Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for Bear Run Apartments Drinking Water System,

Ester, Alaska

PWSID # 314580

September 2002

DRINKING WATER PROTECTION PROGRAM REPORT Report 444

Alaska Department of Environmental Conservation

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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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Drinking Water Protection Program
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EXECUTIVE SUMMARY

The public water system for Bear Run Apartments is a Class A (community) water system consisting of one well along Goldstream Road northeast of Ester, Alaska. Identified potential and current sources of contaminants for Bear Run Apartments public drinking water source include: furniture shops, heavy equipment storage areas, large capacity and residential septic systems, a metal workshop, roads, underground metals mines, and fuel storage tanks. 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 Bear Run Apartments received a vulnerability rating of **High** for bacteria and viruses, nitrates and nitrites, volatile organic chemicals, heavy metals, and other organic chemicals, and **Medium** for synthetic organic chemicals.

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 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. 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.

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 FAIRBANKS AREA, ALASKA

Fairbanks Area

The Fairbanks area is located in the Fairbanks North Star Borough which is near the center of Alaska (Please see the inset of Map 1 in Appendix A for location information). The Borough's current population is 82,840 making it the second-largest population center in the state (ADCED, 2002). Communities located within the Borough include : College, Eielson Air Force Base, Ester, Fairbanks, Fox, Harding Lake, Moose Creek, North Pole, Pleasant Valley, Salcha, and Two Rivers.

The Koyukon Athabascans are native to the Fairbanks area. Non-native population of the area began as a trading post on the Chena River. The discovery of gold in the early 1900s brought more than 6,000 prospectors during the Pedor Dome gold rush (ADCED, 2002). Construction of the Alcan Highway in the 1940s and the Trans-Alaska oil pipeline in the 1970s helped to continue the growth and development of the Fairbanks area.

Ester

Ester is located 8.5 miles west of Fairbanks along the George Parks Highway. Ester originally began as a mining camp established before 1905 and officially became a community in 1936 (ADCED, 2002).

The majority of Ester residents have individual wells and septic systems, and the remainder haul water from a central water point in Ester (ADCED, 2002). Heating oil (stored in both above and below ground 275 to 500-gallon tanks) is used for heating homes and buildings. Electricity is provided by Golden Valley Electric Association. Refuse is transported to the Fairbanks North Star Borough landfill.

Climate

The Fairbanks area experiences extreme weather variations according to season. Temperatures in January vary from –22 to –2 degrees Farenheight and from 50 to 72 degrees in July (ADCED, 2002). Average annual precipitation in the area is 11.3 inches (ADCED, 2002). Ice fog is common during the winter.

Topography and Drainage

The Fairbanks area includes two distinct topographic areas: the floodplain of the Tanana River and the Chena River, and the uplands north of this floodplain. Ester is located in the uplands. Elevation in the uplands varies from about 500 feet to 2500 feet.

The uplands are drained by many small creeks that flow into the Chena, Tanana, and Chatanika Rivers. The hydrology of these streams is greatly affected by the distribution of permafrost. Streams in the upper areas are dry most of the summer with runoff occurring during spring snowmelt and after heavy summer rains.

Geology and Soils

Bedrock under the Fairbanks area is predominantly a metamorphosed marine mud deposit, called a pelitic schist. Calc-mica schist, marble, and quartzite are also found in the area. The schist is locally intruded by granitic rocks – granite and quartz diorite.

Permafrost is common on the lower part of the north-facing slopes and valley bottoms in the uplands area (Nelson, 1978).

Groundwater

Groundwater is principally contained in fractured bedrock of the Yukon-Tanana complex (King, 1969). Groundwater flows through bedrock primarily within the fractures. The capacity of the rocks to yield water to wells depends in part on their ability to hold fractures open against the pressure of overlying rocks. The water wells in the Ester area with the greatest well recharge appear to be in quartz veins, quartzite, and siliceous schist (Nelson, 1978).

Groundwater in the uplands is recharged by local precipitation. Outflow of ground water in the uplands primarily occurs two ways. In areas under artesian pressure (pressure caused by overlying permafrost), water can flow to the surface through thawed conduits within the permafrost. Otherwise groundwater will flow under the permafrost (if present) and out to the groundwater beneath the adjacent flood plain or creek valley (Nelson, 1978).

BEAR RUN APARTMENTS PUBLIC DRINKING WATER SYSTEM

Bear Run Apartments is a Class A (community) public water system. The system consists of one well at the intersection of Goldstream Road and Collins Street approximately 6.5 miles northeast of Ester, Alaska (T1N, R2W, Section 14) (See Map 1 of Appendix A). This area is at an elevation of approximately 750 feet above sea level.

According to the water system well log, the depth of the well is 200 feet and is screened (15-foot screen) in the bedrock. The Sanitary Survey (6/24/99) 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 appropriately sloped away from the well providing adequate surface water drainage. The well is not 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 32 residents through one service connection.

BEAR RUN APARTMENTS 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 releases 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 outline of the immediate watershed was used to determine the size and shape of the DWPA for Bear Run Apartments. Available geology was also considered 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 A Public Water Systems for additional information).

The DWPAs established for wells by the ADEC are usually separated into four zones, limited by the watershed. These zones correspond to differences in the time-of-travel (TOT) of the water moving through the aquifer to the well. 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 (*Jokela et. al., 1991*).

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

Table 1. Definition of Zones

Zone	Definition
A	¼ the distance for the 2-yr. 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.

The DWPA for Bear Run Apartments is limited by its immediate watershed and includes only Zones A and B (See Map 1 of Appendix A).

INVENTORY OF POTENTIAL AND EXISTING CONTAMINANT SOURCES

The Drinking Water Protection Program has completed an inventory of potential and existing sources of contamination within the Bear Run Apartments DWPA. This inventory was completed through a search of agency records and other publicly available information. Potential sources of contamination to the drinking water aquifer include a wide range of categories and types. Potential drinking water contaminants are found within agricultural, residential, commercial, and industrial areas, but can also occur within areas that have little or no development.

For the basis of all Class A public water system assessments, six categories of drinking water contaminants were inventoried. They include:

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

The sources are displayed on Maps 2 through 4 of Appendix C and summarized in Table 1 of Appendix B.

RANKING OF CONTAMINANT RISKS

Once the potential and existing sources of contamination have been identified, they are 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.

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, volatile organic chemicals, heavy metals, synthetic organic chemicals, and other organic chemicals.

VULNERABILITY OF BEAR RUN APARTMENTS 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 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 Bear Run Apartments is 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 Susceptibility scores and ratings for Bear Run Apartments.

Table 2. Susceptibility

	Score	Rating
Susceptibility of the Wellhead	5	Low
Susceptibility of the Aquifer	24	Very High
Natural Susceptibility	29	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 and 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	50	Very High
Heavy Metals, Cyanide, and Other Inorganic Chemicals	50	Very High
Synthetic Organic Chemicals	25	Medium
Other Organic Chemicals	40	Very High

Appendix D contains fourteen charts, which together form the 'Vulnerability Analysis' for a source water assessment for a public drinking water source. Chart 1 analyzes the 'Susceptibility of the Wellhead' to contamination by looking at the construction of the well and its surrounding area. Chart 2 analyzes the 'Susceptibility of the Aquifer' to contamination by looking at the naturally occurring attributes of the water source and influences on the groundwater system that might lead to contamination. Chart 3 analyzes 'Contaminant Risks' for the drinking water source with respect to bacteria and viruses. The 'Contaminant Risks' portion of the analysis considers potential sources of contaminants as well as a review of contamination that has or may have occurred, but has not arrived or been detected at the well. Lastly, Chart 4 contains the 'Vulnerability Analysis for Bacteria and Viruses'. Charts 5 through 14 contain the Contaminant Risks and Vulnerability Analyses for nitrates and nitrites, volatile organic chemicals, heavy metals, synthetic organic chemicals, and other organic chemicals, respectively.

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

Table 4. Overall Vulnerability

Category	Score	Rating
Bacteria and Viruses	75	High
Nitrates and Nitrites	75	High
Volatile Organic Chemicals	75	High
Heavy Metals, Cyanide and Other Inorganic Chemicals	75	High
Synthetic Organic Chemicals	55	Medium
Other Organic Chemicals	70	High

Bacteria and Viruses

The contaminant risk for bacteria and viruses is very high with large capacity and residential septic systems presenting the most significant risk to the drinking water well (See Chart 3 – Contaminant Risks for Bacteria and Viruses in Appendix D). Large capacity septic systems, designated a type of Class V Injection well by the Environmental Protection Agency (EPA), differ from residential septic systems in that they serve multiple dwellings, businesses, or communities.

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 Bear Run Apartments. After combining the contaminant risk for bacteria and viruses

with the natural susceptibility of the well, the overall vulnerability of the well to contamination is high.

Nitrates and Nitrites

The contaminant risk for nitrates and nitrites is very high with large capacity and residential septic systems, because of their effluent discharge, posing the most significant contaminant risk to this source of public drinking water (See Chart 5 - Contaminant Risks for Nitrates and/or Nitrites in Appendix D). Nitrates are very mobile, moving at approximately the same rate as water.

Sampling history for Bear Run Apartments well indicates that high concentrations of nitrate have been detected. Existing nitrate concentration is approximately 18 mg/L or 180% of the Maximum Contaminant Level (MCL) of 10miligrams per liter (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. High concentrations of nitrate can come from runoff of fertilizers; leaching from septic tanks, sewage; and erosion of natural deposits. "Blue baby syndrome" in infants under six months is a potential heath effect of ingesting high concentrations of nitrate in water. Nitrate concentrations have varied between 1.4 to 19.9 mg/L within the past three years.

It is unknown how much of the existing nitrate concentration can be attributed to natural or human-made sources. Nitrate concentrations in uncontaminated groundwater are typically less than 2 mg/L, or 20% of the MCL, and are derived primarily from the decomposition of organic matter in soils [Wang, Strelakos, Jokela, 2000].

After combining the contaminant risk for nitrates and nitrites with the natural susceptibility of the well, the overall vulnerability of the well to contamination is high.

Volatile Organic Chemicals

The contaminant risk for volatile organic chemicals is high with the density of residential heating oil storage tanks, the metal workshops and furniture shops creating the most significant risk for volatile organic chemicals (See Chart 7 – Contaminant Risks for Volatile Organic Chemicals in Appendix D). Both underground and above ground heating oil storage tanks are the standard way of heating homes and businesses in the Ester area. The most common causes of fuel leaks of these heating oil systems are overfilling the tank, ruptured fuel lines, leaking storage tanks, damaged or faulty valves and vandalism. Regular system maintenance can help prevent many of these harmful fuel leaks.

Volatile organic chemicals have not been detected in significant levels during recent sampling of Bear Run Apartment's well. After combining the contaminant risk for volatile organic chemicals with the natural susceptibility of the well, the overall vulnerability of the well to contamination is high.

Heavy Metals, Cyanide, and Other Inorganic Chemicals

The contaminant risk for heavy metals is very high with the metal workshop and underground mines in the DWPA creating the most significant risk (See Chart 9 – Contaminant Risks for Heavy Metals, Cyanide, and Other Inorganic Chemicals in Appendix D). Underground mines in the Ester area are common potential contaminant sources. Water flowing over and through the metal-rich rock exposed by mining activities can react with chemicals in the rock that can contaminate the surface and ground waters. This occurrence is called acid mine drainage, and is often generated from waste rock piles or other mining wastes. Acid mine drainage can occur at an active or inactive mine and continue long after mining ends.

Review of the historical sampling data indicates that heavy metals, cyanide and other inorganic chemicals have not been detected in significant levels during recent history. After combining the contaminant risk for heavy metals with the natural susceptibility of the well, the overall vulnerability of the well to contamination is high.

Synthetic Organic Chemicals

The contaminant risk for synthetic organic chemicals is medium with the furniture shops, metal workshops, and large capacity and residential septic systems representing the most significant risk. After combining the contaminant risk with the natural susceptibility of the well, the overall vulnerability to synthetic organic chemicals of the well is medium.

Other Organic Chemicals

The contaminant risk for other organic chemicals is very high with the metal workshop, furniture shops, and heavy equipment storage areas within the DWPA representing the most significant risk. After combining the contaminant risk with the natural susceptibility of the well, the overall vulnerability to other organic chemicals of the well is high.

Review of the historical sampling data indicates that no synthetic organic chemicals or other organic chemicals have been sampled for in Bear Run Apartment's drinking water within the past 5 years (See Charts 11

and 13 – Contaminant Risks for Synthetic Organic Chemicals and Other Organic Chemicals in Appendix D, respectively).

SUMMARY

A *Source Water Assessment* has been completed for the sources of public drinking water serving Bear Run Apartments. The overall vulnerability of this source to contamination is **High** for bacteria and viruses, nitrates and nitrites, volatile organic chemicals, heavy metals, and other organic chemicals, and **Medium** for synthetic 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 Bear Run Apartments 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 Bear Run Apartments public drinking water source.

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APPENDIX A

Bear Run Apartments
Drinking Water Protection Area Location Map
(Map 1)

Bear Run Apartments Drinking Water Protection Area

Zone B

Zone A

O'Connor Creek

MONTEVERDE ROAD

MONTEVERDE ROAD

MOOSE MOUNTAIN ROAD

COYOTE TRAIL

GOLDRIDGE DRIVE

NORTH RADER DRIVE

WALDHEIM DRIVE

WALDHEIM DRIVE

JONES ROAD

IVAN'S ALLEY

NEW MURPHY DOME ROAD

BEVERLY LANE

BONANZA TRAIL

ROAD EZNMT

PENROSE LANE

PANDORA DRIVE

SKYFLIGHT AVENUE

GOLDEN VIEW DRIVE

CORDES DRIVE

FRANKLIN STREET

TRICE AVENUE

NUGGET LOOP

GOLDSTREAM ROAD

HELIOS AVENUE

SUNNY SLOPE ROAD

BALLAINE ROAD

1 0 1 2 Miles

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Legend

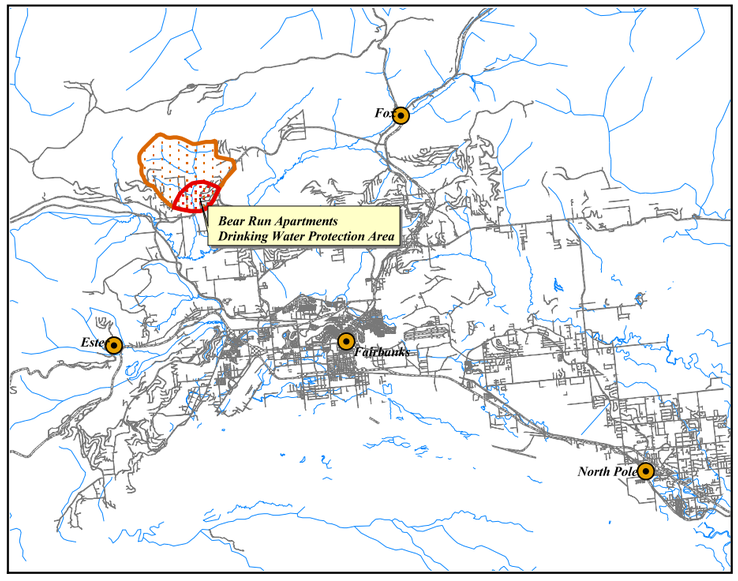
- Bear Run Apartments Well

Zone A Protection Area

- Several Months Travel Time

Zone B Protection Area

- Less Than 2 Years Travel Time
- Roads
- Creeks
- Elevation Contours (20 meters)



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Map 1

APPENDIX B

Contaminant Source Inventory and Risk Ranking for Bear Run Apartments (Tables 1-7)

Table 1

Contaminant Source Inventory for ***Bear Run Apartments***

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Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Furniture manufacturing, repair, and finishing shops	C14	C14-1	A	2	
Heavy equipment rental/storage	C18	C18-1	A	2	
Heavy equipment rental/storage	C18	C18-2	A	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	2	Bear Run Apartments septic system
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-2	A	2	
Machine and metal work shops	I23	I23-1	A	2	
Residential Areas	R01	R01-1	A	3	Approximately 440 acres of residential area within Zone A
Septic systems (serves one single-family home)	R02	R2-1 - 106	A	3	
Tanks, heating oil, residential (above ground)	R08	R8-1 - 107	A	3	
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	2	
Highways and roads, dirt/gravel	X24	X24-01	A	2	
Highways and roads, dirt/gravel	X24	X24-02	A	2	
Highways and roads, dirt/gravel	X24	X24-03	A	2	
Highways and roads, dirt/gravel	X24	X24-04	A	2	
Highways and roads, dirt/gravel	X24	X24-05	A	2	
Highways and roads, dirt/gravel	X24	X24-06	A	2	
Highways and roads, dirt/gravel	X24	X24-07	A	2	
Highways and roads, dirt/gravel	X24	X24-08	A	2	
Highways and roads, dirt/gravel	X24	X24-09	A	2	
Highways and roads, dirt/gravel	X24	X24-10	A	2	
Furniture manufacturing, repair, and finishing shops	C14	C14-2	B	2	
Metals mining, underground (active or inactive?)	E05	E05-1	B	2	O'Connor Creek Prospect
Residential Areas	R01	R1-2	B	4	Approximately 820 acres of residential area within Zone B

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Septic systems (serves one single-family home)	R02	R2-107-243	B	4	
Tanks, heating oil, residential (above ground)	R08	R8-108-244	B	4	
Closed tanks, gasoline (underground)	T13	T13-1	B	2	
Highways and roads, dirt/gravel	X24	X24-11	B	2	
Highways and roads, dirt/gravel	X24	X24-12	B	2	
Highways and roads, dirt/gravel	X24	X24-13	B	2	
Highways and roads, dirt/gravel	X24	X24-14	B	2	
Highways and roads, dirt/gravel	X24	X24-15	B	2	
Highways and roads, dirt/gravel	X24	X24-16	B	2	
Highways and roads, dirt/gravel	X24	X24-17	B	2	
Highways and roads, dirt/gravel	X24	X24-18	B	2	
Highways and roads, dirt/gravel	X24	X24-19	B	2	
Highways and roads, dirt/gravel	X24	X24-20	B	2	

Table 2

Contaminant Source Inventory and Risk Ranking for Bear Run Apartments Sources of Bacteria and Viruses

PWSID 314580.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	High	2	Bear Run Apartments septic system
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-2	A	High	2	
Septic systems (serves one single-family home)	R02	R2-1 - 106	A	Low	3	
Residential Areas	R01	R01-1	A	Low	3	Approximately 440 acres of residential area within Zone A
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-01	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-02	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-03	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-04	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-05	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-06	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-07	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-08	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-09	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-10	A	Low	2	
Residential Areas	R01	R1-2	B	Low	4	Approximately 820 acres of residential area within Zone B
Septic systems (serves one single-family home)	R02	R2-107-243	B	Low	4	
Highways and roads, dirt/gravel	X24	X24-11	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-12	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-13	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-14	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-15	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-16	B	Low	2	

Contaminant Source Inventory and Risk Ranking for Bear Run Apartments Sources of Bacteria and Viruses

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Highways and roads, dirt/gravel	X24	X24-17	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-18	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-19	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-20	B	Low	2	

Table 3

Contaminant Source Inventory and Risk Ranking for Bear Run Apartments Sources of Nitrates/Nitrites

PWSID 314580.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	High	2	Bear Run Apartments septic system
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-2	A	High	2	
Septic systems (serves one single-family home)	R02	R2-1 - 106	A	Low	3	
Residential Areas	R01	R01-1	A	Low	3	Approximately 440 acres of residential area within Zone A
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-01	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-02	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-03	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-04	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-05	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-06	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-07	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-08	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-09	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-10	A	Low	2	
Residential Areas	R01	R1-2	B	Low	4	Approximately 820 acres of residential area within Zone B
Septic systems (serves one single-family home)	R02	R2-107-243	B	Low	4	
Highways and roads, dirt/gravel	X24	X24-11	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-12	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-13	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-14	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-15	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-16	B	Low	2	

Contaminant Source Inventory and Risk Ranking for Bear Run Apartments Sources of Nitrates/Nitrites

Contaminant Source Type	***Contaminant Source ID***	***CS ID tag***	***Zone***	***Risk Ranking for Analysis***	***Map Number***	***Comments***
Highways and roads, dirt/gravel	X24	X24-17	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-18	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-19	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-20	B	Low	2	

Table 4

Contaminant Source Inventory and Risk Ranking for Bear Run Apartments Sources of Volatile Organic Chemicals

PWSID 314580.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Machine and metal work shops	I23	I23-1	A	High	2	
Furniture manufacturing, repair, and finishing shops	C14	C14-1	A	High	2	
Tanks, heating oil, residential (above ground)	R08	R8-1 - 107	A	Medium	3	
Heavy equipment rental/storage	C18	C18-1	A	Medium	2	
Heavy equipment rental/storage	C18	C18-2	A	Medium	2	
Septic systems (serves one single-family home)	R02	R2-1 - 106	A	Low	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	Low	2	Bear Run Apartments septic system
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-2	A	Low	2	
Residential Areas	R01	R01-1	A	Low	3	Approximately 440 acres of residential area within Zone A
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-01	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-02	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-03	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-04	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-05	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-06	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-07	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-08	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-09	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-10	A	Low	2	
Furniture manufacturing, repair, and finishing shops	C14	C14-2	B	High	2	
Metals mining, underground (active or inactive?)	E05	E05-1	B	Medium	2	O'Connor Creek Prospect
Residential Areas	R01	R1-2	B	Low	4	Approximately 820 acres of residential area within Zone B

Table 4 (continued)

Contaminant Source Inventory and Risk Ranking for Bear Run Apartments
Sources of Volatile Organic Chemicals

PWSID 314580.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Septic systems (serves one single-family home)	R02	R2-107-243	B	Low	4	
Tanks, heating oil, residential (above ground)	R08	R8-108-244	B	Medium	4	
Closed tanks, gasoline (underground)	T13	T13-1	B	Medium	2	
Highways and roads, dirt/gravel	X24	X24-11	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-12	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-13	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-14	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-15	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-16	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-17	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-18	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-19	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-20	B	Low	2	

Table 5

Contaminant Source Inventory and Risk Ranking for Bear Run Apartments

Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals

PWSID 314580.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Machine and metal work shops	I23	I23-1	A	High	2	
Metals mining, underground (active or inactive?)	E05	E05-1	B	Very High	2	O'Connor Creek Prospect
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	Low	2	Bear Run Apartments septic system
Furniture manufacturing, repair, and finishing shops	C14	C14-1	A	Low	2	
Heavy equipment rental/storage	C18	C18-1	A	Low	2	
Heavy equipment rental/storage	C18	C18-2	A	Low	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-2	A	Low	2	
Septic systems (serves one single-family home)	R02	R2-1 - 106	A	Low	3	
Residential Areas	R01	R01-1	A	Low	3	Approximately 440 acres of residential area within Zone A
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-01	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-02	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-03	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-04	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-05	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-06	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-07	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-08	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-09	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-10	A	Low	2	
Furniture manufacturing, repair, and finishing shops	C14	C14-2	B	Low	2	
Residential Areas	R01	R1-2	B	Low	4	Approximately 820 acres of residential area within Zone B
Septic systems (serves one single-family home)	R02	R2-107-243	B	Low	4	

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Highways and roads, dirt/gravel	X24	X24-11	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-12	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-13	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-14	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-15	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-16	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-17	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-18	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-19	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-20	B	Low	2	

Table 6

Contaminant Source Inventory and Risk Ranking for Bear Run Apartments Sources of Synthetic Organic Chemicals

PWSID 314580.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Furniture manufacturing, repair, and finishing shops	C14	C14-1	A	Medium	2	
Furniture manufacturing, repair, and finishing shops	C14	C14-2	B	Medium	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	Low	2	Bear Run Apartments septic system
Machine and metal work shops	I23	I23-1	A	Low	2	
Septic systems (serves one single-family home)	R02	R2-1 - 106	A	Low	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-2	A	Low	2	
Residential Areas	R01	R01-1	A	Low	3	Approximately 440 acres of residential area within Zone A
Septic systems (serves one single-family home)	R02	R2-107-243	B	Low	4	
Residential Areas	R01	R1-2	B	Low	4	Approximately 820 acres of residential area within Zone B

Table 7

Contaminant Source Inventory and Risk Ranking for Bear Run Apartments
Sources of Other Organic Chemicals

PWSID 314580.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Machine and metal work shops	I23	I23-1	A	High	2	
Furniture manufacturing, repair, and finishing shops	C14	C14-1	A	Medium	2	
Heavy equipment rental/storage	C18	C18-1	A	Medium	2	
Heavy equipment rental/storage	C18	C18-2	A	Medium	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	Low	2	Bear Run Apartments septic system
Septic systems (serves one single-family home)	R02	R2-1 - 106	A	Low	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-2	A	Low	2	
Residential Areas	R01	R01-1	A	Low	3	Approximately 440 acres of residential area within Zone A
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-01	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-02	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-03	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-04	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-05	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-06	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-07	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-08	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-09	A	Low	2	
Highways and roads, dirt/gravel	X24	X24-10	A	Low	2	
Furniture manufacturing, repair, and finishing shops	C14	C14-2	B	Medium	2	
Residential Areas	R01	R1-2	B	Low	4	Approximately 820 acres of residential area within Zone B
Septic systems (serves one single-family home)	R02	R2-107-243	B	Low	4	
Highways and roads, dirt/gravel	X24	X24-11	B	Low	2	

Contaminant Source Inventory and Risk Ranking for Bear Run Apartments

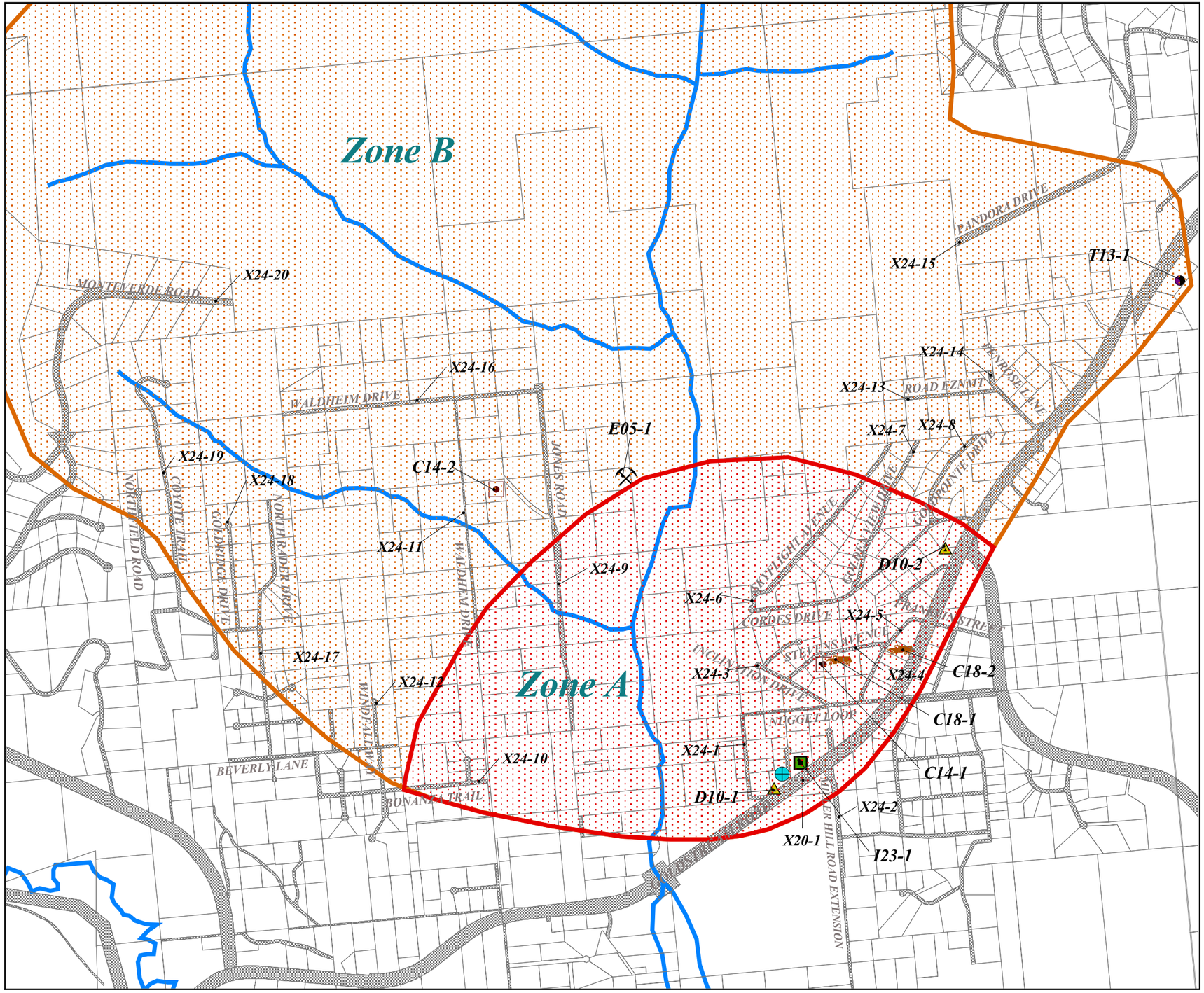
Sources of Other Organic Chemicals

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Highways and roads, dirt/gravel	X24	X24-12	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-13	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-14	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-15	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-16	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-17	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-18	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-19	B	Low	2	
Highways and roads, dirt/gravel	X24	X24-20	B	Low	2	

APPENDIX C

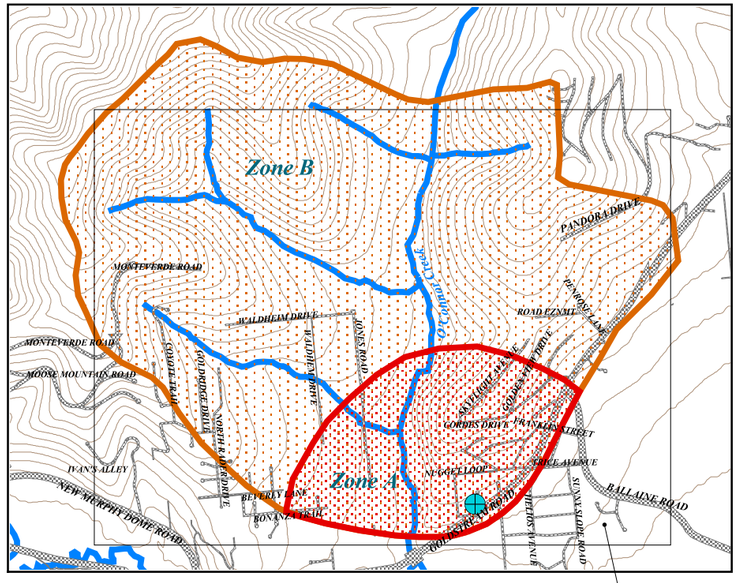
Bear Run Apartments
Drinking Water Protection Area
and Potential and Existing Contaminant Sources
(Maps 2-4)

Bear Run Apartments Drinking Water Protection Area with Potential & Existing Contaminant Sources



Legend

- Bear Run Apartments Well
- Zone A Protection Area
- Several Months Travel Time
- Zone B Protection Area
- Less Than 2 Years Travel Time
- Parcels
- Creeks
- Potential Contaminant Sources
- Furniture Manufacturing, Repair, and Finishing Shops (C14)
- Heavy Equipment Rental/Storage (C18)
- Large Capacity Septic Systems (D10)
- Machine and Metal Workshops (I23)
- Closed Underground Gasoline Tank (T13)
- Roads (X20 or X24)
- Underground Metals Mines (E05)



Area of map

N
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1 0 1 Miles

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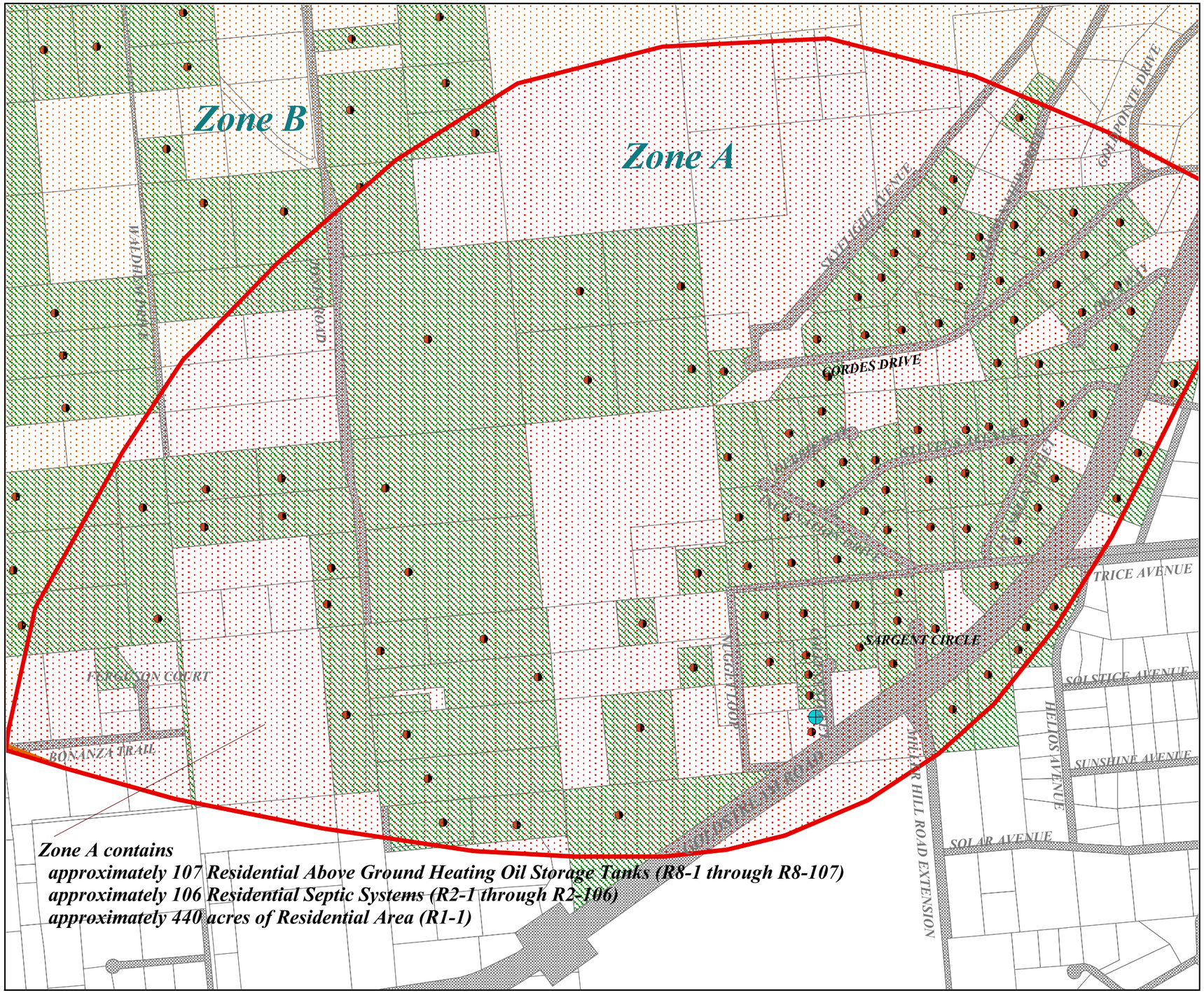
Map 2

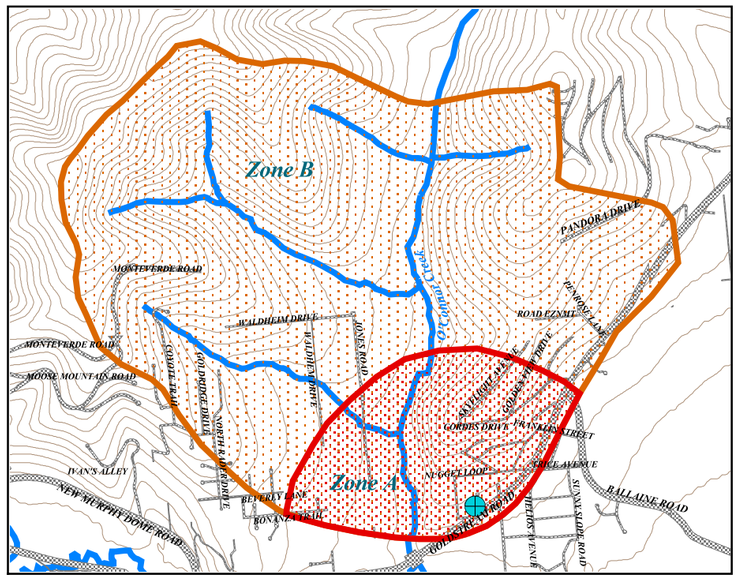
Bear Run Apartments Drinking Water Protection Area with Potential & Existing Contaminant Sources



Zone A contains
approximately 107 Residential Above Ground Heating Oil Storage Tanks (R8-1 through R8-107)
approximately 106 Residential Septic Systems (R2-1 through R2-106)
approximately 440 acres of Residential Area (R1-1)

Legend

- Bear Run Apartments Well
- Zone A Protection Area
- Several Months Travel Time
- Zone B Protection Area
- Less Than 2 Years Travel Time
- Parcels
- Roads (X20 or X24)
- Residential Above Ground Healting Oil Storage Tanks (R8)
- Residential Area (R1)



0.5 0 0.5 Miles

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Map 3

Bear Run Apartments Drinking Water Protection Area with Potential & Existing Contaminant Sources

Zone B contains
approximately 137 Residential Above Ground Heating Oil Storage Tanks (R8-108 through R9-243)
approximately 137 residential Septic Systems (R2-107 through R2-243)
approximately 820 acres of Residential Area (R1-2)

Zone B

Zone A

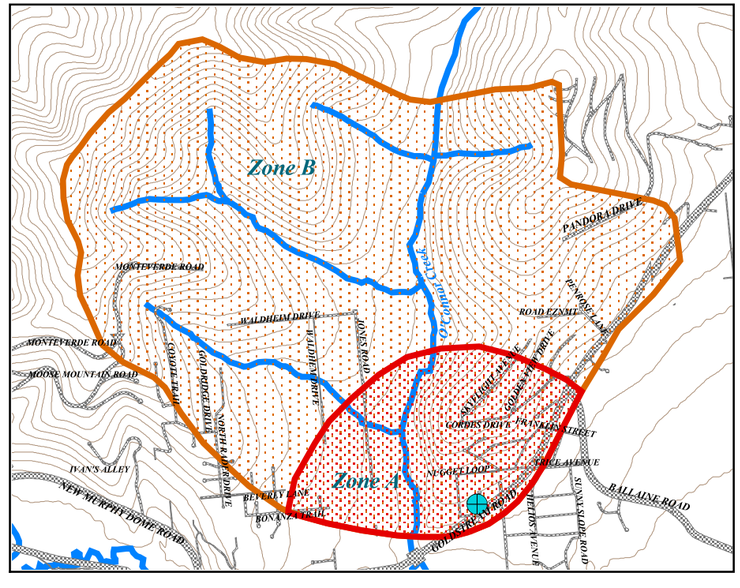
MONTEVERDE ROAD
WALDHEIM DRIVE
COYOTE TRAIL
GOLDRIDGE DRIVE
NORTH RADER DRIVE
JONES ROAD
PANDORA DRIVE
PEAKREST PASS
ROAD EZNMT
SKYFLIGHT AVENUE
CORDES DRIVE
STEVENS AVENUE
NUGGET LOOP
BALLAINE ROAD
GOLDSTREAM ROAD

1 0 1 Miles

PWSID 314580.001

Legend

- Bear Run Apartments Well
- Zone A Protection Area
- Several Months Travel Time
- Zone B Protection Area
- Less Than 2 Years Travel Time
- Parcels
- Roads (X20 or X24)
- Residential Underground Healting Oil Storage Tanks (R9)
- Residential Area (R1)



N
W E
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Map 4

APPENDIX D

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

Chart 1. Susceptibility of the wellhead - Bear Run Apartments

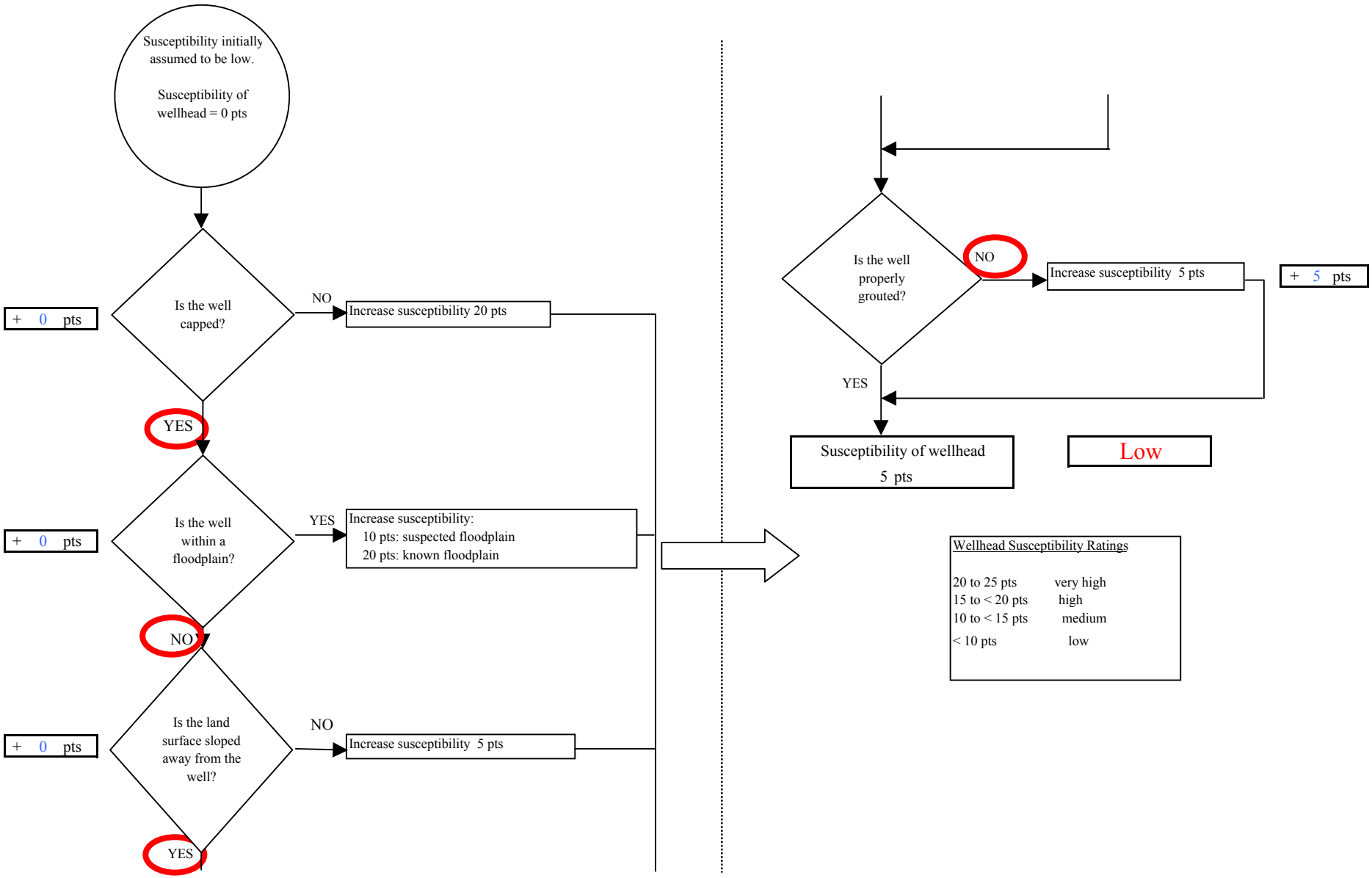


Chart 2. Susceptibility of the aquifer - Bear Run Apartments

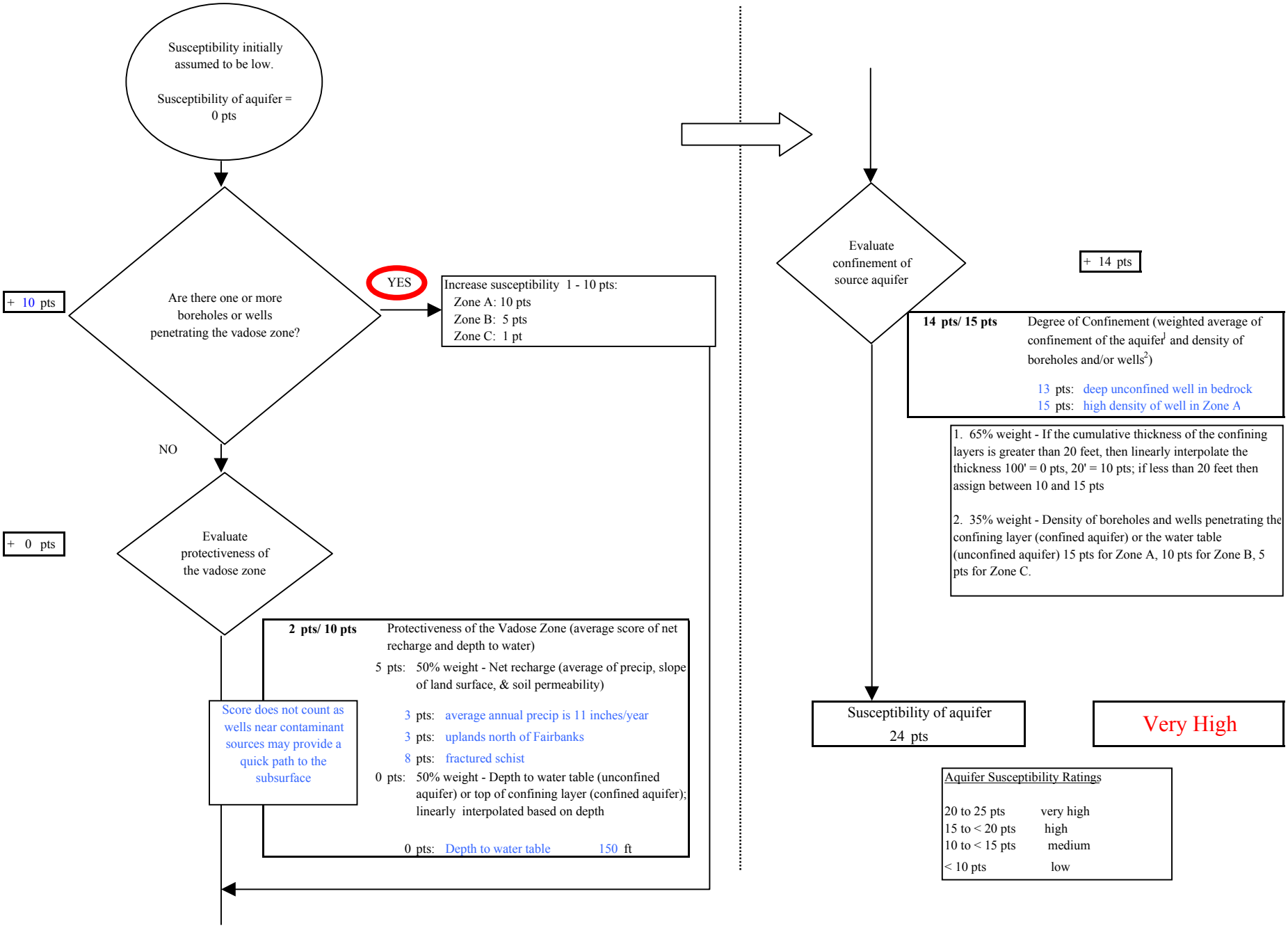
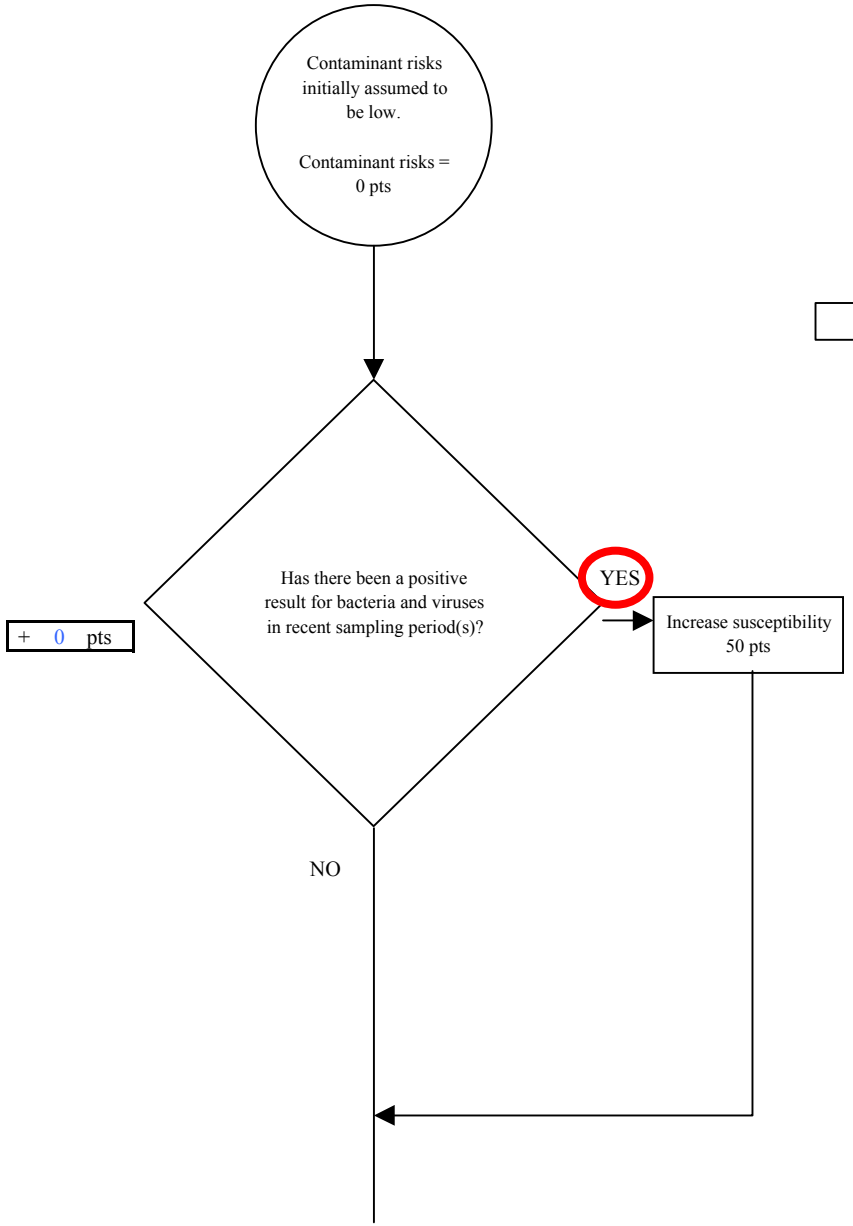
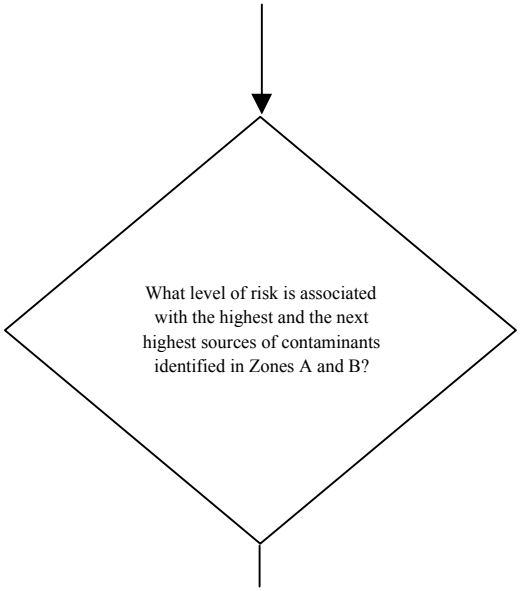


Chart 3. Contaminant risks for Bear Run Apartments - Bacteria & Viruses





+ 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)	0	0	0
Low(s)	116	26	142

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

Matrix Score 40

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

Chart 3. Contaminant risks for Bear Run Apartments - Bacteria & Viruses

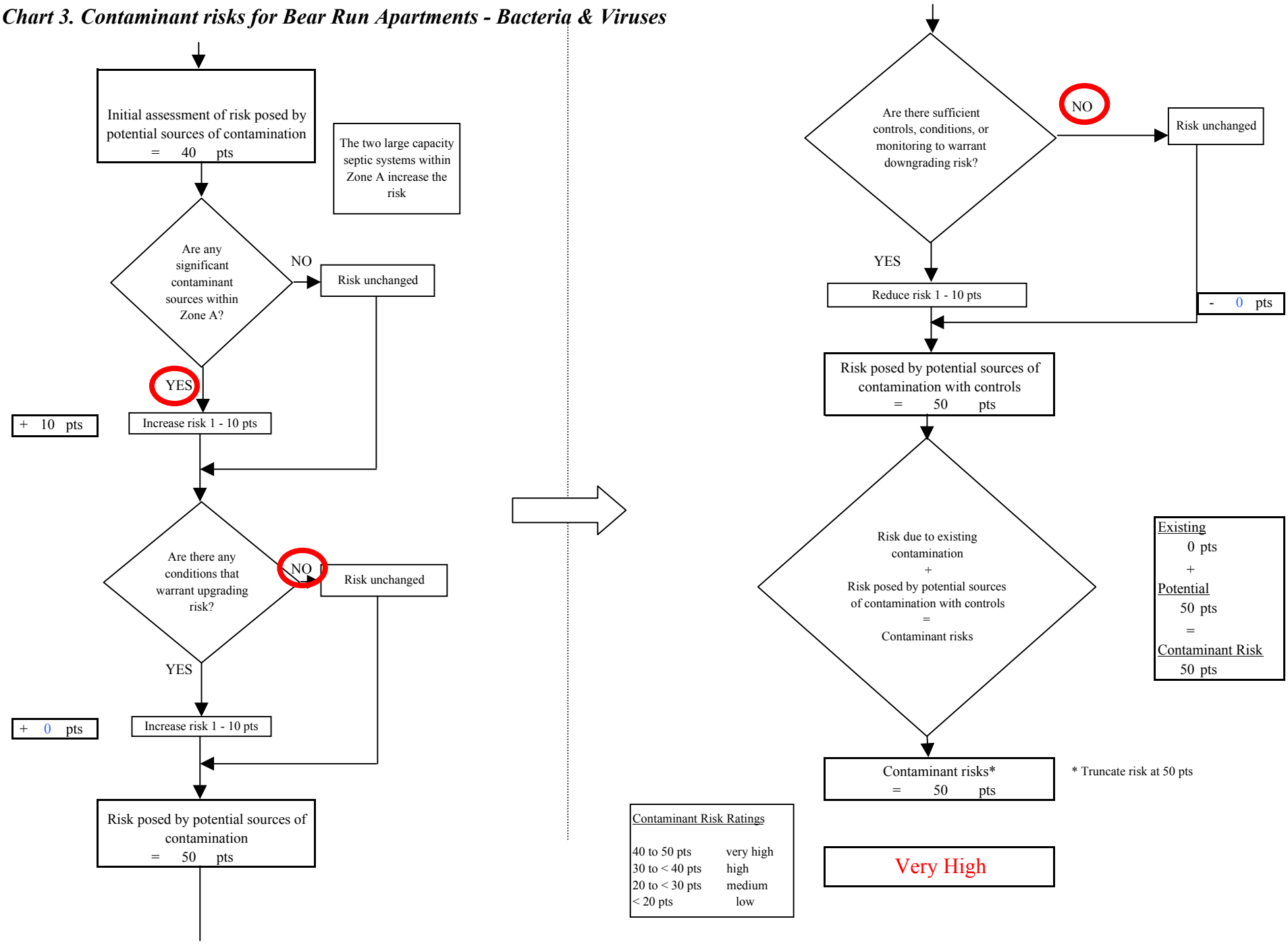


Chart 4. Vulnerability analysis for Bear Run Apartments - Bacteria & Viruses

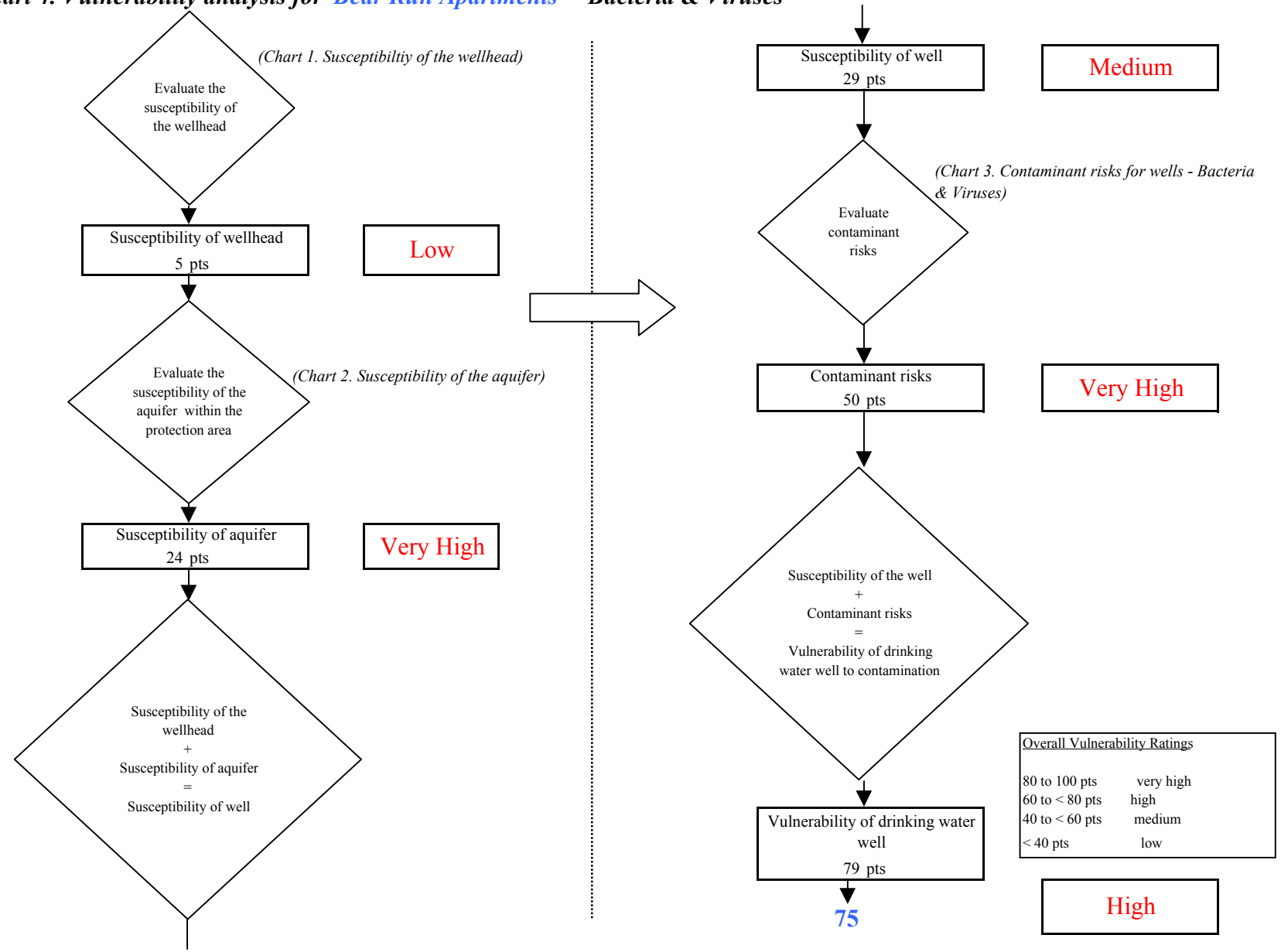


Chart 5. Contaminant risks for Bear Run Apartments - Nitrates and Nitrites

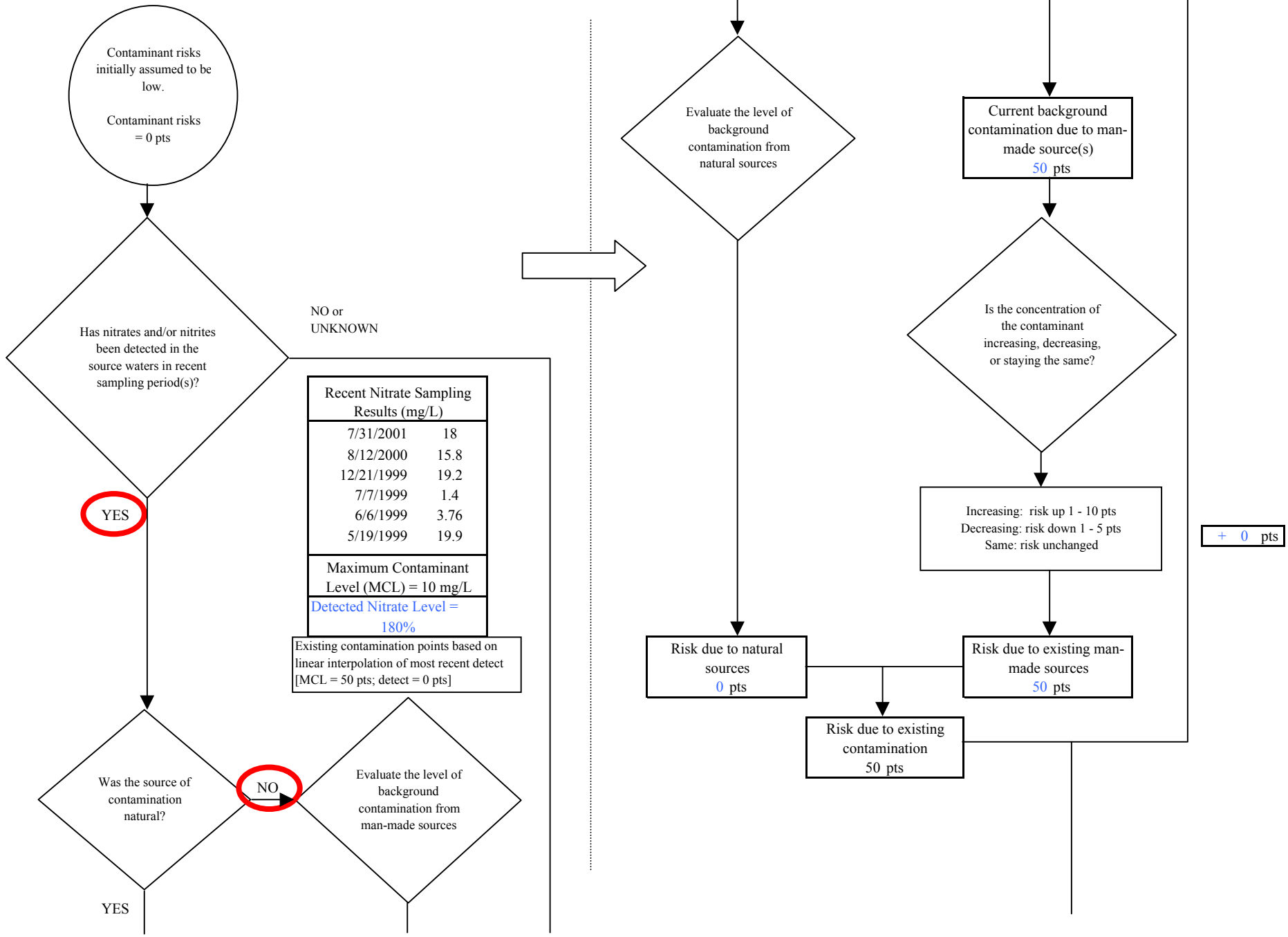


Chart 5. Contaminant risks for Bear Run Apartments - Nitrates and Nitrites

+ 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	0	0
High(s)	2	0	2
Medium(s)	0	0	0
Low(s)	116	26	142

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

Matrix Score 40

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

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 → Decrease risk 1 - 10 pts

- 0 pts

Are any significant sources within Zone A?

NO → Risk unchanged

YES → Increase risk 1 - 10 pts

+ 10 pts

The two large capacity septic systems within Zone A increase the risk

Chart 5. Contaminant risks for Bear Run Apartments - Nitrates and Nitrites

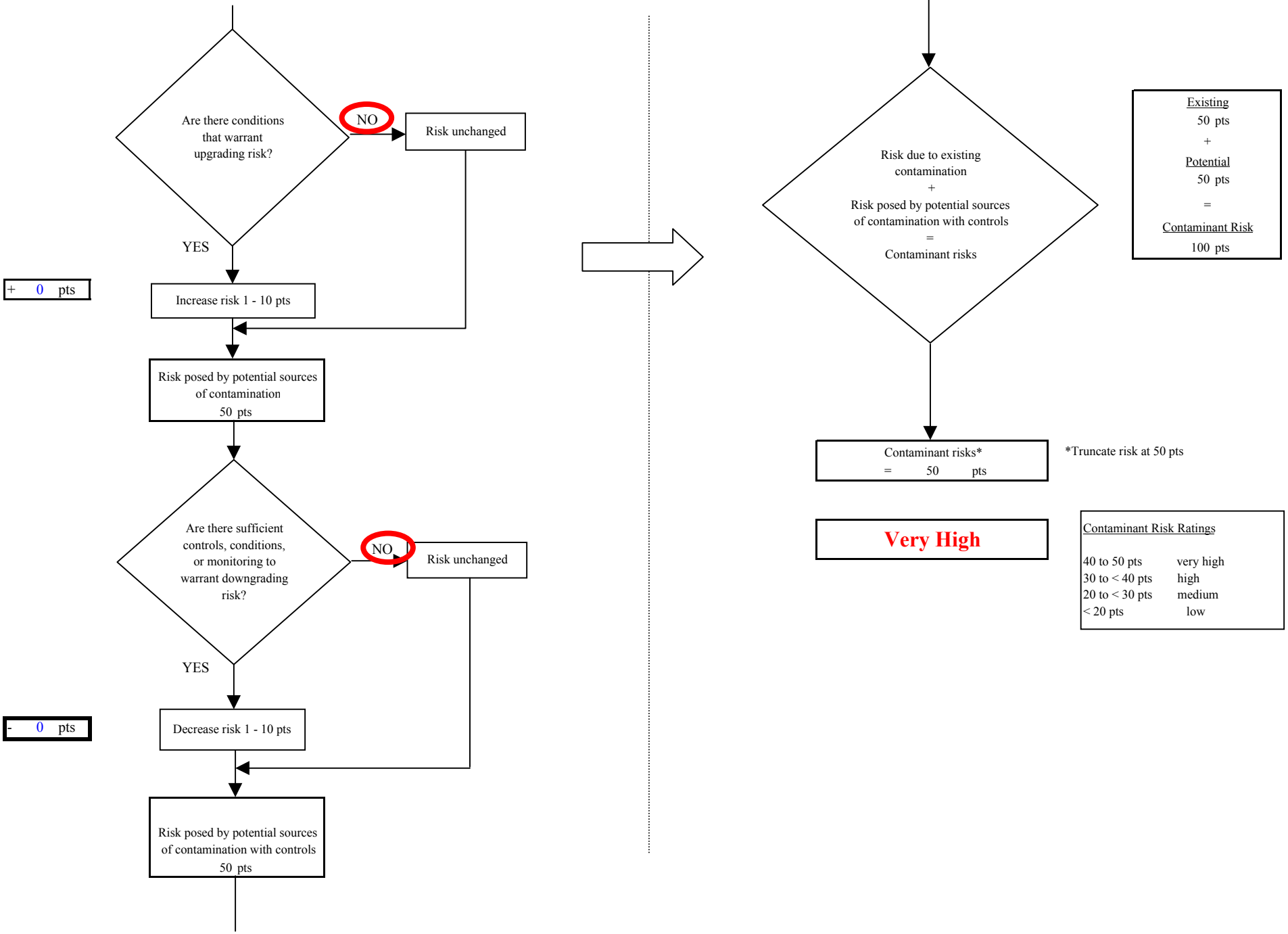


Chart 6. Vulnerability analysis for Bear Run Apartments - Nitrates and Nitrites

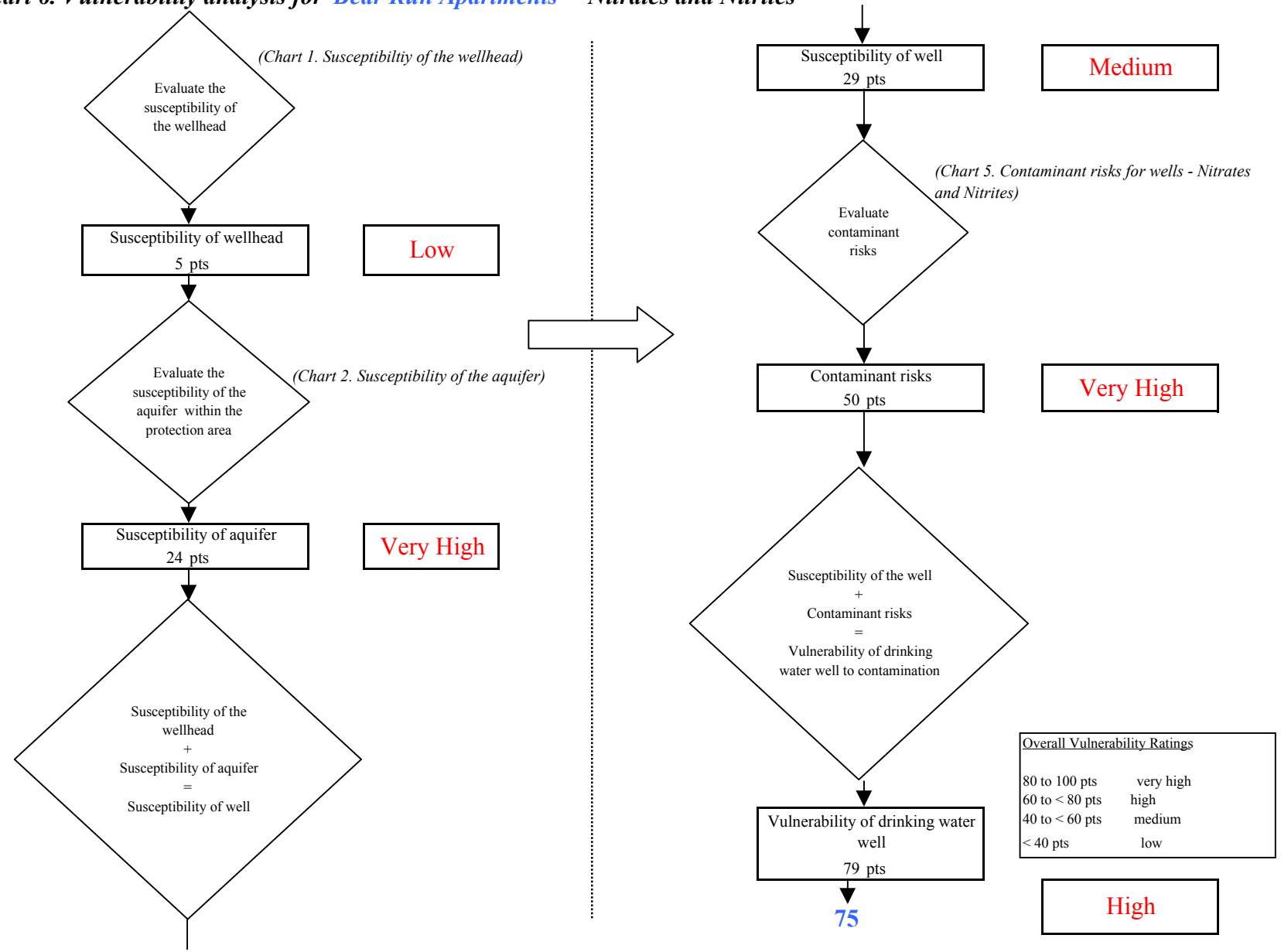


Chart 7. Contaminant risks for Bear Run Apartments - Volatile Organic Chemicals

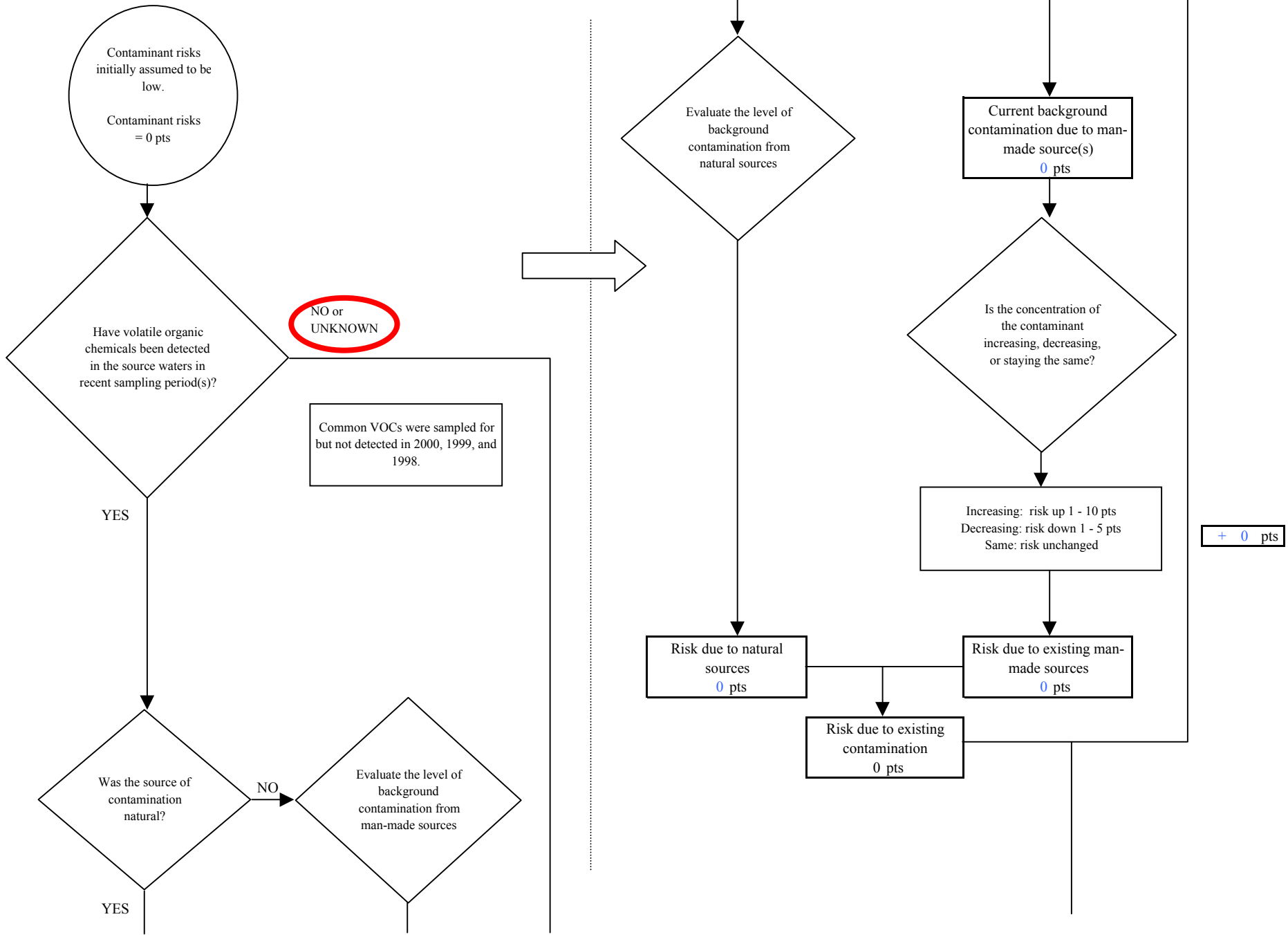
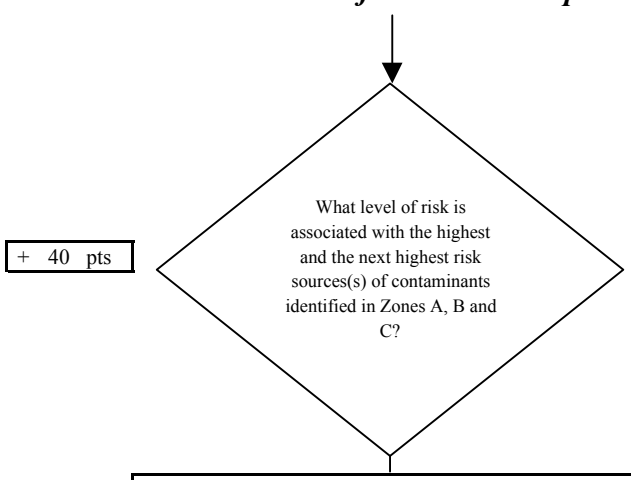


Chart 7. Contaminant risks for Bear Run Apartments - Volatile Organic Chemicals



+ 40 pts

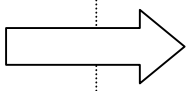
Risk Levels for Contaminant Sources identified in Zones A, B and C

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	2	1	3
Medium(s)	108	139	247
Low(s)	17	13	30

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

Matrix Score 40

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



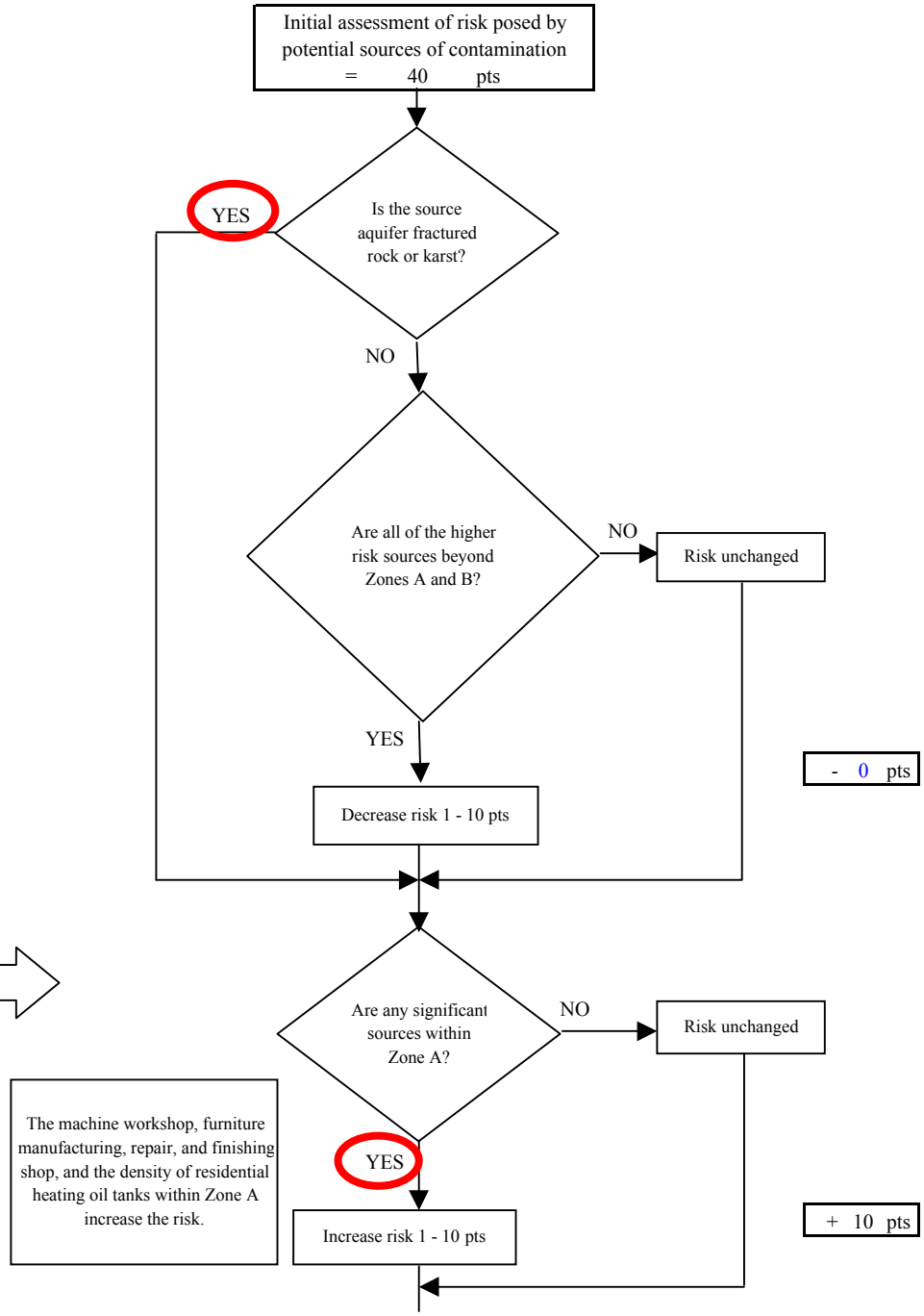


Chart 7. Contaminant risks for Bear Run Apartments - Volatile Organic Chemicals

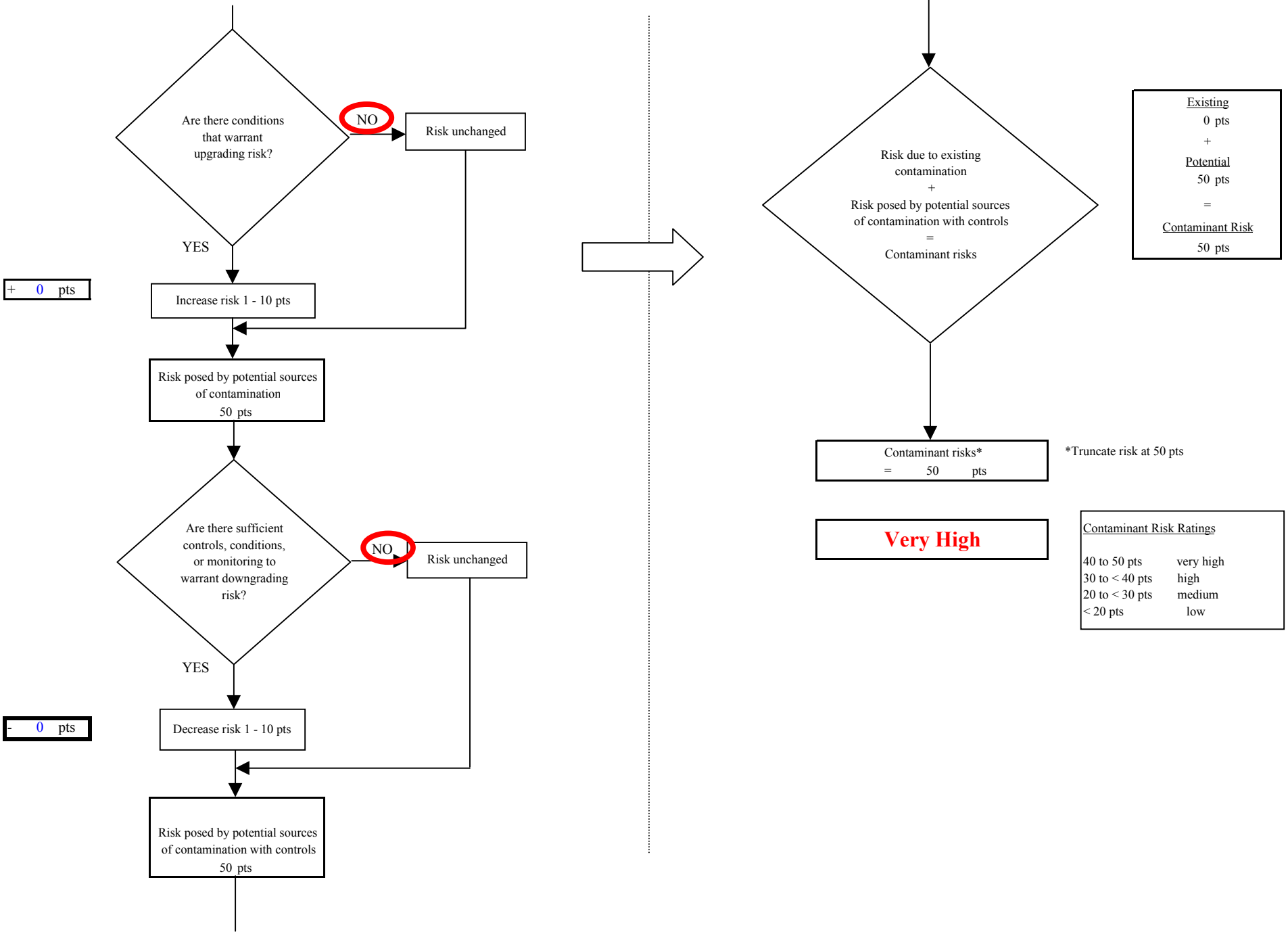


Chart 8. Vulnerability analysis for Bear Run Apartments - Volatile Organic Chemicals

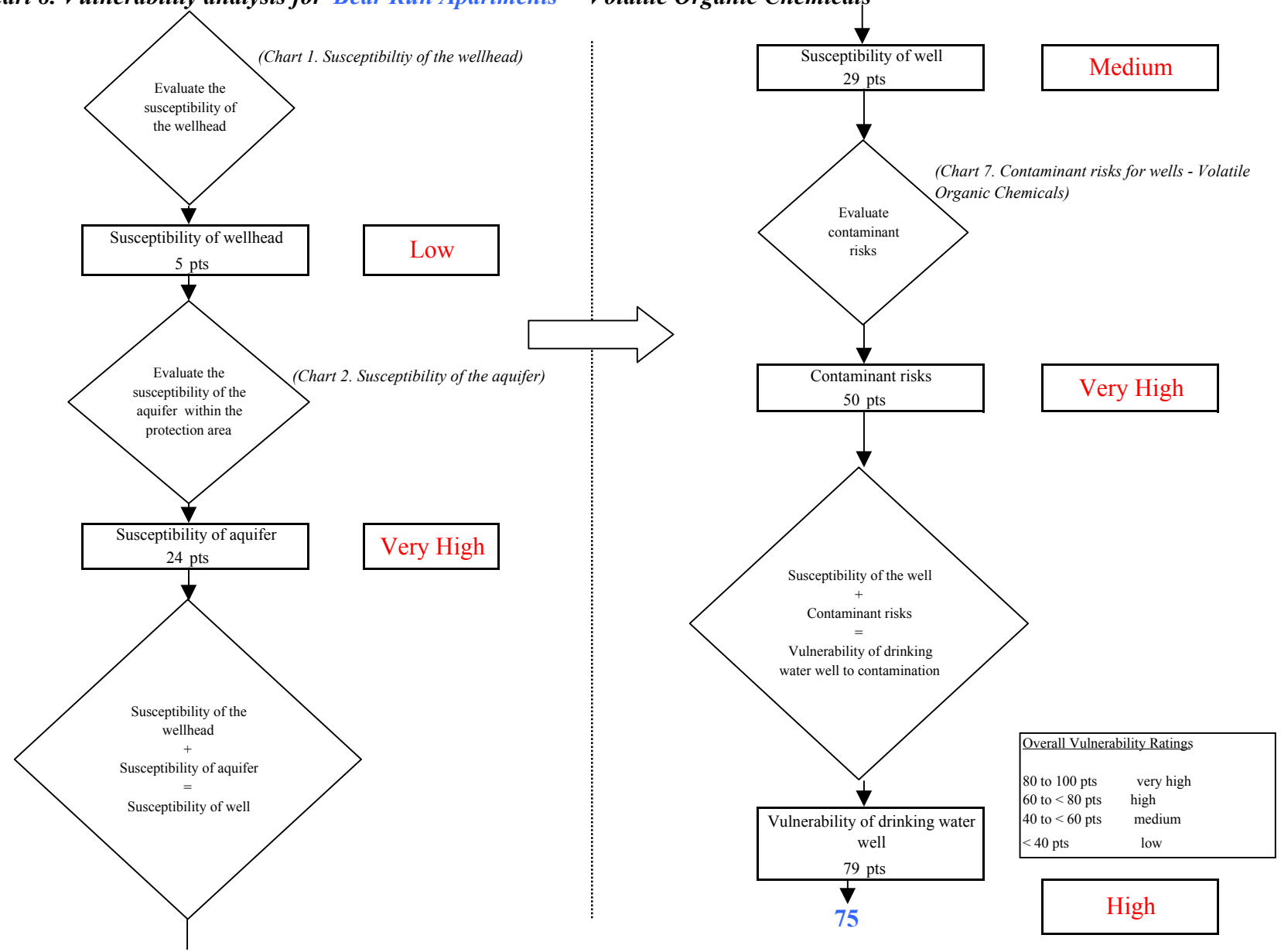


Chart 9. Contaminant risks for Bear Run Apartments - Heavy Metals, Cyanide and Other Inorganic Chemicals

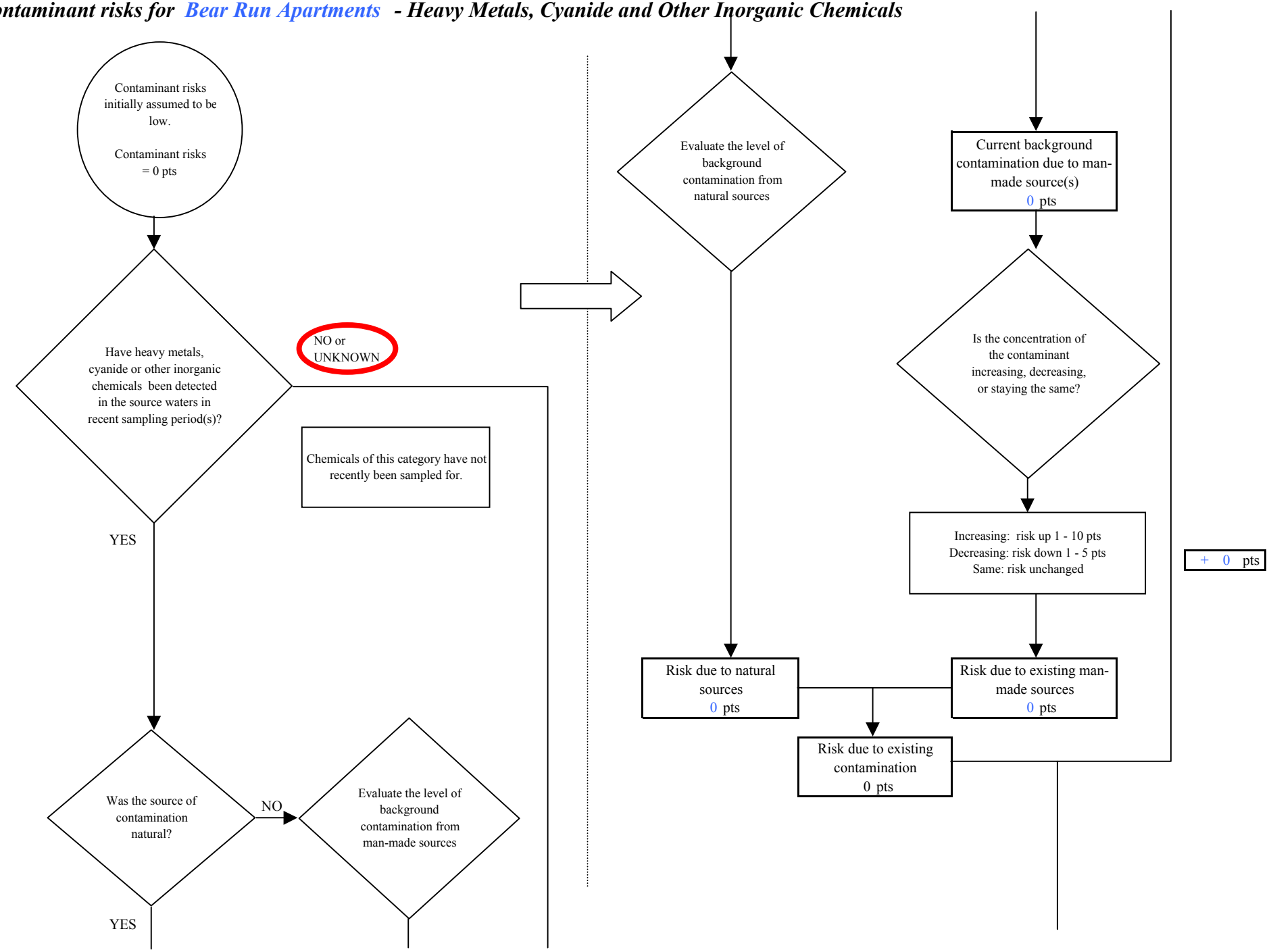
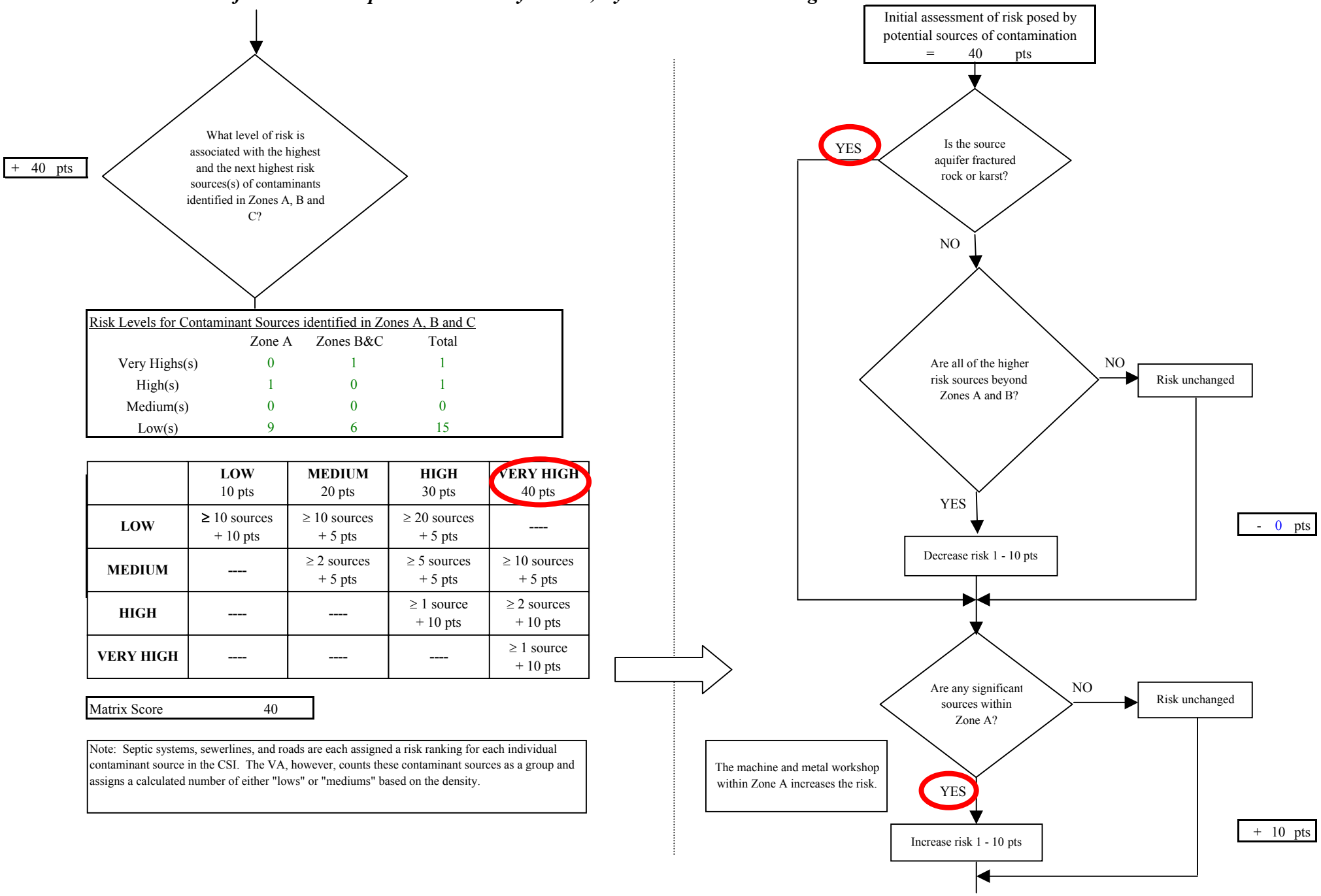


Chart 9. Contaminant risks for Bear Run Apartments - Heavy Metals, Cyanide and Other Inorganic Chemicals



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)	1	0	1
Medium(s)	0	0	0
Low(s)	9	6	15

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

Matrix Score 40

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

Chart 9. Contaminant risks for Bear Run Apartments - Heavy Metals, Cyanide and Other Inorganic Chemicals

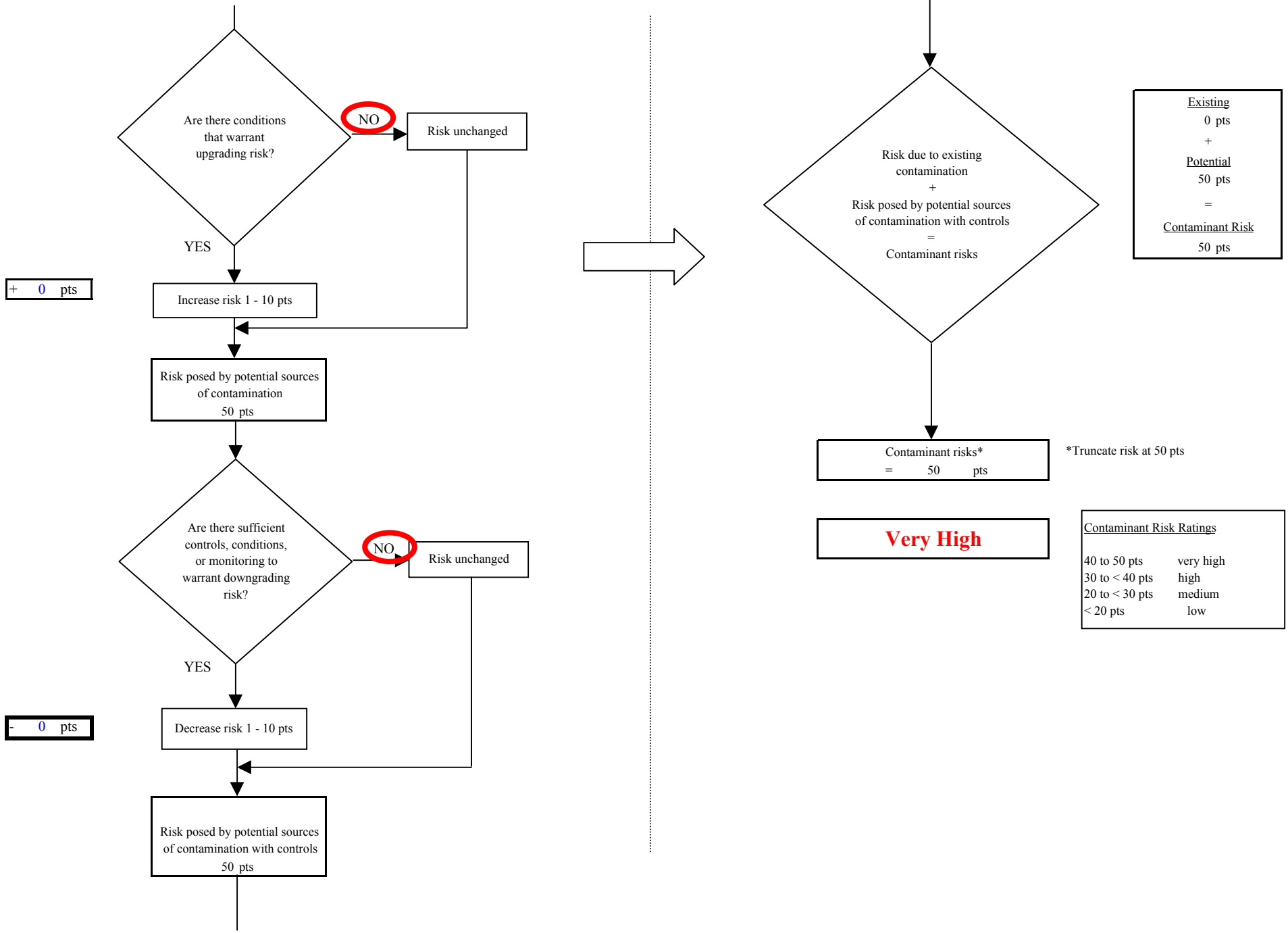


Chart 10. Vulnerability analysis for Bear Run Apartments - Heavy Metals, Cyanide and Other Inorganic Chemicals

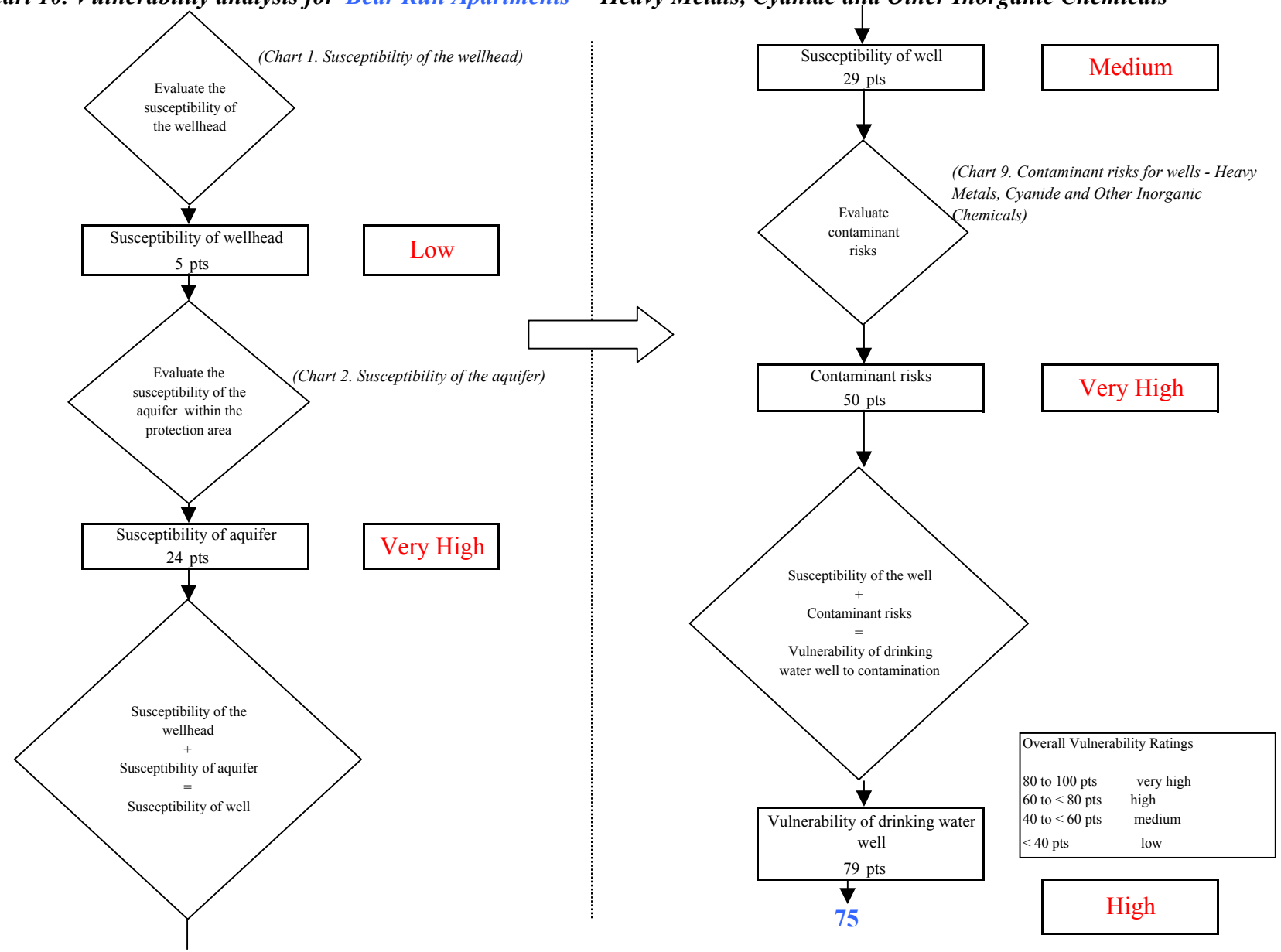


Chart 11. Contaminant risks for Bear Run Apartments - Synthetic Organic Chemicals

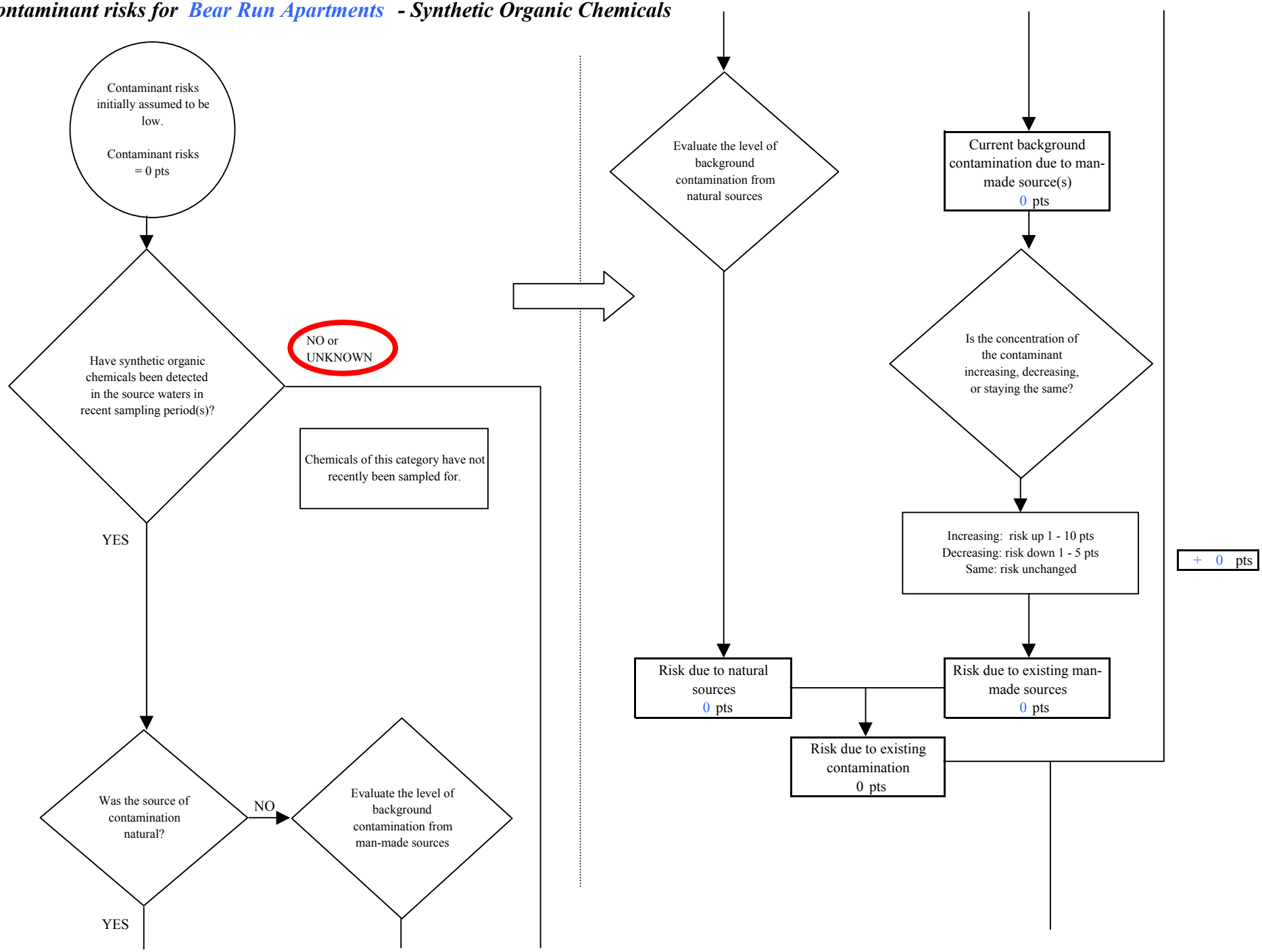


Chart 11. Contaminant risks for Bear Run Apartments - Synthetic Organic Chemicals

+ 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)	1	1	2
Low(s)	5	4	9

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

Matrix Score 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

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

+ 5 pts

The furniture manufacturing, repair, and finishing shop within Zone A increases the risk.

Chart 11. Contaminant risks for Bear Run Apartments - Synthetic Organic Chemicals

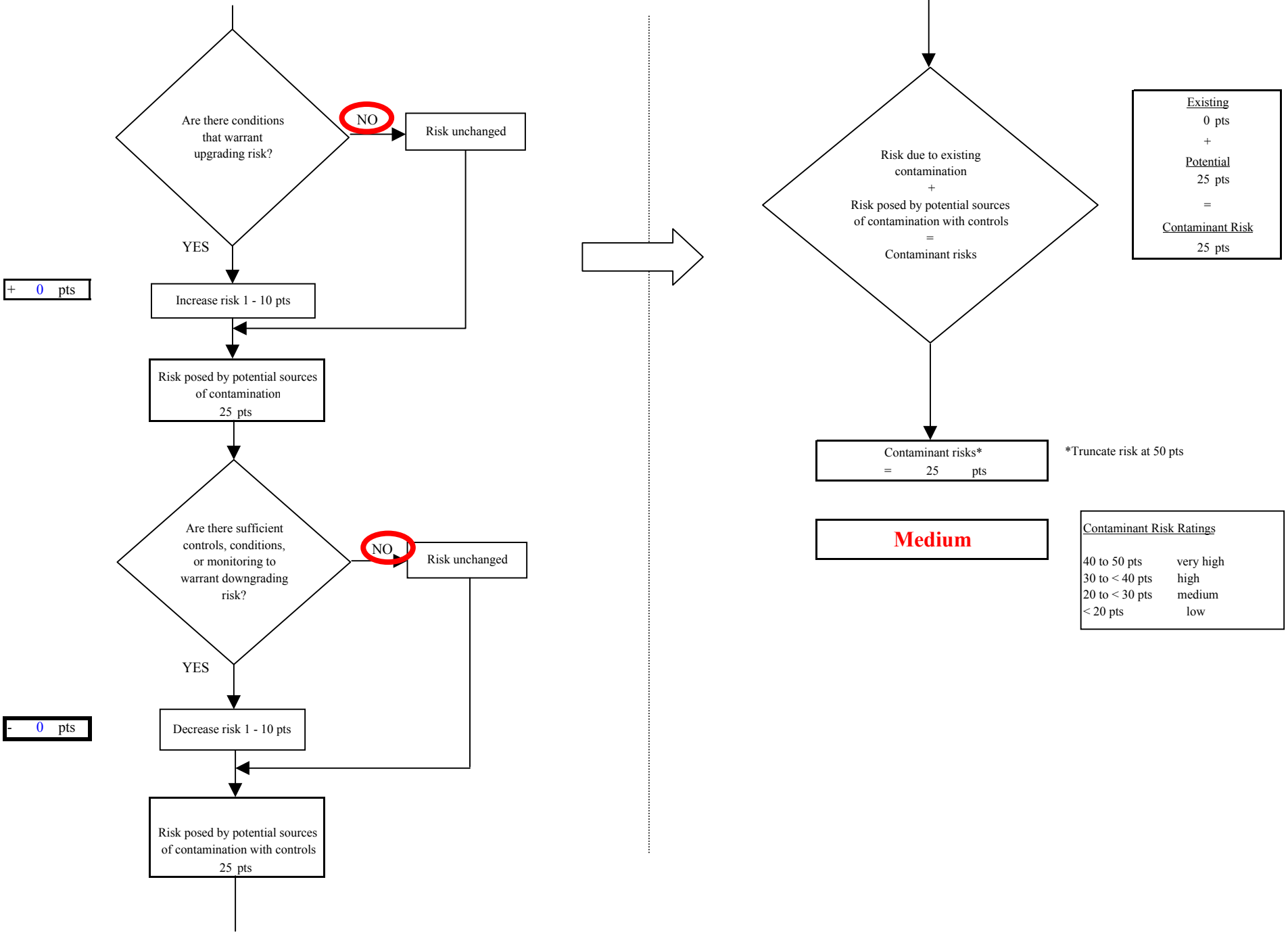


Chart 12. Vulnerability analysis for Bear Run Apartments - Synthetic Organic Chemicals

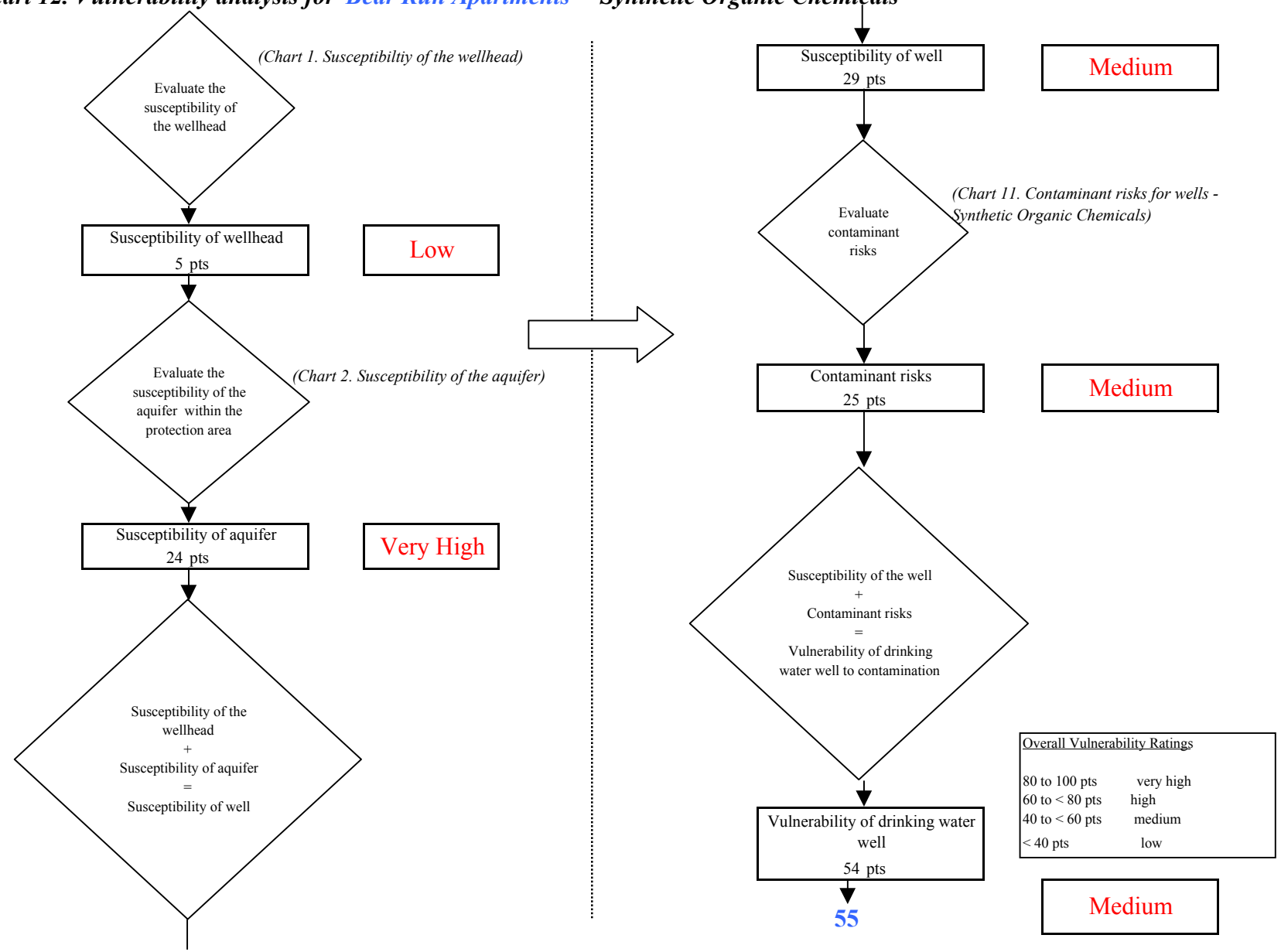


Chart 13. Contaminant risks for Bear Run Apartments - Other Organic Chemicals

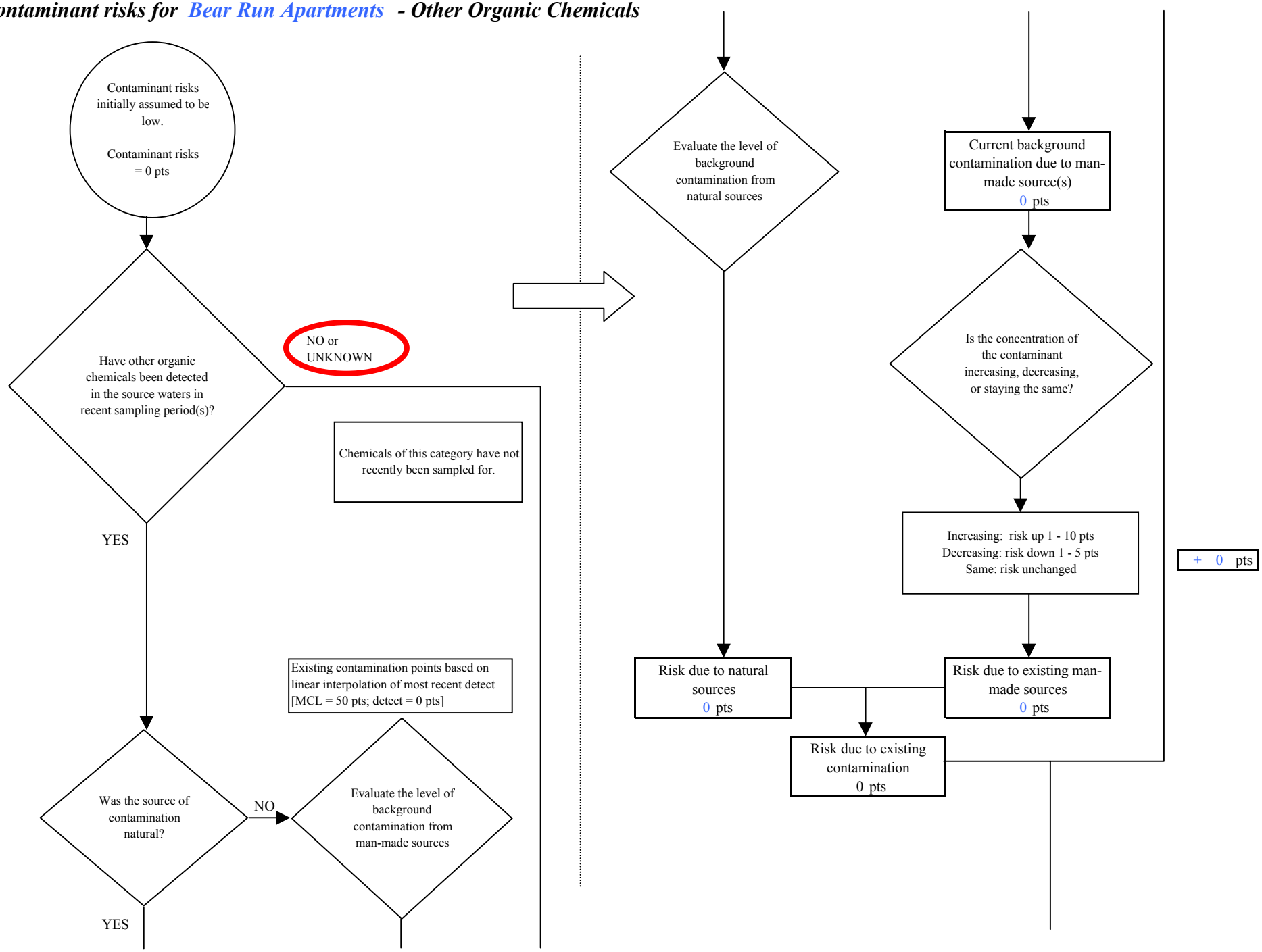


Chart 13. Contaminant risks for Bear Run Apartments - Other Organic Chemicals

+ 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)	1	0	1
Medium(s)	3	1	4
Low(s)	5	5	10

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

Matrix Score 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

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 machine and metal shop within Zone A increases the risk.

YES → Increase risk 1 - 10 pts

+ 10 pts

Chart 13. Contaminant risks for Bear Run Apartments - Other Organic Chemicals

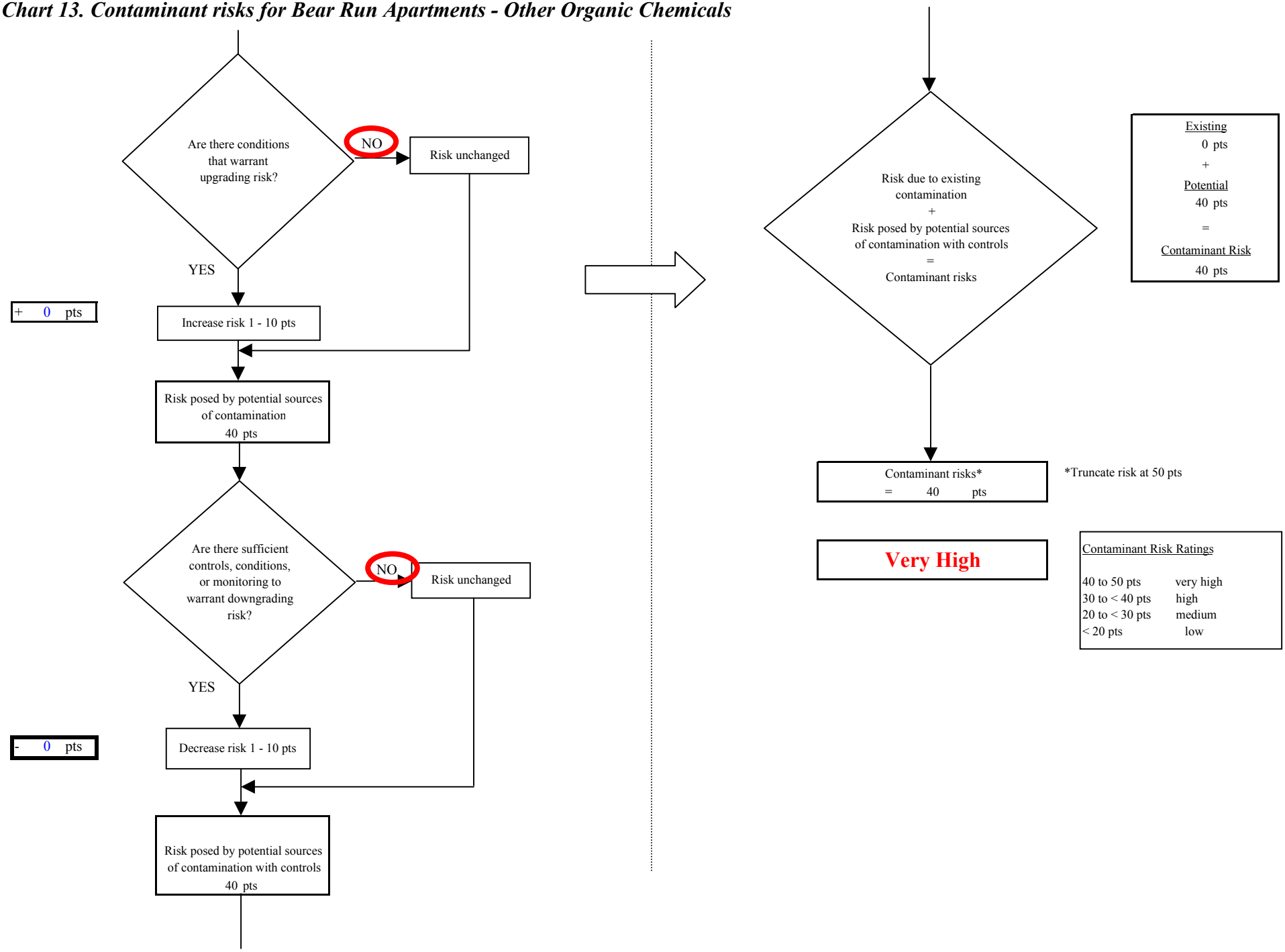


Chart 14. Vulnerability analysis for Bear Run Apartments - Other Organic Chemicals