# Health Consultation

KAISER ALUMINUM AND CHEMICAL CORPORATION
HEGLAR KRONQUIST SITE
HEGLAR AND KRONQUIST ROADS
SPOKANE COUNTY, WASHINGTON

**EPA FACILITY ID: WAD000065508**

**Prepared by the**
**Washington State Department of Health**

AUGUST 27, 2009

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

## Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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## Foreword

The Washington State Department of Health (DOH) has prepared this health consultation in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR is part of the U.S. Department of Health and Human Services and is the principal federal public health agency responsible for health issues related to hazardous waste. This health consultation was prepared in accordance with methodologies and guidelines developed by ATSDR.

The purpose of this health consultation is to identify and prevent harmful human health effects resulting from exposure to hazardous substances in the environment. Health consultations focus on specific health issues so that DOH can respond to requests from concerned residents or agencies for health information on hazardous substances. DOH evaluates sampling data collected from a hazardous waste site, determines whether exposures have occurred or could occur, reports any potential harmful effects, and recommends actions to protect public health. The findings in this report are relevant to conditions at the site during the time of this health consultation, and should not necessarily be relied upon if site conditions or land use changes in the future.

For additional information or questions regarding DOH or the contents of this health consultation, please call the health advisor who prepared this document:

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For persons with disabilities this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (voice) or 1-800-833-6388 (TTY/TDD).

For more information about ATSDR, contact the ATSDR Information Center at 1-888-422-8737 or visit the agency's Web site: www.atsdr.cdc.gov/.

# SUMMARY

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| **INTRODUCTION** | The Washington State Department of Health (DOH) conducted this health consultation because some community members living near the Kaiser Aluminum and Chemical Corporation (Kaiser Aluminum) Heglar Kronquist dross disposal site were concerned that the site might be affecting their private wells and springs. In communities where contaminated sites like the Kaiser Aluminum dross disposal site are located, DOH's job is to ensure that the community has the best information possible about the health threat posed by these sites. |
| **CONCLUSION** | There is not enough information about the site, and its potential impact on nearby groundwater, surface water, and air, for the health department to conclude whether the site, in the past, currently, or in the future, could harm people's health. |
| **BASIS FOR DECISION** | • There is uncertainty about the accuracy of the data collected at the Kaiser Aluminum Heglar Kronquist dross disposal site from the mid-1970s to 2004. As a result, the health department cannot conclude whether the site, in the past, could harm people's health.<br>• There is not enough site information and data available for the health department to conclude whether nearby groundwater, surface water (i.e., springs, creeks, ponds), and air is currently being affected, or will be affected in the future by the site. As a result, the health department cannot conclude whether the residents' exposure to groundwater, surface water, and air near the site could harm their health now or in the future.<br>• The private well testing conducted by Kaiser Aluminum and Spokane Regional Health District in December 2008 at homes located near the disposal area indicates that the landfill <u>might</u> be affecting some private domestic wells. However, other possible sources of these chemicals exist in the area including naturally occurring background levels or possible releases associated with nearby agricultural practices. |
| **NEXT STEPS** | Additional investigation of the impact of Kaiser Aluminum Heglar-Kronquist site on nearby groundwater, surface water, and air is needed for the health department to conclude whether the site could currently, or in the future, harm people's health. Kaiser Aluminum will be conducting such an investigation in the near future, under Washington Department of Ecology oversight. The health department will review investigation plans and reports as they become available. |
| **FOR MORE INFORMATION** | If you have health concerns about the Kaiser Aluminum Heglar Kronquist site, you can contact Barbara Trejo, Washington Department of Health, at 1-877-486-7316. |

# Glossary

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| **Acute** | Occurring over a short time [compare with **chronic**]. |
| **Agency for Toxic Substances and Disease Registry (ATSDR)** | The principal federal public health agency involved with hazardous waste issues and responsible for preventing or reducing the harmful effects of exposure to hazardous substances on human health and quality of life. ATSDR is part of the U.S. Department of Health and Human Services. |
| **Aquifer** | An underground formation composed of materials such as sand, soil, or gravel that can store and/or supply groundwater to wells and springs. |
| **Cancer Risk Evaluation Guide (CREG)** | The concentration of a chemical in air, soil or water that is expected to cause no more than one excess cancer in a million persons exposed over a lifetime. The CREG is a *comparison value* used to select contaminants of potential health concern and is based on the *cancer slope factor* (CSF). |
| **Cancer Slope Factor** | A number assigned to a cancer causing chemical that is used to estimate its ability to cause cancer in humans. |
| **Carcinogen** | Any substance that causes cancer. |
| **Chronic** | Occurring over a long time (more than 1 year) [compare with **acute**]. |
| **Comparison value** | Calculated concentration of a substance in air, water, food, or soil that is unlikely to cause harmful (adverse) health effects in exposed people. The CV is used as a screening level during the public health assessment process. Substances found in amounts greater than their CVs might be selected for further evaluation in the public health assessment process. |
| **Contaminant** | A substance that is either present in an environment where it does not belong or is present at levels that might cause harmful (adverse) health effects. |
| **Dermal Contact** | Contact with (touching) the skin (see route of exposure). |

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| **Dose (for chemicals that are not radioactive)** | The amount of a substance to which a person is exposed over some time period. Dose is a measurement of exposure. Dose is often expressed as milligram (amount) per kilogram (a measure of body weight) per day (a measure of time) when people eat or drink contaminated water, food, or soil. In general, the greater the dose, the greater the likelihood of an effect. An "exposure dose" is how much of a substance is encountered in the environment. An "absorbed dose" is the amount of a substance that actually got into the body through the eyes, skin, stomach, intestines, or lungs. |
| **Environmental Media Evaluation Guide (EMEG)** | A concentration in air, soil, or water below which adverse non-cancer health effects are not expected to occur. The EMEG is a *comparison value* used to select contaminants of potential health concern and is based on ATSDR's *minimal risk level* (MRL). |
| **Environmental Protection Agency (EPA)** | Federal agency that leads the nation's environmental science, research, education and assessment efforts. The mission of the Environmental Protection Agency is to protect human health and the environment. Since 1970, the agency has been working for a cleaner, healthier environment for the American people. |
| **Exposure** | Contact with a substance by swallowing, breathing, or touching the skin or eyes. Exposure may be short-term [**acute exposure**], of intermediate duration, or long-term [**chronic exposure**]. |
| **Groundwater** | Water beneath the earth's surface in the spaces between soil particles and between rock surfaces [compare with surface water]. |
| **Hazardous substance** | Any material that poses a threat to public health and/or the environment. Typical hazardous substances are materials that are toxic, corrosive, ignitable, explosive, or chemically reactive. |
| **Ingestion** | The act of swallowing something through eating, drinking, or mouthing objects. A hazardous substance can enter the body this way [see route of exposure]. |

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| **Ingestion rate (IR)** | The amount of an environmental medium that could be ingested typically on a daily basis. Units for IR are usually liter/day for water, and mg/day for soil. |
| **Inhalation** | The act of breathing. A hazardous substance can enter the body this way [see **route of exposure**]. |
| **Inorganic** | Compounds composed of mineral materials, including elemental salts and metals such as iron, aluminum, mercury, and zinc. |
| **Leachate** | Liquid that is produced when water comes in contact with waste materials disposed in a landfill or other disposal areas. |
| **Life Time Health Advisory (LTHA)** | An EPA drinking water life time health advisory (LTHA). The level is based on exposure of a 70-kg adult consuming 2 liters of water per day. |
| **Maximum Contaminant Level (MCL)** | A drinking water regulation established by the federal Safe Drinking Water Act. It is the maximum permissible concentration of a contaminant in water that is delivered to the free flowing outlet of the ultimate user of a public water system. MCLs are enforceable standards. |
| **Media** | Soil, water, air, plants, animals, or any other part of the environment that can contain contaminants. |
| **Minimal Risk Level (MRL)** | An ATSDR estimate of daily human exposure to a hazardous substance at or below which that substance is unlikely to pose a measurable risk of harmful (adverse), noncancerous effects. MRLs are calculated for a route of exposure (inhalation or oral) over a specified time period (acute, intermediate, or chronic). MRLs should not be used as predictors of harmful (adverse) health effects [see oral **reference dose**]. |
| **Model Toxics Control Act (MTCA)** | The hazardous waste cleanup law for Washington State. |

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| **Monitoring wells** | Special wells drilled at locations on or off a hazardous waste site so water can be sampled at selected depths and studied to determine the movement of groundwater and the amount, distribution, and type of contaminant. |
| **Oral Reference Dose (RfD)** | An amount of chemical ingested into the body (i.e., dose) below which health effects are not expected. RfDs are published by EPA. |
| **Organic** | Compounds composed of carbon, including materials such as solvents, oils, and pesticides that are not easily dissolved in water. |
| **Parts per billion (ppb)/Parts per million (ppm)** | Units commonly used to express low concentrations of contaminants. For example, 1 ounce of trichloroethylene (TCE) in 1 million ounces of water is 1 ppm. 1 ounce of TCE in 1 billion ounces of water is 1 ppb. If one drop of TCE is mixed in a competition size swimming pool, the water will contain about 1 ppb of TCE. |
| **Reference Dose Media Evaluation Guide (RMEG)** | A concentration in air, soil, or water below which adverse non-cancer health effects are not expected to occur. The EMEG is a *comparison value* used to select contaminants of potential health concern and is based on EPA's oral reference dose (RfD). |
| **Remedial investigation** | The CERCLA/MTCA process of determining the type and extent of hazardous material contamination at a site. |
| **Route of exposure** | The way people come into contact with a hazardous substance. Three routes of exposure are breathing [inhalation], eating or drinking [ingestion], or contact with the skin [dermal contact]. |
| **Surface Water** | Water on the surface of the earth, such as in lakes, rivers, streams, ponds, and springs [compare with **groundwater**]. |

## Statement of Issues

The Washington State Department of Health (DOH) initiated this health consultation for the Kaiser Aluminum and Chemical Corporation (Kaiser Aluminum) Heglar Kronquist site in September 2008 at the request of the Washington State Department of Ecology (Ecology). Ecology made this request because some community members living near the Heglar Kronquist site were concerned that the site might be affecting their nearby private wells and springs. Kaiser Aluminum disposed of aluminum dross at the site from 1969 to 1974. Aluminum dross is a waste product created during aluminum processing.(1)

In communities where contaminated sites like the Kaiser Aluminum dross disposal site are located, DOH's job is to ensure that the community has the best information possible about the health threat posed by these sites. DOH prepares health consultation reports under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR).

## Background

The Heglar Kronquist site is located in Mead, Spokane County, Washington, about 10 miles northeast of the City of Spokane. The site lies northeast of the intersection of Heglar and Kronquist Roads (see Figure 1). Prior to being used as dross disposal area, basalt was mined from the property. The basalt quarry closed in 1969. Sometime later in 1969, Kaiser Aluminum began disposing aluminum dross at the property.(1)

Approximately 60,000 tons of aluminum dross was disposed at the site.(2,3) Kaiser Aluminum reports that the dross contained approximately:

- 39 percent (%) sodium chloride
- 19% potassium chloride
- 35% aluminum oxide
- 4% aluminum
- 2% cryolite (aluminum sodium fluoride)
- 1% nitrides and carbides. (3)

Sodium is the only chemical mentioned above that is considered a hazardous substance.(4) However, information included in Ecology's 1987 site inspection report suggests that metals and some organic chemicals are other possible hazardous substances disposed at the site.(5) Dross disposal at the site ended sometime in 1974 when chloride salts were detected in nearby wells.(5)

When wetted the dross can release "ammonia and carbon gases."(2) Like sodium, ammonia is considered a hazardous substance.(4) In mid-1971, Ecology discovered that an ammonia type odor was emanating from the landfill. This appears to have occurred because runoff was not being controlled and the disposal area was not covered with an impervious barrier to prevent infiltration of rainfall or runoff into the dross. Runoff control and a disposal area cover were two Ecology requirements that were part of the approval of the site as a dross disposal site.(5) Subsequent testing at two nearby wells showed chloride levels above the Washington State chloride standard of 250 milligrams per liter (mg/l). Because of these findings, the Spokane County Health District (now known as the Spokane Regional Health District (SRHD)) recommended that the well owners discontinue using this water for drinking and cooking purposes.(5)

From 1974 to 1980, it was reported that landowners near the site were concerned about the changes in water quality at their wells. These concerns resulted in surface water and groundwater testing in the vicinity of the site.(2)

Because of EPA and Spokane County concerns about the waste handling and disposal practices at the site, additional groundwater testing and plans for modifying the site were initiated in the late 1970s (e.g., site grading, placement of a clay cover, and installation of a passive gas venting system).(6) In the 1980s, some environmental investigations and some additional private well and spring testing were conducted to assess whether the dross disposal site was affecting groundwater quality. Concerns about releases of ammonia vapors to air were also evaluated.(6)

In late 1979, the dross disposal area was capped with a temporary soil cover and in early 1980, Kaiser Aluminum began closure activities for the disposal area. The goals of the closure activities were twofold:

- Reduce movement of surface water through the dross, thereby reducing the amount of leachate and gas produced.
- Control landfill gases.

Kaiser Aluminum also looked at installing three residential wells outside the landfill and assessed whether some of the spring water was suitable for irrigating crops and livestock watering.(2) It is unknown whether the three residential wells were ever installed.

Kaiser Aluminum capped the disposal area and installed 17 ammonia gas vents at the site in 1984. They also planted vegetation on the cap, constructed drainage ditches, fenced the area, and posted warning signs.

Ecology conducted a site inspection in 1987, and noted that the dross disposal site appeared to be in excellent physical condition.(5) In 2006, Ecology conducted a Site Hazard Assessment for this site and determined the site posed a hazard ranking of 2 where 1 represents the highest potential risk and 5 the lowest.(1)

Ecology named Kaiser Aluminum a potentially liable party (PLP), pursuant to the Model Toxics Control Act (MTCA), in August 2008, and began negotiating the terms of a legal agreement (called an Agreed Order) with them in September 2008. The Agreed Order, which was signed on March 30, 2009, requires Kaiser Aluminum to complete a remedial investigation (RI) and feasibility study (FS) for the site.(1) The purpose of an RI is to determine the nature and extent of contamination and assess potential health risks while the purpose of a FS is to evaluate possible cleanup options.

*Site Visit*

DOH and Ecology staff conducted a site visit on October 22, 2008, to observe the dross disposal area and surrounding community. The dross disposal site was fenced and access to the property was not possible during the site visit so the condition of the property could not be determined. However, based on visual observations from the road, the dross disposal area appeared grass covered (Figure 2). There was no visual evidence that the dross disposal area was affecting the nearby community. For example, Ecology and DOH looked at a spring and pond on one private property that had been tested in the past but did not observe any visual signs of contamination related to the dross disposal site. However, it should be noted that impacts to the community from the dross disposal area could exist without visual evidence.

During the site visit, some members of the community met with Ecology and DOH staff to discuss their concerns about their private wells, which are their sole sources of drinking water. They requested that their wells be sampled as soon as possible to make sure the water was safe.

*Geology/Hydrogeology*

The Heglar Kronquist site is located on the eastern edge of an ancient, but stable, landslide deposit. This landslide deposit appears to be large blocks and boulders of basalt underlain by about 200 to 400 feet of silt and clay with sand at the base that slipped to its present position. A coarse volcanic rock unit (called quartz monzonite) underlies the landslide deposit. The landslide deposits also extend some distance to the west, northwest, and southwest of the Heglar Kronquist site. Windblown deposits of silt and fine sand with clay (also known as loess) overlying basalts are found on the plateau to the east, northeast, and southeast of the site. This basalt unit is underlain by a rock unit (called the Latah Formation), which generally consists of siltstone, sandstone, and claystone. It appears that the Latah Formation is situated at a higher elevation than the landslide deposits.(6)

Groundwater on the plateau is found in the basalt unit (perched on the Latah Formation). It moves in a westerly direction where it infiltrates the landslide deposits but primarily discharges as springs. Groundwater in the private wells on the plateau is not expected to be affected by the dross disposal site. In 1980, it was found that private wells downgradient of the dross disposal area were all constructed in the landslide deposits. These wells reportedly penetrated about 50 to 400 feet of clayey soil, which was suggested to act as a seal from surface water and contaminants in the perched groundwater.(6)

*Environmental Investigations*

A number of environmental investigations were conducted from the mid-1970s through the early 1980s and some limited spring sampling was conducted until 2004. Available site information does not indicate how the samples were collected or what methods were used to analyze the samples during these investigations, so these samples have limited use. However, these results do provide a limited historical perspective.

In December 2008, Kaiser Aluminum, under Ecology oversight, tested 16 private domestic wells and one spring in the vicinity of the dross disposal site to determine if any dross chemicals could be affecting local drinking water. About a week after Kaiser Aluminum conducted its testing, the Spokane Regional Health District tested four additional private domestic wells near the dross disposal area, but outside the area being tested by Kaiser Aluminum, because of community health concerns.

Mid 1970 to 2004

The U.S. Environmental Protection Agency (EPA) and Spokane County Health Department tested groundwater at a few wells and springs in the vicinity of the dross disposal site from 1973 to 1980. The samples were tested for various chemicals including sodium, potassium, ammonia, nitrate, nitrite, chloride, sulfur, and/or a variety of metals including arsenic and lead. Some groundwater and springs were found to contain nitrates and chloride above the federal drinking water standard. It appears that there may have been some problems with the data (e.g., sample collection, preservation and/or laboratory problems). However, the specific problems were not indicated.(6) This is a significant issue when considering whether to use this data to assess potential past exposures.

In March 1980, Kaiser Aluminum conducted a field survey of private wells located about 1.5 miles west and 0.5 miles east of the site.(6) The rationale for these survey boundaries is not provided. It was reported that the wells were privately owned and were used for domestic, livestock, and irrigation purposes. They also conducted a field survey of springs in the area, and conducted reconnaissance geologic mapping.

Kaiser Aluminum reported in April 1980 that only one downgradient well (3bcc) was definitely contaminated by leachate from the dross disposal site. That well was reported as shallow (57.5 feet) and located northwest of the dross disposal site. However, it appears that the well was not in use at the time. It was also reported that two shallow private wells on the Deadman Creek floodplain might be affected by the disposal site.(6)

A spring located southwest of the disposal area (3cbd) was also reported to be contaminated by the dross leachate. It appears that spring 3cbd had been used for domestic purposes. Kaiser Aluminum reportedly installed a well for the families that had been using this spring water.(6)

Kaiser Aluminum determined that the spring water at location 3cbd could have some potential impact on crops, for example reduction in yields or inhibit plant growth because of the salinity. However, they reported it was uncertain if significant damage had occurred to crops in the area. Kaiser Aluminum also determined that using the spring water would not present significant problems for livestock watering.(2)

In May 1980, Kaiser Aluminum installed two monitoring wells in and downgradient of the dross disposal area (53 and 66 feet deep, respectively). It appears that the monitoring well installed in the disposal area was dry when tested, which was interpreted by Kaiser Aluminum's consultant as indicating that groundwater is not a significant source of leachate generation. However, neither the boring log nor a well installation diagram were available to confirm Kaiser Aluminum's conclusion. It was noted that the dross was capable of generating methane gas but whether elevated methane levels were found was not reported. Some limited data available for the downgradient monitoring well indicates that chloride and nitrate levels in groundwater were elevated above federal drinking water standards at that time.(7)

Although it appears no one was drinking the water from spring 3cbd, Kaiser Aluminum continued testing the spring from September 1983 through December 1989. This appears to have been done to assess the success of the disposal site closure.(1) The number of analytical parameters was decreased from previous sampling but included chloride, nitrate, potassium, sodium, and electrical conductivity. No spring samples were collected at 3cbd from January 1990 through October 1993, but in November 1993 through December 2001, sampling was resumed. The last testing at the spring occurred in September 2004.(8)

Kaiser Aluminum only provided a summary table of the 3cbd spring results (no analytical laboratory data sheets provided) so the data is of limited use. However, the information that is available suggests that the disposal area continued to affect the spring water. Nitrate levels at spring 3cbd ranged from 1 milligram per liter (mg/l) to 37 mg/l from 1983 to 2004, with most of the test results exceeding the federal nitrate drinking water standard of 10 mg/l. The highest nitrate levels occurred in 1997.(8) Why the highest levels occurred at that time is unknown. Chloride levels, which ranged from 60 mg/l to 900 mg/l, exceeded the 250 mg/l drinking water standard through March 1998, and then fell below the standard through September 2004. Sodium levels ranged from 82 mg/l to 198 mg/l.(1) No drinking water standard exists for sodium. However, in 2003, EPA developed a drinking water advisory level of 20 mg/L for individuals on a 500 mg/day restricted sodium diet.(9) No federal drinking water standard or advisory exists for potassium, which ranged from 7 mg/l to 25 mg/l.(1) Electrical conductivity levels ranged from 910 to 2800 uhmos/cm.(8)

Ecology did note during its 1987 site inspection that a noticeable ammonia odor was emanating from the most upgradient of the two monitoring wells.(5)

<u>December 2008</u>

Kaiser Aluminum tested 16 private drinking water wells and one spring in the vicinity of its dross disposal site on December 11 and 12, 2008. The wells were tested for conventional and inorganic drinking water parameters that are potential contaminants associated with the dross disposed at the Kaiser Aluminum disposal site. SRHD tested four additional private wells on December 23, 2008. Both Kaiser and SRHD collected the water samples as close to the well head as possible.

SRHD relied on the analytical laboratory's quality assurance/quality control (QA/QC) evaluation process to assess data quality. This evaluation suggests that the results are adequate for assessing drinking water quality. Kaiser Aluminum used the laboratory QA/QC and also had another QA/QC evaluation conducted by its consultant, Hart Crowser. The holding times for the Kaiser Aluminum nitrate and nitrite samples analysis were exceeded. The samples were re-analyzed for total nitrates and nitrites.(10)

Table 1 summarizes the specific chemicals tested and the analytical methods used by Kaiser Aluminum and SRHD. As noted in Table 1, the same method was not always used. However, DOH has determined that the analytical differences are not significant (personal communication, e-mail message from Len O'Garro, DOH, to Barbara Trejo, DOH, January 26, 2009). Consequently, the Kaiser Aluminum and SRHD results can be used together to assess the potential health threat.

The range of the chemicals detected by Kaiser Aluminum and SRHD in private wells is provided in Table 2 (column 3 shows the minimum level while column 4 shows the maximum level). The conventional parameters are reported in milligrams of chemicals per liter of water (mg/l) or parts per million (ppm) while the inorganic parameters are reported in micrograms of chemical per liter of water (ug/l) or parts per billion (ppb).

The spring sample contained chemicals similar to the private wells. However, potassium, sodium, chloride, and nitrate levels were higher at the spring (10,900 ug/l, 106,000 ug/l, 242 mg/l, and 15.9 mg/l, respectively) than in the private wells. No one is drinking the spring water.

## Discussion

A number of environmental investigations related to the Kaiser Aluminum – Heglar Kronquist site were conducted between the mid-1970s and 2004, which included sampling and testing water from some private domestic wells, monitoring wells, and some spring water. However, there is often no information available describing how samples were collected and in some cases tested. As a result, the accuracy of the data is uncertain, which makes it unusable for assessing whether community members have been exposed in the past to harmful levels of these chemicals.

Although there is uncertainty about the accuracy of the 1970s to 2004 data, the data do suggest that additional environmental investigation is needed at the site to determine whether the site poses a potential threat to groundwater, which is the sole source of drinking water in the area. The December 2008 spring test results also suggest that additional investigation is needed. Whether the dross disposal area poses a threat to nearby surface water and air (indoor and outdoor) also needs to be determined.

Kaiser Aluminum will be conducting an environmental investigation (called a remedial investigation) in the near future to better assess the type and extent of chemicals and potential exposure pathways associated with this site. Ecology will be overseeing Kaiser

Aluminum's work via its authority under the Washington Model Toxics Control Act (MTCA) cleanup regulation (Chapter 173-340 WAC).

*December 2008 Private Well Testing*

Because of recently raised community health concerns about the possible effect of the dross disposal area on nearby private wells, Kaiser Aluminum and SRHD conducted some private domestic well testing at properties near, and what appears to be hydraulically downgradient of the dross disposal area in December 2008. DOH evaluated the results of this testing when it became available to determine whether levels of chemicals found in the wells posed a health threat.

During the first step of the health evaluation, DOH compared the highest level of each chemical found in the private wells to published health comparison values to identify chemicals that might be of health concern. These published health comparison values are set at levels much lower than levels that might cause people to get sick. This is done to be protective of the most sensitive individuals (i.e., children and older adults) as well as to account for our lack of certainty regarding low levels of chemical exposure. When there is evidence that a chemical might cause cancer, the lowest comparison value corresponds to a theoretical cancer risk increase of one additional cancer in a population of one million people for a continuously exposed individual. Although this level of risk is not considered to be a health concern, decisions about cleanup of contamination are often made to reduce risks below this level when possible.

The health comparison values used by DOH included the U.S. Environmental Protection Agency (EPA) drinking water standards and health advisories (i.e., maximum contaminant levels (MCLs), life time health advisories (LTHA), and health based drinking water advisories (DW)). If no drinking water standard or advisories were available, ATSDR drinking water comparison values were used (environmental media evaluation guides (EMEGs) and reference dose media evaluation guides (RMEGs)).

Neither EPA nor ATSDR comparison values exists for potassium. DOH used the FDA's daily reference value for potassium (3500 mg) as the comparison value.(11) The highest level of potassium found at the site was 6,870 ug/l (or 6.87 mg/l). The average adult drinks about 2 liters (l) of water per day, while a child drinks about 1 liter. When considering the highest level of potassium found during the December 2008 well testing, this would result in the daily consumption of potassium from tap water of about 13.7 mg for an adult and 6.9 mg for a child. Both levels are well below the FDA's daily reference value.

When the highest level for each chemical found during the December 2008 well sampling did not go above the health comparison value, no further health evaluation of that chemical was determined to be necessary because DOH does not expect that those chemicals will pose a health threat (i.e. not considered chemicals of health concern). Table 2 shows the minimum level (column 3) and maximum level (column 4) of each chemical found during the December 2008 private domestic well testing. Table 2 also shows the health comparison level used by DOH during its evaluation (column 5) along with the reference (column 6). Column 7 indicates whether the maximum amount of the chemicals found in the wells were greater than the health comparison value. As shown in column 7, only three of the 19 chemicals tested (nitrate/nitrite, arsenic, and sodium) had maximum levels higher than the health comparison levels.

Nitrate/nitrite and arsenic only exceeded the health comparison once, while sodium levels in four wells exceeded the comparison value. Only one well had levels above more than one comparison value. That well contained elevated sodium and nitrate/nitrite. Based on the individual nitrate and nitrite results obtained by SRHD during its sampling, it is expected that nitrates, rather than nitrites, are elevated in the well.

When a chemical is found to be above a health comparison level, it does not necessarily mean that people will get sick if they drink water with that chemical. However, it does indicate to DOH that further evaluation of that chemical is necessary, which is the second step that DOH took when evaluating the health threat posed by nitrate, arsenic, and sodium in the private domestic wells.

*Sodium*

Sodium is an abundant element found in soil, plants, water, and food. Sodium salts (table salt is an example of a sodium salt) are commonly found in water because they dissolve quite easily. Sodium has many uses including flavor enhancer and food preservative. It is also found associated with domestic water softeners, road deicing chemicals, water treatment chemicals, and sewage effluent.(12) It can also be found associated with releases from contaminated sites, like the Kaiser Aluminum dross disposal site.

Adequate levels of sodium are necessary for good health. Food is the main source of daily human exposure to sodium, primarily in the form of sodium chloride (commonly known as salt). Much of the sodium found in our diets is added to food during processing and preparation.(12)

Eating sodium is not expected to cause cancer. However, there have been some studies that suggest that sodium chloride may increase cancer risk caused by other chemicals in the gastrointestinal tract. Evidence suggests that high sodium diets can affect blood pressure.

In 2003, EPA developed a drinking water advisory level for sodium (20 mg/l of sodium for individuals on a 500 mg/day restricted sodium diet).(13) This EPA advisory level is based on a 1965 American Heart Association (AHA) recommendation and is intended to provide guidance to communities that may be exposed to drinking water containing sodium chloride or other sodium salts.(12,13) The EPA advisory also recommends reducing sodium concentrations in drinking water to between 30 and 60 mg/L, which most people would not consider salty tasting.(12) An EPA drinking water advisory levels is not a legally enforceable standard but does describe a non-regulatory level of a chemical in water that is expected to be without adverse effects on both health and esthetics.(9)

In 2006, the AHA updated its diet and lifestyle recommendations, including its recommendations regarding sodium.(14) These recommendations are intended to help reduce cardiovascular disease. The AHA recommends that Americans over the age of 2 years eat less than 2300 milligrams (mg) of sodium per day.(14,15) This amount is equal to about one teaspoon of table salt.(15) It is should be noted that the AHA only considers this an interim level because it is what is thought achievable given our high sodium food supply and the current high levels of sodium consumption and could be lowered in the future.(14) The U.S. Department of Agriculture (USDA) and U.S. Department of Health and Human Services (USDHHS) also recommends that Americans over 2 years eat less than 2300 mg of sodium per day; and that individuals with hypertension, blacks, and middle-aged and older adults consume no more than 1500 mg of sodium per day.(16)

The highest level of sodium found during the December 2008 private domestic wells was 46.5 mg/l (or 46,500 ug/l). The source of the sodium in the private domestic wells is unknown. It is expected that at least part of it is likely to be naturally occurring. However, it is possible that the Kaiser Aluminum dross disposal site might also be contributing to the sodium levels found in the private domestic wells. This should be further evaluated during the site remedial investigation.

The average adult drinks about 2 liters of water per day, while a child drinks about 1 liter. When considering the highest level of sodium found during the December 2008 well testing, this would result in the daily consumption of sodium from tap water of 93 mg for an adult and 46.5 mg for a child. These levels are about four percent and two percent of the AHA, USDA, and USDHHS recommended maximum sodium level of 2300 mg of sodium for adults and children, respectively. Those levels are also below the 1500 mg of sodium per day for individuals with hypertension, blacks, and middle-aged and older adults. As a result, DOH does not consider the sodium levels found in well water in December 2008, to pose a health threat to people over the age of two. It should be kept in the mind that there may be seasonal variations in sodium levels in the private domestic wells.

The National Academy of Sciences (NAS) notes that there is a lack of data regarding sodium needs for infants and children. However, they did find some animal studies indicating that sodium is required in normal growth in neonatal rats. The NAS found no studies that evaluated how sodium levels affect growth or other effects in normal, full-term human infants.(17) This probably accounts for the lack of AHA, USDA, USDHHS, and EPA daily salt consumption recommendations for children less than 2 years. <u>Families with children under 2 years should discuss their child’s sodium needs with their pediatricians</u>.

*Nitrates*

Nitrates/nitrites were only detected once above the EPA drinking water standard at one private domestic well near the Kaiser Aluminum dross disposal site. That well contained 13.5 mg/l, which is slightly above the 10 mg/l federal and state drinking water standard. As noted above, it is expected that nitrates, rather than nitrites, are elevated in that well. The source of the nitrate level found in that well is unknown.

Nitrate is a naturally occurring chemical. It is commonly found in groundwater and surface water. Nitrogen-containing fertilizers or animal or human wastes can also raise the concentration of nitrate in water.(18)

Nitrates are part of the human diet. The National Research Council estimates that a U.S. adult typically consumes about 75 mg of nitrates a day. Most of that occurs from eating vegetables, such as beets, celery, lettuce, and spinach. However, about 2-3 percent (%) of the daily intake reportedly comes from drinking water. The National Research Council also estimates that daily intake of nitrate by vegetarians can exceed 250 mg a day.(19)

Nitrate is considered an acute contaminant, which means a single exposure can affect a person's health. It can affect a person's health because it reduces the ability of red blood cells to carry oxygen. In most adults and children these red blood cells rapidly return to normal. However, for infants, it can take much longer for red blood cells to return to normal. Individuals who don't have enough stomach acids or lack the enzyme that converts affected red blood cells back to normal can make people susceptible to health problems from nitrate.(20)

Infants who drink water with high levels of nitrate (or eat foods made with nitrate contaminated water) may develop a serious health condition called methemoglobinemia or "blue baby syndrome." The health department recommends that infants less than one-year-old should not be given drinking water with nitrate levels more than 10 mg/l.(20)

Women who are pregnant or are trying to become pregnant should also not drink water with more than 10 mg/L of nitrate because some studies have found an increased risk of spontaneous abortion or certain birth defects if the mother drank water high in nitrate.(20)

<u>The health department has developed a fact sheet titled *Nitrate in Drinking Water*, which is included in Appendix A</u>. The fact sheet contains important information about "blue baby syndrome," including what to do and how to prevent it, as well as information about adult exposure to nitrates and testing for nitrates in private wells.

*Arsenic*

Arsenic was only detected once above the federal and state drinking water standard at one private domestic well near the Kaiser Aluminum dross disposal site. That well contained 11.6 micrograms per liter (ug/l) or 11.6 parts per billion (ppb), which is slightly above the 10 ppb federal and state drinking water standard. The source of the arsenic level found in that well is unknown.

Arsenic is a naturally occurring chemical that is found in soil, water, air, food, and house dust. Drinking water in Washington typically contains about 3 ppb. However, levels of arsenic higher than that have been found in Washington. Those elevated levels are usually associated with water located in rock or soil that has a naturally high content of arsenic.(21)

Small amounts of arsenic are added to other metals to form alloys with improved properties. In the past, arsenic was used to treat wood and was also used as a pesticide in orchards.(22)

Long-term exposure to small amounts of arsenic can increase the risk of developing cancer of the bladder, lung, skin, liver, kidney, or prostate. Other health effects may include high blood pressure, narrowing of the blood vessels, nerve damage, anemia, diabetes, stomach upset, and skin changes.(21)

To lower people's health risk from arsenic, the health department recommends that water used for drinking or food preparation contain no more than 10 ppb arsenic. Because arsenic does not pass through the skin very easily, it is all right to bathe, clean, and wash foods with water unless it contains more than 500 ppb arsenic.(21)

The health department has developed a brochure titled *Arsenic and Your Private Well*, which is included in Appendix A. This brochure contains important information about arsenic exposure, information about testing private wells for arsenic, and ways to reduce exposure to arsenic from private wells.

The health department's findings regarding the December 2008 domestic well testing results were discussed with Ecology and SRHD who shared this information with the community via letters to well owners whose wells were tested and at an Ecology-hosted public meeting in February 2009.

*Child Health Initiative*

Children can be uniquely vulnerable to the hazardous effects of environmental contaminants, like sodium, nitrate, and arsenic in drinking water. When compared to adults, pound for pound of body weight, children drink more water, eat more food, and breathe more air. These facts lead to an increased exposure to contaminants. Additionally, the fetus is highly sensitive to many chemicals, particularly with respect to potential impacts on childhood development. For these reasons, DOH considers the specific impacts that contaminated tap water might have on children, as well as other sensitive populations.

## Conclusions

1. There is uncertainty about the accuracy of the data collected at the Kaiser Aluminum Heglar Kronquist dross disposal site from the mid-1970s to 2004. As a result, the health department cannot conclude whether the site, in the past, could harm people's health.

2. There is not enough site information and data available for the health department to conclude whether nearby groundwater, surface water (i.e., springs, creeks, ponds), and air is currently being affected, or will be affected in the future by the site. As a result, the health department cannot conclude whether the residents' exposure to groundwater, surface water, and air near the site could harm their health now or in the future.
3. The private well testing conducted by Kaiser and SRHD in December 2008 at homes located near the disposal area indicates that the landfill <u>might</u> be affecting some private domestic wells. However, other possible sources of these chemicals exist in the area including naturally occurring background levels or possible releases associated with nearby agricultural practices.
4. In December 2008, arsenic was found above the drinking water standard at one private well, another private well had nitrates above the drinking water standard, and four private wells had sodium levels that exceeded EPA's advisory for individuals on a 500 mg/day restricted sodium diet. The levels of chemicals at these wells could potentially harm resident's health. Ecology and SRHD provided well owners with copies of health department fact sheets about nitrates and arsenic in drinking water in February 2009 to educate residents about the health risks associated with the chemicals and ways to reduce exposures. SRHD discussed EPA's sodium advisory with the community at the February 2009, Ecology held public meeting.

## Recommendations

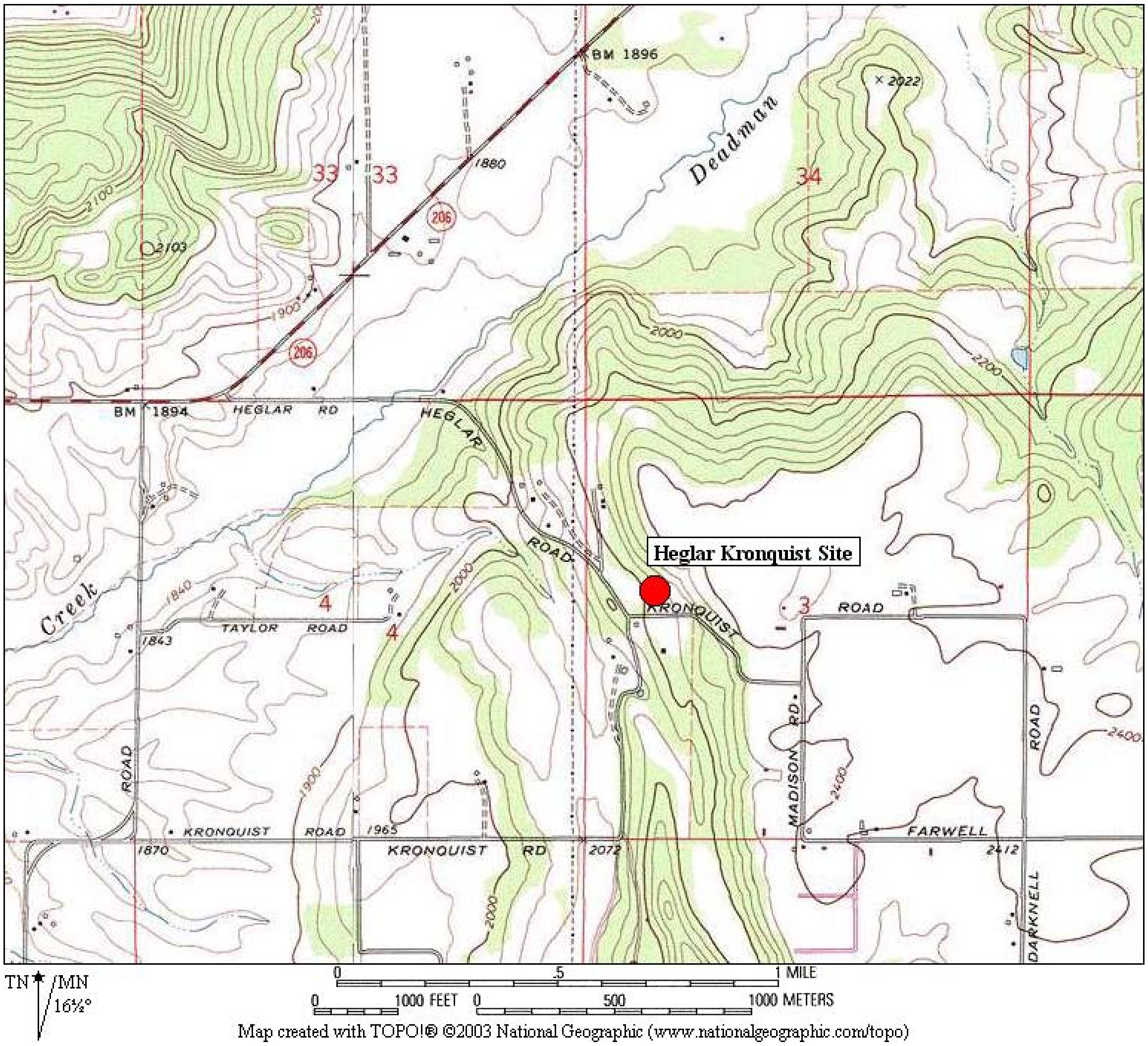
1. Additional investigation of the impact of Kaiser Aluminum Heglar-Kronquist site on nearby groundwater, surface water, and air is needed for DOH to conclude whether the site could currently, or in the future, harm people's health. This additional investigation should include, but not be limited to, the following:
    - Install and test a groundwater monitoring well system to assess whether the dross disposal area is affecting groundwater quality.
    - Conduct a survey to identify surface waters and wells potentially at risk from the site. The survey should include collection of the basic well information (location, depth, elevation, and aquifer were water is being drawn). Similar information should be collected about nearby springs, creeks, and ponds.
    - Conduct surface water testing at potentially affected springs, creeks, and ponds.
    - Conduct gas testing to determine whether the dross disposal area is generating gases (e.g., ammonia, methane) as it has in the past. If gases are being generated, it should be determined whether the gases may potentially affect outdoor air and indoor air at nearby residences.
    - Groundwater, surface water, and soil gas testing should include dross related contaminants, metals, and organic compounds.
2. Private wells determined to be potentially affected by the dross disposal site during the upcoming remedial investigation should be tested to assess the disposal site impact on drinking water quality. The potentially affected private wells should also be tested for metals and organic chemicals if these chemicals are found at the dross disposal area

## Public Health Action Plan

1. Ecology will ensure that the health department's recommendations are fully considered in the preparation of the final approved remedial investigation work plan.
2. DOH will review draft and final remedial investigation and feasibility study plans and reports for the site so it can continue responding to community health concerns and assess whether the site poses a possible human health threat.
3. DOH will provide copies of this health consultation report to Ecology, Spokane County Health District, Kaiser Aluminum, and residents who live near the dross disposal site.
4. DOH will post this health consultation report on its web site to make it available to the general public.

**FIGURES**

**Figure 1**: Vicinity Map – Heglar Kronquist Site, Mead, Spokane County, Washington




Map created with TOPO!® ©2003 National Geographic (www.nationalgeographic.com/topo)

**Figure 2**: Looking southwest to northeast at the Heglar Kronquist site, Mead, Spokane County, Washington (October 22, 2008)

# TABLES

Table 1: Drinking water and spring chemical parameters and test methods

| Chemical | Test Method | |
|---|---|---|
| | **Kaiser** | **SRHD** |
| ***Conventionals*** | | |
| Chloride | 300.0 | 300.0 |
| Fluoride | 300.0 | 300.0 |
| Ammonia | 350.1 | SM4500NH3G |
| Nitrate | 300.0 | 300.0 |
| Nitrite | 300.0 | 300.0 |
| Nitrate + Nitrite | 353.2 | Method not used |
| | | |
| ***Inorganics*** | | |
| Aluminum | 200.8 | 200.8 |
| Antimony | 200.8 | 200.8 |
| Arsenic | 200.8 | 200.8 |
| Beryllium | 200.8 | 200.8 |
| Cadmium | 200.8 | 200.8 |
| Chromium | 200.8 | 200.8 |
| Copper | 200.7 | 200.8 |
| Lead | 200.8 | 200.8 |
| Mercury | 245.1 | 200.8 |
| Nickel | 200.7 | 200.8 |
| Potassium | 200.7 | 200.8 |
| Selenium | 200.8 | 200.8 |
| Silver | 200.7 | 200.8 |
| Sodium | 200.7 | 200.8 |
| Thallium | 200.8 | 200.8 |
| Zinc | 200.7 | 200.8 |

NA – not applicable

**Table 2: Kaiser Aluminum and SRHD December 2008 Private Well Chemical Results and Comparison Values**

| Chemicals | Units± | Minimum Amount | Maximum Amount | Comparison Values | Reference | Maximum Amount Exceeds Comparison Value? |
|---|---|---|---|---|---|---|
| Conventionals | | | | | | |
| Chloride | mg/l | 0.2U | 161 | 250 | Chronic EMEG | No |
| Fluoride | mg/l | 0.087T | 0.5 | 4 | MCL | No |
| Ammonia | mg/l | 0.05U | 0.141 | 30 | LTHA* | No |
| Nitrate | mg/l | 0.5U | 6.63 | 10 | MCL | No |
| Nitrite | mg/l | 0.1U | 0.5U | 1 | MCL | No |
| Nitrate+Nitrite | mg/l | 0.05U | 13.5 | 10 | MCL | Yes |
| | | | | | | |
| Inorganics | | | | | | |
| Aluminum | ug/l | 10U | 50U | 10,000 | Chronic EMEG | No |
| Antimony | ug/l | 0.006B | 1U | 6 | MCL, LTHA | No |
| Arsenic | ug/l | 0.21B | 11.6 | 10 | MCL | Yes |
| Beryllium | ug/l | 0.02U | 1U | 4 | MCL | No |
| Cadmium | ug/l | 0.007B | 1U | 2 | Chronic EMEG - Child | No |
| Chromium | ug/l | 0.037B | 1.62 | 100 | MCL | No |
| Copper | ug/l | 4.1B | 43.6 | 100 | Intermediate EMEG - Child | No |
| Lead | ug/l | 0.02U | 3.19 | 15 | MCL Action Level | No |
| Mercury | ug/l | 0.1U | 0.2U | 2 | MCL | No |
| Nickel | ug/l | 0.17B | 6.23 | 100 | LTHA | No |
| Potassium | ug/l | 400U | 6870 | None available | FDA Daily Reference Value=3,500 mg | No |
| Selenium | ug/l | 0,5B | 3.1 | 50 | MCL | No |
| Silver | ug/l | 0.005B | 1U | 50 | RMEG - child | No |
| Sodium | ug/l | 7560 | 46,500 | 20,000 | EPA Health Based DW Advisory ** | Yes |
| Thallium | ug/l | 0.002B | 1U | 2 | MCL | No |
| Zinc | ug/l | 1.97 | 1190 | 2000 | LTHA | No |

± To convert ug/l to mg/l divide mg/l by 1000; to convert mg/l to ug/l multiple mg/l by 1000. For example, to convert 20,000 ug/l to mg/l divide 20,000 by 1000, which equals 20 mg/l.

* The life time health advisory (LTHA) is based on exposure of a 70-kg adult consuming 2 liters of water per day.

** For individuals on a 500 mg/day restricted sodium diet

Data qualifiers: (U) – not detected at the reported level; (T) & (B) – estimated values (i.e. values that fall between the method detection limit and the method reporting level)

**Appendix A**
**Washington Department of Health**
**Fact Sheets**
**Nitrates and Arsenic**

Fact Sheet

# Nitrate in Drinking Water

**February 2007**
DOH PUB. # 331-214
(Revised)

## How can nitrate get into my well water?

Nitrate is a chemical found in most fertilizers, manure and liquid waste discharged from septic tanks. Natural bacteria in soil can convert nitrogen into nitrate. Rain or irrigation water can carry nitrate down through the soil into groundwater. Your drinking water may contain nitrate if your well draws from this groundwater.

## How does nitrate affect health?

Nitrate is an acute contaminant, which means a single exposure can affect a person's health. It reduces the ability of red blood cells to carry oxygen. In most adults and children these red blood cells rapidly return to normal. However, in infants it can take much longer for the blood cells to return to normal. Infants who drink water with high levels of nitrate (or eat foods made with nitrate-contaminated water) may develop a serious health condition due to the lack of oxygen. This condition is called methemoglobinemia or "blue baby syndrome." Some scientists think diarrhea can make this problem even worse.

Low levels of nitrate in water will not have a long-lasting effect on your baby. If your baby does not have any of the symptoms of "blue baby syndrome," you do not need to have a doctor test for methemoglobinemia.

## How is nitrate in drinking water regulated?

Washington's drinking water quality standard for nitrate is 10 milligrams per liter (mg/L), or 10 parts per million (ppm). State law requires public water systems to sample for many contaminants, including nitrate, on a regular basis. Public water systems with nitrate levels over 10 ppm must notify the people who receive water from them.

## Signs of "blue baby syndrome"

An infant with moderate to serious "blue baby syndrome" may have a brownish-blue skin tone due to lack of oxygen. This condition may be hard to detect in infants with dark skin.

An infant with mild to moderate "blue baby syndrome" may have symptoms similar to a cold or other infection (fussy, tired, diarrhea or vomiting). While there is a simple blood test to see if an infant has "blue baby syndrome," doctors may not think to do this test for babies with mild to moderate symptoms.

## What to do about "blue baby syndrome"

If your baby has a brownish-blue skin tone, take him/her to a hospital immediately. A medication called "methylene blue" will quickly return the baby's blood to normal.

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

HELPING TO ENSURE SAFE AND RELIABLE DRINKING WATER

## Preventing “blue baby syndrome”

The best way to prevent “blue baby syndrome” is to avoid giving your baby water that may be contaminated with nitrate and foods that are high in nitrate. Infants less than one-year-old should not be given drinking water with nitrate levels more than 10 ppm. High-nitrate vegetables such as beets, broccoli, carrots, cauliflower, green beans, spinach and turnips should not be offered until after six months of age.

Nitrate levels in well water can vary throughout the year. If you have a private well and the nitrate level is above five mg/L or if you haven’t tested your well, you may want to use bottled water for your baby’s foods and drinks. Although boiling water kills bacteria, it will not remove chemicals such as nitrate. In fact, boiling may actually increase the nitrate level.

## Will breast-feeding give my infant “blue baby syndrome”?

Low levels of nitrate have been found in breast milk, but the levels are not high enough to cause “blue baby syndrome.”

## Can nitrate affect adults?

Although red blood cells in older children and adults quickly return to normal, some health conditions make people susceptible to health problems from nitrate. They include:

- Individuals who don’t have enough stomach acids.
- Individuals with an inherited lack of the enzyme that converts affected red blood cells back to normal (methemoglobin reductase).

Some studies have found an increased risk of spontaneous abortion or certain birth defects if the mother drank water high in nitrate. Women who are pregnant or trying to become pregnant should not consume water with more than 10 mg/L of nitrate.

## How can I tell if my well water has nitrate?

Shallow wells, poorly sealed or constructed wells, and wells that draw from shallow aquifers are at greatest risk of nitrate contamination. Manure and septic-tank waste may also contain disease-causing bacteria and viruses.

If you own a private well and are unsure about your water quality, you should test for coliform bacteria and nitrate. Your county health department can tell you where you can get your water tested and may have specific recommendations for testing. Many certified labs in Washington charge $20 to $40 per test. If your nitrate test results are over 8 mg/L, we recommend annual testing. If results are less than 8 mg/L, we recommend you test every three years. (Also see ***Important information for private well owners***, DOH Pub. #331-349).

## Where can I get more information?

If you get your water from a public water system, call your water utility or the Washington State Department of Health, Office of Drinking Water at 1-800-521-0323 or visit us online at http://www.doh.wa.gov/ehp/dw/ If you have a private well, call your local health department.

For a list of certified labs, visit the Washington State Department of Ecology online at http://www.ecy.wa.gov/apps/eap/acclabs/labquery.asp Under “Location,” select your state, city and county. Scroll down and click on “Show results.” Click on the name of a lab to see the tests it performs. Call the lab to make sure it is accredited for drinking water analysis of nitrate.

# Arsenic and Your Private Well

Arsenic is found in well water throughout Washington, sometimes at levels that may cause health problems.

Testing a water sample is the only way to know how much arsenic is present.

The Washington State Department of Health (DOH) recommends that water used for drinking or food preparation contain no more than 10 parts per billion (ppb) arsenic.

Washington State Department of Health
Division of Environmental Health
Office of Environmental Health Assessments

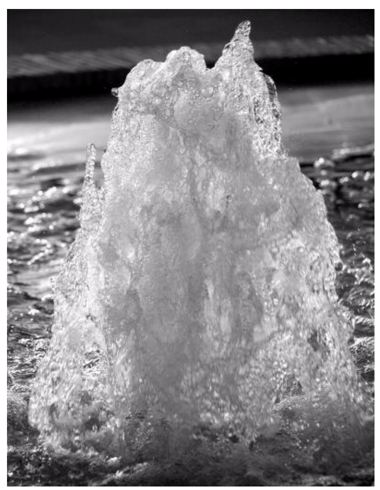
**DOH PUB # 334-156 06/2008**

## What Health Problems Can Be Caused By Arsenic?

Swallowing relatively large amounts of arsenic (even just one time) can cause mild symptoms, serious illness, or in extreme cases, death. Milder effects may include swelling of the face, nausea, vomiting, stomach pain, or diarrhea. Serious effects may include coma, internal bleeding, or nerve damage causing weakness or loss of sensation in the hands, arms, feet, or legs. Only a few private drinking water wells in Washington have been found to have this much arsenic.

Long-term exposure to smaller amounts of arsenic is more common and can increase the risk of developing cancer of the bladder, lung, skin, liver, kidney, or prostate. Other health effects may include high blood pressure, narrowing of the blood vessels, nerve damage, anemia, diabetes, stomach upset, and skin changes.

Consult your medical provider if you think you have any health problems that may be caused by exposure to arsenic.



## Should I Be Concerned?

Most health problems from long-term arsenic exposure are common illnesses that affect many people and have several possible causes besides arsenic.

Even with relatively high levels of arsenic in the water, we expect that these health problems usually are not caused by arsenic exposure, but are mostly due to other factors such as:

- diet,
- genes,
- lifestyle,
- other chemicals, or
- preexisting illness.

Still, arsenic is known to increase the risk of developing these illnesses and likely contributes to some of the cases we see.

It is difficult to predict whether arsenic in drinking water will affect you, or what the effects will be. The risk that you will get sick depends on:

- Your individual sensitivity to arsenic.
- The amount of arsenic in the water.
- How much water you consume.
- How many years you drink the water.

Exposures that can cause serious health problems for some people may have no effect on others. Also, two people with similar exposures may develop totally different health problems. *However, more exposure to arsenic increases the likelihood that health problems will occur. Reducing exposure reduces the risk.*

## How are People Exposed To Arsenic?

Everyone has some daily exposure to arsenic because it is a naturally-occurring chemical element that is normally found in water, soil, indoor house dust, air, and food.

Arsenic in your water supply can get into your body when you drink the water or use it to cook or prepare food and beverages.

Arsenic is not absorbed very well through the skin. Exposure from skin contact alone, such as bathing or washing dishes in arsenic-contaminated water, is unlikely to cause health problems.

Arsenic gets into well water through natural erosion. As ground water flows through rocks and soil that contain arsenic, some of the arsenic dissolves into the water. Drinking water in Washington typically contains less than 3 parts of arsenic per billion parts of water (often abbreviated as 3 ppb). For comparison, 3 ppb is about equal to adding one teaspoon of arsenic to an acre of water that is 4 feet deep. However, levels of health concern (from 10 ppb to 33,000 ppb) have been found in some wells in Washington. These are usually associated with underground aquifers located in rock or soil that has a naturally high content of arsenic.

**PUBLIC HEALTH**
**ALWAYS WORKING FOR A SAFER AND HEALTHIER WASHINGTON**

For persons with disabilities, this brochure is also available in other formats.
To submit a request, please call 1-800-525-0127 (TTY/TDD: 1-800-833-6388)

## Should I Get My Well Tested For Arsenic?

DOH encourages you to test your private well to evaluate the safety of your drinking water supply. Arsenic levels are higher than 10 ppb in many wells in Washington. The only way to know how much arsenic is in your water is to test it.

Because the amount of arsenic in well water can vary throughout the year, you should test for it in the late summer and in the early spring to see if there are seasonal differences.

Laboratories usually charge $20 to $35 for the test. You can find a list of labs online at: http://www.ecy.wa.gov/programs/eap/labs/search.html
or by calling the Washington State Department of Ecology's Laboratory Accreditation Unit at (360) 895-6145. The laboratory can provide instructions for taking a sample and will often supply a container.

## What Do My Test Results Mean?

To lower people's risk of health problems, the federal Safe Drinking Water Act requires 10 ppb or less arsenic in *public drinking water supplies* with more than fourteen homes.

Although a few counties in Washington have rules for arsenic in private water systems, *there is no state-wide standard for arsenic in private wells*.

DOH recommends that water used for drinking or food preparation contain no more than 10 ppb arsenic. If your water has more than 10 ppb arsenic, you will have to balance the health risks, cost, and convenience when deciding whether or not to continue to use your water supply.

If your water contains more than 50 ppb arsenic, DOH recommends that you stop using it immediately for drinking and food preparation.

Since arsenic does not pass through your skin very easily, it is OK to bathe, clean, and wash foods with water unless it contains more than 500 ppb. If the levels in your water are greater than 500 ppb, you should call your local health department or DOH for advice.

## How Can I Reduce My Exposure To Arsenic From My Well?

There are several ways to reduce your exposure to arsenic in your well water. Each alternative has advantages and disadvantages to consider. If you have arsenic in your water above 500 ppb, you should talk to your local health department or DOH before choosing an option.

***Use Bottled Water***

Drinking and cooking with bottled water can reduce your exposure immediately while you consider your options. However, it can be inconvenient and costly in the long run. You should also contact the bottled water supplier to ask about the levels of any impurities, including arsenic, that their water may contain.

***Treat the Well Water***

Many water filters on the market can improve the taste and remove odors from drinking water but do not remove arsenic. Some home water treatment systems that use reverse osmosis, distillation, or special filtration material can reduce the amount of arsenic in the water. These systems vary in cost and the amount of water they can supply every day. Point-of-entry equipment, commonly referred to as a whole-house system, treats all the water used in the house. Point-of-use systems treat water at a single tap, such as a kitchen sink faucet.

The quality of your water will affect how well the treatment system works and how much maintenance it will require.

DOH recommends installing equipment that has been certified by NSF International, a not-for-profit public health and safety company that tests home water treatment systems.

Call 1-800-NSF-MARK or go to their web site, http://www.nsf.org/. After installation and routine maintenance, your water should be tested to ensure that the system is removing arsenic.

***Drill a New Well***

A new well installed at a different location or depth may or may not provide water with acceptable levels of arsenic. However, it is an option that may be worth pursuing in some situations.

***Connect to a Public Water Supply or Community Well***

It may be possible to connect to a public water supply or community well if one is nearby. These water systems must be maintained regularly and meet federal and state public health standards. Contact your local water utility to ask about the possibility of connecting to a public supply.


**For more information, please contact:**

**Washington State Department of Health**
Office of Environmental Health Assessments
877-485-7316 (Toll-Free)
http://www.doh.wa.gov/ehp/oehas/

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## Certification

This Kaiser Aluminum Health Consultation was prepared by the Washington State Department of Health under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodologies and procedures existing at the time the health consultation was initiated. Editorial review was completed by the Cooperative Agreement partner.

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The Division of Health Assessment and Consultation, (DHAC), ATSDR, has reviewed this public health consultation and concurs with the findings.

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