Source Water Assessment:

Hydrogeologic Susceptibility and Vulnerability Assessment for Camp La Da Sa Drinking Water Source, Willow, Alaska

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DRINKING WATER PROTECTION PROGRAM REPORT 44

September 2001

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By Ecology and Environment, Inc.

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By Ecology and Environment, Inc.

Drinking Water Protection Program
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The Camp La Da Sa well is a Class B (transient/noncommunity) drinking water source consisting of one well. The well is located in Willow, Alaska. Identified potential and current sources of contaminants for Camp La Da Sa include residential septic systems and large capacity septic system injection wells, roads, and rail corridors. These identified potential and existing sources of contamination are considered sources of bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals. Overall, the Camp La Da Sa public water source received vulnerability ratings of **Medium** for bacteria and viruses and nitrates and/or nitrites, and **Low** for volatile organic chemicals.

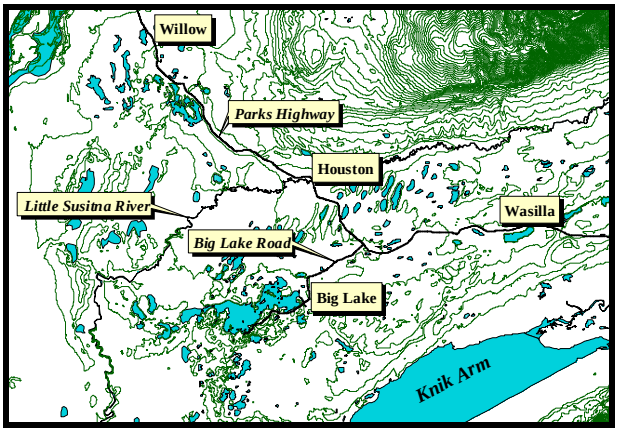

Figure 1. Index map showing the location of the Big Lake-Houston-Willow area.

INTRODUCTION

The purpose of this environmental assessment is to provide public water system owners/operators, communities, and local governments with information they can use to preserve the quality of Alaska's public drinking water supplies. This assessment was completed for the Camp La Da Sa source of public drinking water. This source consists of one well in the Big Lake-Houston-Willow area (see Figure 1). This assessment, known under the Alaska Drinking Water Protection Program as *the Source Water Assessment*, utilized 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 was 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 BIG LAKE-HOUSTON-WILLOW AREA, ALASKA

Location

Big Lake, Houston, and Willow are part of the Matanuska-Susitna Borough. The borough encompasses 24,694 square miles and had a population of 59,322 in 2000. The borough is contained within the watersheds of the Matanuska and Susitna Rivers, which have their source in meltwater from glaciers in the Alaska Range, the Talkeetna Mountains, and the Chugach Mountains. Both rivers flow to tidewater in the Knik Arm of Upper Cook Inlet (*Jokela, Munter and Evans, 1991*). The area bounded by the Matanuska and Susitna Rivers is commonly referred to as "the Mat-Su Valley," or simply "the Valley."

The three communities have experienced dramatic growth in the last 10 years. Big Lake and Houston nearly doubled their population from 1990 to 2000, while Willow saw an almost sixfold increase. Together, the three communities constitute nearly 10% of the borough's population.

Big Lake is accessed via Big Lake Road at Mile 52.3 of the George Parks Highway, 13 miles southwest of Wasilla. The numerous surface water bodies in Big Lake's 132-square-mile area make it an increasingly popular recreation destination. The population of Big Lake was 2,635 in 2000. Eighty-five percent of the households have private water wells and septic systems. The remainder of those households haul water and use outhouses. A substantial number of Big Lake

residences are recreational homes (*ACED Community Database, 2001*).

Houston, an incorporated city, is located on the Parks Highway, approximately 29 miles north of Anchorage. The city encompasses just more than 22 square miles and had a population of 1,202 in 2000. Sixty percent of the households have private drinking water wells and septic systems (*ACED Community Database, 2001*).

Willow is a community of 1,658 residents (2000 Census) located along the Parks Highway between Mile 60 and Mile 80.7. The community encompasses almost 685 square miles. Almost all of the households in Willow have private drinking water wells and septic systems, but approximately 60% of the homes are vacant or used only seasonally (*ACED Community Database, 2001*).

Climate

The Big Lake-Houston-Willow area climate is somewhat transitional in that it does not experience large daily and annual temperature fluctuations like those experienced in the interior of Alaska, nor does it experience high amounts of precipitation typified by gulf coast regions.

The mean daily temperature ranges from 59°F during summer to -2 °F during winter. The mean annual precipitation is approximately 24 inches, and the mean total snowfall is approximately 90 inches per year. The average snow depth during snowy months ranges from 25 inches to 38 inches *(Western Regional Climate Center, Willow West Station, 2000).*

Physiography and Groundwater Conditions

Surface elevations in the Matanuska-Susitna Borough range from sea level where the Knik and Matanuska Rivers enter Cook Inlet to more than 6,000 feet in the peaks that bound the area. Mostly glacial moraine and outwash deposits mantle the surface of the Mat-Su Valley.

The regional geology and groundwater conditions of the Mat-Su Valley vary greatly depending on location. The terrain is dominated by distinctive landforms created by repeated glacial advances and retreats during the Pleistocene epoch (2 million years to 10,000 years before present). The unconsolidated layers (layers of sediment that are not cemented together) comprise well-sorted sands and gravels. Most of the wells in the Mat-Su Valley are located in unconsolidated layers. These layers vary substantially in size and distribution throughout the Valley. In general, the unconsolidated layers increase in thickness throughout the Cook Inlet *(Jokela, Munter and Evans, 1991).* Throughout the area, numerous confining layers ranging from less than 1 foot to 60 feet thick separate the unconsolidated layers.

In the Mat-Su Valley, the groundwater is recharged mainly by snowmelt and precipitation infiltrating into the foothill slopes of the Talkeetna or Chugach Mountains, and by direct precipitation and snowmelt throughout the area.

Water wells in the Big Lake, Houston, and Willow areas are located in unconfined and confined aquifers. Studies indicate that the direction of groundwater flow in the Big Lake area is mainly toward the lake. The direction of groundwater flow in the upper unconfined aquifers is more variable because of the influence of surficial topography and close connection of those aquifers with surface water bodies *(Jokela, Munter, and Evans, 1991).* Less research has been completed for water wells in the Houston and Willow areas; however, available data suggest that groundwater tends to flow toward the Susitna River in the west, and locally toward major surface water bodies and smaller tributaries.

CAMP LA DA SA PUBLIC WATER SOURCE

The Camp La Da Sa public water source is located in Willow, Alaska. The system is a Class B (transient/noncommunity) public drinking water source, and is owned and operated by the Church of Jesus Christ of Latter Day Saints. The source consists of one well near Kelly Lake (see Appendix A, Map 1 inset). According to the well log, the Camp La Da Sa well was drilled through sand and gravel to 95 feet below land surface. The well had a static water level of 16 feet below land surface at the time of drilling (September 1986).

This water source operates seasonally. The Camp La Da Sa drinking water source serves a population of approximately 160 non-residents.

ASSESSMENT AND PROTECTION AREA FOR CAMP LA DA SA DRINKING WATER SOURCE

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

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 well logs from the surrounding area and from past studies *(Jokela, Munter, and Evans, 1991).* This analytical calculation was used as a guide in the first step to establish the protection area for Camp La Da Sa. Additional methods were employed to account for any uncertainties in groundwater flow and aquifer characteristics to arrive at a meaningful and conservative protection area with respect to public health (see the *Guidance Manual for Class B Public Water Systems* for additional information).

The Drinking Water Protection Areas established for wells by the Alaska Department of Environmental Conservation are separated into zones. These zones correspond to a time-of-travel. *Time-of-travel* is the time required for water to move in the saturated zone of the ground from a specific point to the well. The Drinking Water Protection Areas for Camp La Da Sa comprise four zones: Zone A, Zone B, Zone C, and Zone D (see Appendix B, Map 1). Zone A corresponds to the area between the well and the distance equal to one-fourth the distance of the two-year time-of-travel. Depending on where a contaminant source is located within Zone A, travel time for a contaminant to the well may be several days to several hours. Zone A also extends downgradient from the well to account for the area of the aquifer that is influenced by pumping of the well.

The Zone B protection area for Camp La Da Sa corresponds to a time-of-travel of less than two years. The Zone C protection area extends to the five-year time-of-travel demarcation. Lastly, Zone D extends from Zone C to the end of the protection area, which corresponds to the 10-year time-of-travel.

INVENTORY OF POTENTIAL AND EXISTING CONTAMINANT SOURCES

One element of the Drinking Water Protection Program is an inventory of potential and existing sources of contamination within the protection area for Camp La Da Sa. This inventory 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 also can occur within areas that have little or no development.

For the basis of this assessment, and all Class B public water system assessments, three categories of drinking water contaminants were inventoried:

- Bacteria and viruses,
- Nitrates and/or nitrites, and
- Volatile organic chemicals.

Map 2 in Appendix C depicts the contaminant source inventory for Camp La Da Sa. Only highly and very highly potential existing sources of contamination are inventoried within Zone D. No such sources were identified in that zone. Below is a summary of the contaminant sources inventoried within the Camp La Da Sa protection area:

- Residential septic systems,
- Injection wells associated with large-capacity septic systems,
- Railroad corridors, and
- Activities associated with roads.

These potential contaminant sources present risks of any or all three categories to the Camp La Da Sa drinking water source.

RANKING OF CONTAMINANT RISKS

Potential and existing sources of contamination were identified, sorted, and ranked according to the 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 furthermore are a function of the number and density of those types of contaminant sources as well as the proximity of those sources to the well.

VULNERABILITY OF CAMP LA DA SA DRINKING WATER SOURCES

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

- Natural susceptibility, and
- Contaminant risks.

Each of the three categories of drinking water contaminants was analyzed, and an overall vulnerability score of 0 to 100 was assigned:

Natural Susceptibility (0 – 50 points)

+

Contaminant Risks (0 – 50 points)

=

Vulnerability of the

Drinking Water Source to Contamination (0 – 100).

A score for 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)

Combining the susceptibility of the wellhead and the aquifer to contamination leads to a score (0 – 50 points) and rating of overall susceptibility (see Appendix D). Table 1 shows the overall susceptibility score and rating for Div. of Parks Little Su (Upper).

Factors which typically drive the wellhead score include lack of grouting, which may allow potential contaminants to travel down the annulus of the well to the source aquifer; lack of a proper well cap; and vulnerability to inundation due to floods or improper grading of the land surface near the well. Chart 1 in Appendix D details the specific characteristics of the Div. Of Parks Little Su (Upper) water source which affect this score.

Factors which affect the susceptibility of the aquifer score include other wells or boreholes nearby, which may constitute pathways for potential contaminants to the source aquifer; the thickness of the confining layer, if one exists; and the protectiveness of the vadose zone (the zone above the water table) in terms of its likely capability to prevent potential contaminants from reaching the aquifer. The protectiveness of the vadose zone is a function of the typical precipitation received in the region surrounding the water source, the slope of the land surface, the type of soils in the region, and the depth to the unconfined aquifer or the confining layer of a confined aquifer. Chart 2 in Appendix D details the specific factors comprising the score for this water source.

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

	Score	Rating
Susceptibility of the Wellhead	5	Low
Susceptibility of the Aquifer	15	High
Natural Susceptibility	20	Medium

Contaminant risks to a drinking water source depend on the type, number or density, and distribution of contaminant sources. Sources containing risk factors for potential contamination to the Camp La Da Sa source of public drinking water are listed on the previous page.

A score (0 – 50 points) and rating of contaminant risks (see Appendix D) are assigned based on the findings of the contaminant source inventory (see Appendix B, Tables 1 through 4). This portion of the analysis examines any existing or historical contamination that has been detected at the drinking water source through routine sampling. It also reviews contamination that has or may have occurred but has not arrived or been detected at the well. Table 2 summarizes the contaminant risks for each category of drinking water contaminants.

Table 2. Contaminant Risks

Contaminant Risks	Score	Rating
Bacteria and Viruses	35	High
Nitrates and/or Nitrites	36	High
Volatile Organic Chemicals	12	Low

Appendix D contains eight charts, which together form the vulnerability analysis for a source water assessment for a public drinking water source. Chart 1 analyzes the susceptibility of the wellhead to contamination by examining the construction of the well and its surrounding area. Chart 2 analyzes the susceptibility of the aquifer to contamination by examining 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 and 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, and Charts 5 through 8 contain the contaminant risks and vulnerability analysis for nitrates and/or nitrites and volatile organic chemicals.

Vulnerability of the drinking water source to contamination is the combination of susceptibility of the aquifer and the well with contaminant risks. Table 3 contains the overall vulnerability scores (0 – 100) and ratings for each of the three categories of drinking water contaminants (see Appendix D). The scores are rounded off to the nearest 5.

Table 3. Overall Vulnerability of Camp La Da Sa Public Drinking Water Source to Contamination, by Category

Category	Score	Rating
Bacteria and Viruses	55	Medium
Nitrates and/or Nitrites	55	Medium
Volatile Organic Chemicals	30	Low

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

Nitrates and/or nitrites are found in natural background concentrations at the site, as elsewhere in Alaska. The sampling history of the Camp La Da Sa source water indicates low concentrations of nitrates (see Appendix D, Chart 6). Existing nitrate contamination is approximately 3.5% of the maximum allowable limit (maximum contaminant level [MCL]) for this contaminant. Because of high solubility and weak retention by soil, nitrates are very mobile in soil, moving at approximately the same rate as water. Nevertheless, the current nitrate concentration in the Camp La Da Sa water source remains at a safe level with respect to human health.

SUMMARY

This source water assessment was completed for the Camp La Da Sa source of public drinking water. The overall vulnerability of this source to contamination is **Medium** for bacteria and viruses, nitrates and/or nitrites, and **Low** for volatile organic chemicals. This assessment of contaminant risks can be used as a foundation for local voluntary protection efforts and as a basis for continuous efforts on the part of regulatory agencies to protect public health. This source water assessment is anticipated to be updated every five years to reflect any changes in the vulnerability and/or susceptibility of the public drinking water source.

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Western Regional Climate Center, 2000, August 24, Web extension to the *Western Regional Climate Center* [WWW document]. URL http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?akmatv.

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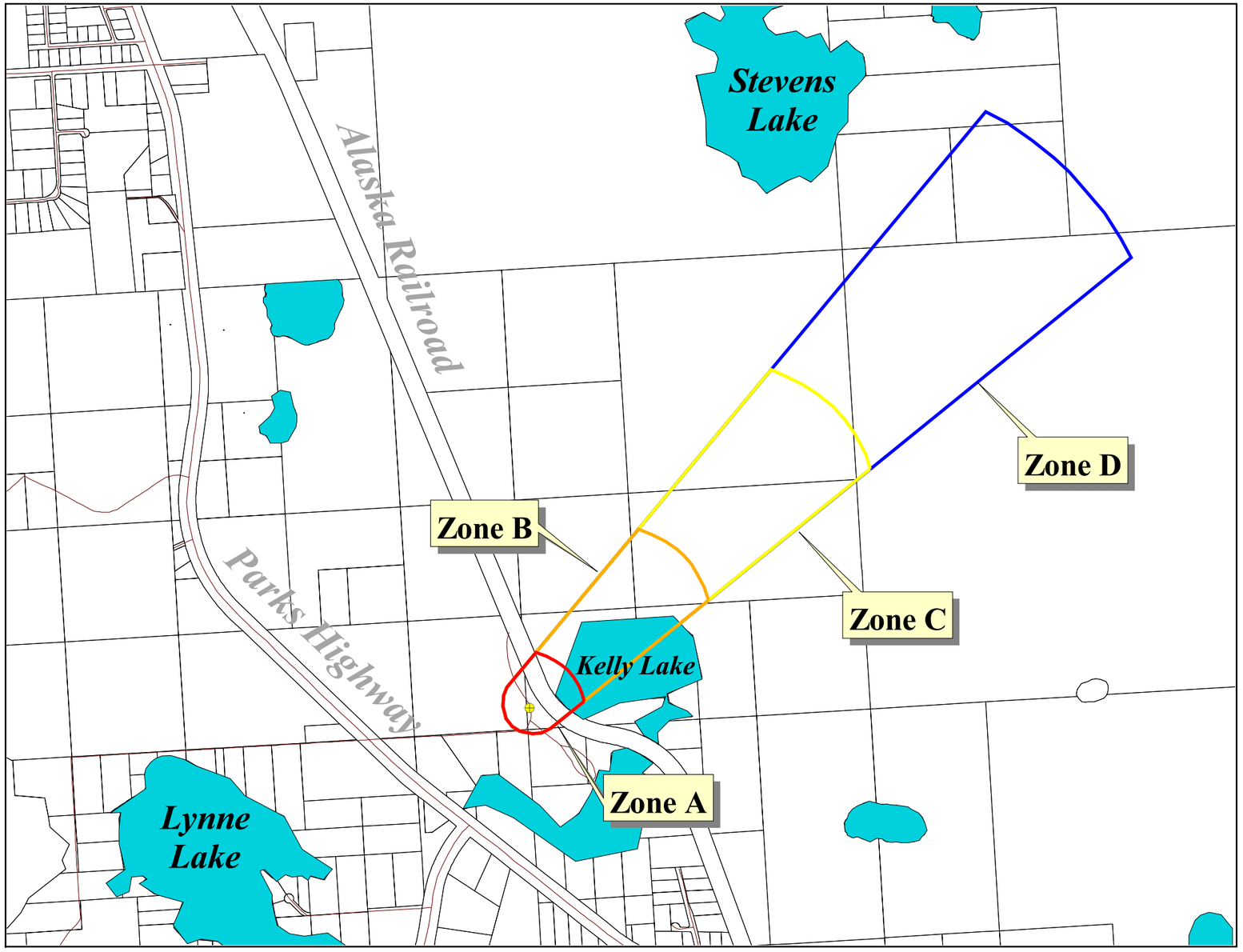
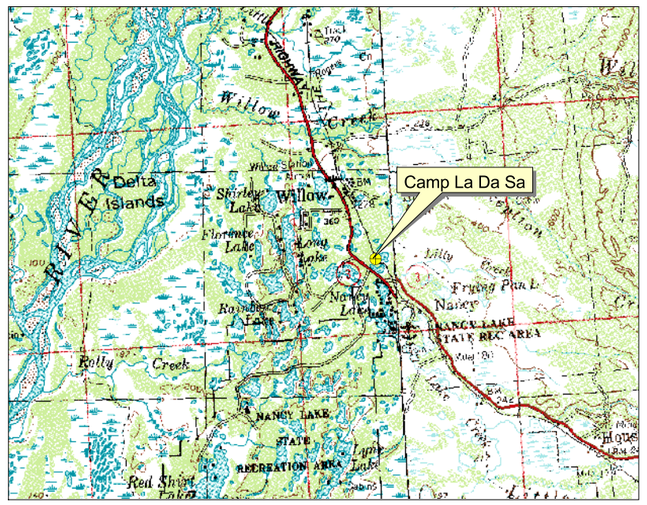
APPENDIX A

Camp La Da Sa
Drinking Water Protection Area

Drinking Water Protection Area for Camp La Da Sa



- Camp La Da Sa well
- Zone A (Few Months' Travel Time)
- Zone B (Less Than 2 Years' Travel Time)
- Zone C (Less Than 5 Years' Travel Time)
- Zone D (Less Than 10 Years' Travel Time)
- Roads and Rights-of-Way
- Lakes and Rivers
- Parcels



0.3 0 0.3 0.6 Miles

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N W E S

Map 1

APPENDIX B

Contaminant Source Inventory and Risk Ranking for Camp La Da Sa

Contaminant Source Inventory for Camp La Da Sa

Contaminant Source Category	Contaminant Source ID	CS ID tag	Zone	Location	Map	Comments
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	CAMP LA DA SA	2	
Highways and roads, dirt/gravel	X24	X24-1	A	LA DA SA RD	2	
Highways and roads, dirt/gravel	X24	X24-2	A	UNNAMED TRAIL	2	
Rail corridors	X30	X30	A	AK RR	2	

Potential and Existing Sources of Contamination for Camp La Da Sa Bacteria and Viruses

Contaminant Source Category	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Overall Rank after Analysis	Location	Map	Comments
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	High	1	CAMP LA DA SA	2	
Highways and roads, dirt/gravel	X24	X24-1	A	Very Low	2	LA DA SA RD	2	
Highways and roads, dirt/gravel	X24	X24-2	A	Very Low	3	UNNAMED TRAIL	2	

Potential and Existing Sources of Contamination for Camp La Da Sa Nitrates and Nitrites

Contaminant Source Category	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Overall Rank after Analysis	Location	Map	Comments
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	High	1	CAMP LA DA SA	2	
Highways and roads, dirt/gravel	X24	X24-1	A	Very Low	2	LA DA SA RD	2	
Highways and roads, dirt/gravel	X24	X24-2	A	Very Low	3	UNNAMED TRAIL	2	

Table 4

Potential and Existing Sources of Contamination for Camp La Da Sa Volatile Organic Chemicals (VOCs)

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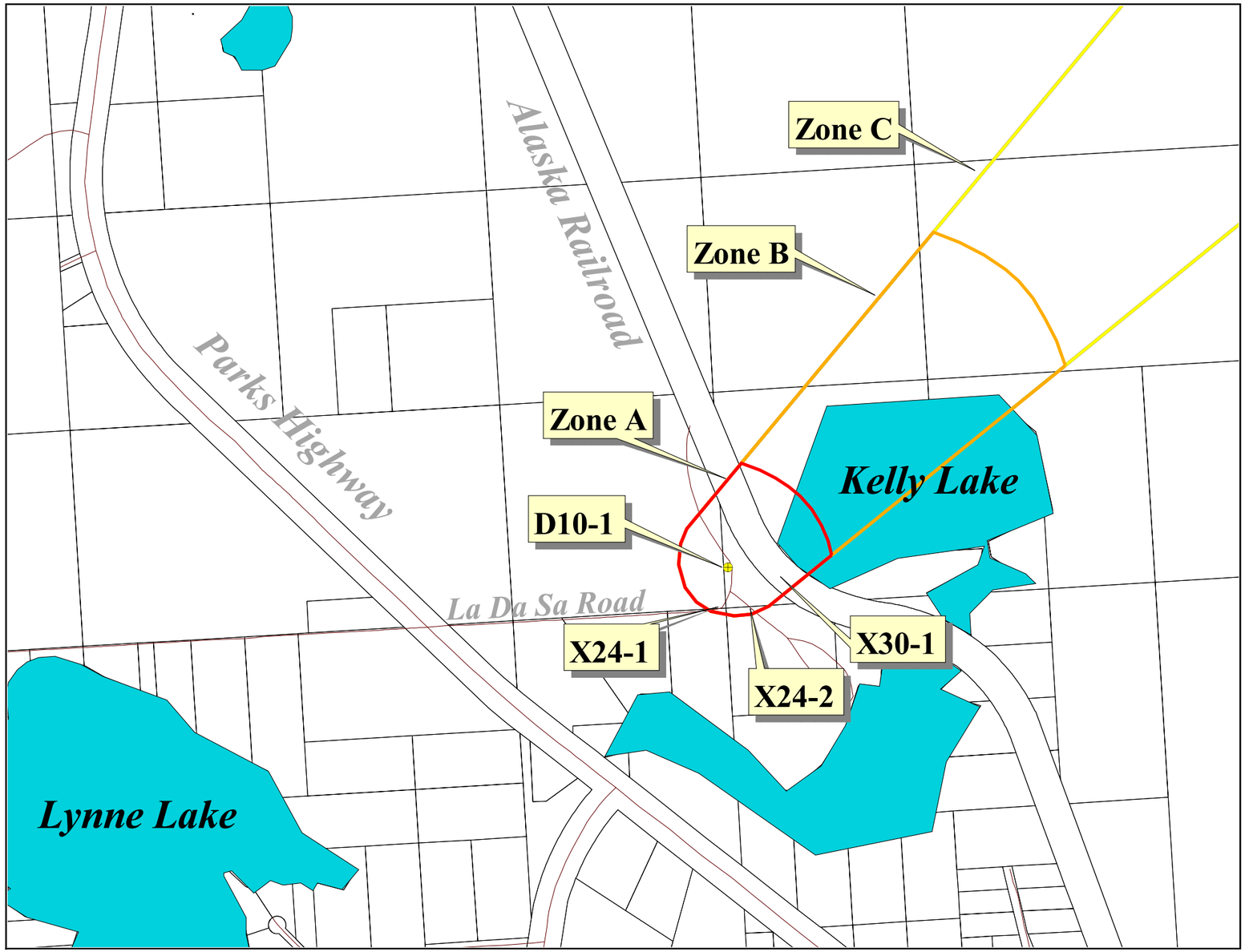
Contaminant Source Category	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Overall Rank after Analysis	Location	Map	Comments
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	Low	1	CAMP LA DA SA	2	
Rail corridors	X30	X30	A	Low	2	AK RR	2	
Highways and roads, dirt/gravel	X24	X24-1	A	Very Low	3	LA DA SA RD	2	
Highways and roads, dirt/gravel	X24	X24-2	A	Very Low	4	UNNAMED TRAIL	2	

APPENDIX C

Camp La Da Sa
Drinking Water Protection Area
and Potential and Existing Contaminant Sources

Drinking Water Protection Area for Camp La Da Sa and Potential and Existing Sources of Contamination



- Camp La Da Sa well
- Zone A (Few Months' Travel Time)
- Zone B (Less Than 2 Years' Travel Time)
- Zone C (Less Than 5 Years' Travel Time)
- Zone D (Less Than 10 Years' Travel Time)
- Roads and Rights-of-Way
- Lakes and Rivers
- Parcels

0.1 0 0.1 0.2 Miles

N W E S

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Map 2

APPENDIX D

Vulnerability Analysis for Camp La Da Sa Public Drinking Water Source

Chart 1. Susceptibility of the wellhead – Camp La Da Sa

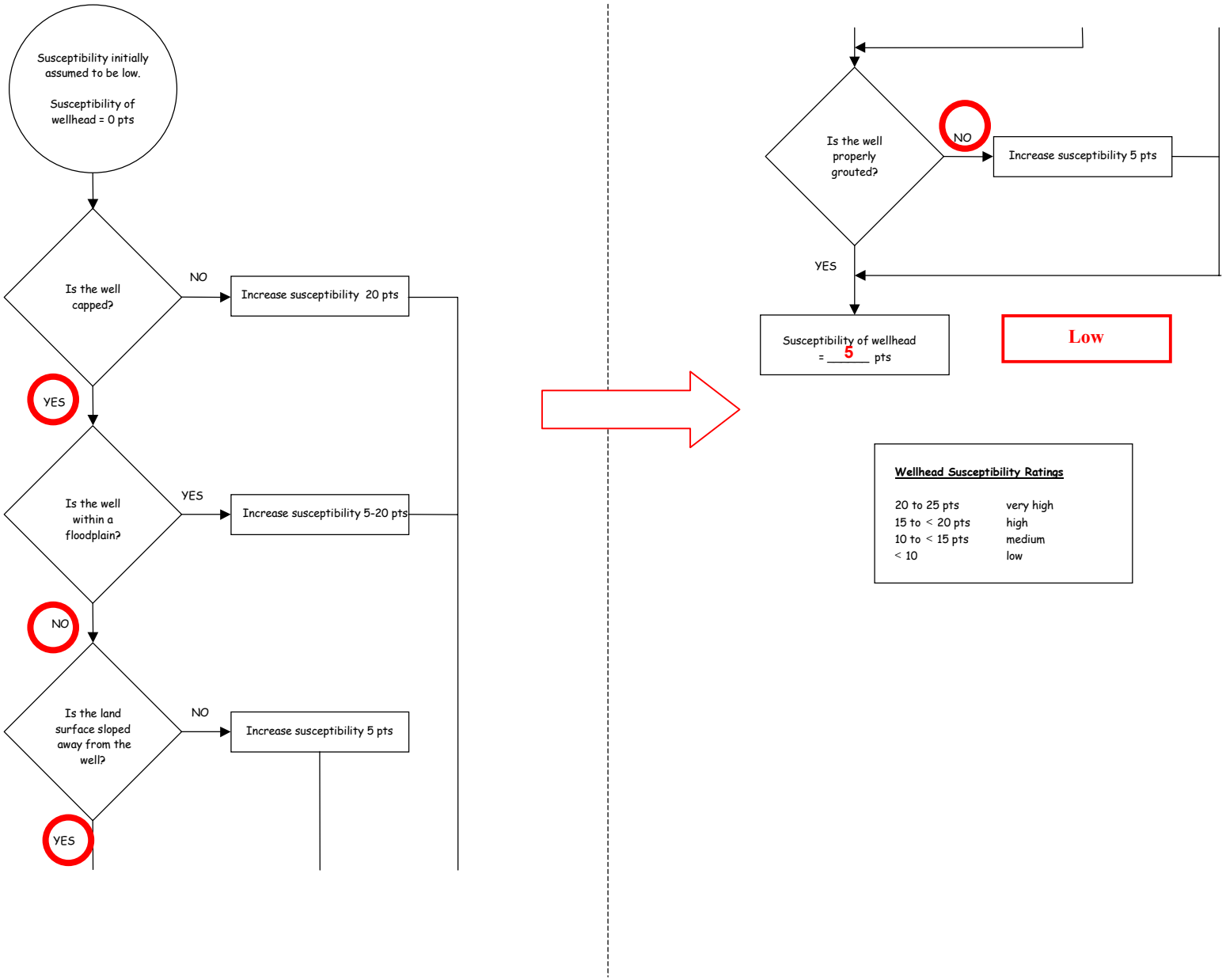
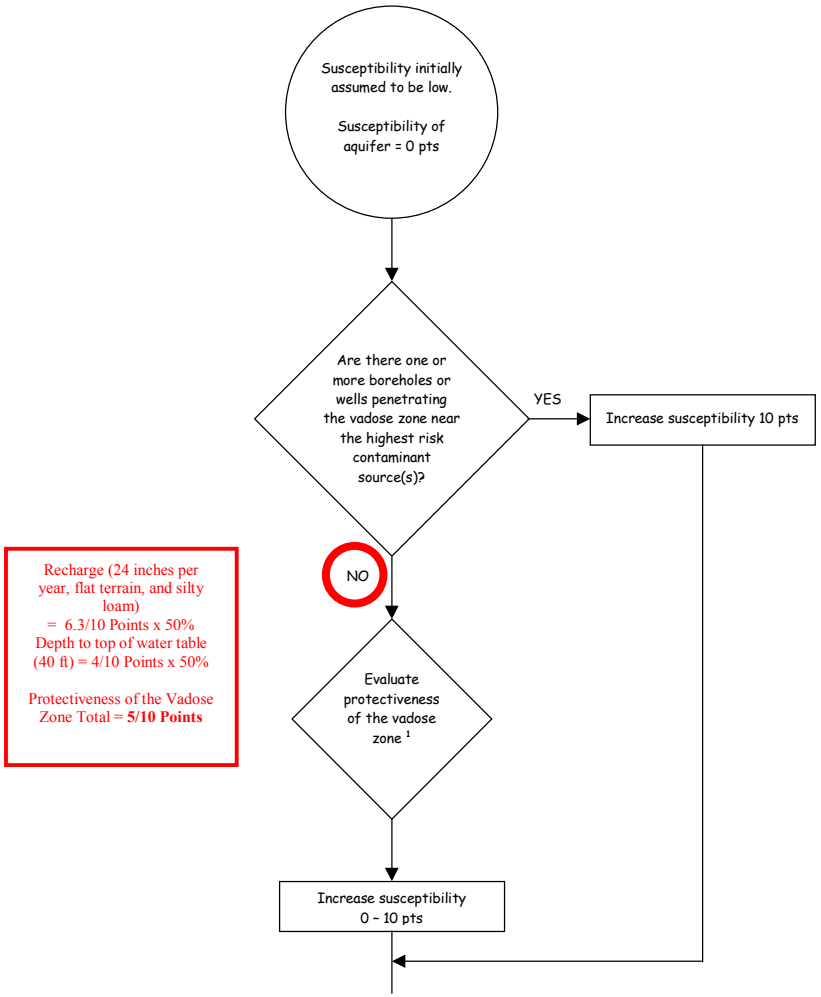
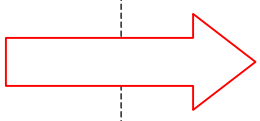
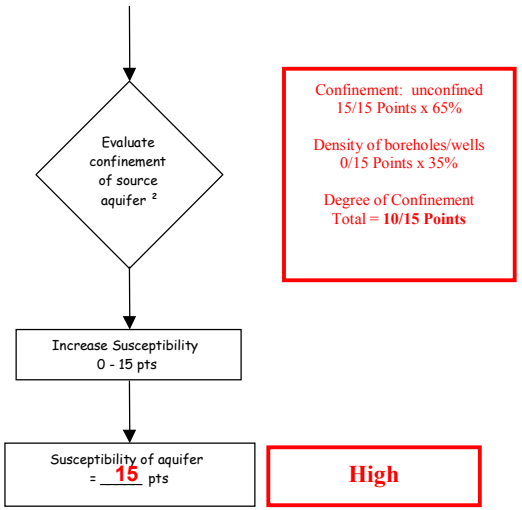


Chart 2. Susceptibility of the aquifer – Camp La Da Sa







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

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

Aquifer Susceptibility Ratings

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

Chart 3. Contaminant risks for Camp La Da Sa – Bacteria & Viruses

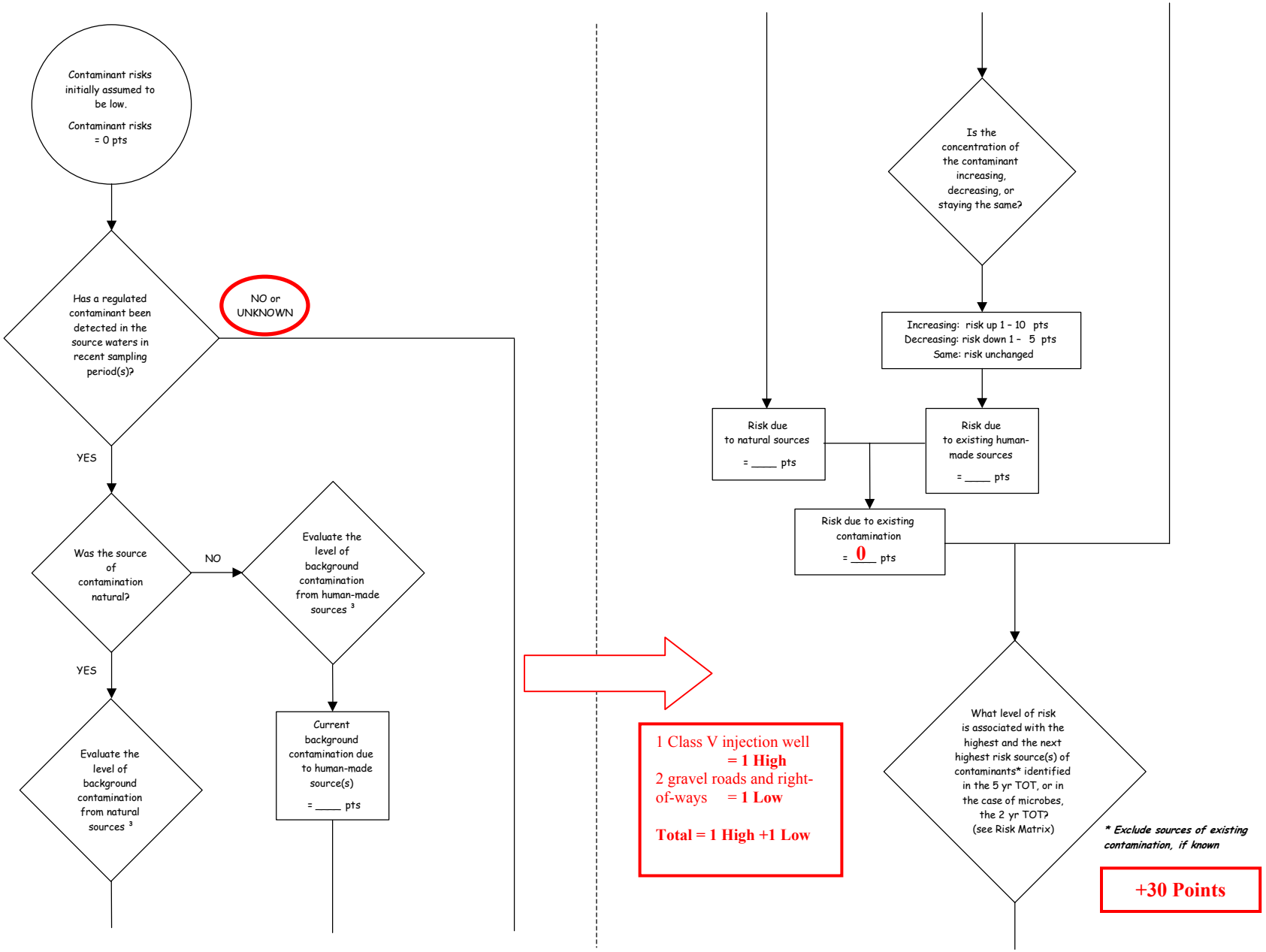


Chart 3. Contaminant risks for Camp La Da Sa – Bacteria & Viruses (Continued)

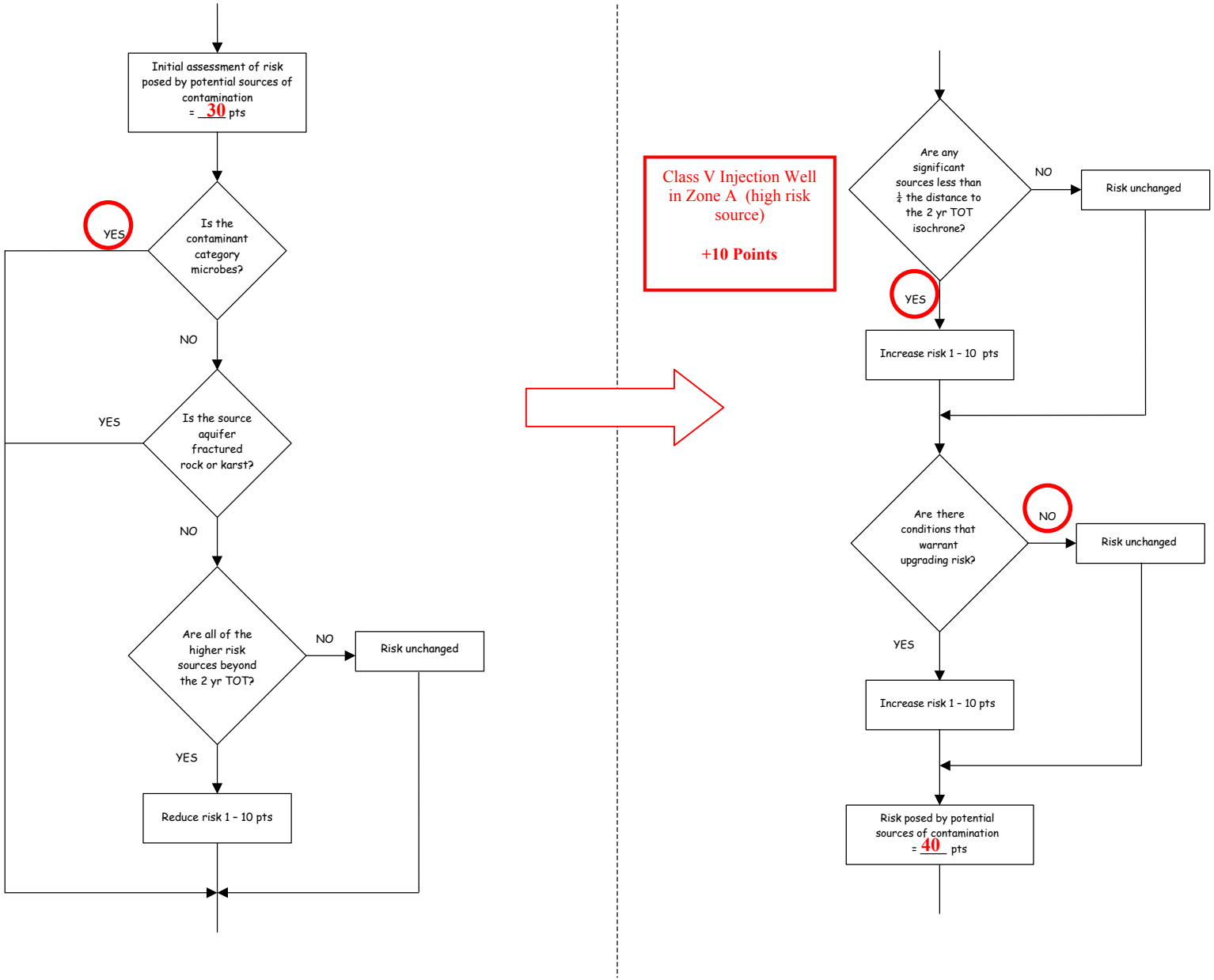
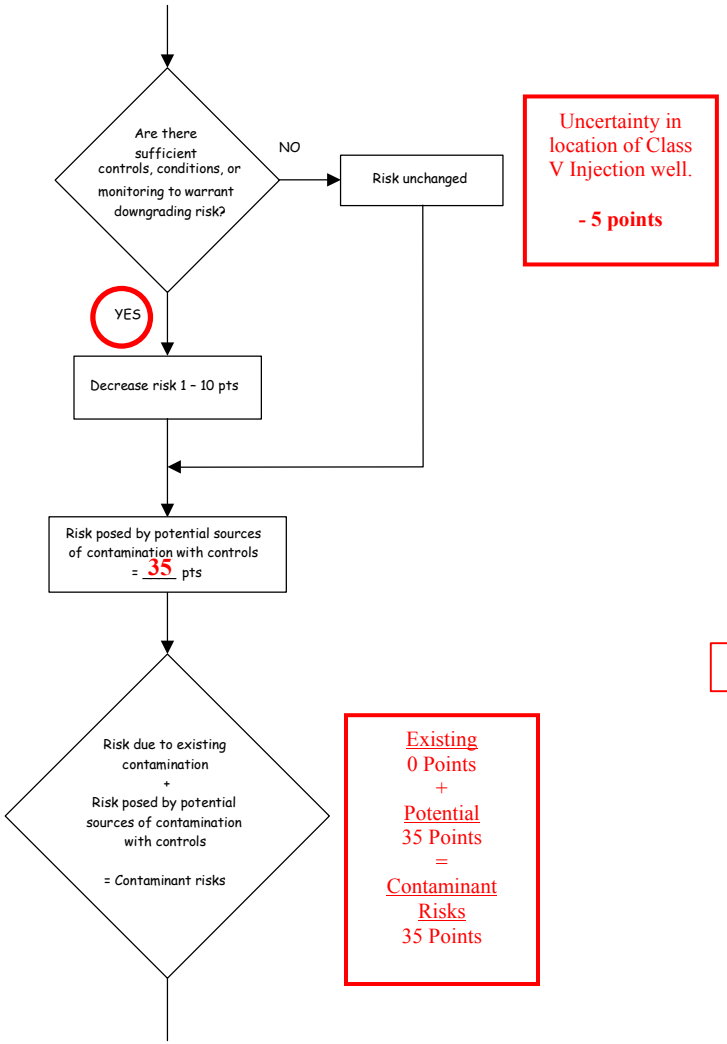


Chart 3. Contaminant risks for Camp La Da Sa – Bacteria & Viruses (Continued)



Uncertainty in location of Class V Injection well.

- 5 points

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

** Truncate risk at 50 pts*

Contaminant risks* = 35 pts

High

3. Level of Background Contamination

> MCL	21 - 50 pts
0.5 MCL to < MCL	11 - 20 pts
0.2 MCL to < 0.5 MCL	6 - 10 pts
'detect' to < 0.2 MCL	0 - 5 pts

Contaminant Risk Ratings

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

Table 1. Risk Matrix for Contaminant Sources for Camp La Da Sa – Bacteria & Viruses

Level of Risk Associated with the Highest Risk Sources

Next Highest Risk Sources(s)	LOW 10 pts	MEDIUM 20 pts	HIGH 30 pts	VERY HIGH 40 pts
Low	≥ 10 sources + 10 pts	≥ 10 sources + 5 pts	≥ 20 sources + 5 pts	—
Medium	—	≥ 2 sources + 5 pts	≥ 5 sources + 5 pts	≥ 10 sources + 5 pts
High	—	—	1 source + 10 pts	≥ 2 sources + 10 pts
Very High	—	—	—	1 source + 10 pts

Chart 4. Vulnerability analysis for Camp La Da Sa – Bacteria & Viruses

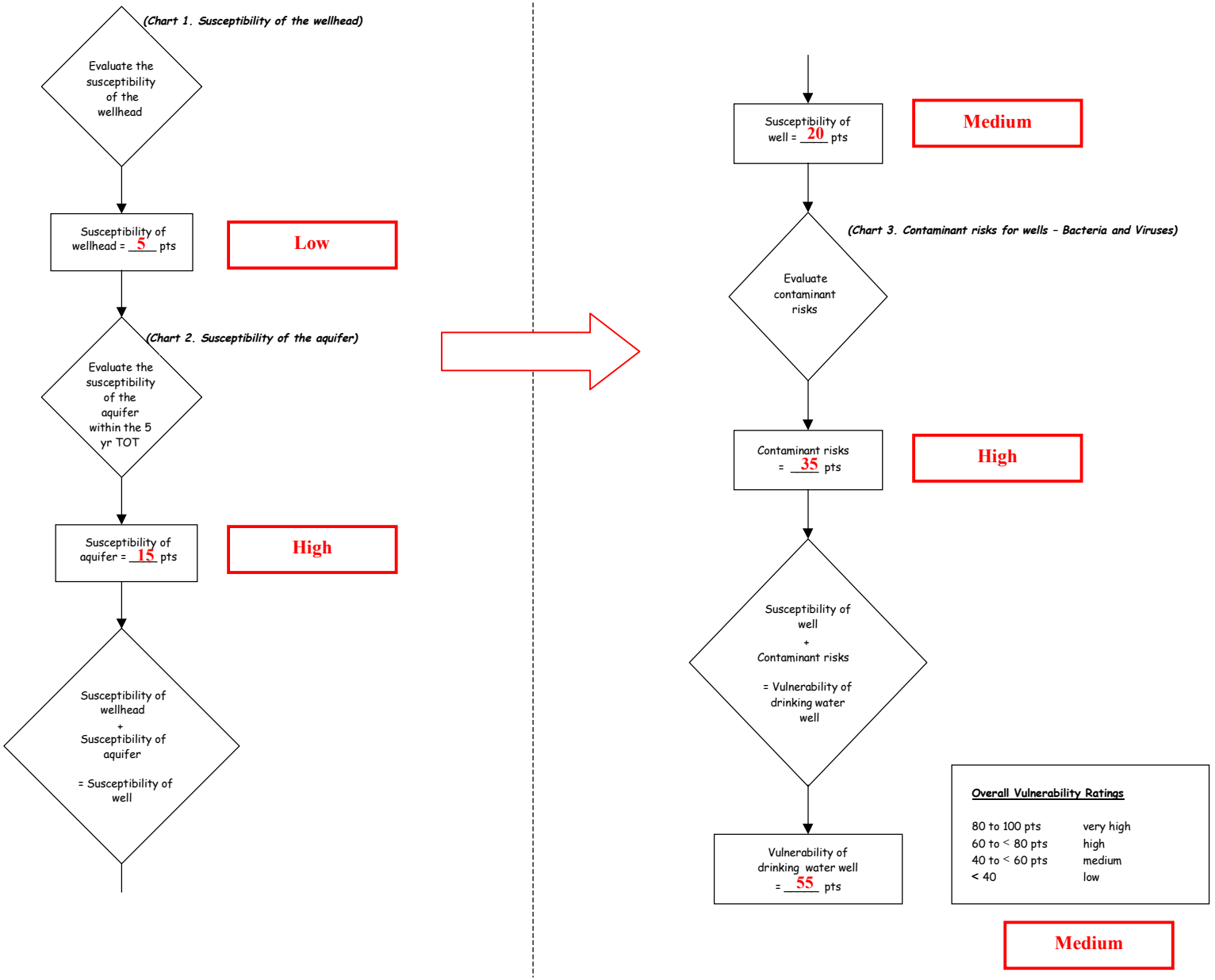


Chart 5. Contaminant risks for Camp La Da Sa – Nitrates and Nitrites

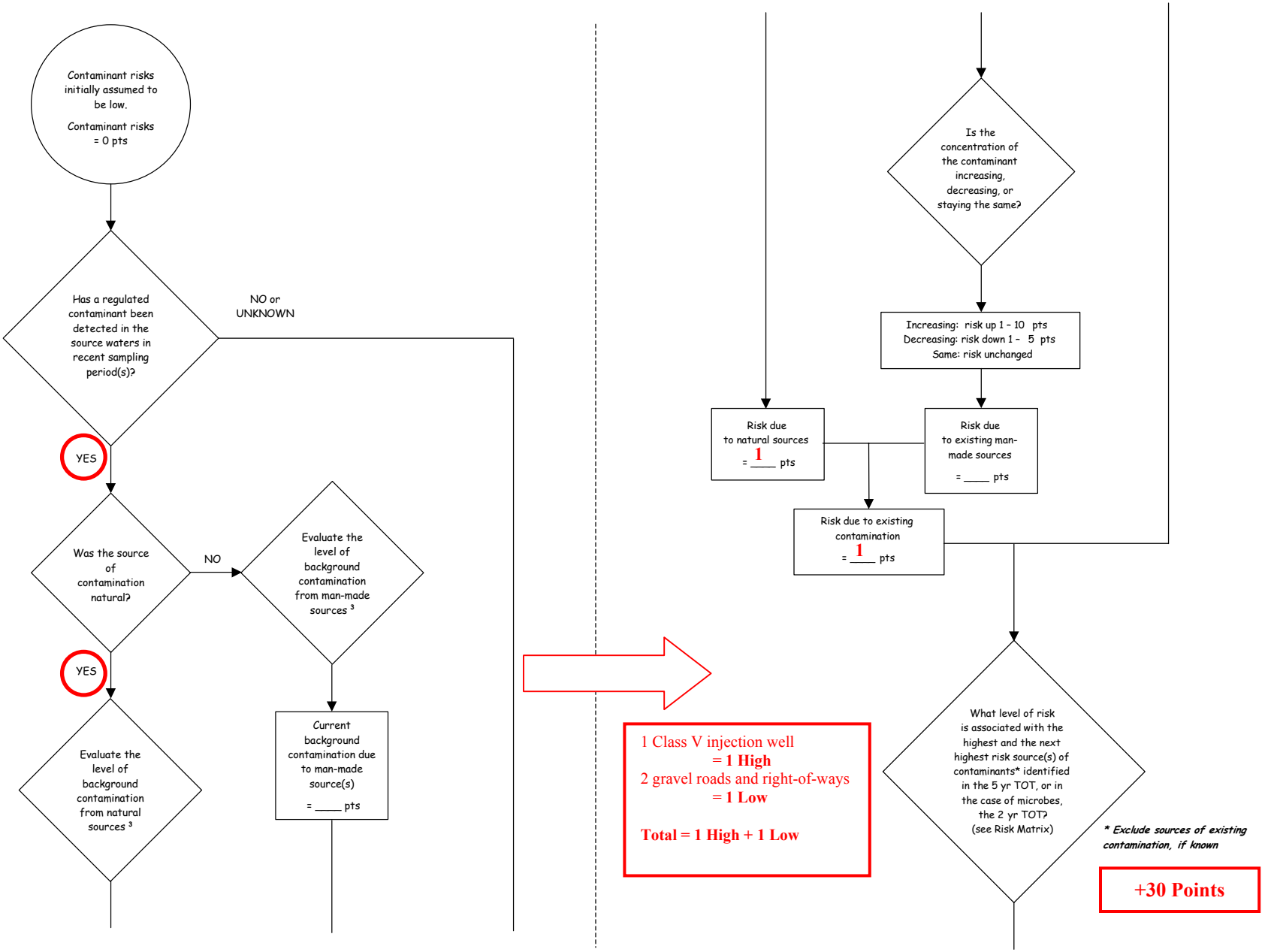


Chart 5. Contaminant risks for Camp La Da Sa – Nitrates and Nitrites (Continued)

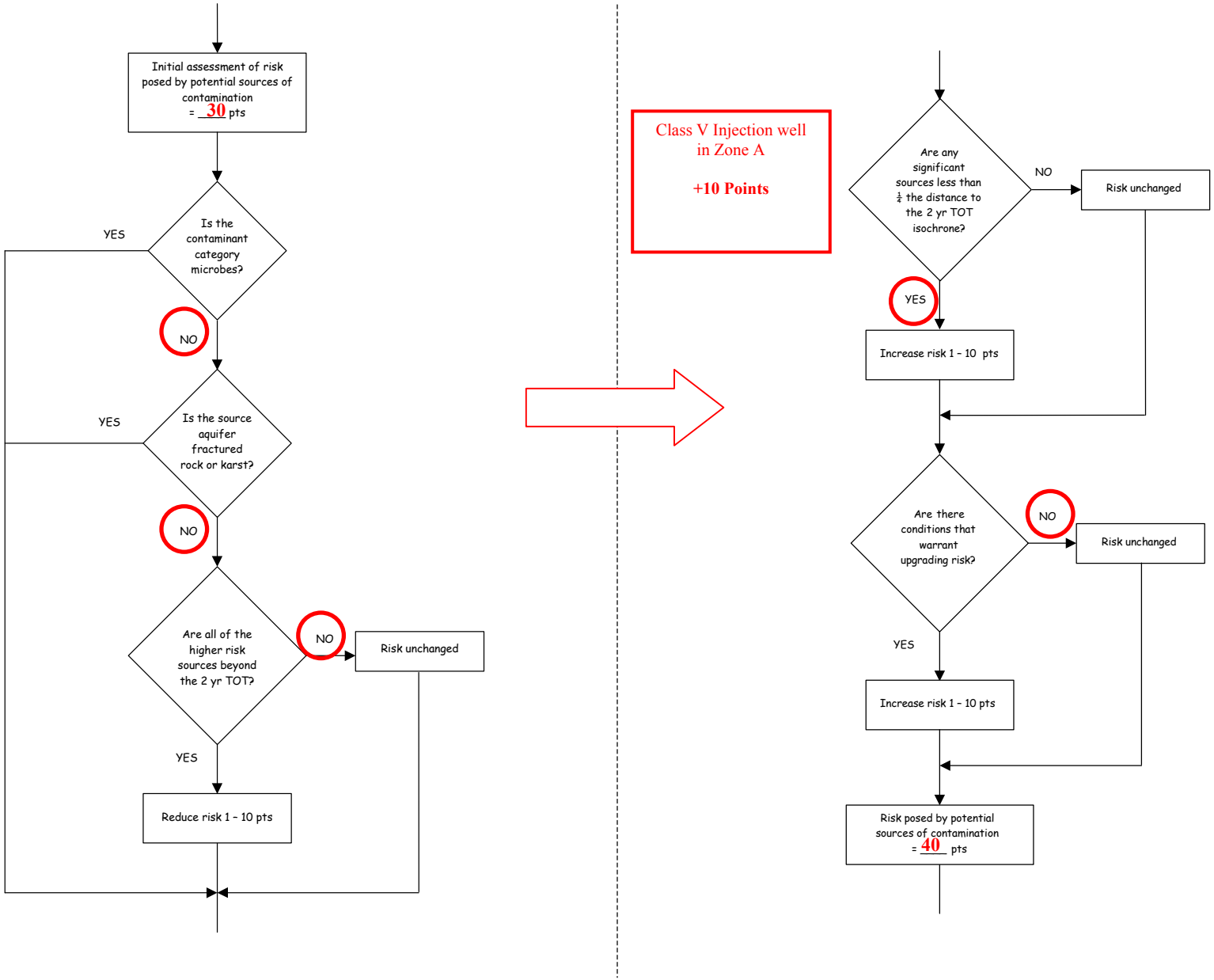
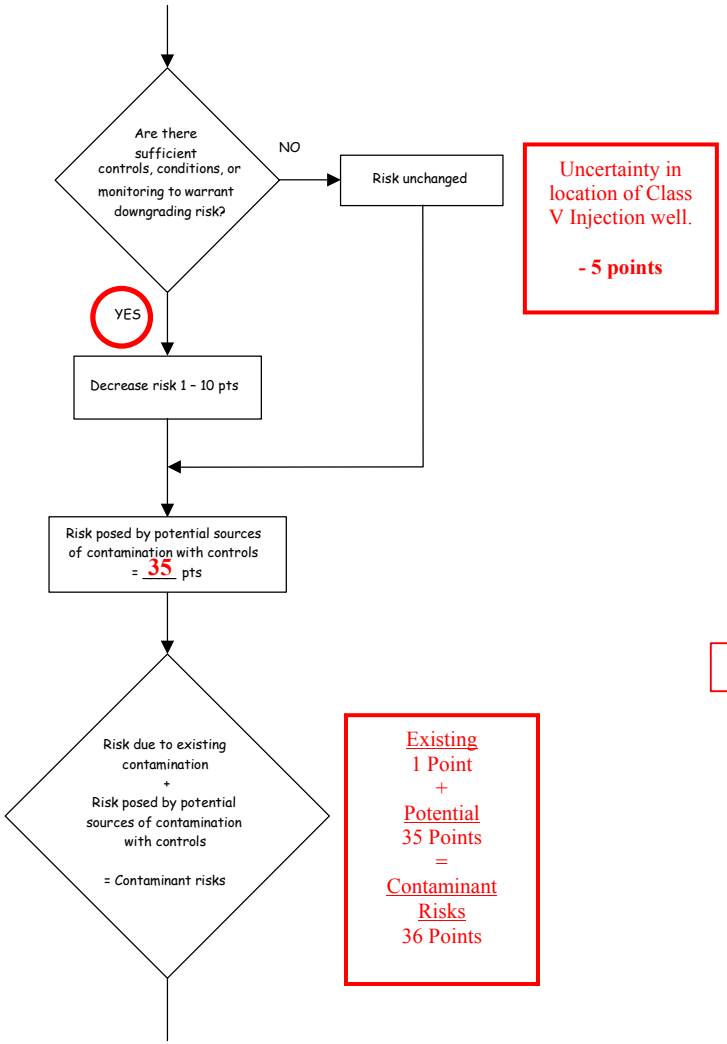


Chart 5. Contaminant risks for Camp La Da Sa – Nitrates and Nitrites (Continued)



Uncertainty in location of Class V Injection well.

- 5 points

Existing
1 Point
+
Potential
35 Points
=
Contaminant Risks
36 Points

** Truncate risk at 50 pts*

Contaminant risks* = 36 pts

High

3. Level of Background Contamination

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

Contaminant Risk Ratings

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

Nitrate
ND 12/27/00
0.350 8/11/99
ND 6/5/98
ND 9/29/97
ND 5/28/96
ND 4/20/95
ND 4/9/95

Maximum Contaminant Level (MCL)
= 10mg/L
0.350/10
= 0.0350 or 4% of MCL

+1 Point

Table 2. Risk Matrix for Contaminant Sources for Camp La Da Sa – Nitrates and Nitrites

Level of Risk Associated with the Highest Risk Sources

Next Highest Risk Sources(s)	LOW 10 pts	MEDIUM 20 pts	HIGH 30 pts	VERY HIGH 40 pts
Low	> 10 sources + 10 pts	> 10 sources + 5 pts	> 20 sources + 5 pts	---
Medium	---	> 2 sources + 5 pts	> 5 sources + 5 pts	> 10 sources + 5 pts
High	---	---	1 source + 10 pts	> 2 sources + 10 pts
Very High	---	---	---	1 source + 10 pts

Chart 6. Vulnerability analysis for Camp La Da Sa – Nitrates and Nitrites

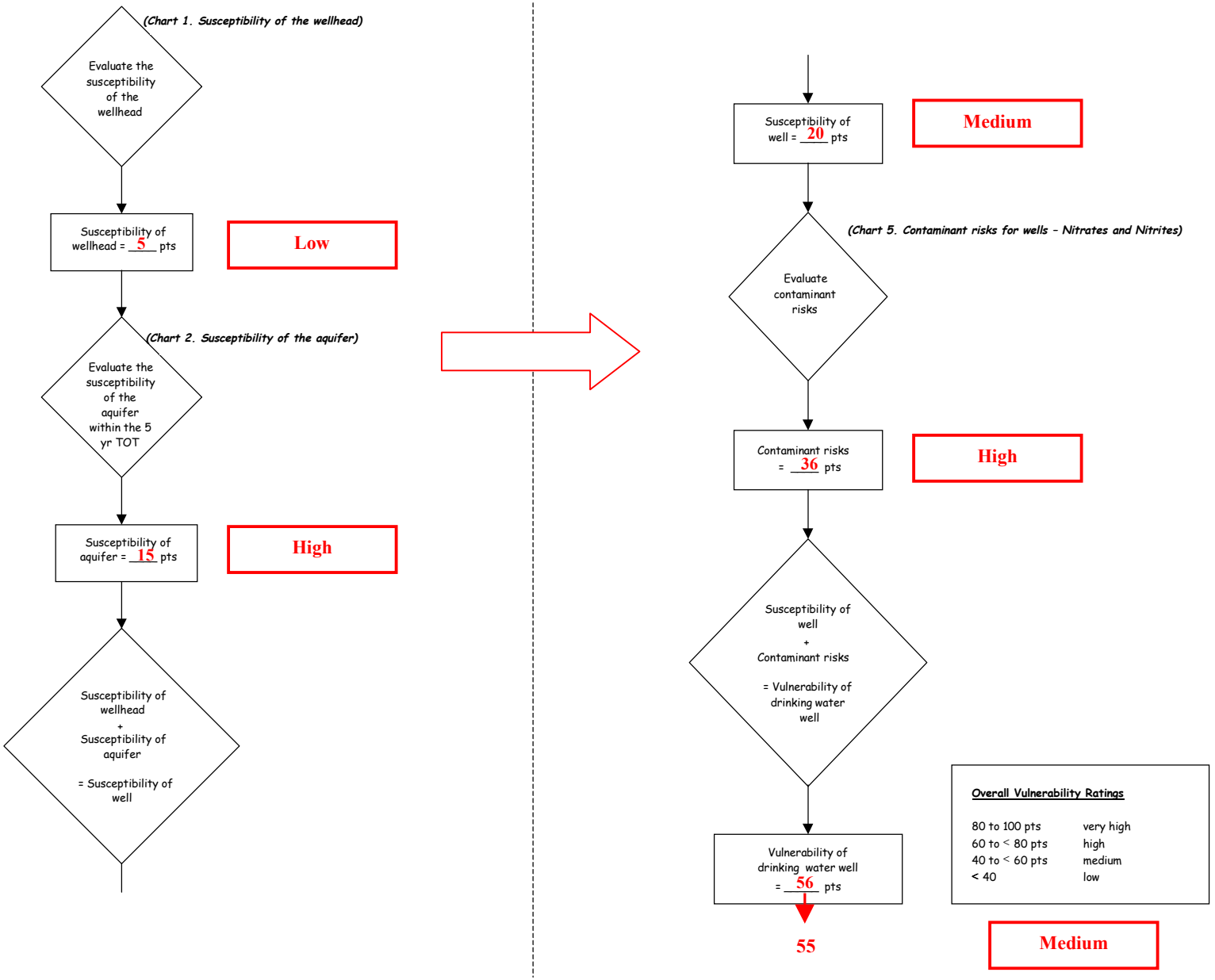


Chart 7. Contaminant risks for Camp La Da Sa – Volatile Organic Chemicals

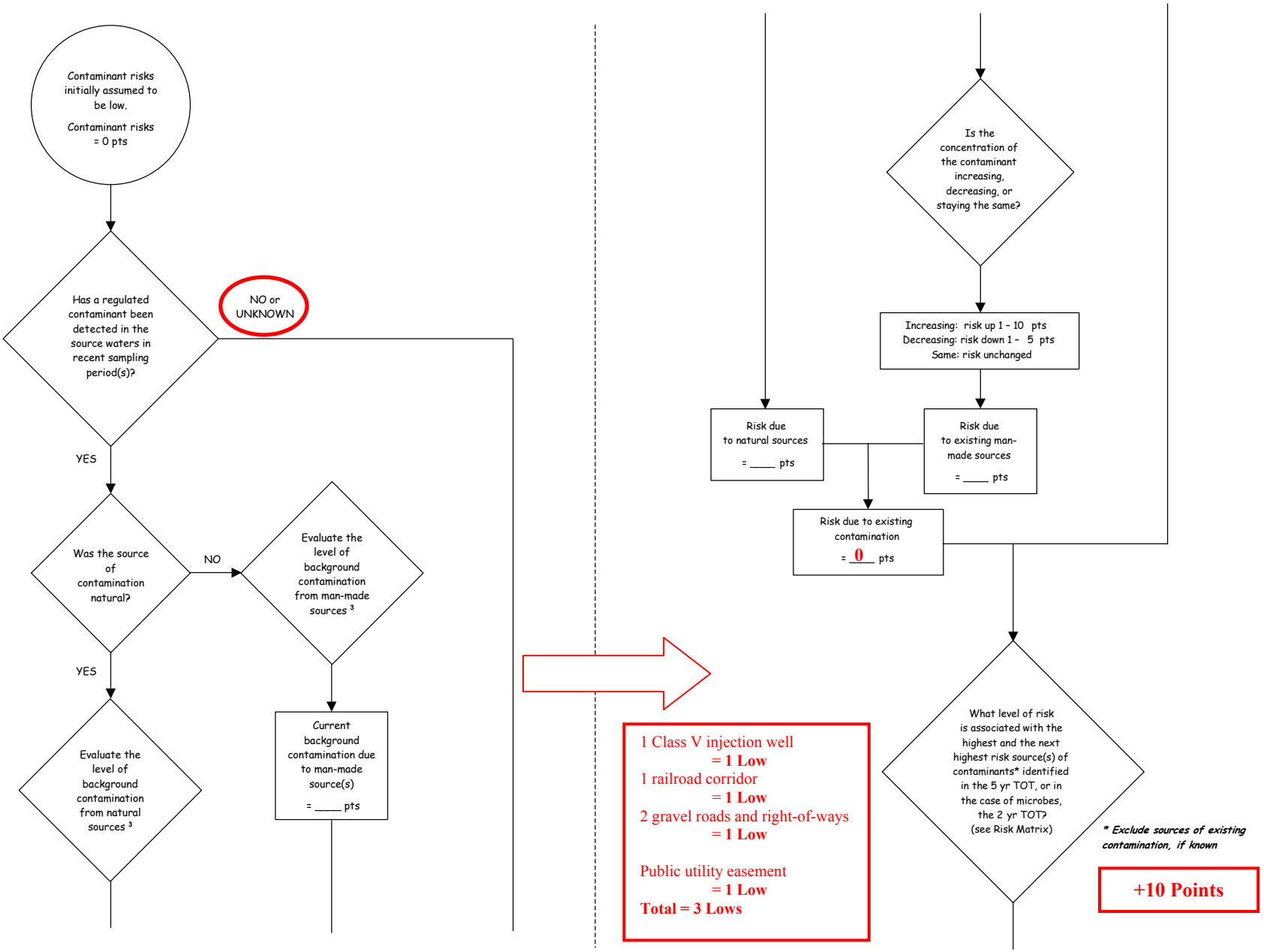


Chart 7. Contaminant risks for Camp La Da Sa – Volatile Organic Chemicals (Continued)

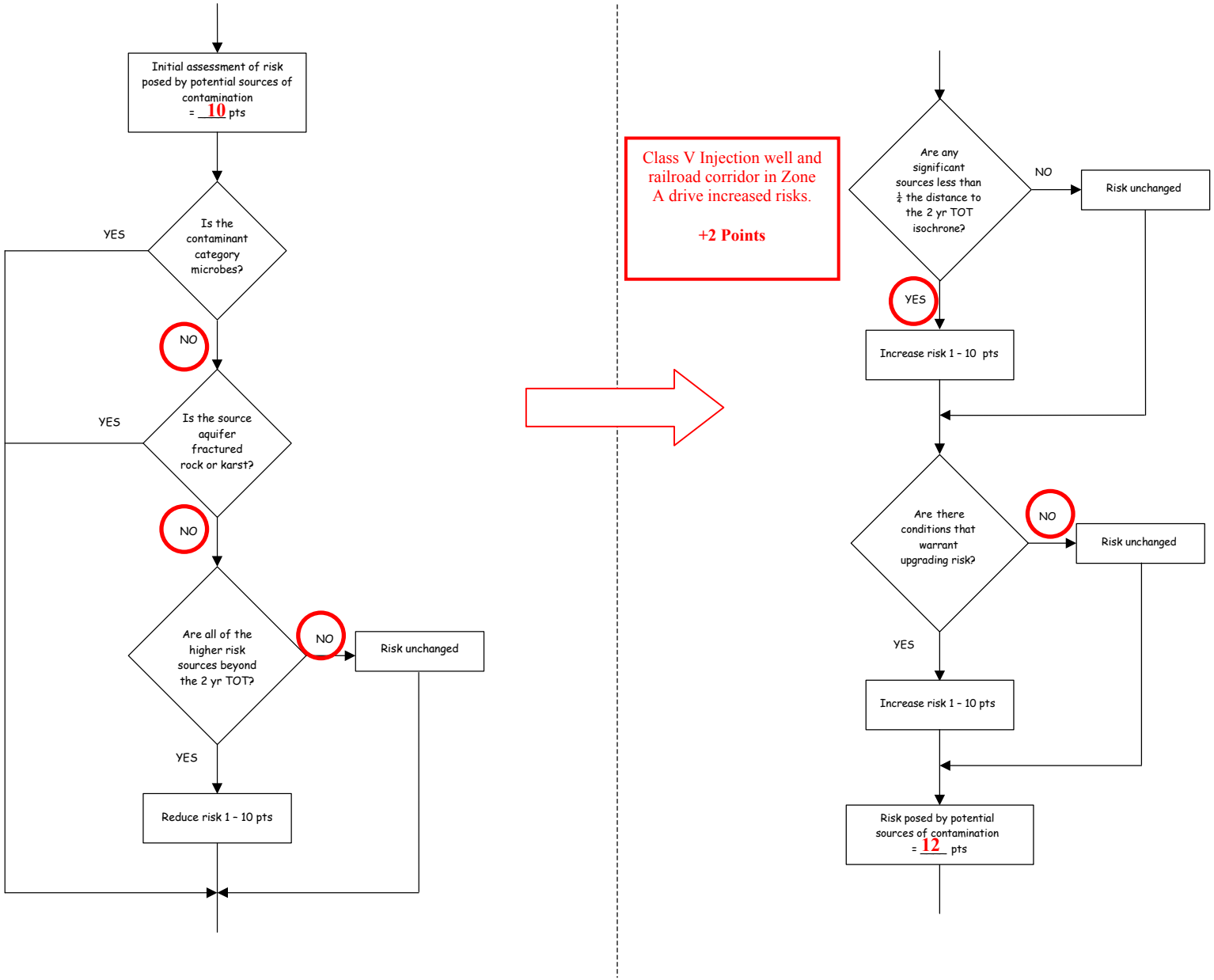
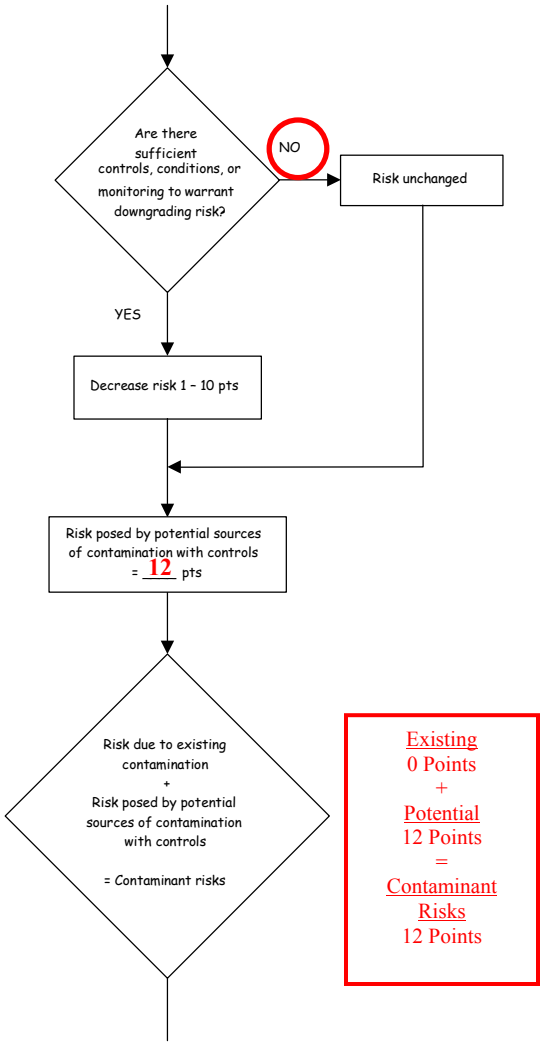
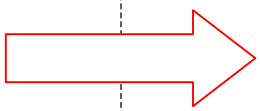
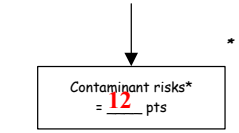


Chart 7. Contaminant risks for Camp La Da Sa – Volatile Organic Chemicals (Continued)



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





** Truncate risk at 50 pts*

Low

3. Level of Background Contamination

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

Contaminant Risk Ratings

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

Table 3. Risk Matrix for Contaminant Sources for Camp La Da Sa – Volatile Organic Chemicals

Level of Risk Associated with the Highest Risk Sources

Next Highest Risk Sources(s)	LOW 10 pts	MEDIUM 20 pts	HIGH 30 pts	VERY HIGH 40 pts
Low	> 10 sources + 10 pts	> 10 sources + 5 pts	> 20 sources + 5 pts	---
Medium	---	> 2 sources + 5 pts	> 5 sources + 5 pts	> 10 sources + 5 pts
High	---	---	1 source + 10 pts	> 2 sources + 10 pts
Very High	---	---	---	1 source + 10 pts

Chart 8. Vulnerability analysis for Camp La Da Sa – Volatile Organic Chemicals