Water Quality Summary Report No. 33

1998 Follow-up Studies to Ground Water Contamination Detections

Idaho Department of Health and Welfare
Division of Environmental Quality
July 1999

Idaho Division of Environmental Quality
Boise Regional Office

1998 Follow-up Studies to Ground Water Contamination Detections

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ABSTRACT

The ground water studies were generally conducted within a one mile radius of the wells with a ground water contamination detection. If there were not enough wells available within the one mile radius, the study was expanded to include the nearest wells available. All of the sites are near wells that were sampled for the Statewide Ambient Ground Water Monitoring Program with results showing contaminants of concern. Only one Statewide Ambient Ground Water Monitoring Program well, in Mountain Home, was sampled during the 1998 Follow-up Ground Water Studies. It was requested by Idaho Department of Water Resources that the Statewide Ambient Ground Water Monitoring Program wells not be included in the studies, unless absolutely necessary.

Three of the nitrate study areas were localized problems. The nitrate and arsenic in the West Caldwell area will need additional samples collected in a larger area to identify the cause of the impacts. The arsenic found in the ground water near the Snake River in Canyon and Owyhee Counties was too pervasive to be a localized problem (see Figures 5, 6, 7 and 8 on pages 11, 12, 13, and 14; respectively). The arsenic along the Snake River and the fluoride in the Idaho Batholith appear to be naturally occurring. Additional work is needed to understand the scope of this problem and to help the well owners understand their ground water quality.

INTRODUCTION

The Ground Water Protection Act of 1989 formed the Ground Water Quality Council to develop a Ground Water Quality Plan for Idaho (Ground Water Quality Council, 1992). The Idaho Ground Water Quality Plan of 1992 is a planning document to manage protection of ground water quality, prevention of ground water contamination and remediation of contaminated ground water. It establishes the basis for continuing efforts to protect ground water now, and for future generations.

The policy of the state of Idaho, as stated in the Idaho Ground Water Quality Plan, is to implement and maintain a monitoring program designed to investigate ground water quality in regional and local areas where contamination may have occurred. The Ground Water Monitoring Technical Committee, which is composed of numerous agencies, was formed to identify and prioritize where ground water contamination was found. This report documents the regional follow-up ground water studies in fifteen “Priority One” areas as identified by the Ground Water Monitoring Technical Committee for the Division of Environmental Quality, Boise Regional Office (DEQ-BRO).

Ground Water Detection Follow-up Flow Chart

DEQ-BRO receives Statewide Ambient Ground Water Quality Monitoring Program or other ground water detections

↓

Information goes to manager

↓

Information goes to lead person conducting follow-ups

↓

Check GWMTC priority for the site or determine GWMTC priority

↓

Check GWMTC database for ongoing, historical or planned ground water study

↓

Find out if it is part of an on-going study

↙ ↘

No — Yes

↙ ↘

Fill out initial screening form — Keep appraised of the study

↓

Additional monitoring necessary to delineate the plume and/or determine the source

↙ ↘

Yes — No

↙ ↘

Develop monitoring plan — File initial screening form in centrally located filing system

C:\DATA\WP61\FOLLOW.UP

METHODS AND MATERIALS

The process of collecting and handling of samples followed the Standard Operating Procedures for the Statewide Ambient Ground Water Quality Monitoring Program (Statewide Program) and Guidelines for the Collection, Treatment, and Analysis of Water Samples, U.S. Geological Survey Western Region Field Manual. All well owners were mailed information regarding the constituent of concern in their area, along with their sampling results and an explanation of their water quality.

RESULTS AND DISCUSSION

Figure 1 on page 4 shows the location of all the ground water study areas. The following text describes the individual ground water studies, first grouped by county and then alphabetically by site name.

ADA COUNTY

Dry Creek

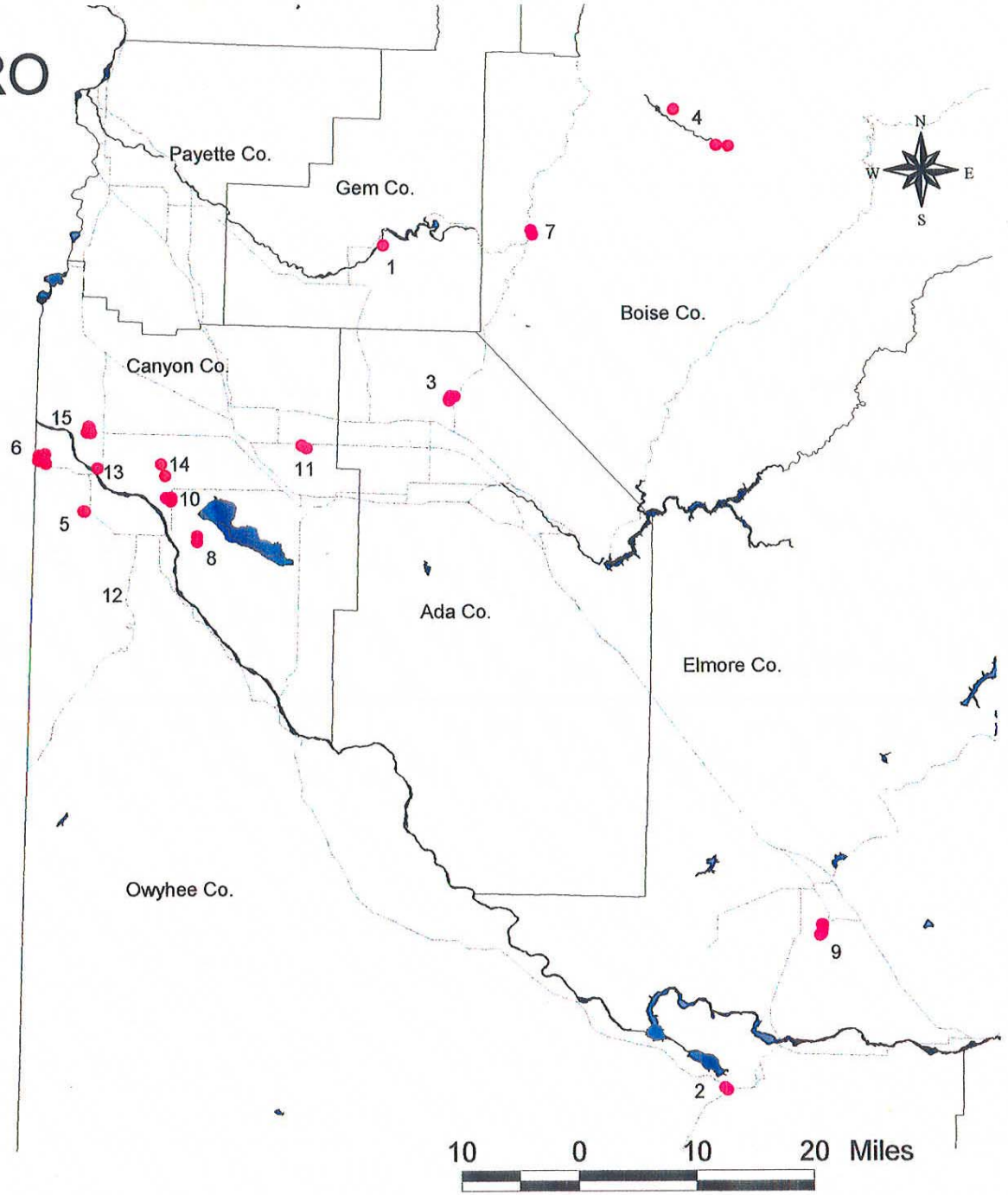
The Dry Creek study area is in Ada County, near Highway 55 and Beacon Light Road, northeast of Eagle. The area is rural with a transition to urban use. Geographically the area is undulating and is located within the alluvial fan of Dry Creek and Goose Creek.

The Statewide Monitoring well in this area had elevated nitrate level of 11 mg/l in 1995. The well was drilled in 1954 to a shallow depth of 54 feet deep with a 20-foot casing. This well is not used for household purposes by the owner. The nitrate problem in this well could originate anywhere from 20 to 54 feet or from the surface since the surface seal for this well is unknown. The integrity of the well may be compromised due to the age of the well (metal corrodes with time) and the location of the well in a low spot from the yard and pastures.

Nitrate is a naturally occurring inorganic ion which makes up part of the nitrogen cycle. Elevated levels of nitrate can result from fertilizers, septic systems and decaying organic material. Nitrate levels greater than 10 milligrams per liter have the potential to cause methemoglobinemia, also known as blue baby syndrome. Methemoglobinemia related to drinking water has been observed in infants up to the age of six months and is suspected of possibly causing miscarriages.

Three permission letters to nearby well owners with well drillers' reports on their wells brought no response from the well owners giving DEQ-BRO permission to sample their wells. At a later

Figure 1. 1998 DEQ-BRO Follow-up Studies to Ground Water Contaminant Detections



Legend

1 Black Canyon
2 Bruneau
3 Dry Creek
4 Garden Valley
5 Homedale
6 Homedale/Adrian
7 Horseshoe Bend
8 Lake Lowell
9 Mountain Home
10 North Marsing
11 North Nampa
12 South Marsing
13 South Wilder
14 West Caldwell
15 West Wilder

date, three more permission letters were sent to nearby well owners with well drillers' reports. By the end of the sampling season, all six well owners asked to be included in the ground water study. Three of the wells results, well # D2, D4 and D6, were non-detect or less than the laboratory detection level for nitrate. The other three wells, well # D1, D3 and D5, had nitrate levels of 2.49 to 4.06 mg/l. The depths of the wells with nitrate detected are 70 feet or less. Nitrate fact sheets were mailed to the well owners with the results.

Similar to some other areas in Idaho, this area is showing elevated nitrate in the very shallow water-bearing zone. The deeper wells have very low nitrate levels, below or just above the laboratory detection level. The Statewide monitoring well is the only well in this area where nitrate level exceeds the Maximum Contaminant Level (MCL) of 10 mg/l. Primary MCLs are based upon health reasons. Previous ground water sampling at a regional level (>10 square miles) has not indicated that nitrate is a regional problem (see Figure 2 page 6).

BOISE COUNTY

Garden Valley

The Garden Valley study area is in Boise County. It is located along the Banks to Lowman Highway and the Payette River, from the city of Garden Valley east about five miles. This is a sparsely populated area on the edge of the Boise National Forest. Except for the yards around the homes native plants are commonly found in this area. The Idaho Batholith, or more specifically the Atlanta Batholith is a visible geologic feature. Numerous geothermal hot springs can be found in this area.

The Statewide Program well in this area had elevated fluoride of 7.5 mg/l. The well is 152 feet deep with a 152-foot casing. The 23-foot surface seal is bentonite. The well was drilled in 1987. The water temperature is 22.2°C, so the possibility of geothermal water influence is very likely. Previous ground water sampling at a regional level (>10 square miles) has indicated that fluoride is a regional problem (see Figure 3 page 7).

Fluoride minerals are commonly found in most volcanic rocks and the soils they form. These minerals are typically not very easily dissolved in water. As a result, natural fluoride concentrations in ground and surface waters are usually low. However, under certain circumstances, natural concentrations can become elevated. Geothermal waters, or cold water bodies that are geothermal-influenced, often contain elevated fluoride concentrations. Fluoride can be helpful or harmful to your body, depending on the fluoride level. Low levels of fluoride in drinking water can be helpful in preventing tooth decay, 0.7 to1.2 mg/l. Moderate levels, 2 to 4 mg/l, can cause staining and pitting of permanent teeth. Elevated levels, >4 mg/l, in drinking

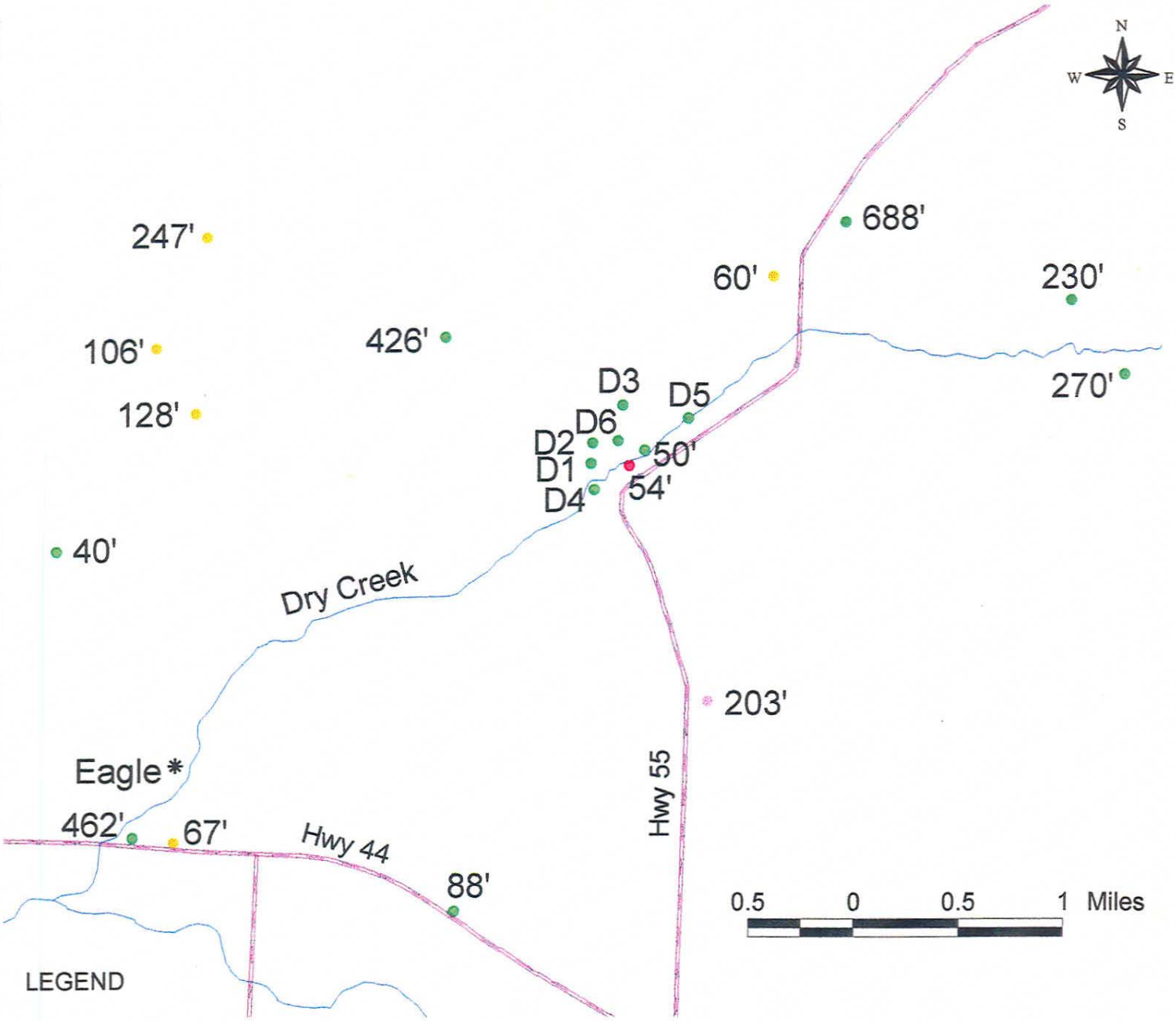


Figure 2. 1998 Follow-up Ground Water Study in the Dry Creek area plus Historic Data

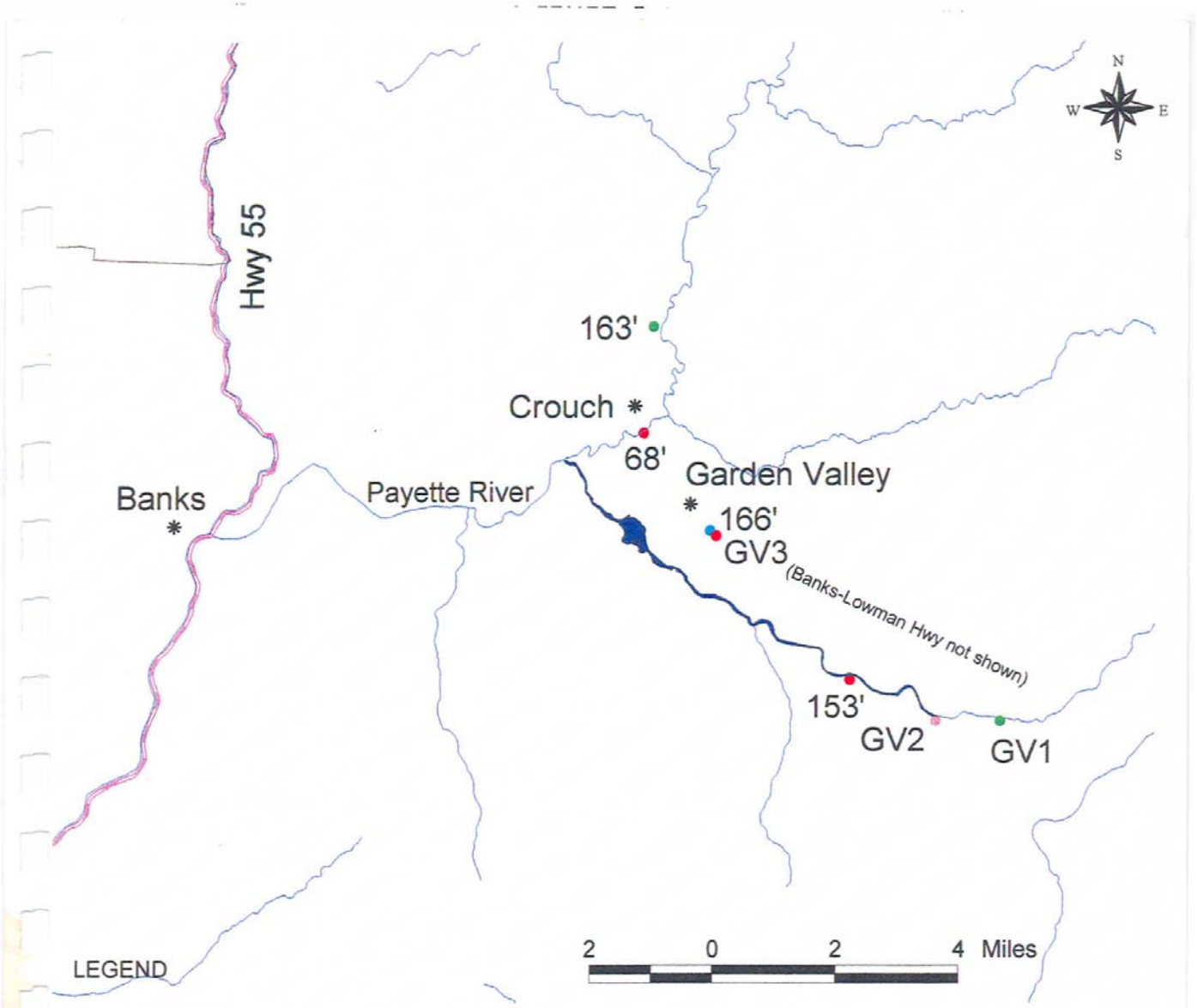


Figure 3. 1998 Follow-up Ground Water Study in the Garden Valley area plus Historic Data

water for many years may result in joint stiffness and pain, followed by serious bone and joint problems known as skeletal fluorosis.

Four well drillers' reports were found and permission letters were sent to the well owners. Only two well owners responded. While out in the area sampling, a neighbor requested to have her well included in the study, which was sampled as well # GV2. A well driller's report for well #GV2 could not be found, the well was reported to be 200 feet.

Of the three wells that were sampled, only one well had fluoride greater than the MCL of 4 mg/l. The fluoride was 5.27 mg/l in well #GV3. All well owners were mailed information explaining fluoride, including what can be done if they have fluoride at levels that should require pre-treatment or an alternate drinking source. Additional information discussed the presence of fluoride as a common naturally occurring constituent found in the ground water in the Idaho Batholith with geothermal influence. Water temperatures show the correlation of the influence of the warmer geothermal waters, the warmer the water the higher the fluoride level (see Table B2).

Horseshoe Bend

The Horseshoe Bend study area is in Boise County along the Payette River and Highway 55 in the foothills just at the edge of the Boise National Forest. This is a sparsely populated rural area of mainly range land is located on the north side of Horseshoe Bend. The Idaho Batholith, or more specifically the Atlanta Batholith, is a visible geologic feature to the north of the area.

The Statewide Monitoring well had elevated fluoride of 13 mg/l. The well is 392 feet deep with a 159-foot casing. It was drilled in 1978. The 20-foot surface seal is composed of the well cuttings.

Four well drillers' reports were found near the Statewide Monitoring well. Three well owners allowed their wells to be sampled. All of the wells had elevated fluoride; well # HB2 and HB3 had fluoride level greater than the MCL which is 4 mg/l. The depths of these wells were 250 to 300 feet. The water temperature ranged from 16.6 to 17.7 °C.

The limited data for this area near Horseshoe Bend shows elevated fluoride in the area ground water (see Figure 4 page 9). All well owners were mailed information explaining fluoride, including what can be done if they have fluoride at levels that should require pre-treatment or an alternate drinking source. Additional information discussed the presence of fluoride as a common naturally occurring constituent found in the ground water in the Idaho Batholith with geothermal influence. Water temperatures show the correlation of the influence of the warmer geothermal waters, the warmer the water the higher the fluoride level (see Table B2).

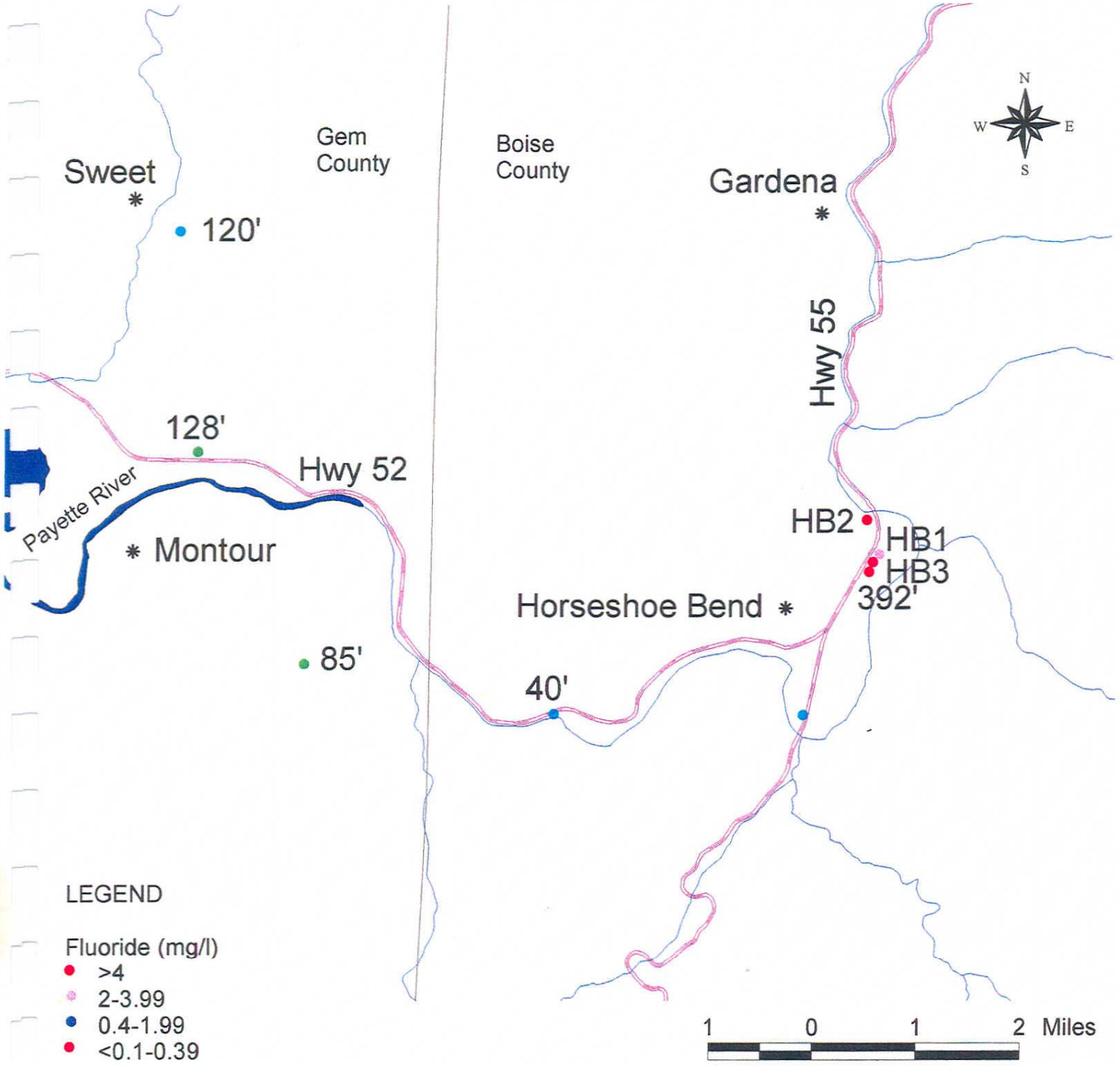


Figure 4. 1998 Follow-up Ground Water Study in the Horseshoe Bend Area plus Historic Data

CANYON COUNTY

Lake Lowell

The Lake Lowell study area is in Canyon County. The location is between the lower dam on Lake Lowell and the Snake River. It is in a sparsely populated rural area of large acreage home sites with some subdividing of homes on just a few acres. Alfalfa and wheat were the major crops growing during this sampling period. The topography is undulating to the terraces overlooking the Snake River.

The Statewide Monitoring well in this study area had elevated arsenic of 58 ug/l. The well is 247 feet deep with a 239-foot casing. The well was drilled in 1983. It has an 18-foot surface seal of puddling clay.

Four well drillers' reports were found in the area near the Statewide Monitoring well. Two of the well owners responded allowing the sampling of their wells. Well # L1 was 190 feet deep and 244 feet deep for L2. Both had elevated arsenic of 50 and 39 ug/l, respectively. The nitrate levels for the wells were a low 0.51 and 2.06 mg/l, respectively. Information on arsenic was provided to the well owners.

This appears to be the first of many sites along the Snake River where elevated arsenic levels will be discussed. The diagram for the area shows elevated arsenic from the Lake Lowell area to Huston (see Figures 5 page 11, 6 page 12, 7 page 13 and 8 page 14). The consistent elevated levels of arsenic in this area will require additional sampling before the cause of the contamination can be determined. Research on the subject alludes to the geology and hydrogeology of the area. Geothermal water along the Snake River has shown elevated arsenic, sulfate, zinc and fluoride levels in the ground water in a reduced environment (Lindholm 1983, Parliman 1983, Wood 1987, and Wood 1988). The elevated arsenic may be a consequence of geothermal water mixing with the cold water system. Health effects of arsenic over 0.05 milligrams per liter may include gastrointestinal problems, changes in fingernails and toenails, abnormal skin thickening or pigment and long term exposure includes nerve damage (including numbness in limbs) and skin cancer. However, sensitivity to arsenic varies between individuals.

North Marsing

The North Marsing study area is in Canyon County near Highway 55 in the Sunnyslope area. Topographic features are undulating. It is in a sparsely populated rural area of large orchards with some subdividing of homes on just a few acres. Just south of the study area is a large, extinct basalt vent called Lizard Butte.

The Statewide Monitoring well in this area had elevated arsenic of 85 ug/l. The well is 80 feet deep with a 79 feet of casing. The surface seal is 18 feet deep of puddling clay. The well was drilled in 1971.

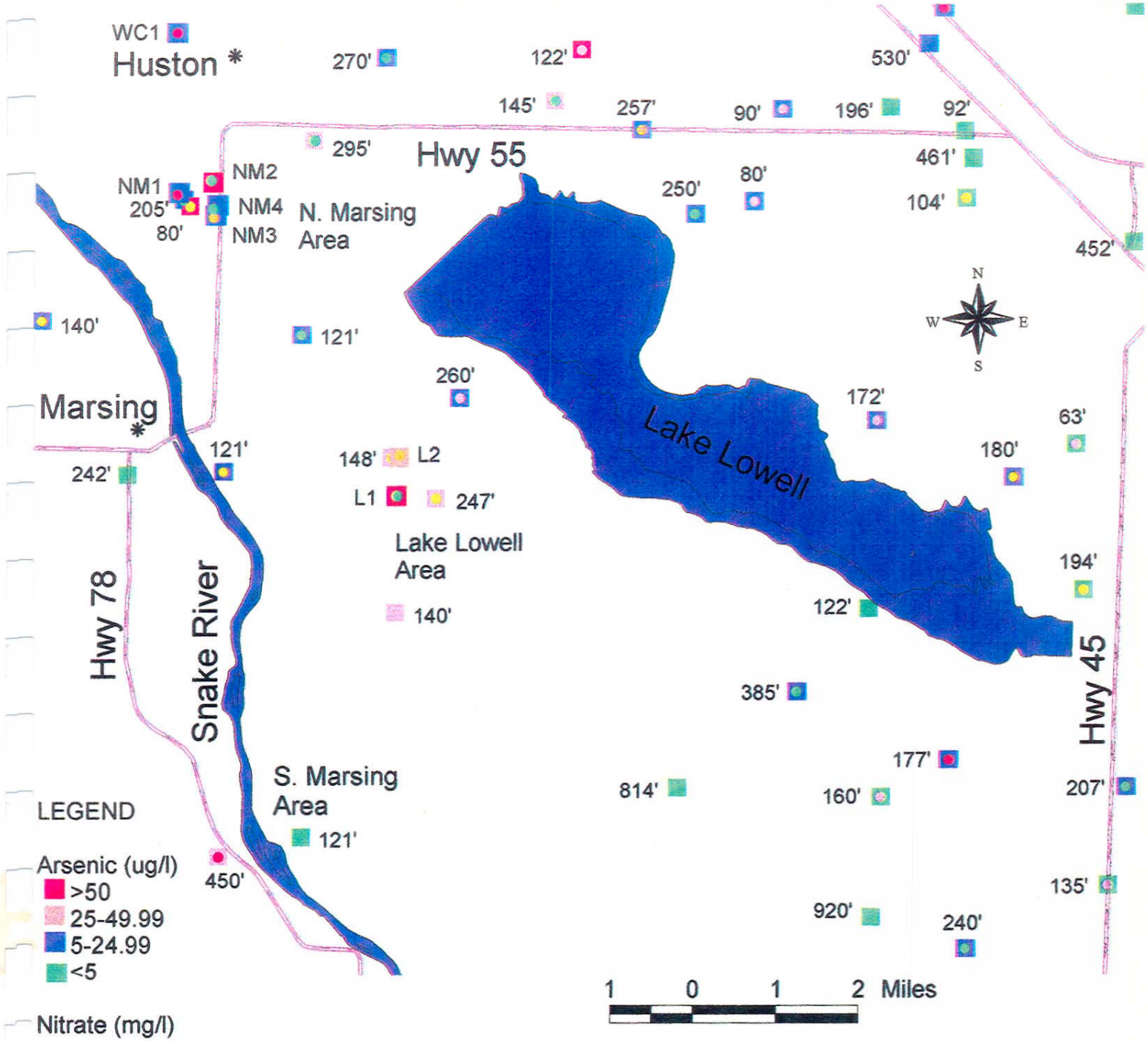


Figure 5. 1998 Follow-up Ground Water Study in the Lake Lowell and Marsing Areas plus Historic Data

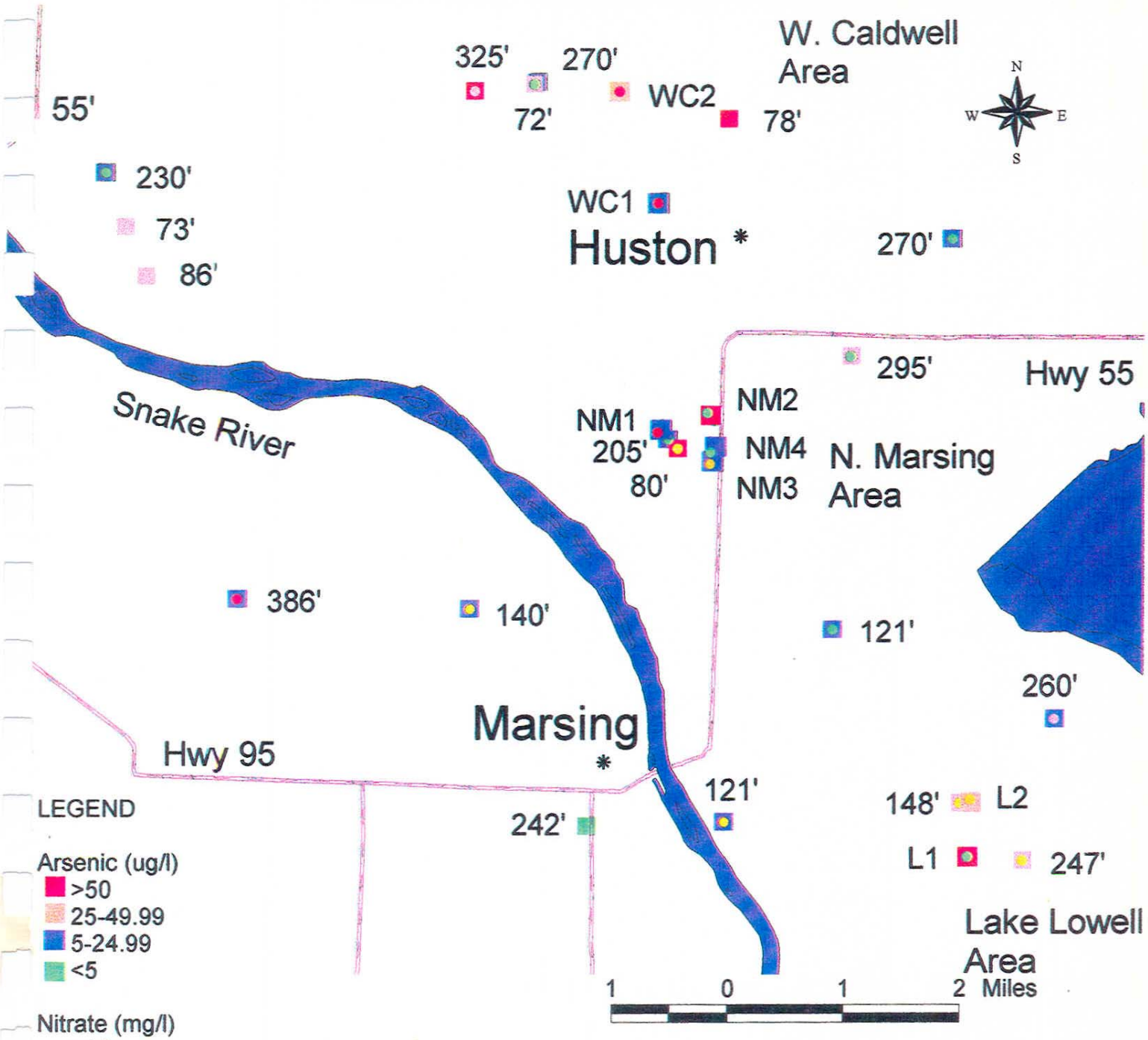


Figure 6. 1998 Follow-up Ground Water Studies in the W. Caldwell and N. Marsing Areas plus Historic Data

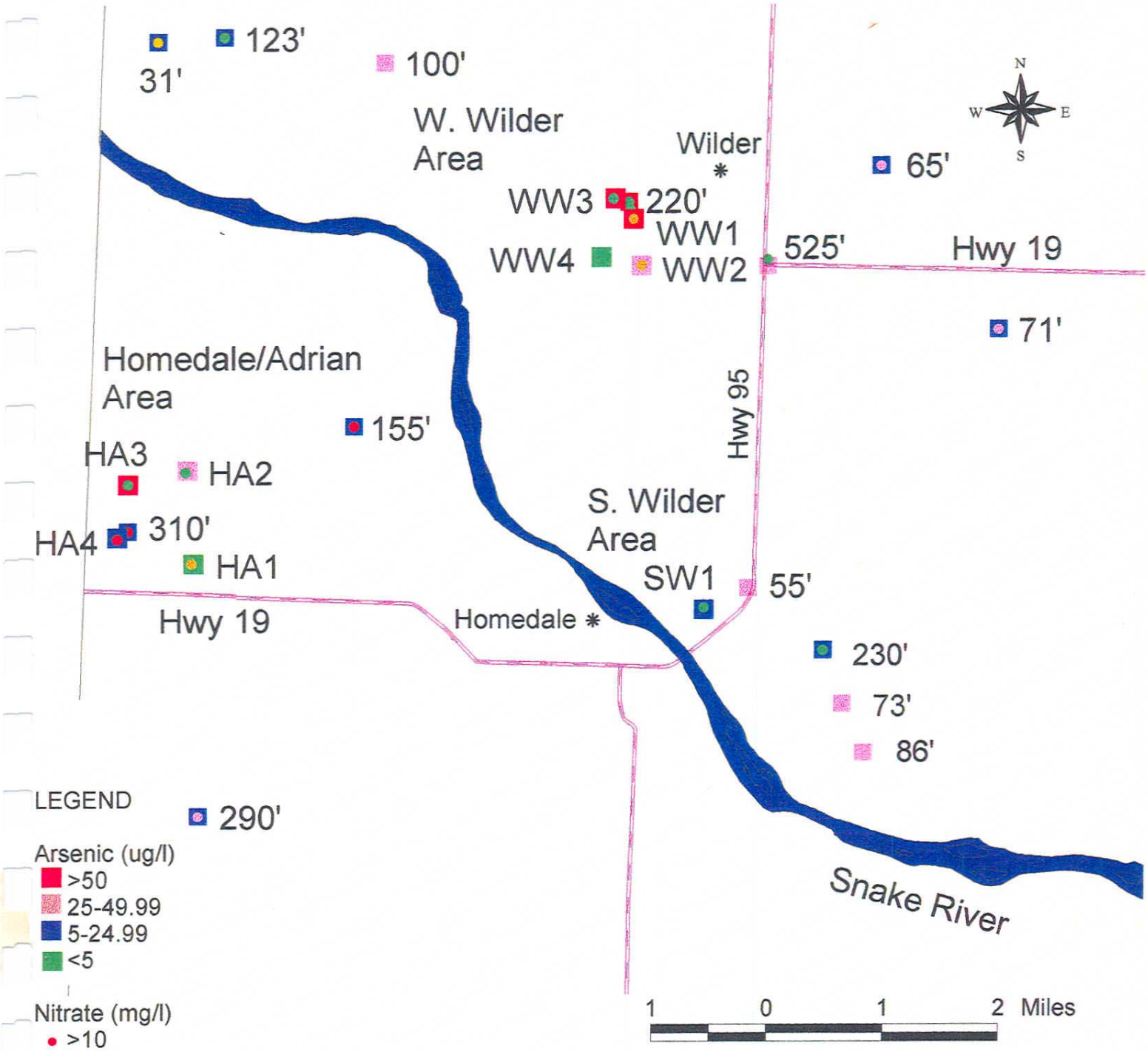


Figure 7. 1998 Follow-up Ground Water Studies in the W. Wilder, S. Wilder and Homedale/Adrian Areas plus Historic Data

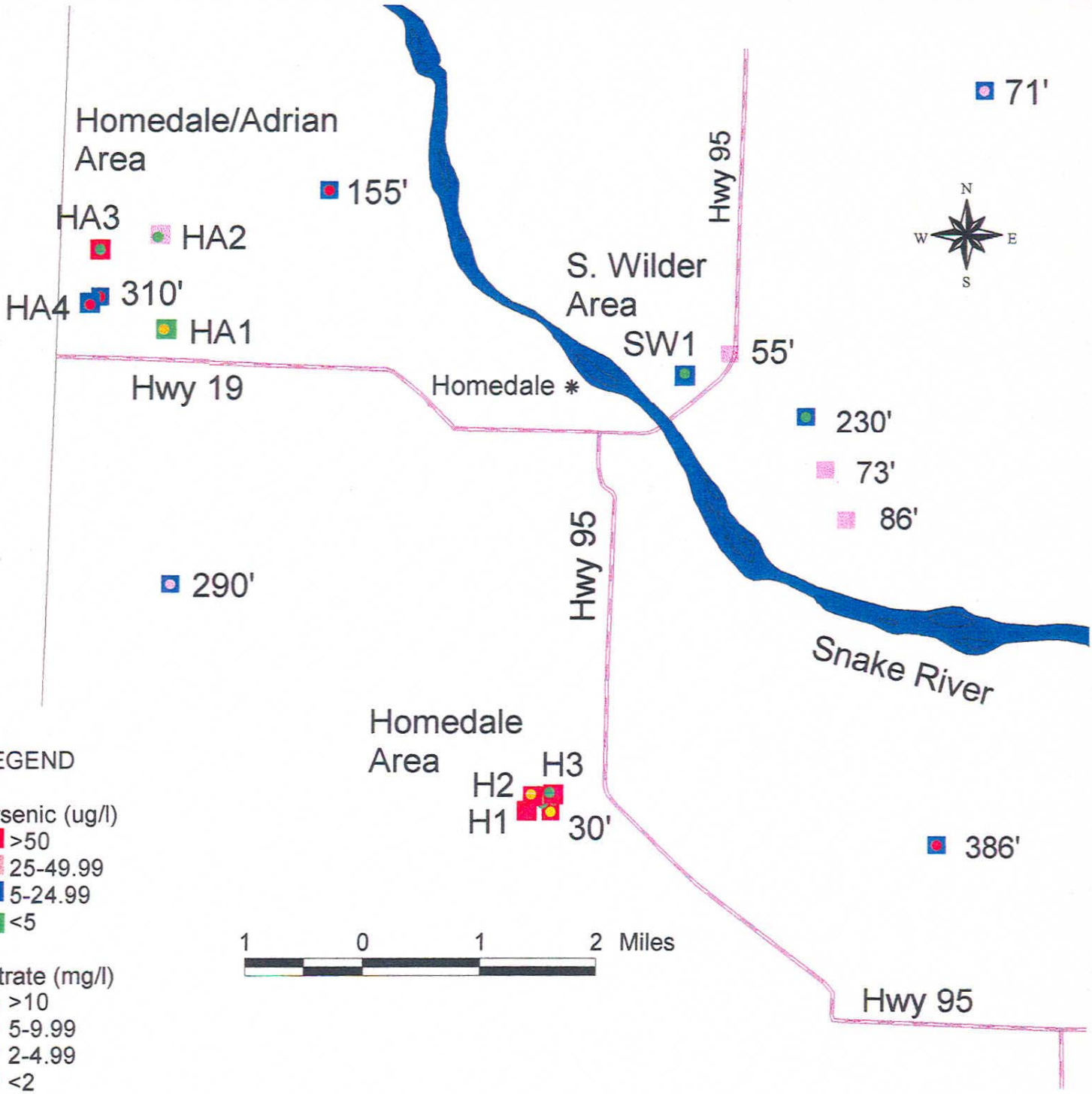


Figure 8. 1998 Follow-up Ground Water Studies in the S. Wilder, Homedale and Homedale/Adrian Areas plus Historic Data

Four well drillers' reports were found for wells near the Statewide Monitoring well. Three of the well owners gave permission to sample their wells. A fourth well, well # NM4, was added while out sampling. This well owner requested the sampling and a well drillers report was available for his well. The nitrate levels in the sampled wells were low to moderate, 1.17 - 6.01 mg/l. The well depths were 98 to 120 feet deep. The arsenic levels were 21 to 68 ug/l. The well owners were mailed information on what arsenic and nitrate are and what they can do in regard to elevated arsenic and nitrate in their well water.

This appears to be another area along the Snake River that has elevated arsenic levels. The diagram for the area shows elevated arsenic from the Lake Lowell area to Huston (see Figures 5 page 11, 6 page 12, 7 page 13 and 8 page 14). The consistent elevated levels of arsenic in this area will require additional sampling before the cause of the contamination can be determined. Research on the subject alludes to the geology and hydrogeology of the area. Geothermal water along the Snake River has shown elevated arsenic, sulfate, zinc and fluoride levels in the ground water in a reduced environment (Lindholm 1983, Parliman 1983, Wood 1987, and Wood 1988). The elevated arsenic may be a consequence of geothermal water mixing with the cold water system.

North Nampa

The North Nampa study area is in Canyon County on the south side of Highway 20/26 and west of Franklin Road. It is in a sparsely populated rural area with some subdividing of homes on just a few acres. The topography is a flat valley. Common row crops are sugar beets, alfalfa and potatoes.

The Statewide Monitoring well is 95 feet deep with a 90-foot casing. The surface seal of well cuttings and slurry pit is 20 feet deep. The well was drilled in 1982. The nitrate level was 17.2 mg/l from the Statewide Program results.

Four well drillers' reports were found in the area of the Statewide Monitoring well. Two well owners agreeded to be part of the ground water study. These two wells are of similar depth and close proximity to the Statewide Monitoring well. Neither wells had elevated nitrate, 1.05 mg/l in well # NN1 and 2.7 mg/l in well #NN2. The historic data in the area does not show the nitrate problem that has been identified in the Statewide Monitoring well (see Figure 9 page 16). The Statewide Program well is the only well in this area where nitrate level exceeds the MCL.

South Wilder

The South Wilder study area is in Canyon County about three miles south of Wilder near Highway 95. It is in a sparsely populated rural area with some subdividing of homes on just a few acres. The topography is undulating.

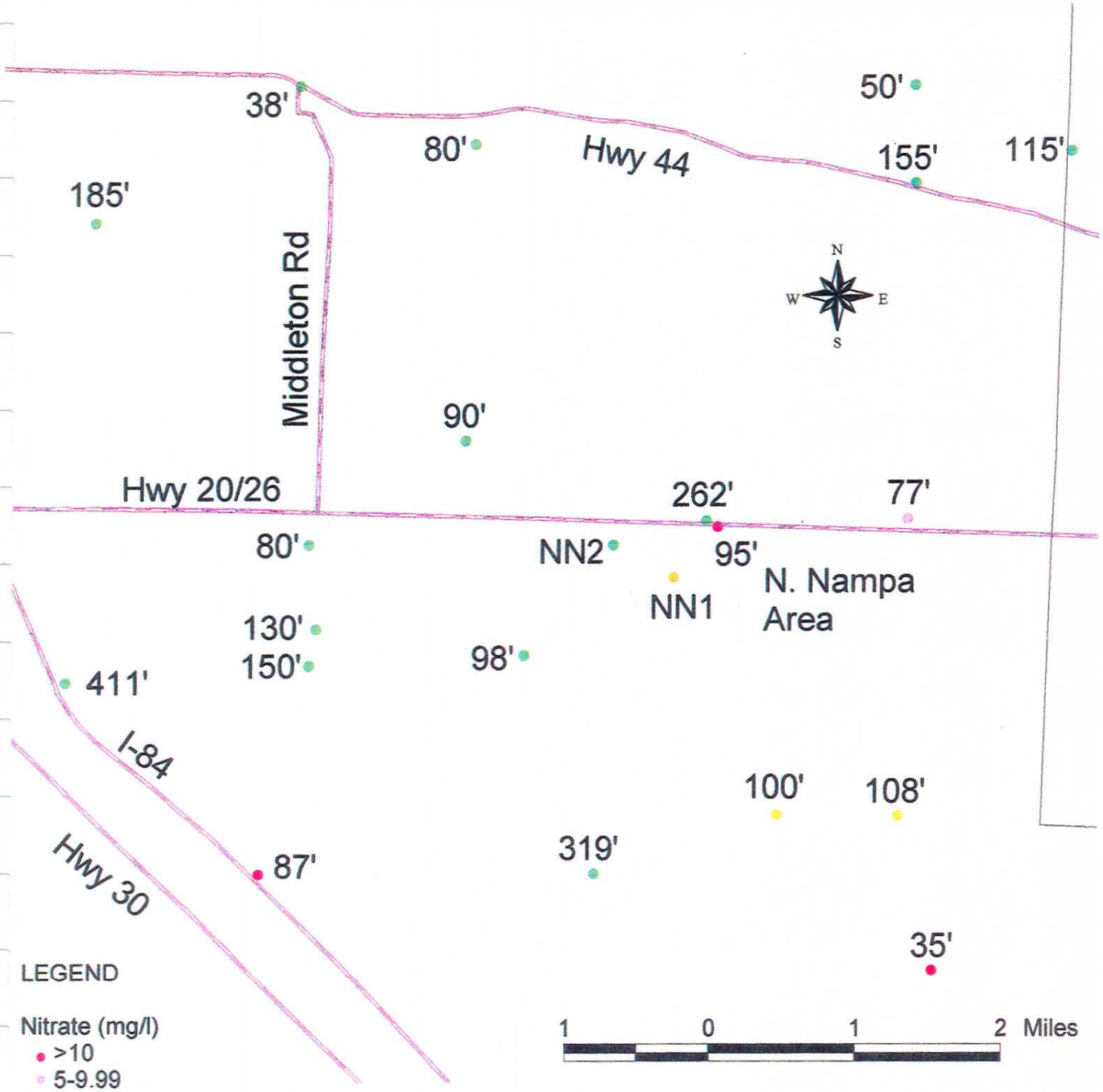


Figure 9. 1998 Follow-up Ground Water Study in N. Nampa Area plus Historic Data

The Statewide Monitoring well had elevated arsenic of 50 ug/l. The well is 55 feet deep with 40 feet of casing. The 18-foot surface seal is composed of well cuttings. The well was drilled in 1976.

Only two well drillers' reports could be found near the Statewide Monitoring well. Only one well owner responded regarding the sampling of his well. His 78-foot well had elevated arsenic of 21 ug/l, which is less than half the concentration found in the Statewide Monitoring well. Arsenic information was mailed to the well owner with his results.

The consistent elevated historic level of arsenic shows that additional sampling will need to be conducted before the cause of the contamination can be determined (see Figure 7 page 13). This appears to be another site along the Snake River that has elevated arsenic levels. The diagram for the area shows elevated arsenic from the Lake Lowell area to Huston (see Figures 5 page 11, 6 page 12, 7 page 13 and 8 page 14). The consistent elevated levels of arsenic in this area will require additional sampling before the cause of the contamination can be determined. Research on the subject alludes to the geology and hydrogeology of the area. Geothermal water along the Snake River has shown elevated arsenic, sulfate, zinc and fluoride levels in the ground water in a reduced environment (Lindholm 1983, Parliman 1983, Wood 1987, and Wood 1988). The elevated arsenic may be a consequence of geothermal water mixing with the cold water system.

West Caldwell

The West Caldwell study area is in Canyon County, about five miles west of Caldwell in Lower Deer Flat area just south of Pipe Gulch. It is in a sparsely populated rural area with some subdividing of homes on just a few acres. The topography is undulating.

The Statewide Monitoring well had elevated arsenic of 120 ug/l, and elevated nitrate of 14 mg/l. The well is 78 feet deep with a 78 feet of casing. The 35-foot surface seal is puddling clay. The well was drilled in 1974 and is used for irrigation purposes.

Five well drillers' reports were found near the Statewide Monitoring well. Only two well owners allowed their wells to be sampled. The wells were 50 and 102 feet deep. The arsenic results were 13 and 31 ug/l and nitrate concentrations were 30 and 14.3 mg/l in the 50 and 102-foot well; respectively. The well owners were mailed information on arsenic and nitrate.

This area needs additional sampling to determine the cause of the elevated nitrate. The elevated arsenic may be naturally occurring. Both constituents need to be address with any additional sampling. The area does not have any obvious potential cause for the nitrate. There is the agricultural land-use that is similar to other areas that do not have elevated nitrate.

Topographically, the area has numerous gulches and drains, in addition to the normal surface water irrigation system. Perhaps this extra water movement allows more movement of nutrients (see Figure 6 page 12).

West Wilder

The West Wilder study area is in Canyon County about a mile west of Wilder. It is in a sparsely populated rural area with some subdividing of homes on just a few acres. The topography is undulating to the terraces overlooking the Snake River.

The Statewide Monitoring well had elevated arsenic of 46 ug/l. The well is 220 feet deep that is cased to 179 feet. The 18-foot surface seal is bentonite. The well was drilled in 1989.

Four well drillers' reports were found near the Statewide Monitoring well. Two of the well owners allowed their wells to be included in the study. Two more wells were added while out in the field, by request of the well owners. A well drillers' report was located for one of the wells, well # WW4. The second well depth was known, since it was a new well, no well drillers' report could be found. Three of the wells had arsenic levels of 37 to 58 ug/l. The fourth well, well # WW2 was <0.01 mg/l for arsenic. Well # WW2 and WW4 were the two wells at the edge of the terrace overlooking the Snake River and were the only wells that had a hydrogen sulfide smell in the water during the sampling. All four wells had low nitrate levels, the highest nitrate level was in well # WW2 which was 2.68 mg/l.

This appears to be another site along the Snake River that has elevated arsenic levels (see Figure 7 page 13). The diagram for the area shows elevated arsenic from the Lake Lowell area to West Wilder (see Figures 5 page 11, 6 page 12, 7 page 13 and 8 page 14). The consistent elevated levels of arsenic in this area will require additional sampling before the cause of the contamination can be determined. Research on the subject alludes to the geology and hydrogeology of the area. Geothermal water along the Snake River has shown elevated arsenic, sulfate, zinc and fluoride levels in the ground water in a reduced environment (Lindholm 1983, Parliman 1983, Wood 1987, and Wood 1988). The elevated arsenic may be a consequence of geothermal water mixing with the cold water system.

ELMORE COUNTY

Mountain Home

The Mountain Home study area is in Elmore County about four miles south of Mountain Home. It is in a sparsely populated rural area of large acreage home sites with some homes on just a few acres. The main crops growing in the area during the sampling was alfalfa, wheat and sugar beets. The land-use is rangeland where crops are not grown. The topography is a flat valley. The well drillers' reports for the area show the geology to have about twenty feet of top soil overlain by basalt. There are visible basalt cobbles and boulders throughout the valley where fields are not used for agriculutural purposes. This study area was a cooperative ground water study with the Idaho State Department of Agriculture (ISDA).

The Statewide Monitoring well is a shallow well (79 feet deep). It is an older well with no well drillers' report available. The well had elevated nitrate of 29 mg/l and low detections of pesticides (atrazine 2 ug/l; cyanazine 0.1 ug/l; deethyatrazine 0.61; and prometon 0.009 ug/l).

Five well drillers' reports were found in the area. The well owner's allowed their wells to be sampled, but only four well drillers' reports matched four of the wells. The well owner of well # MH6 and MH4 requested that their domestic wells be sampled, even though a well driller's report for those wells could not be found. The highest nitrate levels in this study area were found in the shallowest well. However, it may be a localized nitrate problem (see Figure 10 on page 20), the shallow wells are all in close proximity and the deeper wells were located farther away from the shallow wells. A better mix of shallow and deep wells could not be found in this study area.

GEM COUNTY

Black Canyon

The Black Canyon study area is in Gem County. It is located from Plaza Road bridge down stream of the Payette River for approximately two miles. This sparsely populated rural area is within the Payette River floodplain. The area has mainly pastures for livestock and some orchards, only pastures are near the Statewide Program well.

The Statewide Monitoring well in this area had elevated arsenic of 58 ug/l in 1994. The well is 94 feet deep, cased 93 feet with a 18-foot casing. The surface seal is puddling clay. The well was drilled in 1971.

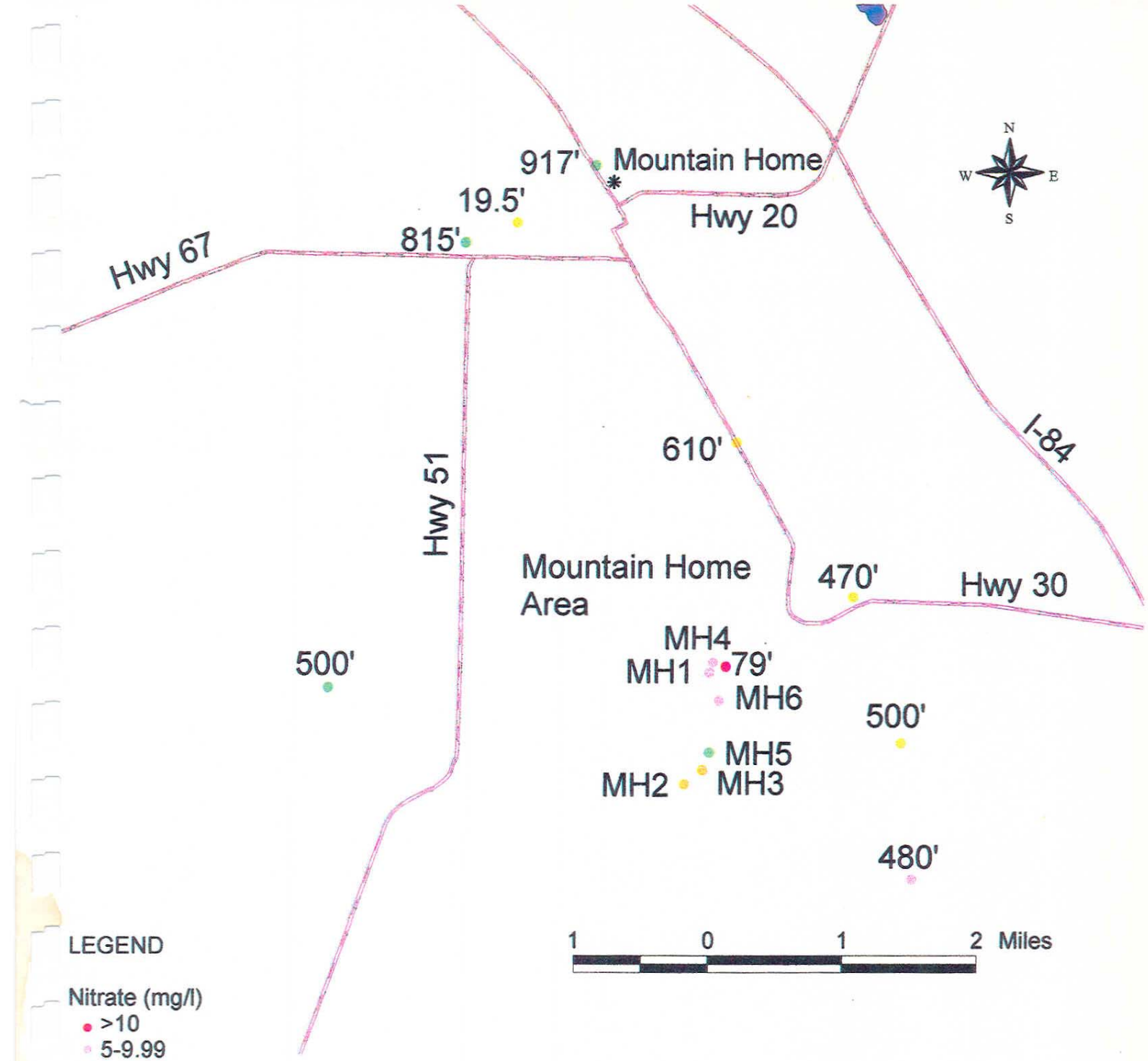


Figure 10. 1998 Follow-up Ground Water Study in the Mountain Home Area plus Historic Data

Only three well drillers' reports could be found on the west side of the Payette River which is where the Statewide Monitoring well is located. None of these well owners responded. Three more well drillers' reports showed wells on the east side of the Payette River. Only one well owner responded and granted permission to sample his well. No arsenic was detected (<10 ug/l) in this well. The process of determining the cause for the elevated arsenic level in the Statewide Monitoring well cannot be made due to the low response from well owners in the study area. Previous ground water sampling at a regional level (>10 square miles) has not indicated arsenic as a regional problem (see Figure 11 page 22).

OWYHEE COUNTY

Bruneau

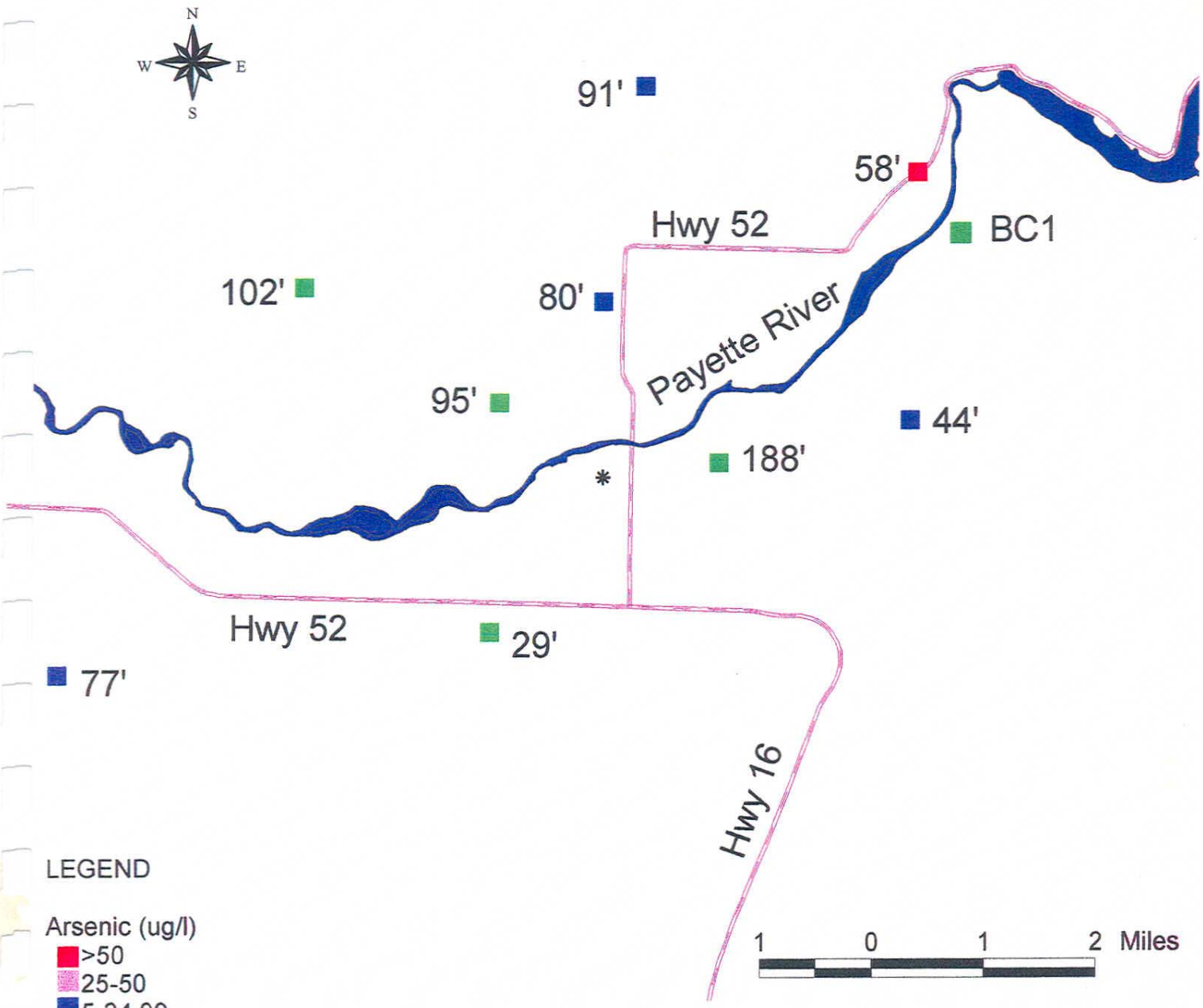
The Bruneau study area is in Owyhee County. It is located near the junction of Highway 78 and Highway 51. This is a sparsely populated rural area within an open range setting. The study sites were approximately a half a mile away and 50 feet higher than the Bruneau River. Basalt outcrops are visible throughout the study area.

The Statewide Monitoring well in this area had elevated nitrate (16.3 mg/l), selenium (170 ug/l) and zinc (5130 ug/l) levels, all of these levels exceed the MCL for those constituents. As mentioned previously, the nitrate regulatory level is 10 mg/l. The regulatory level for selenium is 50 ug/l and 5000 ug/l for zinc. The well was drilled in 1976 to 205 feet deep, but was only cased to 90 feet with a screen section placed from 185 feet to 205 feet. No well casing was installed from 90 to 185 feet, that section is open through the basalt. The water quality impact in this well can be originating anywhere along the open drill hole or the screened section, from 90 feet to 205 feet. Previous ground water sampling at a regional level (>10 square miles) has not indicated that nitrate is a regional problem (see Figure 12 page 23).

Of the three wells with well drillers' reports, two of the well owners participated in the ground water study. Neither of the wells had nitrate, selenium or zinc concentrations in the impacted ranges. One of the wells had slightly elevated arsenic. An arsenic fact sheet was mailed with the results to the well owner. It appears that the Statewide monitoring well has ground water degradation due to the storage of road salting materials near the well. The well is constructed so that the shallower ground water, where contamination is greatest, is providing a significant portion of the water supply.

Homedale

The Homedale study area is in Owyhee County. It is located about three miles south of



LEGEND

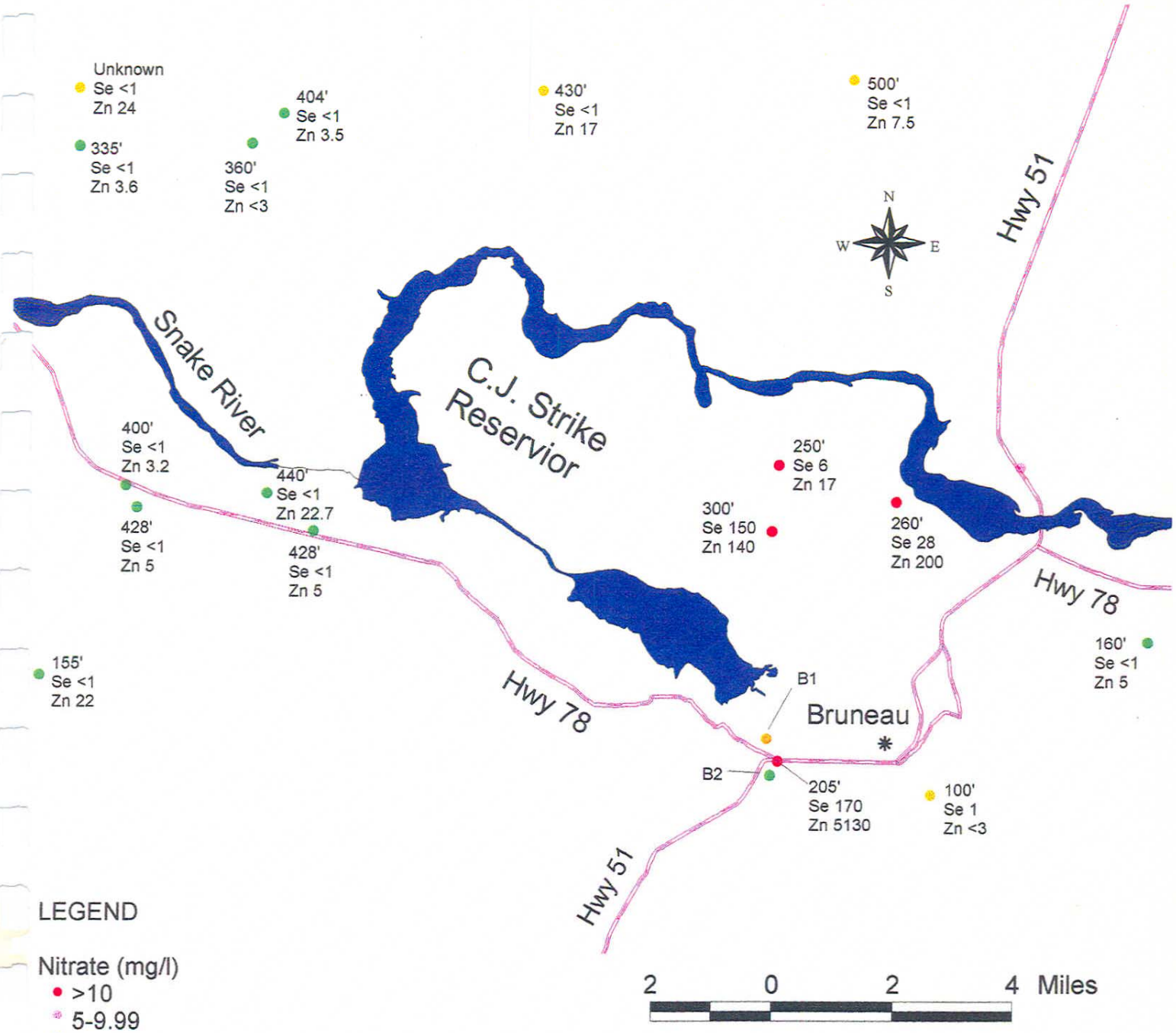
Arsenic (ug/l)
- >50
- 25-50
- 5-24.99
- <5

* Cities

Depths of Wells on Diagram (feet)

Sites sampled during this study have their Well # instead of Well Depth

Figure 11. 1998 Follow-up Ground Water Study in the Black Canyon Area plus Historic Data



LEGEND

Nitrate (mg/l)
- >10
- 5-9.99
- 2-4.99
- <2

* Cities

On Diagram
Well Depth (feet)
Selenium (ug/l)
Zinc (ug/l)

Sites sampled during this study have their Well # instead of Well Depth

Figure 12. 1998 Follow-up Ground Water Study in the Bruneau Area plus Historic Data

Homedale on the west side of Highway 95. This is a sparsely populated rural area. This area has an extensive volcanic geologic history. The land use in the area is primarily agricultural. The most common crops growing during the study were alfalfa and corn.

The Statewide Monitoring well in this area had elevated arsenic of 58 ug/l. The well is 30 feet deep with a 29-foot casing. The 18-foot surface seal is composed of well cuttings. The well was drilled in 1975 and is used to water stock.

Three well drillers' reports were found for wells near the Statewide Monitoring well. Two of the wells owners gave permission to have their wells sampled. After arriving at one of the sites the owner explained that she had two wells on her property with available well drillers' reports, so both wells were sampled, wells # H1 and H2. The depths of the wells varied greatly. Well # H1 was 90 feet deep, well # H2 was 275 feet deep and Well #H3 was 34 feet deep. The arsenic results in the wells were 62, 54 and 105 ug/l, respectively. The nitrate levels in these wells were 12, 6.05 and 1.67 mg/l, respectively. The arsenic and nitrate levels were more elevated in the shallower wells. The arsenic levels, even though it differed with depth, was above the MCL of 50 ug/l in all the wells. The well owners were mailed information on arsenic and nitrate. Figure A8 page 14 shows the water quality for this area.

This appears to be another site along the Snake River that has elevated arsenic levels (see Figure 8 page 14). The diagram for the area shows elevated arsenic from the Lake Lowell area to Homedale (see Figures 5 page 11, 6 page 12, 7 page 13 and 8 page 14). The consistent elevated levels of arsenic in this area will require additional sampling before the cause of the contamination can be determined. Research on the subject alludes to the geology and hydrogeology of the area. Geothermal water along the Snake River has shown elevated arsenic, sulfate, zinc and fluoride levels in the ground water in a reduced environment (Lindholm 1983, Parliman 1983, Wood 1987, and Wood 1988). The elevated arsenic may be a consequence of geothermal water mixing with the cold water system.

Homedale/Adrian

The Homedale/Adrian study area is in Owyhee County. It is located at the Idaho-Oregon state line about four miles west of Homedale on the north side of Highway 19. This is a sparsely populated rural area. This area has an extensive volcanic geologic history. The topography is undulating in this study area. The land use in the area is primarily agricultural. The most common crops growing during the study were alfalfa, wheat and corn.

The Statewide Monitoring well in this area had elevated nitrate of 15 mg/l. The well is 310 feet deep with a 49 feet of casing. The well was drilled in 1990 and has a 18-foot surface seal of puddling clay. With the 49 foot casing and the well drilled to 310 feet the nitrate found in the ground water could be pumped anywhere along the open casing from 49 feet to 310 feet from all the available water bearing zones in this interval.

Four well drillers' reports were found near the Statewide Monitoring well. All four of the well owners' gave permission to sample their wells. One of the well owners informed me that the well drillers' report mailed with the permission letter was not for their well, but that they were interested in having their well sampled. This well, well # HA3, had elevated arsenic at 50 ug/l and nitrate at 3.89 mg/l (well depth unknown). The 80-foot well across from the Statewide well, well # HA4, had elevated nitrate at 16 mg/l and arsenic at 22 ug/l. The other two wells with depths of 255 (well # HA2) and 410 (well # HA1) feet had nitrate at 1.49 and 4.11 mg/l and arsenic at 25 ug/l and non-detect, respectively. The well owners were mailed information on arsenic and nitrate.

The wells with the elevated nitrate are located near old corrals, which were empty at the time of sampling. This may or may not be the cause, but the nitrate appears to be localized (see Figure 8 page 14).

This appears to be another site along the Snake River that has elevated arsenic levels. The diagram for the area shows elevated arsenic from the Lake Lowell area to Homedale (see Figures 5 page 11, 6 page 12, 7 page 13 and 8 page 14). The consistent elevated levels of arsenic in this area will require additional sampling before the cause of the contamination can be determined. Research on the subject alludes to the geology and hydrogeology of the area. Geothermal water along the Snake River has shown elevated arsenic, sulfate, zinc and fluoride levels in the ground water in a reduced environment (Lindholm 1983, Parliman 1983, Wood 1987, and Wood 1988). The elevated arsenic may be a consequence of geothermal water mixing with the cold water system.

South Marsing

The South Marsing study area is in Owyhee County. It is located about five miles south of Marsing on the west side of Owyhee Highway. This is very sparsely populated rural area on the terrace overlooking the Snake River. This area has extensive volcanic geologic history. The topography is undulating in this study area. The land use in the area is primarily range land.

The Statewide Monitoring well in this area has elevated nitrate (38.2 mg/l). The well is 450 feet deep with a 450 feet of casing. The well was drilled in 1975 and has a 50-foot surface seal of puddling clay.

There was no response from any of the few well owners in this sparsely populated area. None of the well owners returned a permission letter to include their well in the study. Consequently, no ground water study was conducted in this area. Figure 5 page 11 shows the historic ground water data for this area.

CONCLUSIONS AND RECOMMENDATIONS

A total of forty-three wells were sampled in fourteen different study areas during the 1998 Follow-up Ground Water Studies. A total of fifteen sites had been selected. No well owners in the South Marsing area returned permission letters for their wells to be sampled, consequently no wells could sampled in that area.

Two of the sites, Black Canyon and South Wilder, only had one well owner that returned a permission letter and allowed their well to be sampled. Neither of the two wells in these two areas exhibited the arsenic or nitrate contamination that had been analyzed in the Statewide Program wells. Due to the low response from the area well owners a possible cause for the contamination could not be determined.

At three sites the results from the Follow-up studies determined that the contamination was only found in the Statewide Program well. These sites were Dry Creek, Bruneau, and North Nampa, all of the Statewide Program wells in these areas had elevated nitrate.

The sampling results from the remaining nine sites showed that the contamination problem is more extensive than just the Statewide Program well. Fifteen of the wells sampled had contamination near or above the levels found in the Statewide Program well.

Twenty-eight of the forty-three wells had contaminant levels that were below the laboratory detection level or half the level found in the Statewide Program well. The remaining fifteen wells had similar concerns that had been evaluated in the Statewide Program wells.

The 1999 Ground Water Follow-up studies need to concentrate on the wells sampled by the Statewide Program with elevated arsenic along the Snake River, and arsenic and nitrate in West Canyon County. A process to get the water quality information to more well owners in the areas and to better delineate the areas of concern needs to be developed, and in addition, continue the necessary follow-up ground water studies by DEQ.

The sites in the Idaho Batholith identified with a fluoride concern by the Statewide Program were included in the 1998 Ground Water Follow-up Studies. The Idaho Batholith ground water has been studied by the Central District Health District and DEQ in 1995 and identified the elevation

of fluoride by geothermal water intrusion in the Crouch/Garden Valley area. The 1998 Ground Water Follow-up Studies showed that the fluoride problem is also found west of Garden Valley and in Horseshoe Bend. A process needs to be developed for getting this information to current well owners and those that are planning to drill a new well in this large area.

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Appendix A

Field Data Sheet

Date_____ Well Id #_____
Time_____ County_____
Sampled by_____ T,R & Sec_____
Well Driller's Log included? Y N 7.5 min. map name_____

Well Owner Information

Well Owner's Name_____
Telephone #_____
Address_____
_____
_____
Well Location if different than address
_____
_____
_____

Well Description

Well Depth_____ Method of Construction_____
Depth of Casing_____ Visual problems with well seal
Size of Casing_____ No Yes - Explain_____
Static Water Level_____ _____
Well pumping upon arrival? Y N
Length of time water ran_____
Immediate surroundings near well_____
_____

Well Use

Public or Private
Use of Water: Domestic Irrigation Stock Industrial Other
Is Water Treated? Y N ; How_____
Was sample taken prior to treatment? Y N
Number of people served by well?_____

Local Land Use

Describe nearby soils (ex. clay, sandy, bedrock outcrops)
_____
Major land uses in 1/2 mile radius_____
_____
If Agriculture, type of crops_____
Last fertilizer application_____
Last pesticide application_____
Irrigated? Y N ; method_____
Source of irrigation water; surface water ground water

Field Water Quality Measurements

Temperature_____
pH_____
Sp. Cond._____
Dissolved Oxygen_____

DEQ-BRO Follow-up to
Ground Water Quality detections

IDWR well tag #_____ Located near GWMTC Site #_____

1/4,1/4,1/4, Section, Township and Range_____

Latitude(hr,min,sec)_____ Longitude(hr,min,sec)_____

Hydrologic Unit Code_____ County_____

7.5 minute topographic map name of location_____

Owner`s Name_____

Address_____

City_____ ZIP_____ Phone_____

Well Construction Information

Depth_____
Date of Construction_____
Water Use_____
Casing Depth_____
Casing Type_____
Casing Diameter_____

Surface Seal Depth_____
Type of Surface Seal_____
Screen Interval_____
Pump Type_____
Well Driller_____
Water Level_____

Contaminants of Concern_____

Local Geology_____

Aquifer Type_____

Immediate Land-use (w/in 1 mile)_____

Demographic Features_____

Geographic Features_____

Reference List of Studies Conducted in the Area (attach a list if necessary)_____

Database Location with Available Information on this Site_____

Evaluation of the Source of the Contaminant_____

_____

Response Provided to the Well Owner_____

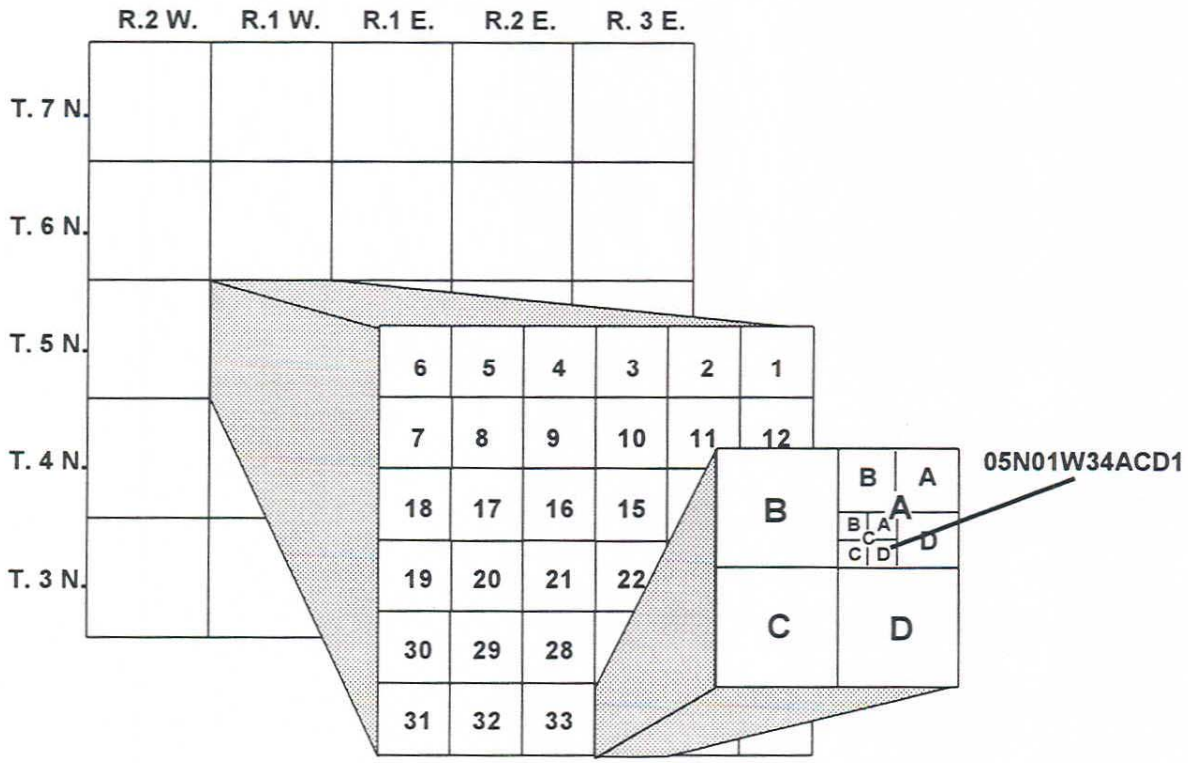
_____

Follow-up Prepared by _____ 10-22-98 C:\DATA\WP61\FOLLOW.UP

Appendix B

B1. Well Numbering System

The well numbering system used for this project is based on the United States Public Land Survey. The locations of the wells are within the official rectangular subdivision of public land, with reference to the Boise Baseline and Meridian. The first two segments of the number designate the township (north or south) and range (east or west). The third segment gives sectional number; four letters, which indicate the 1/4 section (160-acre tract), 1/4-1/4 section (40-acre tract), 1/4-1/4-1/4 section (10-acre tract), and serial number of the well within the tract. Some locations also include a 1/4-1/4-1/4-1/4 section (2 ½-acre tract) letter with in the section number. Quarter sections are designed by the letters A, B, C, and D in counterclockwise order from the northeast quarter of each section. Forty-acre, 10-acre, and 2 ½-acre tracts within each quarter section are lettered in the same manner. Well 05N01W34ACD1 (following figure) is in the SE 1/4, SW 1/4, NE 1/4 of section 34, township 5 north, range 1 west , and was the first well inventoried in that tract (modified from the USGS).



Study Area	Well Location	Well #	Date Sampled	County	Well Depth	Water Use	Water Temp
Black Canyon	07N01W31BAA	BC1	8/27/98	Gem	64	domestic	15.40
Black Canyon	07N01W27BCB1	statewide well	8/11/94	Gem	94	domestic	16.10
Bruneau	06S05E22DDCD	B1	9/29/98	Oywhee	500	business	24.40
Bruneau	06S05E26BBB1	statewide well	8/6/97	Owyhee	205	shop	19.00
Bruneau	06S05E26BBCA-Dup	B2	6/24/98	Owyhee	340	fire prevention	26.30
Bruneau	06S05E26BBCA	B2	6/24/98	Owyhee	340	fire prevention	26.30
Dry Creek	04N01E03ABBB	D4	6/23/98	Ada	74	domestic	14.30
Dry Creek	05N01E34DCBC	D2	6/11/98	Ada	90	domestic	14.40
Dry Creek	05N01E34DBAD	D3	6/11/98	Ada	55	domestic	13.00
Dry Creek	05N01E34DCD1	statewide well	8/6/95	Ada	54	domestic	13.70
Dry Creek	05N01E34DCBB	D1	6/11/98	Ada	70	domestic	13.80
Dry Creek	05N01E34DCAD	D6	7/14/98	Ada	104	domestic	14.20
Dry Creek	05N01E34DADD	D5	7/14/98	Ada	35	domestic	14.20
Garden Valley	08N05E06DDC1	statewide well	7/22/97	Boise	153	domestic	22.20
Garden Valley	08N05E09CBA	GV2	8/26/98	Boise	200	domestic	13.60
Garden Valley	09N05E10CAB	GV1	8/26/98	Boise	60	domestic	10.60
Garden Valley	09N04E26DBB	GV3	8/26/98	Boise	425	domestic	16.70
Homedale	03N05W28BAD1	H2	7/22/98	Owyhee	275	domestic	17.90
Homedale	03N05W28BAD2	H1	7/22/98	Owyhee	90	domestic	15.20
Homedale	03N05W28ABC	H3	6/23/98	Owyhee	34	stock/house	16.20
Homedale	03N05W28ACB1	statewide well	9/13/94	Owyhee	30	stock	15.10
Homedale/Adrian	03N06W01BCB	HA1	6/23/98	Owyhee	410	domestic	20.40
Homedale/Adrian	04N06W35DBC	HA3	6/23/98	Owyhee	unknown	domestic	16.50
Homedale/Adrian	04N06W35DCC1	statewide well	9/12/94	Owyhee	310	domestic/stock	18.20
Homedale/Adrian	03N06W02ABBB	HA4	7/22/98	Owyhee	80	domestic	12.90
Homedale/Adrian	04N06W36BCBB	HA2	7/22/98	Owyhee	255	domestic	17.00
Horseshoe Bend	07N02E23CAC2	HB3	9/23/98	Boise	300	domestic	16.60
Horseshoe Bend	07N02E23BBB	HB2	9/23/98	Boise	270	domestic	16.80
Horseshoe Bend	07N02E23CAC3	HB1	9/23/98	Boise	250	domestic	16.60
Horseshoe Bend	07N02E23CAC1	statewide well	8/15/96	Boise	392	domestic	17.70
Lake Lowell	02N03W06BAB	L2	8/25/98	Canyon	244	domestic	17.10
Lake Lowell	02N03W06CAB	L1	9/24/98	Canyon	190	domestic	19.20
Lake Lowell	02N03W06DBA1	statewide well	8/20/97	Canyon	247	domestic/stock	16.20

pH	Sp Cond	Dissolved O2	Air Temp	Nitrate	Sulfate	Arsenic	Zinc	Fluoride
7.21	265.00	5.03	23.8	1.52		< 10.00		
6.80	331.00			< 0.005	61.000	58.00	11.00	
7.03	1396.00	0.90	17.1	3.33	319.000	28.00	256.00	
7.10	4450.00		35	16.3	2100.000	12.00	5130.00	
8.45	610.00	0.18		< 0.005	48.900	< 10.00	< 5.00	
8.45	610.00	0.18		1.62	48.800	< 10.00	< 5.00	
6.39	652.00	0.22	27.4	< 0.005				
6.86	416.00	0.96	22.5	< 0.005				
6.43	631.00	3.56	17.9	3.32				
7.04	926.00			11	140.000	14.00	< 5.00	
5.58	656.00	0.91	22.5	2.49				
7.02	544.00	0.13	23.6	< 0.005				
7.02	544.00	0.13	26.3	4.06				
8.70	292.00			0.703	20.000	3.00	6.90	7.50
8.61	207.00	4.34	23.3					2.57
6.70	169.00	6.95	24.6					0.13
7.88	249.00	0.98	22.2					5.27
7.09	1710.00	2.15	27.4	6.05	442.000	54.00		
6.91	1938.00	0.66	27.4	12	569.000	62.00		
6.69	1056.00	5.07	30.4	1.67		105.00		
7.40	871.00			2.2	100.000	58.00	6.00	
7.17	2080.00	0.20	28.2	4.11	601.000	< 10.00		
6.41	2040.00	3.89	28.2	3.89	1473.000	50.00		
6.90	2037.00			15	620.000	11.00	560.00	
7.72	937.00	7.38	50	16	441.000	22.00		
7.07	1840.00	5.45	34.5	1.49	272.000	25.00		
9.22	388.00	0.77	15.8					4.19
8.90	730.00	0.25	19.8					14.60
9.45	482.00	0.28	17.2					3.15
9.31	620.00			0.06	86.000	4.00	8.00	11.00
7.56	583.00	8.32	24.1	2.06		39.00		
7.29	878.00	0.47	22.4	0.511		50.00		
7.60	606.00			3.59	110.000	58.00	98.60	

Selenium	Atrazine	TDS	DCPA	Bentazon
< 5.00				
170.00				
< 5.00				
< 5.00				

Probable Cont Cause
contaminants of concern not a problem in this well
unknown, wells in close proximity unavailable for sampling
contaminants of concern not a problem in this well
site specific problem, probably well construction
contaminants of concern not a problem in this well
contaminants of concern not a problem in this well
contaminants of concern not a problem in this well
contaminants of concern not a problem in this well
contaminants of concern not a problem in this well
site specific problem
contaminants of concern not a problem in this well
contaminants of concern not a problem in this well
contaminants of concern not a problem in this well
probably naturally occurring, geothermal water influence
contaminants of concern not a problem in this well
contaminants of concern not a problem in this well
probably naturally occurring, geothermal water influence
probably naturally occurring, additional information necessary
probably naturally occurring, additional information necessary
probably naturally occurring, additional information necessary
probably naturally occurring, additional information necessary
unknown, wide range of nitrate, arsenic and sulfate w/in this study (1 mile area
unknown, wide range of nitrate, arsenic and sulfate w/in this study (1 mile area
unknown, wide range of nitrate, arsenic and sulfate w/in this study (1 mile area
unknown, wide range of nitrate, arsenic and sulfate w/in this study (1 mile area
unknown, wide range of nitrate, arsenic and sulfate w/in this study (1 mile area
probably naturally occurring, geothermal water influence
probably naturally occurring, geothermal water influence
probably naturally occurring, geothermal water influence
probably naturally occurring, geothermal water influence
probably naturally occurring, additional information necessary
probably naturally occurring, additional information necessary
probably naturally occurring, additional information necessary

Study Area	Well Location	Well #	Date Sampled	County	Well Depth	Water Use	Water Temp
Mountain Home	04S06E13AAB2	MH1	7/15/98	Elmore	190	irrigation	14.40
Mountain Home	04S06E13AAA	statewide well	7/15/98	Elmore	79	unused	13.80
Mountain Home	04S06E13DBC	MH2	7/15/98	Elmore	460	domestic	20.30
Mountain Home	04S06E13AAB1	MH4	7/15/98	Elmore	147	domestic	14.00
Mountain Home	04S06E13AAA-Dup	statewide well	7/15/98	Elmore	79	unused	13.80
Mountain Home	04S06E13DAB-2	MH3	7/15/98	Elmore	463	domestic	20.30
Mountain Home	04S06E13DAB	MH3	6/24/98	Elmore	463	domestic	20.00
Mountain Home	04S06E13ADD	MH5	7/15/98	Elmore	475	domestic	19.90
Mountain Home	04S06E13ADA	MH6	7/15/98	Elmore	unknown	domestic	13.30
N. Marsing	03N04W15DCB	NM1	8/6/98	Canyon	120	domestic	16.30
N. Marsing	03N04W15DDA	NM2	8/6/98	Canyon	108	domestic	17.60
N. Marsing	03N04W22AAA1	NM3	8/7/98	Canyon	98	domestic	16.30
N. Marsing	03N04W22AAA2	NM4	8/7/98	Canyon	110	domestic	17.00
N. Marsing	03N04W22AAA2-Dup	NM4	8/7/98	Canyon	110	domestic	17.00
N. Marsing	03N04W15DCB-Dup	NM1	8/6/98	Canyon	120	domestic	16.30
N. Marsing	03N04W15DCC1	statewide well	9/22/93	Canyon	80	domestic	16.20
N. Nampa	04N02W27BDD	NN1	8/18/98	Canyon	101	domestic	13.50
N. Nampa	04N02W27AAB1	statewide well	8/5/97	Canyon	95	domestic	14.60
N. Nampa	04N02W27BBC	NN2	9/24/98	Canyon	100	domestic	13.60
S. Marsing	02N04W26CCD1	statewide well	9/13/93	Owyhee	450	domestic	16.50
S. Wilder	03N05W03ADA1	statewide well	9/20/94	Canyon	55	industrial	15.60
S. Wilder	03N05W03DBB	SW1	8/18/98	Canyon	145	domestic	17.60
W. Caldwell	03N04W03BBB	WC2	8/25/98	Canyon	102	domestic	14.30
W. Caldwell	03N04W03AAD1	statewide well	8/15/95	Canyon	78	irrigation	15.80
W. Caldwell	03N04W03CDD	WC1	8/18/98	Canyon	50	domestic	14.00
W. Caldwell	03N04W03CDD-Dup	WC1	8/18/98	Canyon	50	domestic	14.00
W. Wilder	04N05W21AAD	WW1	8/25/98	Canyon	210	domestic	16.80
W. Wilder	04N05W21AAB2	statewide well	8/11/97	Canyon	220	domestic	17.70
W. Wilder	04N05W21DAA	WW2	7/21/98	Canyon	200	domestic	17.00
W. Wilder	04N05W21AABA	WW3	7/21/98	Canyon	187	domestic	16.90
W. Wilder	04N05W21DBB	WW4	7/21/98	Canyon	255	domestic	18.70

pH	Sp Cond	Dissolved O2	Air Temp	Nitrate	Sulfate	Arsenic	Zinc	Fluoride
7.73	1042.00	10.80		9.2	170.000			
7.48	1996.00	7.60		40	577.000			
8.18	617.00	9.50		3.33	58.700			
7.68	1065.00	11.20		8.07	191.000			
7.48	1996.00	7.60		34.5	563.000			
8.29	338.00	8.42	30.4	1.51	31.000			
7.90	353.00	9.48	30.4	0.013	33.200			
8.14	340.00	10.31	32.3	1.46	30.700			
7.60	707.00	9.39	36.4	7.64	85.000			
7.52	744.00	5.92	34.5	6.01		30.00		
7.59	518.00	7.17	30.3	1.17		68.00		
7.26	823.00	6.59	30.9	4.97		21.00		
7.39	756.00	1.78	34.4	1.98		21.00		
7.39	756.00	1.78	34.4	2		21.00		
7.52	744.00	5.92	34.5	5.9		29.00		
7.60	710.00			2.4	97.000	85.00	36.00	
7.10	559.00	8.43	27.9	2.7				
7.10	895.00			17.2	98.000	< 10.00	< 5.00	
7.15	298.00	5.07	19.1	1.05				
7.10	2950.00			39	720.000	41.00	190.00	
7.58	763.00					50.00		
7.56	796.00	0.17	21.9	< 0.005		21.00		
7.62	643.00	7.35	31.6	14.3		31.00		
7.56	690.00			14	47.000	120.00	35.00	
7.64	809.00	7.50	30	30.1		13.00		
7.64	809.00	7.50	30	30		12.00		
7.34	390.00	7.61	21.9	2.05		70.00		
7.70	358.00			1.69	25.000	46.00	68.90	
7.38	999.00	5.97	34.5	2.68		37.00		
7.79	462.00	7.90	25.3	1.2		58.00		
7.71	608.00	0.23	29.7	< 0.005		< 10.00		

Selenium	Atrazine	TDS	DCPA	Bentazon
	< 0.013	512.00	< 0.008	< 0.010
	0.570	982.00	< 0.008	< 0.010
	< 0.013	304.00	< 0.008	0.460
	< 0.013	524.00	< 0.008	< 0.010
	0.390	982.00	< 0.008	< 0.010
	< 0.013		< 0.008	< 0.010
	< 0.013		0.023	< 0.010
	0.032		< 0.008	< 0.010

Probable Cont Cause
elevated nitrate levels in the shallow water bearing zone
elevated nitrate levels in the shallow water bearing zone
contaminants of concern not a problem in this well
elevated nitrate levels in the shallow water bearing zone
elevated nitrate levels in the shallow water bearing zone
contaminants of concern not a problem in this well
contaminants of concern not a problem in this well
contaminants of concern not a problem in this well
elevated nitrate levels in the shallow water bearing zone
contaminants of concern not a problem in this well
probably naturally occurring, additional information necessary
contaminants of concern not a problem in this well
contaminants of concern not a problem in this well
contaminants of concern not a problem in this well
contaminants of concern not a problem in this well
probably naturally occurring, additional information necessary
contaminants of concern not a problem in this well
site specific problem
contaminants of concern not a problem in this well
unknown, no response from well owners in order to conduct study
unknown, no response from well owners close by - no problem w/ well sample
contaminants of concern not a problem in this well
unknown, high levels of nitrate throughout the study area
unknown, high levels of nitrate and arsenic
unknown, high levels of nitrate throughout the study area
unknown, high levels of nitrate throughout the study area
probably naturally occurring, additional information necessary
probably naturally occurring, additional information necessary
probably naturally occurring, additional information necessary
probably naturally occurring, additional information necessary
contaminants of concern not a problem in this well

B3. Units of Measure for Table B2

Table Field	Units
Well Location	Township, Range and Section 1/4, 1/4, 1/4
Well Depth	Feet Below Ground Surface
Water Temp	Water Temperature in °C
pH	Standard Units (SU)
Sp Cond	Specific Conductance in microsiemens per centimeter (ug/l)
Air Temp	Air Temperature in °C
Sulfate	Milligrams per Liter (mg/l)
Arsenic	Micrograms per Liter (ug/l)
Zinc	ug/l
Fluoride	mg/l
Selenium	ug/l
Atrazine	ug/l
TDS	Total Dissolved Solids in mg/l
DCPA	Dacthal in ug/l
Bentzon	ug/l

Regulated Primary Constituents discussed in this Report

Constituent	Maximum Contaminant Level (MCL)
Nitrate	10 mg/l
Arsenic	50 ug/l
Fluoride	4 mg/l
Selenium	50 ug/l
Atrazine	3 ug/l

Regulated Secondary Constituents discussed in this Report

Constituent	MCL
pH	6.5 - 8.5 SU
Sulfate	250 mg/l
Zinc	5000 ug/l
TDS	500 mg/l

Table B4. Sampling Parameters

Parameter	EPA Method	Container	Preservation	Holding Time
Total NO2 + NO3 as N	353.2	Plastic, 1 liter	2 ml/l conc. H2SO4, cool, 4°C	28 days
Fluoride	300.0	Plastic, 1 liter	cool, 4°C	28 days
Sulfate as SO4	300.0	Plastic, 1 liter	cool, 4°C	28 days
Arsenic, dissolved	200.9	Plastic, 1 liter	3 ml/l conc. HNO3, cool, 4°C	6 months
Selenium, dissolved	200.9	Plastic, 1 liter	3 ml/l conc. HNO3, cool, 4°C	6 months
Zinc, dissolved	200.7	Plastic, 1 liter	3 ml/l conc. HNO3, cool, 4°C	28 days
VOC	8021	Amber Glass, 40 ml	cool, 4°C	28 days

Table B5. Quality Assurance of Sample Analyses

Parameter	Matrix	EPA Method	Detection Limit (mg/l)	Accuracy	Precision	Completeness
Total NO2 + NO3 as N	water	353.2	0.005	80-120%	+/-15%	95%
Fluoride	water	300.0	0.1	80-120%	+/-15%	95%
Sulfate as SO4	water	300.0	2	80-120%	+/-15%	95%
Arsenic, dissolved	water	200.9	0.01	80-120%	+/-15%	95%
Selenium, dissolved	water	200.9	0.005	80-120%	+/-15%	95%
Zinc, dissolved	water	200.7	0.002	80-120%	+/-15%	95%
VOC	water	8021	0.21 ug/l	80-120%	+/-15%	95%

Table B6. Project Organization and Responsibilities

Project Personnel	Responsibility
Sampling Supervisor **Linda Boyle**	Responsibility for supplying and directing field sampling team. Tracks sample custody and results of analyses.
QA/QC Officer **Linda Boyle**	Ensures that specified quality control procedures are maintained. Will evaluate documentation and data for possible QA problems.
Analytical Services Representative **Wally Baker and Barry Pharaoh**	Oversees all analytical chemists involved in the project.
Data Management Representative **Linda Boyle**	Responsible for data entry, storage, and presentation.

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