CITY OF NAMPA (PWS 3140080)
SOURCE WATER ASSESSMENT FINAL REPORT

March 31, 2005

State of Idaho
Department of Environmental Quality

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Executive Summary

Under the 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. This assessment is based on a land use inventory of the designated assessment area and sensitivity factors associated with the wells and aquifer characteristics.

This report, *Source Water Assessment for City of Nampa, Idaho*, describes the public drinking water system, the boundaries of the zones of water contribution, and the associated potential contaminant sources located within these 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.**

The City of Nampa (PWS #3140080) has two additional drinking water system wells that need a susceptibility analysis conducted. This report describes Well #11 and Well #13. Previously, "City of Nampa (PWS 3140080) Source Water Assessment Final Report" was written to assess the other active wells on this system. Currently, the whole system serves approximately 63,800 people through 18,830 connections.

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 category(ies) 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, e.g. nitrates, arsenic), volatile organic contaminants (VOCs, e.g. petroleum products), synthetic organic contaminants (SOCs, e.g. pesticides), and microbial contaminants (e.g. bacteria). As different wells can be subject to various contamination settings, separate scores are given for each type of contaminant.

In terms of total susceptibility, Well #11 rated moderate for IOCs and microbial bacteria, and automatically high for VOCs and SOCs. The automatically high ratings are due to diesel fuel storage within 50 feet of the well. If not for the automatic ratings, Well #11 would have rated moderate susceptibility for all potential contaminant types. System construction rated low and hydrologic sensitivity rated moderate for the well. Land use rated high for IOCs, VOCs, SOCs, and low for microbial bacteria (Table 1).

In terms of total susceptibility, Well #13 rated moderate for IOCs, VOCs, SOCs, and microbial bacteria. System construction rated moderate and hydrologic sensitivity rated low for the well. Land use rated high for IOCs, VOCs, SOCs, and low for microbial bacteria (Table 1).

IOCs, such as chromium, arsenic, fluoride, and thallium have been detected in tested water; however concentrations were within allowable limits. Arsenic has been detected in concentrations up to 9 parts per billion (ppb), which is approaching the maximum contaminant level of 10 ppb. No VOCs, SOCs, or microbial bacteria have ever been detected in either well's tested water. The delineation exists within a priority area for the IOC nitrate and for pesticides (SOCs).

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 City of Nampa, drinking water protection activities should first focus on correcting any deficiencies outlined in the sanitary survey (an inspection conducted every five years with the purpose of determining the physical condition of a water system's components and its capacity). Actions should be taken to maintain a 50-foot radius circle around the wellhead clear of potential contaminants. Any contaminant spills within the delineation should be carefully monitored and dealt with. As much of the designated assessment areas are outside the direct jurisdiction of City of Nampa, collaboration and partnerships with state and local agencies should be established and are critical to success.

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 as the delineation contains some urban and residential land uses. Public education topics could include proper lawn and garden care practices, household hazardous waste disposal methods, proper care and maintenance of septic systems, 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 activities for agriculture should be coordinated with the Idaho State Department of Agriculture, the Soil Conservation Commission, the local Soil and Water 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 the Department of Environmental Quality or the Idaho Rural Water Association.

SOURCE WATER ASSESSMENT FOR
CITY OF 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.** Maps showing the delineated source water assessment area and the inventory of significant potential sources of contamination identified within that area are included. The list of significant potential contaminant source categories and their rankings used to develop the assessment also is included.

Background

Under the 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 susceptibility to contaminants regulated by the Safe Drinking Water Act. This assessment is based on a land use inventory of the delineated assessment area and sensitivity factors associated with the wells and aquifer characteristics.

Level of Accuracy and Purpose of the Assessment

The Idaho Department of Environmental Quality (DEQ) is required by the U.S. EPA to assess the over 2,900 public drinking water sources in Idaho for their relative susceptibility to contaminants regulated by the Safe Drinking Water Act. This assessment is based on a land use inventory of the delineated assessment area, sensitivity factors associated with the wells, and aquifer characteristics. All assessments for sources active prior to 1999 were completed by May of 2003. Source water assessments for sources activated post-1999 are being developed on a case-by-case basis. The resources and time available to accomplish assessments are limited. 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. Wellhead or 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 City of Nampa (PWS #3140080) has two additional drinking water system wells that need a susceptibility analysis conducted. This report describes Well #11 and Well #13. Previously, "City of Nampa (PWS 3140080) Source Water Assessment Final Report" was written to assess the other active wells on this system. Currently, the whole system serves approximately 63,800 people through 18,830 connections.

IOCs, such as chromium, arsenic, fluoride, and thallium have been detected in tested water; however concentrations were within allowable limits. Arsenic has been detected in concentrations up to 9 ppb, which is approaching the maximum contaminant level of 10 ppb. No VOCs, SOCs, or microbial bacteria have ever been detected in either well's tested water. The delineation exists within a priority area for the IOC nitrate and for pesticides (SOCs).

Defining the Zones of Contribution – Delineation

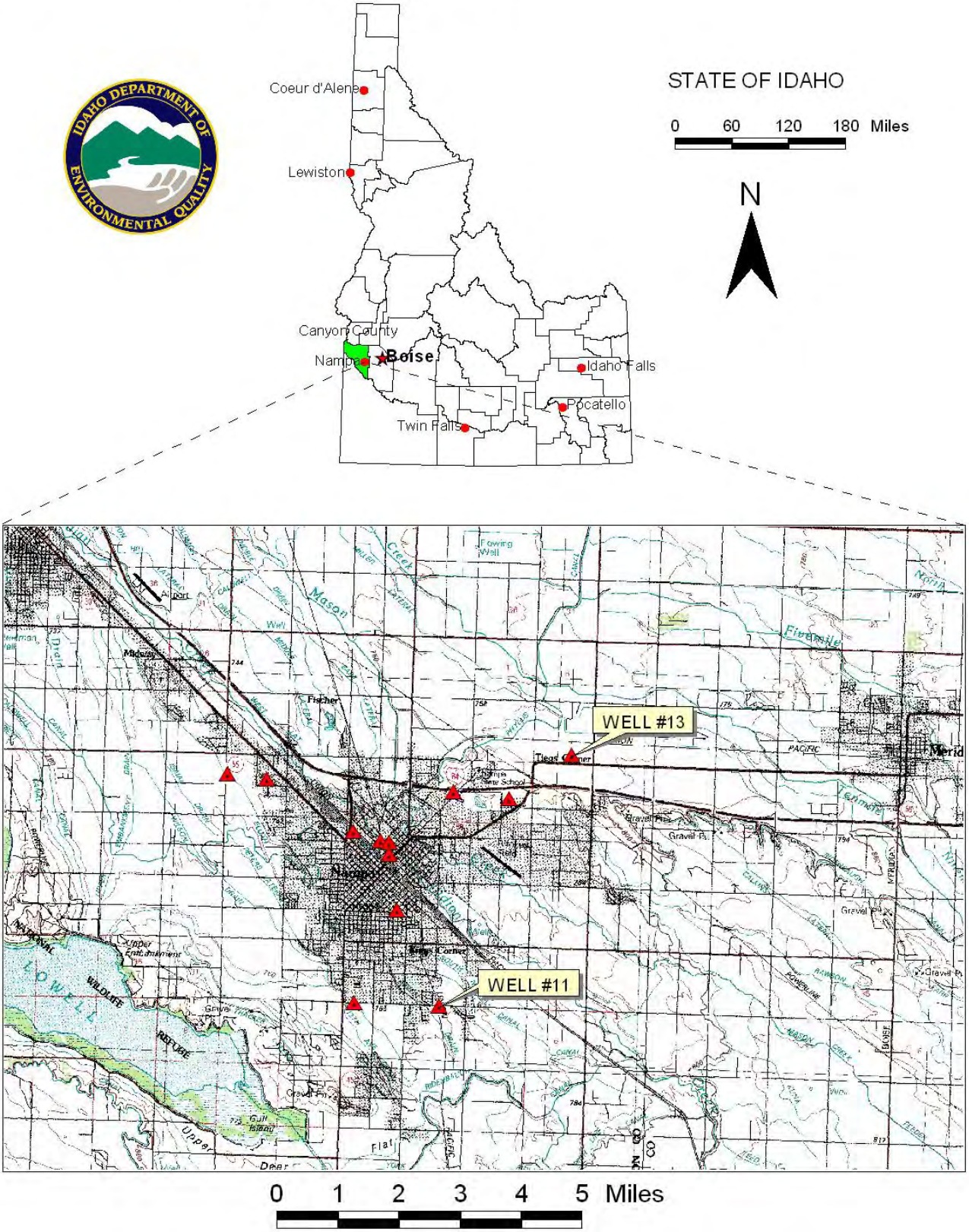
The delineation process establishes the physical area around a well that will become the focal point of the assessment. The process includes mapping the boundaries of the zone of contribution into time-of-travel (TOT) zones (zones indicating the number of years necessary for a particle of water to reach a well) for water in the aquifer. DEQ performed the delineation using a 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 Snake River Plain aquifer in the vicinity of the City of Nampa. The computer model used site-specific data from a variety of sources including local area well logs, and hydrogeologic reports (detailed below).

Boise Valley Aquifer: 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 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 areas. The shallow ground water levels provided an inexpensive and readily obtainable 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 decreasing ground water levels in some areas.

FIGURE 1 Site Vicinity Map of City of Nampa



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.

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 precipitation falling in the high elevation area in the Boise River basin upstream of Lucky Peak Dam. Much of the runoff from high elevation areas is stored in three reservoirs: Anderson Ranch Reservoir, Arrowrock Reservoir, and Lucky Peak Reservoir.

The region's croplands are 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 primary sources of the irrigation water in the Treasure Valley include the Boise, Snake, and Payette Rivers. The majority of canals are owned and maintained by canal companies and irrigation districts.

Boise Valley Aquifer 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.

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 is 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-Meridian 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 800 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 Meridian area (Wood and Anderson, 1981).

Boise Valley 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 described by 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 Meridian-Meridian 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).

Model Description

The majority of public water system ground water sources in the Treasure Valley were modeled for DEQ under contract with BARR Engineering. BARR Engineering developed a valley-wide model using MODFLOW software and a parameter-estimating software. The result was a regional, three-layer optimized and calibrated, finite-difference groundwater flow model. That model was then used in conjunction with MODPATH to produce the Source water delineations.

DEQ delineated the capture zones for this report by using the WhAEM Model 2000, version 1.0.4. The model was run by inputting various ranges of parameters that compared to the BARR Engineering work to produce a better model of the local area. Parameter estimations for wells were obtained from geologic maps, well logs, and topographic maps.

For the local area surrounding the wells, BARR’s regional model indicated hydrologic conductivity values between 50 feet/day and 200 feet/day and an aquifer thickness of 250 feet. DEQ calculations from the closest and most complete well log (City of Nampa Well #11) indicate a hydrologic conductivity of 768 feet/day.

The model was defined by no-flow boundary conditions placed along the Snake River to the South and west, the Boise Ridge to the North, and at the Mountain Home plateau's boundary with the Boise-area Snake River Plain to the east. Near the upgradient boundary and downgradient boundary, and far enough away from test points that interference did not occur, constant heads were placed along the Layer 2 potentiometric surface of BARR's model.

To account for growth in the area a 1.5 multiplier was applied to the usage values of Table 1 were inputted into WhAEM.

The model was then run over a series of simulations where aquifer parameters and model boundaries were adjusted to simulate a scenario that best matched test points within the area. The test point matches simulate the difference of the modeled values versus the actual values measured in the field. The test point matches are within +/- 43 feet.

After a range of simulations were run that best-matched the test points, a combined result was drawn and a standard buffer of 10 degrees added to the perimeter.

The delineated areas for both City of Nampa wells are eastward trending sectors approximately four (4) miles long and two (2) miles wide (Figures 2 and 3). The actual data used in determining the source water assessment delineation area is available from DEQ upon request.

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 groundwater contamination. The locations of potential sources of contamination within the delineation areas were obtained by field surveys conducted by DEQ and from available databases.

Land use within the area surrounding the City of Nampa wells is predominately irrigated agriculture.

It is important to understand that a release may never occur from a potential source of contamination provided they are using best management practices. 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 potential sources of contamination, 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 November and December 2004. The first phase involved identifying and documenting potential contaminant sources within the City of Nampa source water assessment areas (Figures 2 and 3) through the use of computer databases and Geographic Information System (GIS) maps developed by DEQ. The second, or enhanced, phase of the contaminant inventory involved contacting the operator to identify and add any additional potential sources in the delineated areas.

The delineated source water area for Well #11 (Figure 2) has 14 potential contaminant sources and Well #13 (Figure 3) has 41 potential contaminant sources (Appendix B).

Section 3. Susceptibility Analyses

The well'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. Appendix A 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: the surface soil composition, the material in the vadose zone (between the land surface and the water table), the depth to first ground water, and the presence of a 50-foot thick fine-grained zone (aquitard) above the producing zone of the well. Slowly draining soils such as silt and clay typically are more protective of ground water than coarse-grained soils such as sand and gravel. Similarly, fine-grained sediments in the subsurface and a water depth of more than 300 feet protect the ground water from contamination.

Well #1 rated moderate susceptibility for hydrologic sensitivity. According to the Natural Resource Conservation Service (NRCS), area soils are moderately to well-drained. A well's drilling log indicated a vadose zone that is composed of predominantly permeable materials, a water table that is less than 300 feet deep, and an aquitard that is present above the producing zone of the well.

Well #2 rated low susceptibility for hydrologic sensitivity. According to the NRCS, area soils are poorly to moderately drained. The well log indicates that the vadose zone is composed of predominantly permeable materials, the water table is less than 300 feet deep, and an aquitard is present above the producing zone of the well.

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 better buffering capacity. If the wellhead and surface seal are maintained to standards, as outlined in sanitary surveys, then contamination down the well bore is less likely. If the well is protected from surface flooding and is outside the 100-year floodplain, then the potential for contamination from surface events is reduced.

According to the well log, Well #11 was drilled to a depth of 440 feet below ground surface (bgs) and has three screened intervals between 238 feet bgs and 364 feet bgs. A 20-inch casing (0.375 inches thick) extends from the surface to 233 feet bgs into "brown sticky clay". A 12-inch casing (0.375 inches thick) extends from 213 feet bgs to 374 feet bgs. A bentonite surface seal was placed to 233 feet bgs into a clay unit.

Well #1 rated low for system construction. The well is located outside of a 100-year floodplain, the casing and annular seal extend into low permeability units, and the highest production comes from more than 100 feet below static water level. The sanitary survey indicates that both the wellhead and surface seal are maintained.

According to the well log, Well #13 was drilled to a depth of 627 feet and has four screened intervals between 382 feet bgs and 517 feet bgs. A 20-inch casing (0.375 inches thick) extends from the surface to 309 feet bgs into tan clay. A 12-inch casing (0.375 inches thick) exists between 289 feet bgs and 527 feet bgs and between the screened intervals. A bentonite surface seal was placed to 372 feet bgs into a tan clay unit.

Well #13 rated moderate for system construction. The well is located outside of a 100-year floodplain, the highest production comes from more than 100 feet below static water level, and according to the sanitary survey, the wellhead and surface seal are maintained. According to the well log, the annular seal extends into a low permeability unit, however, not all the screened intervals are seated into low-permeability units.

Current PWS well construction standards can be more stringent than when a well(s) was constructed. The Idaho Department of Water Resources *Well Construction Standards Rules* (1993) require all PWSs to follow DEQ standards as well. IDAPA 58.01.08.550 requires that PWSs follow the *Recommended Standards for Water Works* (1997) during construction. Some of the regulations deal with screening requirements, aquifer pump tests, use of a down-turned casing vent, and thickness of casing. Table 1 of the *Recommended Standards for Water Works* (1997) lists the required steel casing thickness for various diameter wells.

Regulations for steel pipe thickness based on size of pipe

Size of pipe (inches)	Thickness (inches)
≤6	0.280
8	0.322
10	0.365
12-20	0.375

Well tests are required at the design pumping rate for 24 hours or until stabilized drawdown has continued for at least six hours when pumping at 1.5 times the design pumping rate.

Because both wells' construction do not meet all current standards, both wells were assessed an additional system construction point.

Figure 2. City of Nampa Delineation Map and Potential Contaminant Source Locations

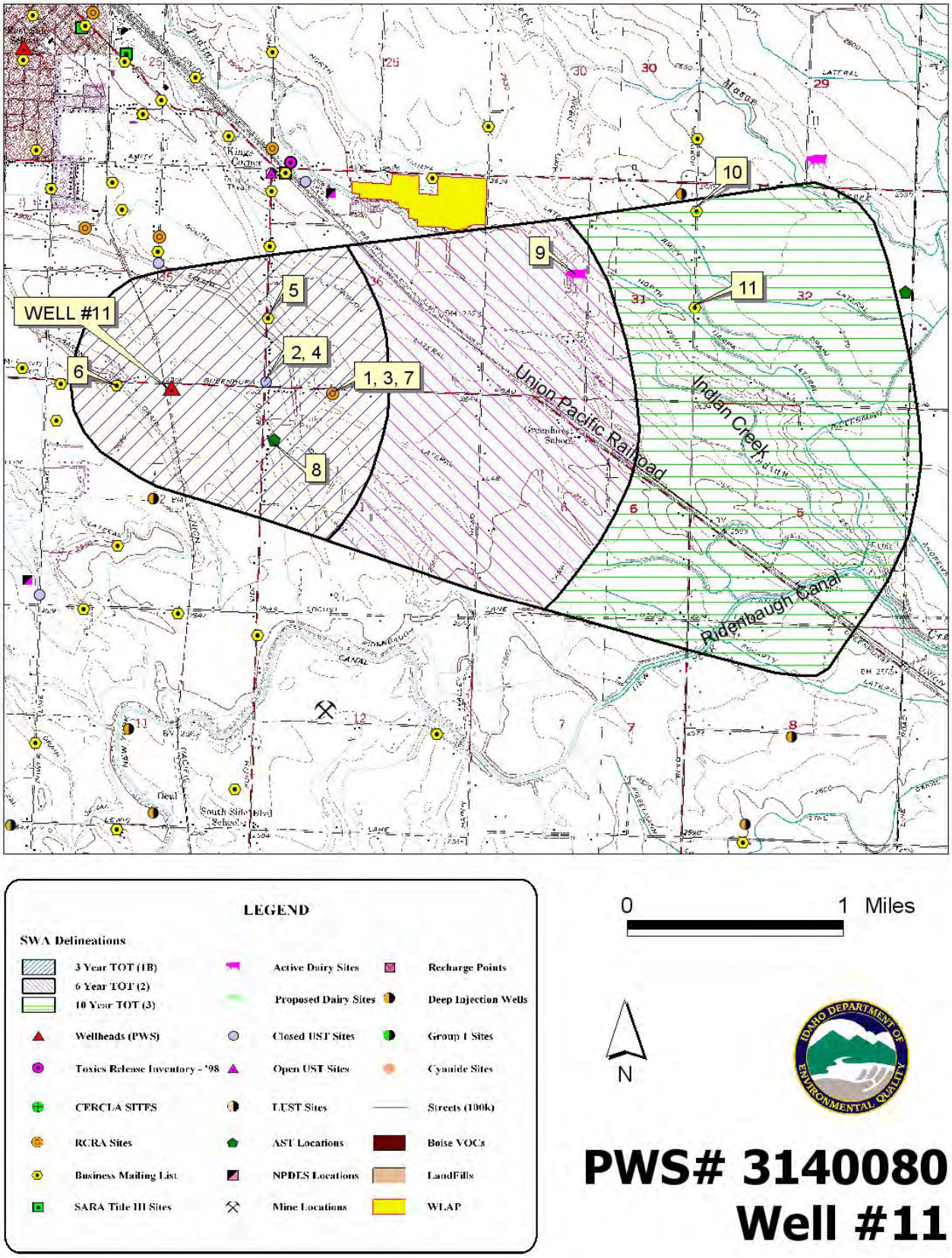
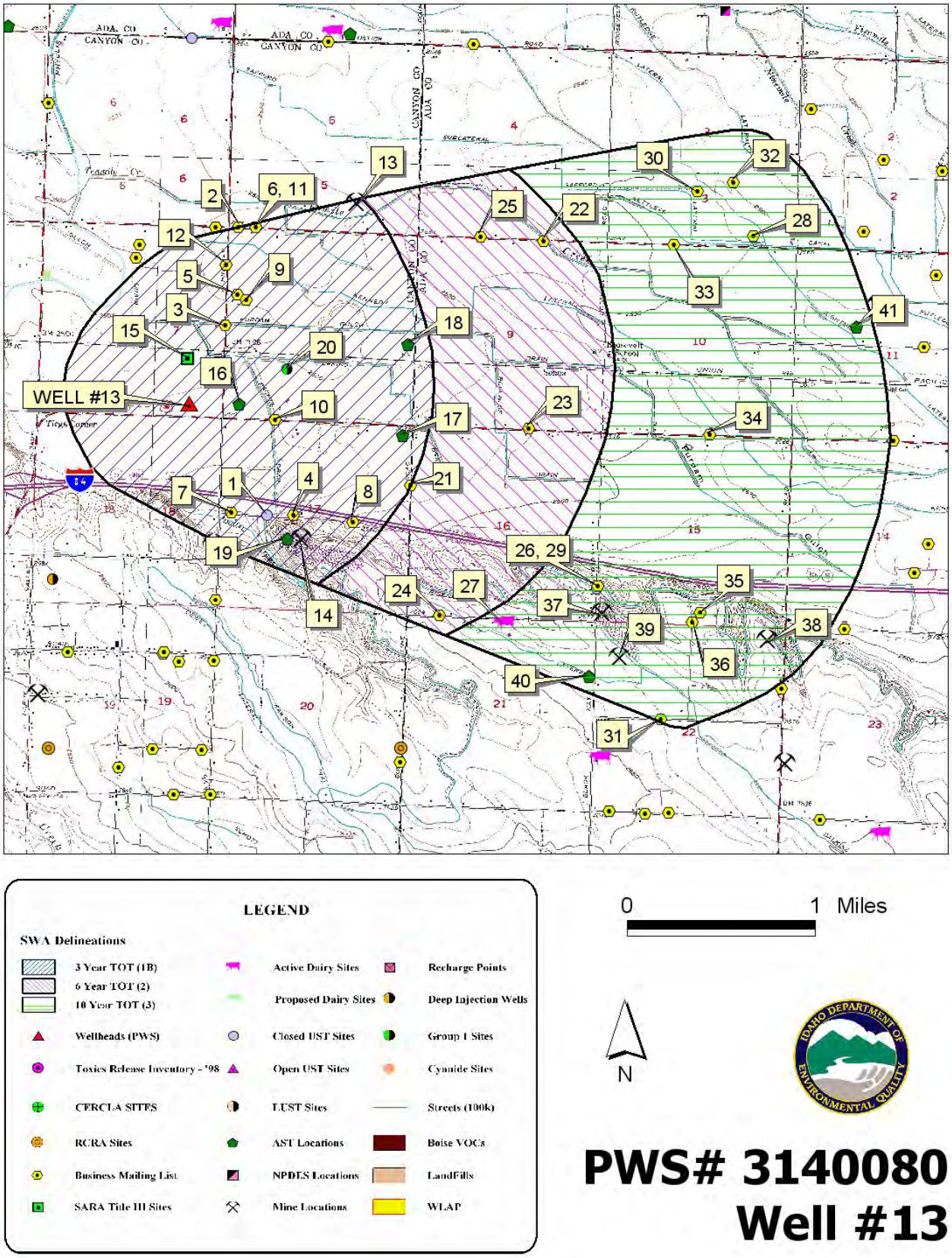


Figure 3. City of Nampa Delineation Map and Potential Contaminant Source Locations



Potential Contaminant Sources and Land Use

Land use for both Well #11 and Well #13 rated high for IOCs, VOCs, SOCs, and low for microbial contaminants. The agriculture activity within the delineation contributed the highest amount to the ratings. Also factoring into the scoring were the 11 potential contaminant sources associated with Well #11 listed in Table 2, and the 41 potential contaminant sources associated with Well #13, listed in Table 3.

Final Susceptibility Ranking

A detection above a drinking water standard MCL, any detection of a VOC or SOC, or a 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 automatically lead to a 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 1B) contribute greatly to the overall ranking. In this case, Well #11 rated automatically high for VOCs and SOCs due to diesel being stored within 50 feet of the well.

Table 1. Summary of City of Nampa Susceptibility Evaluation

	Susceptibility Scores[1]									
	Hydrologic Sensitivity	Contaminant Inventory				System Construction	**Final Susceptibility Ranking**			
Well		IOC	VOC	SOC	Microbials		IOC	VOC	SOC	Microbials
Well #11	M	H	H	H	L	L	M	H*	H*	M
Well #13	L	H	H	H	L	M	M	M	M	M

[1]H = High Susceptibility, M = Moderate Susceptibility, L = Low Susceptibility,
IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical
H* = Automatically high rating due to diesel storage within 50 feet of well.

Susceptibility Summary

In terms of total susceptibility, Well #11 rated moderate for IOCs and microbial bacteria, and automatically high for VOCs and SOCs. The automatically high ratings are due to diesel storage within 50 feet of the well. If not for the automatic ratings, Well #11 would have rated moderate susceptibility for all potential contaminant types. System construction rated low and hydrologic sensitivity rated moderate for the well. Land use rated high for IOCs, VOCs, SOCs, and low for microbial bacteria (Table 1).

In terms of total susceptibility, Well #13 rated moderate for IOCs, VOCs, SOCs, and microbial bacteria. System construction rated moderate and hydrologic sensitivity rated low for the well. Land use rated high for IOCs, VOCs, SOCs, and low for microbial bacteria (Table 1).

IOCs, such as chromium, arsenic, fluoride, and thallium have been detected in tested water; however concentrations were within allowable limits. Arsenic has been detected in concentrations up to 9 ppb, which is approaching the maximum contaminant level of 10 ppb. No VOCs, SOCs, or microbial bacteria have ever been detected in either well's tested water. The delineation exists within a priority area for the IOC nitrate and for pesticides (SOCs).

Section 4. 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 City of Nampa, drinking water protection activities should first focus on correcting any deficiencies outlined in the sanitary survey. Actions should be taken to keep a 50-foot radius circle clear around the wellheads. Any spills within the delineation should be carefully monitored and dealt with. As much of the designated protection area is outside the direct jurisdiction City of Nampa, making collaboration and partnerships with state and local agencies and industry groups are critical to the success of drinking water protection. The well should maintain sanitary standards regarding wellhead protection.

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 public education program should be a primary focus of any drinking water protection plan as the delineation is near residential land uses areas. Public education topics could include proper household hazardous waste disposal methods, proper care and maintenance of septic systems, 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.

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 DEQ or the Idaho Rural Water Association.

Assistance

Public water suppliers 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.state.id.us/deq

Water suppliers serving fewer than 10,000 persons may contact Melinda Harper (mlharper@idahoruralwater.com), Idaho Rural Water Association, at 1-208-343-7001 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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Appendix A

City of Nampa
Susceptibility Analysis
Worksheets

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 : CITY OF NAMPA Well# : WELL # 11

Public Water System Number 3140080

1. System Construction		SCORE
Drill Date	3/30/1999	
Driller Log Available	YES	
Sanitary Survey (if yes, indicate date of last survey)	YES	2001
Well meets IDWR construction standards	NO	1
Wellhead and surface seal maintained	YES	0
Casing and annular seal extend to low permeability unit	YES	0
Highest production 100 feet below static water level	YES	0
Well located outside the 100 year flood plain	YES	0
Total System Construction Score		1

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	YES	0
Total Hydrologic Score		4

3. Potential Contaminant / Land Use - ZONE 1A		IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	IRRIGATED AGRICULTURE	2	2	2	2
Farm chemical use high	YES	2	0	2	
IOC, VOC, SOC, or Microbial sources in Zone 1A	YES	NO	YES	YES	NO
Total Potential Contaminant Source/Land Use Score - Zone 1A		4	2	4	2
Potential Contaminant / Land Use - ZONE 1B					
Contaminant sources present (Number of Sources)	YES	7	8	10	4
(Score = # Sources X 2) 8 Points Maximum		8	8	8	8
Sources of Class II or III leacheable contaminants or	YES	4	5	5	
4 Points Maximum		4	4	4	
Zone 1B contains or intercepts a Group 1 Area	YES	2	0	2	0
Land use Zone 1B	Greater Than 50% Agricultural Land	4	4	4	0
Total Potential Contaminant Source / Land Use Score - Zone 1B		12	7	9	8
Potential Contaminant / Land Use - ZONE II					
Contaminant Sources Present	YES	2	2	2	
Sources of Class II or III leacheable contaminants or	YES	1	1	1	
Land Use Zone II	Greater than 5o% Agricultural Land	2	2	2	
Potential Contaminant Source / Land Use Score - Zone II		5	5	5	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	1	1	
Is there irrigated agricultural lands that occupy > 50% of	NO	1	1	1	
Total Potential Contaminant Source / Land Use Score - Zone III		3	3	3	0
Cumulative Potential Contaminant / Land Use Score		30(H)	26(H)	30(H)	10(L)
4. Final Susceptibility Source Score		11	10	11	8
5. Final Well Ranking		Moderate	High	High	Moderate

Ground Water Susceptibility Report Public Water System Name : CITY OF NAMPA Well# : WELL #13

Public Water System Number 3140080

1. System Construction		SCORE			
Drill Date	2/09/2000				
Driller Log Available	YES				
Sanitary Survey (if yes, indicate date of last survey)	YES	2001			
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	YES	0			
Well located outside the 100 year flood plain	YES	0			
Total System Construction Score		3			
2. Hydrologic Sensitivity					
Soils are poorly to moderately drained	YES	0			
Vadose zone composed of gravel, fractured rock or unknown	NO	0			
Depth to first water > 300 feet	NO	1			
Aquitard present with > 50 feet cumulative thickness	YES	0			
Total Hydrologic Score		1			
3. Potential Contaminant / Land Use - ZONE 1A		IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	IRRIGATED AGRICULTURE	2	2	2	2
Farm chemical use high	YES	2	0	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	2	4	2
Potential Contaminant / Land Use - ZONE 1B					
Contaminant sources present (Number of Sources)	YES	16	19	19	7
(Score = # Sources X 2) 8 Points Maximum		8	8	8	8
Sources of Class II or III leacheable contaminants or	YES	4	7	7	
4 Points Maximum		4	4	4	
Zone 1B contains or intercepts a Group 1 Area	YES	2	0	2	0
Land use Zone 1B	Greater Than 25% Agricultural Land	4	4	4	0
Total Potential Contaminant Source / Land Use Score - Zone 1B		18	16	18	8
Potential Contaminant / Land Use - ZONE II					
Contaminant Sources Present	YES	2	2	2	
Sources of Class II or III leacheable contaminants or	YES	1	1	1	
Land Use Zone II	Greater than 5o% Agricultural Land	2	2	2	
Potential Contaminant Source / Land Use Score - Zone II		5	5	5	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	1	1	
Is there irrigated agricultural lands that occupy > 50% of	NO	1	1	1	
Total Potential Contaminant Source / Land Use Score - Zone III		3	3	3	0
Cumulative Potential Contaminant / Land Use Score		30(H)	26(H)	30(H)	10(L)
4. Final Susceptibility Source Score		10	9	10	7
5. Final Well Ranking		Moderate	Moderate	Moderate	Moderate

Appendix B

Tables 2 and 3
Potential Contaminant Inventories

Table 2. City of Nampa, Well #11, Potential Contaminant Inventory

SITE	Source Description[1]	TOT[2] ZONE	Source of Information	Potential Contaminants[3]
1, 3, 7	RCRA site, UST site, LUST site (cleanup completed, impact unknown)	0-3 YR	Database Search	VOC, SOC
2, 4	Gas Station, UST site, LUST site (cleanup completed, impact = groundwater)	0-3 YR	Database Search	VOC, SOC
5	Crane service	0-3 YR	Database Search	IOC, VOC, SOC
6	Carpet and rug cleaners	0-3 YR	Database Search	IOC, VOC, SOC, Microbials
8	Deep injection well	0-3 YR	Database Search	IOC, SOC
9	Deep injection well	0-3 YR	Database Search	IOC, SOC
10	AST	0-3 YR	Database Search	VOC, SOC
11	Dairy	3-6 YR	Database Search	IOC, SOC
12	Portable toilets	6-10 YR	Database Search	IOC, VOC, SOC
13	Farm equipment	6-10 YR	Database Search	IOC, VOC, SOC
14	Deep injection well	6-10 YR	Database Search	IOC, SOC
	Union Pacific Railroad	0-3, 3-6, 6-10 YR	GIS Map	IOC, VOC, SOC, Microbials
	Indian Creek and Ridenbaugh Canal	0-3, 3-6. 6-10 YR	GIS Map	IOC, VOC, SOC, Microbials
	Major roads	0-3, 3-6, 6-10 YR	GIS Map	IOC, VOC, SOC, Microbials

[2] SARA Site = Superfund Authorization Recovery Act, NPDES Site = National Pollutant Discharge Site, UST Site = Underground Storage Tank, LUST Site = Leaking Underground Storage Tank, RCRA Site = Resource Conservation Recovery Act Site, WLAP Site = Waste Land Application Site, AST = Above Ground Storage Tank.
[2] TOT = time-of-travel (in years) for a potential contaminant to reach the wellhead
[3] IOC = inorganic chemical, SOC = synthetic organic chemical, VOC = volatile organic chemical

Table 3. City of Nampa, Well #13, Potential Contaminant Inventory

SITE	Source Description[1]	TOT[2] ZONE	Source of Information	Potential Contaminants[3]
1	UST site (closed)	0-3 YR	Database Search	VOC, SOC
2	Excavating contractor	0-3 YR	Database Search	IOC, VOC, SOC
3	Glass products	0-3 YR	Database Search	IOC, VOC, SOC
4	Carpet and rug cleaners	0-3 YR	Database Search	IOC, VOC, SOC, Microbials
5	Concrete contractors	0-3 YR	Database Search	IOC, VOC, SOC
6, 11	Water treatment equipment & supplies	0-3 YR	Database Search	IOC, VOC, SOC
7	Hay (wholesale)	0-3 YR	Database Search	IOC, SOC, Microbials
8	Printers and supplies	0-3 YR	Database Search	IOC, VOC
9	Agricultural Chemicals	0-3 YR	Database Search	IOC, VOC, SOC
10	Wood Products NEC	0-3 YR	Database Search	IOC, VOC, SOC
12	Printers	0-3 YR	Database Search	IOC, VOC
13	Gravel Pit	0-3 YR	Database Search	IOC, VOC, SOC, Microbials
14	Gravel Pit	0-3 YR	Database Search	IOC, VOC, SOC, Microbials
15	SARA site	0-3 YR	Database Search	IOC, VOC, SOC
16	AST site	0-3 YR	Database Search	VOC, SOC
17	AST site	0-3 YR	Database Search	VOC, SOC
18	AST site	0-3 YR	Database Search	VOC, SOC
19	AST site	0-3 YR	Database Search	VOC, SOC
20	WLAP site	0-3 YR	Database Search	IOC, SOC, Microbials
21	Excavating contractors	3-6 YR	Database Search	IOC, VOC, SOC

22	Nursery	3-6 YR	Database Search	IOC, SOC
23	Lawn Maintenance	3-6 YR	Database Search	IOC, VOC, SOC
24	Carpet and rug cleaners	3-6 YR	Database Search	IOC, VOC, SOC
25	Construction contractor	3-6 YR	Database Search	IOC, VOC, SOC
26, 29	Paving contractor, UST site	6-10 YR	Database Search	VOC, SOC
27	Dairy	6-10 YR	Database Search	IOC, SOC
28	Paving contractor	6-10 YR	Database Search	IOC, VOC, SOC
30	Golf course, public	6-10 YR	Database Search	IOC, SOC
31	Remodeling/repairing contractor	6-10 YR	Database Search	IOC, VOC, SOC
32	Farm equipment (wholesale)	6-10 YR	Database Search	IOC, VOC, SOC
33	Concrete ditch liners	6-10 YR	Database Search	IOC, VOC, SOC
34	Livestock buyers	6-10 YR	Database Search	IOC, SOC
35	General contractor	6-10 YR	Database Search	IOC, VOC, SOC
36	Repair shop and related services	6-10 YR	Database Search	IOC, VOC, SOC
37	Gravel pit	6-10 YR	Database Search	IOC, VOC, SOC
38	Gravel pit	6-10 YR	Database Search	IOC, VOC, SOC
39	Gravel pit	6-10 YR	Database Search	IOC, VOC, SOC
40	ASt site	6-10 YR	Database Search	VOC, SOC
41	AST site	6-10 YR	Database Search	VOC, SOC
	Interstate 84	0-3, 3-6, 6-10 YR	Gis Map	IOC, VOC, SOC, Microbials
	Canals	0-3, 3-6, 6-10 YR	GIS Map	IOC, VOC, SOC, Microbials

[2] SARA Site = Superfund Authorization Recovery Act, NPDES Site = National Pollutant Discharge Site, UST Site = Underground Storage Tank, LUST Site = Leaking Underground Storage Tank, RCRA Site = Resource Conservation Recovery Act Site, WLAP Site = Waste Land Application Site, AST = Above Ground Storage Tank.
[2] TOT = time-of-travel (in years) for a potential contaminant to reach the wellhead
[3] IOC = inorganic chemical, SOC = synthetic organic chemical, VOC = volatile organic chemical