Health Consultation

SNOWFLAKE SKI AREA WELLS

DULUTH, ST. LOUIS COUNTY, MINNESOTA

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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR 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 document has previously been released for a 30 day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The health consultation has now been reissued. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

SNOWFLAKE SKI AREA WELLS

DULUTH, ST. LOUIS COUNTY, MINNESOTA

Prepared by:

Minnesota Department of Health
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

FOREWORD

This document summarizes public health concerns near a hazardous waste site (the Duluth Dump #1 site) in Minnesota. It is based on a formal site evaluation prepared by the Minnesota Department of Health (MDH). For a formal site evaluation, a number of steps are necessary:

- *Evaluating exposure:* MDH scientists begin by reviewing available information about environmental conditions at the site. The first task is to find out how much contamination is present, where it is found on the site, and how people might be exposed to it. Usually, MDH does not collect its own environmental sampling data. Rather, MDH relies on information provided by the Minnesota Pollution Control Agency (MPCA), the US Environmental Protection Agency (EPA), and other government agencies, private businesses, and the general public.

- *Evaluating health effects:* If there is evidence that people are being exposed—or could be exposed—to hazardous substances, MDH scientists will take steps to determine whether that exposure could be harmful to human health. MDH's report focuses on public health— that is, the health impact on the community as a whole. The report is based on existing scientific information.

- *Developing recommendations:* In the evaluation report, MDH outlines its conclusions regarding any potential health threat posed by a site and offers recommendations for reducing or eliminating human exposure to contaminants. The role of MDH in dealing with hazardous waste sites is primarily advisory. For that reason, the evaluation report will typically recommend actions to be taken by other agencies—including EPA and MPCA. If, however, an immediate health threat exists, MDH will issue a public health advisory to warn people of the danger and will work to resolve the problem.

- *Soliciting community input*: The evaluation process is interactive. MDH starts by soliciting and evaluating information from various government agencies, the individuals or organizations responsible for cleaning up the site, and community members living near the site. Any conclusions about the site are shared with the individuals, groups, and organizations that provided the information. Once an evaluation report has been prepared, MDH seeks feedback from the public. *If you have questions or comments about this report, we encourage you to contact us.*

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I. Summary of Background and History

In July, 2003 staff from the Minnesota Pollution Control Agency (MPCA) Duluth regional office contacted Minnesota Department of Health (MDH) staff in the Site Assessment and Consultation (SAC) unit to discuss unusually high levels of heavy metals found in a water supply system serving the Snowflake Ski Area in Duluth, Minnesota. The Snowflake Ski Area is a recreational facility located at 4348 Rice Lake Road, approximately five miles north of downtown Duluth, and is used for camping, disc golf, hiking and biking, and soccer in the summer months, and cross country skiing and speed skating in the winter months. The facility is popular with area residents, families, youth, and school groups, and is operated by a former U.S. Olympic Ski Team member.

The MPCA staff collected water samples from the system, and the two wells that serve it, as a part of the continued monitoring of groundwater and surface water contamination at and around the former Duluth Dump #1 site. This 24-acre dump site operated from the mid-1950s to the mid-1960s, and contains approximately 260,000 cubic yards of municipal and industrial wastes, demolition debris, and potentially hazardous wastes. The Duluth Dump #1 is a state Superfund site (MND981529795), and is located approximately 2,000 feet northwest of the wells at the Snowflake Ski Area. Remedial actions completed at the dump site included consolidation and covering of wastes, relocating former on-site residents, and performing groundwater and surface water monitoring around the former dump site. Groundwater beneath the dump is contaminated with volatile organic compounds (VOCs) and various metals, including arsenic and manganese. MDH has produced several documents relating to the former Duluth Dump #1, the most recent being a Site Review and Update in 1997 (MDH 1997). The locations of the former Duluth Dump #1 site as well as the Snowflake Ski Area are shown in Figure 1. A tennis center is also located between the dump site and ski area.

Geology/Hydrogeology

The Snowflake Ski Area is located in a hilly area of the city of Duluth. Several streams, wetlands, and ponds are located in the vicinity. Boring logs from the two wells at the ski area, which were installed in 1993, indicate that the area is underlain by approximately 40 to 60 feet of glacial till, consisting of sandy clay, gravelly clay, and gravel. Beneath the glacial till is bedrock (gabbro). Groundwater in the area is typically first found in the glacial till, and is expected to flow north-northwest, towards surface water features at and near the former Duluth Dump #1 site (MDH 1997; MPCA 2003). The Snowflake Ski Area is considered to be upgradient of the former Duluth Dump #1 site based on existing data.

The two wells at the site are located approximately 100 feet north-northeast of the chalet, which is the main building at the ski area. The first well (unique well #532447) is 60 feet deep, six inches in diameter, and is completed just at the top of the bedrock. It is located approximately 100 feet north, and ten feet higher in elevation than the second well (unique well #532449). This well is 304 feet deep, also six inches in diameter, and is completed as an open hole in the bedrock from 42 to 304 feet. The locations of the wells relative to the chalet and other nearby features are shown in Figure 2.

Well Monitoring Data

The two wells that provide water to the ski area water supply are plumbed through separate lines into the basement of the chalet. Each well has its own pressure tank, and a series of valves allows for either well to be operated alone, or their flows combined to serve the system. The latter has been the normal mode of operation for the system. When a tap is turned on, water appears to be pumped from the shallow well first; water would be pumped from the deep well only when needed to meet heavy demand. The system is considered by MDH as a transient non-community public water system (PWS ID#5691140) and is monitored periodically for coliform bacteria and nitrates, both of which were below detection limits in the last sample collected in the summer of 2002.

The MPCA staff first collected water samples from the Snowflake Ski Area system on May 7th, 2003. The system, in the above configuration, was first purged by running water from the outside tap at the chalet at a rate of approximately 7.5 gallons per minute for 40 minutes. Water was presumably running from both wells. The water was then shut off, and the valves serving each well were alternately closed so that individual samples from each well could be collected. The water samples from each well were analyzed at the Northeast Technical Services (NTS) laboratory in Virginia, Minnesota for VOCs, general inorganic parameters, and total metals. No VOCs were detected in either sample. The results of the analyses for metals and inorganic parameters can be found in Table 1. Elevated levels of metals (such as lead and zinc) were found in the sample from the shallow well. Very high concentrations of metals such as aluminum, boron, copper, lead, and zinc were found in the sample from the deep well. The concentration of lead in the south well was 425 micrograms per liter of water (μg/L), well in excess of the federal action limit for lead in water supplies of 15 μg/L. Levels of other metals approached or exceeded the MDH's Health Risk Limits (HRLs) for contaminants in drinking water, or federal secondary standards that are based on taste, odor or appearance as opposed to health protection. The HRLs represent levels of contamination in drinking water that MDH considers safe for daily (about 2 liters per day) human consumption over a lifetime.

Due to the high concentrations of metals detected in the May samples, a second set of water samples were collected by the MPCA staff on June 30th, 2003. The water samples were collected at several locations in the following manner:

- Kitchen sink on the main level of the chalet, before system purging
- Drinking water fountain, basement of chalet, before purging
- Sample from the south (deep) well, before purging
- The system was then purged for 40 minutes at 7.5 gallons per minute, switching between the two wells by using the valves
- Sample from north (shallow) well after purging
- Sample from the south (deep) well after purging (w/duplicate)

The samples were analyzed at the MDH laboratory for general inorganic parameters and total metals. Those metals that did not appear to be of concern, or were below detection limits in the May samples were not included in the analysis of this round of sampling. MPCA staff noted that

samples from the kitchen sink and drinking fountain, as well as all of the samples from the south well became slightly turbid (cloudy) after they sat for a short time. Cloudiness was not observed in the sample from the north well. The results of the sampling are also shown in Table 1.

The analysis of the June samples showed that metal concentrations (primarily lead, aluminum, iron, and boron) were elevated in the pre-purge samples from the kitchen tap and from the south well (a pre-purge sample was not collected from the north well). The lead concentration was in excess of the federal action limit of 15 µg/L. Metal concentrations were much lower in the basement drinking fountain sample, which should have been drawing the same water as the kitchen tap sample, for reasons which are not clear. The post-purge metals concentrations in the south well were generally similar to the pre-purge samples, indicating that the well was not being adequately purged, or the purging was having no effect on metals concentrations. In the north well sample (post-purge), metals concentrations were greatly reduced, with all metals being below their respective HRLs or federal standards. The operator of the ski area was sent letters from both MDH and MPCA with the results, as well as a recommendation not to use the kitchen tap water for drinking or cooking until the situation could be further investigated and resolved.

MDH and MPCA staff returned to the site on August 18, 2003, to collect additional water samples. The intent of this sampling event was to monitor the geochemical conditions of the well water during purging to determine when the wells were adequately purged, and to try to determine if the plumbing system components were contributing to the elevated levels of metals that had been detected. The water samples were again collected in several locations in the following manner:

- Kitchen sink on the main level of the chalet, before system purging
- Drinking water fountain, basement of chalet, before purging
- Sample from the south (deep) well, before purging
- Sample from the north (shallow) well, before purging
- The north well was then purged for approximately 20 minutes at 6 gallons per minute until stabilized; the south well was purged for at least 20 minutes at 5 gallons per minute before running dry
- Sample from north (shallow) well after purging
- Sample from the south (deep) well after purging and recovery period of approximately 2 hours (with duplicate)

The north (shallow) well stabilized in a relatively short time based on monitoring of common geochemical parameters such as pH, conductivity, temperature, and dissolved oxygen content. The south well, which was assumed to require a much longer time to stabilize due to its greater depth, unfortunately ran dry after an undetermined time period while staff temporarily left the site. After it was shut down and allowed to recover, it again produced water, but it was very turbid and contained visible sediment. The samples were taken to the MDH laboratory for analysis for selected metals and general inorganic parameters.

The results of the August 2003 samples (Table 2) showed elevated levels of the previously identified metals of concern in the pre-purge samples from the kitchen tap, drinking fountain,

and south (deep) well. The concentrations were below their respective health-based HRLs or federal standards, although aluminum and iron exceeded federal secondary standards based on taste, odor, and appearance. The concentrations of all metals were generally lower than in the May and June samples. The post-purge samples from the south well contained much higher levels of metals, especially aluminum, boron, lead, and iron. The metals may be associated with the much higher levels of suspended solids that were in the samples as a result of the well running dry, as mentioned previously and discussed in more detail below. Pre- and post-purge samples from the north well were relatively consistent with one another and were similar to the June samples, with only iron exceeding its federal secondary standard. Before leaving the ski area, the valve from the south well was turned off such that water from the north well only would serve the system. The site owner was again provided with the results by letter from MDH, with a recommendation to only use the north well.

As a follow-up, the MPCA collected additional samples from the ski area wells on November 18, 2003. The samples were again analyzed at the NTS laboratory for VOCs, metals, and general inorganic parameters. No VOCs were detected. Data for metals and inorganic parameters are presented in Table 3. Levels of metals (aluminum, boron, iron, and lead) were again elevated, as well as suspended solids. The south well had presumably not been in use since the August sampling event. In the sample from the north well, only copper was slightly elevated. The results confirm that water from the north well is the best suited for supplying potable water for the facility.

Also on November 18, 2003, a sample was collected from the water supply system at the adjacent tennis center and analyzed for the same list of parameters. This system is served by two approximately 380-foot deep wells (unique well #'s 266356 and 266358) that feed a common supply tank. The wells could not be sampled individually, so the water sample was collected from an inside tap. The well locations are shown in Figure 2, and are just to the north of the Snowflake wells. No VOCs were detected; data for metals and inorganic parameters are also presented in Table 3. A number of metals were detected in the sample; only boron was considered to be at an elevated level. None of the analytes in this sample were detected at concentration exceeding state or federal health-based drinking water standards.

Site Visit

MDH staff visited the Snow Flake Ski Area on August 18, 2003, to assist in the collection of water samples. The ski area is not typically occupied in the summer months, except for occasional campers, and only a few people were on the property to play disc golf that day. It is apparent from photos, publications, and the ski area's web site that it is quite popular during the winter months, with many ski events being held. The ski area has 15 kilometers of ski trails, some of which are lighted for night skiing. The chalet contains shower facilities, as well as a sauna. A caretaker may also spend nights in a small apartment in the chalet when needed. The area around the ski area is essentially rural and only sparsely populated, despite being within the Duluth city limits. A tennis center is located adjacent to the ski area, and the former Duluth Dump #1 is located just to the north.

II. Discussion

The main concern relative to the wells at the Snowflake Ski Area is the potential for human exposure to contaminants in well water that could approach or exceed MDH HRLs or federal standards, primarily lead, cadmium, boron, and zinc. Aluminum and iron have also been commonly detected in the well water samples at levels exceeding federal secondary standards relating to taste, odor, and appearance. These secondary standards may also provide some protection from possible toxic effects of these metals. Some studies, for instance, suggest that exposure to high concentrations of aluminum may be associated with adverse effects on the bones and brain but the relationship has not been firmly established (ATSDR 1999a). With the exception of boron, it is possible that at least some of the metals could also have come from components of the well or plumbing system.

Lead was initially detected at a concentration 28 times the federal action limit, and remained above the action limit in some follow-up samples from the south well. Lead is toxic to many of the body's organ systems. The nervous system is the organ of primary concern (ATSDR 1999b). Of greatest concern is lead's toxicity to the developing nervous system, and young children are especially vulnerable to the toxic effects of lead exposure. Children between one and five years of age are also the most likely group in the general population to have high lead exposures because their behaviors (e.g., playing on the floor or ground, frequent hand-to-mouth contact) result in greater exposures than the behaviors of older children and adults to contaminated paint, dust, and soil, both in general and based on a per pound of body weight basis. Additional exposure to lead in water, especially at the high level initially observed in the south well, can add to a possibly high burden of lead in young children who may also be exposed through other routes. Children who ingest large amounts of lead may develop anemia, kidney damage, colic, muscle weakness, and brain damage (ATSDR 1999b). Ingestion of smaller amounts of lead, at once or over time, may result in lesser effects on the blood and brain function. Exposure to low levels over time may affect physical and mental growth. Prenatal exposure may result in premature birth, low birth weight, and impaired development. Long-term exposure to lead has been associated with decreased neurological function in workers exposed to lead on the job. High blood pressure is another possible effect from exposure to lead.

The concentration of lead in blood serves as an indicator of exposure. The Centers for Disease Control and Prevention (CDC) considers children to have an elevated level of lead in their blood if the lead level is 10 micrograms per deciliter of blood (μg/dl) or higher (ATSDR 1999b). This level of concern has also been recognized by MDH, EPA, and MPCA. Minnesota state statutes (Minn. Stat. § 144.9501) established 10 μg/dl as an "elevated blood lead level." However, there is no firm threshold of toxic exposure to lead, so it is important for blood lead levels in any population to be as low as possible. Low blood lead levels are important both to protect the health of children (and others) from subtle adverse effects that might occur below the level of concern and to limit the size of the population with blood lead levels above 10 μg/dl. A recent study published in the *New England Journal of Medicine* in fact suggests that blood lead levels even below 10 μg/dl may be associated with intellectual impairment in children (Canfield et al

2003). For these reasons, children's exposures to lead should be minimized or eliminated wherever possible.

Cadmium was only detected once at levels above the laboratory detection limits (and well in excess of the HRL), in the initial sample from the south well collected in May 2003. Its presence may have been associated with sediments in the wells or water system, from some component of the water system, or from lack of use of the wells. Exposure to high levels of cadmium in drinking water may be associated with adverse effects on the stomach, blood, liver, and especially the kidneys (ATSDR 1999c). Cadmium can build up in the kidneys, and can cause kidney damage if the concentrations become high enough.

Boron and zinc have not been detected at concentrations exceeding HRLs. Boron has been consistently detected at concentrations of approximately one-third to one-half of the HRL of 600 μg/L, while zinc was detected at a concentration just below its HRL of 2,000 μg/L in the initial water sample from the south well. Boron is common in the environment, and has been previously found at high levels in private wells along the north shore of Lake Superior and in other parts of Minnesota (MPCA 1995). Exposure to high levels of boron may be associated with adverse effects on the male reproductive system, and potentially with birth defects (MDH 1995). Zinc is also common at low levels in the environment. Zinc is an essential element needed by the body in small amounts. Exposure to high levels of zinc in drinking water may be irritating to the stomach, and long-term exposure may be associated with anemia, damage to the pancreas, and a decrease in levels of high-density lipoprotein (HDL) cholesterol (ATSDR 2003).

The frequency and extent of human exposure to metals in the well water at the Snowflake Ski Area is difficult to assess. Short-term exposures to elevated or high levels of metals may have occurred, including by children. The potential toxic effects associated with exposure to the metals found in the south well and described above (with the exception of lead and possibly cadmium) are unlikely to have occurred based on the assumed pattern of exposure. Because exposures to lead can be cumulative, however, identifiable environmental exposures to lead should be reduced or eliminated wherever possible. Approximately 7% of the 1,677 children under the age of six living in St. Louis County whose blood lead level was tested in 2002 had a blood lead level in excess of 10 μg/dl (MDH 2002). Even short-term exposure to the extremely high level of lead observed in the initial sample from the south well (425 μg/L) could potentially cause toxic effects, and without intervention could have become a significant public health concern.

The high levels of metals in the initial (early May 2003) sample from the south well may have been associated with suspended sediments from the lack of use of the water system during the spring months. The facility likely does not receive very heavy use in the spring when the snow is melting and skiing conditions are poor, and before the weather improves so that disc golf, camping and other summer activities draw people to the facility. The south well has no well screen, and is completed as an open hole across 262 feet of bedrock; fine-grained sediments from the rock formation may easily erode into the water and build up during periods of disuse, and enter the distribution system as a result. Levels of metals and total suspended solids declined as the summer went on. In the August 2003 samples, the pre-purge samples from the south well

and system were relatively low in suspended solids and metals, indicating that the well and system may have been flushed relatively clean from use during the summer. When the well ran dry during purging, however, the amount of suspended solids in the post-purge sample was again very high, and the levels of metals rose as a result. Because it is located upgradient, the metals in the south well do not appear to be related to the former Duluth Dump #1 site. The lack of detections of elevated levels of metals (with the exception of boron) in the tennis center wells, which are located between the Snowflake Ski Area and the Duluth Dump #1 supports this conclusion.

The north well is completed at the very top of the bedrock, with only a 1-foot open hole. Concentrations of suspended sediments and metals in the north well have been relatively low in each sample event, and based on its construction it may be relatively immune to the sediment and metals problems associated with the south well. It also has a much higher pumping capacity based on the purging conducted by MDH and MPCA staff in August 2003. The pH of the water from the two wells is also slightly different, with the water from the south well fairly basic (high pH). When MDH and MPCA staff left the Snowflake Ski Area after collecting the water samples on August 18th, 2003, the system was left configured so that water would be supplied from the north (shallow) well only. Follow-up samples collected by the MPCA on November 18, 2003 confirmed that the system (using the north well only) is supplying water that meets state and federal health-protective standards for metals.

Child Health Considerations

ATSDR and MDH recognize that the unique vulnerabilities of infants and children make them of special concern to communities faced with contamination of their water, soil, air, or food. Children are at greater risk than adults from certain kinds of exposures to hazardous substances at waste disposal sites. They are more likely to be exposed because they play outdoors and they often bring food into contaminated areas. They are smaller than adults, which means they breathe dust, soil, and heavy vapors close to the ground. Children also weigh less, resulting in higher doses of chemical exposure per body weight. The developing body systems of children can sustain permanent damage if toxic exposures occur during critical growth stages. Most importantly, children depend completely on adults for risk identification and management decisions, housing decisions, and access to medical care.

Children may have been exposed for short periods of time to elevated levels of heavy metals, primarily lead, cadmium, boron, and zinc through drinking water at the site. The amount of exposure is hard to quantify, and would be based on the number of times a child visited the facility, how much water they typically consumed, and the concentrations of metals in the well water at that given time. In the future, exposure to levels of metals approaching or exceeding the HRLs / federal standards should be prevented by the use of the north well only for drinking water, and by following the recommendations below.

III. Conclusions

Because individual exposures to the elevated or high levels of metals found in well water at the Snowflake Ski Area are difficult to estimate, and may have varied due to behaviors and fluctuations in the concentrations of metals in the south well, past exposures to metals in the water system represent an indeterminate public health hazard. Because the system has now been configured to draw water solely from the shallow north well, which has relatively low levels of metals, exposure to contaminants in the water system currently represents no apparent public health hazard.

IV. Recommendations

1. The water supply system should be left configured so that the north (shallow) well is the only well used to supply the potable water system at the Snowflake Ski Area.
2. The water system should be monitored for the standard water quality parameters (nitrate and bacteria) by MDH and/or St. Louis County.
3. If the south (deep) well is not to be converted to non-potable uses (i.e., irrigation), it should be disconnected from the system and properly sealed.

V. Public Health Action Plan

MDH's Public Health Action Plan for the site consists of consultation with MPCA staff, St. Louis County, and the site owner on the monitoring and safe operation of the water supply system (such as thoroughly flushing the system after periods of disuse, especially in the spring and fall), answering any questions from the public regarding the situation, and participation in any planned public outreach activities.

VI. References

Agency for Toxic Substances and Disease Registry (a). Toxicological profile for aluminum. Atlanta: US Department of Health and Human Services; 1999 Jul.

Agency for Toxic Substances and Disease Registry (b). Toxicological profile for lead. Atlanta: US Department of Health and Human Services; 1999 Jul.

Agency for Toxic Substances and Disease Registry (c). Toxicological profile for cadmium. Atlanta: US Department of Health and Human Services; 1999 Jul.

Agency for Toxic Substances and Disease Registry. Draft toxicological profile for zinc. Atlanta: US Department of Health and Human Services; 2003 Sep.

Canfield RL, Henderson CR, Cory-Slechta DA, Cox C, Jusko TA, Lanphear BP. Intellectual impairment in children with blood lead concentrations below 10 μg per deciliter. N Engl J Med 2003; 348:1517–1526.

MDH 1995. Information Sheet – Boron in Drinking Water. Minnesota Department of Health, St. Paul, Minnesota. February 1995.

MDH 1997. Site Review and Update, Duluth Former City Dump Site #1. Minnesota Department of Health, St. Paul, Minnesota. February 19, 1997.

MPCA 1995. Ground Water Monitoring and Assessment Program Annual Report. Minnesota Pollution Control Agency, St. Paul, Minnesota. November 1995.

MDH 2002. Minnesota Blood Lead Surveillance Data, 2002. Available online at: http://www.health.state.mn.us/divs/eh/lead/reports/profile2002.pdf.

MPCA 2003. Memorandum from Mark C. Elliott to Maureen Johnson. Minnesota Pollution Control Agency, St. Paul, Minnesota. July 1, 2003.

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CERTIFICATION

This Snowflake Ski Area Wells Health Consultation was prepared by the Minnesota Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

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ATSDR

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

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Roberta Erlwein
Chief, State Program Section, SSAB, DHAC, ATSDR

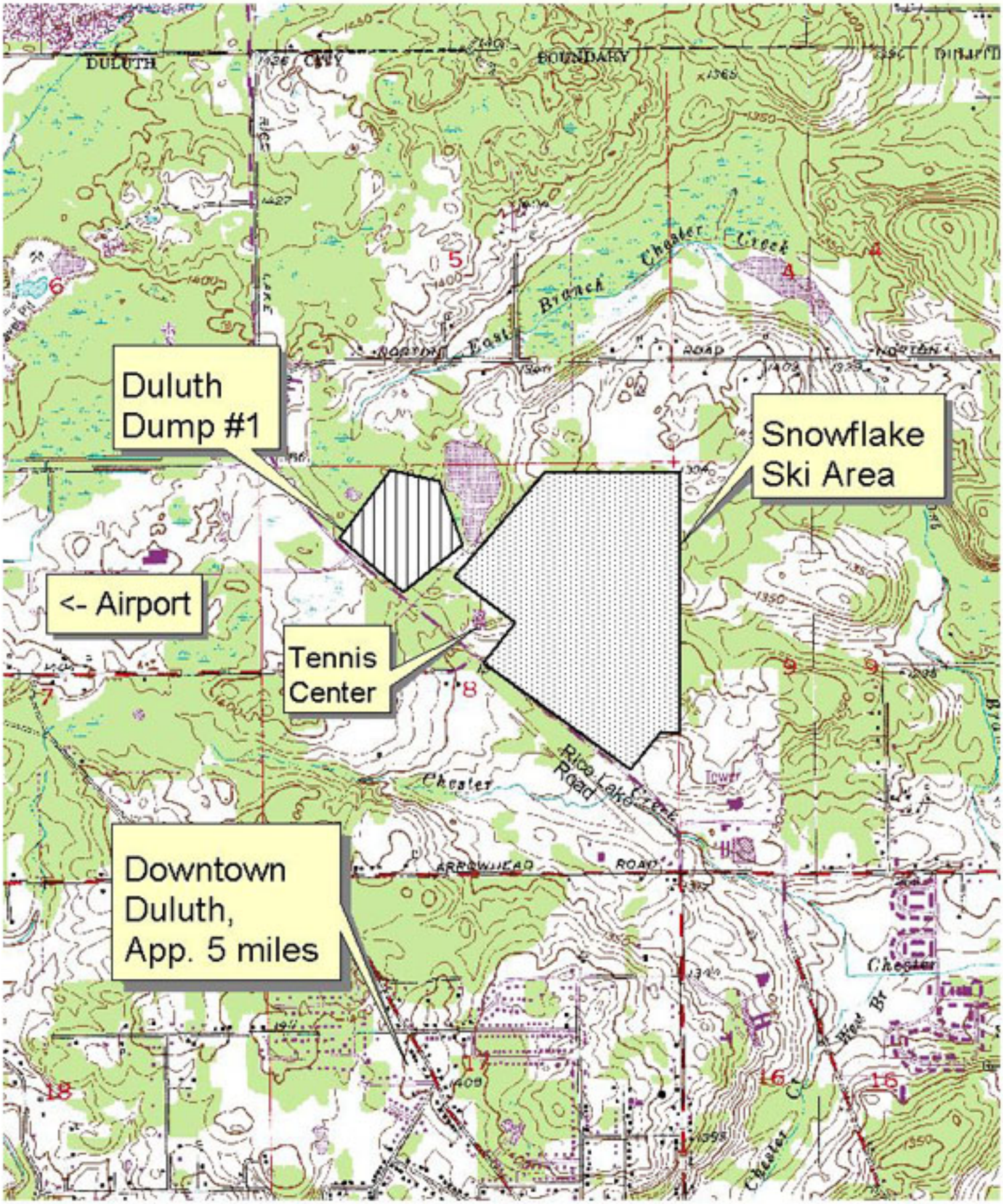

Figure 1: Site Location

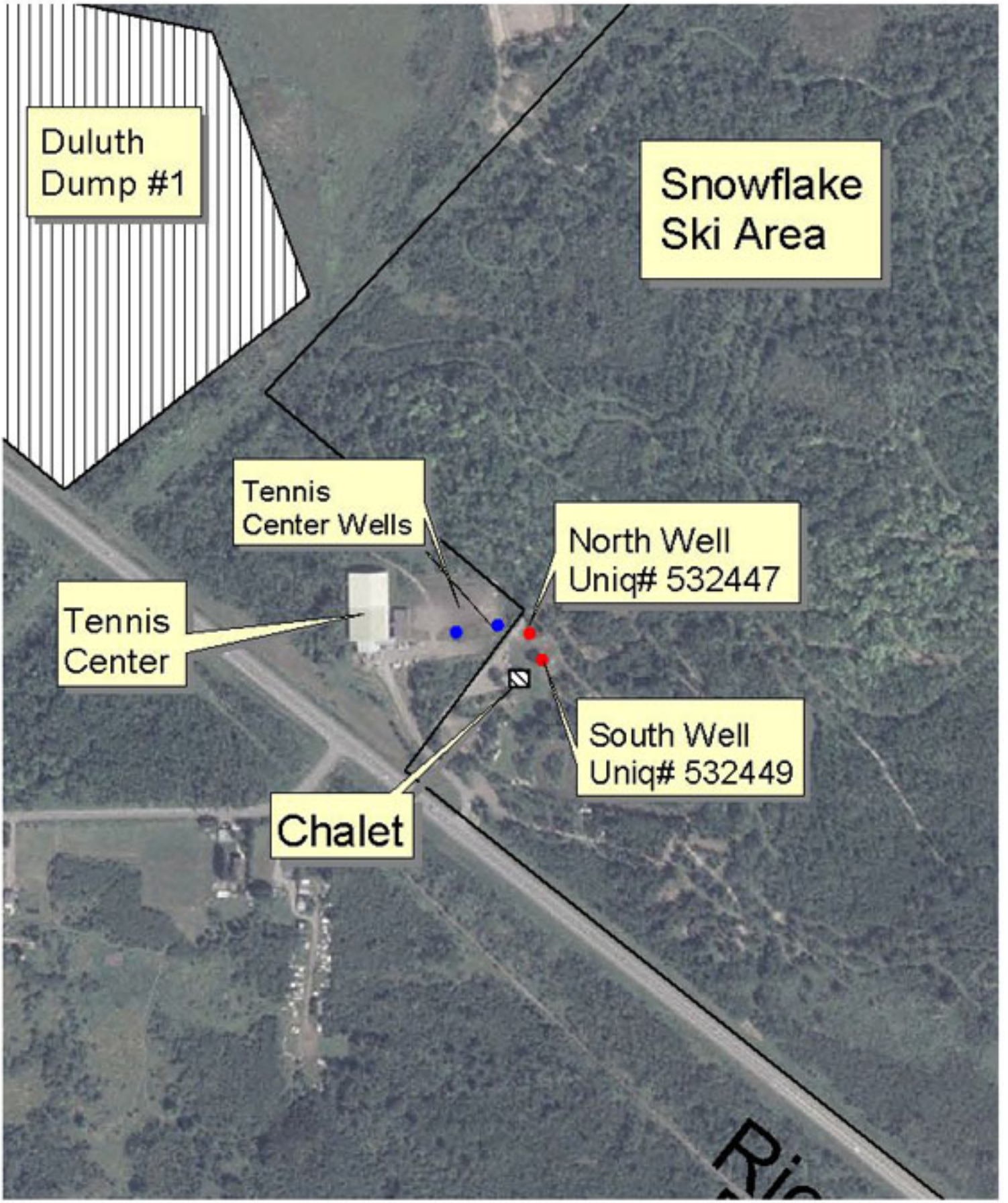

Figure 2: Well Locations