



Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for LYSD Pilot Station High School Drinking Water System, Pilot Station, Alaska

PWSID # 271415.001

April 2004

DRINKING WATER PROTECTION PROGRAM REPORT 1134 Alaska Department of Environmental Conservation

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DRINKING WATER PROTECTION PROGRAM REPORT 1134

The Drinking Water Protection Program (DWPP) 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. It is anticipated this assessment will be updated every five years to reflect any changes in the vulnerability and/or susceptibility of public drinking water source. 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 LYSD Pilot Station High School Source of Public Drinking Water, Pilot Station, Alaska

Drinking Water Protection Program Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The LYSD Pilot Station High School has one Public Water System (PWS) well. The well (PWS No. 271415.001) has been used as a drinking water source since it was drilled in 1979.

The well is a Class A (community and non-transient non-community) water system located off of Airport Road in Pilot Station, Alaska. Sanitary survey records were not available through ADEC; therefore, it is unknown if there is secondary storage of drinking water, or if the drinking water source is treated or derived directly from the wellhead. It is assumed that this system operates seasonally and serves approximately 50 residents and 100 non-residents. The wellhead received a susceptibility rating of **Very High** and the aquifer received a susceptibility rating of **High**. Combining these two ratings produce a **Very High** rating for the natural susceptibility of the well.

Identified potential and current sources of contaminants for the public drinking water source include: aboveground fuel tanks, a petroleum product bulk station/terminal, an airport, and roads. These identified potential and existing sources of contamination are considered as sources of bacteria and viruses, nitrates and/or nitrites, volatile organic chemicals, heavy metals, cyanide and other inorganic chemicals, synthetic organic chemicals, and other organic chemicals contaminant categories.

Overall, the water well received a vulnerability rating of **Medium** for bacteria and viruses, and heavy metals, cyanide and other inorganic chemicals, a vulnerability rating of **High** for nitrates and nitrites and synthetic organic chemicals, and a vulnerability rating of **Very High** for volatile organic chemicals and other organic chemicals.

PUBLIC DRINKING WATER SYSTEM

The LYSD Pilot Station High School well is a Class A (community/non-transient/non-community) public water system. The system is located off of Airport

Road in Pilot Station, Alaska (Sec. 5, T21N, R74W, Seward Meridian; see Map A of Appendix A). Pilot Station is located on the northwest bank of the Yukon River. The community is 11 miles east of St. Mary's and 26 miles west of Marshall on the Yukon-Kuskokwim Delta. Pilot Station has a population of 564 (ADCED, 2003). Average annual precipitation in Pilot Station is 16 inches, including approximately 60 inches of snowfall. Temperatures range from -44 to 83°F.

The community of Pilot Station obtains most of their water supply from community wells. Most households are served by the piped sewage collection system and the remaining households haul honey buckets (ADCED, 2003). Pilot Station receives electrical power from AVEC, a REA Cooperative. Power generating facilities are fueled by diesel. Refuse is collected by the City of Pilot Station and transported to the landfill (ADCED, 2003).

According to information supplied by the well operator for the LYSD Pilot Station High School PWS, the depth of the primary water well is 85 feet below the ground surface. Well construction details are unknown; however it is assumed that the well is screened in a confined aquifer based on available well construction details for surrounding wells. The well is not located within a floodplain.

Sanitary survey records for the public water system were not available through ADEC; therefore it is unknown if the land surface is sloped away from the well. Generally, land surfaces that slope away from the wellhead promote surface water drainage, which reduces the potential of contaminant migration down the well casing annulus. It is also unknown if the well is grouted according to ADEC regulations. Proper grouting provides added protection against contaminants traveling along the well casing annulus and into source waters.

Pilot Station is located within the Yukon Delta National Wildlife Refuge in southwestern Alaska. The bedrock in the area consists primarily of sandstone, which form well defined northeast trending hills. The hills are composed of a thick sequence of interbedded marine and nonmarine deposits. Soils generally consist of poorly drained mineral soils, organic rich soils, and well-drained mineral soils. Pilot Station is located in an area known to be underlain by a layer of discontinuous permafrost (Nakanishi & Dorava, 1994).

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. 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 protection area 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 for the LYSD Pilot Station High School PWS. The input parameters describing the attributes of the aquifer in this calculation were adopted from Groundwater (Freeze and Cherry, 1979). Available geology and groundwater contours were also considered to take into account any uncertainties in groundwater flow and aquifer characteristics to arrive at a meaningful protection area.

The protection areas 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 (Please refer to the Guidance Manual for Class A Public Water Systems for additional information).

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 protection area zones for wells and the calculated time -of-travel for each:

Table 1. Definition of Zones

Definition
¹ / ₄ the distance for the 2-yr. time -of-travel
Less than the 2 year time-of-travel
Less Than the 5 year time -of-travel
Less than the 10 year time-of-travel

The DWPA for the LYSD Pilot Station High School PWS was determined using an analytical calculation and includes Zones A, B, and D (See Map A 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 LYSD Pilot Station High School 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,
- Other organic chemicals.

The sources are displayed on Map C 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 assigned a ranking 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. Rankings include:

- Low,
- Medium,
- High, and
- Very High.

The time-of-travel for contaminants within the water varies and is dependent on the physical and chemical characteristics of each contaminant. Bacteria and Viruses are only inventoried in Zones A and B

because of their short life span. Only "Very High" and "High" rankings are inventoried within the outer Zone D due to the probability of contaminant dilution by the time the contaminants get to the well. 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, volatile organic chemicals, heavy metals, cyanide and other inorganic chemicals, synthetic organic chemicals, and other organic chemicals.

VULNERABILITY OF THE DRINKING WATER SYSTEM

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

- Natural susceptibility, and
- Contaminant risks.

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. 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, cyanide and other inorganic chemicals, synthetic organic chemicals, and other organic chemicals, respectively.

A score for the Natural Susceptibility is reached by considering the properties of the well and the aquifer.

Susceptibility of the Wellhead (0 – 25 Points) (Chart 1 of Appendix D)

Susceptibility of the Aquifer (0 – 25 Points) (Chart 2 of Appendix D)

=

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

A ranking is assigned for the Natural Susceptibility according to the point score:

Natural Susceptibility Ratings						
40 to 50 pts	Very High					
30 to < 40 pts	High					
20 to < 30 pts	Medium					
< 20 pts	Low					

The LYSD Pilot Station High School's water well is in a confined aquifer. Confined aquifers are less susceptible to potential groundwater quality impacts posed by the migration of surface water contaminants downward from the surface. Table 2 shows the susceptibility scores and ratings for this PWS.

Table 2. Susceptibility

	Score	Rating
Susceptibility of the	25	Very High
Wellhead		
Susceptibility of the	15	High
Aquifer		
Natural Susceptibility	40	Very High

Contaminant risks to a drinking water source depend on the type, number or density, and distribution of contaminant sources. This score 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. Flow charts are used to assign a point score, and ratings are assigned in the same way as for the natural susceptibility:

Contami	Contaminant Risk Ratings							
40 to 50 30 to < 4 20 to < 3 < 20 pts	0 pts	Very High High Medium Low						

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	25	Medium
Volatile Organic Chemical	ls 50	Very High
Heavy Metals, Cyanide an	ıd	
Other Inorganic Chemicals	12	Low
Synthetic Organic Chemic	als 25	Medium
Other Organic Chemicals	40	Very High

Finally, an overall vulnerability score is assigned for each water system by combining each of the contaminant risk scores with the natural susceptibility score:

Natural Susceptibility (0 – 50 points)

+

Contaminant Risks (0 – 50 points)

=

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

Again, rankings are assigned according to a point score:

Overall Vulnerability Ratings							
80 to 100 pts	Very High						
60 to < 80 pts	High						
40 to < 60 pts	Medium						
< 40 pts	Low						

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

Rating
Medium
High
Very High
Medium
High
Very High

Bacteria and Viruses

The contaminant risk for bacteria and viruses is **Low**. The risk is primarily attributed to the presence of roads in Zone A (see Table 2 – Appendix B).

No positive bacteria counts have been reported in recent (within five years) sampling events (See Chart 3 – Contaminant Risks for Bacteria and Viruses in Appendix D). Only a small amount of bacteria and viruses are required to endanger public health.

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 **Medium**.

Nitrates and Nitrites

The contaminant risk for nitrates and nitrites is **Medium**. The risk to this source of public drinking water is primarily attributed to the presence of an airport and roads in Zones A and B (see Table 3 – Appendix B).

Nitrates are very mobile, moving at approximately the same rate as water. The sampling history for this well indicates that moderate levels of nitrates have been detected in recent sampling events. However, the reported concentrations of nitrates do not exceed the maximum contaminant level (MCL) of 10 mg/L. Nitrate concentrations in uncontaminated groundwater are typically less than 2 mg/L; therefore, nitrate concentrations above 2 mg/L may be indicative of man-made sources (See Chart 5 - Contaminant Risks for Nitrates and/or Nitrites in Appendix D).

Nitrate levels are often derived from the decomposition of organic matter in soils. Although the nitrate source is unknown, such occurrences may be attributed to septic systems or other sources. After combining the contaminant risk for nitrates and nitrites with the natural susceptibility of the well, the overall vulnerability of the well to nitrate and nitrite contamination is **High**.

Volatile Organic Chemicals

The contaminant risk for volatile organic chemicals is **Very High**. The risk is primarily attributed to the presence of a petroleum product bulk station/terminal and an airport located in Zones A and B. Several other potential contaminant sources are also found within the protection area (see Table 4 – Appendix B).

All recent sampling data for VOCs were below detection levels for the LYSD Pilot Station High School (See Chart 7 – Contaminant Risks for Volatile Organic Chemicals in Appendix D).

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 **Very High**

Heavy Metals, Cyanide and Other Inorganic Chemicals

The contaminant risk for heavy metals, cyanide and other inorganic chemicals is **Low**. The risk is primarily attributed to the lack of contaminant sources present (see Table 5 – Appendix B).

Based on review of recent sampling records for this public water system, moderate levels of copper have been detected, but have not exceeded the MCL of 1.3 mg/L (see Chart 9 – Contaminant Risks for Heavy Metals, Cyanide, and Other Inorganic Chemicals in Appendix D).

The reported concentrations of copper in recent sampling events are not likely to be representative of source water conditions. This analyte is likely attributed to either the water treatment process or water distribution network; therefore, no risk points were assigned based on the presence of this analyte.

After combining the contaminant risk for heavy metals, cyanide and other inorganic chemicals with the natural susceptibility of the well, the overall vulnerability of the well to contamination is **Medium**.

Synthetic Organic Chemicals

The contaminant risk for synthetic organic chemicals is **Medium**. The risk is primarily attributed to the presence of an airport located in Zones A and B (see Table 6 – Appendix B).

No recent sampling data was available in ADEC records for the LYSD Pilot Station High School (See Chart 11 – Contaminant Risks for Synthetic Organic Chemicals in Appendix D).

After combining the contaminant risk for synthetic organic chemicals with the natural susceptibility of the well, the overall vulnerability of the well to contamination is **High**.

Other Organic Chemicals

The contaminant risk for other organic chemicals is **Very High**. The risk is primarily attributed to the presence of a petroleum product bulk station/terminal

in Zone A. Several other potential contaminant sources are also found within the protection area (see Table 7 – Appendix B).

No recent sampling data was available in ADEC records for the LYSD Pilot Station High School (See Chart 13 – Contaminant Risks for Other Organic Chemicals in Appendix D).

After combining the contaminant risk for other organic chemicals with the natural susceptibility of the well, the overall vulnerability of the well to contamination is **Very High**

Using the Source Water Assessment

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 the LYSD Pilot Station High School and the community of Pilot Station 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 the drinking water source.

REFERENCES

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- Alaska Department of Environmental Conservation, Contaminated Sites Database, 2003 [WWW database], URL http://www.state.ak.us/dec/dspar/csites/cs search.htm
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- Freeze, R. A., and Cherry, J.A. 1979, Groundwater, Prentice-Hall, Englewood Cliffs, New Jersey
- Nakanishi, A.S., and Dorava, J.M. 1994, Overview of Environmental and Hydrogeologic Conditions at St. Mary's, Alaska, U.S. Geological Survey Open File Report 94-481, prepared in cooperation with the FAA.
- United States Environmental Protection Agency (EPA), 2002 [WWW document]. URL http://www.epa.gov/safewater/mcl.html.

APPENDIX A

Drinking Water Protection Area Location Map (Map A)

Public Water Well System for PWS #271415.001 LYSD Pilot Station High School **LEGEND** Public Water System Well Hydrography/Physical Parcels Lake or Pond Contours Watershed Boundary Transportation ---- Primary Route (Class 1) Secondary Route (Class 2) Road (Class 3) Road (Class 4) Road (Class 5, Four-wheel drive) **Groundwater Protection Zones** Zone A Protection Area— Several Months Travel Time LYSD Pilot Station High School PWS 271415.001 Zone B Protection Area- 2 Years Travel Time Zone D Protection Area— 10 Years Travel Time or Watershed Boundary Contaminant Sources, Public Water System Wells, Contours Alaska Department of Environmental Conservation (ADEC) Critical Facilities, Federal Emergency Management Agency (FEMA) All other data: United States Geological Survey (USGS) Drinking Water Protection Areas based on "Alaska Drinking Water Protection Program - Guidance Manual for Class A Public Water Systems" published by ADEC URS Corporation does not guarantee the accuracy or validity of the data provided. 9 Mountain Village Pitkas Point Saint Mary's _Pilot Station Area of Map 1 LYSD Pilot Station High School PWS 271415.001 Appendix A Map A

APPENDIX B

Contaminant Source Inventory and Risk Ranking (Tables 1-7)

Contaminant Source Inventory for LYSD Pilot Station High School

PWSID 271415.001

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Map Number	Comments
Tanks, heating oil, nonresidential (aboveground)	T14	T14-01	A	C	LYSD
Petroleum product bulk station/terminals	X11	X11-01	A	С	LYSD
Airports	X14	X14-01	A	С	
Highways and roads, dirt/gravel	X24	X24-01	A	C	Assume 1-20 roads in Zone A
Airports	X14	X14-02	В	C	

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Table 2

Contaminant Source Inventory and Risk Ranking for LYSD Pilot Station High School 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	X24-01	A	Low	С	Assume 1-20 roads in Zone A

Table 3

Contaminant Source Inventory and Risk Ranking for LYSD Pilot Station High School Sources of Nitrates/Nitrites

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Map Number	Comments
Airports	X14	X14-01	A	Low	С	
Highways and roads, dirt/gravel	X24	X24-01	A	Low	С	Assume 1-20 roads in Zone A
Airports	X14	X14-02	В	Low	С	

Table 4

Contaminant Source Inventory and Risk Ranking for LYSD Pilot Station High School Sources of Volatile Organic Chemicals

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Map Number	Comments
Tanks, heating oil, nonresidential (aboveground)	T14	T14-01	A	Low	C	LYSD
Petroleum product bulk station/terminals	X11	X11-01	A	Very High	С	LYSD
Airports	X14	X14-01	A	High	С	
Highways and roads, dirt/gravel	X24	X24-01	A	Low	С	Assume 1-20 roads in Zone A
Airports	X14	X14-02	В	High	С	

Table 5

Contaminant Source Inventory and Risk Ranking for LYSD Pilot Station High School Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Map Number	Comments
Tanks, heating oil, nonresidential (aboveground)	T14	T14-01	A	Low	C	LYSD
Petroleum product bulk station/terminals	X11	X11-01	A	Low	С	LYSD
Airports	X14	X14-01	A	Low	С	
Highways and roads, dirt/gravel	X24	X24-01	A	Low	С	Assume 1-20 roads in Zone A
Airports	X14	X14-02	В	Low	С	

Table 6

Contaminant Source Inventory and Risk Ranking for LYSD Pilot Station High School Sources of Synthetic Organic Chemicals

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Map Number	Comments
Petroleum product bulk station/terminals	X11	X11-01	A	Low	С	LYSD
Airports	X14	X14-01	A	Medium	С	
Airports	X14	X14-02	В	Medium	С	

Table 7

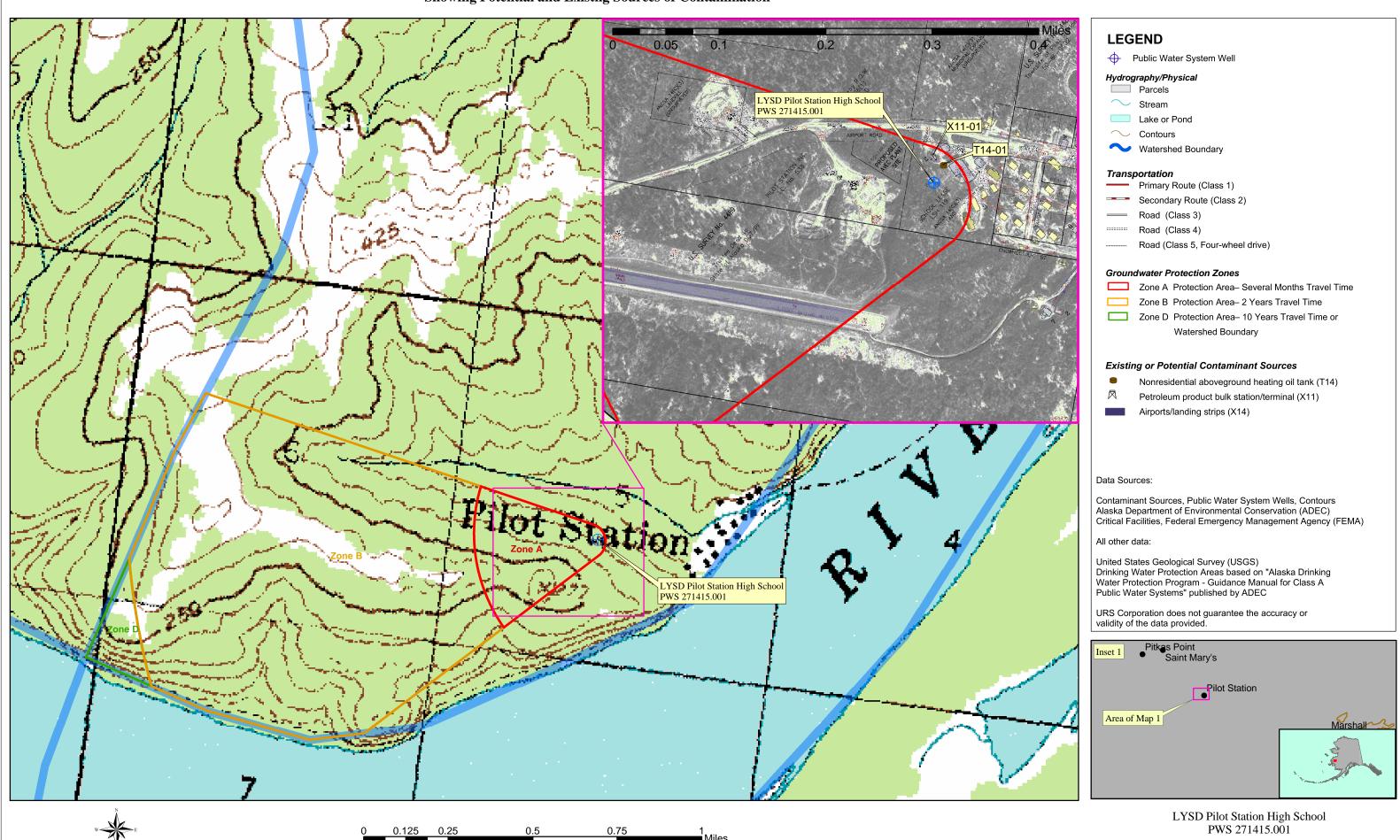
Contaminant Source Inventory and Risk Ranking for LYSD Pilot Station High School Sources of Other Organic Chemicals

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Map Number	Comments
Petroleum product bulk station/terminals	X11	X11-01	A	High	C	LYSD
Airports	X14	X14-01	A	Medium	С	
Highways and roads, dirt/gravel	X24	X24-01	A	Low	С	Assume 1-20 roads in Zone A
Airports	X14	X14-02	В	Medium	С	

APPENDIX C

Drinking Water Protection Area and Potential and Existing Contaminant Sources (Map C)

Public Water Well System for PWS #271415.001 LYSD Pilot Station High School Showing Potential and Existing Sources of Contamination



Appendix C Map C

APPENDIX D

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

Susceptibility initially assumed to be low. Susceptibility of wellhead = 0 pts Well details are unknown as no information was available from ADEC regarding this PWSID. NO Is the well Increase susceptibility 5 pts + 5 pts properly NO grouted? Is the well Increase susceptibility 20 pts + 20 pts capped? YES YES Very High Susceptibility of wellhead 25 pts Increase susceptibility: YES Is the well 10 pts: suspected floodplain + 0 pts within a Wellhead Susceptibility Ratings 20 pts: known floodplain floodplain? 20 to 25 pts very high 15 to < 20 pts 10 to < 15 pts medium < 10 pts low Is the land NO surface sloped Increase susceptibility 5 pts 0 pts away from the

Chart 1. Susceptibility of the wellhead - LYSD Pilot Station High School (PWS No. 271415.001)

Chart 2. Susceptibility of the aquifer LYSD Pilot Station High School (PWS No. 271415.001)

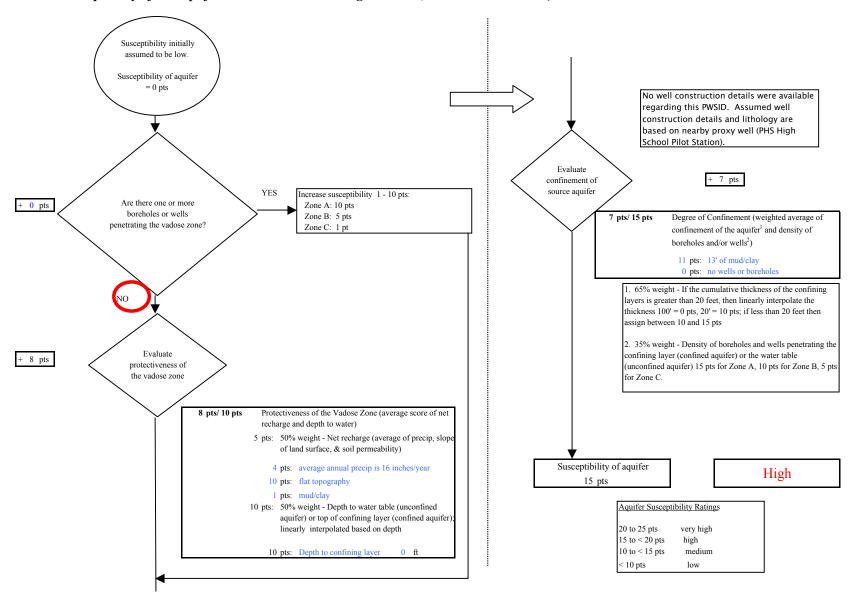


Chart 3. Contaminant risks for LYSD Pilot Station High School (PWS No. 271415.001) - Bacteria & Viruses

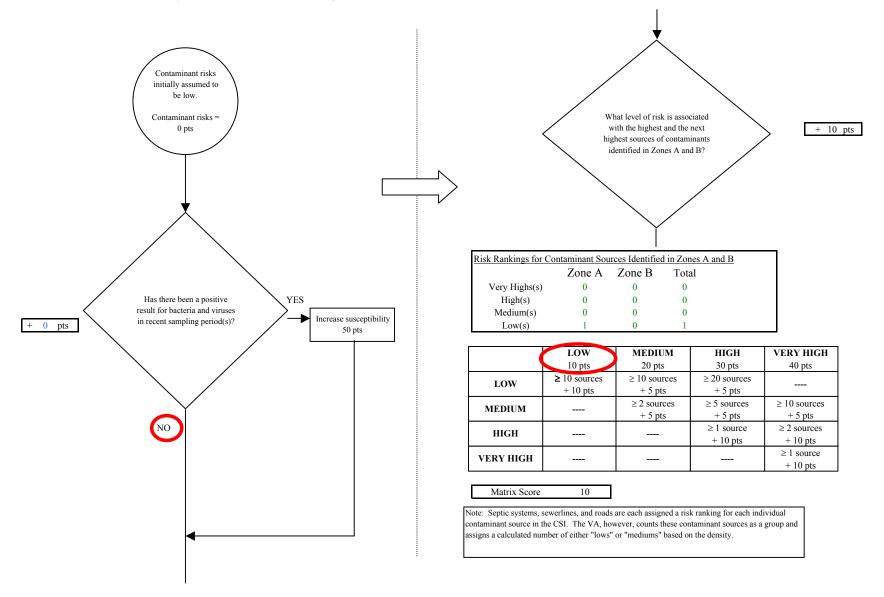


Chart 3. Contaminant risks for LYSD Pilot Station High School (PWS No. 271415.001) - Bacteria & Viruses NO Are there sufficient Initial assessment of risk posed by Risk unchanged controls, conditions, or potential sources of contamination monitoring to warrant = 10 pts downgrading risk? Are any YES significant Risk unchanged contaminant Reduce risk 1 - 10 pts sources within - 0 pts Zone A? The number and magnitude of Risk posed by potential sources of contaminant sources in YES contamination with controls Zone A determines a risk increase. See Table 2 for 12 2 pts Increase risk 1 - 10 pts inventory. Existing Risk due to existing 0 pts contamination Are there any conditions that Risk unchanged Risk posed by potential sources warrant upgrading Potential of contamination with controls risk? 12 pts Contaminant risks Contaminant Risk YES 12 pts Increase risk 1 - 10 pts + 0 pts Contaminant risks* * Truncate risk at 50 pts 12 Contaminant Risk Ratings Risk posed by potential sources of contamination 40 to 50 pts very high = 12 30 to < 40 pts high Low $20 \text{ to} \le 30 \text{ pts}$

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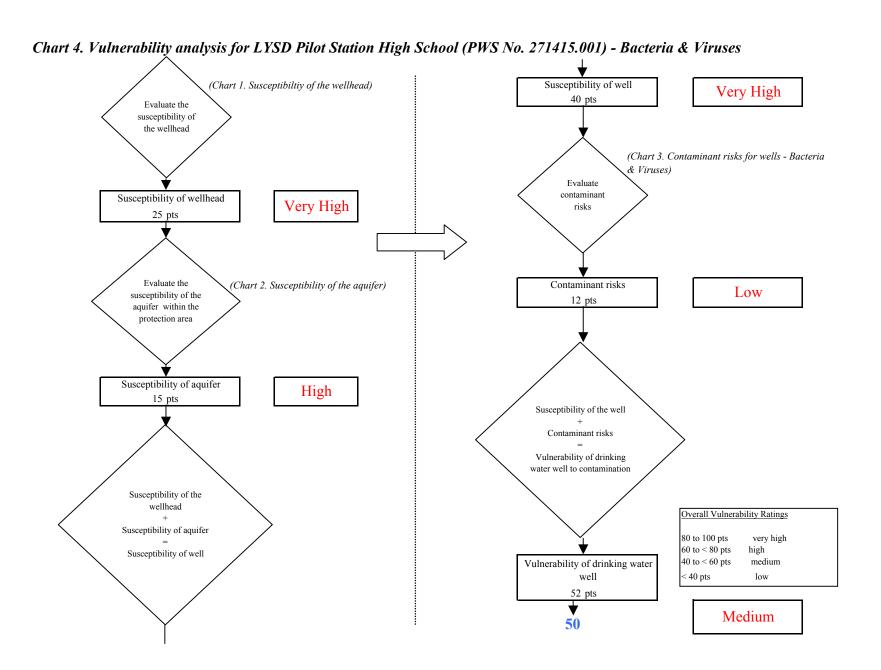


Chart 5. Contaminant risks for LYSD Pilot Station High School (PWS No. 271415.001) - Nitrates and Nitrites Contaminant risks initially assumed to be low. Current level of Evaluate the level of Contaminant risks background contamination due to man-= 0 pts contamination from made source(s) natural sources 13 pts Is the concentration of Has nitrates and/or NO the contaminant nitrites been detected in increasing, decreasing, the source waters in or staying the same? recent sampling period(s)? Recent Nitrate Sampling Results (mg/L) 4/19/2001 2.69 12/8/1998 3.01 The nitrate concentration is assumed to be natural if less than 2 mg/L (20%), or Increasing: risk up 1 - 10 pts YES attributed to man made Decreasing: risk down 1 - 5 pts sources if greater than 2 + 0 pts Same: risk unchanged mg/L. Maximum Contaminant Level (MCL) = 10 mg/LDetected Nitrate Level = Existing contamination points based on Risk due to existing man-Risk due to natural linear interpolation of most recent detect sources made sources [MCL = 50 pts; detect = 0 pts]0 pts 13 pts Risk due to existing contamination 13 pts Was the source of Evaluate the level of NO contamination contamination from natural? man-made sources YES

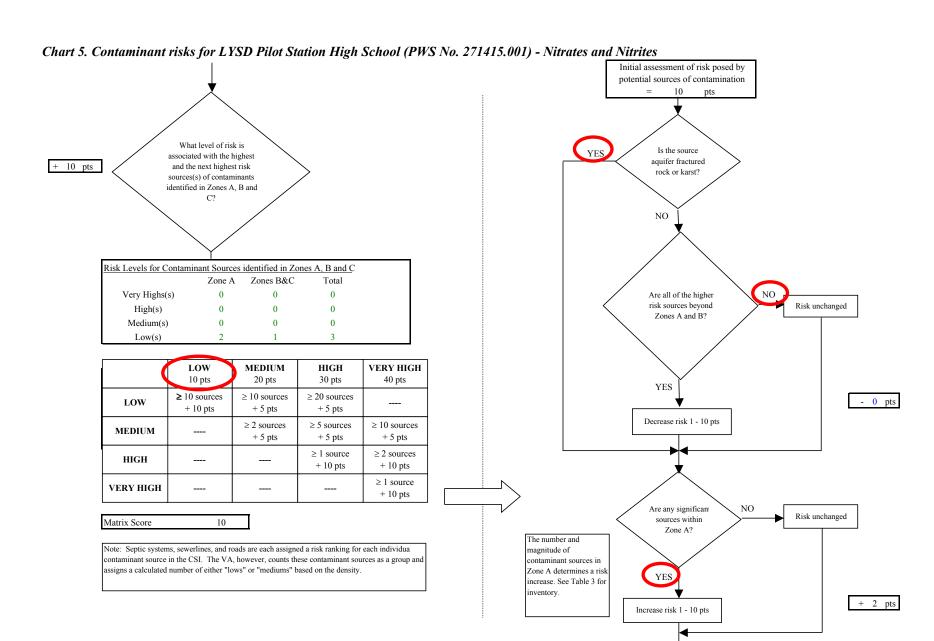
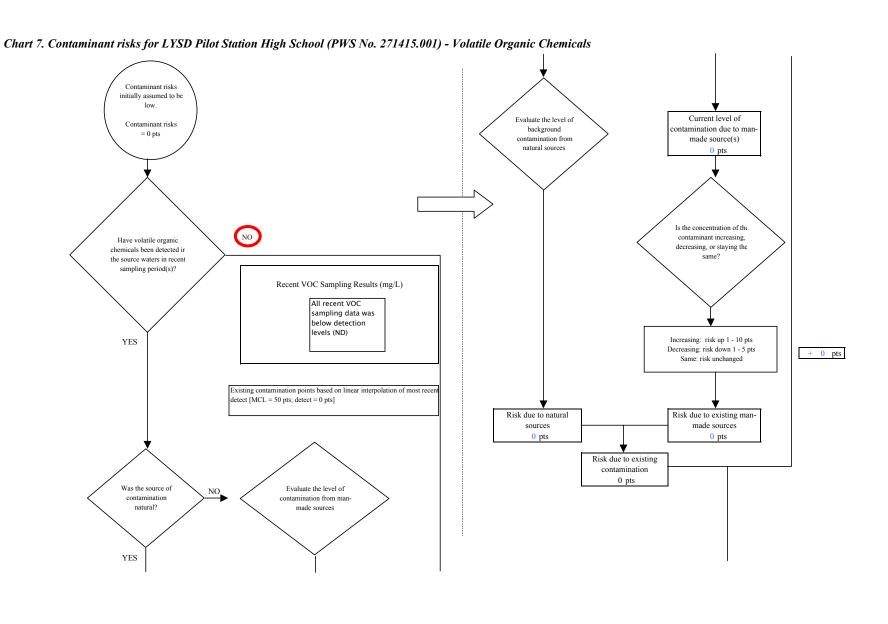


Chart 5. Contaminant risks for LYSD Pilot Station High School (PWS No. 271415.001) - Nitrates and Nitrites Existing NO Are there conditions 13 pts Risk unchanged that warrant upgrading risk? Risk due to existing Potential contamination 12 pts The number and magnitude of Risk posed by potential sources contaminant sources in of contamination with controls Contaminant Risk Zone D determines a risk YES 25 pts increase. See Table 3 for Contaminant risks inventory. 0 pts Increase risk 1 - 10 pts Risk posed by potential sources of contamination 12 pts *Truncate risk at 50 pts Contaminant risks* 25 Contaminant Risk Ratings Are there sufficient **Medium** controls, conditions, NO. Risk unchanged or monitoring to 40 to 50 pts very high warrant downgrading 30 to < 40 pts high 20 to < 30 pts risk? medium < 20 pts low YES 0 pts Decrease risk 1 - 10 pts Risk posed by potential sources of contamination with controls

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Chart 6. Vulnerability analysis for LYSD Pilot Station High School (PWS No. 271415.001) - Nitrates and Nitrites (Chart 1. Susceptibiltiy of the wellhead) Susceptibility of well Very High 40 pts Evaluate the susceptibility of the wellhead (Chart 5. Contaminant risks for wells - Nitrates and Nitrites) Evaluate Susceptibility of wellhead contaminant risks Very High 25 pts Evaluate the (Chart 2. Susceptibility of the aquifer) Contaminant risks Medium susceptibility of the 25 pts aquifer within the protection area Susceptibility of aquifer High 15 pts Susceptibility of the well Contaminant risks Vulnerability of drinking water well to contamination Susceptibility of the wellhead Overall Vulnerability Ratings Susceptibility of aquifer 80 to 100 pts very high Susceptibility of well 60 to < 80 pts high 40 to < 60 pts medium Vulnerability of drinking water well < 40 pts 65 pts High **65**

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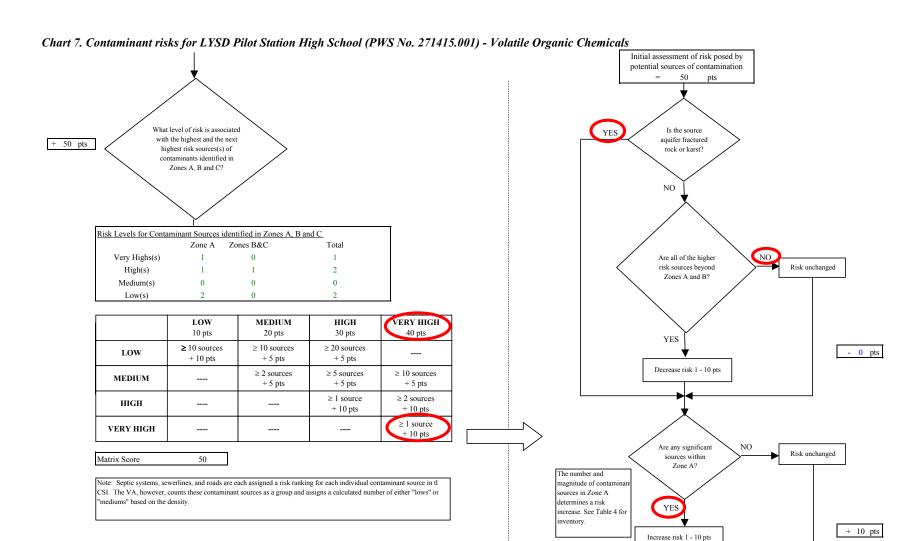


Chart 7. Contaminant risks for LYSD Pilot Station High School (PWS No. 271415.001) - Volatile Organic Chemicals Existing NO Are there conditions 0 pts Risk unchanged that warrant upgrading Risk due to existing risk? Potential contamination The number and 60 pts magnitude of Risk posed by potential sources contaminant sources in of contamination with controls Contaminant Risk Zone D determines a risk YES increase. See Table 4 for 60 pts Contaminant risks inventory. + 0 pts Increase risk 1 - 10 pts Risk posed by potential sources of contamination 60 pts *Truncate risk at 50 pts Contaminant risks* Contaminant Risk Ratings Are there sufficient Very High NO , controls, conditions, or Risk unchanged 40 to 50 pts very high monitoring to warrant 30 to < 40 pts high downgrading risk? 20 to < 30 pts medium < 20 pts YES 0 pts Decrease risk 1 - 10 pts Risk posed by potential sources of contamination with controls 60 pts

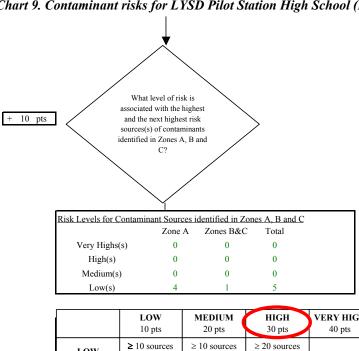
Chart 8. Vulnerability analysis for LYSD Pilot Station High School (PWS No. 271415.001) - Volatile Organic Chemicals (Chart 1. Susceptibiltiy of the wellhead) Susceptibility of well Very High 40 pts Evaluate the susceptibility of the wellhead (Chart 7. Contaminant risks for wells - Volatile Organic Chemicals) Evaluate Susceptibility of wellhead contaminant risks Very High 25 pts Evaluate the (Chart 2. Susceptibility of the aquifer) Contaminant risks Very High susceptibility of the 50 pts aquifer within the protection area Susceptibility of aquifer High 15 pts Susceptibility of the well Contaminant risks Vulnerability of drinking water well to contamination Susceptibility of the wellhead Overall Vulnerability Ratings Susceptibility of aquifer 80 to 100 pts very high Susceptibility of well 60 to < 80 pts high 40 to < 60 pts medium Vulnerability of drinking water well < 40 pts 90 pts Very High 90

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Chart 9. Contaminant risks for LYSD Pilot Station High School (PWS No. 271415.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals Contaminant risks initially assumed to be low. Current level of Evaluate the level of Contaminant risks contamination due to manbackground = 0 ptscontamination from made source(s) natural sources 48 pts The reported concentrations of copper NO or are likely attributed to the Is the concentration of Have heavy metals, UNKNOWN water the contaminant cyanide or other inorganic treatment/conveyance increasing, decreasing, chemicals been detected system. No risk points or staying the same? in the source waters in assigned since the analyte recent sampling period(s)? did not exceed 100% of Recent Metals Sampling Results (mg/L the MCL in most recent sampling event. 12/31/2001 0.962 0.892 12/31/1999 6/30/1999 1.24 YES Increasing: risk up 1 - 10 pts Decreasing: risk down 1 - 5 pts + -48 pts Same: risk unchanged Maximum Contaminant Although other inorganic compounds have Level (MCL) (mg/L) % of MCI been detected in previous sampling events, Copper= copper has reported the highest percent MCL values in the past 5 years. Risk due to existing man-Risk due to natural Existing contamination points based on linear sources made sources interpolation of most recent detect [MCL = 50 pts; 0 pts 0 pts detect = 0 ptsRisk due to existing contamination 0 pts Evaluate the level Was the source of NO. of contamination contamination from man-made natural? sources YES

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Chart 9. Contaminant risks for LYSD Pilot Station High School (PWS No. 271415.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals



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

Matrix Score 10

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

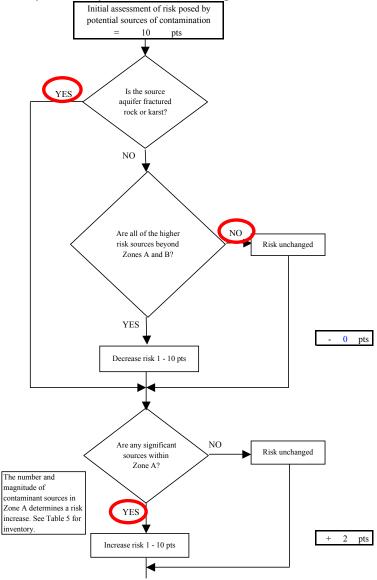
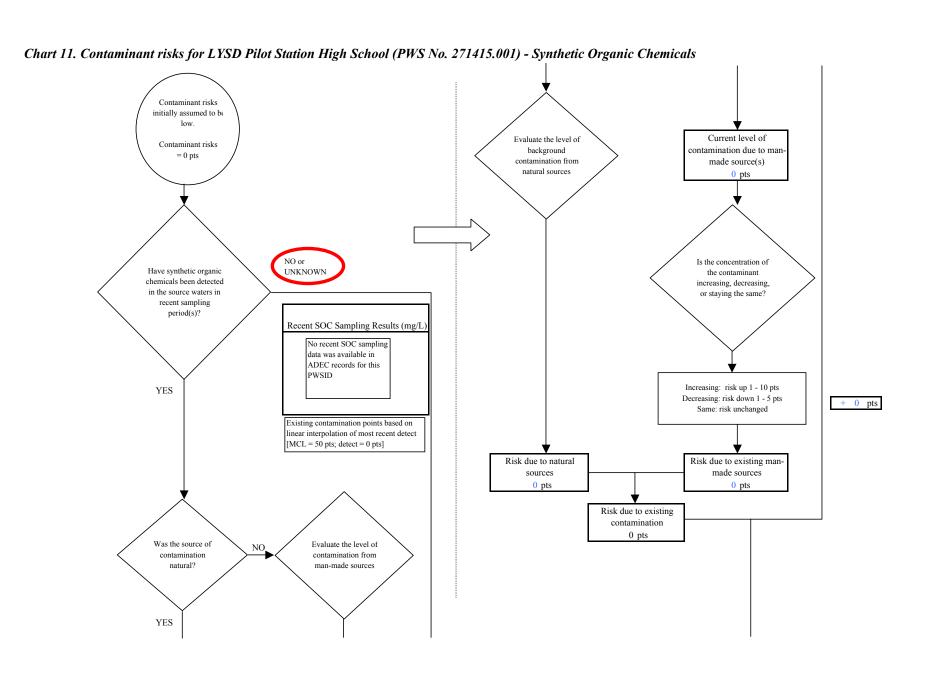


Chart 9. Contaminant risks for LYSD Pilot Station High School (PWS No. 271415.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals Existing Are there conditions 0 pts Risk unchanged upgrading risk? Risk due to existing Potential contamination 12 pts The number and magnitude of Risk posed by potential sources contaminant sources in of contamination with controls Contaminant Risk Zone D determines a YES 12 pts risk increase. See Table Contaminant risks 5 for inventory. 0 pts Increase risk 1 - 10 pts Risk posed by potential sources of contamination 12 pts Contaminant risks* *Truncate risk at 50 pts 12 Contaminant Risk Ratings Are there sufficient Low NQ controls, conditions, Risk unchanged 40 to 50 pts very high or monitoring to 30 to < 40 pts warrant downgrading high risk? 20 to < 30 pts medium < 20 pts low YES 0 pts Decrease risk 1 - 10 pts Risk posed by potential sources of contamination with controls 12 pts

Chart 10. Vulnerability analysis for LYSD Pilot Station High School (PWS No. 271415.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals (Chart 1. Susceptibiltiy of the wellhead) Susceptibility of well Very High 40 pts Evaluate the susceptibility of the wellhead (Chart 9. Contaminant risks for wells - Heavy Metals, Cyanide and Other Inorganic Evaluate Chemicals) contaminant Susceptibility of wellhead Very High 25 pts Evaluate the (Chart 2. Susceptibility of the aquifer) Contaminant risks Low susceptibility of the 12 pts aquifer within the protection area Susceptibility of aquifer High 15 pts Susceptibility of the well Contaminant risks Vulnerability of drinking water well to contamination Susceptibility of the wellhead Overall Vulnerability Ratings Susceptibility of aquifer 80 to 100 pts very high 60 to < 80 pts Susceptibility of well high 40 to < 60 pts Vulnerability of drinking water medium well 40 pts low 52 pts Medium **50**

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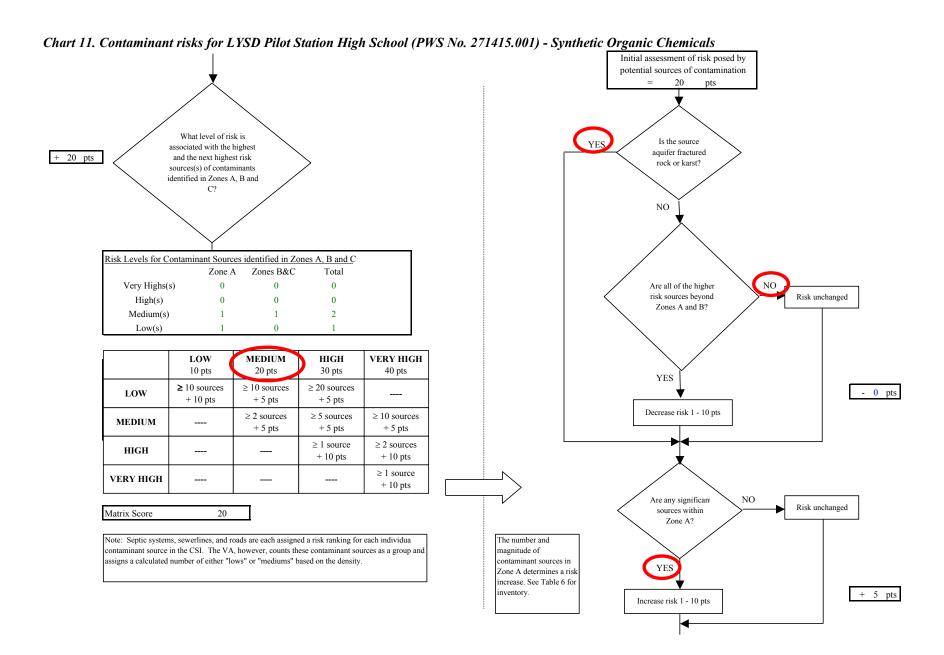


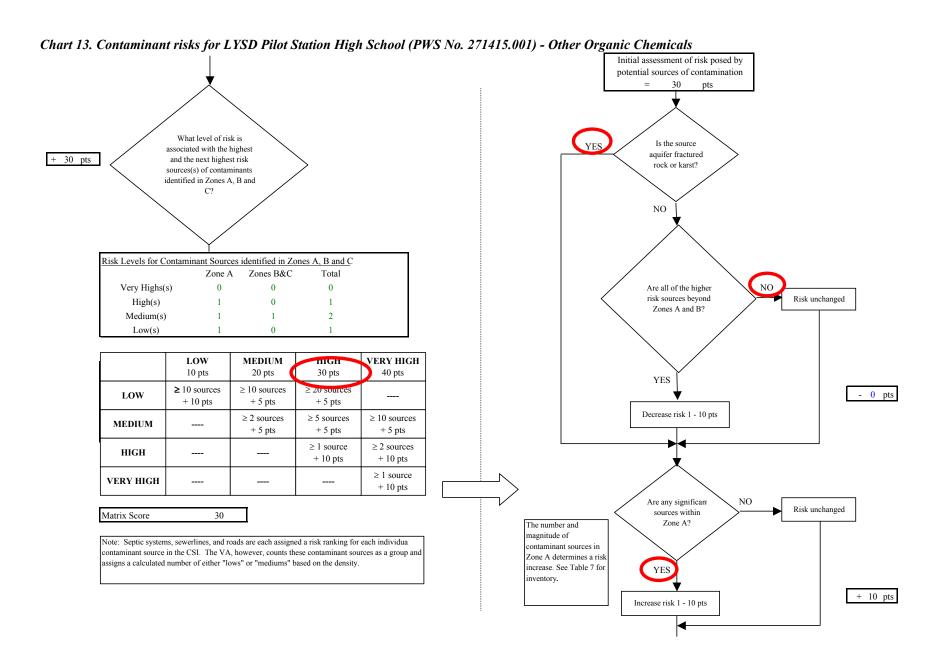
Chart 11. Contaminant risks for LYSD Pilot Station High School (PWS No. 271415.001) - Synthetic Organic Chemicals Existing NO Are there conditions 0 pts Risk unchanged that warrant upgrading risk? Risk due to existing Potential contamination 25 pts The number and magnitude of Risk posed by potential sources contaminant sources in of contamination with controls Contaminant Risk Zone D determines a risk YES 25 pts increase. See Table 6 for Contaminant risks inventory. 0 pts Increase risk 1 - 10 pts Risk posed by potential sources of contamination 25 pts *Truncate risk at 50 pts Contaminant risks* 25 Contaminant Risk Ratings Are there sufficient **Medium** controls, conditions, NO. Risk unchanged or monitoring to 40 to 50 pts very high warrant downgrading 30 to < 40 pts high 20 to < 30 pts medium < 20 pts low YES 0 pts Decrease risk 1 - 10 pts Risk posed by potential sources of contamination with controls

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Chart 12. Vulnerability analysis for LYSD Pilot Station High School (PWS No. 271415.001) - Synthetic Organic Chemicals (Chart 1. Susceptibiltiy of the wellhead) Susceptibility of well Very High 40 pts Evaluate the susceptibility of the wellhead (Chart 11. Contaminant risks for wells -Synthetic Organic Chemicals) Evaluate contaminant Susceptibility of wellhead Very High risks 25 pts Evaluate the (Chart 2. Susceptibility of the aquifer) Contaminant risks Medium susceptibility of the 25 pts aquifer within the protection area Susceptibility of aquifer High 15 pts Susceptibility of the well Contaminant risks Vulnerability of drinking water well to contamination Susceptibility of the wellhead Overall Vulnerability Ratings Susceptibility of aquifer 80 to 100 pts very high 60 to < 80 pts high Susceptibility of well 40 to < 60 pts Vulnerability of drinking water medium < 40 pts low well 65 pts High **65**

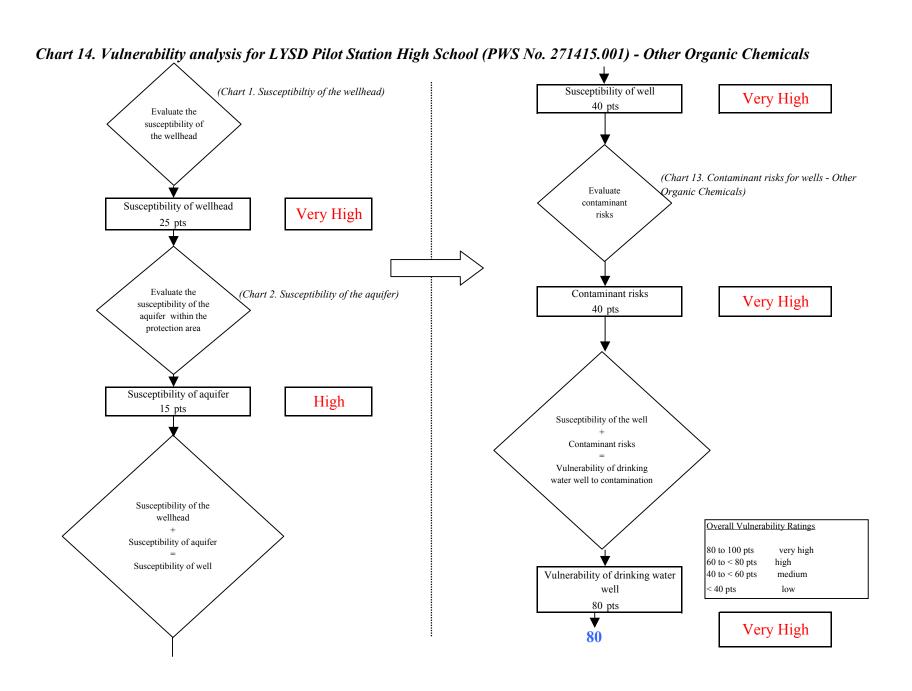
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Chart 13. Contaminant risks for LYSD Pilot Station High School (PWS No. 271415.001) - Other Organic Chemicals Contaminant risks initially assumed to be low. Current level of Evaluate the level of Contaminant risks background contamination due to man-= 0 ptscontamination from made source(s) natural sources NO or Is the concentration of Have other organic UNKNOWN the contaminant chemicals been detected increasing, decreasing, in the source waters in or staying the same? recent sampling period(s)? Recent OOC Sampling Results (mg/L) No recent OOC sampling data was available in ADEC records for this PWSID Increasing: risk up 1 - 10 pts YES Decreasing: risk down 1 - 5 pts + 0 pts Same: risk unchanged Existing contamination points based on linear interpolation of most recent detect [MCL = 50 pts; detect = 0 pts]Risk due to natural Risk due to existing mansources made sources 0 pts 0 pts Risk due to existing contamination 0 pts Was the source of Evaluate the level of NO. contamination from natural? man-made sources YES



Existing Are there conditions 0 pts Risk unchanged that warrant upgrading risk? Risk due to existing Potential contamination 40 pts The number and magnitude of Risk posed by potential sources contaminant sources in of contamination with controls Contaminant Risk Zone D determines a risk YES 40 pts increase. See Table 7 for Contaminant risks inventory. 0 pts Increase risk 1 - 10 pts Risk posed by potential sources of contamination 40 pts *Truncate risk at 50 pts Contaminant risks* Contaminant Risk Ratings Are there sufficient Very High controls, conditions, NO. Risk unchanged or monitoring to 40 to 50 pts very high warrant downgrading 30 to < 40 pts high 20 to < 30 pts medium < 20 pts low YES 0 pts Decrease risk 1 - 10 pts Risk posed by potential sources of contamination with controls

Chart 13. Contaminant risks for LYSD Pilot Station High School (PWS No. 271415.001) - Other Organic Chemicals



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