SOURCE WATER DELINEATION AND ASSESSMENT REPORT

11/99

Draft

Savage School
Public Water System
Richland County, Montana

PWSID # MT0001542

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INTRODUCTION

This report is intended to meet the technical requirements for the completion of the Source Water Delineation and Assessment for the Savage School Public Water Supply System (PWSID# 01542) as required by the Montana Source Water Protection Program and the federal Safe Drinking Water Act (SDWA). The Source Water Delineation and Assessment Report (SWDAR) for the Savage School was completed by Karen LaClair and Chad Walby, MSU undergraduate students, and Dr. Steve Custer Associate Professor of Geology, MSU - Bozeman. Text related to the School's new well comes from Jim Stimson of the Source Water Protection staff at the Department of Environmental Quality (DEQ). Information on the old and new wells and public water supply comes from published sources, individuals familiar with the public water supply, and a sanitary survey completed in April of 2001 by HDR Engineering, Inc of Missoula, Montana (available from DEQ upon request).

The Montana Source Water Protection Program is intended to be a practical and cost-effective approach to protecting public drinking water supplies from contamination. A major component of the Montana Source Water Protection Program is termed delineation and assessment. The emphasis of this delineation and assessment report is to identify significant potential contaminant threats to public drinking water sources and provide the information needed to develop a source water protection plan for Savage School.

Delineation is a process whereby areas that contribute water to aquifers or surface waters used for drinking water, called source water protection areas, are identified on a map. Geologic and hydrologic conditions are evaluated in order to delineate source water protection areas. Assessment involves identifying locations or regions in source water protection areas where contaminants may be generated, stored, or transported and then determining the potential for contamination of drinking water by these sources.

Delineation and assessment is the foundation of source water protection plans, the mechanism Savage School can use to protect their drinking water source. Although voluntary, source water protection plans are the ultimate focus of source water delineation and assessment. This delineation and assessment report is written to encourage and facilitate the Savage School water operator and the community to complete a source water protection plan that meets their specific needs.

CHAPTER 1
BACKGROUND

The Community

Savage School is considered a non-community non-transient public water supply system because it regularly serves at least 25 of the same persons for more than six but less than twelve months per year. The school is located in Savage, Montana. Savage is an unincorporated town in Richland County with a population of 284 (NRIS, 2001). The town is 20 miles south-southwest of Sidney and 30 miles northeast of Glendive on MT 16 (Appendix A, Figure 1). The legal location of the school is NW ¼, SW ¼, SW ¼, NW ¼, Section 33, Township 20N, Range 58E (Appendix A, Figure 2).

The population of Richland County was estimated at 9,667 according to the Montana Census 2000 and 9,343 according to the Federal Census 2001. Agriculture, Wholesale and Retail trade and Service Industries form the economic base in Richland County. Mining, Construction Manufacturing, Transportation and Public Utilities, and Finance, Insurance, and Real Estate are important components of the economic environment as well (USDC, 1996). The largest industries reported by the census in 2000 were services, 21.1 percent of earnings; state and local government, 13.1 percent; and transportation and public utilities, 11.5 percent (USDC, 2000).

Savage is served by a sanitary sewer system. Sanitary wastes gravity feed to a 3-acre, one-cell, clay-lined lagoon approximately 1/2 mile NE of the Savage School (Appendix A, Figures 3 & 4). Wastes deposit directly into the lagoon with no prior treatment. The system is permitted to discharge wastewater into the Yellowstone River by way of an irrigation ditch. The lagoon's capacity meets current standards for the population served. Before completion of the community sewer wastewater collection and treatment system in the 1950's each structure in Savage was served by an on-site septic system. Information about the sanitary sewer system was obtained from Kelly Logan, the Richland County sanitarian.

Geographic Setting

Richland County is in the southern reach of the Glaciated Missouri Plateau physiographic province (Zelt, et al., 1999). This province is within the Interior Plains physiographic division of the Northwestern Great Plains. The Northwestern Great Plains region is semiarid and described as rolling plains of shale and sandstone composition punctuated by occasional buttes. The Interior Plains division varies from gently rolling plains to sharply dissected badlands (CERNITT, 1999; Zelt, et al., 1999). Richland County is in the southwestern part of the Williston Basin and the Glaciated Central groundwater region (Zelt, et al., 1999). Elevation ranges from 2,900 feet on the divide between the Yellowstone and Redwater River drainages and 1,800 feet on the flood plain of the Yellowstone (USDA, 1980). Elevation in Savage is approximately 1,980 feet.

The Yellowstone River runs north-northeast, less than a mile from Savage (Appendix A, Figure 2). Burns Creek drains the area southwest of Savage and enters the Yellowstone approximately 7.8 miles upstream. Smith Creek drains the area southeast of Savage and enters the Yellowstone opposite of Savage (Appendix A, Figure 7). Savage is in the Lower Yellowstone Watershed (designated hydrologic unit code 10100004).

The average high and low temperatures in the Savage vicinity are 23.9° F and 2.5° F in January and 87.4 °F and 57.0 °F in July. The climate is semi-arid with precipitation averaging 11 - 15 inches annually concentrated in the months of May and July. Snowfall averages 37 inches annually. Climate data was averaged over the period of 1961 to 1990 and was taken from the Savage weather station summary (USDA, NRCS, NWCC)

Soil underlying the Savage School is classified as Farnuf loam. Small areas of Savage, Shambo, and Turner soils are included in the mapping unit. Farnuf loam is nearly level with slopes of 0 to 2% and is found on fans and terraces. Run-off is slow and the erosion hazard is slight. This soil type has moderate to severe limitations due to very dry conditions or a short growing season. The soil is well-drained and deep. It can support wheat, barley, oats, corn for silage, hay, alfalfa, dry beans, and sugar beets crops or use as pasture. The Farnuf loam is present in a small area and is surrounded closely by the Havrelon silt loam, 0 – 1% slope, Harelon silt clay loam, 0 – 2%, Shambo loam, 0 – 2%, and Shambo loam 2 – 4% soils (USDA, 1980). Recent alluvium of the Yellowstone River underlies the Farnuf loam (Ross, et al., 1955).

General Source Water Description

The Savage School PWS is supplied by groundwater. The aquifer is the Yellowstone River Quaternary alluvium. The Yellowstone alluvium is characterized by sediment derived from materials in upland and upstream areas from which it was formed. The groundwater flow direction is generally northeast parallel to the flow of the Yellowstone River (Zelt, et al., 1999). Recharge to the aquifer is expected to be mainly from loss of river water to the alluvium. Small amounts of recharge may come from the underlying Tertiary Sedimentary aquifer, but the magnitude of transmission (transmissivity) relative to that within the alluvium is expected to be quite small. The School's replacement well obtains water from the same aquifer as the old abandoned well. No changes to the description of the source water are necessary and only minor adjustments to the inventory and susceptibility analysis were needed.

Aquifer characteristics are used to assess the overall sensitivity of the aquifer to potential contamination. According to the Montana Source Water Protection criteria, an aquifer consisting of unconsolidated alluvium that is unconfined is rated as highly sensitive to potential sources of contamination. Semi-consolidated and consolidated bedrock aquifers are considered to have a low sensitivity to potential contamination (Montana DEQ, 2000, Table 2). The Yellowstone alluvium is unconsolidated and unconfined and therefore has a high sensitivity to potential contamination.

Public Water Supply

The Savage School PWS is supplied by one well (source 002). The well serves approximately 165 individuals in winter through one active service connection and is occasionally used during the summer. Total daily water demand in the winter is approximately 4125 gallons. This number was arrived at by multiplying the number served by 25 gallons per day per person, the average daily demand estimated by the EPA for a day school with cafeteria, gymnasium, and showers (1991).

Prior to the installation of the new well, the most recent sanitary survey on file at the DEQ indicated the School's water was obtained from a well located in the basement of the school building (see Appendix B for site plan diagrams showing the old well). The sanitary survey states that the old well was hand dug to a depth of 13 feet and has no casing. The well log on file at the Montana Bureau of Mines and Geology Ground Water Information Center states that the well extends to a depth of 29 feet, has a 6-inch steel casing from 0 to 29 feet, a bentonite seal from 0 to 24 feet, and is perforated from 24 to 29 feet below ground surface (see Appendix C for well log). Water is forced through a sodium hypochlorite feed system, then to a polyphosphate chemical feed system. A piping loop provides detention time for the sequestering agent (polyphosphate) before delivery to a 40 – 60 psi vertical pressure tank, then upstairs to service throughout the school. A complete copy of the sanitary survey is in Appendix D.

Due to the fact that the old well's construction did not meet current standards for a public water supply well, a new well was completed on October 09, 2003. The new well is located just south of the school building and west of the gymnasium. The north arrow on the site plan appears to be incorrect and points east (note corrected arrow hand-drawn on the page). This well is completed to a depth of 35 feet below the ground surface with 6 inch steel casing. Stainless steel screens are set from 30 to 35 feet below the ground surface and are 5 inches in diameter. A bentonite seal is in place around the casing from 0 to 25 feet below the surface. Water comes from a gravel and sand unit that is listed a approximately 6 feet thick running from 29 to 35 feet below the surface. The well log for the new well is in Appendix C and the new site plan and schematic showing the location of the well and distribution system are located in Appendix B. Water treatment for the water appears to be unchanged.

Water Quality

The Savage School PWS is routinely monitored for compliance with drinking water standards. Bacteriological monitoring occurs monthly. Compliance with other drinking water standards is based on additional sampling on a variety of schedules depending on system classification and population served. Nitrate can come from human or animal wastes but also occurs naturally. The highest level of nitrate-nitrogen detected in the Savage School well in the last five years was 2.3 mg/l. The U.S. Environmental Protection Agency standard for maximum allowable nitrates is 10 mg/l. The Savage School PWS has tested free of bacteria for the last five years (DEQ, BAC-T).

There is no water quality data available for the Yellowstone River alluvium in the Savage vicinity. Water quality is available for the Yellowstone River at Sidney through the USGS National Stream Water Quality Network, station # 06329500. Water from flood-plain alluvium is a calcium bicarbonate type in general with a dissolved-solids concentration of less than 250 mg/L.

Detailed water quality data are available from the DEQ Source Water Protection Program, upon request.

CHAPTER 2
DELINEATION

All source water protection areas for the Savage School well were delineated as required for non-community, non-transient public water supplies under the Montana Source Water Protection Program (DEQ, 1999). A 100-foot radius control zone was delineated for the Savage School (Appendix A, Figures 5 and 6). The control zone is the most critical area within which direct introduction of contaminants into the well or immediate area can occur. An inventory region using a 1-mile fixed radius was delineated for the school well (Appendix A, Figure 4). The Inventory Region encompasses the area from which water or contaminants can flow to the well over a period of months to years. The recharge region (Appendix A, Figure 7) was delineated using hydrogeologic mapping. This region encompasses the area contributing recharge water to groundwater that may flow to a drinking water supply over long time periods or under a higher pumping rate.

Hydrogeologic Conditions

Land surface elevation decreases towards the Yellowstone River from the east and west (Appendix A, Figure 2). Groundwater flow direction in the Savage vicinity is generally north-northeast following the flow of the Yellowstone River (Zelt, et al., 1999).

There are five aquifers in the Savage area. Wells closer to the Yellowstone River appear to be completed in unconsolidated Quaternary alluvium or terrace deposits. These shallow unconfined aquifers are composed of silt, sand, and gravel deposits. Wells installed farther away from the river are completed in deeper aquifers of the Tertiary Fort Union formation, the upper Cretaceous Hell Creek formation, and the Colgate sandstone member of the Fox Hills formation. General and detailed geologic maps of the Savage area are in Appendix A, Figures 8 and 9.

Savage is in the southwestern portion of the Williston basin, on the northeastern flank of the Cedar Creek anticline, which plunges to the northwest. Strata underneath Savage dip shallowly to the Northeast (Zelt, et al., 1999). Note that the dip is parallel to the Yellowstone River. A structure contour map of basement rock in the Yellowstone River basin is in Appendix A, Figure 10.

Three members of the Fort Union formation outcrop in the area surrounding Savage. The uppermost member is the Sentinel Butte member. The Sentinel Butte member is completely eroded at Savage, but small outcrops can be found to the east. The Tongue River member underlies the Sentinel Butte and outcrops to the southwest of Savage. The Tongue River member overlies the Ludlow member. Given the position of the contact between these two members on the area geology map, it is likely that the Tongue River member below Savage is also eroded. The Ludlow member is between 230 and 500 feet thick (Vuke & Colton, 1998).

Units beneath the Fort Union formation include, in order of increasing depth, the Hell Creek formation (260-330 ft thick) and the Fox Hills formation (148-233 ft thick) (Vuke & Colton, 1998). Area wells completed in the Hell Creek and Fox Hills formations are very deep. According to well logs, wells are finished at depths approaching and rarely exceeding 1,000 feet (MBMG, GWIC).

Reports from projects in the Savage area may provide additional information on hydrogeologic conditions. A list of projects is provided in Table 1. Geologic and Hydrogeologic maps available for the area are listed in Table 2.

Table 1. Geologic or hydrogeologic investigations near the Savage area.

Title of Project	Period of Project	Area Covered	Project Purpose
Impacts of oil field wastes on soil and ground water in Richland County, Montana wastes	1991	Richland County, Montana	To assess impacts of oil field wastes on soil and ground water
Preliminary report of coal drill-hole data and chemical analyses of coal beds in Campbell, Converse and Sheridan counties, Wyoming, and Big Horn, Dawson and Richland counties, Montana	1976	Campbell, Converse and Sheridan counties, Wyoming, and Big Horn, Dawson and Richland counties, Montana	Chemical analyses of coal beds
Geochemistry of water in aquifers and confining units of the Northern Great Plains in parts of Montana, North Dakota, South Dakota, and Wyoming	1995	Northern Great Plains in parts of Montana, North Dakota, South Dakota, and Wyoming	To characterize the geochemistry of water in five aquifers and two confining units in the Williston Basin and contrast it with the geochemistry of water outside the basin
Buried drainage systems in glaciated Montana east of the Rocky Mountains	1984	Glaciated Montana east of the Rocky Mountains	Groundwater potential and glacial deposit analysis.

A 1-mile radius inventory region is delineated for the Savage School well as it is installed in the unconfined Yellowstone River alluvium (Appendix A, Figure 4). The mapping included in this report was done for the old abandoned well located in the School's basement. The new well appears to be between 50 and 100 feet south of the old well. Because the new well is located close to the school and the old location, the delineation regions (control zone and inventory region) are essentially the same as for the old well so the mapping and inventory of potential contaminant sources completed for the old well location also apply to the new well. It will be important for the School to formally abandon and seal the basement well. If this is not done, the basement well could act as a conduit for contaminants to enter the aquifer. Because the Yellowstone River alluvium is classified as an unconsolidated aquifer the source water sensitivity to potential contamination is considered high.

Conceptual Model and Assumptions

There are five aquifers in the Savage area. They include Quaternary alluvial deposits, Quaternary terrace deposits, Tertiary Fort Union formation, the lower part of the upper Cretaceous Hell Creek formation, and the Upper Cretaceous Colgate sandstone member of the Fox Hills formation (MBMG, GWIC). The latter two units, the Hell Creek and Fox Hills formation are referred to as the Fox Hills/Hell Creek aquifer, as the lower sandstone body of the Hell Creek lies directly on the Colgate sandstone of the Fox Hills, creating an interlayer aquifer. General and detailed geologic maps of the Savage area are in Appendix A, Figures 8 and 9.

Table 2. Geologic or hydrogeologic maps available for the Savage area.

Title or Description	Date	Area Covered	Reference
Ground-water resources of the Lower Yellowstone River Area: Dawson, Fallon, Prairie, Richland, and Wibaux Counties, Montana	1999	Lower Yellowstone River Area: Dawson, Fallon, Prairie, Richland, and Wibaux Counties, Montana	Smith, L.N., et al., 1999
Potentiometric surface map for the deep hydrologic unit, Lower Yellowstone River Area: Montana	1998	Lower Yellowstone River Area: Montana	LaFave, J.I., 1998
Potentiometric surface map for the shallow hydrologic Unit, Lower Yellowstone River Area: Dawson, Fallon, Prairie, Richland, and Wibaux Counties, Montana	1998	Lower Yellowstone River Area: Dawson, Fallon, Prairie, Richland, and Wibaux Counties, Montana	Patton, T.W., Rose, J.C., LaFave, J.I., Smith, L.N., 1998
Geologic map of the Glendive 30' x 60' quadrangle, eastern, Montana and adjacent North Dakota	1998	Glendive 30' x 60' quadrangle	Vuke, S.M., Colton R.B., 1998
Bibliography of geologic mapping for the Glendive 1° x 2° quadrangle, eastern Montana	1984	Glendive 1° x 2° quadrangle	Sholes, B.C., 1984
Geologic Map of Montana	1955	State of Montana	Ross, et.al., 1955

Wells drilled into Quaternary alluvium in the Savage area typically consist of 10 to 20 feet of clay followed by 20 to 50 feet of sand and/or gravel. Quaternary alluvium (Qal) is found adjacent to the Yellowstone River and Smith Creek. It is generally 20 feet or less, but can be up to 40 feet thick (Vuke & Colton, 1998).

Quaternary terrace (Qat) deposits near Savage are limited to small areas surrounding alluvial deposits (Appendix A, Figure 9). Savage lies directly over terrace deposits. These deposits are generally 10 to 30 feet thick (Vuke & Colton, 1998). A review of GWIC well logs indicates two wells in the area are known to be finished in terrace deposits. Water quality is available for GWIC well #140643. Quality is generally good. A lithologic record is available for GWIC well #34244. The record reports 16 feet of sandy clay, 4 feet of gravel and sand, and 2 feet of gray shale (MBMG, GWIC).

The relationship between the Quaternary alluvium and surrounding deposits (Quaternary terrace, Tertiary Fort Union) is unknown, as there are no studies documenting ground-water movement between the units. Quaternary terrace and alluvium are expected to be in hydraulic connectivity. Since the terrace deposits are small, spatially adjacent to the alluvium, and likely connected. For purposes of inventory and recharge delineation they can be considered one unit. The ground-water interaction between the Fort Union formation and Quaternary alluvium is also unknown. Little recharge to the Quaternary alluvium is expected from the Fort Union formation due to the low transmissivity in the Fort Union relative to that in the alluvium. Recharge to the Yellowstone River alluvium most likely comes from river water loss to the aquifer.

It is uncertain whether the well is drilled into terrace deposits or alluvium based on the depth of the well (13 ft.) and the thickness of terrace deposits (10-30). Since little recharge is likely from underlying formations, primary recharge to the Savage PWS comes from surface recharge and groundwater recharge. Sources of groundwater recharge are percolation of surface water from the up-gradient direction, primarily from the west, northwest, and southwest, and water loss from Peabody Coulee to the north and Garden Coulee to the south (Appendix A,

Figure 3).

A 1-mile radius inventory region is delineated for the Savage School well as it is installed in the unconfined Yellowstone River alluvium (Appendix A, Figure 4).

Well Information

As of October 2003, the Savage school public water supply is provided by a new well (source ID not known) located on the south side of the Savage School building (Appendix B). The well log for this well is included in Appendix C. Table 3 summarizes information for the new well, the Schoool's old well, and the shop well that is not used to provide drinking water.

Table 3. Source well information for Savage School

Information	New Well Completed October 9, 2003	Old Well in the School's Basement	Shop Well Well #2
PWS Source Code	???	002	NA
MBMG #	NA	NA	48402
Water Right #	NA	NA	NA
Legal Location (T, R, Sec.)	20N 58E 33 BCCB	20N 58E 33 BCCB	20N 58E 33 BCCB
Latitude/Longitude	47.4504 / 104.3424	47.4497 / 104.3422	47.4506 / 104.3417
Date Completed	10/09/2003	Unknown	1993
Well Depth	35'	13'	29'
Perforated Interval	30 – 35'	NA	24 – 29'
Static Water Level Depth	20'	Unknown	15'
Pumping Water Level Depth	Unknown	Unknown	20'
Drawdown	Unknown	Unknown	5'
Test Pumping Rate	60'	Unknown	15 gpm
Specific Capacity	-	Unknown	3 gpm/ft
Source Type	Terrace/Alluvium	Terrace/Alluvium	Alluvium

Limiting Factors

The inventory zone was delineated with a fixed radius instead of using time-of-travel calculations. This was due to lack of available information and limits the usefulness of the delineation as it is not based on hydrogeologic factors.

CHAPTER 3
INVENTORY

The Montana Source Water Protection Program (DEQ, 1999) requires that land uses and all potential contaminant sources be identified within the control zone and inventory region of non-transient non-community public water supplies. Inventory of potential sources of contamination was conducted for Savage School within the control and inventory regions (Appendix A, Figures 4 and 6). Potential sources of known primary drinking water contaminants and Cryptosporidium were identified, however, only significant potential contaminant sources were selected for detailed inventory. The significant potential contaminants in the Savage School inventory region are nitrate, pathogens, fuels, solvents, and agricultural chemicals.

The inventory for Savage School focuses on all activities in the control zone, certain sites or land use activities in the inventory region, and general land uses and large facilities in the recharge region.

Inventory Method

Available databases were initially searched to identify businesses and land uses that are potential sources of regulated contaminants in the inventory region. The following steps were followed:

Step 1: Urban and agricultural land uses were identified from the U.S. Geological Survey's Geographic Information Retrieval and Analysis System (http://nris.state.mt.us/gis/datalist.html). Sewered and unsewered residential land uses were identified from boundaries of sewer coverage obtained from municipal wastewater utilities.

Step 2: EPA's Envirofacts System (http://www.epa.gov/enviro/) was queried to identify EPA regulated facilities located in the Inventory Region. This system accesses facilities listed in the following databases: Resource Conservation and Recovery Information System (RCRIS), Biennial Reporting System (BRS), Toxic Release Inventory (TRI), and Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS). The available reports were browsed for facility information including the Handler/Facility Classification to be used in assessing whether a facility should be classified as a significant potential contaminant source.

Step 3: The Permit Compliance System (PCS) was queried using Envirofacts (http://www.epa.gov/enviro/) to identify Concentrated Animal Feeding Operations with MPDES permits. The water system operator or other local official familiar with the area included in the inventory region identified animal feeding operations that are not required to obtain a permit.

Step 4: Databases were queried to identify the following in the inventory region: Underground Storage Tanks (UST) (http://webdev.deq.state.mt.us/UST/), hazardous waste contaminated sites (DEQ hazardous waste site cleanup bureau), landfills (http://nris.state.mt.us/gis/datalist.html), abandoned mines (http://nris.state.mt.us/gis/datalist.html) and active mines including gravel pits. Any information on past releases and present compliance status was noted.

Step 5: The Select Phone business directory was queried to identify businesses that generate, use, or store chemicals in the inventory region. Equipment manufacturing and/or repair facilities, printing or photographic shops, dry cleaners, farm chemical suppliers, and wholesale fuel suppliers were targeted by SIC code.

Step 6: Major road and rail transportation routes were identified throughout the inventory region (http://nris.state.mt.us/gis/datalist.html).

Step 7: All land uses and facilities that generate, store, or use large quantities of hazardous materials were identified within the recharge region and located on a base map.

Step 8: All wells within the inventory region were identified and well logs were reviewed when available.

Step 9: The 1929 Sanborn Insurance Co. fire maps were reviewed to identify historic sources of potential contaminants.

Potential contaminant sources are designated as significant if they fall into one of the following categories:

1) Large quantity hazardous waste generators.
2) Landfills.
3) Underground storage tanks.
4) Known groundwater contamination (including open or closed hazardous waste sites, state or federal superfund sites, and UST leak sites).
5) Underground injection wells.
6) Major roads or rail transportation routes.
7) Cultivated cropland greater than 20 % of the inventory region.
8) Animal feeding operations.
9) Wastewater treatment facilities, sludge handling sites, or land application areas.
10) Septic systems.
11) Sewer mains.
12) Storm sewer outflows.
13) Abandoned or active mines.

Inventory Results/Control Zone

The school district owns all land within the 100-foot control zone. The school is on a large piece of property at the edge of town surrounded to the north, northeast, and west by city streets and residential houses and to the south and southeast by county roads and open land that is likely agricultural fields. The area within the control zone is designated as 25% shrubland, 25% grassland/herbaceous, 25% deciduous forest, and 25% commercial/industrial/transportation according to the USGS National Land Cover dataset (Appendix A, Figure 11). Currently, there is no information to indicate that there are significant potential contaminants used within the control zone. However, the school should consider restricting the use of fertilizers, pesticides, and herbicides near the well and should not wash sprayers or clean equipment near the well.

Inventory Results/Inventory Region

Land cover information for the Savage School inventory region (Appendix A, Figure 11) was summarized from the National Landcover Dataset, Montana (USGS, 2000). Land cover within the 1-mile Savage Inventory Zone includes 30% small grains, 13% open water, 12% deciduous forest and fallow, 11% pasture/hay, 6% grassland/herbaceous, 4% woody wetlands, 3% low intensity residential, commercial/industrial/transportation, shrubland, and evergreen forest, 1% row crops, and less than 1% mixed forest (Appendix A, Figure 12). Agricultural land is considered a significant potential contaminant source and at 66% is given a high hazard rating.

The most significant potential source of contamination in the inventory region is an underground storage tank

1/4 of a mile west of the school well and sanitary sewer mains located 1/10 of a mile to the north and west of the school well. The landfill, sewage lagoon, and fertilizer plant are down gradient from the well. A map of sewer mains is in Appendix F. Other significant potential contaminant sources are summarized in Table 4. Several historic potential sources of contaminants were identified from the Sanborn fire maps. They are mapped in Figure 5 of Appendix A.

Table 4. Significant potential contaminant sources for Savage School.

Source	Contaminants	Description
UST	VOCs, SOCs, inorganics	Contaminants leaching to groundwater
Highway	All	Contaminants leaching to groundwater
Railway	All	Contaminants leaching to groundwater
Cultivated cropland	Pathogens, nitrates, agchemicals	Nitrates, pathogens, and agchemicals leaching to groundwater
Inactive Landfill	VOCs, SOCs, inorganics, nitrates	Contaminants leaching to groundwater
Municipal Sewage Lagoon	Pathogens and Nitrates	Nitrates and pathogens leaching to groundwater
Sanitary Sewer Mains	Pathogens and Nitrates	Nitrates and pathogens leaching to groundwater

Inventory Results/Recharge Region

Land cover within the Savage School recharge region (Appendix A, Figure 13) includes 28% grassland/herbaceous, 19% small grains, 12% open water, 10% deciduous forest, 8% fallow, 7% pasture/hay, 5% shrubland, 3% row crops and evergreen forests, 1% commercial/industrial/transportation, and less than 1% each low intensity residential, mixed forest, and bare rock/sand/clay (Appendix A, Figure 14). No other potential contaminant sources additional to those identified in the inventory zone are known to exist in the recharge region.

The Savage Lignite Mine an extensive coal producing surface mine located 4-1/4 miles west-northwest of the Savage School well, but outside of the recharge region. An interstate oil pipeline runs south-southwest to north-northwest at a distance of 2-1/4 miles to the northwest of the Savage School well outside the inventory zone and recharge region. Several underground storage tanks exist in the Savage area at unmapped locations. LUSTs are listed in Table 5 and USTs in Table 6. A search of the Select Phone database yielded several businesses that are potential sources for contaminants. These are listed in Table 7. The exact locations of these businesses are unknown. A plot of lat/long coordinates places them differently than indicated by the minimal address information available.

Table 5. Leaking underground storage tanks of unknown locations in the Savage area

City	Site Name	Location	AltEvent ID	Date	Confirmed Release Date	Project Officer	Active
Savage	CENEX LTD - FERTILIZER DEPT.	Address Unknown	4209706*2229	19-May-94	19-May-94		No
Savage	Savage Mine	Rural Location	4202225*4008	04-Jan-01	04-Jan-01	William Hammer	Yes
Savage	SAVAGE SERVICE CENTER	MAIN STREET	4213233*2019	04-Dec-93	04-Dec-93		No

Table 6. Underground storage tanks of unknown locations in the Savage area

AltFacilityID	Facility Name	Street Address	City	County	Active Tanks	Nonactive Tanks
42-04748	1 Mile East Of Savage	Box 195	Savage	Richland		1
42-04736	1/4 Mile East Of Hwy 16	Box 99	Savage	Richland		2
42-04525	Badtreys Inc	Hwy 16 S	Savage	Richland		2
42-09706	Cenex Ltd - Fertilizer Dept.	Address Unknown	Savage	Richland		1
42-01502	Conradsen Bros	Rte 2	Savage	Richland		2
42-06512	Conradsen Bros Inc	Rr 2 Box 214	Savage	Richland		4
42-02583	Damm, Arthur	Rr 2 Box 271	Savage	Richland		3
42-06771	Dardis, Wayne	Address Unknown	Savage	Richland		2
42-10575	Dks Farms Inc	Box 124	Savage	Richland		2
42-05906	Edam, Dale	Rt 2 Box 172	Savage	Richland		1
42-04524	Etzel, Robert	Box 152	Savage	Richland		2
42-05314	Gear, John	330 4Th Box 125	Savage	Richland		1
42-03360	Howard E Norgard	Sec 30B R57E T20N	Savage	Richland		1
42-08530	Jorgensen, Harold	Rt 2 Box 81	Savage	Richland		1
42-10524	L Schmierer Farms Inc	1 Mile S	Savage	Richland		1
42-05674	Ler Farms Inc	Rt 2 Box 192	Savage	Richland		1
42-03814	Ler, Vera	498 Montana	Savage	Richland		1
42-08579	Lower Yellowstone Irrig. Project	E Of Savage	Savage	Richland		1
42-01499	Madsen, Elver L.	100 Feet S Of Main Street	Savage	Richland		2
42-02445	Nelson, Keith	Rt 2 Box 27	Savage	Richland		2
42-02943	Nelson, Larry R	Rr 2 Box 39	Savage	Richland		2
42-07466	Nollmeyer Farms	Rt 2 Box 105	Savage	Richland		1
42-05878	Pasture Creek Cattle Co.	Rt 2 Box 306	Savage	Richland		1
42-13233	Savage Service Center	Main Street	Savage	Richland		3
42-03366	Seeve, Craig R	Rr 2 Box 222	Savage	Richland		1
42-03773	Tombre Inc	Box 288	Savage	Richland		3
42-02026	Tp Ranch	12-21-56	Savage	Richland		4
42-01878	Triple H Farms	3.5 miles NE of Richland	Savage	Richland		2

Table 7. Select Phone results

Facility	Address				Phone	Latitude	Longitude
Craig's Meat Processing	Highway 16	Savage	MT	59262	406-776-2447	47.529180	-104.65434
Farmer's Union Oil Co	E Of Savage	Savage	MT	59262	406-776-2489	47.529180	-104.65434
Knife River Coal Mining Co	PO Box 30	Savage	MT	59262-0030	406-798-3651	47.529180	-104.65434
Valley Fuel & Supply	Highway 16 S	Savage	MT	59262	406-776-2354	47.529180	-104.65434
Valley Garage	299 Main	Savage	MT	59262	406-776-2237	47.453400	-104.34270

Inventory Update

The certified operator will update the inventory for his or her records every year. Changes in land uses or potential contaminant sources will be noted and additions made as needed. The complete inventory will be submitted to DEQ every five years to ensure re-certification of the source water delineation and assessment report.

Inventory Limitations

The potential sources of contamination for the Savage School have been identified using readily available data and reports. Unregulated activities or unreported contaminant releases may have been missed. The use of multiple sources of data, however, should ensure that the major potential contaminant threats to the Savage School are known.

CHAPTER 4
SUSCEPTIBILITY ASSESSMENT

Susceptibility is the potential for a public water supply to draw water contaminated by inventoried sources at concentrations that would pose concern. Susceptibility is assessed in order to prioritize potential pollutant sources for management actions by local entities, in this case Savage School.

The goal of Source Water Management is to protect the source water by 1) controlling activities in the control zone, 2) managing significant potential contaminant sources in the Inventory Region, and 3) ensuring that land use activities in the Recharge Region pose minimal threat to the source water. Management priorities in the Inventory Region are determined by ranking the significant potential contaminant sources identified in the previous chapter according to susceptibility. Alternative management approaches that could be pursued by the Savage School to reduce susceptibility are recommended.

Susceptibility is determined by considering the hazard rating for each potential contaminant source and the existence of barriers (Table 7) that decrease the likelihood that contaminated water will flow to Savage School well(s). Hazard for confined aquifers is low if all wells in the inventory region are constructed to current state standards. Hazard is high if the PWS well is not sealed into the confining layer and moderate if only other wells are not properly constructed.

Table 8. Relative susceptibility to contaminant sources as determined by hazard and the presence of barriers.

Presence Of Barriers	Hazard High	 Moderate	 Low
No Barriers	Very High Susceptibility	High Susceptibility	Moderate Susceptibility
One Barrier	High Susceptibility	Moderate Susceptibility	Low Susceptibility
Multiple Barriers	Moderate Susceptibility	Low Susceptibility	Very Low Susceptibility

Susceptibility ratings are presented in Table 8 for each significant potential contaminant source and each associated contaminant. The overall susceptibility of the Savage School well is high because the Yellowstone River alluvium is classified as an unconsolidated aquifer. Additionally, there is no well log available for the Savage School PWS and the sanitary survey states that the well casing is not properly sealed and drilled to a depth of 13 feet. Other wells in the vicinity also lack annular seal records (MBMG, GWIC). Savage school should consider drilling a new well that complies with current standards for construction and completion.

Table 9. Susceptibility assessment for significant potential contaminant sources in the Inventory Region**.**

Source	Contaminant	Hazard	Hazard Rating	Barriers	Susceptibility	Management
Sanitary Sewer Mains	Nitrates and pathogens	Nitrates and bacteriological agents leaching to groundwater from ruptured pipes	High	None	Very High	Monitor mains for leaks and replace & repair as needed
Cultivated cropland	Nitrates, pathogens, agchemicals	Nitrates, pathogens, & agchemicals leaching to groundwater from spills, over application, and run-off	Moderate	None	High	Use best management practices & apply agchemicals according to labels
Highways	All	Spill threat	Moderate	-About ¼ mile up-gradient and relatively low truck traffic volume	Moderate	Develop an emergency response plan
UST	VOC's, SOC's, inorganics	Contaminants leaching to groundwater from spills or leaks	High	-About ¼ mile up-gradient -As of Dec 1999, USTs had to be replaced with ones that met new standards. If replaced the new tank and monitoring can be used as a barrier	Moderate	Remove leaking tank, remediate site, monitor groundwater for contaminants
Railways	All	Spill threat	Low	-About ¼ mile down-gradient*	Low	Develop an emergency response plan
Inactive Landfill	All	Contaminants leaching to groundwater from ruptured liner	High	-About 1 mile down-gradient*	Low	Monitor groundwater for contaminants
Municipal Sewer Lagoon	Nitrates and pathogens	Nitrates and bacteriological agents leaching to groundwater from ruptured liner	High	- About 1 mile down-gradient - Clay Liner Down Flow	Low	Monitor lining for tares and groundwater to assess impact
All contamination sources	Management Recommendations: Savage school should consider drilling a new well that complies with current standards for construction and completion.					

* A down gradient location is given the same weight as multiple barriers in lowering the susceptibility rating.

CHAPTER 5
MONITORING WAIVERS

Waiver Recommendation
Savage School does not appear to have any monitoring waivers. Because of the vulnerability of the shallow aquifer and the high to very high susceptibility to several potential contaminant sources in the area, the Source Water Protection Program does not advise applying for water quality waivers. Water quality monitoring will serve, as an early warning system for the School should source water quality change in the future. However, if the School elects to apply for any waiver, the PWS Operators are encouraged to carefully review the following section on Monitoring Waiver Requirements for confined aquifers. If after reviewing this section it is determined that an additional waivers are feasible, the School should submit a letter with the proper documentation to DEQ requesting monitoring waivers.

Table 10. Susceptibility Assessment – Is not included in this report.

Monitoring Waiver Requirements
The 1986 Amendments to the Safe Drinking Water Act require that community and non-community PWSs sample drinking water sources for the presence of volatile organic chemicals (VOCs) and synthetic organic chemicals (SOCs). The US EPA has authorized states to issue monitoring waivers for the organic chemicals to systems that have completed an approved waiver application and review process. All PWSs in the State of Montana are eligible for consideration of monitoring waivers for several organic chemicals. The chemicals diquat, endothall, glyphosate, dioxins, ethylene dibromide (EDB), dibromochloropropane (DBCP), and polychlorinated biphenyls are excluded from monitoring requirements by statewide waivers.

Use Waivers
A Use Waiver can be allowed if through a vulnerability assessment, it is determined that specific organic chemicals were not used, manufactured, or stored in the area of a water source (or source area). If certain organic chemicals have been used, or if the use is unknown, the system would be determined to be vulnerable to organic chemical contamination and ineligible for a Use Waiver for those particular contaminants.

Susceptibility Waivers
If a Use Waiver is not granted, a system may still be eligible for a Susceptibility Waiver, if through a vulnerability assessment it is demonstrated that the water source would not be susceptible to contamination. Susceptibility is based on prior analytical or vulnerability assessment results, environmental persistence, and transport of the contaminants, natural protection of the source, wellhead protection program efforts, and the level of susceptibility indicators (such as nitrate and coliform bacteria). The vulnerability assessment of a surface water source must consider the watershed area above the source, or a minimum fixed radius of 1.5 miles upgradient of the surface water intake. PWSs developed in unconfined aquifers should use a minimum fixed radius of 1.0 mile as an area of investigation for the use of organic chemicals. Vulnerability assessment of spring water sources should use a minimum fixed radius of 1.0 mile as an area of investigation for the use of organic chemicals. Shallow groundwater sources under the direct influence of surface water (GWUDISW) should use the same area of investigation as surface water systems; that is, the watershed area above the source, or a minimum fixed radius of 1.5 miles upgradient of the point of diversion. The purpose of the vulnerability assessment procedures outlined in this section is to determine which of the organic chemical contaminants are in the area of investigation.

Given the wide range of landforms, land uses, and the diversity of groundwater and surface water sources across the state, additional information is often required during the review of a waiver application. Additional information may include will logs, pump test data, or water quality monitoring data from surrounding public water systems; delineation of zones of influence and contribution to a well; Time-of-Travel or attenuation studies; vulnerability mapping; and the use of computerized groundwater flow and transport models. DEQ's PWS Section and DEQ's Source Water Protection Program will conduct review of an organic chemical monitoring waiver application. Other state agencies may be asked for assistance.

Susceptibility Waiver for Confined Aquifers

Confined groundwater is isolated from overlying material by relatively impermeable geologic formations. A confined aquifer is subject to pressures higher than atmospheric pressure that would exist at the top of the aquifer if the aquifer were not geologically confined. A well that is drilled through the impervious layer into a confined aquifer will enable the water to rise in the borehole to a level that is proportional to the water pressure (hydrostatic head) that exists at the top of a confined aquifer.

The susceptibility of a confined aquifer relates to the probability of an introduced contaminant to travel from the source of contamination to the aquifer. Susceptibility of an aquifer to contamination will be influenced by the hydrogeologic characteristics of the soil, vadose zone (the unsaturated geologic materials between the ground surface and the aquifer), and confining layers. Important hydrogeologic controls include the thickness of the soil, the depth of the aquifer, the permeability of the soil and vadose zones, the thickness and uniformity of low permeability and confining layers between the surface and the aquifer, and hydrostatic head of the aquifer. These factors will control how readily a contaminant will infiltrate and percolate toward the groundwater.

The Susceptibility waiver has the objective of assessing the potential of contaminants reaching the groundwater used by the PWS. A groundwater source that appears to be confined from surface infiltration in the immediate area of the wellhead may eventually be affected by contaminated groundwater flow from elsewhere in the recharge area. Contaminants could also enter the confined aquifer through improper well construction or abandonment where the well provides a hydraulic connection from the surface to the confined aquifer. The extent of confinement of an aquifer is critical to limiting susceptibility to organic chemical contamination. Regional conditions that define the confinement of a groundwater source must be demonstrated by the PWS in order to be considered for a confined aquifer susceptibility waiver. Confinement of an aquifer can be demonstrated by pump test data (storage coefficient), geologic mapping, and well logs. Site-specific information is required to sufficiently represent the recharge area of the aquifer and the zone of contribution to the PWS well. The following information should be provided:

- Abandoned wells in the region (zone of contribution to the well),
- Other wells in the region (zone of contribution to the well),
- Nitrate/Coliform bacteria analytical history of the PWS well,
- Organic chemical analytical history of the PWS well,

Susceptibility Waiver for Unconfined Aquifers

Unconfined aquifers are the most common source of usable groundwater. Unconfined aquifers differ from confined aquifers in that the groundwater is not regionally contained within relatively impervious geologic strata. As a result, the upper groundwater surface or water table in an unconfined aquifer is not under pressure that produces hydrostatic head common to confined aquifers.

Unconfined aquifers are usually locally recharged from surface water or precipitation. In general, groundwater flow gradients in unconfined aquifers reflect surface topography, and the residence time of water in the aquifer is comparatively shorter than for water in confined aquifers. Similar water chemistry often exists between unconfined groundwater and area surface water, and physical parameters and dissolved constituents can be an indicator of the hydraulic connection between groundwater and surface water. Consequently, unconfined aquifers can be susceptible to contamination by organic chemicals migrating from the ground surface to groundwater.

The objective of the susceptibility waiver application is to assess the potential of organic chemical migration from the surface to the unconfined aquifer. The general procedures make use of a combination of site-specific information pertaining to the location and construction of the source development, monitoring history of the source, geologic characteristics of the unsaturated soil and vadose zones, and chemical characteristics of the organic chemicals pertaining to their mobility and persistence in the environment. The zone of contribution of the unconfined groundwater source must be defined and plotted. This should describe the groundwater flow directions, gradients, and a 3-year time-of-travel. All surface bodies within 1,000 feet of the PWS well(s) must be plotted. Analytical monitoring history of the PWS well and those nearby should be provided as well.

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APPENDICES

APPENDIX A

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APPENDIX C

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APPENDIX E

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APPENDIX F

HAZARDS AND BARRIERS WORKSHEETS

APPENDIX A: FIGURES

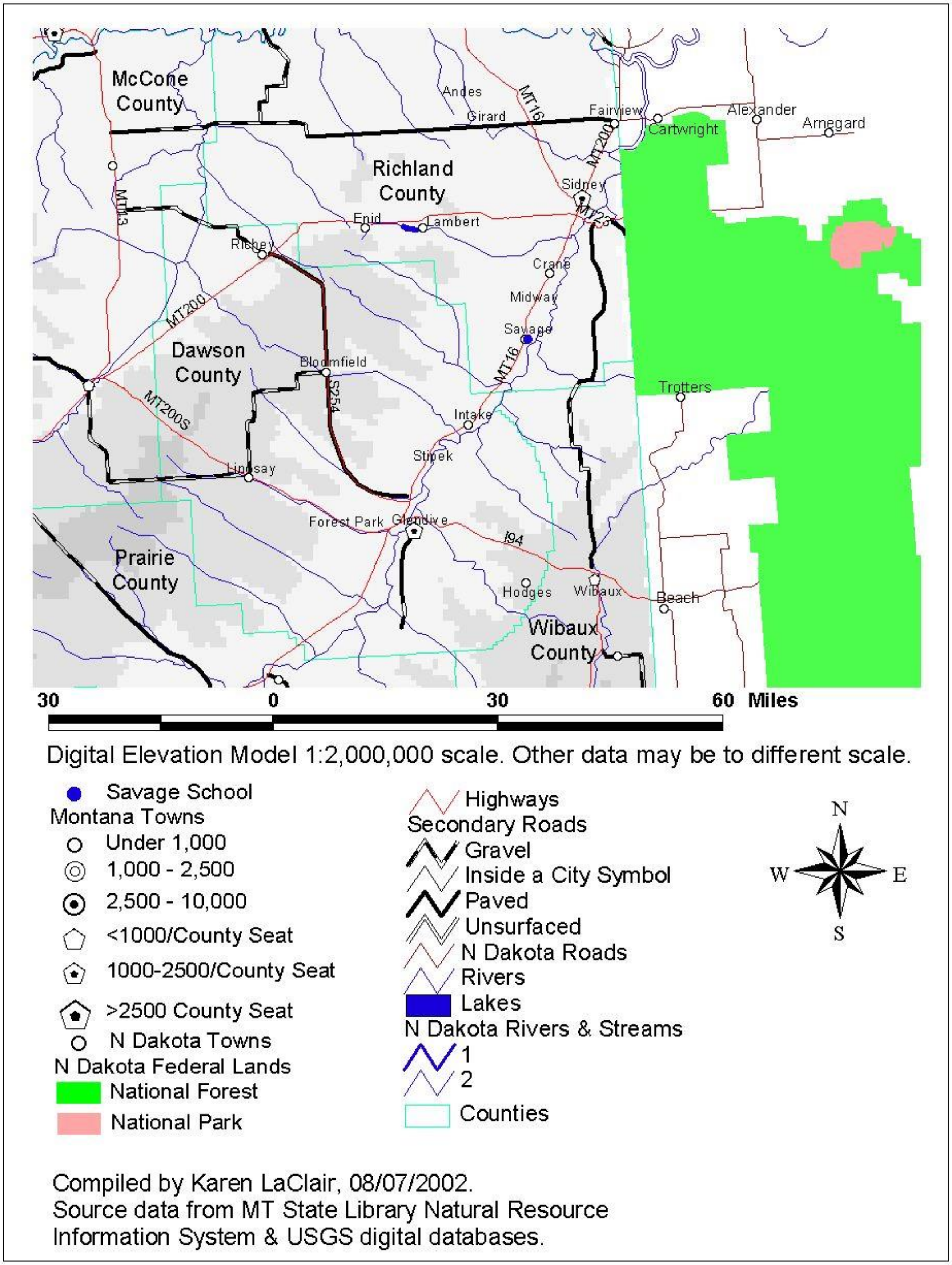


Figure 1. Savage vicinity map

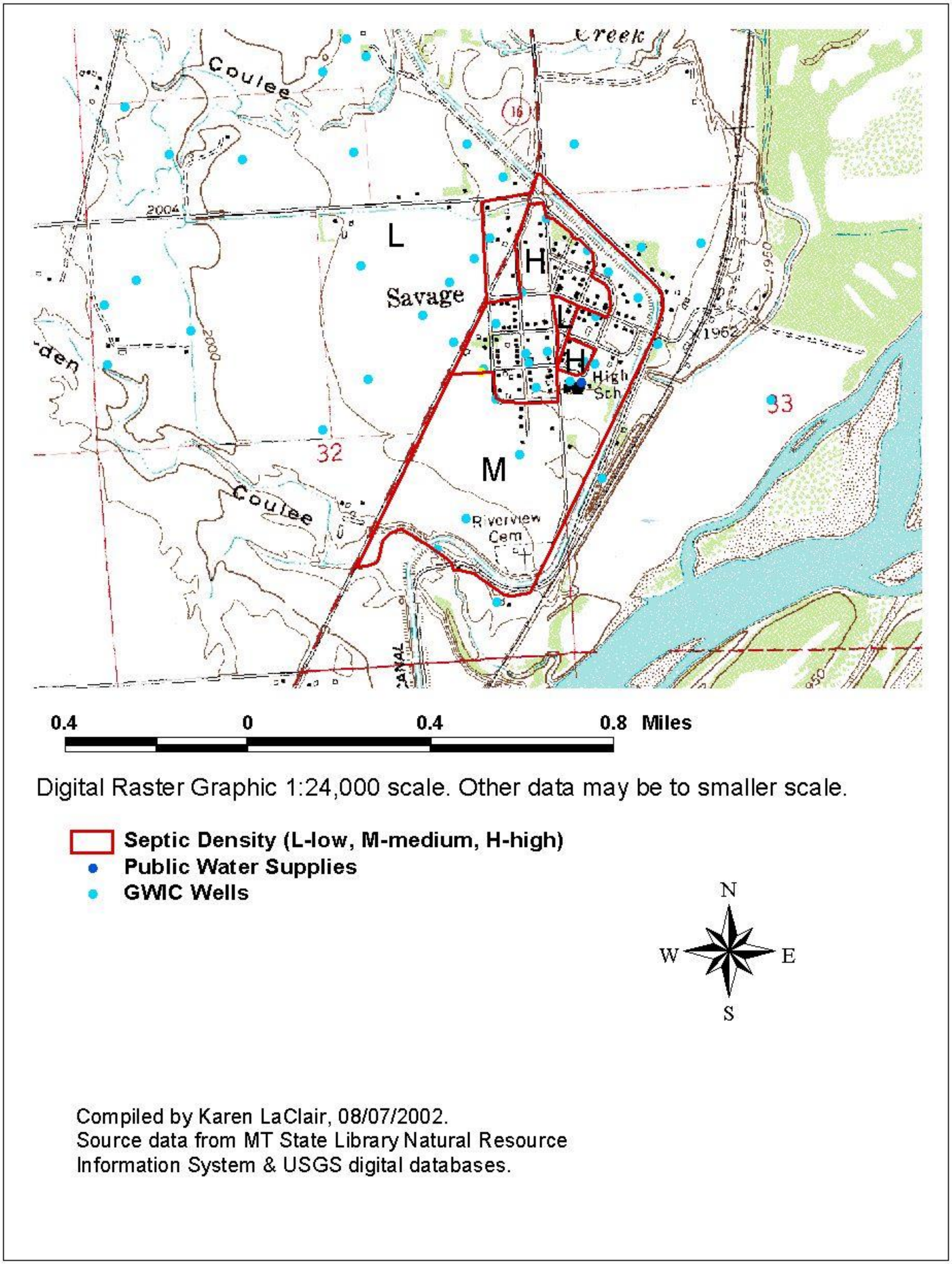


Figure 2. Private and public wells and septic density in the Savage vicinity

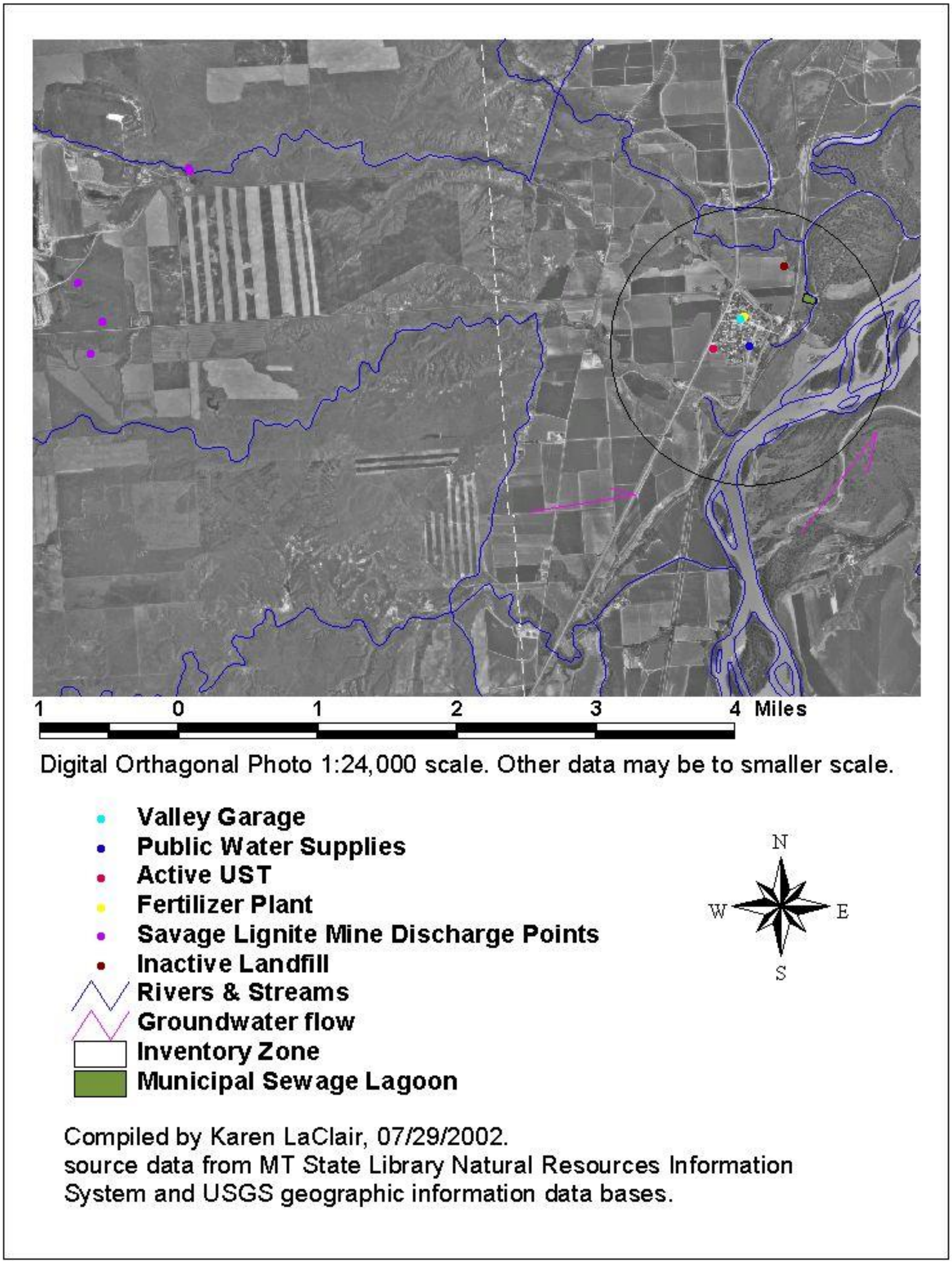


Figure 3. Potential contaminant sources in the Savage vicinity

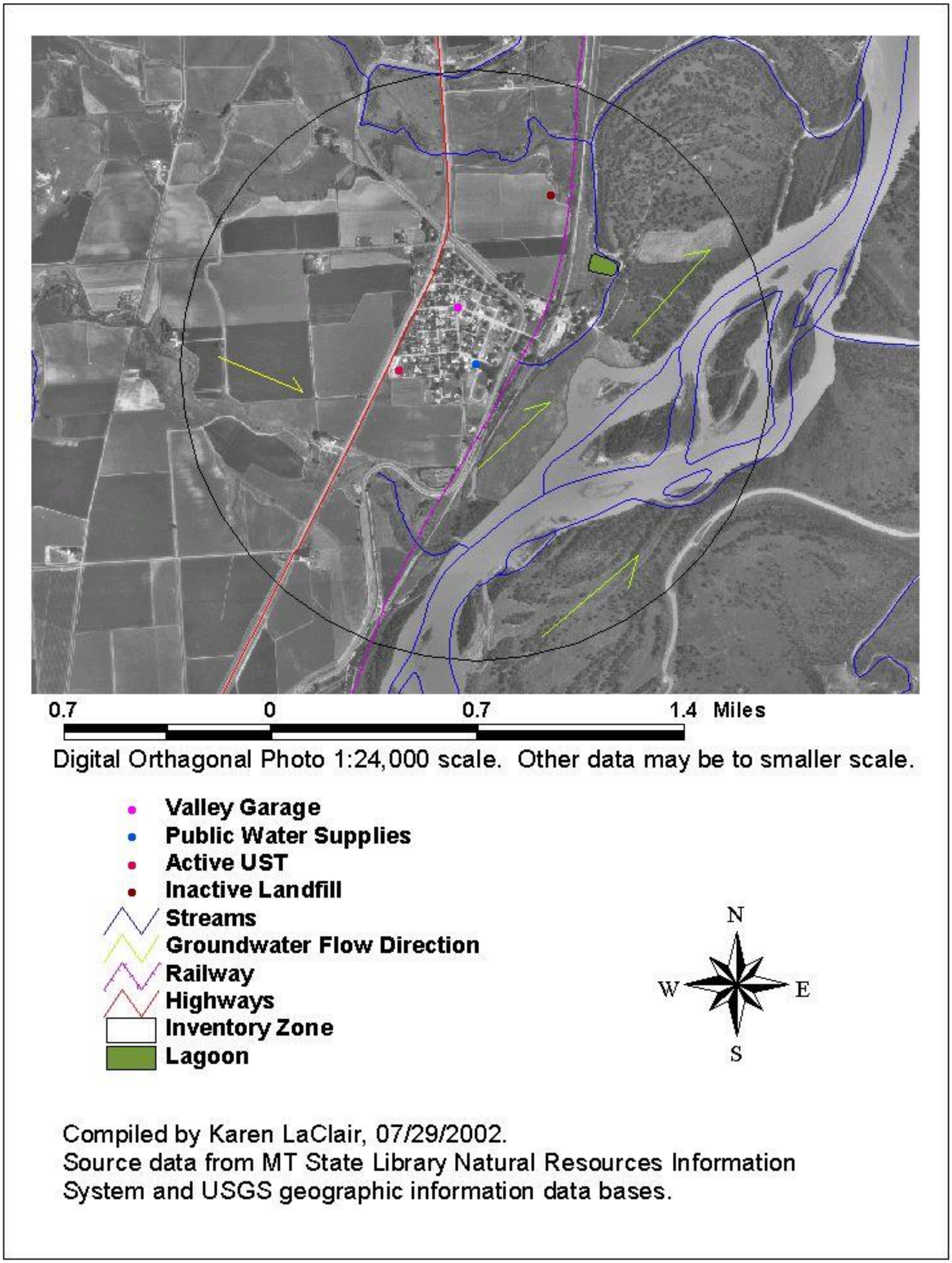


Figure 4. Potential contaminant sources in the inventory zone of the Savage School PWS

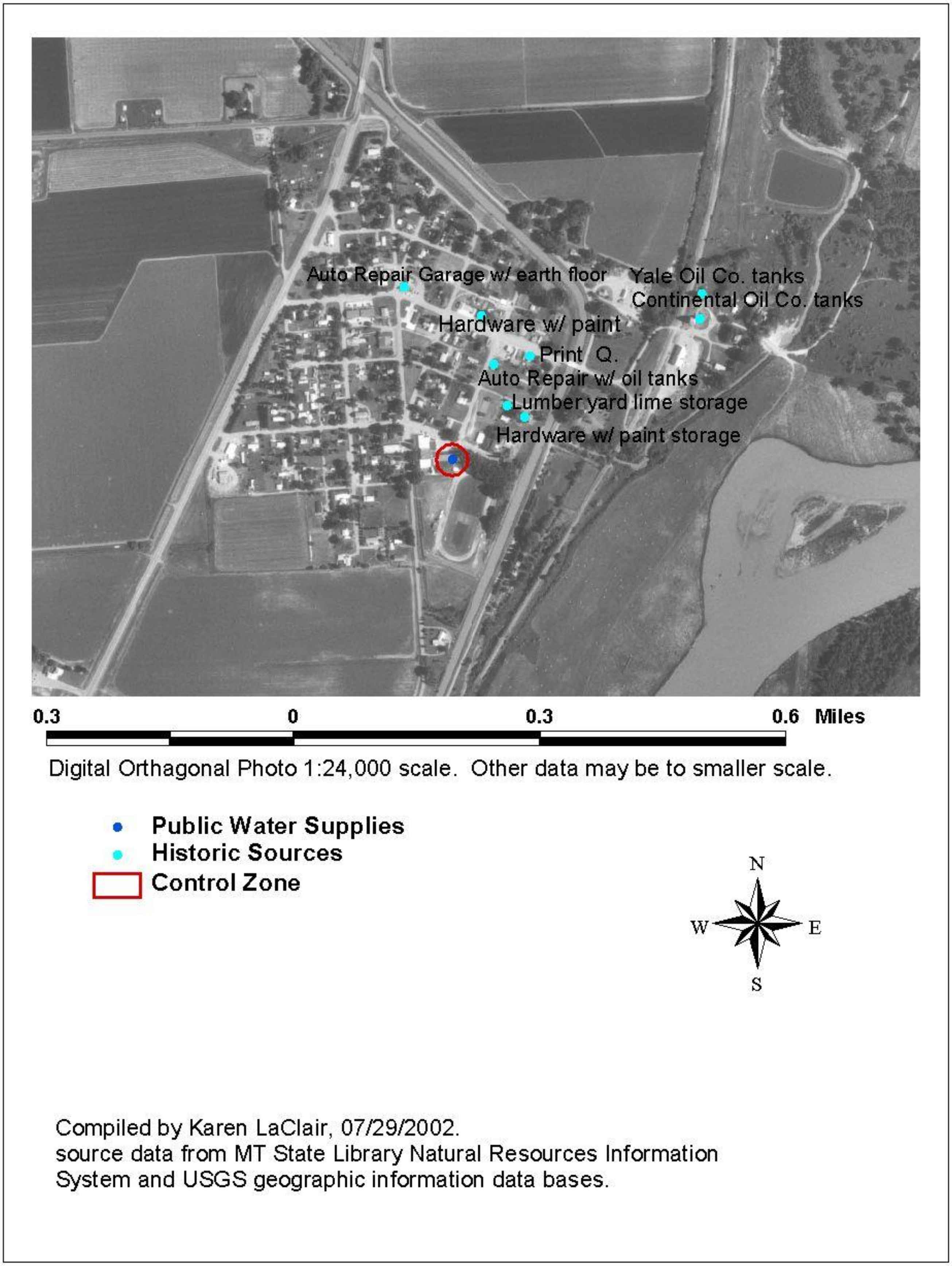


Figure 5. Historic sources of potential contaminants from 1929 Sanborn maps

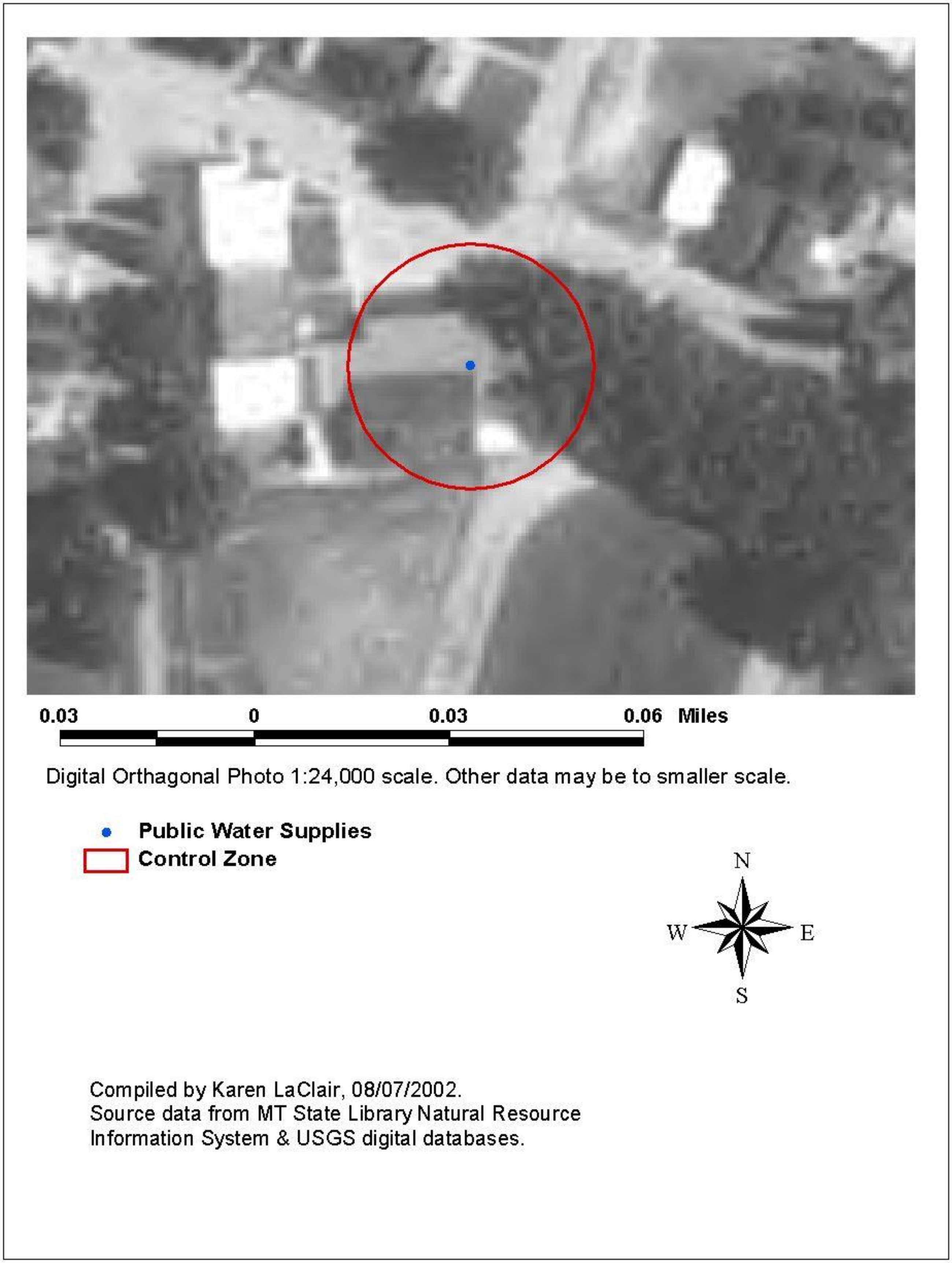


Figure 6. Savage School well control zone

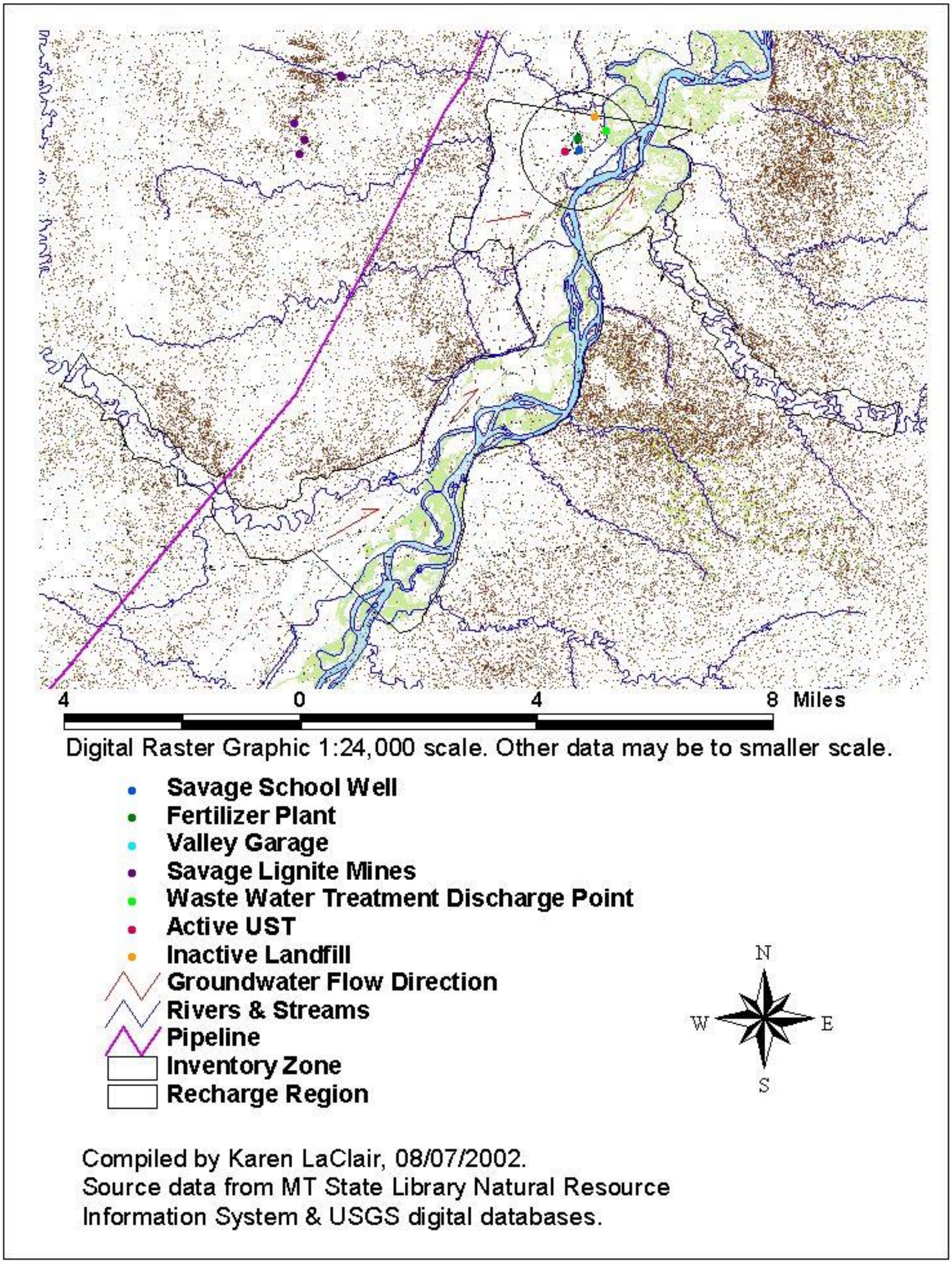


Figure 7. Savage School PWS recharge region

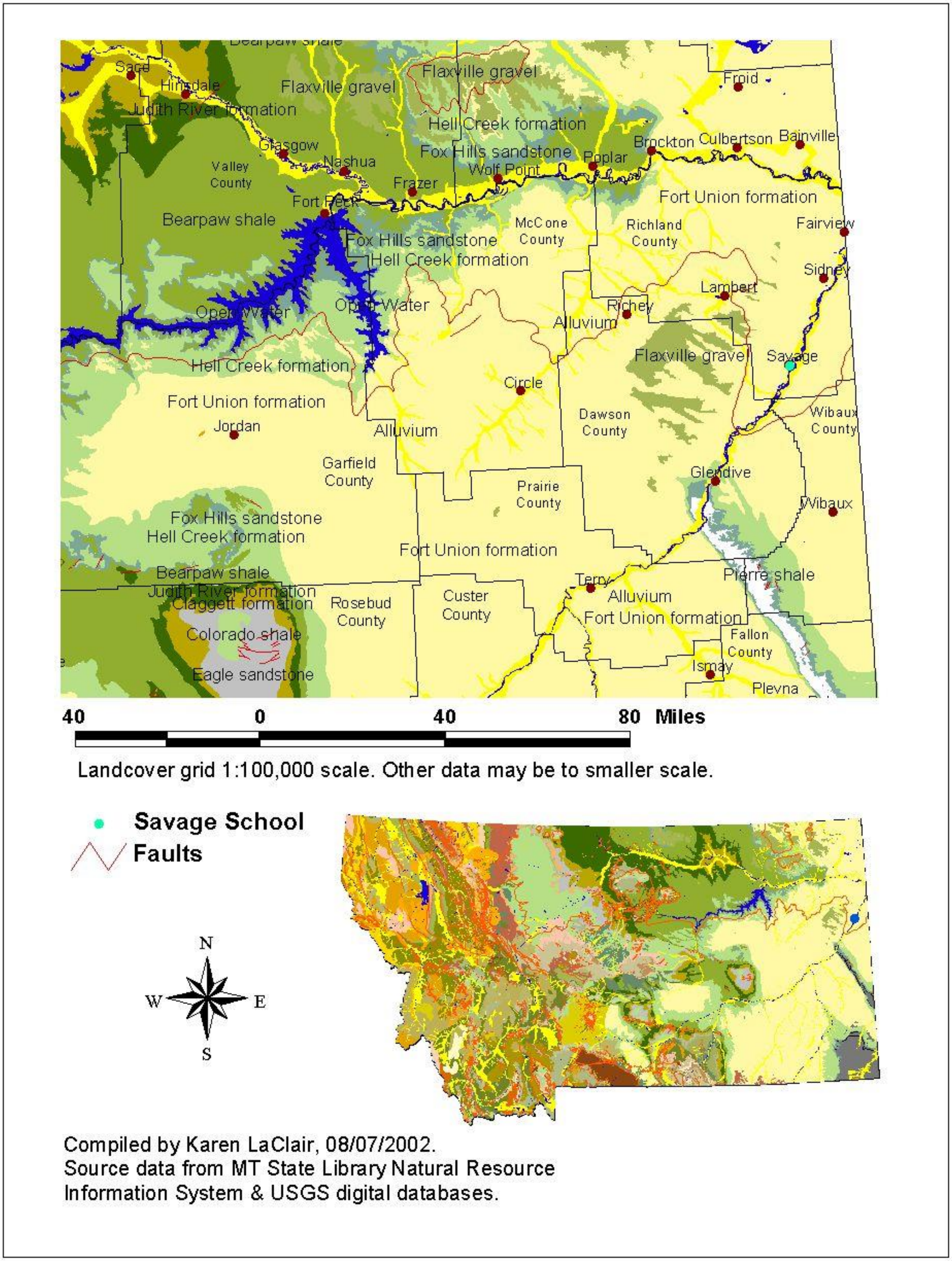


Figure 8. General geology of the Savage vicinity (Ross, et. al., 1955).

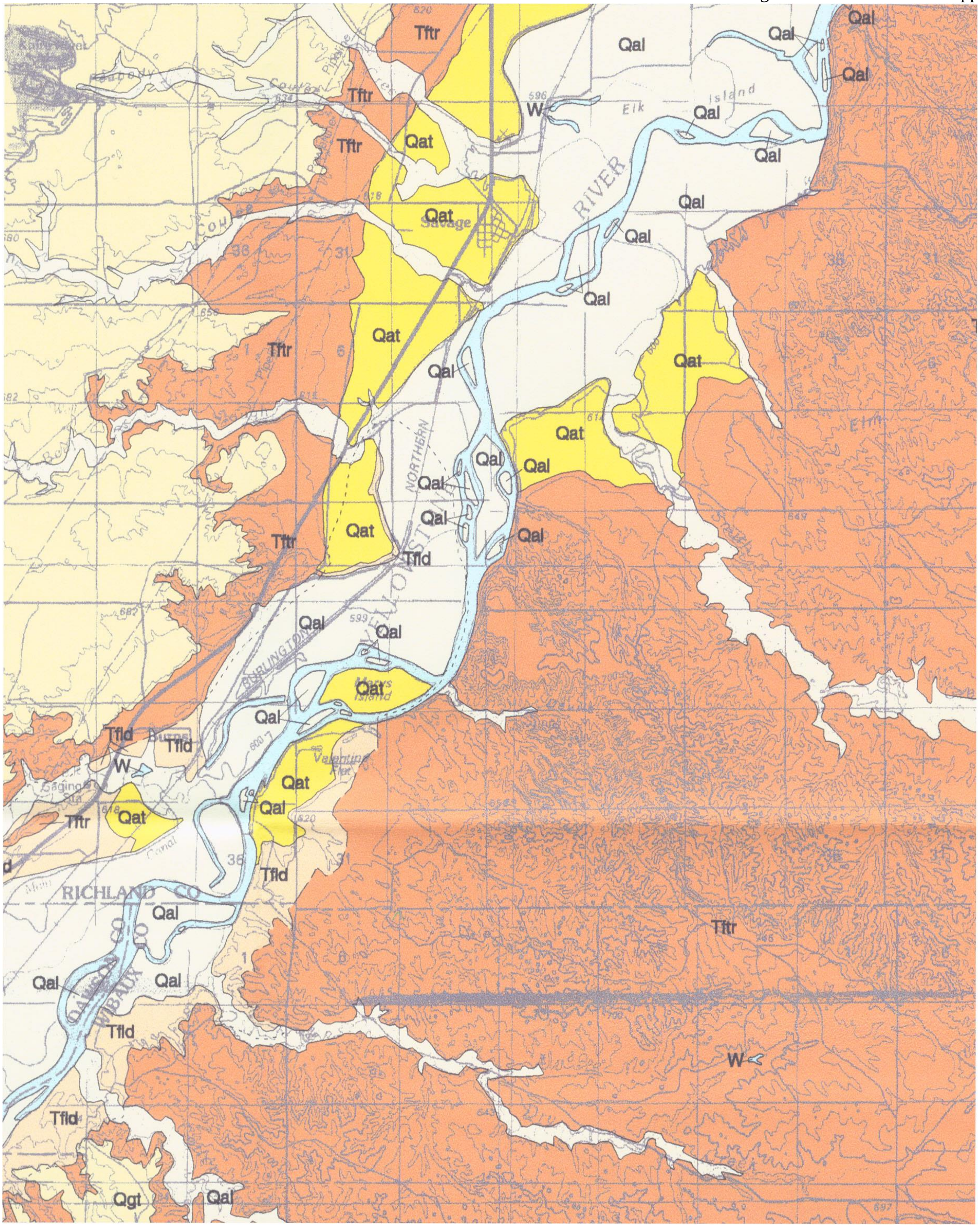


Figure 9a. Detailed geology of the Savage vicinity (Vuke, et. al., 1998)

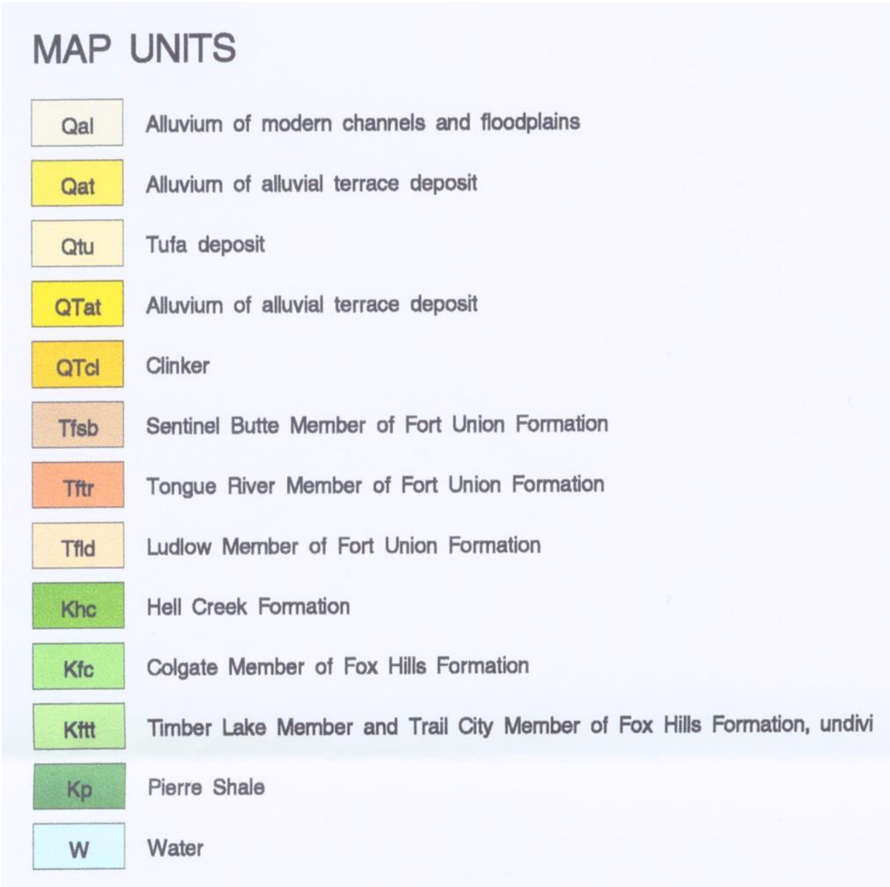


Figure 9b. Geologic Map Units (Vuke, et. al., 1998).

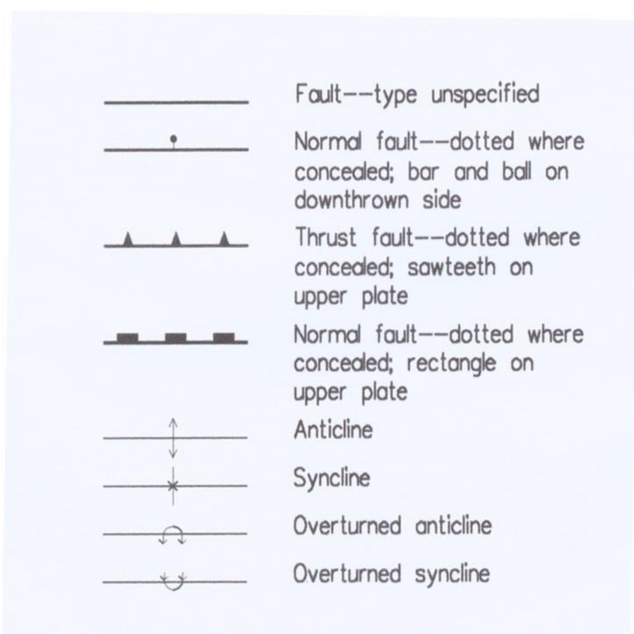


Figure 9c. Map Key for Detailed Geologic Map (Vuke, et. al., 1998).

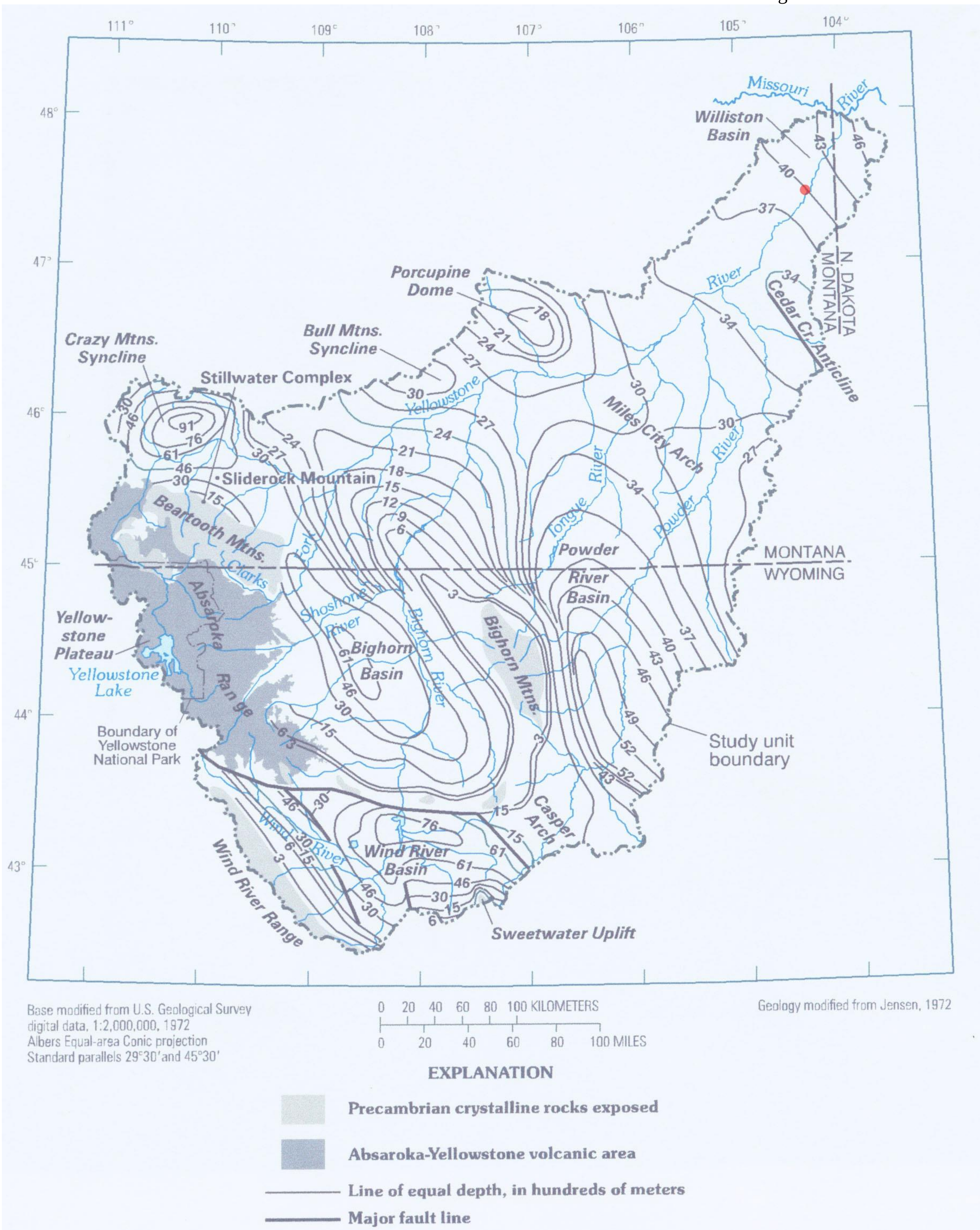


Figure 10. Structure contour map of basement rock in the Yellowstone River Basin (Zelt, et. al., 1999). Red dot indicates location of Savage.

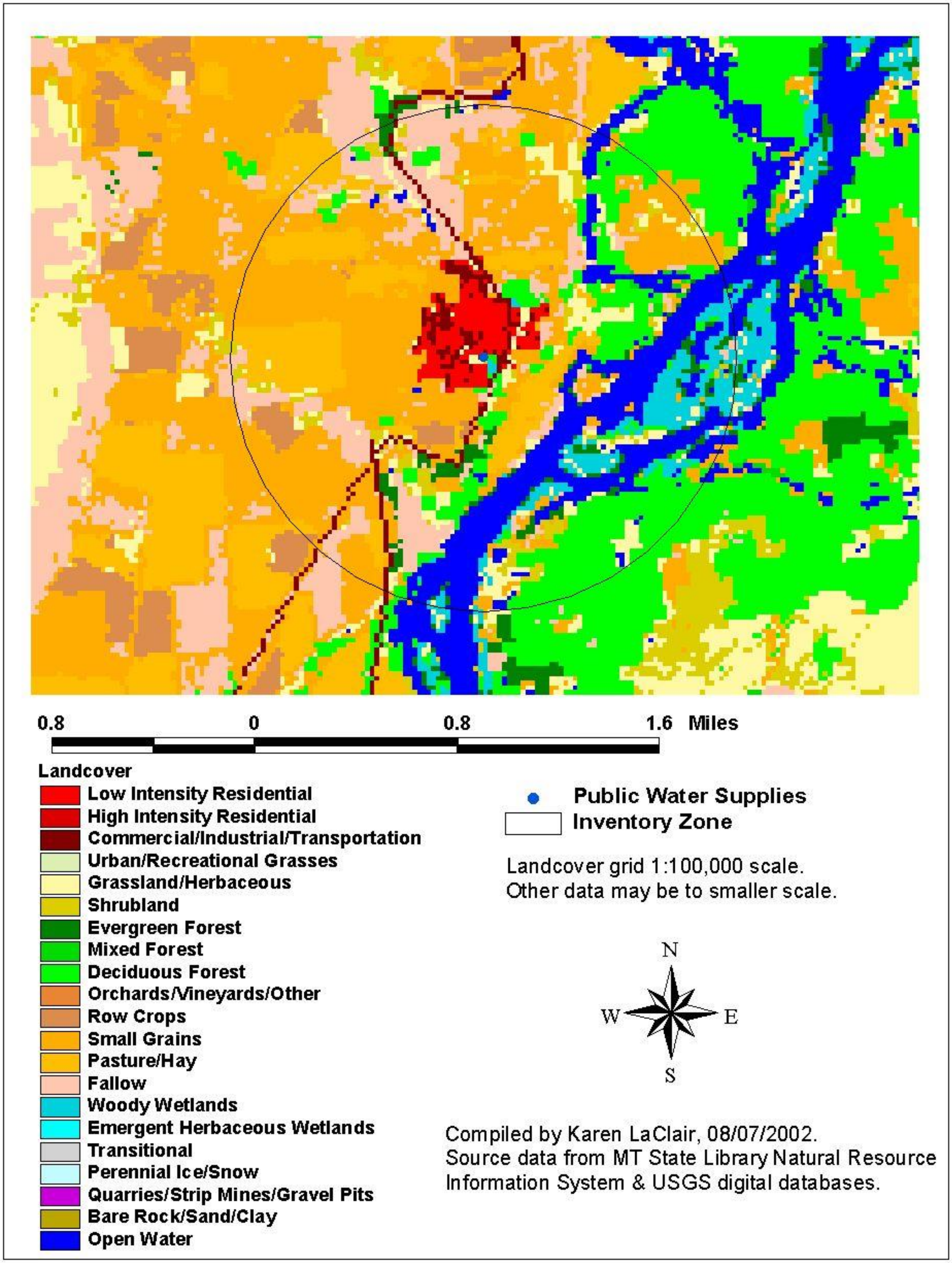


Figure 11. Landcover for the Savage School PWS inventory and control zones

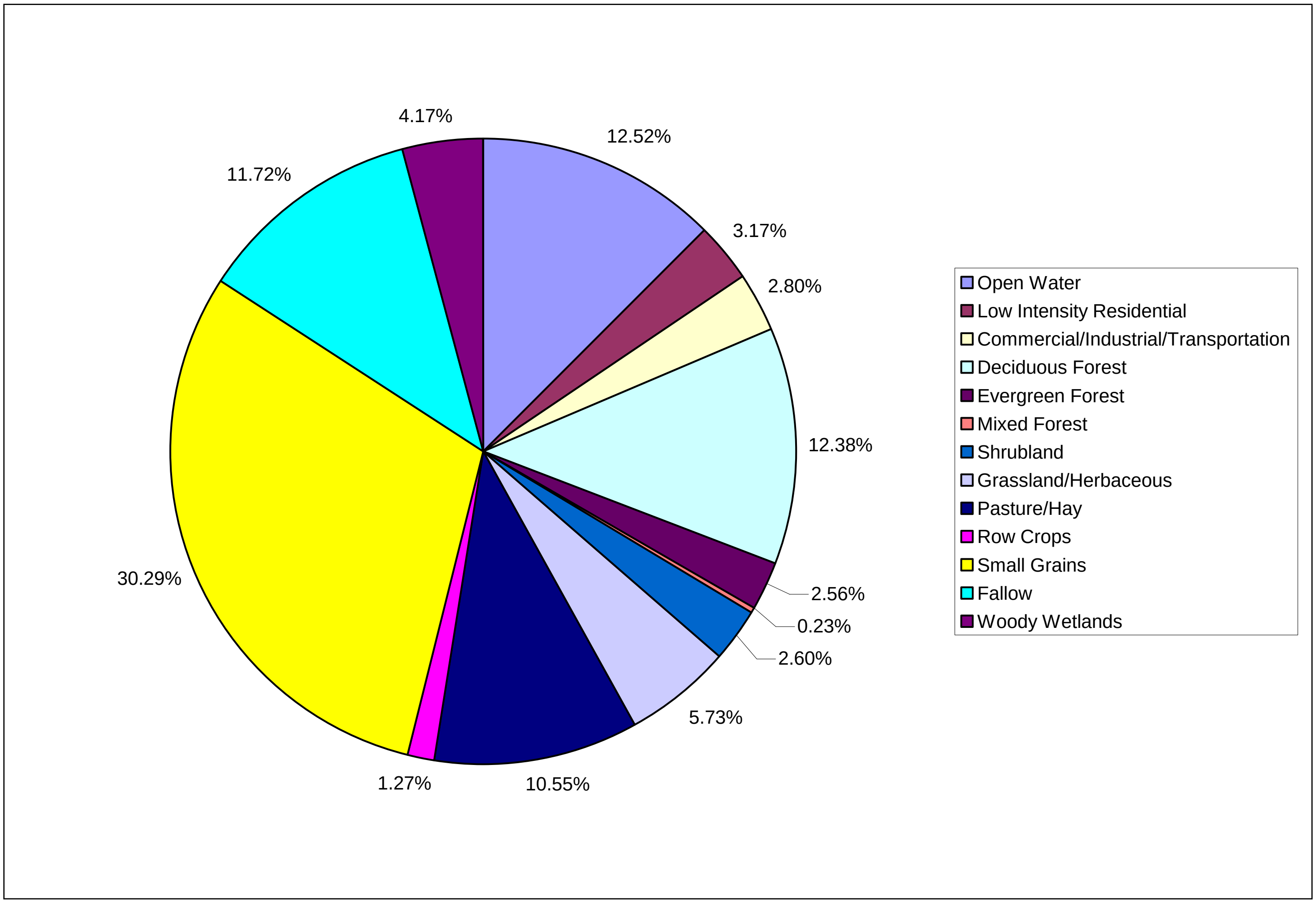


Figure 12. Percent land cover chart for the Savage School inventory zone

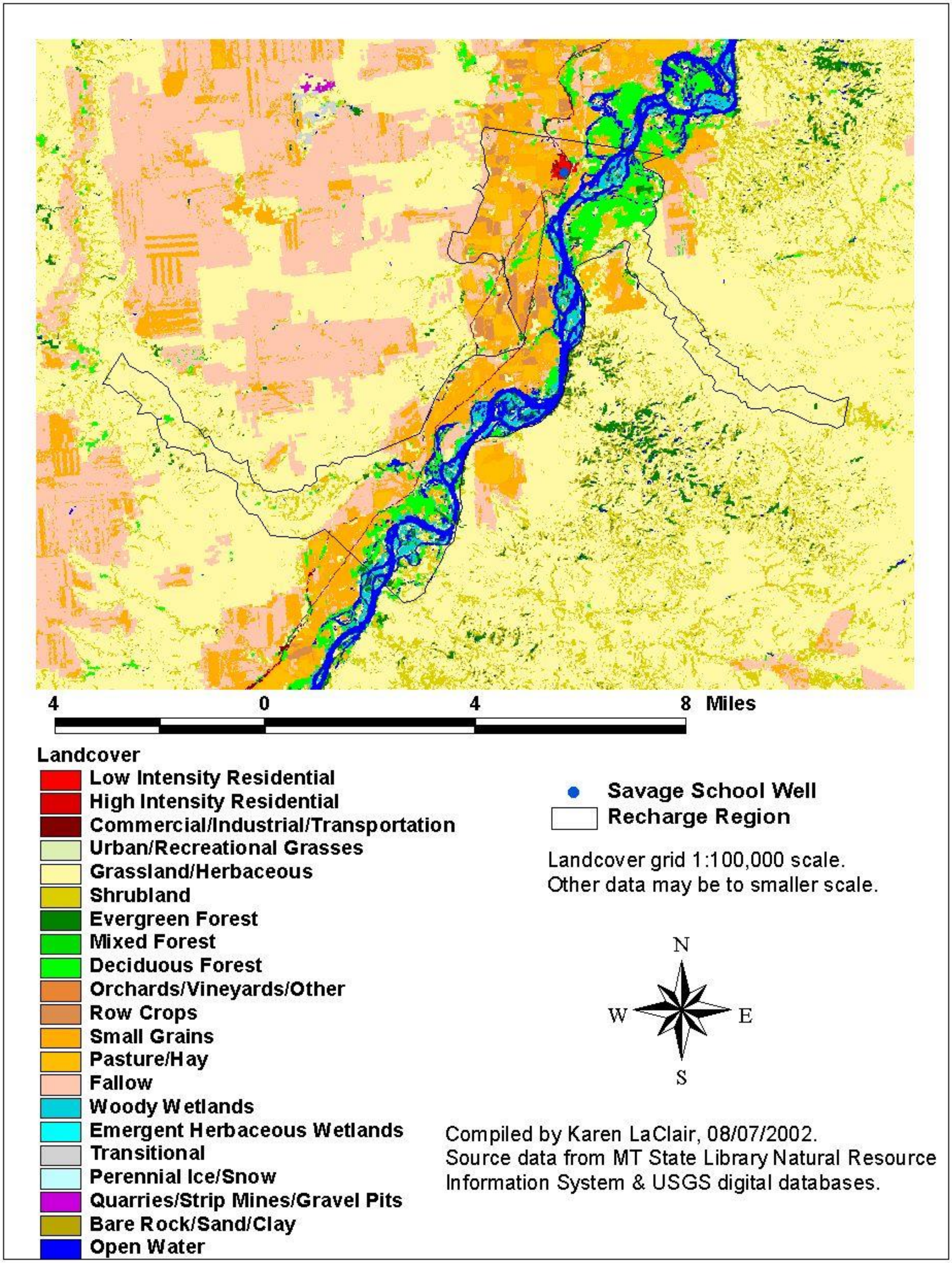


Figure 13. Land cover for the Savage School PWS recharge region

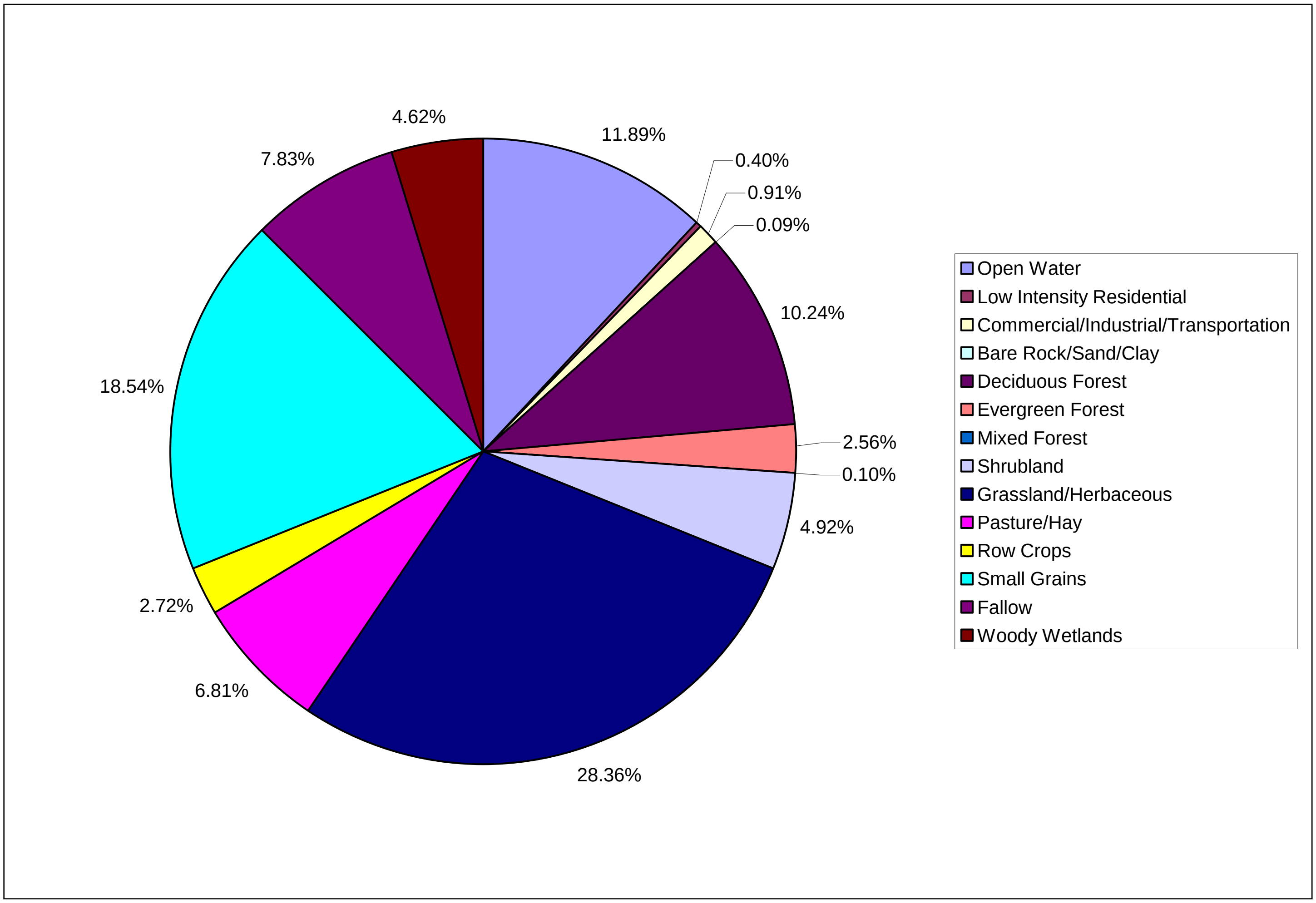
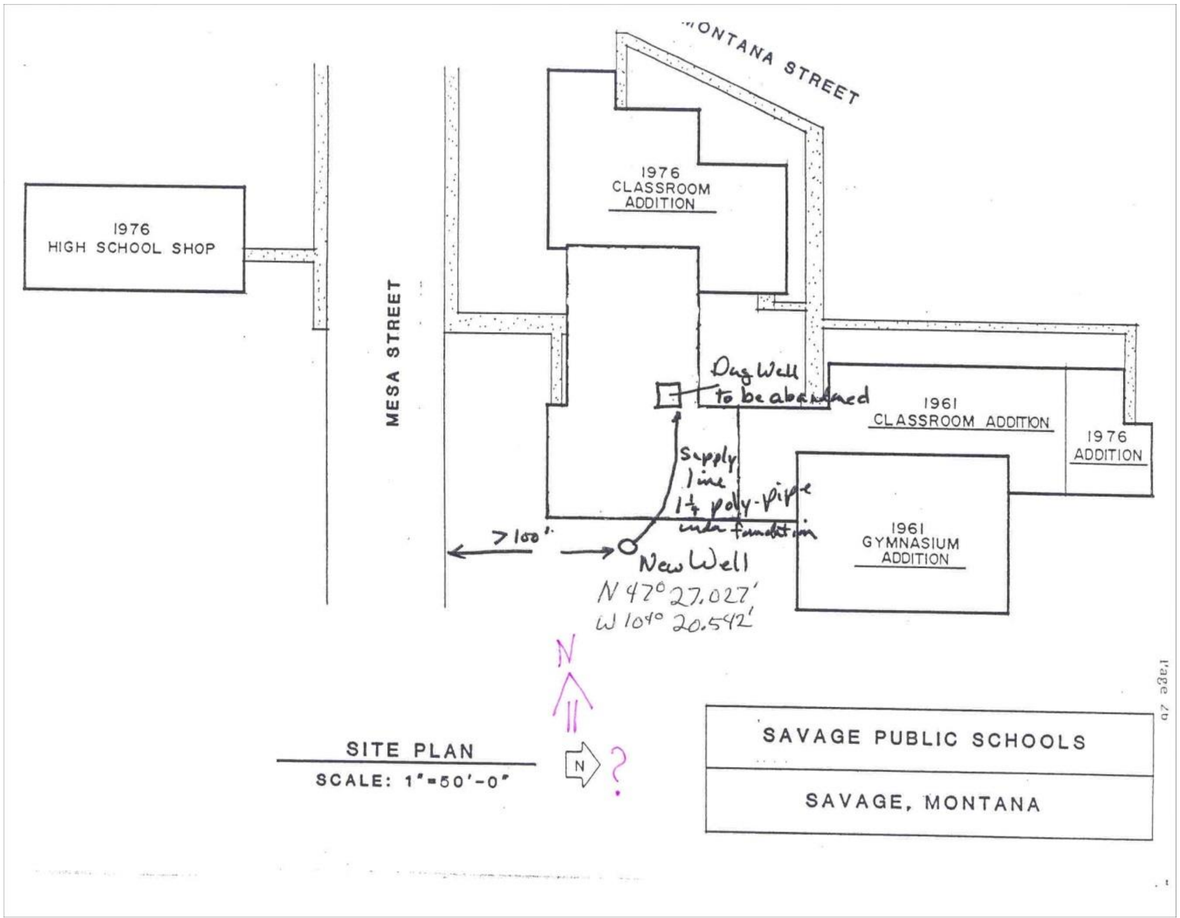
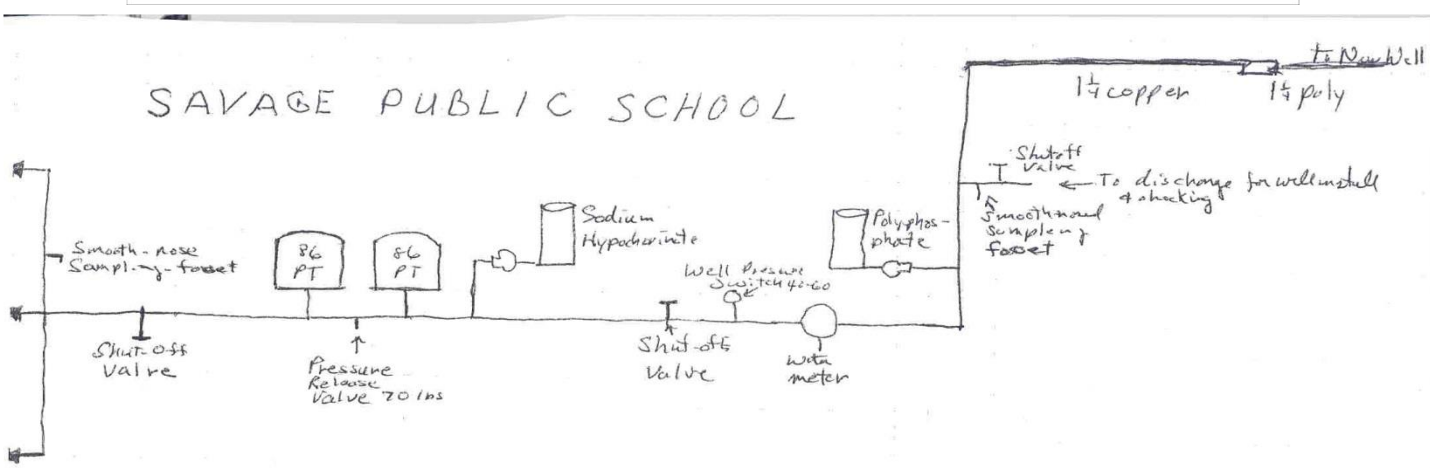


Figure 14. Percent land cover chart for the Savage School recharge region

APPENDIX B: SITE PLAN

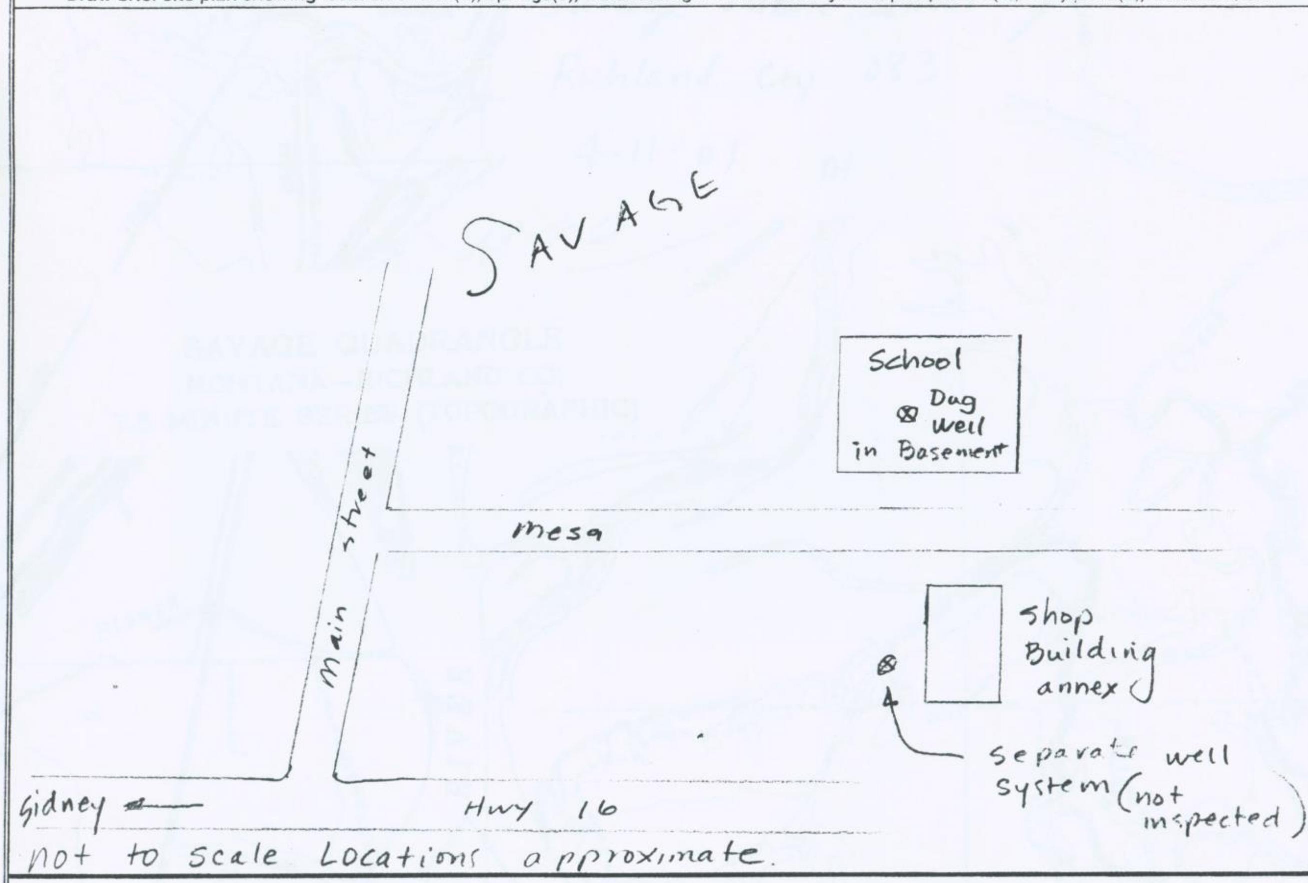
New Site Plan and Water Treatment Schematic



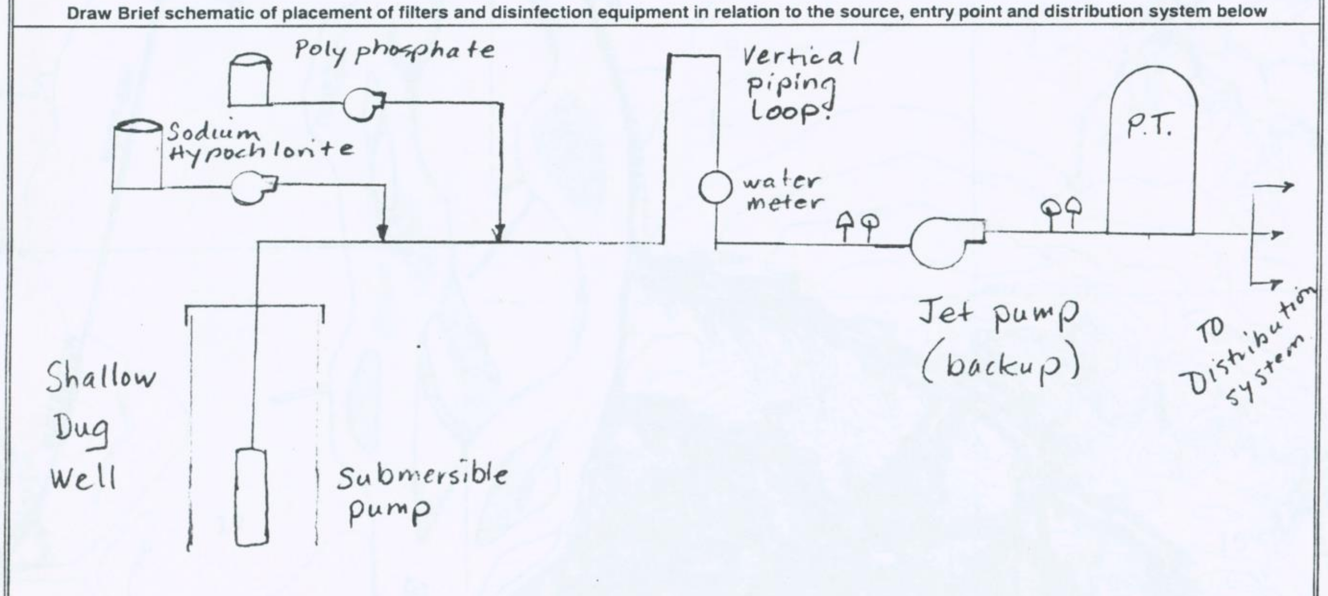


SANITARY SURVEY FORM - DIAGRAMS Page 7 of 8

Draw brief site plan showing location of well(s), springs(s), water storage. distribution system. pumphouse(s), entry point(s), treatment, etc.



Draw Brief schematic of placement of filters and disinfection equipment in relation to the source, entry point and distribution system below



APPENDIX C: WELL LOG(S)

New Well Completed 10/09/2003

MONTANA WELL LOG REPORT

Form No. 603 R2-99

Well ID# ____________

This log reports the activities of a licensed Montana well driller and serves as the official record of work done within the borehole and casing and describes the amount of water encountered. **This form is to be completed by the driller and filed with DNRC within 60 days of completion of the work. Acquiring Water Rights is the well owner's responsibility and is not accomplished by the filing of this report.**

Well log information is stored in the Groundwater Information Center at the Montana Bureau of Mines and Geology (Butte) and water right information is stored in the Water Rights Bureau records (Helena).

For fields that are not applicable, enter NA. Optional fields have a grayed background. Record additional information in the REMARKS section.

1. WELL OWNER:
Name: Savage High School
Mailing address: Box 110
Savage mt 59262

2. WELL LOCATION List ¼ from smallest to largest 33
____ ¼ ____ ¼ SW ¼ SE ¼, Section 33
Township 23 N/S Range 58 E/W County Richland
Lot ____, Tract/Blk ____ Subdivision Name
Well Address ____
GPS ☒ Yes ☐ No
Latitude N 47° 27.027' Longitude W 104° 20.542'
Error as reported by GPS locator (± feet) ____
Horizontal datum ☐ NAD27 ☐ WGS84

3. PROPOSED USE: ☐ Domestic ☐ Stock ☐ Irrigation ☒ Public water supply ☐ Monitoring Well ☐ Other:

4. TYPE OF WORK:
☒ New well ☐ Deepen existing well ☐ Abandon existing well
Method: ☐ Cable ☒ Rotary ☐ Other: ____

5. WELL CONSTRUCTION DETAILS:

Borehole:
Dia. 12 in. from 0 ft. to 25 ft.
Dia. 6 in. from 25 ft. to 35 ft.
Dia. ____ in. from ____ ft. to ____ ft.

Casing:
Steel: Wall thickness .250 ☐ Threaded ☒ Welded
Dia. 6" in. from +18" ft. to 30 ft.
Dia. ____ in. from ____ ft. to ____ ft.

Plastic: Pressure Rating ____ lbs. ☐ Threaded ☐ Welded
Dia. ____ in. from ____ ft. to ____ ft.

Perforations/Slotted Pipe:
Type of perforator used ____
Size of perforations/slots ____ in. by ____ in.
____ no. of perforations/slots from ____ ft. to ____ ft.
____ no. of perforations/slots from ____ ft. to ____ ft.

Screens: ☒ Yes ☐ No
Material stainless steel
Dia. 5" Slot size .025 from 30 ft. to 35 ft.
Dia. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel Packed: ☐ Yes ☒ No
Size of gravel ____
Gravel placed from ____ ft. to ____ ft.

Packer: ☐ Yes ☒ No
Type ____ Depth(s) ____

Grout: Material used Bentonite
Depth from 0 ft. to 25 ft. OR ☒ Continuous feed

6. WELL TEST DATA:
A well test is required for all wells. (*See details on well log report cover.*)
☒ Static water level 20 ft. below top of casing or
☐ Closed-in artesian pressure ____ psi.
How was test flow measured: (bucket/stopwatch) weir, flume, flowmeter, etc ____
Yellowstone Controlled Groundwater Area - Water Temperature ____ °F
☐ AQUIFER TEST DATA FORM ATTACHED

Test - 1 hour minimum
Drawdown is the amount water level is lowered below static level. All depth measurements shall be from the top of the well casing. Time of recovery is hours/minutes since pumping stopped.

Air test*
60 gpm with drill stem set at 25 ft. for 8 hours
Time of recovery 10 hrs/(min.) Recovery water level 20 ft.

OR Bailer test*
____ gpm with ____ ft. of drawdown after ____ hours
Time of recovery ____ hrs/min. Recovery water level ____ ft.

OR Pump test*
Depth pump set for test 30 ft.
60 gpm pump rate with 12 ft. of drawdown after 6 hrs pumping
Time of recovery 10 hrs/(min) Recovery water level 20 ft.

OR Flowing Artesian*
____ gpm for ____ hours
Flow controlled by ____

**During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the resevoir of the well casing.*

7. WELL LOG:

Depth, Feet From	Depth, Feet To	Material: color/rock and type/descriptor (example: blue/shale/hard, or brown/gravel/water, or brown/sand/heaving)
0	12	yellow sand
12	25	Fine Gravel
25	29	Grey sand
29	35	Gravel + sand

☐ ADDITIONAL SHEETS ATTACHED

8. DATE WELL COMPLETED: 9-8-03

9. REMARKS: ____

10. DRILLER/CONTRACTOR'S CERTIFICATION:
All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.
Name, firm, or corporation (print) H+H Drilling
Address 107 west River Ln Glendive mt
Signature ____
Date 10-9-03 License no. 310

MBMG ID# ____

Montana DNRC P.O. BOX 201601 HELENA, MT 59620-1601 444-6610

DEPARTMENT COPY

Water Right Form

Form 602 R9-01

NOTICE OF COMPLETION OF GROUNDWATER DEVELOPMENT

For groundwater developments with a maximum use of 35 GPM not to exceed 10 AC-FT per year.
GROUNDWATER IS DEFINED AS ANY WATER BENEATH THE GROUND SURFACE
(Use Form 600, Application for Beneficial Water Use Permit for appropriations in excess of 35 GPM or 10 AC-FT per year.)

State law requires this form be filed by the water user within 60 days after the water has been put to use. Your priority is determined by the date of filing.

Complete the notice and attach an aerial photo, survey, or other map showing the location of your development. Submit it with the filing fee, to your Water Resources Regional Office.

FOR DEPARTMENT USE ONLY

Notice No. ______ Basin ______
Priority Date ______ Time ______ AM / PM
Transmittal # ______ Rec'd By ______
Fee Rec'd $ ______ Check No. ______
Payor ______
Refund $ ______ Date ______

Filing Fee: $25.00
Instructions for completing form on back.

1. **NAME(s)** SAVAGE PUBLIC SCHOOL
Mailing Address P.O. Box 110 368 Mesa S
City SAVAGE State MT Zip 59262
Home Phone 406-776-2317 Other Phone ______

2. **SOURCE OF GROUNDWATER SUPPLY:** ☒ Well ☐ Pit — Dimensions (in feet) ______ L ______ W ______ D
☐ Developed Spring (Excavation, performed at spring location)

3. **ACTUAL PUMPING RATE** 25 GPM · Pump: HP Rating 3/4 Installation Depth 30 Ft.

4. **WHEN WAS THE WATER PUT TO ITS INTENDED USE?** (water must be used before you send this form to DNRC)
10/10/03 (Month / Day / Year)

5. **DOES THIS WELL REPLACE AN EXISTING WELL?** ☒ Yes ☐ No
Old Well Depth 13 Ft. Old Well GPM 19 Date Old Well Drilled or Dug unknown (Month / Day / Year)

6. **WILL THIS DEVELOPMENT** be manifold (connected) with another well or spring? ☐ Yes ☒ No
If yes, list the water right numbers and explain how they are used. ______

7. **POINT OF DIVERSION** (At least 2 quarter sections are required) Actual location of well, spring, or groundwater pit.
Legal land descriptions may be obtained from your county records.
____ 1/4 ____ 1/4 ____ 1/4 Section 33 Twp 20 N/S Range 58 E/W County Richland
Lot 7 Block 5 Tract No. ______ COS No. ______ Government Lot ______
Subdivision Name SAVAGE Street/Road Address 368 Mesa S

8. **PLACE OF USE** (where water is being used) If same as Point of Diversion, Check ☐
☐ Domestic ☐ Lawn & Garden ☐ Stock ☐ Irrigation ☐ Other
____ 1/4 SW 1/4 SE 1/4 Section 33 Twp 20 N/S Range 58 E/W County Richland
Lot 7 Block 5 Tract No. ______ COS No. ______ Government Lot ______
Subdivision Name SAVAGE Street/Road Address 368 Mesa S

9. **PURPOSE AND PERIOD OF USE**

Domestic	Number of homes supplied by the well being filed on ______ Year-round use? ☐ Yes ☐ No If no, from ______ (Month / Day) to ______ (Month / Day), inclusive of each year. **If lawn & garden/shelterbelt is greater than 1/4 acre, complete section below.**
Lawn & Garden Shelterbelt Greater Than 1/4 AC.	Total size of lawn and/or garden ______ (length in feet x width in feet ÷ 43560 = acres) Total size of shelterbelt ______ (length in feet x width in feet ÷ 43560 = acres) Period of use: from ______ (Month / Day) to ______ (Month / Day), inclusive of each year.
Stock	Number and type ______ Year-round use? ☐ Yes ☐ No If no, from ______ (Month / Day) to ______ (Month / Day), inclusive of each year.
Irrigation	Type of crop ______ Total acres irrigated ______ Period of use: from ______ (Month / Day) to ______ (Month / Day), inclusive of each year.
Other	Describe the purpose of use Public School Amount of water used 5200 gallons per day Year-round use? ☒ Yes ☐ No If no, from ______ (Month / Day) to ______ (Month / Day), inclusive of each year.

10. **ADDITIONAL INFORMATION** ______

11. **AFFIDAVIT OF OWNERSHIP OR WRITTEN CONSENT** *The statements here are to the best of my knowledge true and correct.*
I have possessory interest in the property where the water has been put to beneficial use:

Check the box(es) that pertain to your situation: (REQUIRED)
☒ I exclusively own the ground water development works.
☐ I do not exclusively own the ground water development works. (Attach written consent of the person who owns the ground water development)
☐ I have possessory interest in the land where the ground water development is located.
☐ I do not have possessory interest in the land where the ground water development is located. (Attach written notification to land owner pursuant to MCA 85-2-306(1).)

Appropriator's signature SAVAGE Public School by Date: ______
[illegible] Supt. of Schools Date: 10-15-03
Subscribed and sworn before me this 15 day of October, 2003
Notary's signature [illegible]
Notary for the State of Montana Residing at Savage, Richland County
My commission expires Nov. 8, 2004

(SEAL)

MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION
48 N. LAST CHANCE GULCH P.O. BOX 201601 HELENA, MT 59620-1601 444-6610
web site: http://www.dnrc.state.mt.us/wrd/home.htm

Old Well – Should be abandoned

Montana Bureau of Mines and Geology
Ground-water Information Center Site Report
SAVAGE PUBLIC SCHOOL

Plot this site on a topographic map

Location Information

GWIC Id: 135627
Location (TRS): 20N 58E 33 BCCB
County (MT): RICHLAND
DNRC Water Right: C086171
PWS Id: 01542002
Block: 21
Lot: 15
Certificate of Survey: Not Reported

Source of Data: LOG
Latitude (dd): 47.4506
Longitude (dd): -104.3417
Geomethod: MAP
Datum: 1927
Addition: ULCH EDITION
Type of Site: WELL

Well Construction and Performance Data (measurements are reported below land surface)

Total Depth (ft): 29.00
Static Water Level (ft): 15.00
Pumping Water Level (ft): 20.00
Yield (gpm): 15.00
Test Type: AIR/PUMP
Test Duration: 6.00
Drill Stem Setting (ft):
Recovery Water Level (ft):
Recovery Time (hrs):

How Drilled: ROTARY
Driller's Name: H & H
Driller License: WWC310
Completion Date: Jun 14, 1993
Special Conditions: None Reported
Is Well Flowing?: No
Shut-In Pressure:
Geology/Aquifer: 111ALVM
Well/Water Use: DOMESTIC
PUBLIC WATER SUPPLY

Hole Diameter Information

From (ft)	To (ft)	Dia (in)
0.0	20.0	11.0
20.0	29.0	6.0

Casing Information

From (ft)	To (ft)	Dia (in)	Description
-1.5	29.0	6.0	STEEL

Annular Seal Information

From (ft)	To (ft)	Description
0.0	24.0	BENTONITE

Completion Information

From (ft)	To (ft)	Dia (in)	Description
24.0	29.0	6.0	1/4X12 TORCH

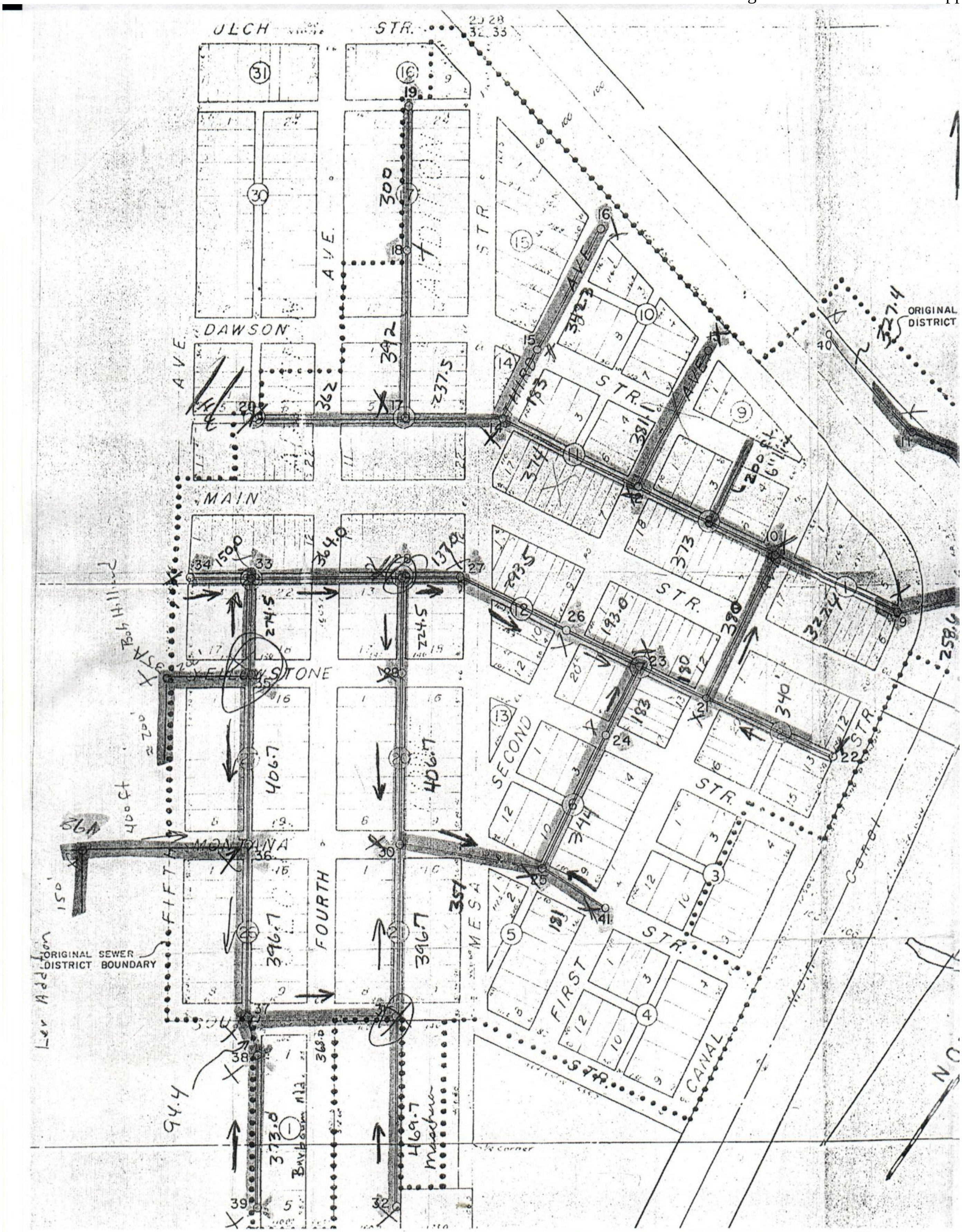
Lithology Information

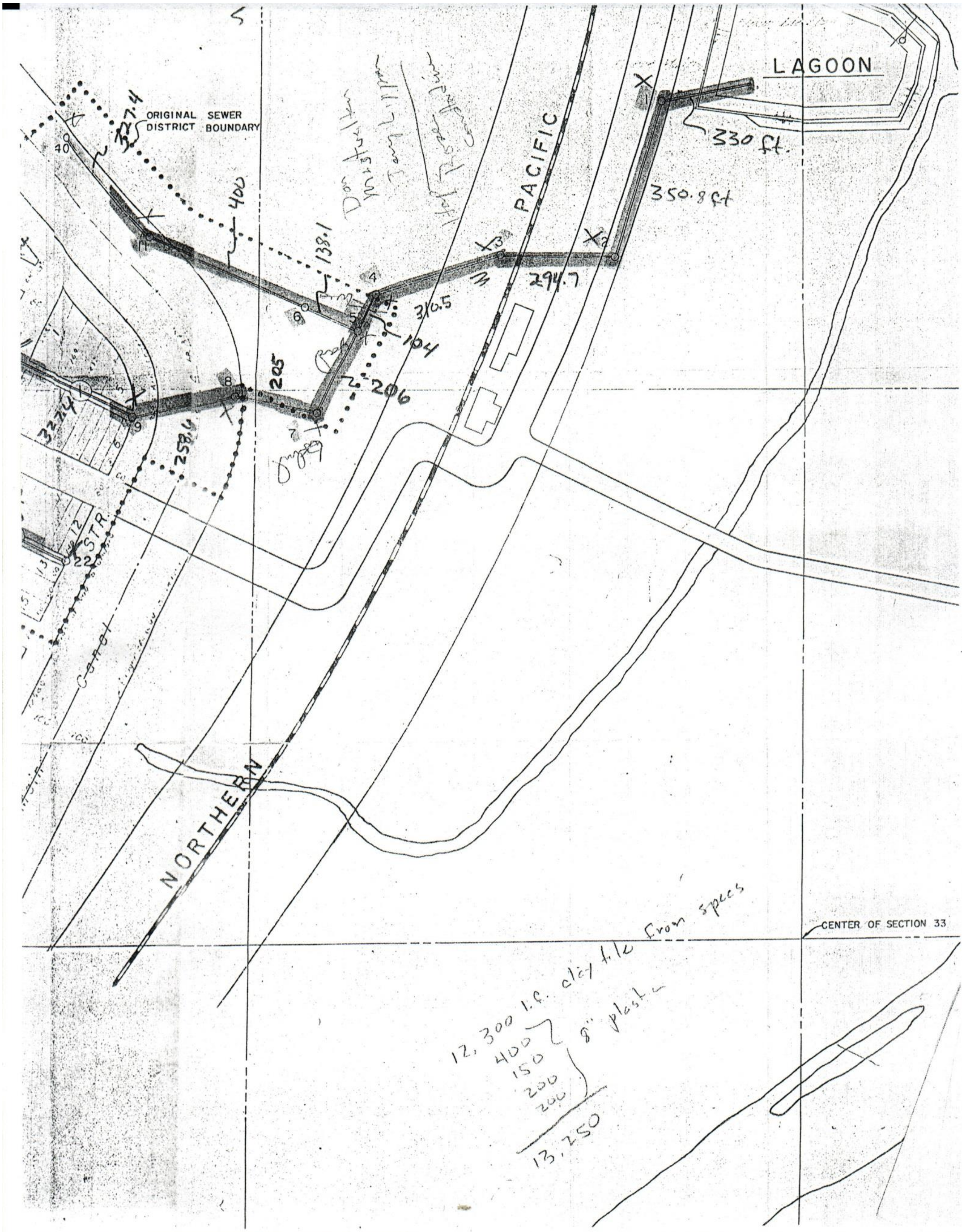
From (ft)	To (ft)	Description
0.0	11.0	BLUE SAND
11.0	29.0	GRAVEL & SAND

APPENDIX D: SANITARY SURVEY

Available Upon Request

APPENDIX E: Savage Sanitary Sewer Mains


DAWSON
MAIN
YELLOWSTONE
MONTANA
FIFTH
FOURTH
SECOND
MESA
FIRST
CANAL
ORIGINAL DISTRICT
ORIGINAL SEWER DISTRICT BOUNDARY


LAGOON
ORIGINAL SEWER
DISTRICT BOUNDARY
PACIFIC
NORTHERN
CENTER OF SECTION 33
330 ft.
350.8 ft
294.7
310.5
104
206
205
258.4
400
138.1
327.4
12,300 l.f. clay tile from specs
8" plastic
400
150
200
200
13,250