter and stop the migration of microorganisms in the subsurface. However, failure of a septic system can result in the migration of contaminants away from the leach field, sometimes to great distances, especially in highly transmissive soils.

The large capacity septic system found in Zone C also slightly increases the risk for bacteria and viruses and nitrates and nitrites. Large capacity septic systems are classified as a type of Class V Injection well, and differ

from residential septic systems in that they serve multiple dwellings, businesses, or communities. This classification does not include single family residential and other non-residential system serving less than 20 people.

Review of the historical sampling data indicates that the surrounding septic systems have not impacted the source water for Forty Niner Homeowner's Association public water system. Neither bacteria and viruses nor nitrates and nitrites have been detected during recent water sampling of the system.

The portion of the Alaska Railroad running through part of Zone C and Zone D of the protection area poses the greatest risk for the remaining four contaminant categories: volatile organic chemicals, heavy metals, synthetic organic chemicals, and other organic chemicals.

SUMMARY

A *Source Water Assessment* has been completed for the sources of public drinking water serving Forty Niner Homeowner's Association. The overall vulnerability of this source to contamination is **Low** for all six contaminant categories: bacteria and viruses, nitrates and nitrites, volatile organic chemicals, heavy metals, synthetic organic chemicals and other 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 Forty Niner Homeowner's Association 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 Forty Niner Homeowner's Association public drinking water source.

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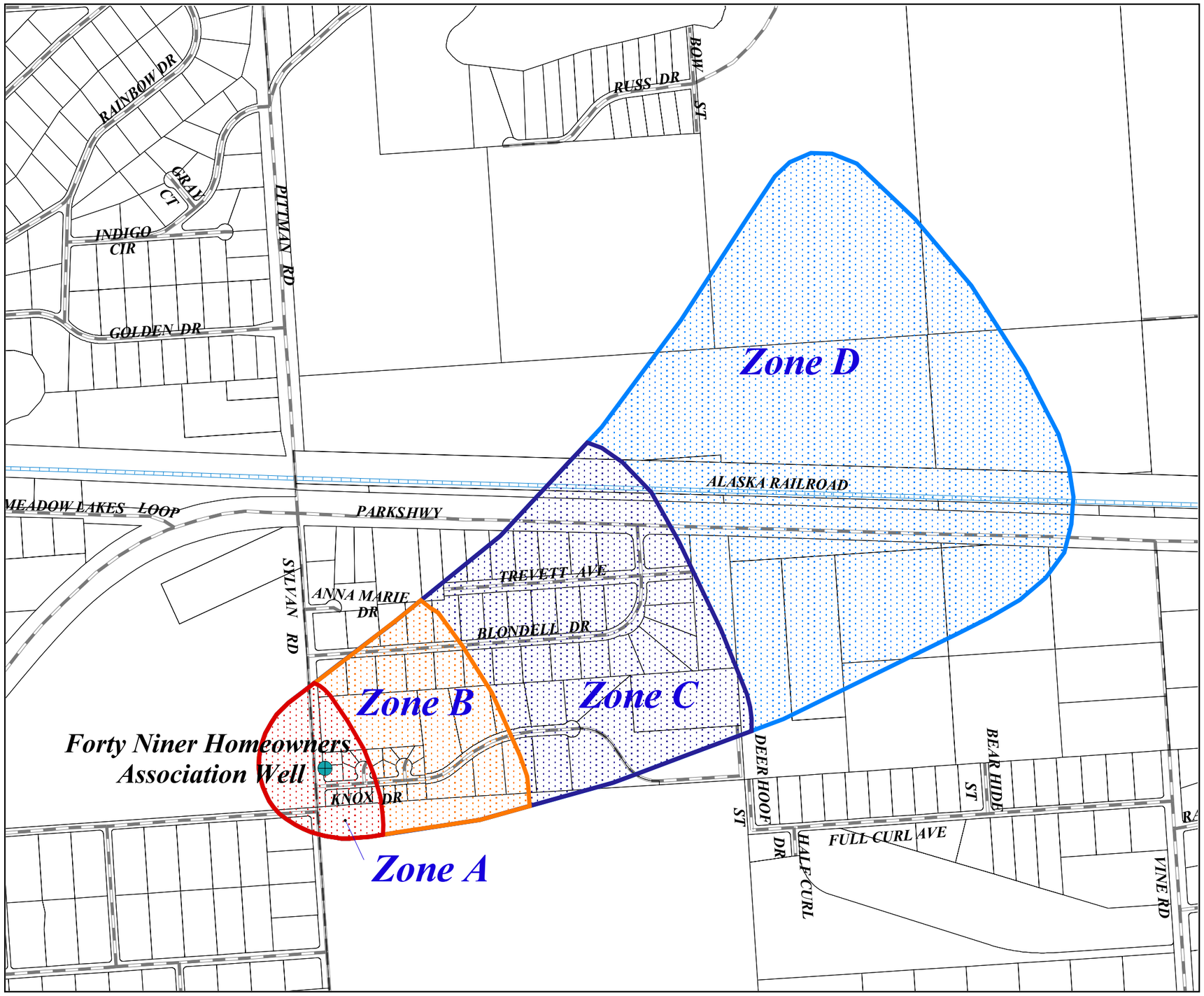
APPENDIX A

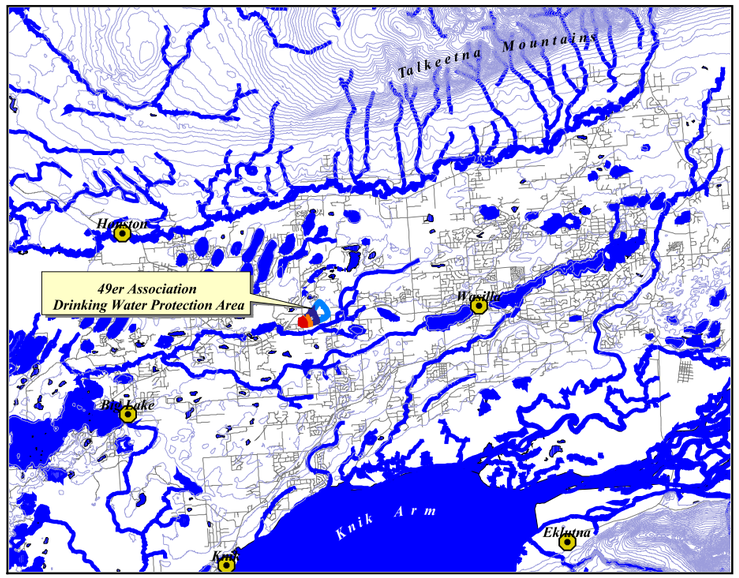
Forty Niner Homeowner's Association
Drinking Water Protection Area

Forty Niner Homeowner's Association Drinking Water Protection Area



Legend

- Public Water System
- 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
- Parcels
- Roads
- Railroads



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Map 1

APPENDIX B

Contaminant Source Inventory and Risk Ranking for Forty Niner Homeowner's Association

Table 1

Contaminant Source Inventory for
Forty Niner Homeowners Association

PWSID 224028.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Location*	*Map Number*	*Comments*
Residential Areas	R01	R1-1	A	West of Sylvan Rd	2	2.5 acres of residential area in Zone A
Septic systems (serves one single-family home)	R02	R2-01	A	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-02	A	Sylvan Dr	3	
Septic systems (serves one single-family home)	R02	R2-03	A	Mike Cir	3	
Septic systems (serves one single-family home)	R02	R2-04	A	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-05	A	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-06	A	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-07	A	Knox Dr	3	
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Sylvan Rd	2	
Highways and roads, dirt/gravel	X24	X24-1	A	Knox Dr	2	
Highways and roads, dirt/gravel	X24	X24-2	A	Mike Cir	2	
Residential Areas	R01	R1-2	B	Along Blondell Dr and Knox Dr	2	21 acres of residential area in Zone B
Septic systems (serves one single-family home)	R02	R2-08	B	Mike Cir	3	
Septic systems (serves one single-family home)	R02	R2-10	B	Gary Cir	3	
Septic systems (serves one single-family home)	R02	R2-11	B	Sylvan Rd	3	
Septic systems (serves one single-family home)	R02	R2-12	B	Gary Cir	3	
Septic systems (serves one single-family home)	R02	R2-13	B	Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-14	B	Gary Cir	3	
Septic systems (serves one single-family home)	R02	R2-15	B	Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-16	B	Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-17	B	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-18	B	Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R209	B	Mike Cir	3	
Highways and roads, dirt/gravel	X24	X24-3	B	Gary Circle	2	

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Location*	*Map Number*	*Comments*
Highways and roads, dirt/gravel	X24	X24-4	B	Blondell Dr	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	C	Trevett Ave	3	
Residential Areas	R01	R1-3	C	Between Parks Hwy and Knox Dr	2	42 acres of residential area in Zone C
Septic systems (serves one single-family home)	R02	R2-19to26	C	Trevett Ave, Blondell Dr, Knox Dr	3	
Highways and roads, paved (cement or asphalt)	X20	X20-2	C	Parks Hwy	2	
Highways and roads, dirt/gravel	X24	X24-5	C	Trevett Ave	2	
Rail corridors	X30	X30-1	C	Alaska Railroad	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-2	D	Parks Hwy	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-3	D	Parks Hwy	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-4	D	Parks Hwy	3	
Tanks, gasoline (underground)	T12	T12-1	D	Parks Hwy	3	
Tanks, gasoline (underground)	T12	T12-2	D	Parks Hwy	3	
Tanks, diesel (underground)	T08	T8-1	D	Parks Hwy	3	

Table 2

Contaminant Source Inventory and Risk Ranking for Forty Niner Homeowners Association Sources of Bacteria and Viruses

PWSID 224028.001

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)	R02	R2-01	A	Low	1	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-02	A	Low	2	Sylvan Dr	3	
Septic systems (serves one single-family home)	R02	R2-03	A	Low	3	Mike Cir	3	
Septic systems (serves one single-family home)	R02	R2-04	A	Low	4	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-05	A	Low	5	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-06	A	Low	6	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-07	A	Low	7	Knox Dr	3	
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	8	Sylvan Rd	2	
Highways and roads, dirt/gravel	X24	X24-1	A	Low	9	Knox Dr	2	
Highways and roads, dirt/gravel	X24	X24-2	A	Low	10	Mike Cir	2	
Residential Areas	R01	R1-1	A	Low		West of Sylvan Rd	2	2.5 acres of residential area in Zone A
Residential Areas	R01	R1-2	B	Low		Along Blondell Dr and Knox Dr	2	21 acres of residential area in Zone B
Septic systems (serves one single-family home)	R02	R2-08	B	Low		Mike Cir	3	
Septic systems (serves one single-family home)	R02	R2-10	B	Low		Gary Cir	3	
Septic systems (serves one single-family home)	R02	R2-11	B	Low		Sylvan Rd	3	
Septic systems (serves one single-family home)	R02	R2-12	B	Low		Gary Cir	3	
Septic systems (serves one single-family home)	R02	R2-13	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-14	B	Low		Gary Cir	3	
Septic systems (serves one single-family home)	R02	R2-15	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-16	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-17	B	Low		Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-18	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-18	B	Low		Blondell Dr	3	

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	R209	B	Low		Mike Cir	3	
Highways and roads, dirt/gravel	X24	X24-3	B	Low		Gary Circle	2	
Highways and roads, dirt/gravel	X24	X24-4	B	Low		Blondell Dr	2	

Table 3

Contaminant Source Inventory and Risk Ranking for Forty Niner Homeowners Association Sources of Nitrates/Nitrites

PWSID 224028.001

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	C	High	1	Trevett Ave	3	
Septic systems (serves one single-family home)	R02	R2-01	A	Low	2	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-02	A	Low	3	Sylvan Dr	3	
Septic systems (serves one single-family home)	R02	R2-03	A	Low	4	Mike Cir	3	
Septic systems (serves one single-family home)	R02	R2-04	A	Low	5	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-05	A	Low	6	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-06	A	Low	7	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-07	A	Low	8	Knox Dr	3	
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	9	Sylvan Rd	2	
Highways and roads, dirt/gravel	X24	X24-1	A	Low	10	Knox Dr	2	
Residential Areas	R01	R1-1	A	Low		West of Sylvan Rd	2	2.5 acres of residential area in Zone A
Highways and roads, dirt/gravel	X24	X24-2	A	Low		Mike Cir	2	
Residential Areas	R01	R1-2	B	Low		Along Blondell Dr and Knox Dr	2	21 acres of residential area in Zone B
Septic systems (serves one single-family home)	R02	R2-08	B	Low		Mike Cir	3	
Septic systems (serves one single-family home)	R02	R2-10	B	Low		Gary Cir	3	
Septic systems (serves one single-family home)	R02	R2-11	B	Low		Sylvan Rd	3	
Septic systems (serves one single-family home)	R02	R2-12	B	Low		Gary Cir	3	
Septic systems (serves one single-family home)	R02	R2-13	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-14	B	Low		Gary Cir	3	
Septic systems (serves one single-family home)	R02	R2-15	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-16	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-17	B	Low		Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-18	B	Low		Blondell Dr	3	

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	R2-18	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R209	B	Low		Mike Cir	3	
Highways and roads, dirt/gravel	X24	X24-3	B	Low		Gary Circle	2	
Highways and roads, dirt/gravel	X24	X24-4	B	Low		Blondell Dr	2	
Residential Areas	R01	R1-3	C	Low		Between Parks Hwy and Knox Dr	2	42 acres of residential area in Zone C
Septic systems (serves one single-family home)	R02	R2-19to26	C	Low		Trevett Ave, Blondell Dr, Knox Dr	3	
Highways and roads, paved (cement or asphalt)	X20	X20-2	C	Low		Parks Hwy	2	
Highways and roads, dirt/gravel	X24	X24-5	C	Low		Trevett Ave	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-2	D	High		Parks Hwy	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-3	D	High		Parks Hwy	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-4	D	High		Parks Hwy	3	

Table 4

Contaminant Source Inventory and Risk Ranking for Forty Niner Homeowners Association Sources of Volatile Organic Chemicals

PWSID 224028.001

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	C	Medium	1	Alaska Railroad	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	C	Low	2	Trevett Ave	3	
Septic systems (serves one single-family home)	R02	R2-01	A	Low	3	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-02	A	Low	4	Sylvan Dr	3	
Septic systems (serves one single-family home)	R02	R2-03	A	Low	5	Mike Cir	3	
Septic systems (serves one single-family home)	R02	R2-04	A	Low	6	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-05	A	Low	7	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-06	A	Low	8	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-07	A	Low	9	Knox Dr	3	
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	10	Sylvan Rd	2	
Residential Areas	R01	R1-1	A	Low		West of Sylvan Rd	2	2.5 acres of residential area in Zone A
Highways and roads, dirt/gravel	X24	X24-1	A	Low		Knox Dr	2	
Highways and roads, dirt/gravel	X24	X24-2	A	Low		Mike Cir	2	
Residential Areas	R01	R1-2	B	Low		Along Blondell Dr and Knox Dr	2	21 acres of residential area in Zone B
Septic systems (serves one single-family home)	R02	R2-08	B	Low		Mike Cir	3	
Septic systems (serves one single-family home)	R02	R2-10	B	Low		Gary Cir	3	
Septic systems (serves one single-family home)	R02	R2-11	B	Low		Sylvan Rd	3	
Septic systems (serves one single-family home)	R02	R2-12	B	Low		Gary Cir	3	
Septic systems (serves one single-family home)	R02	R2-13	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-14	B	Low		Gary Cir	3	
Septic systems (serves one single-family home)	R02	R2-15	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-16	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-17	B	Low		Knox Dr	3	

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	R2-18	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-18	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R209	B	Low		Mike Cir	3	
Highways and roads, dirt/gravel	X24	X24-3	B	Low		Gary Circle	2	
Highways and roads, dirt/gravel	X24	X24-4	B	Low		Blondell Dr	2	
Residential Areas	R01	R1-3	C	Low		Between Parks Hwy and Knox Dr	2	42 acres of residential area in Zone C
Septic systems (serves one single-family home)	R02	R2-19to26	C	Low		Trevett Ave, Blondell Dr, Knox Dr	3	
Highways and roads, paved (cement or asphalt)	X20	X20-2	C	Low		Parks Hwy	2	
Highways and roads, dirt/gravel	X24	X24-5	C	Low		Trevett Ave	2	
Tanks, gasoline (underground)	T12	T12-1	D	High		Parks Hwy	3	
Tanks, gasoline (underground)	T12	T12-2	D	High		Parks Hwy	3	
Tanks, diesel (underground)	T08	T8-1	D	High		Parks Hwy	3	

Table 5

Contaminant Source Inventory and Risk Ranking for Forty Niner Homeowners Association Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals

PWSID 224028.001

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	C	Low	1	Alaska Railroad	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	C	Low	2	Trevett Ave	3	
Septic systems (serves one single-family home)	R02	R2-01	A	Low	3	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-02	A	Low	4	Sylvan Dr	3	
Septic systems (serves one single-family home)	R02	R2-03	A	Low	5	Mike Cir	3	
Septic systems (serves one single-family home)	R02	R2-04	A	Low	6	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-05	A	Low	7	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-06	A	Low	8	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-07	A	Low	9	Knox Dr	3	
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	10	Sylvan Rd	2	
Residential Areas	R01	R1-1	A	Low		West of Sylvan Rd	2	2.5 acres of residential area in Zone A
Highways and roads, dirt/gravel	X24	X24-1	A	Low		Knox Dr	2	
Highways and roads, dirt/gravel	X24	X24-2	A	Low		Mike Cir	2	
Residential Areas	R01	R1-2	B	Low		Along Blondell Dr and Knox Dr	2	21 acres of residential area in Zone B
Septic systems (serves one single-family home)	R02	R2-08	B	Low		Mike Cir	3	
Septic systems (serves one single-family home)	R02	R2-10	B	Low		Gary Cir	3	
Septic systems (serves one single-family home)	R02	R2-11	B	Low		Sylvan Rd	3	
Septic systems (serves one single-family home)	R02	R2-12	B	Low		Gary Cir	3	
Septic systems (serves one single-family home)	R02	R2-13	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-14	B	Low		Gary Cir	3	
Septic systems (serves one single-family home)	R02	R2-15	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-16	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-17	B	Low		Knox Dr	3	

Contaminant Source Inventory and Risk Ranking for Forty Niner Homeowners Association

Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals

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	R2-18	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-18	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R209	B	Low		Mike Cir	3	
Highways and roads, dirt/gravel	X24	X24-3	B	Low		Gary Circle	2	
Highways and roads, dirt/gravel	X24	X24-4	B	Low		Blondell Dr	2	
Residential Areas	R01	R1-3	C	Low		Between Parks Hwy and Knox Dr	2	42 acres of residential area in Zone C
Septic systems (serves one single-family home)	R02	R2-19to26	C	Low		Trevett Ave, Blondell Dr, Knox Dr	3	
Highways and roads, paved (cement or asphalt)	X20	X20-2	C	Low		Parks Hwy	2	
Highways and roads, dirt/gravel	X24	X24-5	C	Low		Trevett Ave	2	

Table 6

Contaminant Source Inventory and Risk Ranking for Forty Niner Homeowners Association Sources of Synthetic Organic Chemicals

PWSID 224028.001

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	C	Medium	1	Alaska Railroad	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	C	Low	2	Trevett Ave	3	
Septic systems (serves one single-family home)	R02	R2-01	A	Low	3	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-02	A	Low	4	Sylvan Dr	3	
Septic systems (serves one single-family home)	R02	R2-03	A	Low	5	Mike Cir	3	
Septic systems (serves one single-family home)	R02	R2-04	A	Low	6	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-05	A	Low	7	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-06	A	Low	8	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-07	A	Low	9	Knox Dr	3	
Residential Areas	R01	R1-1	A	Low	10	West of Sylvan Rd	2	2.5 acres of residential area in Zone A
Residential Areas	R01	R1-2	B	Low		Along Blondell Dr and Knox Dr	2	21 acres of residential area in Zone B
Septic systems (serves one single-family home)	R02	R2-08	B	Low		Mike Cir	3	
Septic systems (serves one single-family home)	R02	R2-10	B	Low		Gary Cir	3	
Septic systems (serves one single-family home)	R02	R2-11	B	Low		Sylvan Rd	3	
Septic systems (serves one single-family home)	R02	R2-12	B	Low		Gary Cir	3	
Septic systems (serves one single-family home)	R02	R2-13	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-14	B	Low		Gary Cir	3	
Septic systems (serves one single-family home)	R02	R2-15	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-16	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-17	B	Low		Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-18	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-18	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R209	B	Low		Mike Cir	3	

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		Between Parks Hwy and Knox Dr	2	42 acres of residential area in Zone C
Septic systems (serves one single-family home)	R02	R2-19to26	C	Low		Trevett Ave, Blondell Dr, Knox Dr	3	

Table 7

Contaminant Source Inventory and Risk Ranking for Forty Niner Homeowners Association Sources of Other Organic Chemicals

PWSID 224028.001

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	C	Low	1	Alaska Railroad	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	C	Low	2	Trevett Ave	3	
Septic systems (serves one single-family home)	R02	R2-01	A	Low	3	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-02	A	Low	4	Sylvan Dr	3	
Septic systems (serves one single-family home)	R02	R2-03	A	Low	5	Mike Cir	3	
Septic systems (serves one single-family home)	R02	R2-04	A	Low	6	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-05	A	Low	7	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-06	A	Low	8	Knox Dr	3	
Septic systems (serves one single-family home)	R02	R2-07	A	Low	9	Knox Dr	3	
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	10	Sylvan Rd	2	
Residential Areas	R01	R1-1	A	Low		West of Sylvan Rd	2	2.5 acres of residential area in Zone A
Highways and roads, dirt/gravel	X24	X24-1	A	Low		Knox Dr	2	
Highways and roads, dirt/gravel	X24	X24-2	A	Low		Mike Cir	2	
Residential Areas	R01	R1-2	B	Low		Along Blondell Dr and Knox Dr	2	21 acres of residential area in Zone B
Septic systems (serves one single-family home)	R02	R2-08	B	Low		Mike Cir	3	
Septic systems (serves one single-family home)	R02	R2-10	B	Low		Gary Cir	3	
Septic systems (serves one single-family home)	R02	R2-11	B	Low		Sylvan Rd	3	
Septic systems (serves one single-family home)	R02	R2-12	B	Low		Gary Cir	3	
Septic systems (serves one single-family home)	R02	R2-13	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-14	B	Low		Gary Cir	3	
Septic systems (serves one single-family home)	R02	R2-15	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-16	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-17	B	Low		Knox Dr	3	

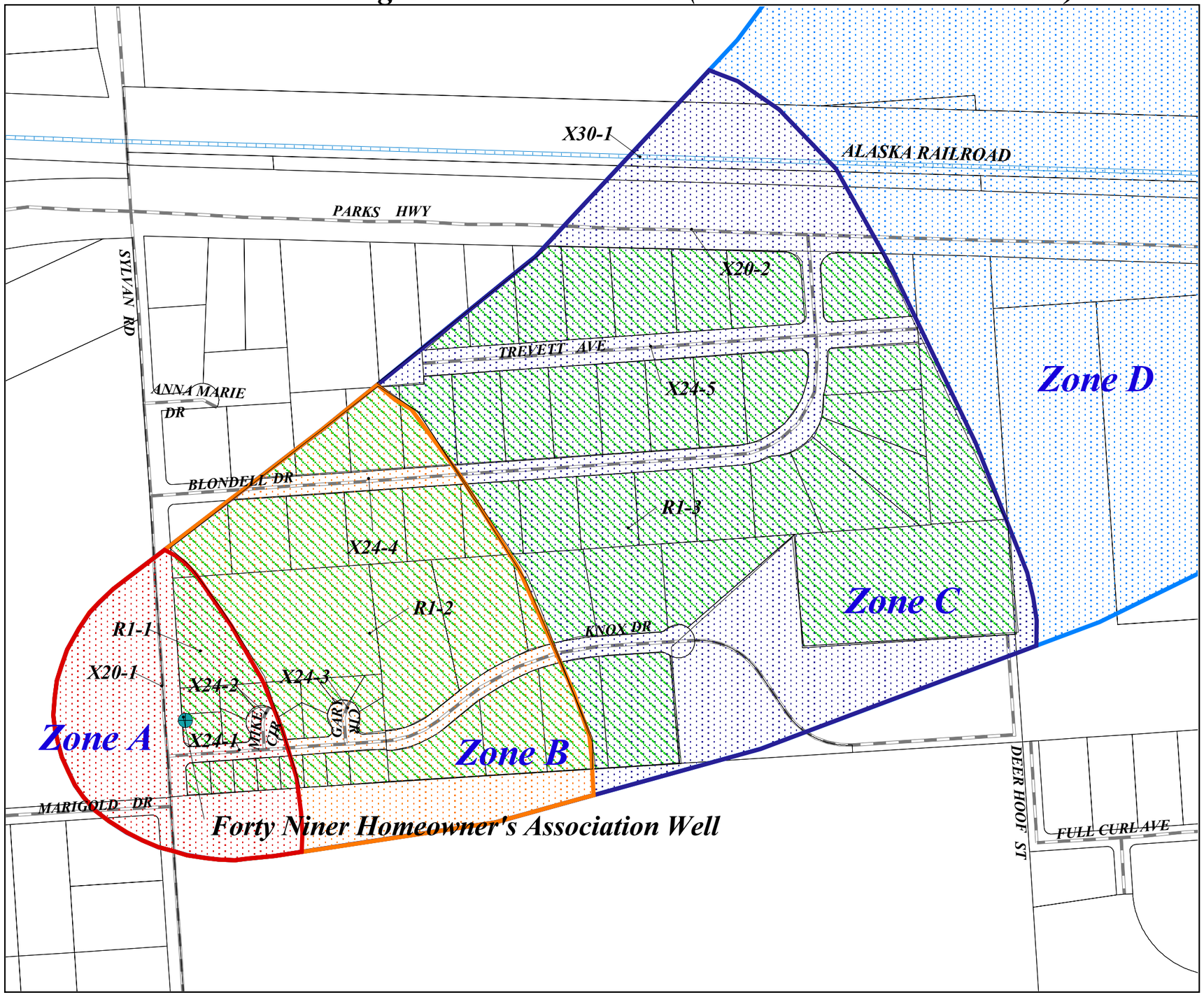
Contaminant Source Inventory and Risk Ranking for Forty Niner Homeowners Association Sources of Other Organic Chemicals

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	R2-18	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R2-18	B	Low		Blondell Dr	3	
Septic systems (serves one single-family home)	R02	R209	B	Low		Mike Cir	3	
Highways and roads, dirt/gravel	X24	X24-3	B	Low		Gary Circle	2	
Highways and roads, dirt/gravel	X24	X24-4	B	Low		Blondell Dr	2	
Residential Areas	R01	R1-3	C	Low		Between Parks Hwy and Knox Dr	2	42 acres of residential area in Zone C
Septic systems (serves one single-family home)	R02	R2-19to26	C	Low		Trevett Ave, Blondell Dr, Knox Dr	3	
Highways and roads, paved (cement or asphalt)	X20	X20-2	C	Low		Parks Hwy	2	
Highways and roads, dirt/gravel	X24	X24-5	C	Low		Trevett Ave	2	

APPENDIX C

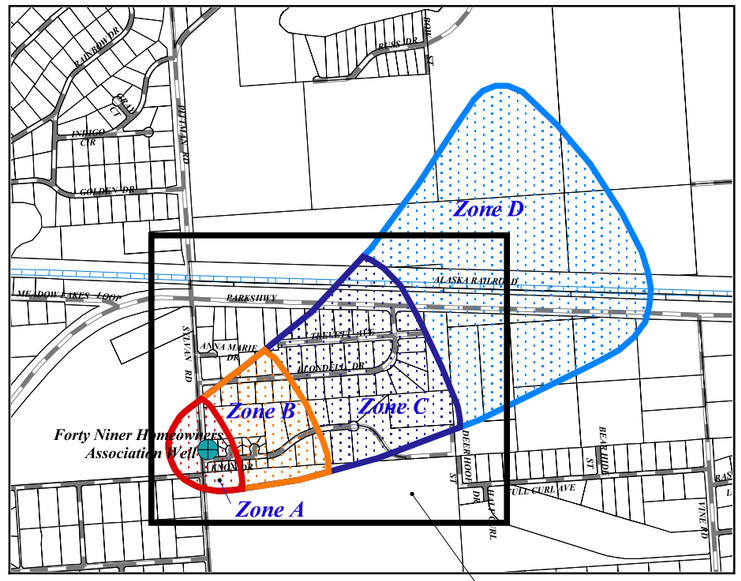
Forty Niner Homeowner's Association
Drinking Water Protection Area
and Potential and Existing Contaminant Sources

Forty Niner Homeowner's Association Drinking Water Protection Area with Potential & Existing Contaminant Sources (Residential Areas and Roads)



Legend

- Public Water System
- 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
- Parcels
- Roads (X20 or X24)
- Railroads (X30)
- Residential Areas (R2)



0.25 0 0.25 Miles

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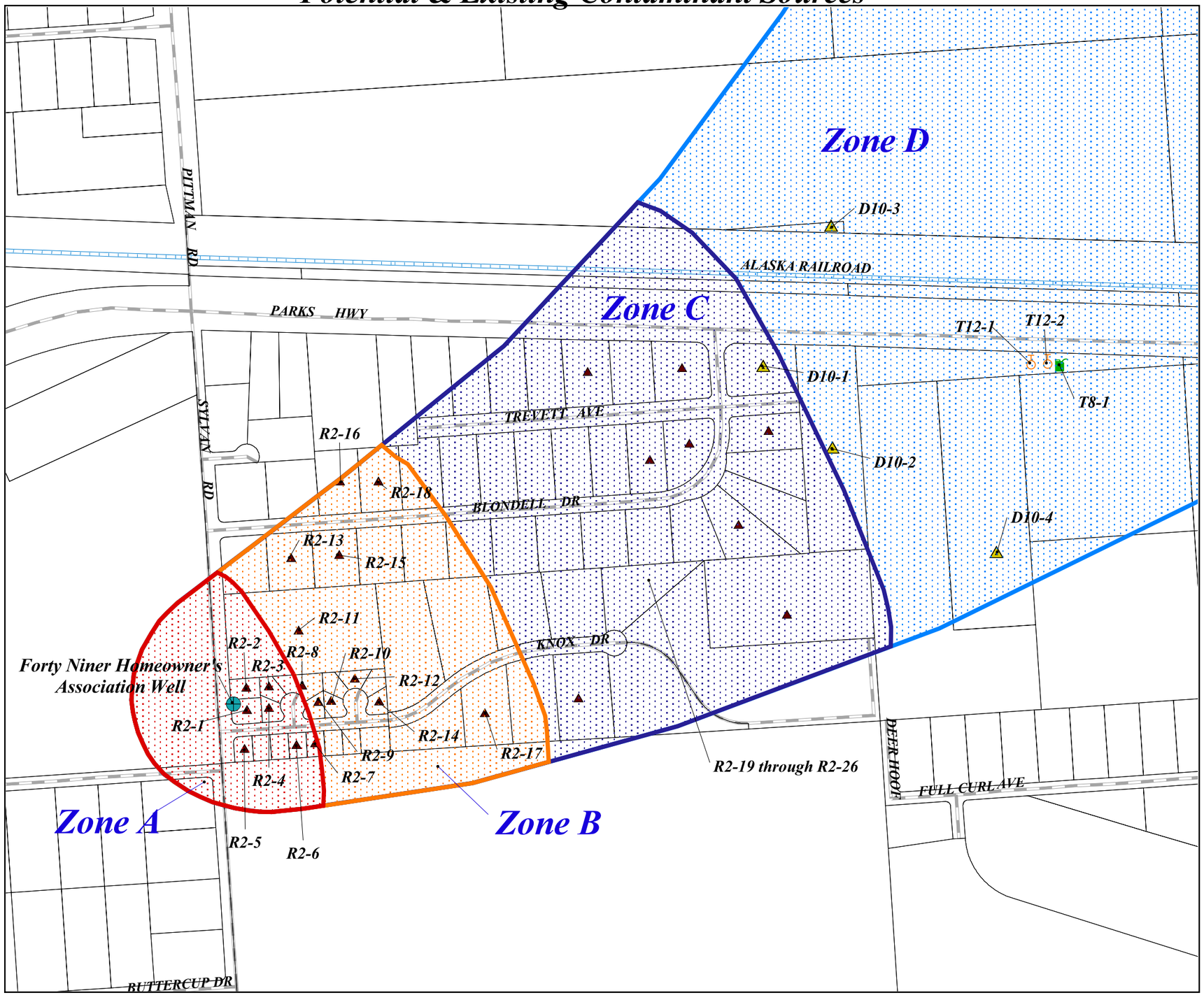
N W E S

Map 2

Forty Niner Homeowner's Association Drinking Water Protection Area with Potential & Existing Contaminant Sources



Legend

- Public Water System

Zone A Protection Area
- Several Months Travel Time

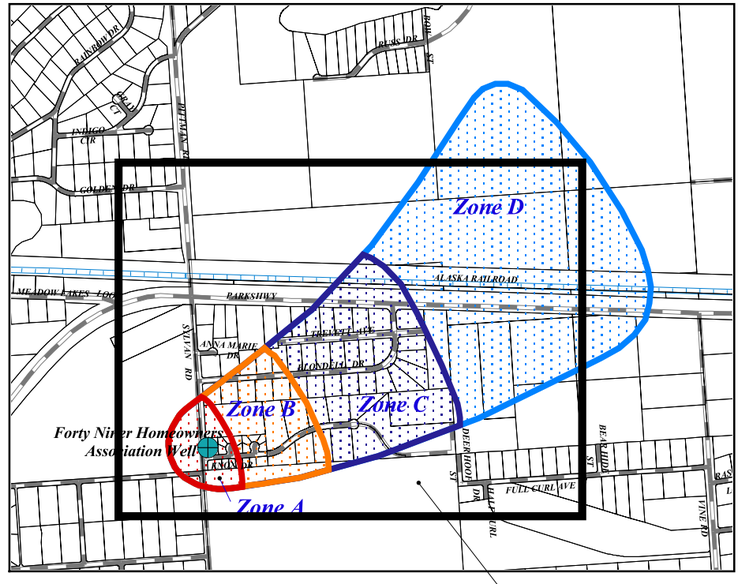
Zone B Protection Area
- Less Than 2 Years Travel Time

Zone C Protection Area
- Less Than 5 Years Travel Time

Zone D Protection Area
- Parcels
- Roads
- Railroads

Potential Contaminant Sources
- Underground Gasoline Tank (T12)
- Underground Deisel Tank (T8)

Septic Systems
- Large Capacity Septic Systems (D10)
- Single Family Septic Systems (R2)



N
W E
S

0.25 0 0.25 Miles

PWSID 224028.001

Map 3

APPENDIX D

Vulnerability Analysis for Forty Niner Homeowner's Association Public Drinking Water Source

Chart 1. Susceptibility of the wellhead - Forty Niner Homeowners Association

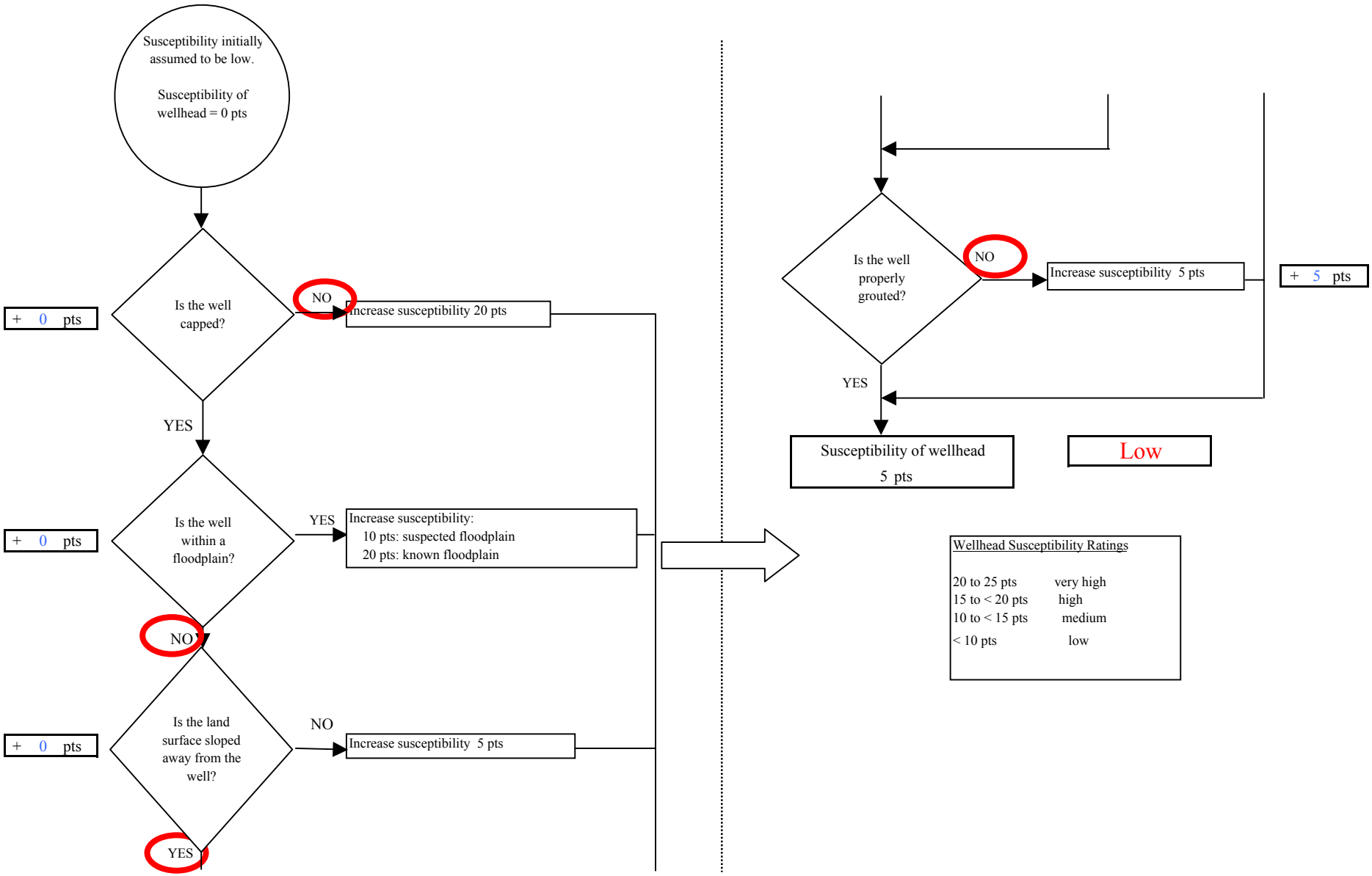


Chart 2. Susceptibility of the aquifer - Forty Niner Homeowner's Association

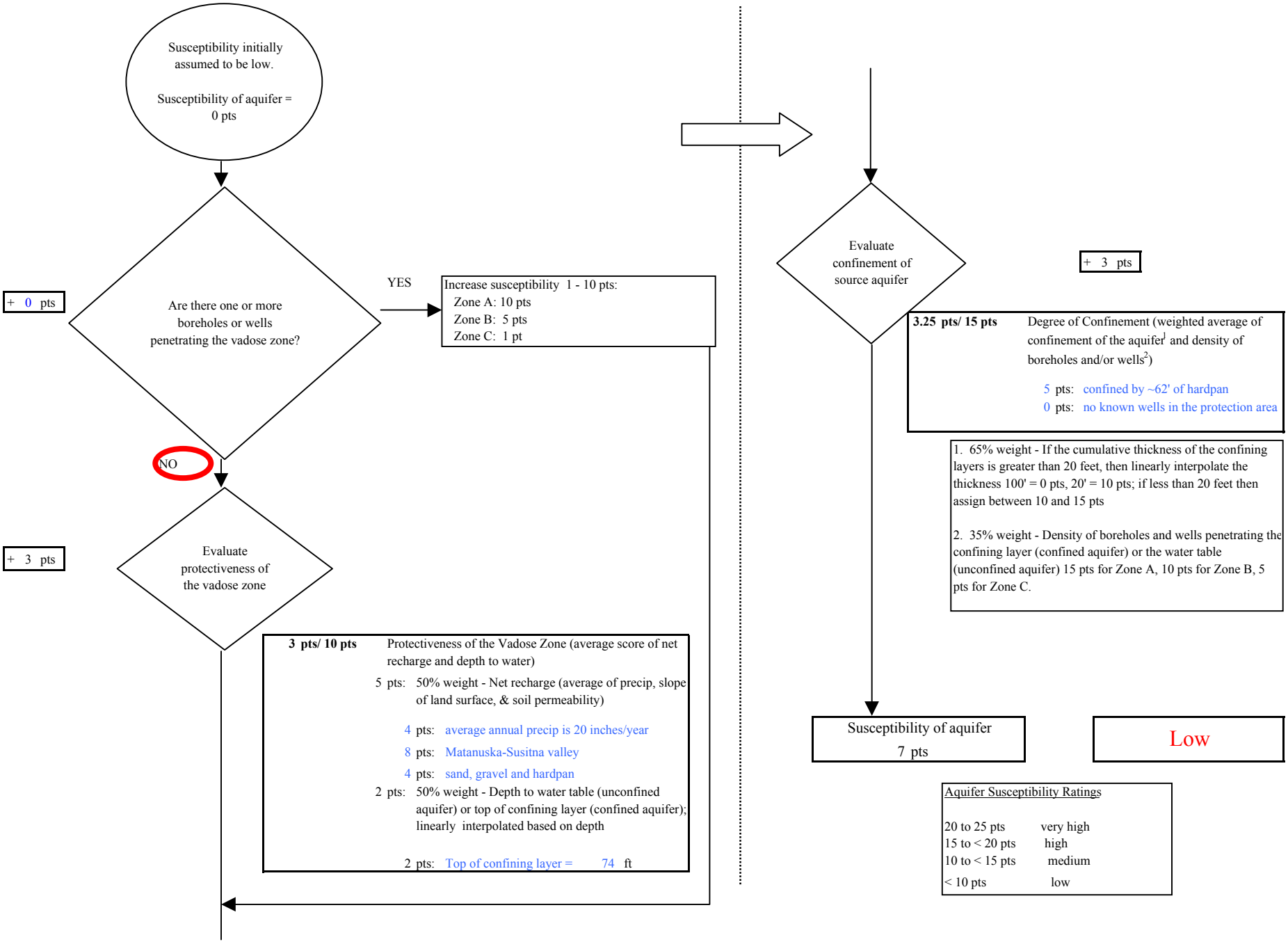
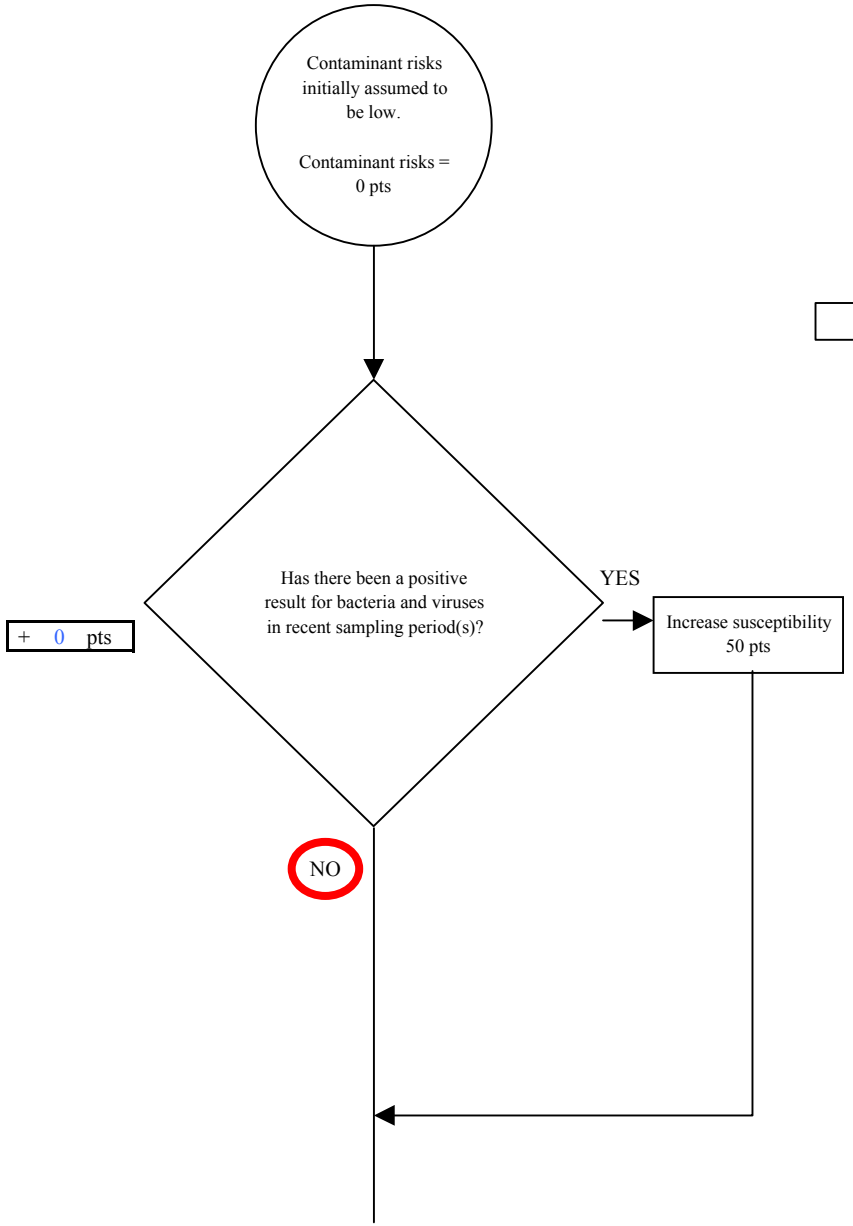
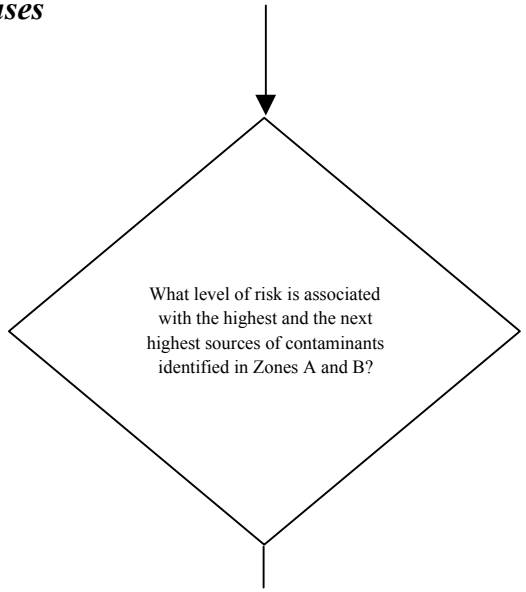


Chart 3. Contaminant risks for Forty Niner Homeowner's Association - Bacteria & Viruses





+ 20 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)	0	0	0
Medium(s)	0	0	0
Low(s)	9	4	13

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

Matrix Score 20

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 Forty Niner Homeowner's Association - Bacteria & Viruses

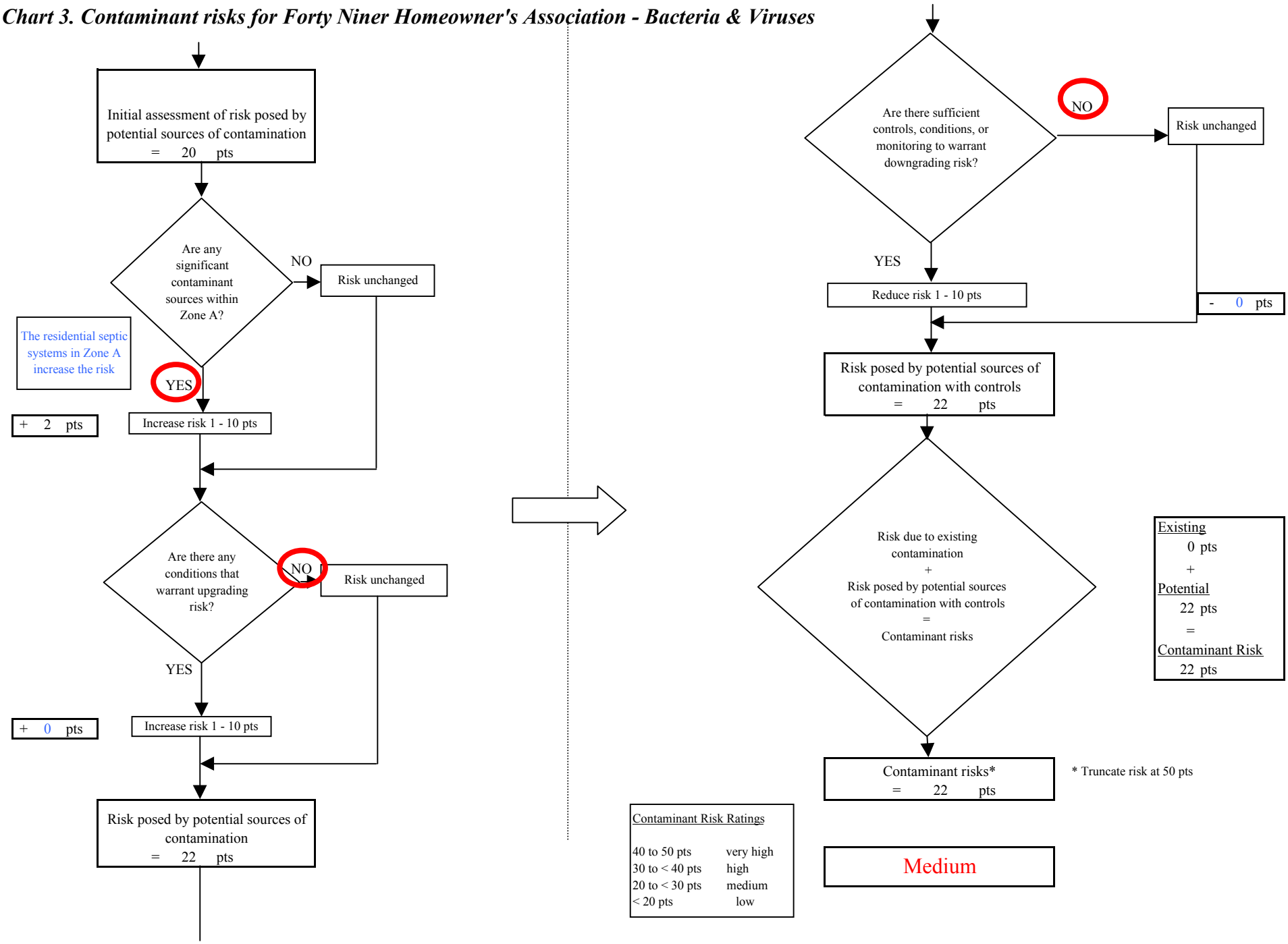


Chart 4. Vulnerability analysis for Forty Niner Homeowner's Association - Bacteria & Viruses

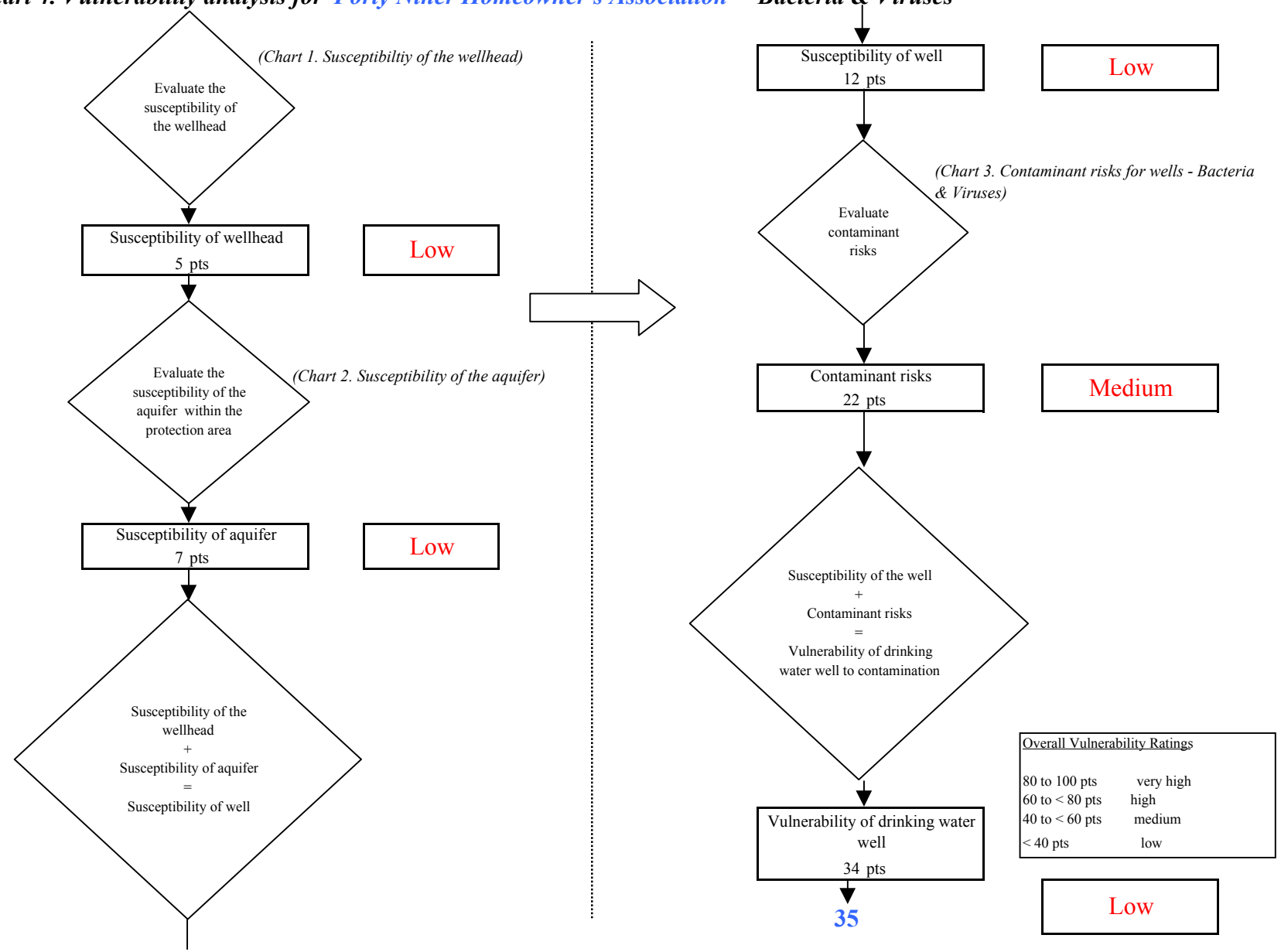


Chart 5. Contaminant risks for Forty Niner Homeowners Association - Nitrates and Nitrites

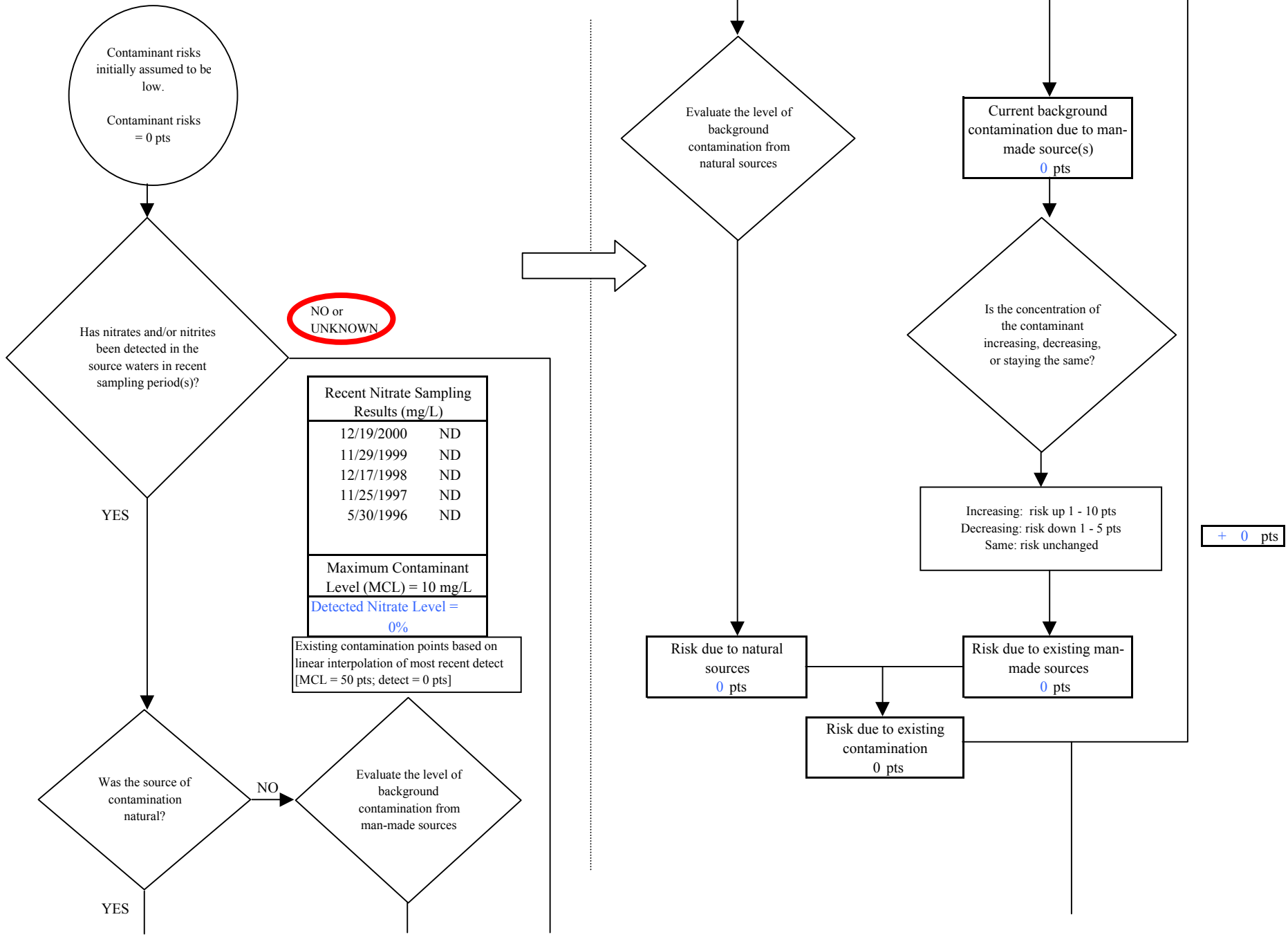


Chart 5. Contaminant risks for Forty Niner Homeowners Association - Nitrates and Nitrites

+ 30 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	0	0
High(s)	0	1	1
Medium(s)	0	0	0
Low(s)	9	4	13

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

Matrix Score 30

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

Initial assessment of risk posed by potential sources of contamination = 30 pts

Is the source aquifer fractured rock or karst?

YES

NO

The highest risk source is the large capacity septic system located on the furthest edge of Zone C

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

NO → Risk unchanged

YES

- 8 pts

Decrease risk 1 - 10 pts

Are any significant sources within Zone A?

NO → Risk unchanged

YES

+ 2 pts

Increase risk 1 - 10 pts

Chart 5. Contaminant risks for Forty Niner Homeowners Association - Nitrates and Nitrites

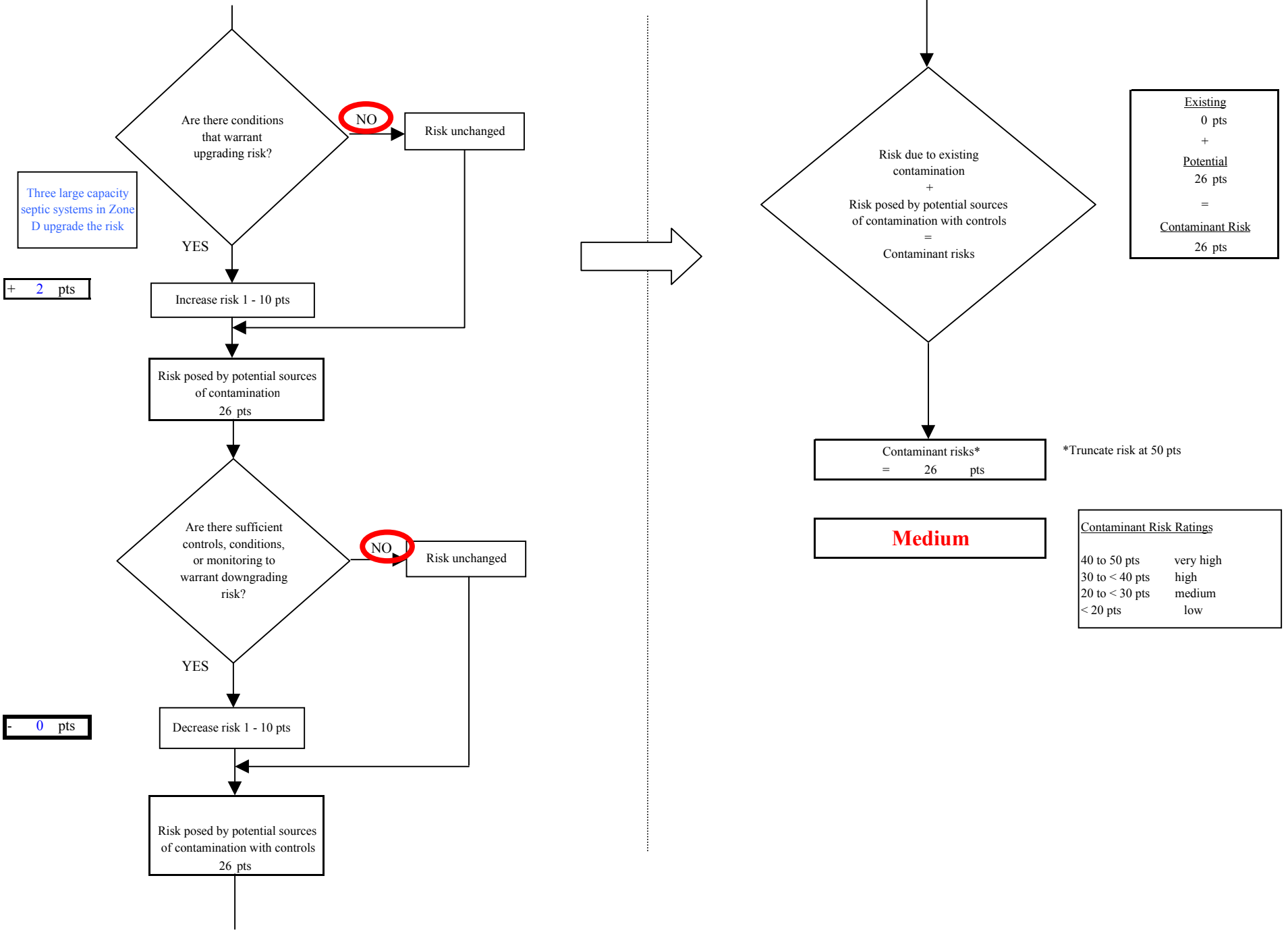


Chart 6. Vulnerability analysis for Forty Niner Homeowners Association - Nitrates and Nitrites

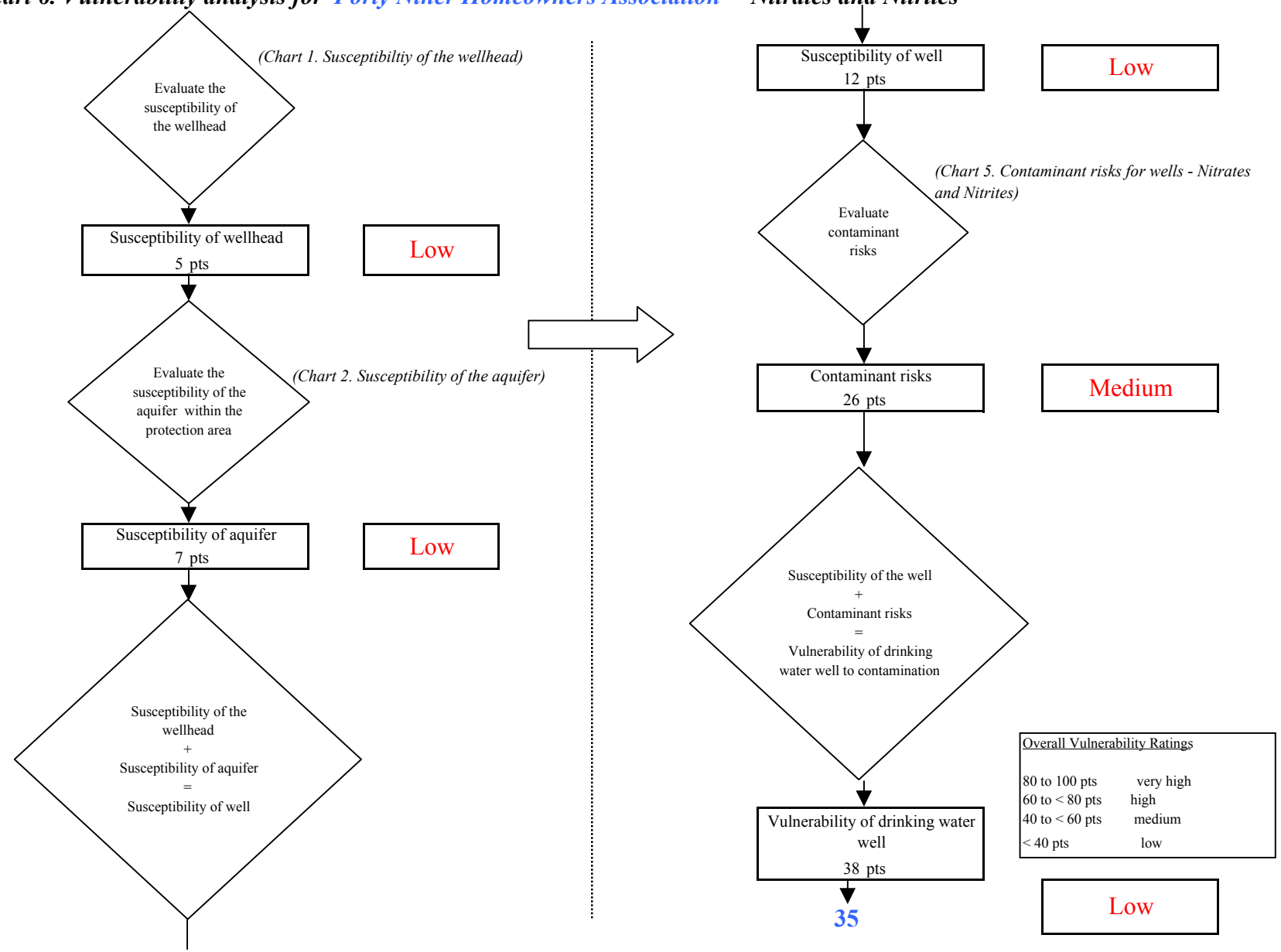


Chart 7. Contaminant risks for Forty Niner Homeowner's Association - Volatile Organic Chemicals

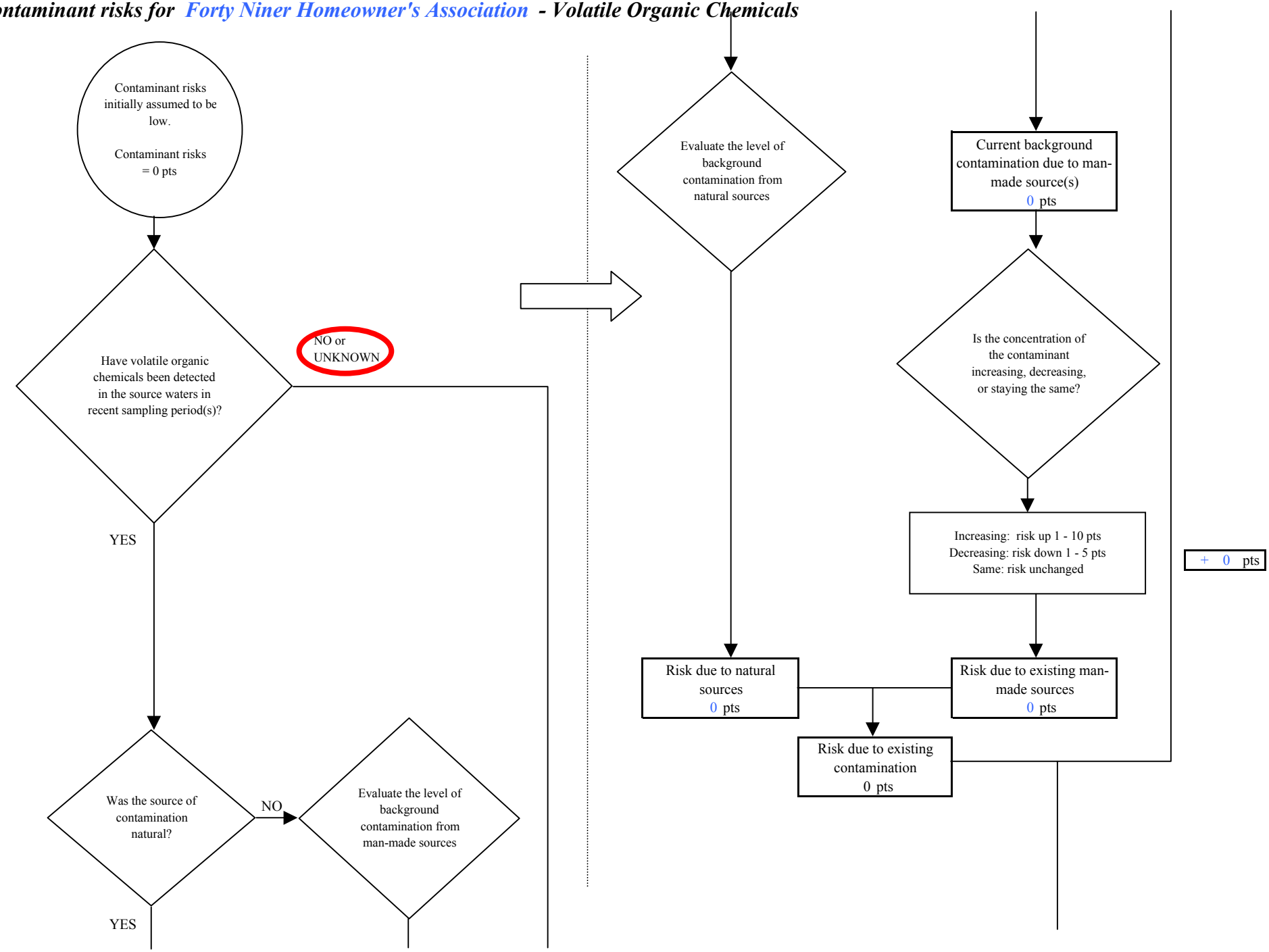


Chart 7. Contaminant risks for Forty Niner Homeowner's Association - Volatile Organic Chemicals

+ 20 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	0	0
High(s)	0	0	0
Medium(s)	0	1	1
Low(s)	3	4	7

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

Matrix Score 20

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 = 20 pts

Is the source aquifer fractured rock or karst?

YES

NO

The highest risk source is the railroad located on the edge of Zone C

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

NO → Risk unchanged

YES

- 5 pts

Decrease risk 1 - 10 pts

Are any significant sources within Zone A?

NO → Risk unchanged

The residential septic systems, roads, and residential area in Zone A combine to increase the risk

YES

+ 2 pts

Increase risk 1 - 10 pts

Chart 7. Contaminant risks for Forty Niner Homeowner's Association - Volatile Organic Chemicals

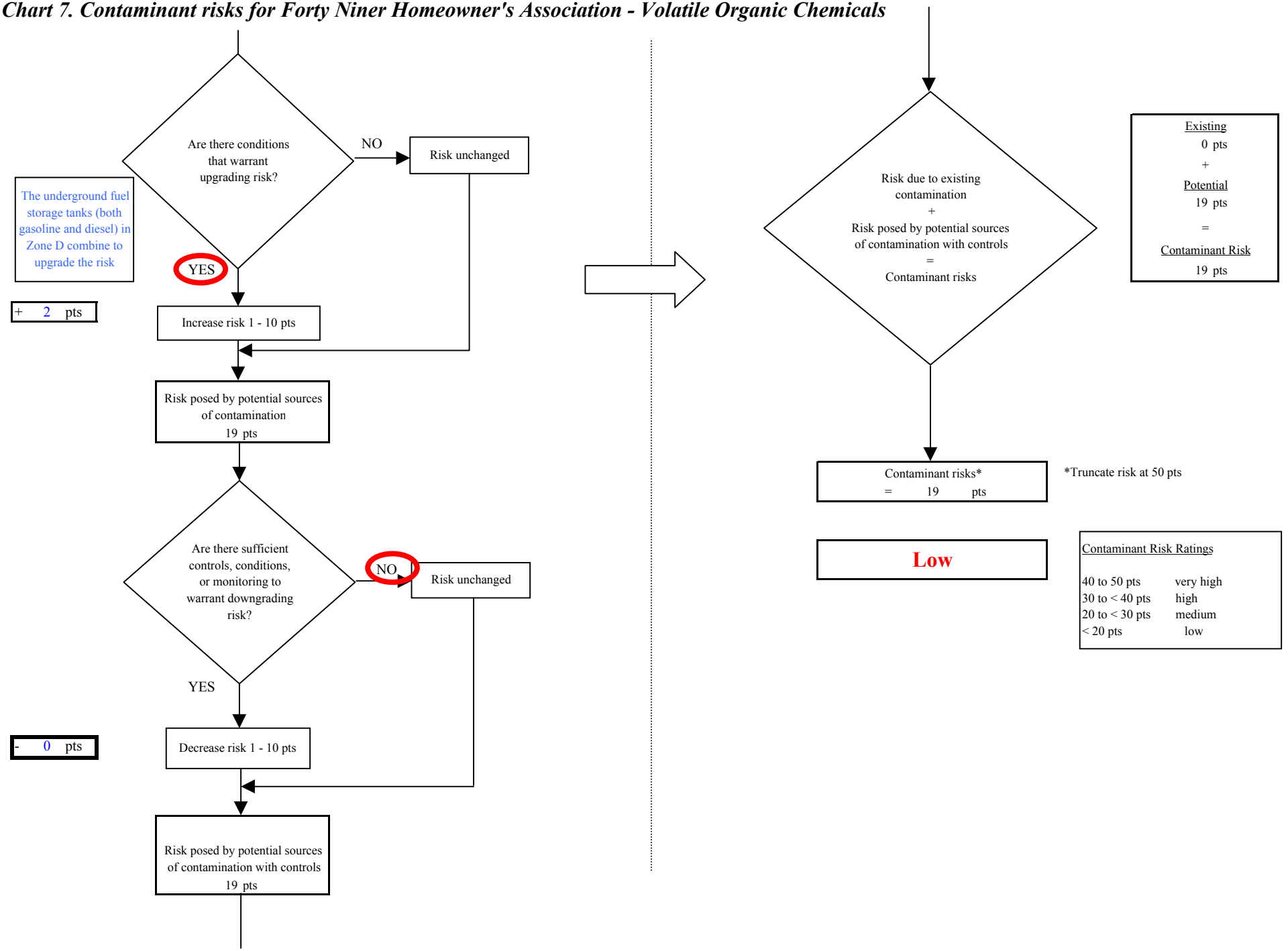


Chart 8. Vulnerability analysis for Forty Niner Homeowner's Association - Volatile Organic Chemicals

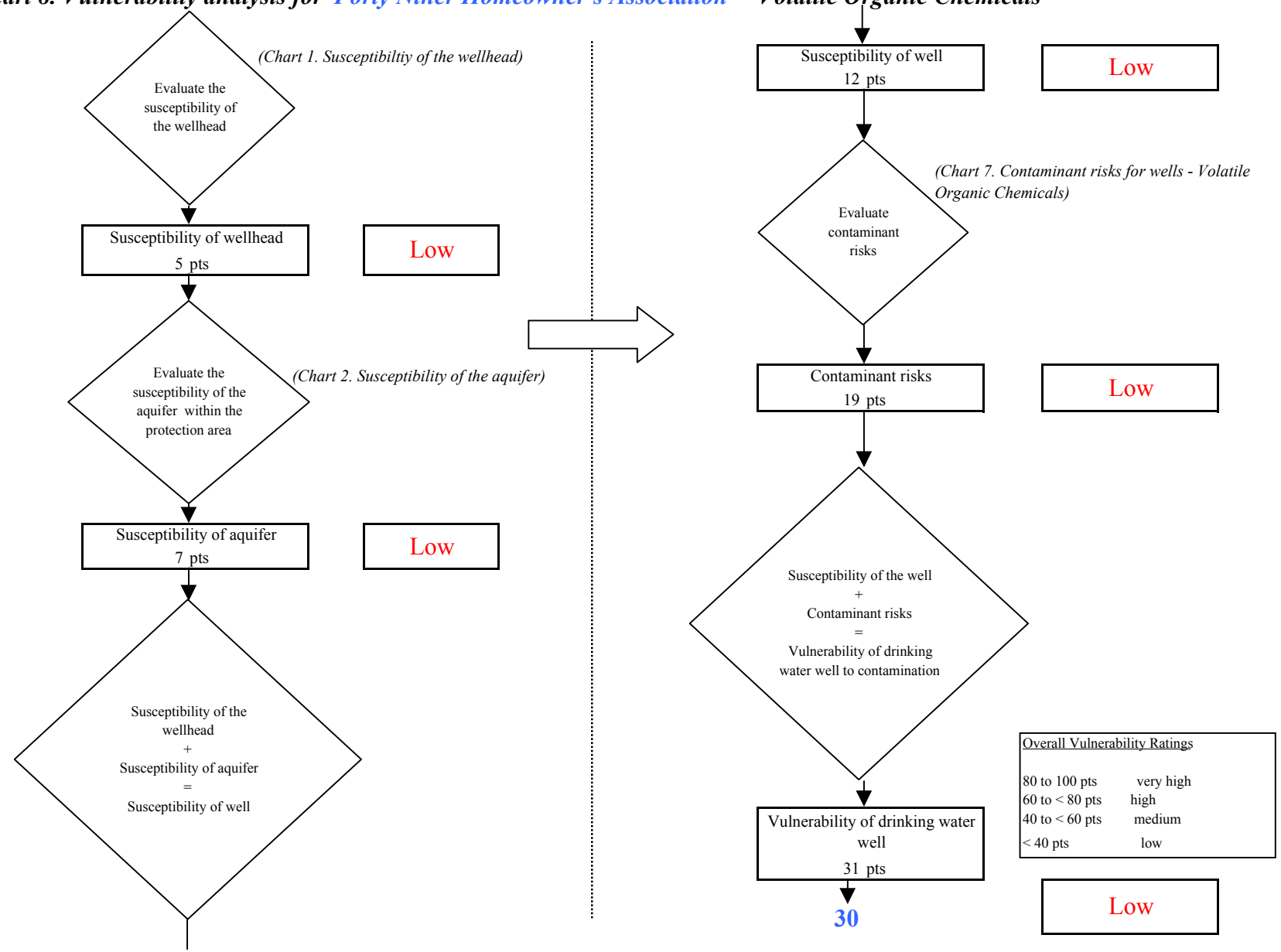


Chart 9. Contaminant risks for Forty Niner Homeowner's Association - Heavy Metals, Cyanide and Other Inorganic Chemicals

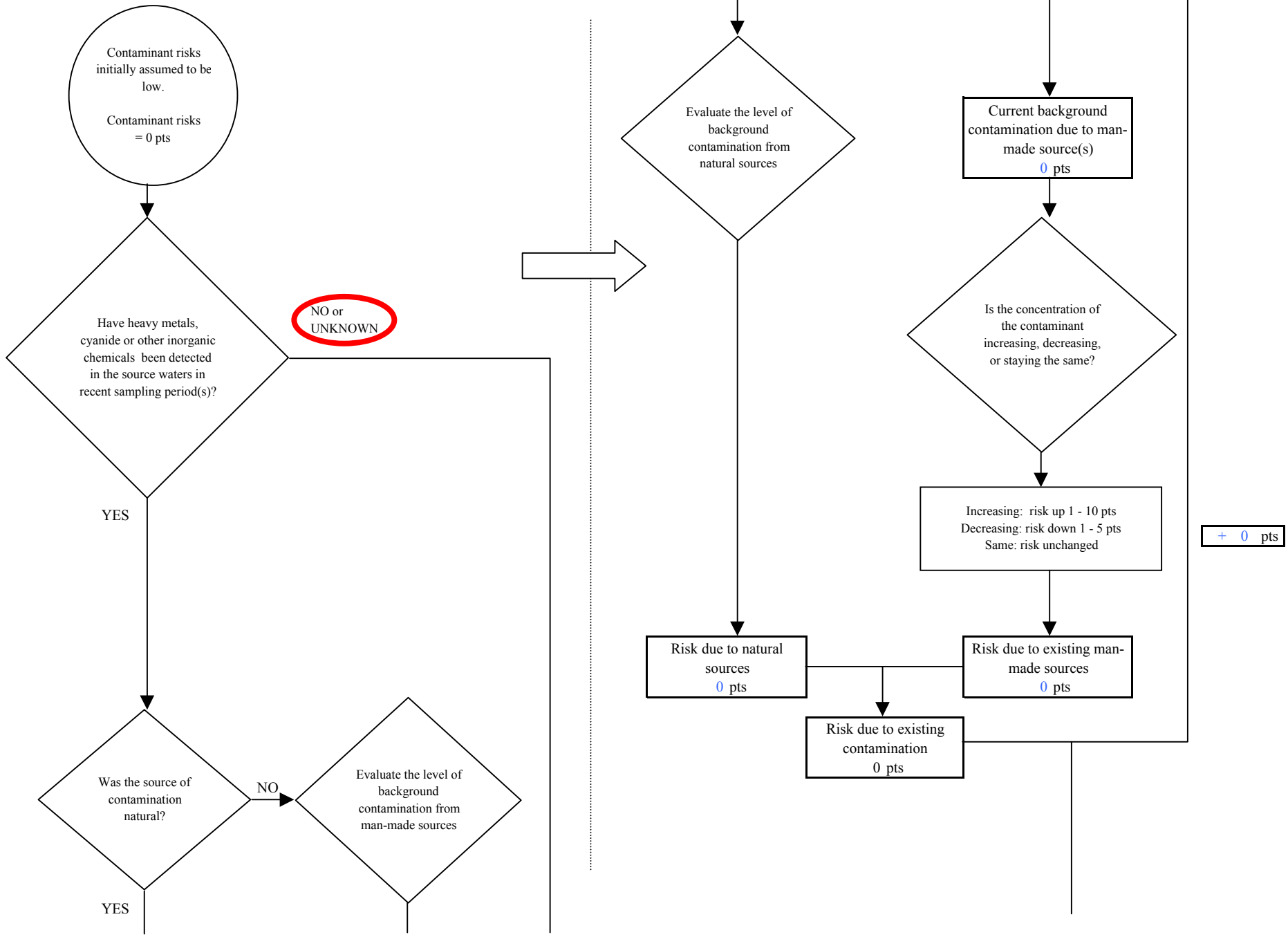


Chart 9. Contaminant risks for Forty Niner Homeowner's Association - Heavy Metals, Cyanide and Other Inorganic Chemicals

+ 10 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	0	0
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	3	5	8

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

Matrix Score 10

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 = 10 pts

Is the source aquifer fractured rock or karst?

YES

NO

The highest risk sources, the rail corridor and large capacity septic system, are located on the outer edge of zone C; however the score does not decrease because 10 in the minimum score for lows

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

NO → Risk unchanged

YES

Decrease risk 1 - 10 pts

- 0 pts

Are any significant sources within Zone A?

NO → Risk unchanged

The residential septic systems, roads, and residential area in Zone A combine to increase the risk

YES

Increase risk 1 - 10 pts

+ 2 pts

Chart 9. Contaminant risks for Forty Niner Homeowner's Association - Heavy Metals, Cyanide and Other Inorganic Chemicals

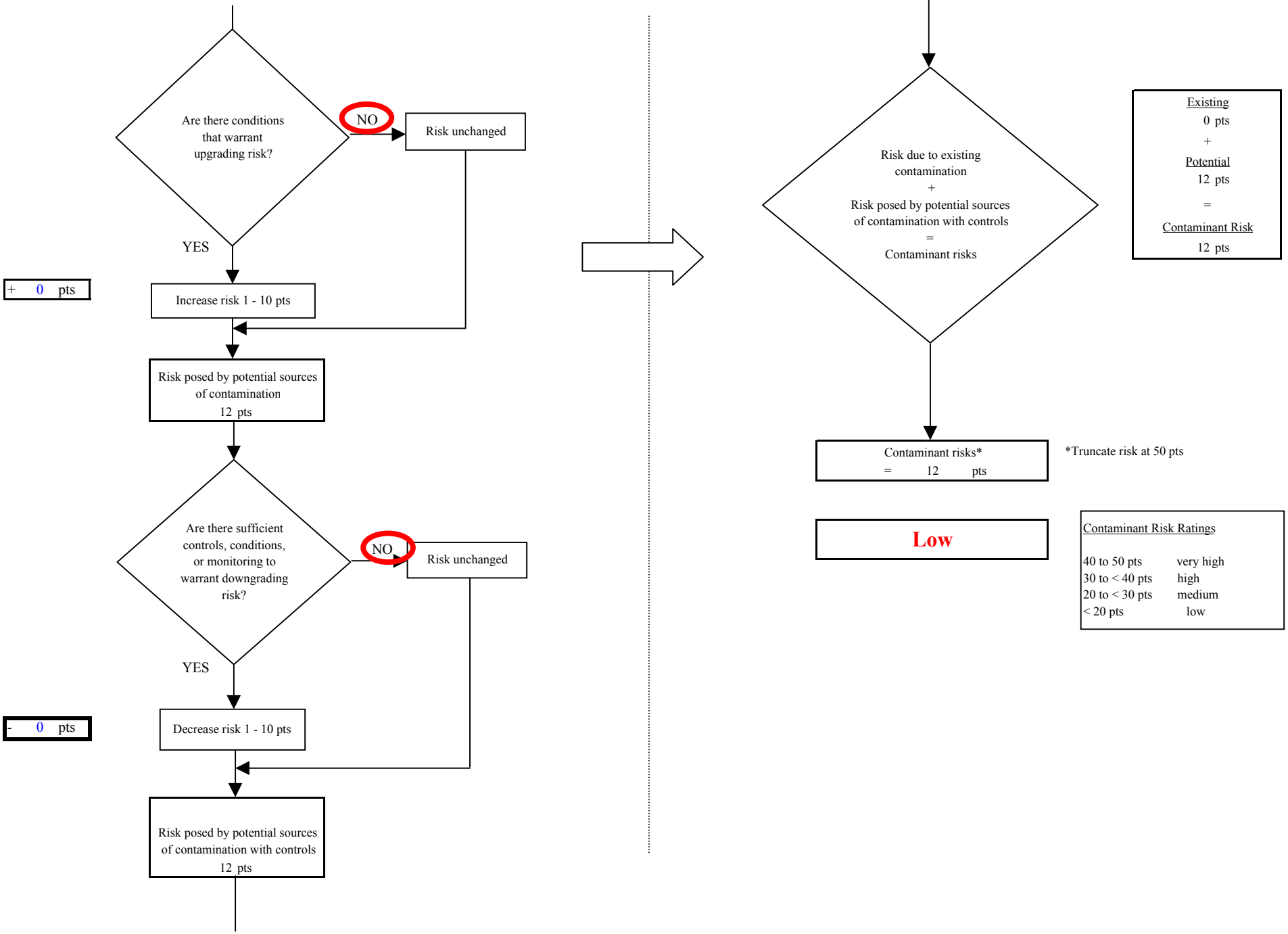


Chart 10. Vulnerability analysis forForty Niner Homeowner's Association- Heavy Metals, Cyanide and Other Inorganic Chemicals

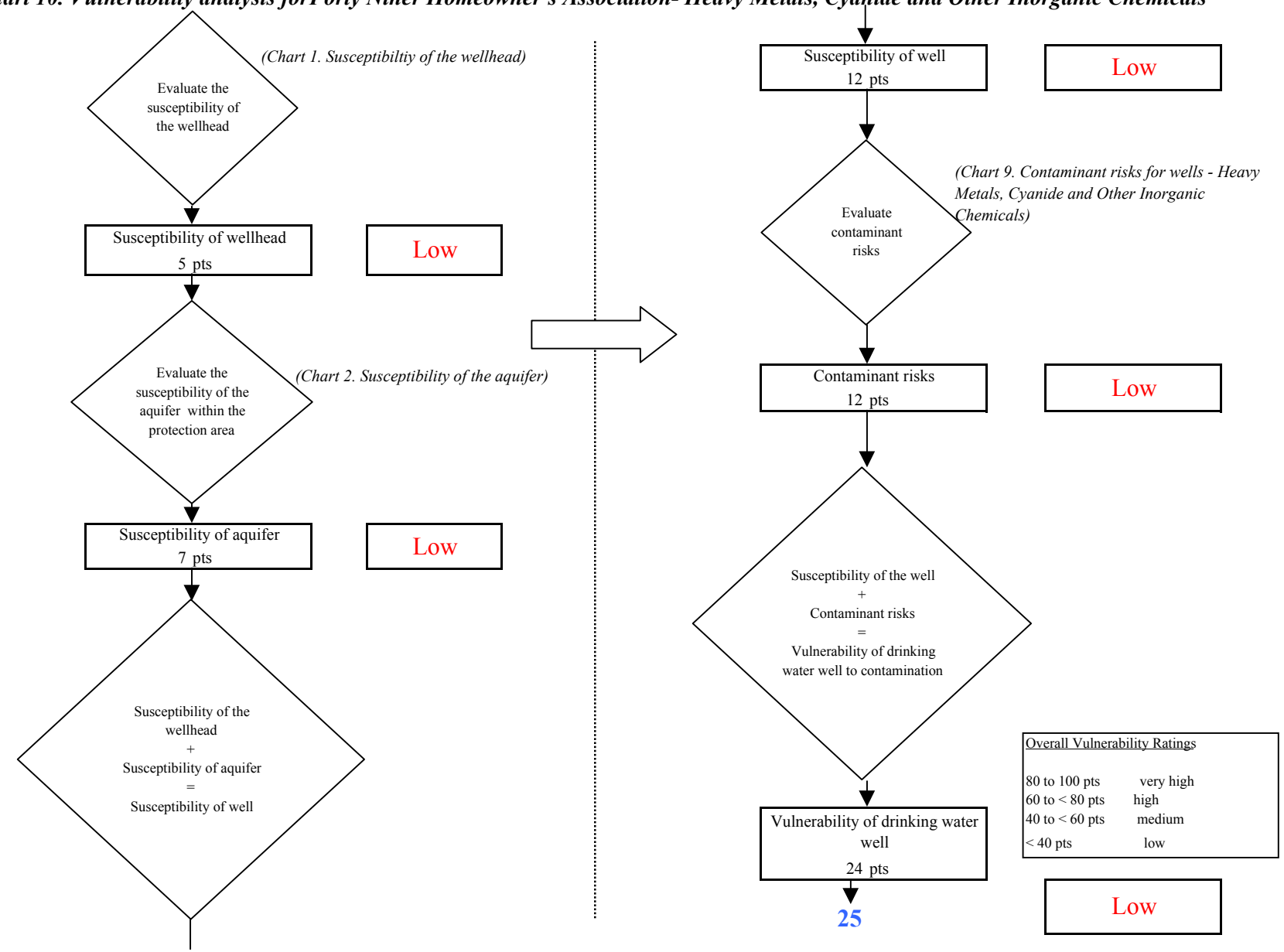


Chart 11. Contaminant risks for Forty Niner Homeowner's Association - Synthetic Organic Chemicals

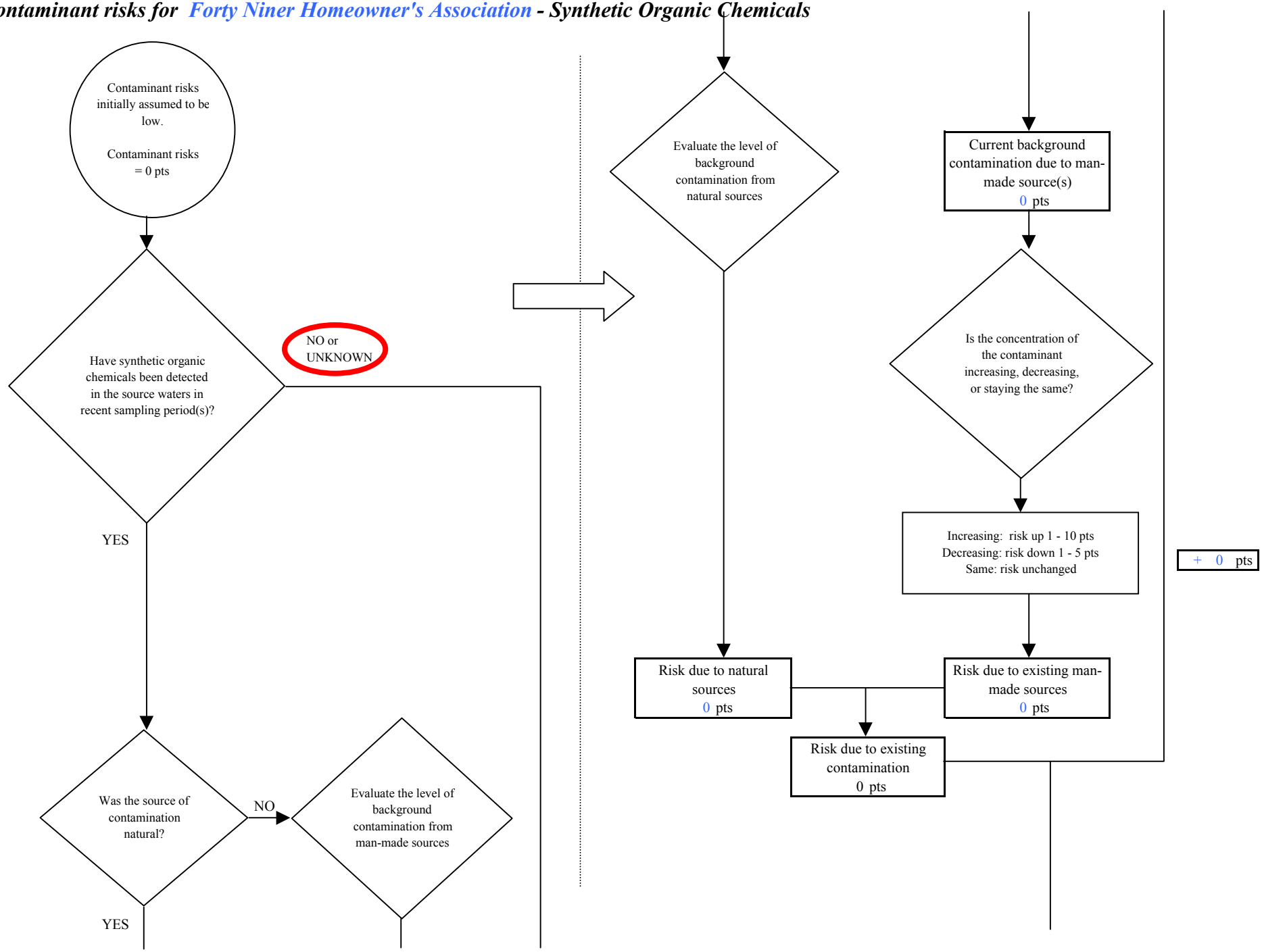
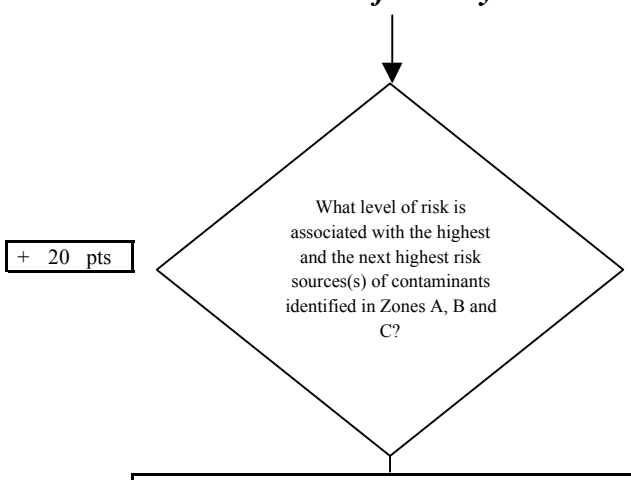


Chart 11. Contaminant risks for Forty Niner Homeowner's Association- Synthetic Organic Chemicals



+ 20 pts

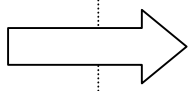
Risk Levels for Contaminant Sources identified in Zones A, B and C

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	0	1	1
Low(s)	2	3	5

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

Matrix Score 20

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



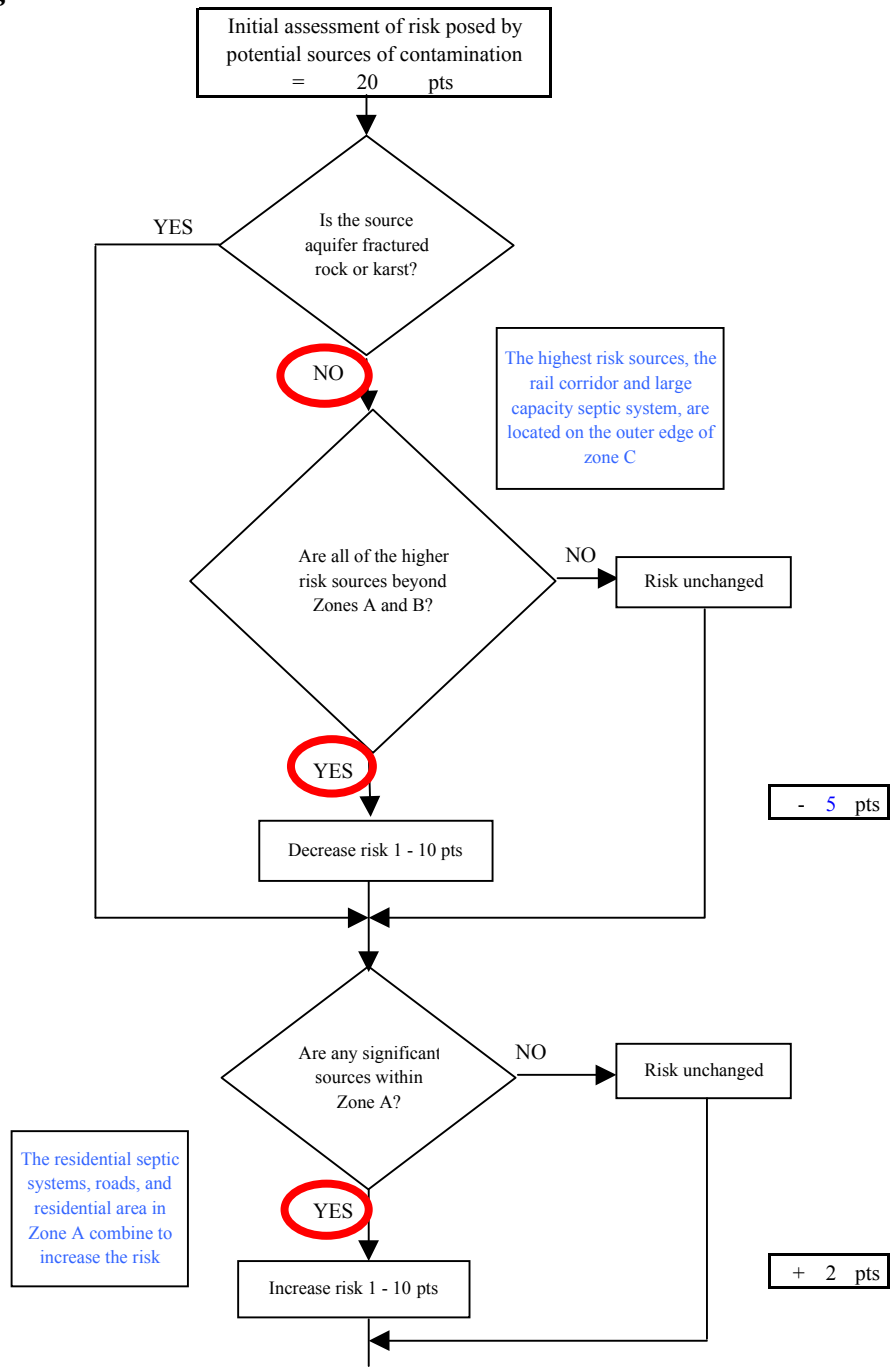


Chart 11. Contaminant risks for Forty Niner Homeowner's Association- Synthetic Organic Chemicals

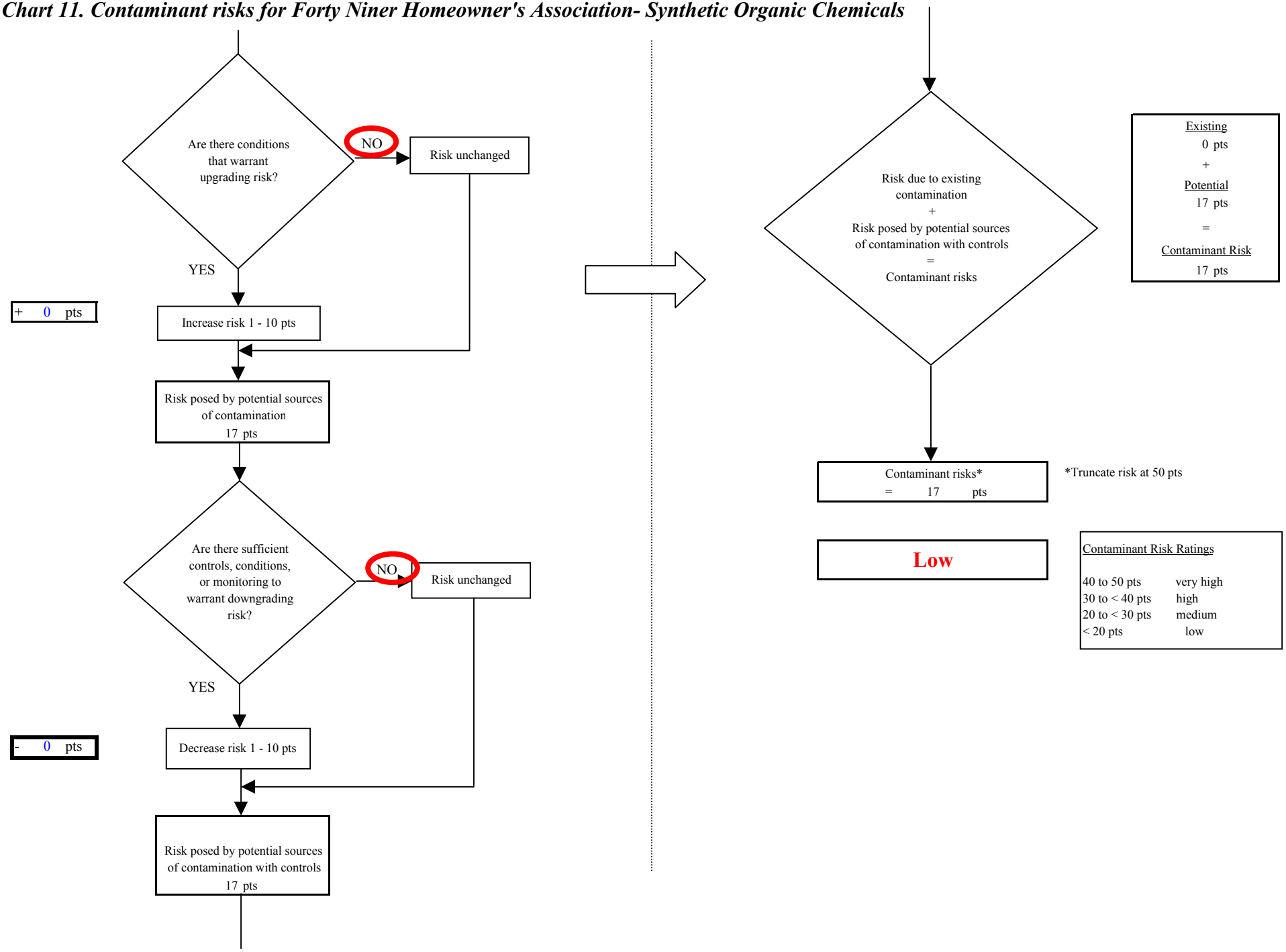


Chart 12. Vulnerability analysis for Forty Niner Homeowner's Association - Synthetic Organic Chemicals

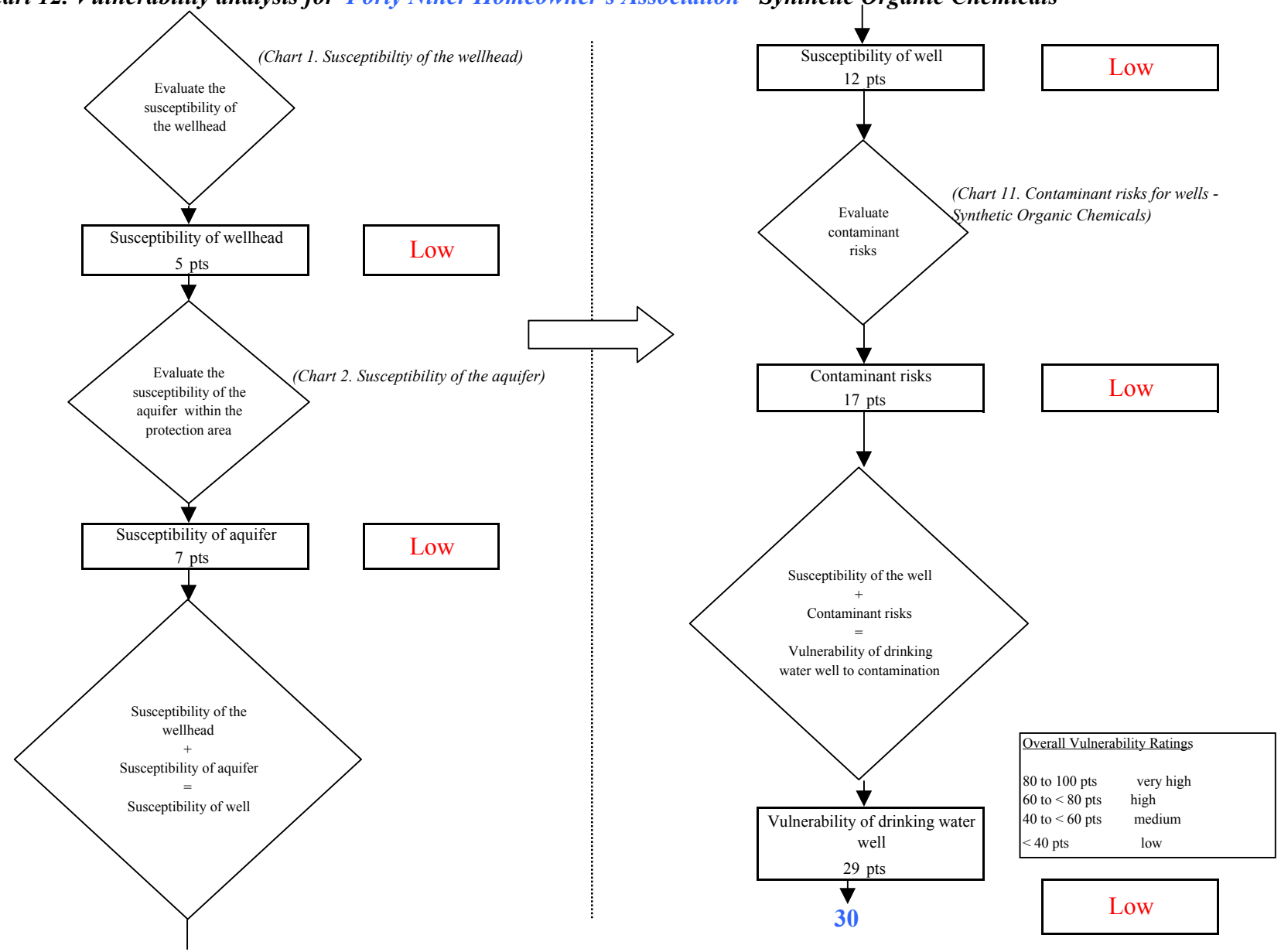


Chart 13. Contaminant risks for Forty Niner Homeowner's Association - Other Organic Chemicals

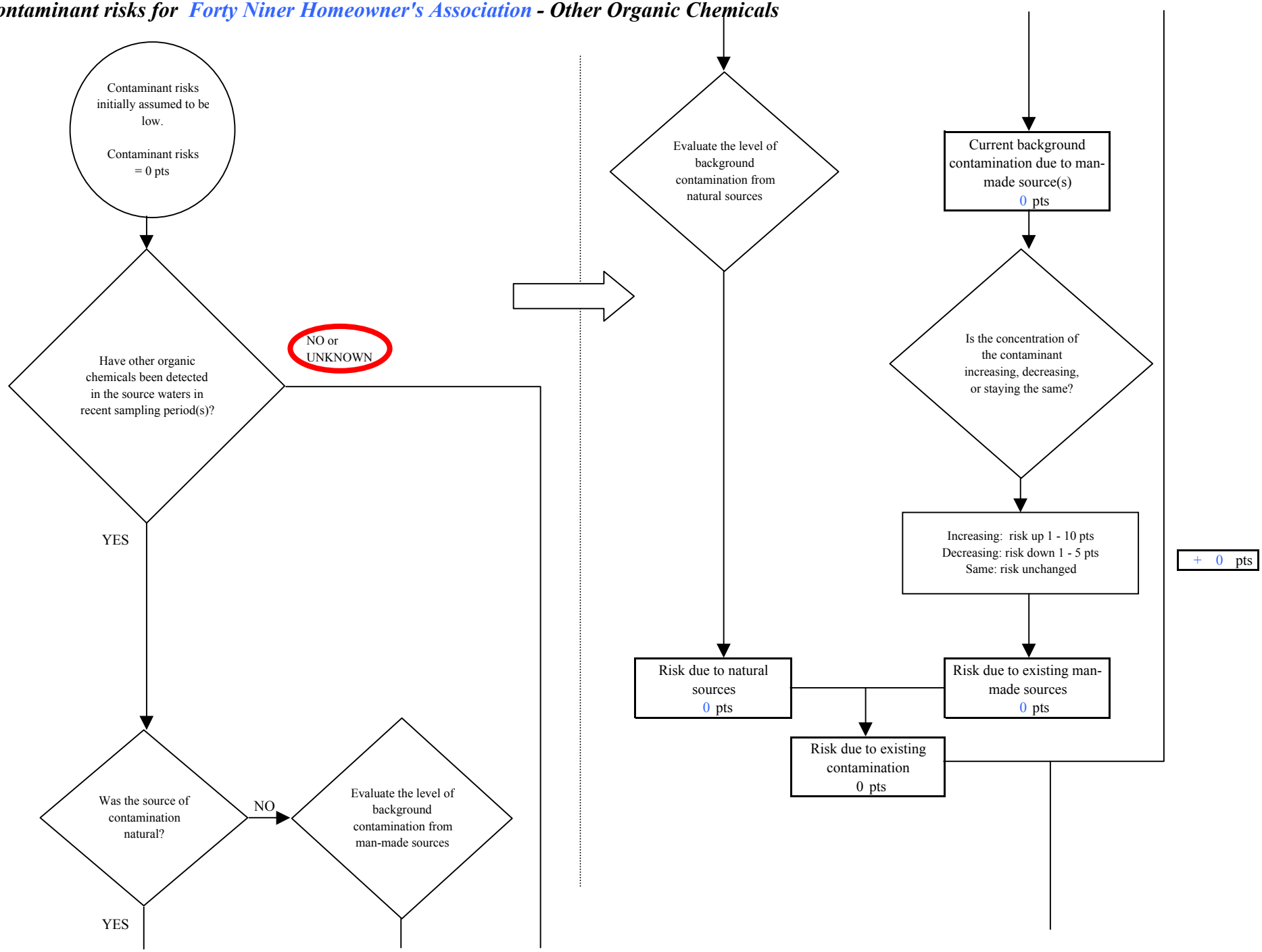


Chart 13. Contaminant risks for Forty Niner Homeowner's Association- Other Organic Chemicals

+ 10 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	0	0
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	3	5	8

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

Matrix Score 10

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 = 10 pts

Is the source aquifer fractured rock or karst?

YES

NO

The highest risk sources, the rail corridor and large capacity septic system, are located on the outer edge of zone C; however the score does not decrease because 10 in the minimum score for lows

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

NO

Risk unchanged

YES

Decrease risk 1 - 10 pts

- 0 pts

Are any significant sources within Zone A?

NO

Risk unchanged

YES

Increase risk 1 - 10 pts

+ 2 pts

The residential septic systems, roads, and residential area in Zone A combine to increase the risk

Chart 13. Contaminant risks for Forty Niner Homeowner's Association- Other Organic Chemicals

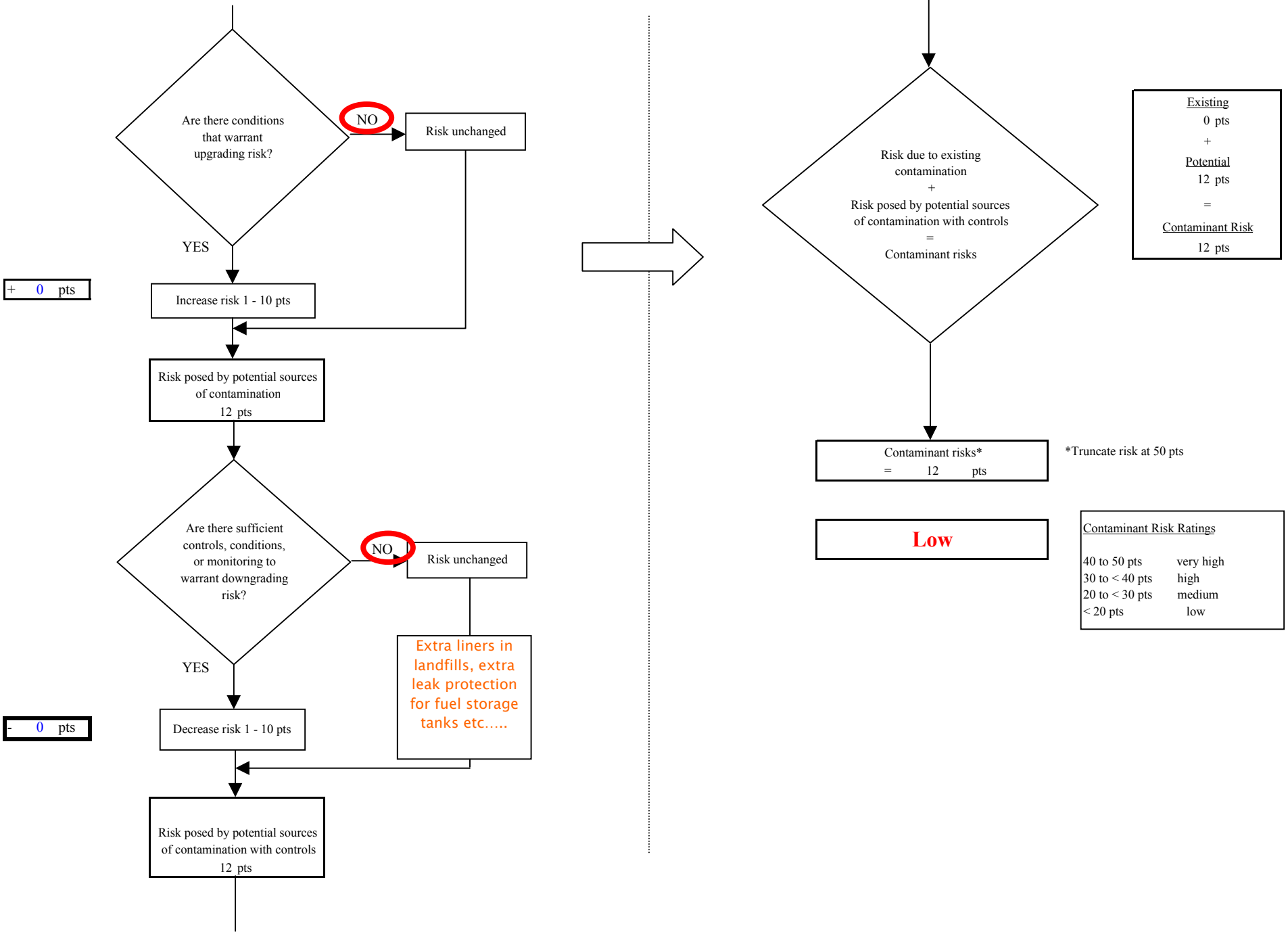


Chart 14. Vulnerability analysis for Forty Niner Homeowner's Association - Other Organic Chemicals