Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for

Automax

Drinking Water System,

Eagle River, Alaska

Automax #216148

DRINKING WATER PROTECTION PROGRAM REPORT # 213
Alaska Department of Environmental Conservation

AUGUST 2002

Source Water Assessment for Automax Drinking Water System, Eagle River, Alaska Automax #216148

By Shannon & Wilson, Inc.

DRINKING WATER PROTECTION PROGRAM REPORT # 213

The Drinking Water Protection Program is producing Source Water Assessments in compliance with the Safe Drinking Water Act Amendments of 1996. Each assessment includes a delineation of the source water area, an inventory of potential and existing contaminant sources that may impact the water, a risk ranking for each of these contaminants, and an evaluation of the potential vulnerability of these drinking water sources.

These assessments are intended to provide public water systems owners/operators, communities, and local governments with the best available information that may be used to protect the quality of their drinking water. The assessments combine information obtained from various sources, including the U.S. Environmental Protection Agency, Alaska Department of Environmental Conservation (ADEC), public water system owners/operators, and other public information sources. The results of this assessment are subject to change if additional data becomes available. If you have any additional information that may affect the results of this assessment, please contact the Program Coordinator of DWPP, (907) 269-7521.

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Source Water Assessment for Automax Source of Public Drinking Water, Eagle River, Alaska

By Shannon & Wilson, Inc.

Drinking Water Protection Program
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The Automax is a Class B (transient/non-community) water system consisting of one well, located at 10910 Mausel Drive in Eagle River, Alaska. Identified potential and current sources of contaminants for Automax public drinking water source include: a contaminated site; paved and dirt/gravel roads; furniture manufacturing; gasoline stations; motor vehicle repair shops; recycling facilities; residential areas; large capacity and single family septic systems; gasoline and diesel underground storage tanks; forested land; car washes; construction trade areas and materials; and explosives manufacturing. These identified potential and existing sources of contamination are considered sources of bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals. Overall, the public water sources for Automax received a vulnerability rating of **High** for volatile organic chemicals, **Low** for bacteria and viruses, and **Low** for nitrates and nitrites.

INTRODUCTION

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

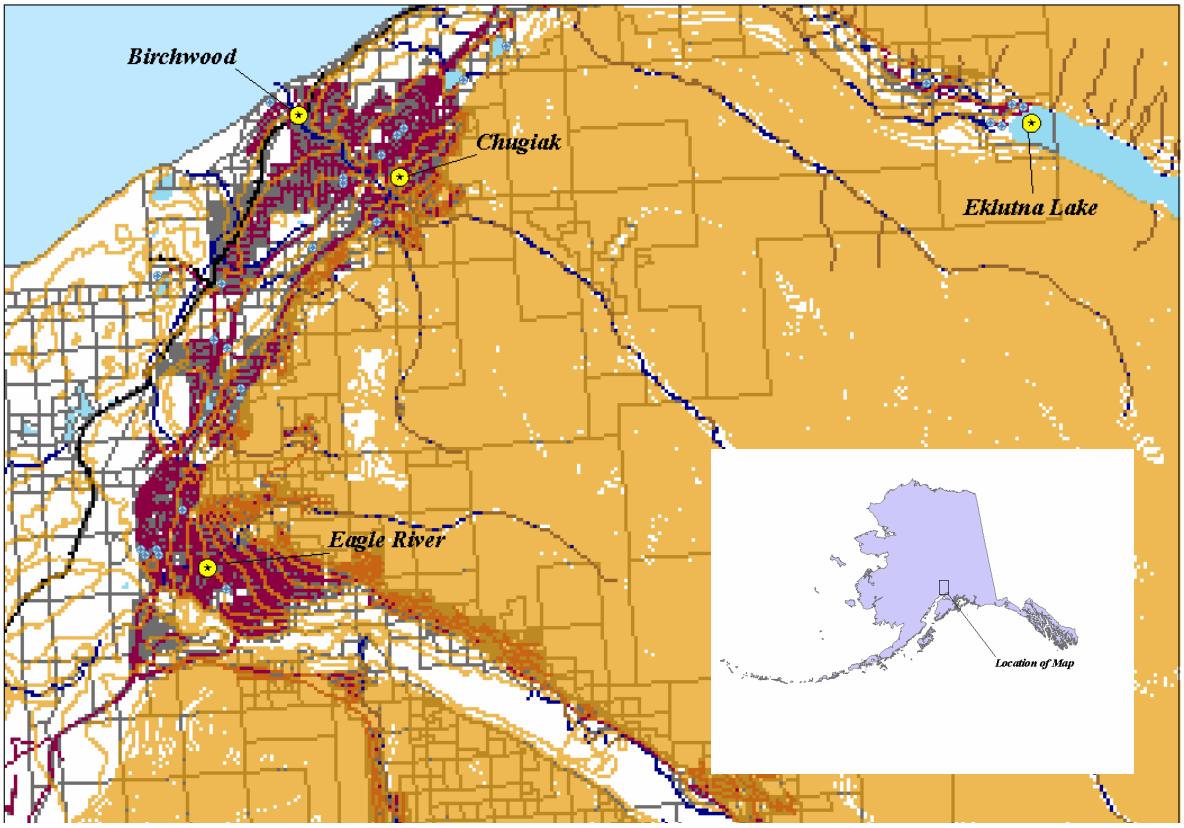


Figure 1. Index Map showing the location of the Eagle River Valley and Surrounding Areas.

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

DESCRIPTION OF THE CHUGACH MOUNTAIN FRONT EAST OF ANCHORAGE

Location

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

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

Precipitation

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

Topography and Drainage

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

Groundwater

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

Geology and Soils

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

AUTOMAX PUBLIC DRINKING WATER SYSTEM

Automax is a Class B (transient/non-community) water system. The system consists of one well located at 10910 Mausel Drive in Eagle River, Alaska.

A well log for the Automax public drinking water system was not available for review. According to a well log completed for the nearby Eagle River Elementary School, the total depth of the Automax well is estimated at 140 feet below ground surface and was completed with 6-inch well casing. The most recent Sanitary Survey (10/28/98) 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 apparently sloped away from the well, and provides adequate surface water drainage. It is unknown if the well was grouted according to ADEC regulations. Proper grouting provides added protection against contaminants travelling along the well casing and into source waters.

This system operates year-round and serves 0 residents and more than 30 non-residents through one service connection.

AUTOMAX DRINKING WATER PROTECTION AREA

In order to evaluate whether a drinking water source is at risk, we must first evaluate what are the most likely pathways for surface contamination to reach the groundwater. Some areas are more likely to allow contamination to reach the well than others. These areas are determined by looking at the characteristics of the soil, groundwater, aquifer, and well.

The most probable area for contamination to reach the drinking water well is the area that contributes water to the well, the groundwater recharge area. This area is designated as the Drinking Water Protection Area (DWPA). Because a release of contaminants within the DWPA are most likely to impact the drinking water well, this area will serve as the focus for voluntary protection efforts.

An analytical calculation was used to determine the size and shape of the DWPA. The input parameters describing the attributes of the aquifer in this calculation were adopted from the U.S. Geological Survey (*Patrick, Brabets, and Glass, 1989*), and State of Alaska Department of Water Resources. Additional methods were also used to take into account any uncertainties in groundwater flow and aquifer characteristics to arrive at a meaningful DWPA (Please refer to the Guidance Manual for Class B Public Water Systems for additional information).

The DWPAs established for wells by the ADEC are separated into four zones. These zones correspond to differences in the time-of-travel (TOT) of the water moving through the aquifer to the well. The TOT for contaminants within the water varies and is dependent on the physical and chemical characteristics of each contaminant. The following is a summary of the four DWPA zones and the calculated TOT for each:

Table 1. Definition of Zones

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

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

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

INVENTORY OF POTENTIAL AND EXISTING CONTAMINANT SOURCES

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

For the basis of all Class B public water system assessments, three categories of drinking water contaminants were inventoried, they include:

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

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

RANKING OF CONTAMINANT RISKS

Once the potential and existing sources of contamination have been identified, they are sorted and ranked according to what type and level of risk they represent. Ranking of contaminant risks for a "potential" or "existing" source of contamination is a function of toxicity and volumes of specific contaminants associated with that source. Further, contaminant risks are a function of the number and density of those types of contaminant sources as well as the proximity of those sources to the well.

VULNERABILITY OF AUTOMAX DRINKING WATER SOURCE

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

- Natural susceptibility; and
- Contaminant risks.

Each of the three categories of drinking water contaminants has been analyzed and an overall vulnerability score of 0 to 100 is ultimately assigned:

Natural Susceptibility (0 – 50 points)

+

Contaminant Risks (0 – 50 points)

=

Vulnerability of the
Drinking Water Source to Contamination (0 – 100).

A score for the Natural Susceptibility is achieved by analyzing the properties of the well and the aquifer.

Susceptibility of the Wellhead (0 – 25 Points)

+

Susceptibility of the Aquifer (0 – 25 Points)

=

Natural Susceptibility (Susceptibility of the Well)
(0 – 50 Points)

The well for Automax is assumed to be completed in an unconfined aquifer setting. Because an unconfined aquifer is recharged by surface water and precipitation that migrates downward from the surface, contaminants at the surface have the potential to adversely impact this aquifer. Table 2 shows the Overall Susceptibility score and rating for Automax.

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

	Score	Rating
Susceptibility of the Wellhead	5	Low
Susceptibility of the Aquifer	18	High
Natural Susceptibility	23	Medium

Contaminant risks to a drinking water source depend on the type, number or density, and distribution of contaminant sources. This data has been derived from an examination of existing or historical contamination that has been detected at the drinking water source through routine sampling. It also evaluates potential sources of contamination. Table 3 summarizes the Contaminant Risks for each category of drinking water contaminants.

Table 3. Contaminant Risks

Category	Score	Rating
Bacteria and Viruses	12	Low
Nitrates and/or Nitrites	12	Low
Volatile Organic Chemicals	42	Very High

Appendix D contains eight charts, which together form the 'Vulnerability Analysis' for a source water assessment for a public drinking water source. Chart 1 analyzes the 'Susceptibility of the Wellhead' to contamination by looking at the construction of the well and its surrounding area. Chart 2 analyzes the 'Susceptibility of the Aquifer' to contamination by looking at the naturally-occurring attributes of the water source and influences on the groundwater system that might lead to contamination. Chart 3 analyzes 'Contaminant Risks' for the drinking water source with respect to bacteria and viruses. The 'Contaminant Risks' portion of the analysis considers potential sources of contaminants as well as a review of contamination that has or may have occurred, but has not arrived or been detected at the well. Lastly, Chart 4 contains the 'Vulnerability Analysis for Bacteria and Viruses.' Charts 5 through 8 contain the Contaminant Risks and Vulnerability Analyses for nitrates and nitrites and volatile organic chemicals, respectively.

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

Table 4. Overall Vulnerability of Automax to Contamination by Category

Category	Score	Rating
Bacteria and Viruses	35	Low
Nitrates and Nitrites	35	Low
Volatile Organic Chemicals	65	High

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

The contaminated site, paved and dirt/gravel roads, furniture manufacturing, gasoline stations, motor vehicle repair shops, recycling facilities, residential areas, large capacity and single family septic systems, gasoline and diesel underground storage tanks, forested land, car washes, construction trade areas and materials, and explosives manufacturing create a risk increase for bacteria and viruses, nitrates and nitrites, and volatile organic compounds.

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

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

Sampling history for Automax well indicates that low concentrations of nitrates have not been detected (see Chart 5 - Contaminant Risks for Nitrates and/or Nitrites in Appendix D). The Maximum Contaminant Level (MCL) for Nitrates is 10 mg/L. The MCL is the maximum level of contaminant that is allowed to exist in drinking water and still be consumed by humans without harmful health effects. Due to the high solubility and weak retention by soil, nitrates are very mobile, moving at approximately the same rate as water.

SUMMARY

A *Source Water Assessment* has been completed for the sources of public drinking water serving Automax. The overall vulnerability of this source to contamination is **High** for volatile organic chemicals, **Low** for bacteria and viruses, and **Low** for nitrates and nitrites. This assessment of contaminant risks can be used as a foundation for local voluntary protection efforts as well as a basis for the continuous efforts on the part of Automax 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 Automax public drinking water source.

REFERENCES CITED

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

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

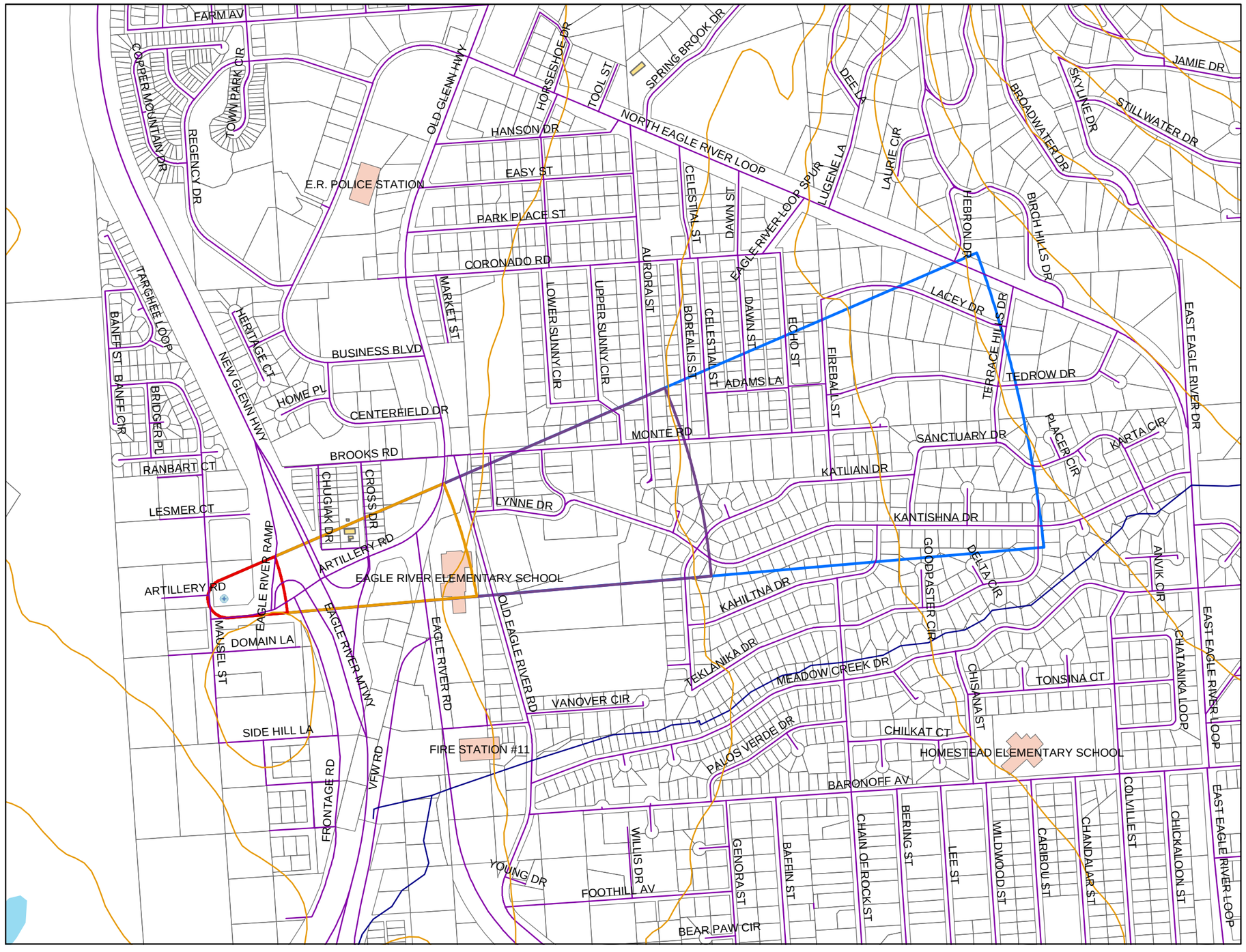
Wang, B., Strelakos, P.M., and Jokela, J.B., 2000, Nitrate source indicators in ground water of the scimitar subdivision, Peters Creek Area, Anchorage, Alaska: US Geological Survey Water-Resources Investigations Report 00-4137.

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

APPENDIX A

Automax
Drinking Water Protection Area
(Map 1)

Drinking Water Protection Areas for Automax



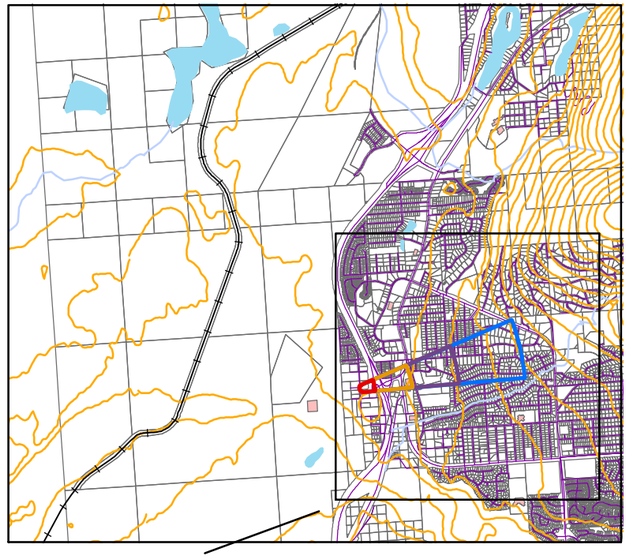
- Automax Well
- 25m Contours
- Railroads
- Streams
- Roads
- MOA Buildings
- MOA land parcels
- Cook Inlet
- MOA Airports
- Site Buildings

Zone A Protection Area
Several Months Travel Time

Zone B Protection Area
Less than 2-Years Travel Time

Zone C Protection Area
Less than 5-Years Travel Time

Zone D Protection Area
Less than 10-Years Travel Time



Location of map

1,600 800 0 1,600 Feet

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N W E S

Map 1

APPENDIX B

Contaminant Source Inventory and Risk Ranking for Automax (Tables 1-4)

Table 1 *Contaminant Source Inventory for Automax* ***PWSID 216148.001***

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Location*	*Map Number*	*Comments*
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U4-1	A	NE of the Automax Well	3	
Highways and roads, paved (cement or asphalt)	X20	X20-1-3	A	Roads in Zone A	2	3 roads in Zone A
Furniture manufacturing, repair, and finishing shops	C14	C14-1	B	Eagle River Elementary School	3	
Gasoline stations (without repair shop)	C15	C15-1	B	Artillery Road	3	
Motor /motor vehicle repair shops	C31	C31-1	B	Eagle River Elementary School	3	
Recycling and waste reduction facilities	D57	D57-1	B	Off Cross Drive	3	
Residential Areas	R01	R1-1	B	Residence off Chugiak and Cross Drives	2	3 acres in Zone B
Septic systems (serves one single-family home)	R02	R2-1	B	North of Artillery Road, east of Cross Drive	3	
Tanks, gasoline (underground)	T12	T12-1	B	Artillery Road	3	
Tanks, diesel (underground)	T08	T8-1	B	Artillery Road	3	
Highways and roads, dirt/gravel	X24	X24-1-4	B	Roads in Zone B	2	4 roads in Zone B
Motor vehicle/general storage yards/facilities	X27	X27-1	B	Eagle River Elementary School	3	
Forested land (pesticide application)	X48	X48-1	B	Off Artillery Road	3	
Motor /motor vehicle repair shops	C31	C31-2	C	Old Eagle River Road	3	
Motor /motor vehicle repair shops	C31	C31-3	C	N. of Lynne Dr	3	
Car washes with engine or undercarriage cleaning	C08	C8-1	C	Old Eagle River Road	3	
Construction trade areas and materials	C09	C9-1	C	Off Aurora Street	3	
Recycling and waste reduction facilities	D57	D57-2	C	Lynne Drive	3	
Residential Areas	R01	R1-2	C	Residence off Kantishna Drive	2	18 acres in Zone C
Septic systems (serves one single-family home)	R02	R2-2-12	C	Septic systems in Zone C	3	
Highways and roads, dirt/gravel	X24	X24-5-13	C	Roads in Zone C	2	9 roads in Zone C
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	D	S. of Monte Rd	3	
Explosives and ammunitions manufacturing	I15	I15-1	D	Katlian Dr	3	

Contaminant Source Inventory and Risk Ranking for

Table 2 ***PWSID 216148.001***

Automax

Sources of Bacteria and Viruses

Contaminant Source Type	***Contaminant Source ID***	***CS ID tag***	***Zone***	***Risk Ranking for Analysis***	***Overall Rank after Analysis***	***Location***	***Map Number***	***Comments***
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	D	High	1	S. of Monte Rd	3	
Highways and roads, paved (cement or asphalt)	X20	X20-1-3	A	Low	2	Roads in Zone A	2	3 roads in Zone A
Residential Areas	R01	R1-1	B	Low	3	Residence off Chugiak and Cross Drives	2	3 acres in Zone B
Septic systems (serves one single-family home)	R02	R2-1	B	Low	4	North of Artillery Road, east of Cross Drive	3	
Highways and roads, dirt/gravel	X24	X24-1-4	B	Low	5	Roads in Zone B	2	4 roads in Zone B

Contaminant Source Inventory and Risk Ranking for

Table 3 ***PWSID 216148.001***

Automax

Sources of Nitrates/Nitrites

Contaminant Source Type	***Contaminant Source ID***	***CS ID tag***	***Zone***	***Risk Ranking for Analysis***	***Overall Rank after Analysis***	***Location***	***Map Number***	***Comments***
Explosives and ammunitions manufacturing	I15	I15-1	D	Very High	1	Katlian Dr	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	D	High	2	S. of Monte Rd	3	
Highways and roads, paved (cement or asphalt)	X20	X20-1-3	A	Low	3	Roads in Zone A	2	3 roads in Zone A
Residential Areas	R01	R1-1	B	Low	4	Residence off Chugiak and Cross Drives	2	3 acres in Zone B
Septic systems (serves one single-family home)	R02	R2-1	B	Low	5	North of Artillery Road, east of Cross Drive	3	
Highways and roads, dirt/gravel	X24	X24-1-4	B	Low	6	Roads in Zone B	2	4 roads in Zone B
Residential Areas	R01	R1-2	C	Low	7	Residence off Kantishna Drive	2	18 acres in Zone C
Septic systems (serves one single-family home)	R02	R2-2-12	C	Low	8	Septic systems in Zone	3	
Highways and roads, dirt/gravel	X24	X24-5-13	C	Low	9	Roads in Zone C	2	9 roads in Zone C

Contaminant Source Inventory and Risk Ranking for

Table 4 ***PWSID 216148.001***

Automax

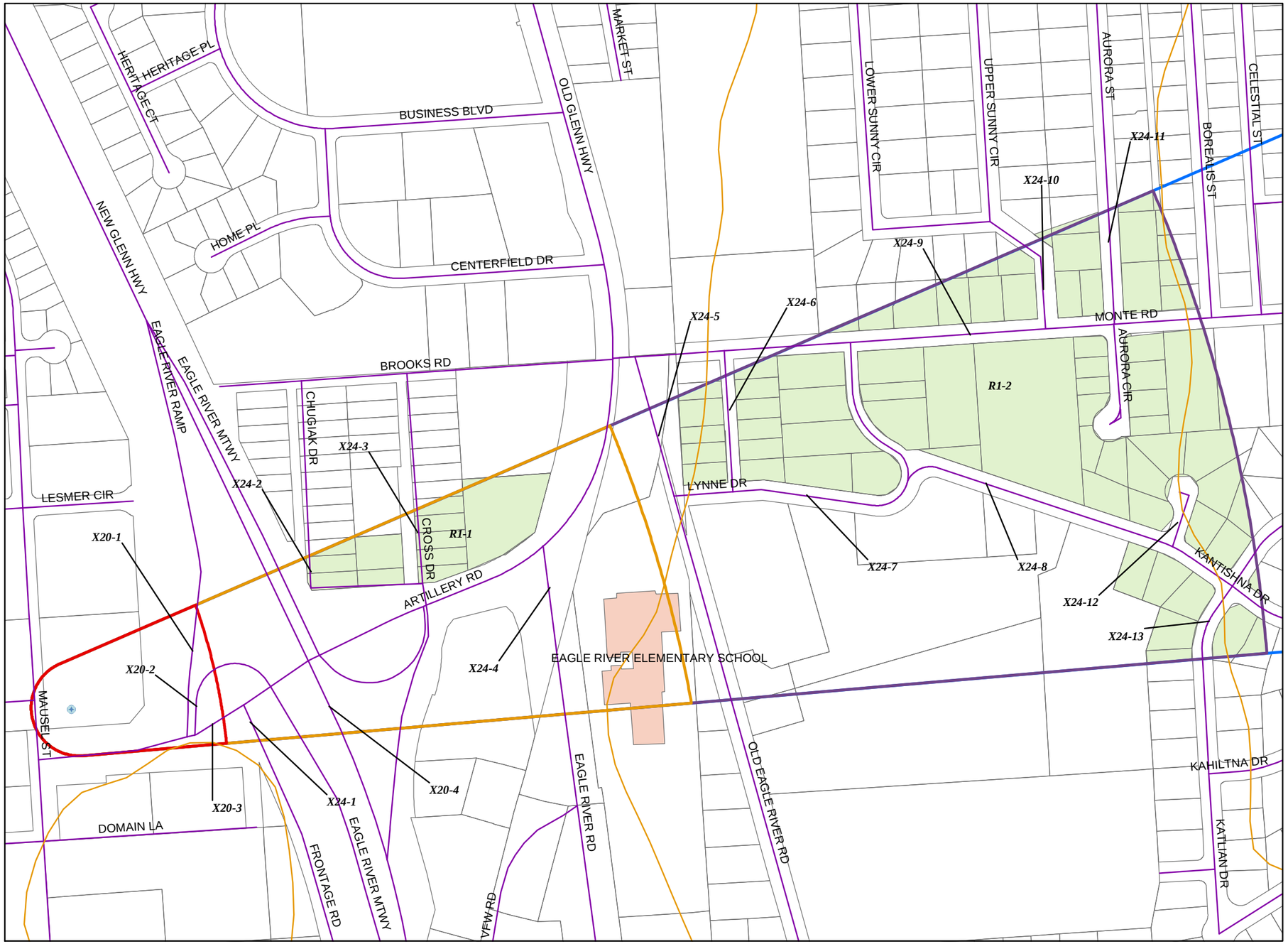
Sources of Volatile Organic Chemicals

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Overall Rank after Analysis*	*Location*	*Map Number*	*Comments*
Furniture manufacturing, repair, and finishing	C14	C14-1	B	High	1	Eagle River Elementary School	3	
Gasoline stations (without repair shop)	C15	C15-1	B	High	2	Artillery Road	3	
Tanks, gasoline (underground)	T12	T12-1	B	High	3	Artillery Road	3	
Tanks, diesel (underground)	T08	T8-1	B	High	4	Artillery Road	3	
Car washes with engine or undercarriage cleaning	C08	C8-1	C	High	5	Old Eagle River Road	3	
Motor /motor vehicle repair shops	C31	C31-1	B	Medium	6	Eagle River Elementary School	3	
Motor /motor vehicle repair shops	C31	C31-2	C	Medium	7	Old Eagle River Road	3	
Motor /motor vehicle repair shops	C31	C31-3	C	Medium	8	N. of Lynne Dr	3	
Highways and roads, paved (cement or asphalt)	X20	X20-1-3	A	Low	9	Roads in Zone A	2	3 roads in Zone A
Residential Areas	R01	R1-1	B	Low	10	Residence off Chugiak and Cross Drives	2	3 acres in Zone B
Septic systems (serves one single-family home)	R02	R2-1	B	Low		North of Artillery Road, east of Cross Drive	3	
Highways and roads, dirt/gravel	X24	X24-1-4	B	Low		Roads in Zone B	2	4 roads in Zone B
Motor vehicle/general storage yards/facilities	X27	X27-1	B	Low		Eagle River Elementary School	3	
Construction trade areas and materials	C09	C9-1	C	Low		Off Aurora Street	3	
Residential Areas	R01	R1-2	C	Low		Residence off Kantishna Drive	2	18 acres in Zone C
Septic systems (serves one single-family home)	R02	R2-2-12	C	Low		Septic systems in Zone	3	
Highways and roads, dirt/gravel	X24	X24-5-13	C	Low		Roads in Zone C	2	9 roads in Zone C

APPENDIX C

Automax
Drinking Water Protection Area
and Potential and Existing Contaminant Sources
(Maps 2-3)

Drinking Water Protection Areas for Automax and Potential and Existing Sources of Contamination



- Automax Well
- 25m Contours
- Railroads
- Streams
- Roads
- MOA Buildings
- MOA land parcels
- Cook Inlet
- MOA Airports
- Residential Areas (R1)

Zone A Protection Area
Several Months Travel Time

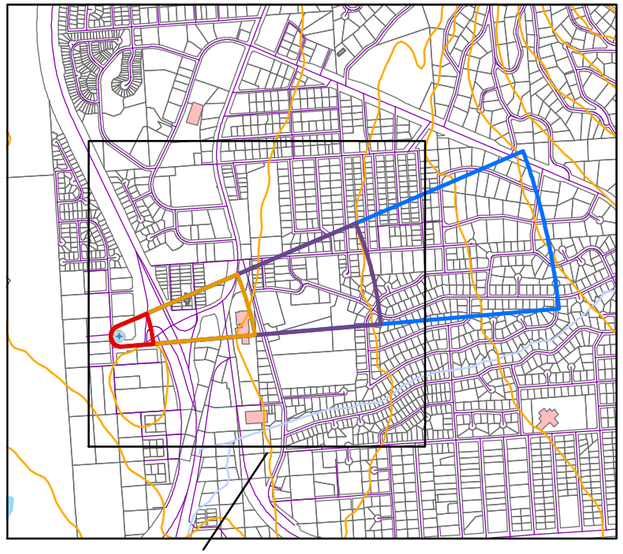
Zone B Protection Area
Less than 2-Years Travel Time

Zone C Protection Area
Less than 5-Years Travel Time

Zone D Protection Area
Less than 10-Years Travel Time

700 350 0 700 Feet

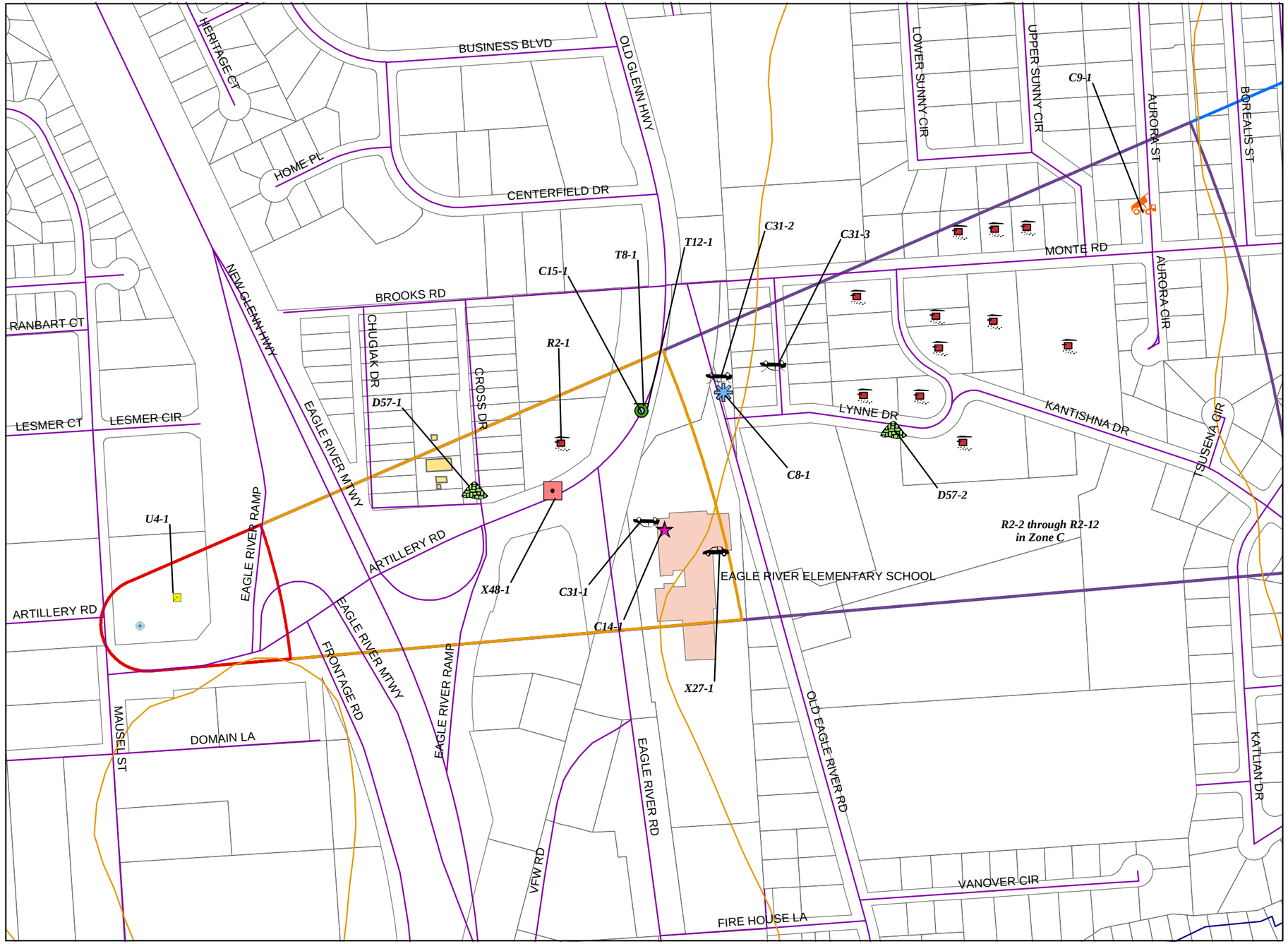
PWSID 216148.001



Location of map

Map 2

Drinking Water Protection Areas for Automax and Potential and Existing Sources of Contamination



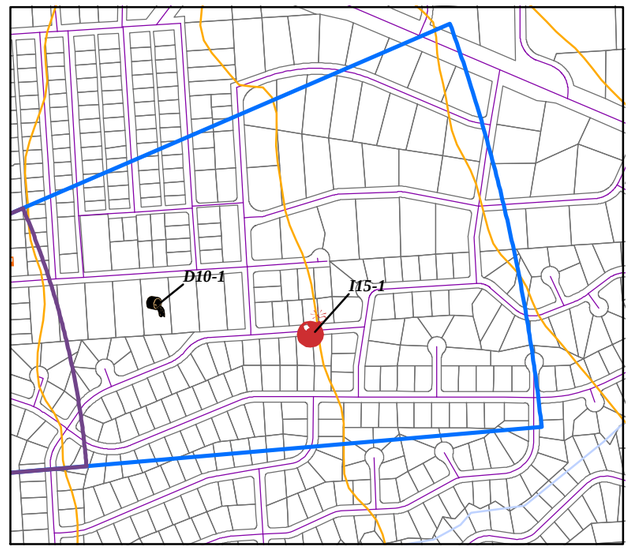
- Automax Well
- Contaminated sites, DEC recognized, non-Superfund, non-RCRA, U4
- Large Capacity Septic Systems (D10)
- Single Family Septic Systems (R2)
- Car washes with engine or undercarriage cleaning, C8
- Construction trade areas and materials, C9
- Explosives and ammunitions manufacturing, I15
- Furniture manufacturing, repair, and finishing shops, C14
- Gasoline stations (without repair shop), C15
- Kennels, X48
- Motor / motor vehicle repair shops, C31
- Motor vehicle/general storage yards/facilities, X27
- Scrap, salvage, or junk yards, D57
- Tanks, diesel (underground), T8
- Tanks, gasoline (underground), T12
- 25m Contours
- Railroads
- anchorage streams
- Roads
- MOA Buildings
- MOA land parcels
- Cook Inlet
- MOA Airports
- Site Buildings

Zone A Protection Area
Several Months Travel Time

Zone B Protection Area
Less than 2-Years Travel Time

Zone C Protection Area
Less than 5-Years Travel Time

Zone D Protection Area
Less than 10-Years Travel Time



690 345 0 690 Feet

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N W E S

Map 3

APPENDIX D

Vulnerability Analysis for Automax Public Drinking Water Source

(Charts 1-8)

Chart 1. Susceptibility of the Wellhead - Automax

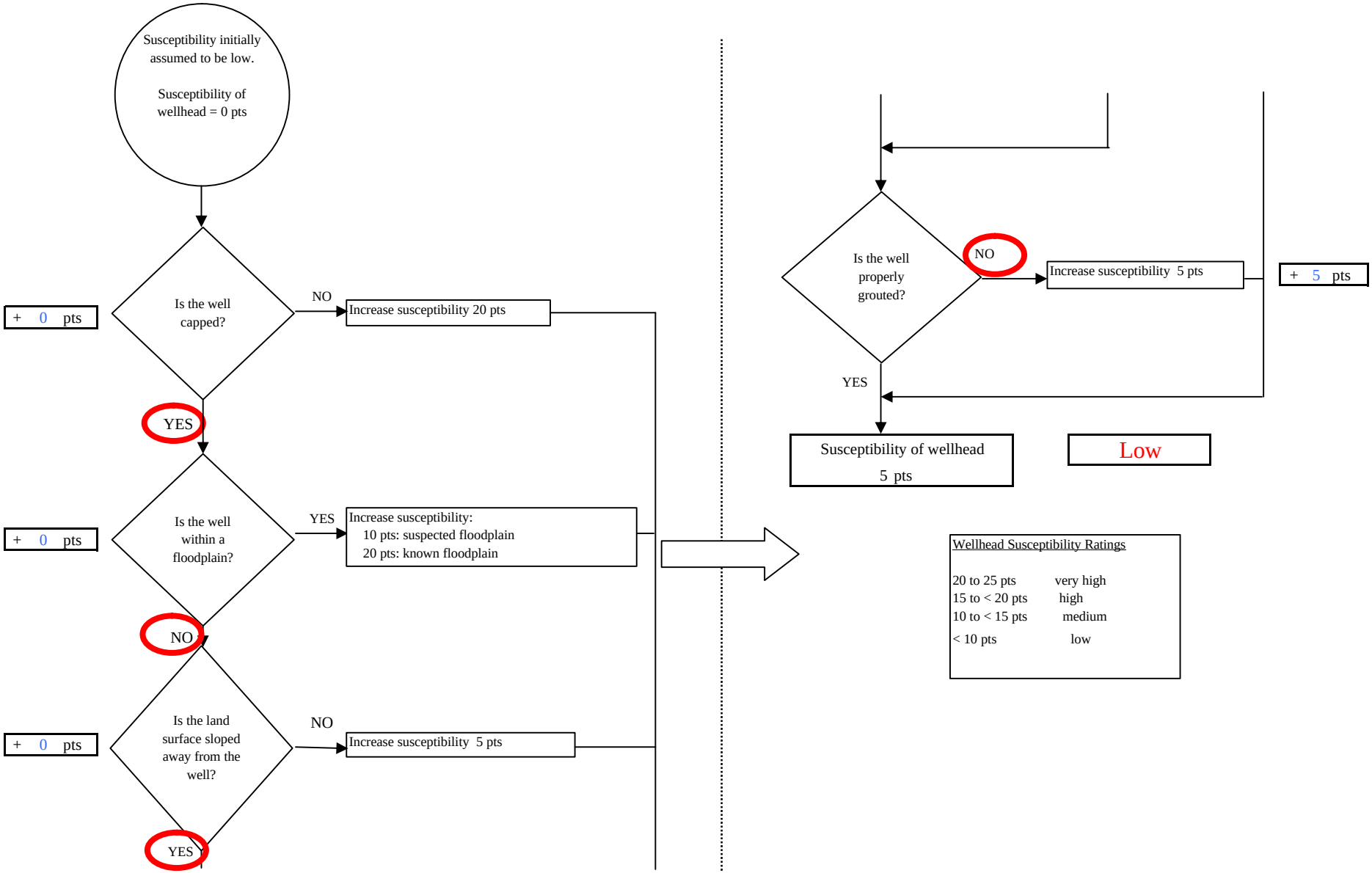


Chart 2. Susceptibility of the Aquifer - Automax

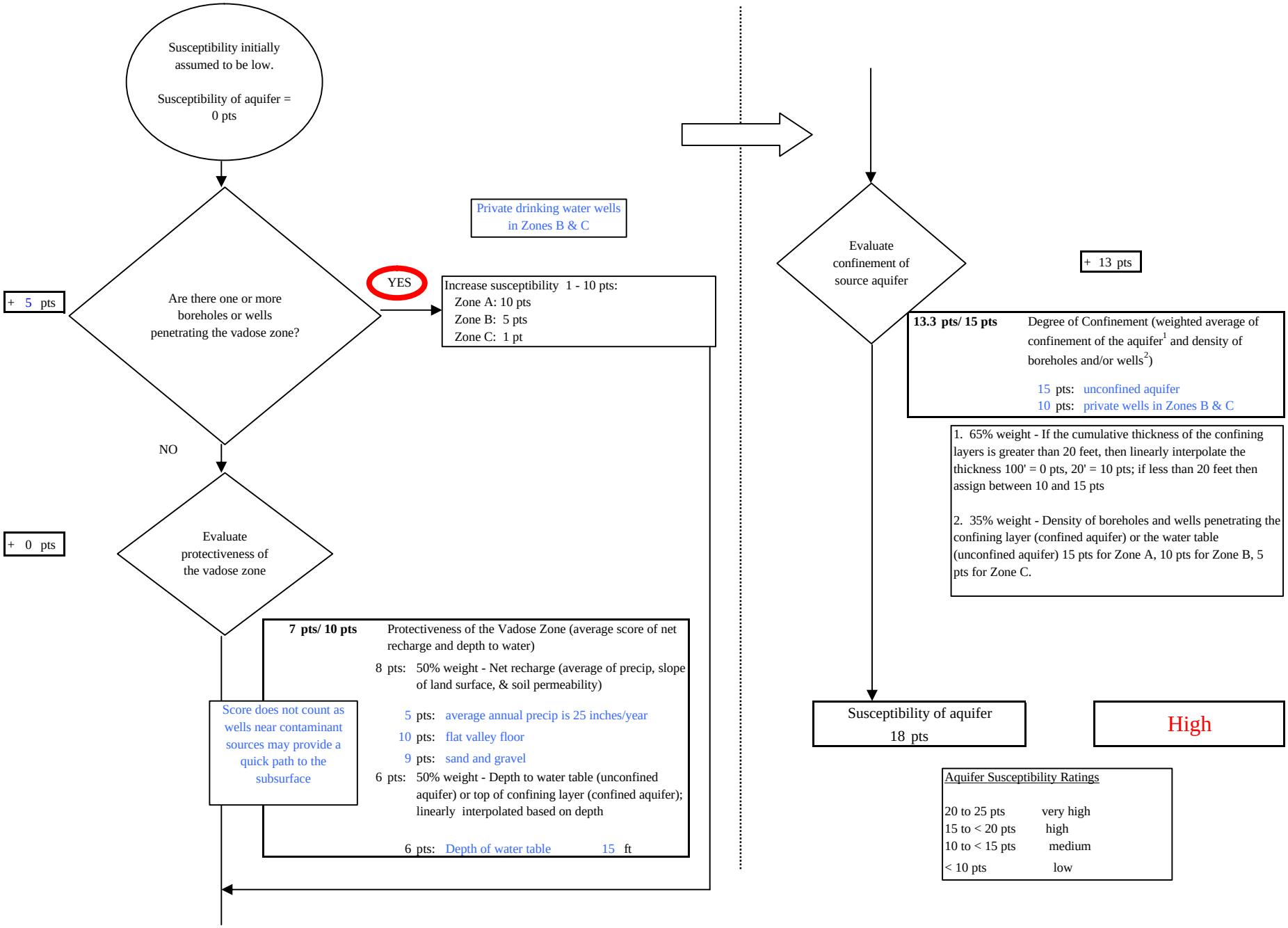
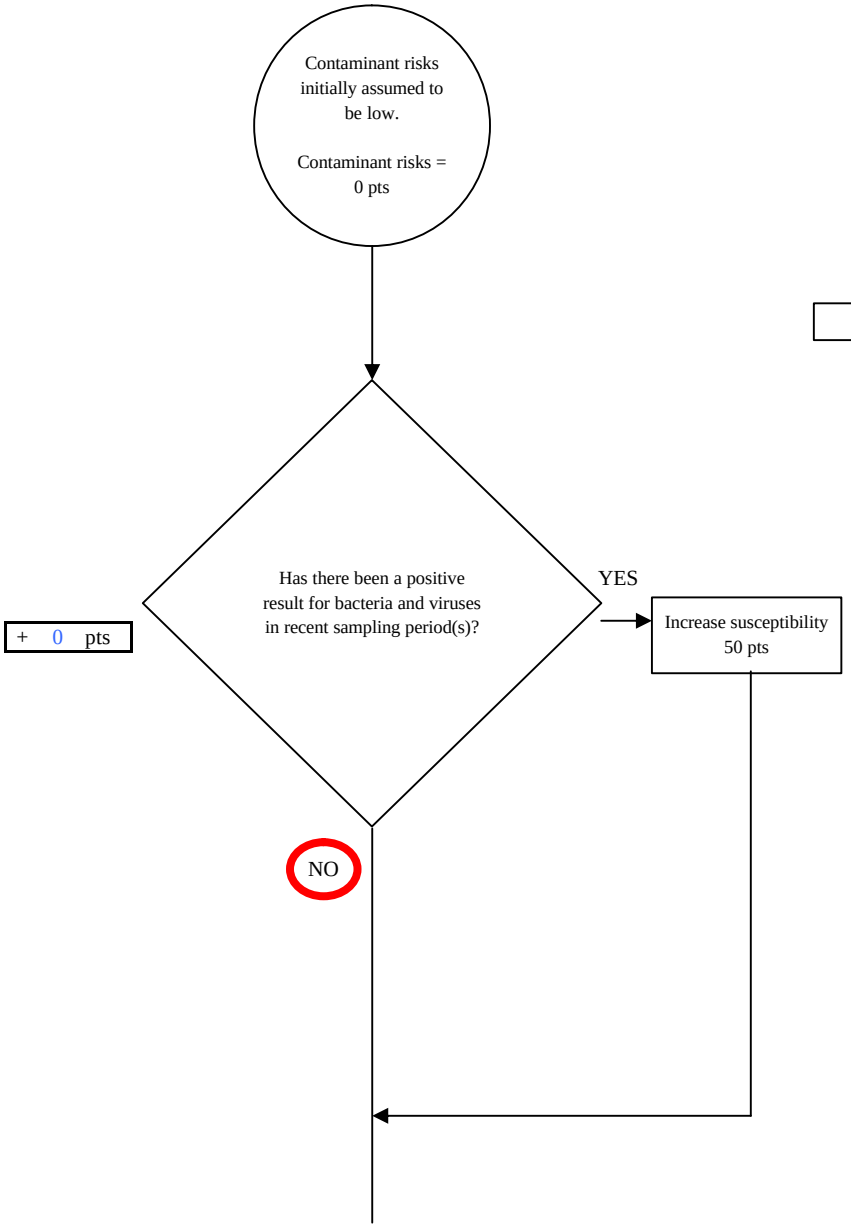
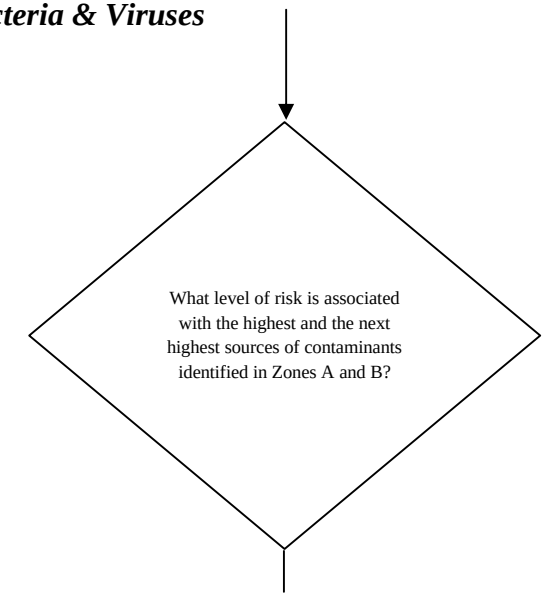


Chart 3. Contaminant Risks for Automax - Bacteria & Viruses





+ 10 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)	1	3	4

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

Matrix Score 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.

Chart 3. Contaminant Risks for Automax - Bacteria & Viruses

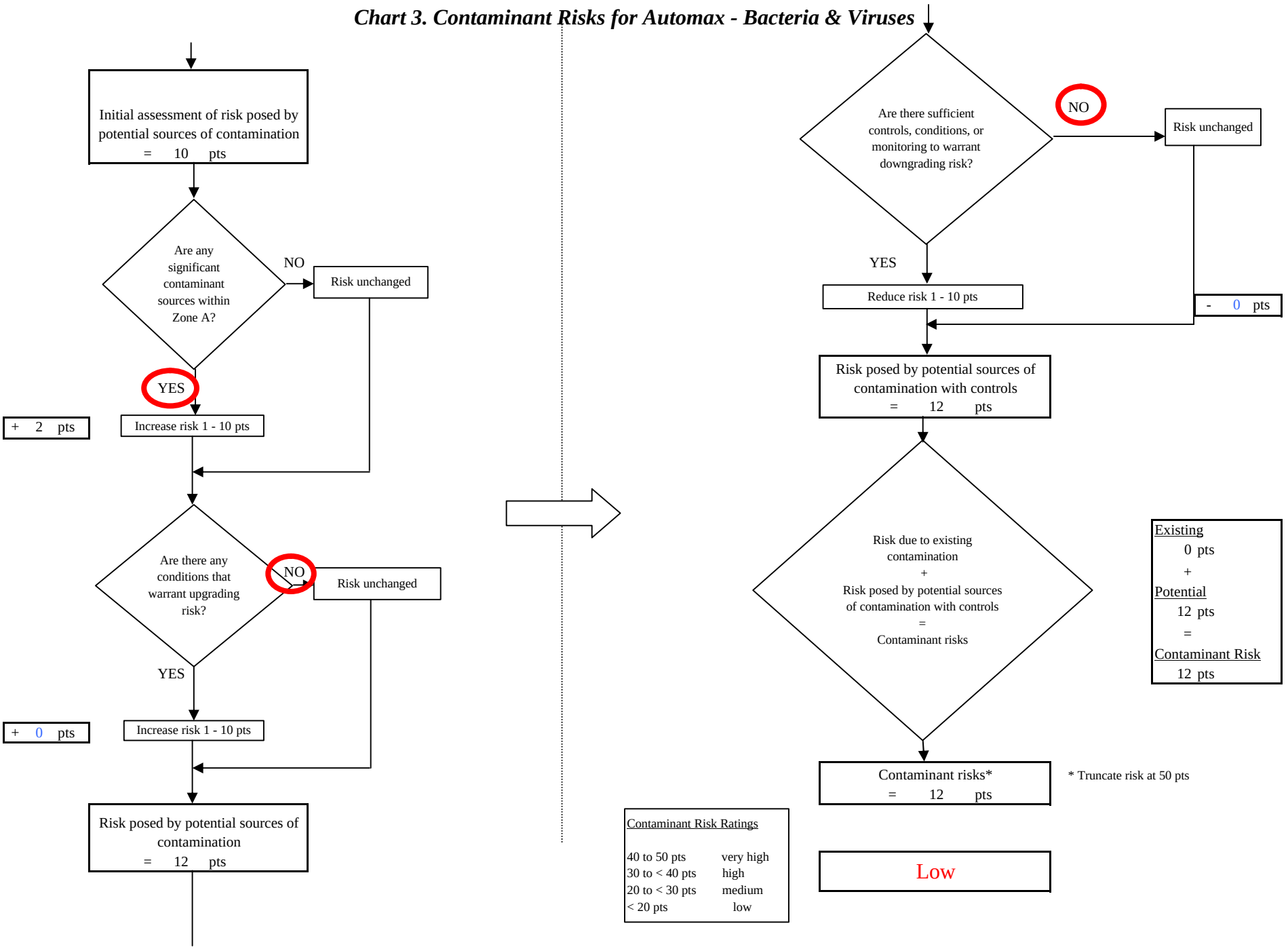


Chart 4. Vulnerability Analysis for Automax - Bacteria & Viruses

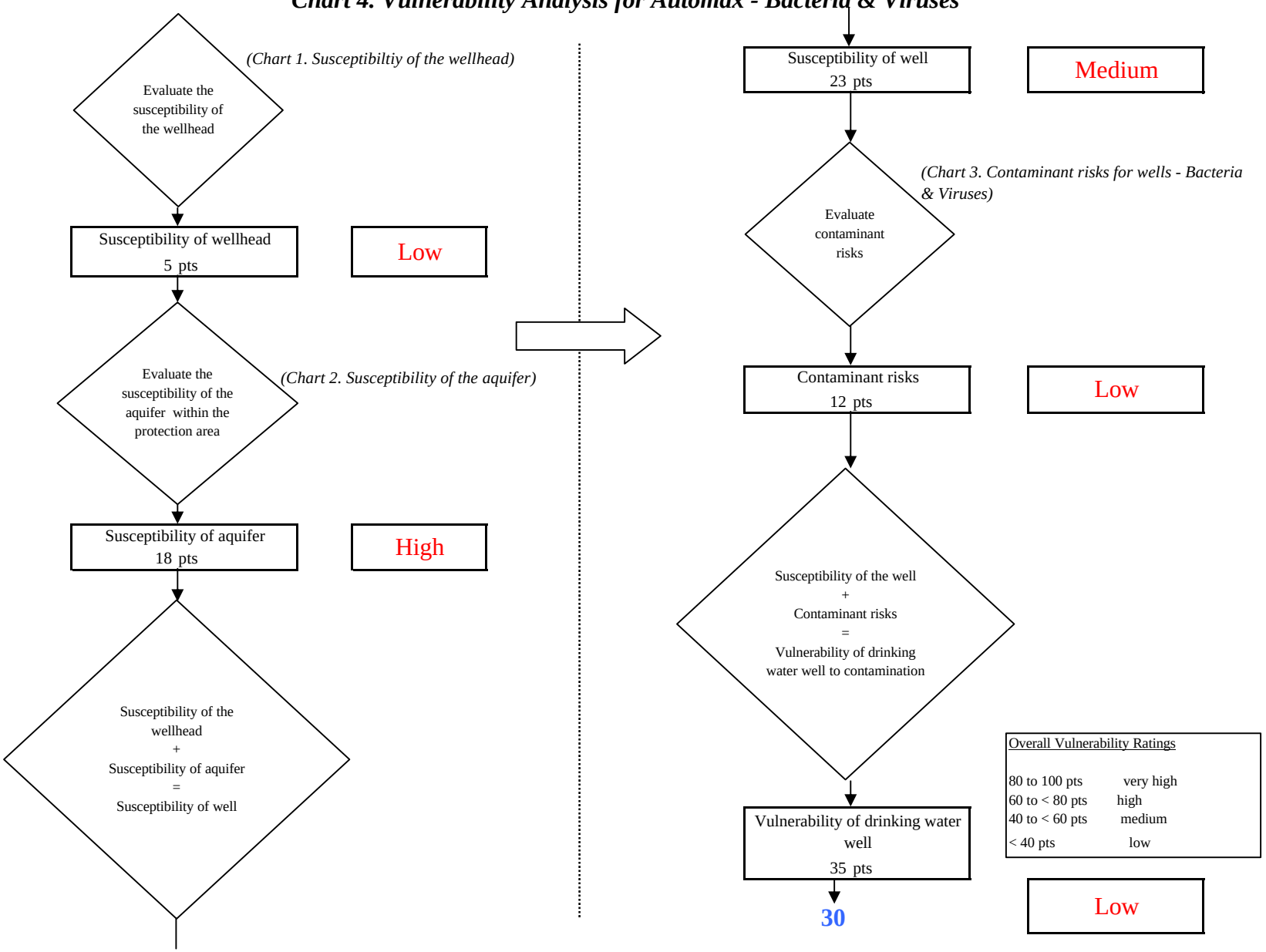


Chart 5. Contaminant Risks for Automax - Nitrates and Nitrites

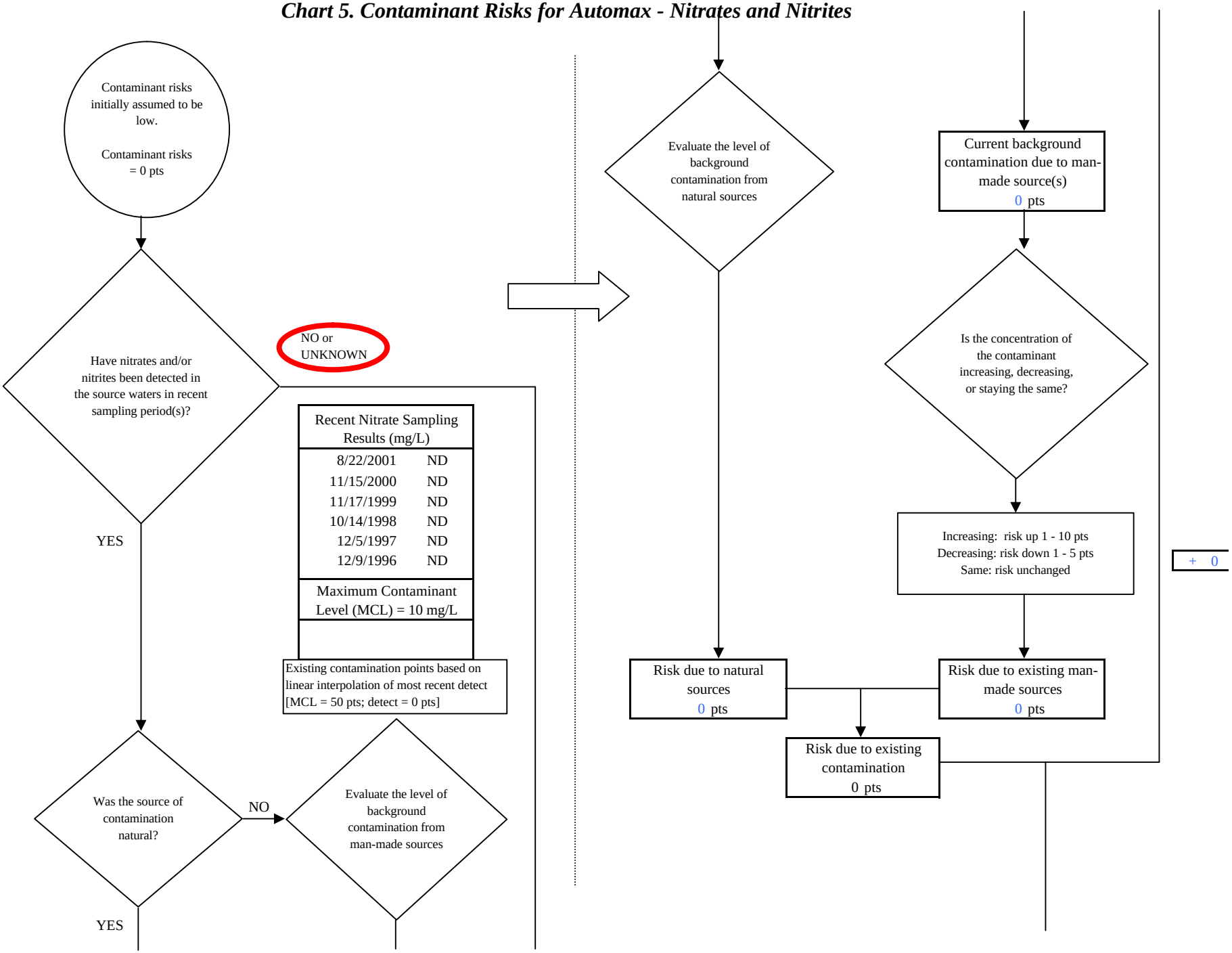


Chart 5. Contaminant Risks for Automax - Nitrates and Nitrites

Initial assessment of risk posed by potential sources of contamination = 10 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

Are any significant sources within Zone A?

NO

Risk unchanged

YES

Increase risk 1 - 10 pts

+ 2

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?

+ 10 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	0	0
Low(s)	1	4	5

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

Matrix Score 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.

Chart 5. Contaminant Risks for Automax - Nitrates and Nitrites

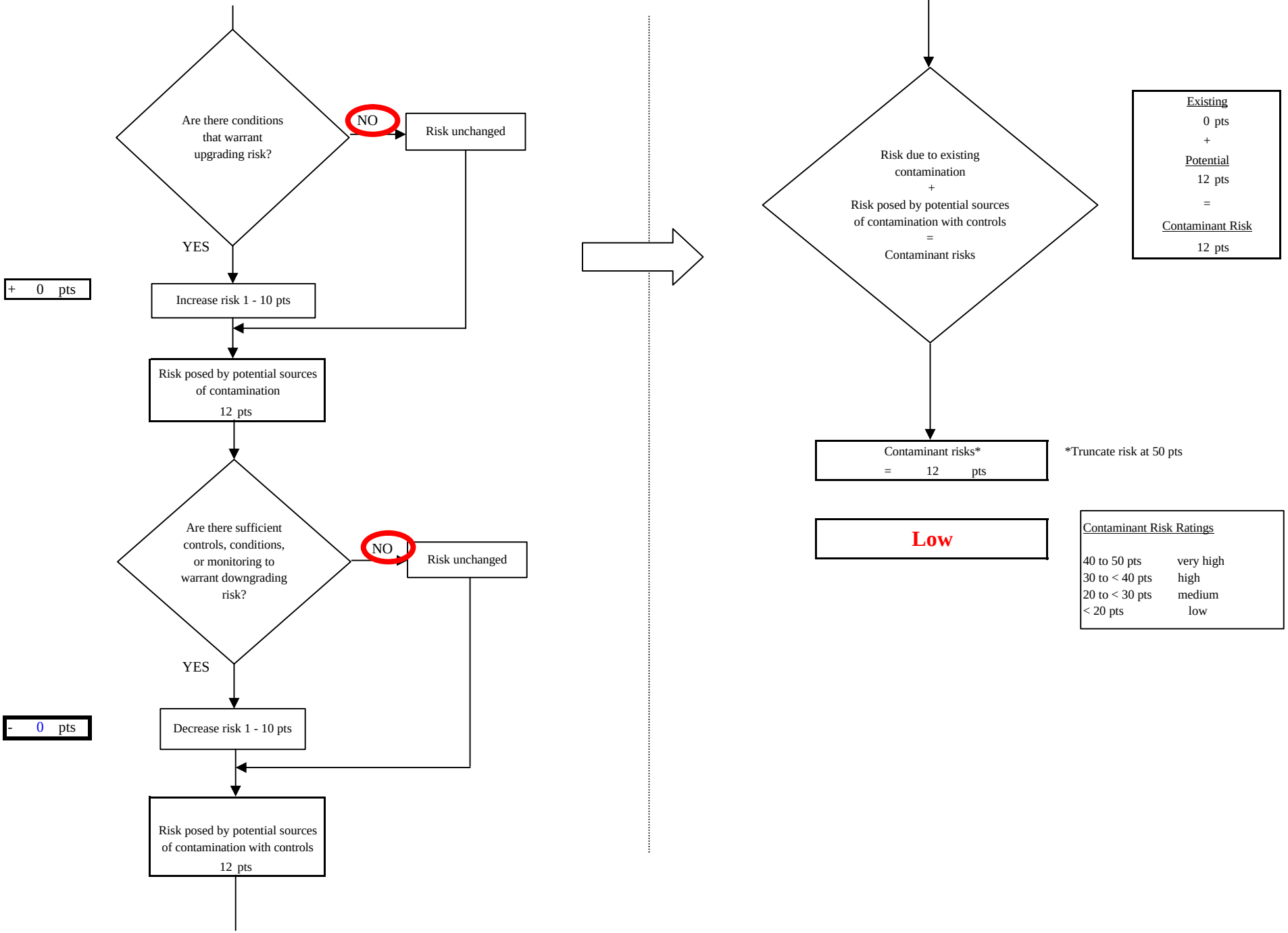


Chart 6. Vulnerability Analysis for Automax - Nitrates and Nitrites

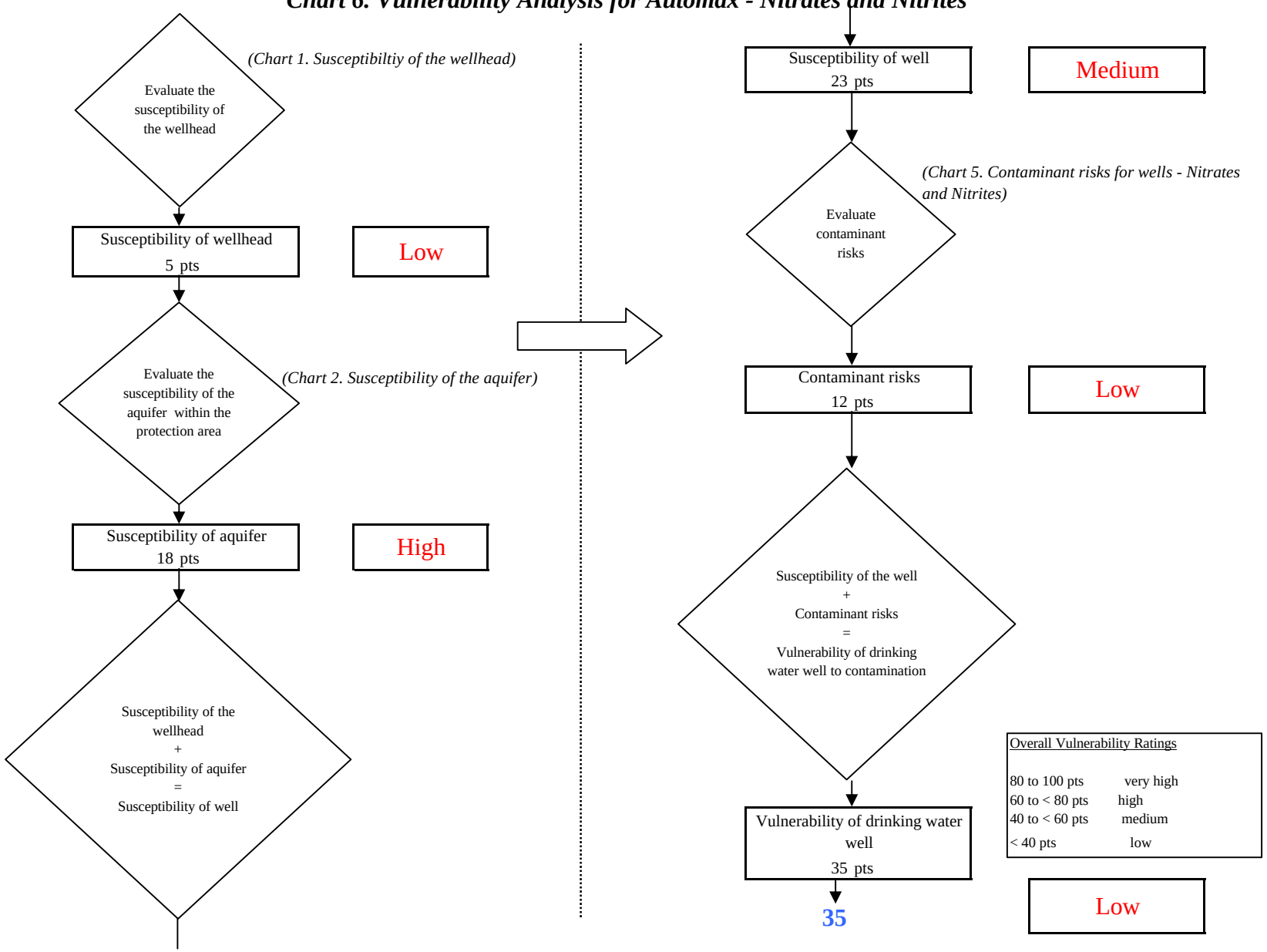


Chart 7. Contaminant Risks for Automax - Volatile Organic Chemicals

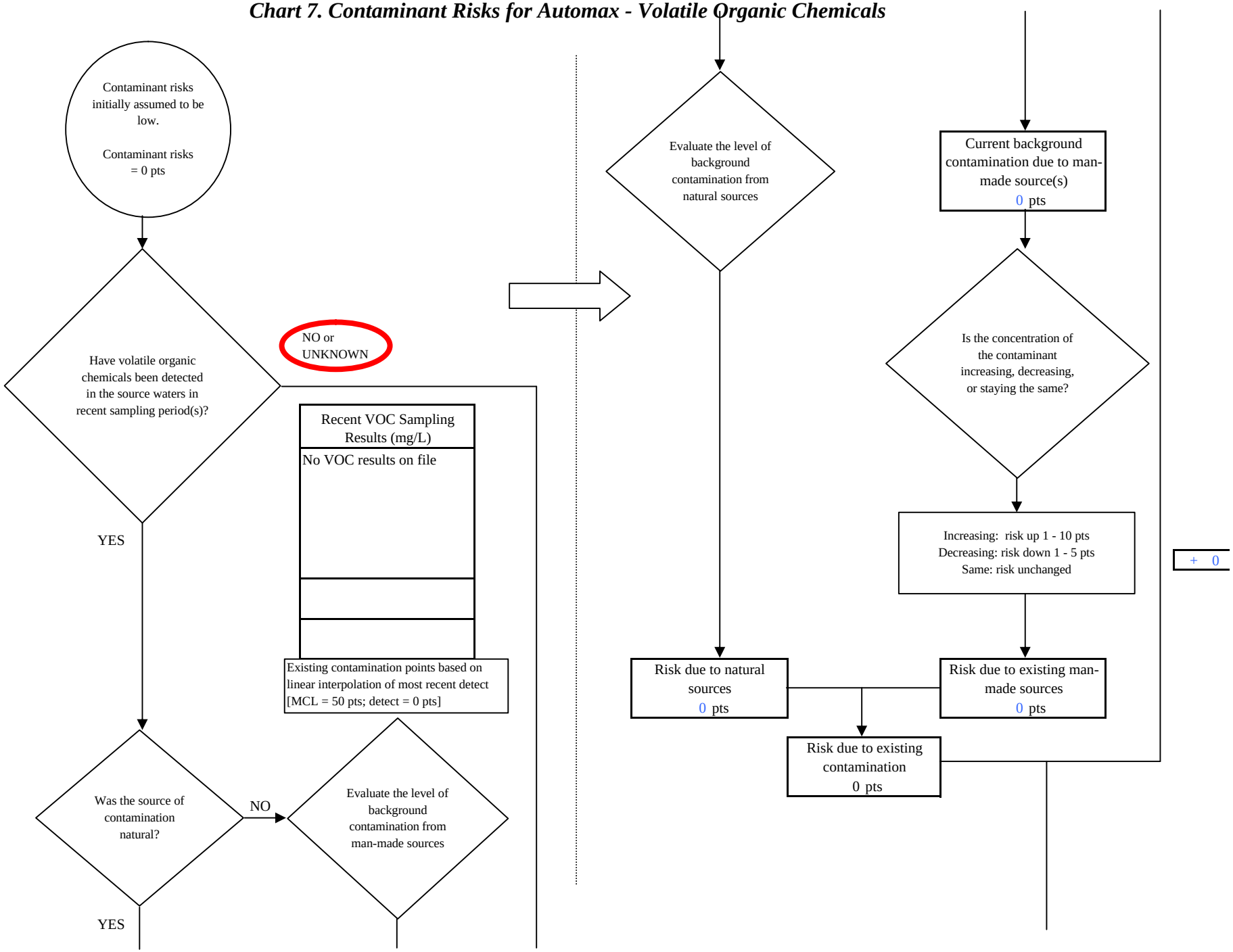


Chart 7. Contaminant Risks for Automax - Volatile Organic Chemicals

+ 40 pts

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

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

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	0	5	5
Medium(s)	0	3	3
Low(s)	1	5	6

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

Matrix Score 40

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

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

Are any significant sources within Zone A?

NO

Risk unchanged

YES

Increase risk 1 - 10 pts

+ 2

Chart 7. Contaminant Risks for Automax - Volatile Organic Chemicals

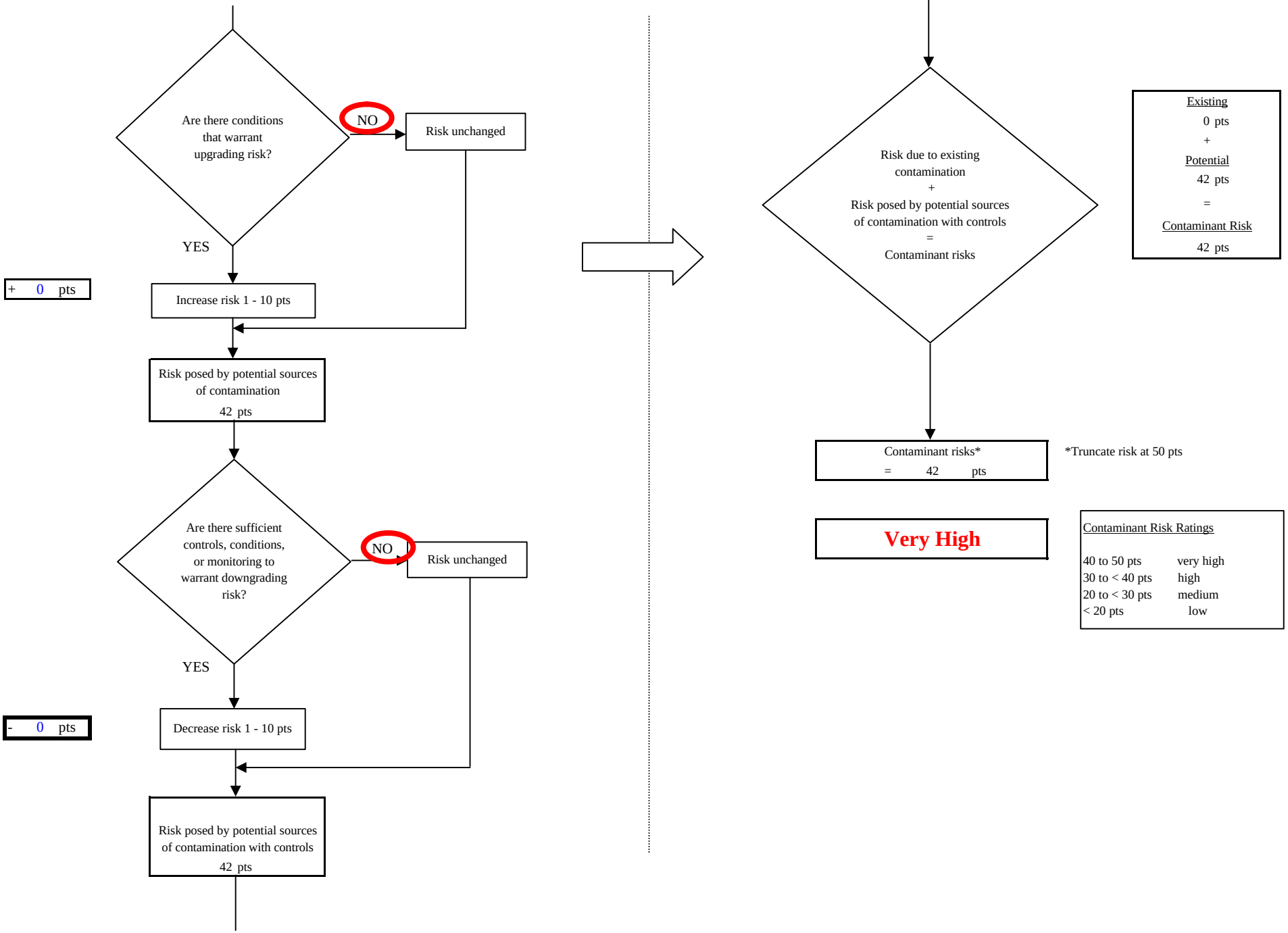


Chart 8. Vulnerability Analysis for Automax - Volatile Organic Chemicals