GOOSE CREEK WATERSHED PROJECT

# Septic System Impact Study Executive Summary

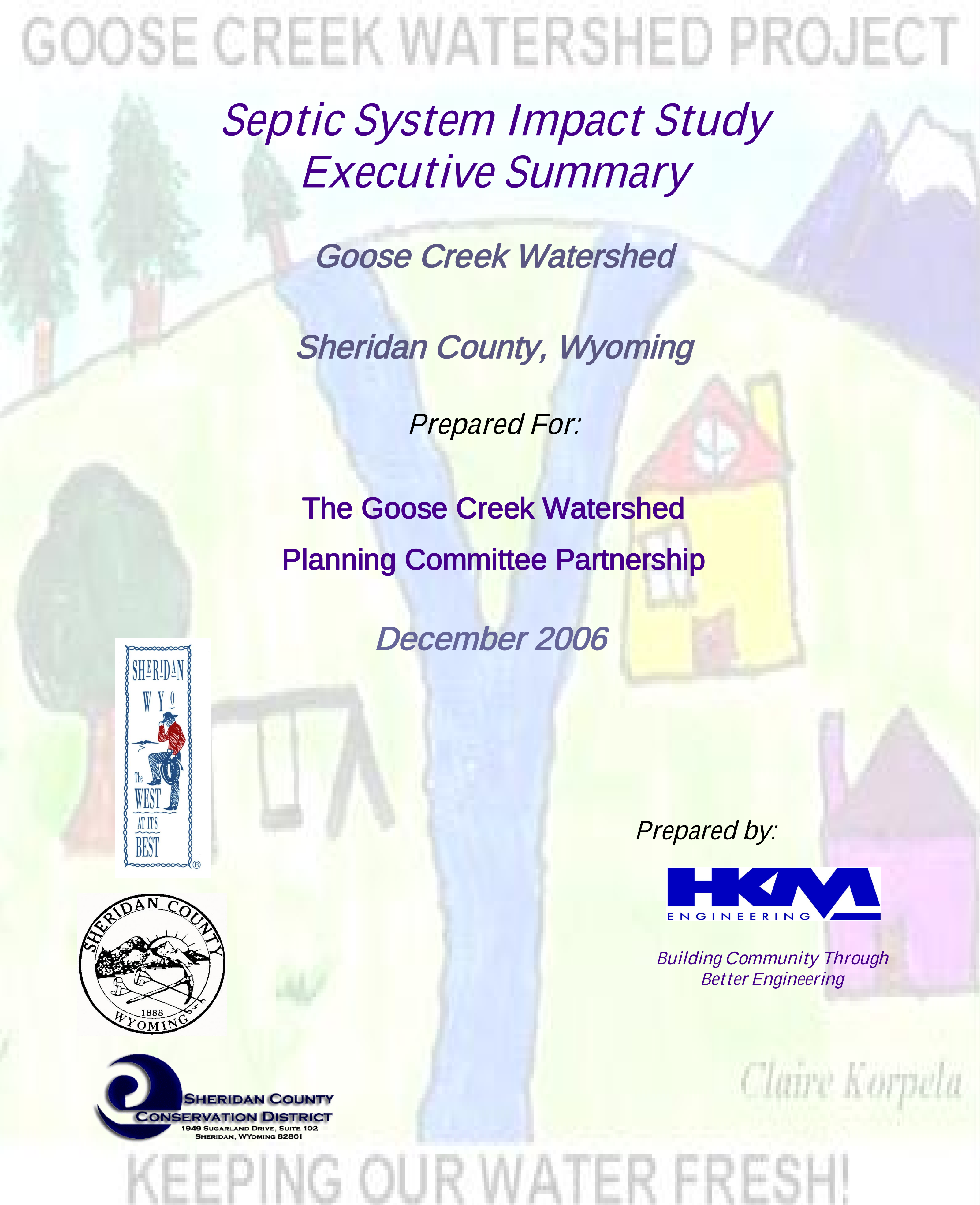
## Goose Creek Watershed

## Sheridan County, Wyoming

*Prepared For:*

**The Goose Creek Watershed Planning Committee Partnership**

*December 2006*




*Prepared by:*

HKM ENGINEERING

*Building Community Through Better Engineering*

SHERIDAN COUNTY CONSERVATION DISTRICT
1949 SUGARLAND DRIVE, SUITE 102
SHERIDAN, WYOMING 82801

KEEPING OUR WATER FRESH!

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# 1.0 BACKGROUND

Assessment and planning activities have been ongoing in the Goose Creek Watershed since 1993. This Septic Impact Study is one component of a Management Plan to address water quality concerns in the watershed.

## 1.1 History of the Goose Creek Assessment and Planning Program

Between 1993 and 1997 the United States Geologic Survey collected water quality data in the Goose Creek Watershed. Based on the data, the Wyoming Department of Environmental Quality placed Big Goose and Little Goose Creeks on Table A of the 1998 Section 303 (d) list of impaired waters in Wyoming.

In 1998, WDEQ implemented a more detailed water-quality monitoring program that resulted in the listing of Beaver, Jackson, Kruse, Park, Rapid, Sackett and Soldier Creeks on the 303(d) list of impaired streams, as well as confirming impairment in Goose, Big Goose and Little Goose Creeks.

In 2000, the City and County of Sheridan and the Sheridan County Conservation District created the Goose Creek Drainage Advisory Group (GCDAG) to address the apparent water quality problem in the watershed. A comprehensive assessment project occurred in 2001 and 2002 when 46 locations were sampled and analyzed for 17 parameters. The final report was published in July 2003, accompanied by a public information and outreach program.

A watershed planning process was initiated in September 2003. The Goose Creek Watershed Management Plan was published in December 2004 and filed with the Sheridan County Clerk's office in April 2005. The Watershed Management Plan identifies specific Issues and provides Objectives and a list of Action Items to address each Issue. This Septic Impact Study addresses, in whole or in part, three of the Action Items.

## 1.2 Purpose

The purpose of this study is to develop a recommended mechanism with which septic system installation and replacement can be evaluated for appropriate use of alternative technologies in areas of high risk for impacts to groundwater.

The recommended strategy for implementing alternative septic system technologies requires minor amendment to the current Sheridan County septic system permitting program. Implementation of the program should include review and update of agreements between Sheridan County and the City of Sheridan and the WDEQ, if determined appropriate. In addition, detailed evaluation criteria and design guidelines should be developed, which are beyond the scope of this study. A commitment of appropriately trained staff to implement and administer the program will be necessary.

## 1.3 Acknowledgements

Tremendous support and guidance was provided by staff from the Sheridan County Conservation District, and the Sheridan County and City of Sheridan engineering and planning departments. The questions and comments provided during public meetings held on October 5, 2006 and December 7, 2006 helped formulate the conclusions and recommendations of this report.

# 2.0 PHASE I – INVENTORY OF EXISTING SEPTIC SYSTEMS

Geographic Information System (GIS) mapping was used to inventory and evaluate septic systems in the watershed. Using GIS, many types of data from many different sources can be displayed and analyzed on a common map allowing comparison and evaluation of complex sets of data in a simple format.

The following sections describe the data input into the GIS map for this project.

## 2.1 Base Map

The base map is a general depiction of features of interest in the Septic Impact Study Area. The following data are included in the Base Map.

*2.1.1 Study Area* – The study area encompasses the Goose Creek Watershed, excluding public lands administered by the U.S. Forest Service.
*2.1.2 Cities*
*2.1.3 Lakes*
*2.1.4 Sheridan County Roads* – Road names, locations, and other accompanying information is presented in this dataset supplied by the Sheridan County GIS department.
*2.1.5 National Forest* – This dataset illustrates the National Forest and other public lands within the study area.
*2.1.6 Parcel Boundary* – A parcel is land owned by a single private owner. More than one subdivided lot may be contained within a parcel.
*2.1.7 SAWS Boundary* – This service boundary encompasses the area within which water service can be provided as part of the SAWS regional water system.
*2.1.8 Drinking Water* – The drinking water pipe layout for the City of Sheridan and SAWS service areas is illustrated within this dataset.
*2.1.9 Sewer Service Boundary* – This boundary was established in 1977 as part of the EPA 208 Wastewater Planning Study and continues to be referenced as the “sewer service boundary.”
*2.1.10 Potential Sewer Service Boundary* – The existing Sewer Service Boundary is under review and possible revision as part of the City of Sheridan Wastewater Collection System Assessment.
*2.1.11 Sewer* – Sheridan’s existing sewer system layout is in the mapping.
*2.1.12 Imagery* – A mosaic of imagery was compiled for the study area.

## 2.2 Input Data

Following compilation of the base map, data of specific relevance to the Septic Impact Study was input.

*2.2.1 Water Quality Monitoring Stations* – Forty-six water quality monitoring stations were used during the 2001-2002 Goose Creek Watershed Assessment to monitor various water quality parameters on Big Goose, Little Goose, and Goose Creeks as well as several tributary streams within the watershed. The locations of these stations are shown in this layer along with a summary of some of the fecal coliform bacteria data collected at each.

Out of eight geometric mean sampling events, the highest occurrence of exceedance was four times. That occurred at one station, Soldier Creek just upstream of the confluence with Goose Creek. Three exceedances occurred at two different sampling stations, on Jackson Creek near the community of Big Horn and on Little Goose Creek near the confluence with Big Goose. All remaining stations had two or less exceedances of the fecal coliform standard during the eight sampling events.

The highest average fecal concentration occurred in Little Goose Creek at the bridge crossing Highway 87 just south of Woodland Park School (LG7).

The second highest average concentration occurred in Park Creek (BG13), tributary to Big Goose Creek fairly high in the watershed and in an area of few septic systems. This suggests other sources of fecal coliform bacteria are contributing to the impairment in Park Creek.

The third highest average concentration occurred at a storm drain outlet discharging into Little Goose Creek at Coffeen Avenue (LG3). This storm drain collects runoff from developed areas along Coffeen Avenue, an area where septic systems are unlikely. Again, other sources appear to be contributing fecal coliform impacts to the creek.

The fourth highest average fecal concentration was in Soldier Creek (GC4) at the confluence with Goose Creek and the fifth highest was on Jackson Creek (LG17), tributary to Little Goose Creek near Big Horn.

*2.2.2 Impaired Streams* – This layer shows the segments found to be impaired due to fecal coliform bacteria.

Generally, impaired creek sections are located as follows:

- Goose Creek: From the confluence of Little and Big Goose, downstream.
- Big Goose Creek: From Normative Services, downstream to the confluence with Little Goose Creek.
- Little Goose Creek: From the bridge on Highway 87 just south of the Big Horn Wye (junction with Highway 335), downstream to the confluence with Big Goose Creek.
- Tributaries: All tributaries showed some level of impairment near their confluences with either Big Goose or Little Goose Creeks. Sampled tributaries included Soldier (Goose Creek Drainage), Park, Rapid Creeks in the Big Goose drainage and Jackson, Sackett, Kruse and McCormick Creeks in the Little Goose drainage.

*2.2.3 City of Sheridan Wastewater Treatment Plant* –The plant outfall is located on Goose Creek north of Fort Road. Fecal coliform data for the time period from January 2001 to August 2006 is shown as a table within the map. The City of Sheridan WWTP discharge does not exceed the fecal coliform water quality standard for Goose Creek.

*2.2.4 Septic Permits* – Data for permitted septic systems in Sheridan County was obtained through the County GIS department.

Approximately 1,360 septic permits fall within the study boundary of the total 2,356 permitted septic systems within the entire County.

*Data Limitations:*

- Many parcels have more that one septic permit. This may be because the septic system was initially permitted and was re-permitted due to repair or replacement of the system.
- Several septic permits exist within the City of Sheridan where sanitary sewer service is currently available. The dataset does not reflect systems that were abandoned after connection to sewer.
- Only those septic systems which are properly permitted with Sheridan County are shown.

*2.2.5 SAWS Taps* – Data for the number of water accounts/taps was obtained through SAWS. These accounts represent all users served within the SAWS service boundary excluding City users.

*Data Limitations:*

- The SAWS tap layer contains 1,668 accounts/taps. Based on a recent report completed by Entech, Inc. the current number of SAWS users is 1,449

*2.2.6 FEMA/FIRM Boundary* – This layer shows boundaries of the 100 and 500-year flood areas as presented by the Flood Insurance Rate Maps.

## 2.3 Data Interpretation

The following evaluations of data are considered important to understanding conditions in the watershed.

*2.3.1 Septic Density* – The highest density of septic systems are located along Little Goose Creek from just downstream of the Powder Horn development to just south of the airport. In addition, the area around Big Horn revealed similar higher densities. Along Big Goose Creek, higher densities are seen in rural subdivisions approximately 5 miles west of Sheridan as well as the area to the southeast of Kendrick Golf Course.

Within the Little Goose drainage, the higher septic system density appears to generally correlate with the creek impairment. This correlation is less defined in other areas of the watershed, suggesting other sources may be contributing to creek impairment.

*2.3.2 Developed Parcels* – A developed parcels layer was generated so that a general idea of development density may be obtained. The amount of developed land within the study area encompasses approximately 66,000 acres, or 46% of the total 142,000 acres within the study area. There are 2,044 developed parcels of 3,270 total within the study area, excluding parcels within Sheridan's corporate limits.

*2.3.3 Undeveloped Parcels* – The amount of undeveloped land within the study boundary equates to approximately 76,000 acres, or 53% of the available parcels within the study area. There are 1,226 undeveloped parcels of 3,270 total within the study area, excluding parcels within Sheridan's corporate limits.

*2.3.4 Sanitary Sewer Capacity* – This layer was developed for the draft City of Sheridan Wastewater Collection System Assessment completed in January 2006. The majority of the sewer lines at or over capacity are located on the western side of Sheridan.

This layer also includes a possible revised Sewer Service Boundary anticipated to be included in the finalized Wastewater Collection System Assessment. This boundary extends into the watershed, indicating interest in extending infrastructure and land use planning boundaries.

*Data Limitations:*

- This dataset is based on ongoing modeling conducted for the City of Sheridan and is subject to revision.

## 2.4 Aquifer Sensitivity Data

In 1992 a mapping project entitled the "Wyoming Ground Water Vulnerability Assessment", was undertaken by the Wyoming Department of Environmental Quality's Water Quality Division, the University of Wyoming's Water Resources Center, the Wyoming State Geological Survey, the Wyoming Department of Agriculture, and the US Environmental Protection Agency. The project's goal was to develop a digital GIS-based map that could assess the state's relative groundwater sensitivity and vulnerability to contaminants that may be introduced at some location above the uppermost aquifer.

For the purposes of this study, the aquifer sensitivity data and contributing layers were utilized. This information is beneficial to the study as it identifies areas where groundwater is more sensitive to contamination.

The following aquifer sensitivity layers were used for this study:

*2.4.1 Depth to Initial Groundwater* – This layer describes depth to first groundwater from the State Engineer's Office well permits.
*2.4.2 Geohydrologic Setting* – This refers to the characteristics of the aquifer and is based on aquifer media and hydraulic conductivity.
*2.4.3 Soils* –The soils layer was developed using five soil-forming factors: soil parent material, climate, biota, topography, and time. This layer was compiled based on digital surficial geology, bedrock geology, and elevation.
*2.4.4 Aquifer Recharge* – Aquifer recharge refers to the amount of water that infiltrates the soil and percolates through the unsaturated material into the groundwater. Factors affecting recharge include precipitation, sand and rock content of the soil, and seasonal patterns such as snowmelt runoff.
*2.4.5 Land Surface Slope* –This dataset represents land slope calculated from the USGS 3-arc-second digital elevation model (DEM).
*2.4.6 Vadose Zone* – The vadose zone is the unsaturated zone above the water table and below the ground. This dataset describes the vadose zone media in terms of how easily contaminants can move through it.

*2.4.7 Aquifer Sensitivity* – "Aquifer sensitivity refers to the relative ease with which a contaminant applied on or near the land surface can migrate to the aquifer, based solely upon hydrogeologic factors." This layer was created using the six sensitivity rating layers described above.

## 2.5 Designation of Impact Zones

Using the aquifer sensitivity classes described above, Impact Zones were delineated within the study area. The Impact Zone designations are intended to provide a key map which shows areas in which alternative systems might be appropriate.

For example, if a parcel proposed for development or septic replacement falls within either the Critical Impact Zone, High Impact Zone or the Medium Impact Zone, extensive site investigations should be required. From the information gained in the site investigation, the designer can select an appropriate septic technology. The specific alternative technologies are discussed later in this report. If a proposed septic system installation or replacement falls in the Regular Impact Zone, a conventional system installation should be adequate. The Impact Zones simply direct the determination of whether an alternative system should be considered.

*Designation Criteria:*

- The five sensitivity classes determined in the Ground Water Vulnerability Assessment were designated into four Impact Zones for this study. High sensitivity = High Impact. Medium-high sensitivity = Medium Impact. Medium, Medium-low and Low sensitivity areas = Regular Impact for septic system impacts.
- A Critical Impact Zone was designated for Big Horn and its surrounding area. All of this area falls within the High Groundwater Sensitivity Class and due to its high density of development, it warrants a greater level of care regarding onsite wastewater management.
- A fifth Impact Zone of "SS" was designated for parcels that can be connected to an existing central sewer system. For the City of Sheridan, if sanitary sewer is available within 400 feet of a parcel boundary, it is assumed the parcel can be connected to the sewer. The entire platted boundary of the Powder Horn was designated as the "SS" Impact Zone.
- The Impact Zones are mapped according to parcel boundary. If a parcel is split by a sensitivity class, the sensitivity class encompassing the greatest area of the parcel was used to designate the Impact Zone.

The figure at the end of this summary illustrates the Impact Zones determined for this study.

# 3.0 PHASE II – ASSESS OPTIONS TO MITIGATE SEPTIC-RELATED IMPACTS

## 3.1 Introduction

A primary purpose of enhanced wastewater management is to preserve the environment and protect public health.

### *3.1.1 Benefits of Alternative Technology Evaluation*

The benefits of analyzing alternative sewage facilities include:

- Comply with the Goose Creek Watershed Management Plan and avoid more stringent regulation by the WDEQ.
- Upgrade the level of sewage treatment throughout this most populated area of Sheridan County.
- Provide sewage treatment methods that can accommodate growth and increased density of homes in the Big and Little Goose valleys.
- Encourage extension of central sewage collection facilities.
- Provide alternative methods of onsite treatment that are superior to conventional systems.

### *3.1.2 Jurisdictional Oversight*

Depending on the project, the City, County or WDEQ may be involved in the review and approval of designs. Once constructed, it is the responsibility of the owner of the system to provide proper operation and maintenance and keeping the system in good working order.

Compliance with local plans and planning processes is an important consideration. While proper sewage treatment is a critical component to managing growth in the Goose Creek Watershed, it should not be the primary factor. Overall land use planning should control development.

### *3.1.3 Systems Considered*

The “conventional onsite sewage system” is a septic tank followed by a drainfield that is gravity-fed. This is the most common onsite system in Sheridan County for homes that are not connected to a central system.

Alternative systems that are considered in this report are:

- City of Sheridan sewer system expansion;
- Regional central sewer system, including cluster systems;
- Alternative collection systems (for a central sewer system); and
- Alternative onsite systems.

The following related matters are also discussed:

- Design requirements for proposed system;
- Requirements for the site investigation;
- Construction requirements; and
- Management and operational requirements.

## 3.2 Alternative Central Systems

### *3.2.1 City of Sheridan Sewer System Expansion*

The City has an extensive evaluation of its sewer collection system underway which includes a master plan for possible extension of the system. The City has tentatively established a new Sewer Service Boundary, but work is still underway on this master plan.

*Regional Central Sewer System*
An alternative to the extension of City sewer is to create a separate sewer system with its own treatment plant. This is not proposed in the Big Goose valley, but may be feasible in the Little Goose valley which has larger population and higher density. Such a system would need to be owned and operated by a public entity such as the County, joint powers board or a sewer district.

A likely service area includes Big Horn and developments such as the Powder Horn, McNally, Meadowlark Meadows, Knode Ranch and Big Horn Ranch. Currently the Powder Horn provides a central sewer system and extended aeration package treatment plant. They are interested in studying the idea of a regional sewer system.

*3.2.2 Cluster Systems*
Central sewer systems on a smaller scale are “cluster” systems or “decentralized” systems. These systems serve one or adjoining developments. The system consists of a central collection system and a treatment unit such as an extended aeration package plant, or a larger variation of the onsite systems discussed in this report.

The feasibility of using cluster systems should be included in any overall master planning effort for providing central sewer service within the study area.

*3.2.4 Permitting Considerations for Additional Central Systems*
There does not appear to be any increased difficulty in obtaining discharge permits for these creeks due to their impairment status.

## 3.3 Alternative Collection Systems

*3.3.1 Conventional Collection Systems*
A conventional sewer collection system is designed to carry raw sewage from all types of users connecting to the sewer system. Conventional gravity sewer collection systems are relatively expensive because of the need to lay lines to grade. Conventional systems typically work well within a city or a densely populated area. Less densely populated areas typically require that alternative systems be considered, due to the cost.

*3.3.2 Septic Tank Effluent Collection Systems*
Septic tank effluent collection systems receive septic tank effluent (also called greywater).

There are two types of septic tank effluent collection systems:
- Septic tank effluent gravity systems (STEG)
- Septic tank effluent pumping systems (STEP)

The STEG system works using gravity flow and the STEP system requires pumping.

### *3.3.3 Vacuum Sewer Collection Systems*

Vacuum sewer collection systems are newer technology, but have been used throughout the country and in Europe for many years. Vacuum sewer collection systems utilize a vacuum to transport the sewage through the pipes and bring it to a point where it can be delivered to a receiving interceptor.

Since vacuum sewers are newer to this area, owners of several vacuum sewers were contacted. All of the contacts were pleased with their systems and had installed multiple neighborhood vacuum systems because of their positive experiences with their initial installation. Vacuum sewers were used in these communities due to:

- high groundwater;
- shallow bedrock;
- close proximity to lakes; and
- the need to minimize trenching.

## 3.4 Alternative Onsite Systems

Several types of onsite, single-user sewage treatment and disposal systems are described.

Onsite systems should not be used when connection to a central system is an option. If the new sewer service is within 400 feet of a central sewer system, or falls within the SS Zone as defined in this study, connection should be made to that system.

The applicability of various alternative systems for specific sites or to address specific problems is summarized in the following table.

## Applicability of Alternative Onsite Septic Systems

| | Soil Permeability | | | Depth to Bedrock | | | Depth to Water | | Steeper Slope[6] | Small Lot Size[7] |
|---|---|---|---|---|---|---|---|---|---|---|
| | Too Slow | Moderate | Too Fast | Shallow | Fractural | Deep | Shallow | Deep | | |
| Alternative Treatment Systems[1] | | | | | | | | | | |
| Anaerobic Tank | P | P | | P | | P | P | P | P | P |
| Aerobic Tank | P | P | P | P | P | P | P | P | P | P |
| Alternative Effluent Disposal[2] | | | | | | | | | | |
| Conventional Drainfields | | P | | | | P | | P | P | |
| Alternating Drainfields[3] | | P | | | | P | | P | P | |
| Gravelless Drainfields | | P | | | | P | | P | P | P |
| Sand-lined Drainfields | P | P | P | | P | P | | P | | |
| Dosed Drainfields[3] | | P | | | | P | | P | P | |
| Mounds | P | P | P | P | P | P | P | P | | P |
| Evapotranspiration[4] | P | P | P | P | P | P | P | P | P | P |
| Sand Filters | P | P | P | P | P | P | P | P | P | P |
| Wetlands/Lagoons | P | P | | | | P | | P | | |
| Land Application[5] | P | P | P | P | P | P | P | P | P | |

1. Generally, either of these treatment systems are applicable, however aerobic can provide superior treatment and for some effluent disposal systems such as wetlands/lagoon it is the best choice.
2. Assume these systems will follow one of the above treatment systems.
3. Similar to Conventional, but over the long term will provide improved treatment.
4. These systems can be lined or unlined. Lined systems are required if effluent cannot also move downward.
5. May need other treatment ahead, such as sand filters.
6. Greater than about 7%.
7. Less than 2 acres.

### *3.4.1 Alternative Treatment Methods*

A conventional septic tank removes solids from the waste stream and initiates biological treatment, providing secondary treatment. The process is anaerobic, i.e. no oxygen in the system. Effluent from a conventional septic tank flows by gravity to a drainfield or leach field.

Aerobic Treatment. Aerobic treatment units may be used in lieu of septic tanks. They can provide better treatment than conventional septic tanks, but are still considered secondary treatment. They may discharge into drainfields or alternative absorption beds.

Pumping Systems. Effluent from the treatment unit may need to be pumped to the disposal location. Pumping should only occur after wastewater is treated in either a septic tank or aerobic treatment unit.

### *3.4.2 Alternative Septic Tank Effluent Disposal Methods*

There are several alternatives to the standard drainfield method of disposing of septic tank effluent. These include:

Alternating Drainfields. Alternating drainfields consist of two drainfields following the septic tank. Effluent is switched back and forth between the fields.

Gravelless Drainfields. Chamber units, sometimes called infiltrators, may reduce the absorption area, or be more conducive to construction on certain sites.

Sand-lined Absorption Trenches. Where percolation rates are faster than 5 minutes per inch, a sand-lined absorption trench may be used to provide additional filtration.

Dosed Drainfields. A dosed drainfield uses either a pump or a siphon to dose the drainfield, in lieu of the trickle flow that a drainfield typically receives with the conventional gravity design.

Mounds. Mound systems may be used where a disposal system is needed to provide separation to groundwater or bedrock, or because of soils with percolation rates greater than 60 minutes/inch.

Evapotranspiration Units. Evapotranspiration units may be used in areas of high groundwater, bedrock, and fast percolating soils. An evapotranspiration unit has its absorption bed exposed to the atmosphere and is designed for vegetative growth on the bed material.

Sand Filters. Sand filters can be used when onsite conditions require added filtration media. This need for added filtration may be due to groundwater, bedrock or poor soils; or the need to provide improved treatment over a conventional onsite system.

Wetlands or Rock Beds. Wetlands or rock beds shall be on property that is large enough so odors or other nuisances do not impact neighboring property. Wetlands or rock beds should be designed to encourage wetland-type vegetation to aid in the treatment process.

Small Lagoons. Ponds may be used where property is large enough to prevent odors from affecting neighboring properties. They may only be used following secondary treatment.

Advanced or Experimental Systems. More advanced systems such as synthetic media filters may be appropriate for a particular site. Another promising system is the fixed media processes that support a biomass on the surface of the media.

Land Application. The application of treated effluent to the land, such as for irrigation, is allowed by the Wyoming DEQ.

## 3.5 Design Requirements

Currently, the DEQ and County programs do not provide design criteria or permitting processes for a few of the alternative technologies appropriate for the Goose Creek Watershed. Updating the relevant programs to accommodate alternative technologies is advisable if effective use of alternatives is to occur.

An application to construct an alternative system should include the following:

- Design Report
- Design drawings and specifications signed by a professional engineer.
- Completed application for the review and approval of the system.

The Design Report should include the following:

- The type of facility and wastewater design flows.
- Type of wastewater if different from typical domestic.
- Ownership of land and treatment facility.
- Location address and legal description.
- Size of lot.
- Status of the approval of the creation of the lot or subdivision.
- Type of water supply.
- Results of site investigation, including:
  - Data on groundwater and surface water (including seasonal variations);
  - Data on bedrock or impermeable soils;
  - Soils data – a soils profile, testing results of the soil type and texture, percolation tests, design loading rate;
  - Description of irrigation practices and data on groundwater levels;
  - Logs of nearby wells and onsite subsurface explorations;
  - Map showing natural features, topography and proposed improvements; and
  - Pictures of the site.
- Overview of system components.
- Size of treatment facilities, including all design calculations.
- Summarize the design objectives.
- Discuss the need for special treatment or pretreatment facilities, such as grease traps or disinfection of effluent.

- Recommended operation and maintenance practices.
- Identify a future replacement system.
- Signed seal of the professional engineer.

## 3.6 Site Investigation

A detailed investigation is appropriate for alternative systems because they require a high level of design detail. Investigations for systems in areas that lie within the Critical, High or Medium Impact Zones as defined in this report should provide a site investigation according to the list provided below. Then, an appropriate alternative technology can be selected if determined appropriate.

- Initial reconnaissance site investigation.
- Surveying and site mapping. Show:
  - Property lines.
  - Contours, slopes and how the site drains.
  - Surface waters on or within 50 feet of site.
  - Onsite buildings and improvements (both proposed and existing).
  - Adjacent development, utilities, buildings, treatment facilities, etc.
  - Wells and water lines.
  - Irrigation or drainage ditches.
  - Rock outcroppings or other geological features.
  - Roads, parking areas and any impervious surfaces.
  - Underground utilities that may conflict with the system.
  - Flood plains, wetlands or riparian protection areas.
  - Any setback requirements.
  - Potential sites for the treatment system, and replacement area.
  - Benchmark for subsequent surveys.
  - Include north arrow, scale and proximity to readily known location.
- Soils investigation
  - Test pit at the proposed disposal site at least 4 feet below the bottom of the drainfield or 8 feet deep, which ever is greater. Describe the types of soil, including color, structure and texture.
  - For alternative systems, depth to and type of bedrock should be determined either by drilling or deeper excavation of a test pit. Groundwater levels should be monitored over a period of time by use of a piezometer rather than by just a single reading from a test pit. Soil profiles should be determined by a qualified geotechnical engineer, soil scientist, or geologist.
  - Permanent groundwater monitoring wells should be required in the Critical Impact Zone.
  - Determine seasonal depths to groundwater.
  - Percolation tests per County or DEQ regulations.
- Pictures of the site investigation operations and soil profile. Also obtain an aerial photo of the site.

## 3.7 Construction and Post-construction Requirements

Construction and post-construction requirements might include:

- Inspection to verify construction complies with the design.
- Preparing record ("as-built") drawings following construction.
- Keeping the permitting authority involved in construction.

- Providing documentation of the completed construction project.
- Providing the record drawings, design report, and operation and maintenance procedures to the owner.

Sheridan County should establish a licensing program for installers and servicers of onsite systems. The licensing program should include:

- Education on regulations, alternative system technology, installation, operation and repair.
- A test.
- A certification and license for the contractor that can be withdrawn.
- Bonding and insurance requirements.
- Periodic renewal requirements such as education or retest.

## 3.8 Program Management

To upgrade the quality of onsite septic systems in the Goose Creek Watershed, the County's involvement in management must also be upgraded. Five possible management models are outlined below.

"Homeowner Awareness" applies where treatment systems are owned and operated by individual property owners and is adequate where treatment technologies are limited to conventional systems. The regulatory authority mails maintenance reminders to owners at appropriate intervals.

"Maintenance Contracts" apply where more complex designs are employed to treat wastewater. Because of treatment complexity, contracts with qualified technicians are needed to ensure proper and timely maintenance.

"Operating Permits" are necessary where sustained performance of a system is critical to protect public health and water quality. Operating permits are issued to the owner and are renewable if the owner demonstrates compliance with the conditions of the permit.

"Entity Operation and Maintenance" applies where highly reliable operation and maintenance of decentralized systems is required to ensure water resource protection. Under this model, the operating permit is issued to an entity instead of the property owner to provide assurance that maintenance is performed.

"Entity Ownership" is for treatment systems owned, operated, and maintained by an entity, which removes the property owner from responsibility for the system. This program is analogous to central sewerage and provides the greatest assurance of system performance.

A Management Model should be selected and implemented by the County that is consistent with an updated permitting program, as previously recommended. Since this study identifies much of the Goose Creek Watershed as High Impact Zones from conventional septic systems, "Homeowner's Awareness" is probably not adequate. A higher level of management is justified.

# 4.0 CONCLUSIONS AND RECOMMENDATIONS

The groundwater sensitivity mapping shows a considerable area within the Goose Creek Watershed is at high risk to impact groundwater from surface uses. With the documented impairment of the creeks within the Goose Creek Watershed, it is only sensible to improve conditions which could potentially impact groundwater.

In addition, current development density and the potential for additional development in the watershed indicate a high level of care regarding wastewater management is appropriate. The following recommendations.

4.1 Continue implementing programs outlined in the Goose Creek Watershed Management Plan. Based on evaluation of the fecal coliform data, it appears other sources are impacting the creeks in the watershed. Efforts to control and improve the quality of sources such as stormwater discharges, irrigation return flows, over-population of wildlife and livestock management practices are critical to successful mitigation of impacts to the watershed.

4.2 Sheridan County should consider updating the current septic permitting program. With current increased development pressure and a need to implement alternative septic technologies, it may be time to update the program.

The current program struggles to maintain adequate staffing to fulfill all program requirements. For certain, an updated program would require a commitment of additional personnel to establish and administer the program.

4.3 Sheridan County should consider establishing a licensing program for septic system installers and pumpers.

4.4 Sheridan County should select an appropriate Management Program. Management Programs vary from providing landowner information, to the permitting authority assuming ownership of septic system maintenance. A Management Program should be selected that is appropriate for the high level of sophistication of alternative technologies. An appropriate Management Program will require a commitment of additional personnel.

4.5 Initiate a Regional Sewer Master Plan for the Little Goose Drainage.

4.6 The City of Sheridan should continue wastewater collection and treatment master planning and plan implementation.