# LINDENWOOD WATER ASSOCIATION (PWS #3140010)
# SOURCE WATER ASSESSMENT FINAL REPORT

**August 22, 2002**

## State of Idaho
## Department of Environmental Quality

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# Executive Summary

Under the federal Safe Drinking Water Act Amendments of 1996, all states are required by the U.S. Environmental Protection Agency (EPA) to assess every source of public drinking water for its relative sensitivity to contaminants regulated by the act. The assessment for your particular system is based on a land use inventory of the designated source water area, sensitivity factors associated with each well, and characteristics of the aquifer that supplies your community with drinking water.

This report, *Source Water Assessment for the Lindenwood Water Association, located in Nampa, Idaho*, describes the public drinking water system, the boundaries of the zones of water contribution, and the associated potential contaminant sources located within those boundaries. This assessment should be used as a planning tool, taken into account with local knowledge and concerns, to develop and implement appropriate protection measures for this source. **The results should <u>not be</u> used as an absolute measure of risk and they should <u>not be</u> used to undermine public confidence in the water system.**

Final susceptibility scores are derived from equally weighting system construction scores, hydrologic sensitivity scores, and potential contaminant/land use scores. Therefore, a low rating in one or two categories coupled with a higher rating in other categories results in a final rating of low, moderate, or high susceptibility. With the potential contaminants associated with most urban and heavily agricultural areas, the best score a well can get is moderate. Potential contaminants are divided into four categories, inorganic contaminants (IOCs, i.e. nitrates, arsenic), volatile organic contaminants (VOCs, i.e. petroleum products), synthetic organic contaminants (SOCs, i.e. pesticides), and microbial contaminants (i.e. bacteria). As different wells can be subject to various contamination settings, separate scores are given for each type of contaminant.

The Lindenwood Water Association (PWS #3140010) drinking water system consists of a single ground water well. The well rated an overall high susceptibility to IOCs, VOCs, SOCs, and microbial, (Table 1). Additionally, the area has been classified as a high agricultural chemical use area. Even though the system has experienced a significant decrease in nitrate in its finished water, the area is a priority area for nitrate and the herbicides alachlor and atrazine. The water system may be vulnerable to these types of contaminants since they are prevalent in the region.

Additionally, no VOCs or SOCs have been detected in any drinking water sample collected from the Lindenwood Water Association water system. Fluoride and barium have been detected in the well, but was at levels below the maximum contaminant level (MCL) as established by the EPA. Arsenic has also been detected and in the two sample collected to date would are at the recently revised MCL of 10 parts per billion (ppb). The EPA recently lowered the MCL for arsenic from 50 ppb to 10 ppb (October 31, 2001), requiring all water systems to comply with the new standard by 2006. The Lindenwood Water Association may wish to carefully monitor arsenic in their system since the monitoring would be near the revised MCL. The Lindenwood Water Association may also want to consider implementing engineering controls or technologies in order to manage the arsenic levels to continue to meet the new arsenic requirements. According to a press release posted on the EPA website (http://www.epa.gov/safewater/ars/implement.html), the EPA intends to provide up to $20 million over the next two years for research and development of more cost-effective technologies to help small systems meet the new standard and provide technical assistance to small system operators. The EPA has also stated that it “will work with small communities to maximize grants and loans under current State

Revolving Fund and Rural Utilities Service programs of the Department of Agriculture." (USEPA, 2001, para 5). The elevated level of arsenic presently poses the greatest concern for the Lindenwood Water Association.

Bacteria have been detected on a couple of occasions and all detections have been associated with the distribution system. Should bacteria in the future continue to pose a problem for the Lindenwood Water Association, it may become necessary to modify disinfection practices associated with the system.

Within the delineated drinking water capture zone (Figure 2), there are a number (14) of potential contaminant sources, which were identified on the computer map. These include several transportation corridors including local streets and canals, which bisect the delineation and could in the unlikely event of a spill or release contaminate the aquifer. Each potential contaminant source, along with the type of pollutant stored at each site is listed in Table 2.

This assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what ranking a source receives, protection is always important. Whether the source is currently located in a "pristine" area or an area with numerous industrial and/or agricultural land uses that require surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources. If the system should need to expand in the future, new well sites should be located in areas with as few potential sources of contamination as possible, and the site should be reserved and protected for this specific use.

For the Lindenwood Water Association, drinking water protection activities should first focus on continued maintenance of the sanitary seal and distribution system. Actions should also be taken to keep a 50-foot radius circle clear around the wellhead. Any spills associated with the transportation corridors or the canals should be monitored and dealt with expeditiously. Additionally, there should be a focus on implementation of practices aimed at reducing the leaching of chemicals associated with irrigated agriculture within the designated source water area.

Because a significant portion of the ground water capture zone is outside the direct jurisdiction of Lindenwood Water Association, the creation of partnerships with state and local agencies and industry groups are critical to the success of drinking water protection. Furthermore, if microbial contamination should continue to be a problem, appropriate disinfection practices would need to be implemented to ensure the health of the Lindenwood Water Association residents.

Due to the time involved with the movement of ground water, drinking water protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. A strong public education program should be a primary focus of any drinking water protection plan, especially since the delineation contains some urban and residential land uses. Public education topics could include proper lawn care practices, household hazardous waste disposal methods, and the importance of water conservation to name but a few.

There are multiple resources available to help communities implement protection programs, including the Drinking Water Academy of the EPA. Drinking water protection practices dealing with agriculture should be coordinated with the Idaho State Department of Agriculture, the Soil Conservation Commission, the Canyon Soil Conservation District, and the Natural Resources Conservation Service.

A community must incorporate a variety of strategies in order to develop a comprehensive drinking water protection plan, be they regulatory in nature (i.e. zoning, permitting) or non-regulatory in nature (i.e. good housekeeping, public education, specific best management practices). For assistance in developing protection strategies please contact the Boise Regional Office of Idaho Department of Environmental Quality or the Idaho Rural Water Association.

# SOURCE WATER ASSESSMENT FOR LINDENWOOD WATER ASSOCIATION, NAMPA, IDAHO

## Section 1. Introduction - Basis for Assessment

The following sections contain information necessary to understand how and why this assessment was conducted. **It is important to review this information to understand what the ranking of this assessment means.** A map showing the delineated source water assessment area and the inventory of significant potential sources of contamination identified within that area are contained in this report (Attachment A). The list of significant potential contaminant source categories and their rankings used to develop the assessment is also attached.

### Level of Accuracy and Purpose of the Assessment

The Idaho Department of Environmental Quality (DEQ) is required by the U.S. Environmental Protection Agency (EPA) to assess each drinking water source in Idaho for their relative susceptibility to contaminants regulated by the Safe Drinking Water Act Amendments of 1996. This assessment is based on a land use inventory of the delineated source water area, sensitivity factors associated with each well, and aquifer characteristics. Since there are over 2,900 public water sources in Idaho, there is limited time and resources available to accomplish the assessments. All of these assessments must be completed by May of 2003. An in-depth, site-specific investigation of each significant potential source of contamination is not possible. **Therefore, this assessment should be used as a planning tool, taken into account with local knowledge and concerns, to develop and implement appropriate protection measures for this source. The results should <u>not be</u> used as an absolute measure of risk and they should <u>not be</u> used to undermine public confidence in the water system.**

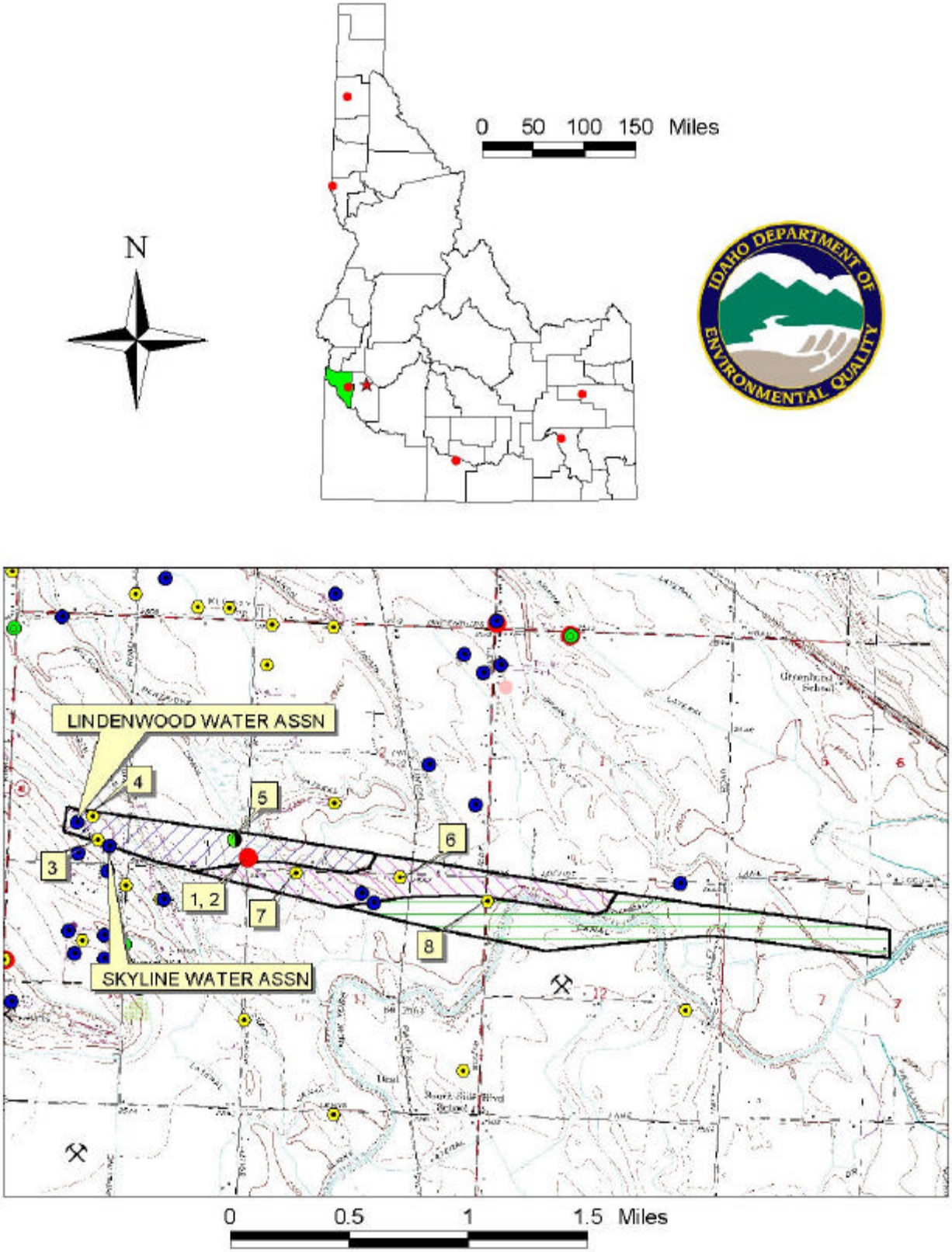
The ultimate goal of the assessment is to provide data to local communities to develop a protection strategy for their drinking water supply system. DEQ recognizes that pollution prevention activities generally require less time and money to implement than treatment of a public water supply system once it has been contaminated. DEQ encourages communities to balance resource protection with economic growth and development. The decision as to the amount and types of information necessary to develop a drinking water protection program should be determined by the local community based on its own needs and limitations. Drinking water protection is one facet of a comprehensive growth plan, and it can complement ongoing local planning efforts.

## Section 2. Conducting the Assessment

### General Description of the Source Water Quality

The Lindenwood Water Association has a community public drinking water system serving approximately 48 people through 20 service connections and is located south of Nampa, Idaho (Figure 1). Residents receive their water from a single ground water source. The primary water quality issue currently facing the Lindenwood Water Association is the elevated level of arsenic that was 10 ppb in samples taken in 1996. The EPA recently lowered the MCL for arsenic from 50 ppb to 10 ppb (October 31, 2001), requiring all water systems to comply with the new standard by 2006.

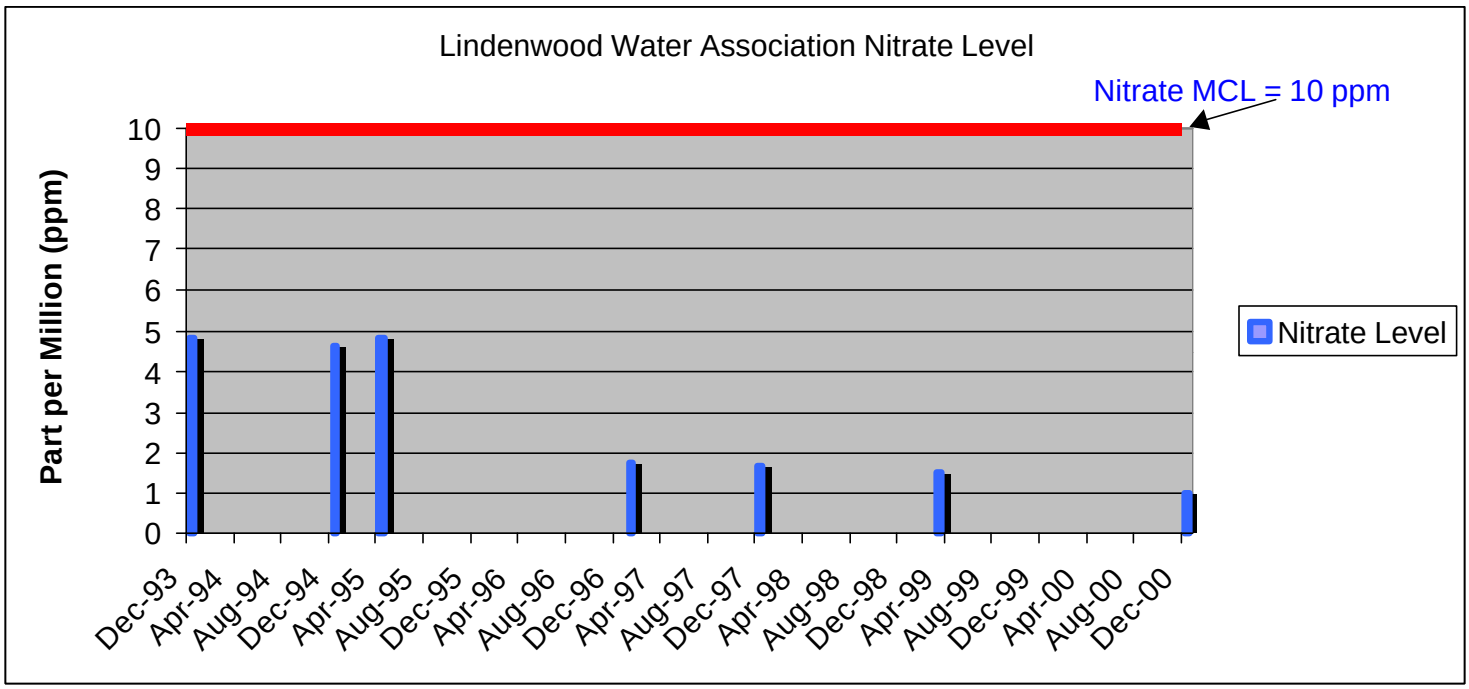
***Figure 1: Geographic Location of the Lindenwood Water Assoc.***



The Lindenwood Water Association may wish to carefully monitor arsenic in their system since the monitoring would be near the revised MCL. The Lindenwood Water Association may also want to consider implementing engineering controls or technologies in order to manage the arsenic levels to continue to meet the new arsenic requirements. According to a press release posted on the EPA website (www.epa.gov), the EPA intends to provide up to $20 million over the next two years for research and development of more cost-effective technologies to help small systems meet the new standard and provide technical assistance to small system operators. The EPA has also stated that it "will work with small communities to maximize grants and loans under current State Revolving Fund and Rural Utilities Service programs of the Department of Agriculture." (USEPA, 2001, para 5).

No VOCs or SOCs have been detected in the drinking water system. The IOCs nitrate, fluoride, and barium have also been detected, but at levels safely below each respective MCL as established by the EPA. Nitrates have been steadily decreasing since 1993 as indicated in Graph 1.

**Graph 1. Nitrate Level for the Lindenwood Water Association**




Bacteria have been detected in only two samples. Both of the detections were associated with the distribution system. As such, data was not available to determine if waters within the aquifer may have been contaminated at that time.

**Defining the Zones of Contribution – Delineation**

The delineation process establishes the physical area around a well that will become the focal point of the assessment. The process includes mapping the boundaries of the zone of contribution into time-of-travel (TOT) zones (regions indicating the number of years necessary for a particle of water to reach a pumping well) for water in the aquifer. DEQ contracted with BARR Engineering to perform the delineations using a combination of MODFLOW and a refined analytical element computer model approved by the EPA in determining the 3-year (Zone 1B), 6-year (Zone 2), and 10-year (Zone 3) TOT for water associated with the Boise Valley aquifer. The computer model used site specific data, assimilated by BARR Engineering from a variety of sources including area well logs, the Treasure Valley Hydrologic Project, and hydrogeologic reports (detailed below in Section 3).

### Identifying Potential Sources of Contamination

A potential source of contamination is defined as any facility or activity that stores, uses, or produces, as a product or by-product, the contaminants regulated under the Safe Drinking Water Act and has a sufficient likelihood of releasing such contaminants at levels that could pose a concern relative to drinking water sources. The goal of the inventory process is to locate and describe those facilities, land uses, and environmental conditions that are potential sources of ground water contamination. The locations of potential sources of contamination within the delineation areas were obtained by field surveys conducted by DEQ and from available databases.

It is important to understand that a release may never occur from a potential source of contamination provided best management practices are used at the facility. Many potential sources of contamination are regulated at the federal level, state level, or both to reduce the risk of release. Therefore, when a business, facility, or property is identified as a potential contaminant source, this should not be interpreted to mean that this business, facility, or property is in violation of any local, state, or federal environmental law or regulation. What it does mean is that the potential for contamination exists due to the nature of the business, industry, or operation. There are a number of methods that water systems can use to work cooperatively with these possible contamination sources, including educational visits and inspections of stored materials. Many owners of such facilities may not even be aware that they are located near a public water supply well.

### Contaminant Source Inventory Process

A two-phased contaminant inventory of the study area was conducted in October 2001. The first phase involved identifying and documenting potential contaminant sources within the Lindenwood Water Association source water assessment area (Figure 2) through the use of computer databases and Geographic Information System maps developed by DEQ. The second, or enhanced, phase of the contaminant inventory involved contacting the system representative, to validate the sources identified in phase one and to add any other potential sources in the area.

The delineated source water area contains a number (14) of potential sources of concern. These include several transportation corridors that service the area and irrigation laterals/drains. Each potential contaminant source, along with the type of pollutant stored at each site is listed in Table 2.

## Section 3. Hydrologic Conditions of the Treasure Valley

### Treasure Valley Hydrologic Project Information (Petrich and Urban, 1996; Neely and Crockett, 1998; Petrich et al., 1999)

The “Treasure Valley” is a geopolitical region that includes the lower Boise River sub-basin. The lower Boise River sub-basin begins where the Boise River exits the mountains near the Lucky Peak Reservoir. From the Lucky Peak Dam the lower Boise River flows about 64 (river) miles northwestward through the Treasure Valley to its confluence with the Snake River. The Treasure Valley Hydrologic Project area encompasses the lower Boise River area, and extends south to the Snake River. The southern area is included in the study area because of ground water flow from the Lower Boise River basin south toward the Snake River.

Significant amounts of desert area were converted to flood irrigated agriculture beginning in the 1860s. Irrigation led to increases in shallow ground water levels in some regions. These shallow ground water levels provided an inexpensive and readily obtainable source of water supply that is used extensively throughout the valley. Much of the population growth in the Treasure Valley has been occurring in previously flood-irrigated agricultural areas, resulting in increased pumpage and a reduction in local aquifer recharge. In addition, irrigation in some areas has become more efficient, reducing the amount of irrigation-related infiltration. Decreasing aquifer recharge and increasing pumpage is thought to be contributing to the decline of ground water levels in some areas.

The Treasure Valley experiences a temperate and arid-to-semiarid climate. Average high temperatures range from about 90°F in summer to 36°F in winter; low temperatures range from about 20°F in winter to about 56°F in summer. The average precipitation ranges from about 8 to 14 inches throughout most of the valley, most of which falls during the colder months in the form of snow in higher elevations and rain in the low-lying valleys.

Major surface water bodies include the Boise River, Lake Lowell, and Lucky Peak Reservoir. The primary source of surface water in the Treasure Valley is the high elevation area in the Boise River basin upstream of Lucky Peak Dam. Much of the spring runoff from the snow pack in high elevation areas is stored in three reservoirs: Anderson Ranch Reservoir, Arrowrock Reservoir, and Lucky Peak Reservoir.

Regional cropland is irrigated primarily with surface water through an extensive network of reservoirs and canals. The first canals were constructed in the 1860's; there are now over 1,100 miles of major and intermediate canals in the Treasure Valley, the majority of which are owned and maintained by canal companies and irrigation districts. Primary sources of irrigation water in the Treasure Valley include the Boise, Snake, and Payette Rivers.

**Hydrogeology (from Petrich et al., 1999)**

The lower Boise River sub-basin (Treasure Valley) is located within the northwest-trending topographic depression known as the western Snake River Plain. The western Snake River Plain is a relatively flat lowland separating Cretaceous granitic mountains of west-central Idaho from the granitic/volcanic Owyhee mountains in southwestern Idaho. The western Snake River Plain extends from about Twin Falls, Idaho northwestward to Vale, Oregon. The Snake River Plain is about 30 miles wide in the section containing the lower Boise River.

Historically, sediments originating from the surrounding mountains began accumulating on top of thick, basal basalts. Rifting and continued subsidence maintained the lowland topography, leading to the additional accumulation of water and sediments (Othberg, 1994). Basin infilling by sediments and basalt occurred from the late Miocene through the late Pliocene (Othberg, 1994). Incision caused by flowing water in major drainages (e.g., Snake and Boise Rivers) began in the late Pliocene or early Pleistocene, although deposition of coarse sediments continued during Quaternary glaciations (Othberg, 1994).

Several Quaternary basalt flows have been described in the western Snake River Plain, and have been assigned to the upper Snake River Group (Malde, 1991; Malde and Powers, 1962). Lava flowed across portions of the ancestral Snake River Valley (Malde, 1991) in an area that is now south of the Boise River. The Snake River then changed course, incising at its present location along the southern margin of the basalt flows. More recent eruptions (from Kuna Butte and other local sources) spilled lava into the canyon south of Melba. The Snake River has since incised this basalt (Malde, 1991).

The general stratigraphy of the western Snake River Plain consists of (from top to bottom) a thick layer of sedimentary deposits underlain by a thick series of basalt flows, which in turn are underlain by older, tuffaceous sediments and basalt (Malde, 1991; Clemens, 1993). The upper thick zone of sediments (up to approximately 6,000 feet thick) distinguishes the western Snake River Plain from the eastern Snake River Plain, in which the upper section is primarily Quaternary basalt (Wood and Anderson, 1981).

The uppermost sediments and basalt belong to the Pleistocene-age Snake River Group. The Snake River Group consists of terrace sediments, Quaternary alluvium, and Pleistocene basalt flows (Wood and Anderson, 1981). Snake River Group sediments and basalts cover much of the project area (Othberg and Stanford, 1992).

The Snake River Group overlies the Idaho Group sediments. The Idaho Group sediments can be divided into two general parts (Wood and Anderson, 1981). The lower Idaho Group contains sediments described as lake and stream deposits of buff white, brown, and gray sand, silt, clay, diatomite, numerous thin beds of vitric ash, and some basaltic tuffs. The upper part of the lower Idaho Group also contains some local, thin, basalt flows. The upper Idaho Group consists of sands, claystones, and siltstones, but differs from the lower Idaho Group in that it contains a greater percentage of coarser-grained materials. The upper Idaho Group sediments are associated with a fluvial/deltaic/lacustrine depositional environment; the lower Idaho Group sediments were deposited in more of a lacustrine/deltaic environment (Wood, 1994).

Wood (1994) identified a buried lacustrine delta within the Idaho Group sediments in the Nampa-Caldwell area. The location of the delta in the middle of the western Snake River Plain suggests that the eastern part of the Boise River basin was delta plain and flood plain at the time of deposition, while the western part was a deep lake environment. The delta probably prograded northwestward into a lake basin 830 feet deep, based upon high resolution seismic reflection data and resistivity log interpretations. The delta-plain and front sediments were shown to be mostly fine-grained, well-sorted sand with thin layers of mud (Wood, 1994). The northwest trend of the delta indicates a sediment source to the southeast, such as where the Snake River flows today (Wood, 1994).

A substantial, laterally extensive layer of clay is found at depths of 300 to 700 feet below ground surface. The clay is important because it represents, in some areas, a significant aquitard separating shallow overlying aquifers from deeper zones. The clay, often described in well logs as having a blue or gray color, has been observed as far west as Parma, and as far east as Boise (although the clay is not found in the extreme eastern portions of the Treasure Valley). The clay varies from a few feet to a few hundred feet in thickness. Although significant layers of clay are present throughout the Idaho Group sediments, individual clay units are not necessarily continuous over large areas. Also, the top of the clay can vary in elevation by up to approximately 200 feet in some locations, such as in an area west of Lake Lowell. In general, sediments above the “blue clay” are coarser-grained than the interbedded sands, silts, and clays underlying the “blue clay.”

The top of the upper Idaho Group is marked in several parts of the Treasure Valley by a widespread fluvial gravel deposit known as the Tenmile gravels. Tenmile gravels contain rounded granitic rocks and felsic porphyries originating from the Idaho Batholith to the north and northeast. The Tenmile gravels range up to 500 feet in thickness along the Tenmile Ridge south of Boise, but are less than 50 feet thick in the Nampa-Caldwell area (Wood and Anderson, 1981).

**Aquifer Systems and Hydrogeologic Characteristics**

Ground water for municipal, industrial, rural domestic, and irrigation uses in the Treasure Valley is drawn almost entirely from Snake River Group and Idaho Group aquifers. Many domestic wells draw water from shallow aquifers, such as those in the Snake River Group deposits. Larger production wells (for municipal and agricultural uses) draw water from the deeper Idaho Group sediments.

Aquifers contained in the Snake River and Idaho Group sediments comprise shallow and regional ground water flow systems. Shallow aquifers contained in Snake River Group sediments and basalts may belong to local flow systems. Most local flow system recharge stems from irrigation infiltration and channel (e.g., streams or canals) losses. Discharge from shallow, local flow systems often is to local drains or streams. The time from recharge to discharge in shallow flow systems (residence times) probably ranges from days to tens of years.

In contrast, regional ground water flow systems extend much deeper than local flow systems. The Treasure Valley regional flow system begins in the eastern part of the valley, as indicated by downward hydraulic gradients in the Boise Fan sediments (Squires et al., 1992). Some water also enters the regional flow system as underflow from the Boise Foothills in the northeastern part of the valley. The regional flow system is thought to discharge primarily to the Boise and Snake Rivers in the western and southwestern parts of the valley.

Aquifer material characteristics, material heterogeneity, and structural controls influence Treasure Valley ground water flow. Coarse-grained materials (e.g., sand and gravel) in upper zones are more capable of transmitting ground water than fine-grained sediments (e.g., silt and clay). Clay and silt in the Snake River sediments can restrict vertical and/or horizontal ground water movement. Perched aquifers are created when fine-grained lenses impede downward vertical flow. A distinctive clay layer, sometimes referred to as "blue clay," is present over large portions of the valley. The clay is absent in the easternmost portions of the lower Boise River Basin, but can reach a thickness of more than 200 feet toward the central and western portions of the basin.

Sequences of interbedded sand, silt, and clay, such as the Deer Flat Surface and the upper portion of the Glenns Ferry Formation of the upper Idaho Group in the Nampa-Caldwell area, are the major water-producing aquifers in a large part of Canyon County (Anderson and Wood, 1981). The coarse-grained sediments in this zone produce water in excess of 2,000 gallons per minute (gpm).

The delineated source water assessment area for the Lindenwood Water Association can best be described as an eastward trending corridor approximately three and one-half miles long and one-half mile wide at its widest extent (Figure 2).

# Section 4. Susceptibility Analysis

The water system's susceptibility to contamination was ranked as high, moderate, or low risk according to the following considerations: hydrologic characteristics, physical integrity of the well, land use characteristics, and potentially significant contaminant sources. The susceptibility rankings are specific to a particular potential contaminant or category of contaminants. Therefore, a high susceptibility rating relative to one potential contaminant does not mean that the water system is at the same risk for all other potential contaminants. The relative ranking that is derived for each well is a qualitative, screening-level step that, in many cases, uses generalized assumptions and best professional judgement. Attachment B contains the susceptibility analysis worksheet. The following summaries describe the rationale for the susceptibility ranking.

**Hydrologic Sensitivity**

The hydrologic sensitivity of a well is dependent upon four factors: 1) the surface soil composition, 2) the material in the vadose zone (region between the land surface and the water table), 3) the depth to first ground water, and 4) the presence of a 50-foot thick impermeable zone above the production interval of the well. Slowly draining fine-grained soils such as silt and clay typically are more protective of ground water than coarse-grained soils such as sand and gravel. For Lindenwood Water Association, regional surface soil information indicates the presence of moderate to well draining soils within the delineated drinking water capture zone. These soils, in general, provide less protection to the ground water by allowing for a more rapid downward progress of contaminants in the unlikely event of a spill or release.

Hydrologic sensitivity is high for the well (Table 2) mainly because of the surface soil properties. The vadose zone consists mainly of cemented gravel. Ground water was first encountered at 36 feet below ground surface (bgs). The well log shows that there are multiple clay layers, including a section from 127 to 185 feet bgs.

**Well Construction**

Well construction directly affects the ability of the well to protect the aquifer from contaminants. System construction scores are reduced when information shows that potential contaminants will have a more difficult time reaching the intake of the well. Lower scores imply a system is less vulnerable to contamination. For example, if the well casing and annular seal both extend into a low permeability unit, then the possibility of contamination is reduced and the system construction score goes down. If the highest production interval is more than 100 feet below the water table, then the system is considered to have a better buffering capacity. In addition, if the wellhead and surface seal are maintained to standards, as outlined in sanitary surveys, then contamination down the well bore is less probable. Also, if the wellhead is protected from surface flooding and is outside the 100-year floodplain, then the likelihood of contamination from surface events is reduced. A sanitary survey was conducted in 1994. The well rated moderate for the well construction category of the susceptibility analysis.

The well, originally drilled to 103 feet, was deepened to 256 feet in 1995. The well has 0.250-inch thick, 8-inch casing to 236 feet bgs and 0.250-inch thick, 6-inch casing to 256 feet bgs into clay. The annular seal was placed to 80 feet bgs into clay. These materials are considered low permeability. The casing was perforated from 236 feet bgs to 246 feet bgs. The main production zone is greater than 100 feet below the static water table. The sanitary survey states that though the casing rises above land surface by 24 inches, there is no downturned casing vent and no sanitary seal. However, an inspection of the well on July 12, 2001 showed that the defects indicated on the previous sanitary survey to have been repaired.

**Potential Contaminant Source and Land Use**

In terms of the potential contaminant source/land use score, the well rated moderate for microbes and VOCs and high for IOCs and SOCs. These ratings can be attributed, in large part, to the predominant land use within the delineated drinking water capture zone, which is urban/commercial. Additionally, the system resides within a priority area for nitrate and the herbicides atrazine and alachlor and a number (14) of potential contaminant sources reside within the delineation.

**Final Susceptibility Ranking**

A detection above a drinking water standard MCL, any detection of a VOC or SOC, or a repeat detection of total coliform bacteria or fecal coliform bacteria at the wellhead will automatically give a high susceptibility rating to a well despite the land use of the area because a pathway for contamination already exists. Additionally, potential contaminant sources within 50 feet of a wellhead will lead to an automatically high susceptibility rating. Hydrologic sensitivity and system construction scores are heavily weighted in the final scores. Having multiple potential contaminant sources in the 0- to 3-year time of travel zone (Zone IB) and the presence of both urban/commercial and agricultural lands contribute greatly to the overall ranking.

Instead, the system rated a high overall susceptibility to IOCs, VOCs, SOCs, and microbes (Table 1).

**Table 1. Summary of the Lindenwood Water Association Susceptibility Evaluation**

| Well | Susceptibility Scores[1] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Hydrologic Sensitivity | Contaminant Inventory | | | | System Construction | Final Susceptibility Ranking | | | |
| | | IOC | VOC | SOC | Microbials | | IOC | VOC | SOC | Microbials |
| Well #1 | H | H | M | H | M | M | H | H | H | H |

**[1]H = High Susceptibility, M = Moderate Susceptibility, L = Low Susceptibility,**
**IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical**

**Susceptibility Summary**

A high hydrologic sensitivity and moderate system construction combined to give the well a moderate overall rating for VOCs, SOCs and microbes, and a moderate overall rating to IOCs. Arsenic has also been detected and in the two sample collected to date would are at the recently revised MCL of 10 parts per billion (ppb). The EPA recently lowered the MCL for arsenic from 50 ppb to 10 ppb (October 31, 2001), requiring all water systems to comply with the new standard by 2006. The Lindenwood Water Association may wish to carefully monitor arsenic in their system since the monitoring would be near the revised MCL. The Lindenwood Water Association may also want to consider implementing engineering controls or technologies in order to manage the arsenic levels to continue to meet the new arsenic requirements. According to a press release posted on the EPA website (http://www.epa.gov/safewater/ars/implement.html), the EPA intends to provide up to $20 million over the next two years for research and development of more cost-effective technologies to help small systems meet the new standard and provide technical assistance to small system operators.

# Section 5. Options for Drinking Water Protection

The susceptibility assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what the susceptibility ranking a source receives, protection is always important. Whether the source is currently located in a "pristine" area or an area with numerous industrial and/or agricultural land uses that require surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources.

An effective drinking water protection program is tailored to the particular local drinking water protection area. A community with a fully developed drinking water protection program will incorporate many strategies. For the Lindenwood Water Association, drinking water protection activities should first focus on continued maintenance of the sanitary seal and distribution system. Actions should also be taken to keep a 50-foot radius circle clear around the wellhead. If the system should need to expand in the future, new well sites should be located in areas with as few potential sources of contamination as possible, and the site should be reserved and protected for this specific use.

Any spills associated with the transportation corridors, canals, or agricultural drains should be monitored and dealt with expeditiously. Additionally, there should be a focus on implementation of practices aimed at reducing the leaching of agricultural chemicals associated with urban land use within the designated source water area.

Because a significant portion of the ground water capture zone is outside the direct jurisdiction of Lindenwood Water Association, the creation of partnerships with state and local agencies and industry groups are critical to the success of drinking water protection. Furthermore, if microbial contamination should continue to be a problem, appropriate disinfection practices would need to be implemented to ensure the health of the Lindenwood Water Association residents.

Due to the time involved with the movement of ground water, drinking water protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. A strong public education program should be a primary focus of any drinking water protection plan, especially since the delineation contains some urban and residential land uses. Public education topics could include proper lawn care practices, household hazardous waste disposal methods, and the importance of water conservation to name but a few.

There are multiple resources available to help communities implement protection programs, including the Drinking Water Academy of the EPA. Drinking water protection practices dealing with agriculture should be coordinated with the Idaho State Department of Agriculture, the Soil Conservation Commission, the Canyon Soil Conservation District, and the Natural Resources Conservation Service.

A community must incorporate a variety of strategies in order to develop a comprehensive drinking water protection plan, be they regulatory in nature (i.e. zoning, permitting) or non-regulatory in nature (i.e. good housekeeping, public education, specific best management practices). For assistance in developing protection strategies please contact the Boise Regional Office DEQ or the Idaho Rural Water Association.

**Assistance**

Public water supplies and others may call the following DEQ offices with questions about this assessment and to request assistance with developing and implementing a local protection plan. In addition, draft protection plans may be submitted to the DEQ office for preliminary review and comments.

| | |
|---|---|
| Boise Regional DEQ Office | (208) 373-0550 |
| State DEQ Office | (208) 373-0502 |

Website: http://www.deq.state.id.us

Water suppliers serving fewer than 10,000 persons may contact Ms. Melinda Harper, Idaho Rural Water Association, at 208-343-7001 (mharper@idahoruralwater.com) for assistance with drinking water protection (formerly wellhead protection) strategies.

# POTENTIAL CONTAMINANT INVENTORY
# LIST OF ACRONYMS AND DEFINITIONS

**AST (Aboveground Storage Tanks) –** Sites with aboveground storage tanks.

**Business Mailing List –** This list contains potential contaminant sites identified through a yellow pages database search of standard industry codes (SIC).

**CERCLIS –** This includes sites considered for listing under the **Comprehensive Environmental Response Compensation and Liability Act (CERCLA)**. CERCLA, more commonly known as ASuperfund@ is designed to clean up hazardous waste sites that are on the national priority list (NPL).

**Cyanide Site –** DEQ permitted and known historical sites/facilities using cyanide.

**Dairy –** Sites included in the primary contaminant source inventory represent those facilities regulated by Idaho State Department of Agriculture (ISDA) and may range from a few head to several thousand head of milking cows.

**Deep Injection Well –** Injection wells regulated under the Idaho Department of Water Resources generally for the disposal of stormwater runoff or agricultural field drainage.

**Enhanced Inventory** – Enhanced inventory locations are potential contaminant source sites added by the water system. These can include new sites not captured during the primary contaminant inventory, or corrected locations for sites not properly located during the primary contaminant inventory. Enhanced inventory sites can also include miscellaneous sites added by the Idaho Department of Environmental Quality (DEQ) during the primary contaminant inventory.

**Floodplain –** This is a coverage of the 100year floodplains.

**Group 1 Sites –** These are sites that show elevated levels of contaminants and are not within the priority one areas.

**Inorganic Priority Area –** Priority one areas where greater than 25% of the wells/springs show constituents higher than primary standards or other health standards.

**Landfill –** Areas of open and closed municipal and non-municipal landfills.

**LUST (Leaking Underground Storage Tank)** – Potential contaminant source sites associated with leaking underground storage tanks as regulated under RCRA.

**Mines and Quarries** – Mines and quarries permitted through the Idaho Department of Lands.)

**Nitrate Priority Area –** Area where greater than 25% of wells/springs show nitrate values above 5mg/l.

**NPDES (National Pollutant Discharge Elimination System) –** Sites with NPDES permits. The Clean Water Act requires that any discharge of a pollutant to waters of the United States from a point source must be authorized by an NPDES permit.

**Organic Priority Areas –** These are any areas where greater than 25 % of wells/springs show levels greater than 1% of the primary standard or other health standards.

**Recharge Point –** This includes active, proposed, and possible recharge sites on the Snake River Plain.

**RICRIS –** Site regulated under **Resource Conservation Recovery Act (RCRA)**. RCRA is commonly associated with the cradle to grave management approach for generation, storage, and disposal of hazardous wastes.

**SARA Tier II (Superfund Amendments and Reauthorization Act Tier II Facilities) –** These sites store certain types and amounts of hazardous materials and must be identified under the Community Right to Know Act.

**Toxic Release Inventory (TRI)** – The toxic release inventory list was developed as part of the Emergency Planning and Community Right to Know (Community Right to Know) Act passed in 1986. The Community Right to Know Act requires the reporting of any release of a chemical found on the TRI list.

**UST (Underground Storage Tank) –** Potential contaminant source sites associated with underground storage tanks regulated as regulated under RCRA.

**Wastewater Land Applications Sites** – These are areas where the land application of municipal or industrial wastewater is permitted by DEQ.

**Wellheads –** These are drinking water well locations regulated under the Safe Drinking Water Act. They are not treated as potential contaminant sources.

**NOTE:** Many of the potential contaminant sources were located using a geocoding program where mailing addresses are used to locate a facility. Field verification of potential contaminant sources is an important element of an enhanced inventory.

Where possible, a list of potential contaminant sites unable to be located with geocoding will be provided to water systems to determine if the potential contaminant sources are located within the source water assessment area.

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# Attachment A

# Delineation Figure and Potential Contaminant Source Table for Lindenwood Water Association

*Figure 2. Lindenwood Delineation Map and Pontential Contaminant Source Locations*

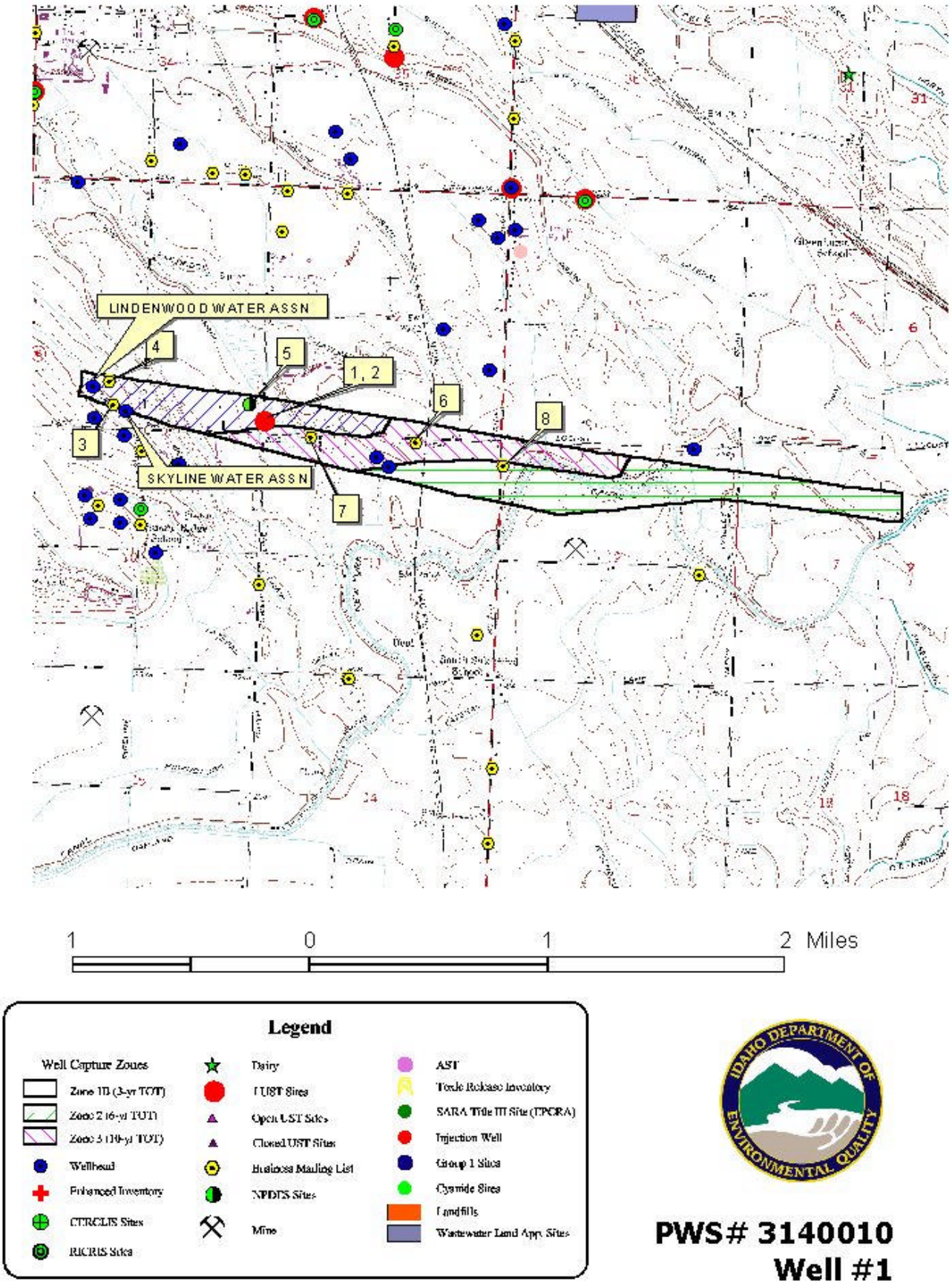

**Table 2. Lindenwood Water Association Potential Contaminant Inventory**

| SITE # | Source Description[1] | TOT Zone[2] (years) | Source of Information | Potential Contaminants[3] |
|---|---|---|---|---|
| 1, 2 | Fish Hatchery UST/LUST | 0-3 | Database Search | IOCs, VOCs, SOCs, Microbes |
| 3 | Roofing Contractor | 0-3 | Database Search | IOCs, VOCs |
| 4 | Ceramic Tile Dealership | 0-3 | Database Search | IOCs, VOCs, SOCs, |
| 5 | NPDES Site | 0-3 | Database Search | IOCs, VOCs, SOCs, Microbes |
| | March Drain | 0-3 | Database Search | IOCs, VOCs, SOCs, Microbes |
| | Wilson Drain | 0-3 | Database Search | IOCs, VOCs, SOCs, Microbes |
| 6 | Motorcycle Repair | 3-6 | Database Search | VOCs, SOCs |
| 7 | General Contractor | 3-6 | Database Search | IOCs, VOCs, SOCs |
| | Railroad | 3-6 | Database Search | IOCs, VOCs, SOCs |
| | New York Canal | 3-6 | Database Search | IOCs, VOCs, SOCs |
| | Southside Boulevard | 3-6 | Database Search | IOCs, VOCs, SOCs |
| 8 | Auto Repair & Painting | 6-10 | Database Search | IOCs, VOCs, SOCs |
| | Railroad | 6-10 | Database Search | IOCs, VOCs, SOCs |
| | New York Canal | 6-10 | Database Search | IOCs, VOCs, SOCs |

**[1] Find Source Description definitions on page 13**
**[2] TOT = time-of-travel (in years) for a potential contaminant to reach the wellhead**
**[3] IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical**

NOTE: The site number in this table corresponds to Figure 2.

# Attachment B

# Lindenwood Water Association
# Susceptibility Analysis
# Worksheet

The final scores for the susceptibility analysis were determined using the following formulas:

1) VOC/SOC/IOC Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.2)

2) Microbial Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.375)

Final Susceptibility Scoring:

0 - 5 Low Susceptibility

6 - 12 Moderate Susceptibility

≥ 13 High Susceptibility

Ground Water Susceptibility Report  Public Water System Name : LINDENWOOD WATER ASSN  Well# : WELL #1
Public Water System Number 3140010  7/23/02 1:56:18 PM

| 1. System Construction | | SCORE | | | |
|---|---|---|---|---|---|
| Drill Date | 1/1/95 | | | | |
| Driller Log Available | YES | | | | |
| Sanitary Survey (if yes, indicate date of last survey) | YES | 1994 | | | |
| Well meets IDWR construction standards | NO | 1 | | | |
| Wellhead and surface seal maintained | YES | 0 | | | |
| Casing and annular seal extend to low permeability unit | NO | 2 | | | |
| Highest production 100 feet below static water level | NO | 1 | | | |
| Well located outside the 100 year flood plain | YES | 0 | | | |
| Total System Construction Score | | 4 | | | |
| **2. Hydrologic Sensitivity** | | | | | |
| Soils are poorly to moderately drained | NO | 2 | | | |
| Vadose zone composed of gravel, fractured rock or unknown | YES | 1 | | | |
| Depth to first water > 300 feet | NO | 1 | | | |
| Aquitard present with > 50 feet cumulative thickness | NO | 2 | | | |
| Total Hydrologic Score | | 6 | | | |
| **3. Potential Contaminant / Land Use - ZONE 1A** | | IOC Score | VOC Score | SOC Score | Microbial Score |
| Land Use Zone 1A | URBAN | 2 | 2 | 2 | 2 |
| Farm chemical use high | YES | 2 | 2 | 2 | |
| IOC, VOC, SOC, or Microbial sources in Zone 1A | NO | NO | NO | NO | NO |
| Total Potential Contaminant Source/Land Use Score - Zone 1A | | 4 | 4 | 4 | 2 |
| **Potential Contaminant / Land Use - ZONE 1B** | | | | | |
| Contaminant sources present (Number of Sources) | YES | 6 | 6 | 6 | 4 |
| (Score = # Sources X 2 ) 8 Points Maximum | | 8 | 8 | 8 | 8 |
| Sources of Class II or III leacheable contaminants or | YES | 1 | 1 | 1 | |
| 4 Points Maximum | | 1 | 1 | 1 | |
| Zone 1B contains or intercepts a Group 1 Area | YES | 2 | 0 | 2 | 0 |
| Land use Zone 1B | 25 to 50% Irrigated Agricultural Land | 2 | 2 | 2 | 2 |
| Total Potential Contaminant Source / Land Use Score - Zone 1B | | 13 | 11 | 13 | 10 |
| **Potential Contaminant / Land Use - ZONE II** | | | | | |
| Contaminant Sources Present | YES | 2 | 2 | 2 | |
| Sources of Class II or III leacheable contaminants or | YES | 1 | 0 | 1 | |
| Land Use Zone II | Greater Than 50% Non-Irrigated Agricultural | 1 | 1 | 1 | |
| Potential Contaminant Source / Land Use Score - Zone II | | 4 | 3 | 4 | 0 |
| **Potential Contaminant / Land Use - ZONE III** | | | | | |
| Contaminant Source Present | YES | 1 | 1 | 1 | |
| Sources of Class II or III leacheable contaminants or | YES | 1 | 0 | 1 | |
| Is there irrigated agricultural lands that occupy > 50% of | YES | 1 | 1 | 1 | |
| Total Potential Contaminant Source / Land Use Score - Zone III | | 3 | 2 | 3 | 0 |
| Cumulative Potential Contaminant / Land Use Score | | 24 | 20 | 24 | 12 |
| 4. Final Susceptibility Source Score | | 15 | 14 | 15 | 14 |
| 5. Final Well Ranking | | High | High | High | High |