GALLATIN GATEWAY
COUNTY WATER & SEWER DISTRICT

Preliminary Engineering Report
Wastewater System Improvements

April 2010

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1.0 EXECUTIVE SUMMARY

1.1 Introduction and Background

The community of Gallatin Gateway reached a point during a period of accelerated growth in Gallatin County to embark on a planning effort to ensure their community would grow in a reasonable and prudent manner. The neighborhood planning process brought the need for a centralized wastewater system to the forefront. The citizens became more aware of their water quality problems and the potential health hazards they faced with older congested onsite septic systems. Gallatin Gateway could not meet the goals of their community plan, especially in their designated community core area, without a municipal wastewater treatment facility. Thereby, the Gallatin Gateway County Water and Sewer District (District) was established, and soon thereafter sought the assistance of Great West Engineering, Inc. to help move forward toward building a community wastewater treatment system.

1.2 Problem Definition

Gallatin Gateway is an unincorporated community that for the most part was built prior to the establishment of Health Department regulations in 1966, thus many individual septic disposal systems do not comply with current regulations. The majority of these systems are cesspools, seepage pits or metal septic tank with drainfields that have either failed, or have a high potential of failing in the near future. The soils in this particular area consist of coarse grained sands and gravels, so when a system fails, there is an increasingly high probability of quickly contaminating the groundwater and water supply wells. This situation creates a public health hazard for the community and warrants the need for a centralized wastewater collection and treatment system. Without this type of system in place, the local residents face a serious health risk. Section 4.1 of this report documents an illness due to well contamination of close proximity of a failing septic system. Additionally, the Gallatin County Board of Health will not allow the construction of new homes or businesses in the area unless the proposed septic systems can meet all the required regulations. The end result is a moratorium on new construction, and a very difficult dilemma for the health officials when pre-dated septic systems fail.

1.3 Alternatives Considered

The alternative screening process considered numerous alternatives aimed at resolving the problems faced by the community of Gallatin Gateway to ensure that the best possible solution was not overlooked. After an initial evaluation, it was determined that several of the potential alternatives were not viable options for Gallatin Gateway and were eliminated from further review. Climate and project feasibility were the primary reasons for the initial eliminations. Alternatives that were considered for a more detailed review include:

Collection System

→ Alternative CS-1: Gravity Collection – Street Layout

→ Alternative CS-2: Gravity Collection – Alley Layout

Lift Station

→ Alternative L-1: Single Centralized Lift Station

Treatment System

→ Alternative T-1: No Action Alternative

→ Alternative T-2: Connection to Utility Solutions Wastewater Treatment Plant

→ Alternative T-3: Storage and Irrigation (Low Rate Land Application)

→ Alternative T-4: Septic Tank / Level 2 Treatment / Pressure Dosed Drainfield

→ Alternative T-5: Biological Nutrient Removal (BNR) Mechanical Treatment Plant

Site Selection

→ Alternative S-1: West of Highway 191

→ Alternative S-2: East of Highway 191

→ Alternative S-3: Utility Solutions Facility

1.4 Preferred Alternative

Each of the alternatives presented above in Section 1.3 were analyzed in detail. A decision matrix was developed to compare alternatives and help select a preferred alternative. The decision matrix included environmental impacts, technical feasibility, 20-year life cycle costs, public health and safety, operation and maintenance, and public opinion. A public meeting was held by the District board, and Great West Engineering presented the preliminary engineering report to the public in order to get their opinion and support of the project.

Based upon the results of the decision matrix, the preferred alternative was determined to include:

→ Alternative CS-2: Gravity Collection System – Alley layout

→ Alternative L-1: Single Centralized Lift Station – Packaged Submersible

→ Alternative T-4: Septic Tank / Level 2 Treatment / Pressure Dosed Drainfield

→ Alternative S-2: East of Highway 191

Alternative CS-2 includes the installation of collection system infrastructure primarily in the alley ways of the town grid. The majority of the existing septic systems are located in the back of the lots, so the new service line construction will have less impact, and be more feasible to reconnect to the central system.

Alternative L-1 includes installation of a new centralized raw sewage lift station located in the far northwest corner of the District near the river, which is the low point of the system. The entire service area consistently slopes to the northwest, allowing for a single lift station design. After evaluating different types of lift stations, a packaged submersible type was selected.

Alternative T-4 consists of a centralized septic tank, level 2 treatment system (AdvanTex), and discharge to groundwater via a pressure dosed drainfield (subsurface infiltration galleries). This type of treatment system is relatively new technology; however, there is plenty of data available to support the effectiveness of the treatment. Disposal to groundwater works well given the soils found in this region, and the ability to incrementally expand this system as needed in the future gives support in making this a good alternative for Gallatin Gateway.

Alternative S-2 consists of the suitable sites east of highway 191. Three general areas have been identified as potential treatment and disposal sites. This alternative was selected primarily because of the nondegradation requirements of the selected treatment and disposal alternative.

1.5 Project Costs and Budget

The total estimated capital cost for the preferred alternative is $4,315,000 with an annual operations and maintenance cost of $32,000. This includes construction of the collection system, lift station, treatment and disposal systems, land acquisition, financing, engineering, and administration costs. A detailed line-item breakdown of these costs can be found in Tables 9.6.1A, 9.6.1B and 9.6.2.

Various funding scenarios were considered with a variety of grant and low interest loan sources available to the District. The recommended funding strategy includes grant funds from the Treasure State Endowment Program (TSEP), the Department of Natural Resources and Conservation (DNRC), the Community Development Block Grant (CDBG), as well as STAG/WRDA grants. Additional project funding would be through the Rural Development (RD) grant and loan program. Table 10.1.2A in Section 10 presents the proposed funding strategy and Table 10.1.2C presents a detailed breakdown of the proposed funding strategy with user rates.

The overall funding strategy is anticipated to consist of a property tax component levied on all benefitted properties plus a monthly fee levied on system users. The property tax component would vary from parcel to parcel depending upon the taxable value and the size and/or type of the parcel. For the smallest users in the District, equivalent monthly rates would range from $46.97 to $123.55 depending upon funding scenario and tax allocation. Of this equivalent monthly rate, $25.64 is attributable to O&M and would be charged as rates and fees. The remainder is attributable to debt service and would be assessed as tax. Small non-users would pay equivalent monthly rates from $21.33 to $97.92. Non-users rates do not include O&M charges. Larger users would be allocated a larger portion of the O&M costs while larger or more valuable properties would be allocated a larger portion of the debt service. Table 10.1.2C in Section 10 further summarizes projected tax assessment amounts.

2.0 INTRODUCTION AND PROBLEM DEFINITION

This Preliminary Engineering Report (PER) investigates and addresses wastewater collection, treatment, and disposal alternatives that will result in a successful wastewater management system for Gallatin Gateway. The PER is being prepared under the direction and approval of the Gallatin Gateway County Water and Sewer District (District) and in accordance with the Montana Department of Environmental Quality's (MDEQ) design requirements and regulations.

Criteria for wastewater PER's have previously been established by the United States Environmental Protection Agency (EPA) as part of the Federal Water Pollution Control Act of 1972 (PL 92-500) and the amendments of 1977 (PL 95-217), 1981 (PL 97-117), and 1987 (CWA Section 319). The purpose of this act is to establish a comprehensive approach to maintain and enhance the quality of the nation's water resources. The Act established the basic structure for regulating discharges of pollutants into the waters of the United States. It gave the EPA authority to implement pollution control programs such as setting industry standards for wastewater. The Clean Water Act also continued requirements for setting water quality standards for all contaminants in surface waters. The Act made it unlawful for any person to discharge any pollutant from a point source into navigable waters, unless a permit was obtained under its provisions. The emphasis of the EPA in implementing this act is to maximize the effectiveness of actions taken in restoring water resources to acceptable quality. This PER meets the EPA criteria for wastewater facility plans.

The Act originally provided for a three-step program of grants for the construction of improvements to public-owned treatment works. The development of a PER was Step 1 of the original three-step process. Step 2 involved the engineering design of the improvements, and Step 3 encompassed the actual construction of the recommended improvements. As amended in 1987, the act no longer provides grants for the design and construction of projects but does provide for low-interest loans through the State Revolving Fund Loan (SRF). The SRF Program in Montana is administered by the Montana Department of Environmental Quality (DEQ) and the Montana Department of Natural Resources and Conservation (DNRC).

Design and construction may still receive grants through other federal and state programs such as the Department of Commerce's Treasure State Endowment Program (TSEP) and the Community Development Block Grant Program (CDBG), the Rural Development Grant and Loan Program (RD), the Department of Natural Resources (DNRC) Resource Development Program, and low-interest loans are also available through the previously mentioned RD program and the Montana Department of Environmental Quality's SRF program.

The Act mandates alternative wastewater management technologies be evaluated to ensure that the most cost-effective alternative is implemented. An integral part of this PER, is the development, consideration and cost-effectiveness of alternatives. The PER includes an analysis of those alternatives considered to be technologically feasible and politically acceptable to the District and community of Gallatin Gateway.

State and federal funding agencies that are members of the Water, Wastewater and Solid Waste Action Coordination Team (W_2ASACT) have adopted the Uniform Preliminary Engineering Report for Montana Public Facility Projects. Members of W_2ASACT include CDBG, TSEP, RD, SRF, INTERCAP, and DNRC funding programs. Preliminary Engineering Report (PER) requirements must be met by communities that are planning on using any of these funding agencies. Following the standard PER criteria and report format is a condition of all planning and construction grant funds that may be received from TSEP, CDBG, DNRC, and RD as well as the SRF loan program.

This PER meets the requirements of the Preliminary Engineering Report Outline and other applicable requirements of W_2ASACT and has been authorized by the Gallatin Gateway County Water and Sewer District. The District is utilizing TSEP and DNRC Technical Assistance Grants, funding from the Gallatin County Planning Department, and funds raised by the *Sewer Fest* fundraiser organized by the District to fund the PER. The District also retained Great West Engineering, Inc. to complete the PER. The firm is responsible for preparing the Wastewater Preliminary Engineering Report in accordance with state and federal guidelines.

The scope of this PER is to evaluate the effectiveness of the existing treatment and collection systems; review existing reports and collect data to identify and document problems; evaluate alternatives for the correction of such problems; select a recommended plan of improvements; and outline an implementation strategy. Recommended improvements are addressed so they meet the conditions forecasted over the 20-year planning period. This plan is intended to result in the most cost-effective and environmentally sound wastewater management system appropriate for the District.

2.1 Planning Area and Existing/Potential Service Area

The wastewater planning area is shown in Figure 2.1, and includes the current District boundary and adjacent property suitable for future expansion and annexation. The planning area boundary is the result of logical and geographical boundaries, as well as planning areas defined by the Gallatin Gateway Community Plan. A copy of the Community Plan is located in Appendix U. Since the area inside the District boundary includes several vacant lots, it is assumed that most of the initial growth will occur inside the District, and this expanded planning area is more likely to grow near-term.

2.2 Location

Gallatin Gateway is located in the central part of Gallatin County in southwestern Montana. The nearest large city is Bozeman, which lies roughly nine miles to the northeast. Gallatin Gateway is situated along US Highway 191 six miles south of Four Corners, Montana, and is adjacent to the Gallatin River. More specifically, the town is located at:

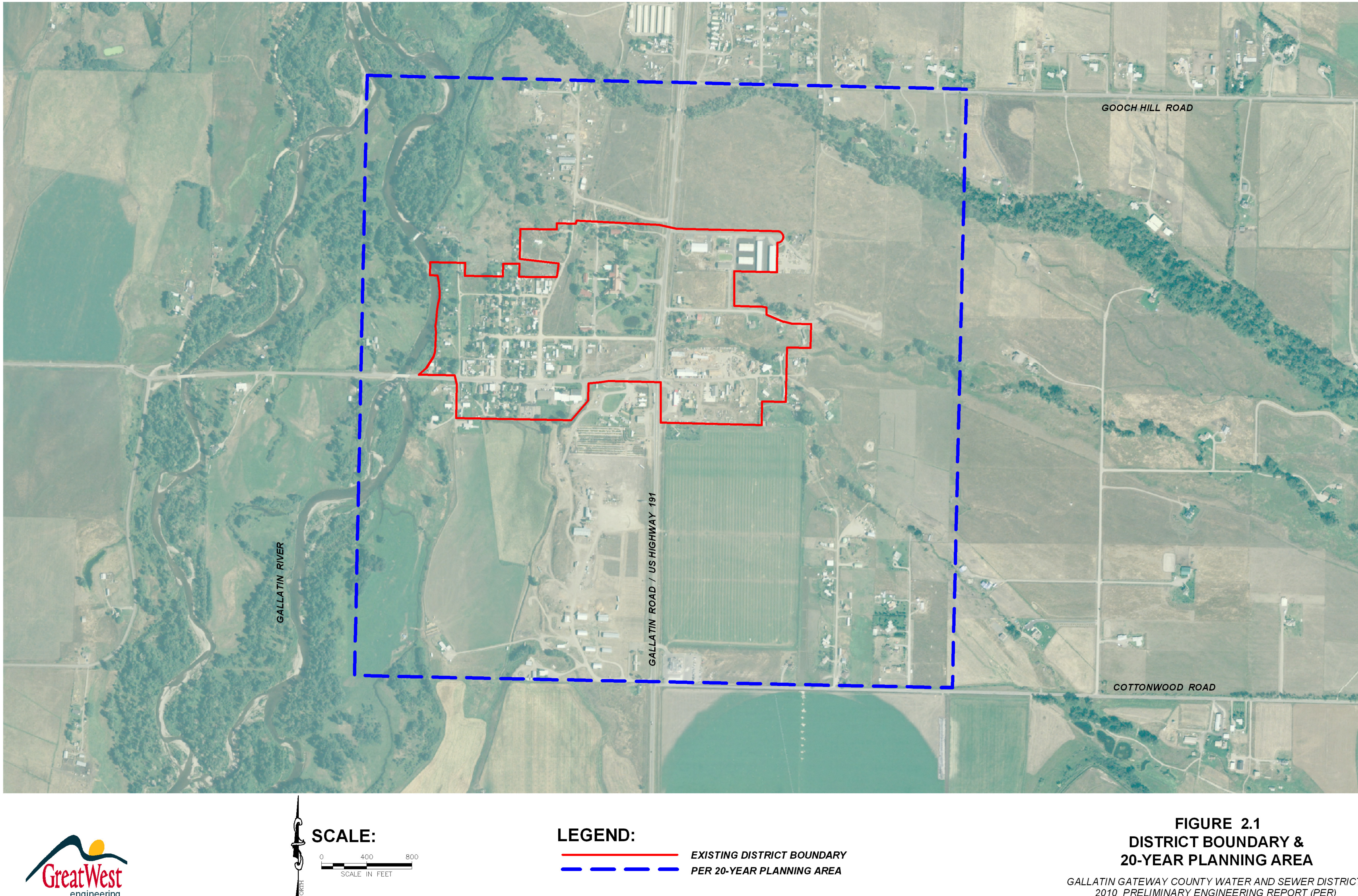

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FIGURE 2.1
DISTRICT BOUNDARY &
20-YEAR PLANNING AREA

GALLATIN GATEWAY COUNTY WATER AND SEWER DISTRICT
2010 PRELIMINARY ENGINEERING REPORT (PER)

C:\Documents and Settings\rfilbach\Desktop\CADD 1-08159\Exhibits\PER\1-08159-Fig 2-1 District Boundary.dwg

Elevation	4,950 feet
Latitude/Longitude	45° 35' 31" N latitude and 111° 11' 56" W longitude
Township/Range/Section	Township 3 South, Range 4 East, Section 11
State Plane Coordinates	150584 North and 467484 East

Gallatin Gateway was originally called “Salesville” and was platted in 1883. Although never incorporated as a town, the community features a K-8 school, post office and fire station. The plat is included in Appendix V.

The Gallatin Gateway County Water and Sewer District, and surrounding planning area, encompasses the entire town of Gallatin Gateway. The District is bisected by US Highway 191, with the west half extending to the river and containing mostly low lying ground. Also, the majority of the original town and congested onsite septic systems and wells are also located west of US Highway 191. East of the highway is a bench of higher ground with newer development, and the expected site for the proposed wastewater treatment system.

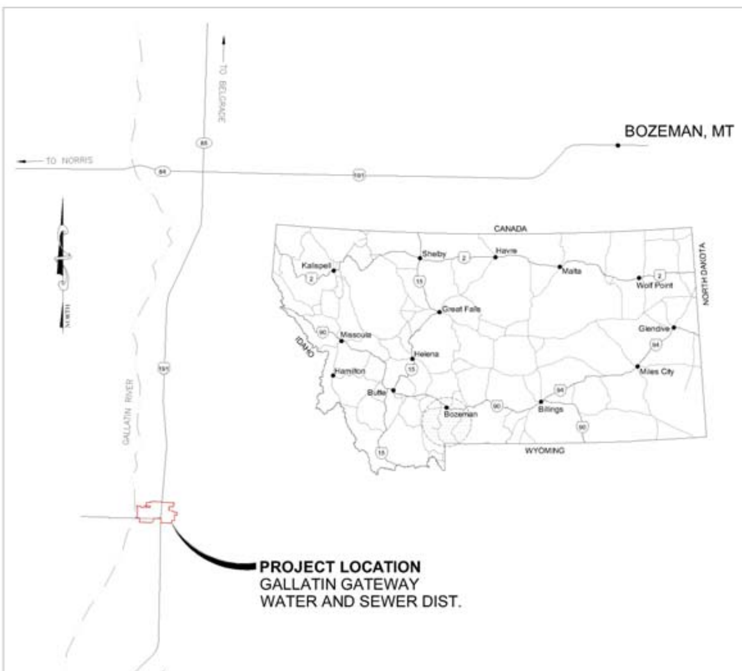

FIGURE 2.2
LOCATION MAP

2.3 Physical Characteristics of the Area

2.3.1 Topography

Gallatin Gateway is located along the Gallatin River in a transitional area from the mountains to the valley floor. The District area is generally flat ground (±2%) with steeper benches stepping down toward the river. The largest step in elevation change is just on the west side of Highway 191, which bisects the District from north to south. There are approximately 75-feet of relief from one end of the District to the other with a relatively consistent slope direction. For these reasons, the topography is conducive for gravity sewer collection systems, which are typically more cost effective to operate than pressurized collection systems. Figures 2.3.1A and 2.3.1B show the USGS quad map and topographical site map respectively.

2.3.2 Area Soils and Geology

Soils information from the subject area was obtained from the United States Department of Agriculture's (USDA) National Resources Conservation Service (NRCS) *Web Soil Survey*[1] online database, and from an independent 2006 study completed by Nicklin Earth & Water, Inc.[2] Soils maps of the area and information on soil characteristics from the *Web Soil Survey* area attached in Appendix A, and the Nicklin Study is attached in Appendix B.

The majority of the soils in the community are part of the Hyalite-Beaverton complex with approximately 70% Hyalite, 20% Beaverton, and the remaining 10% minor components. The setting for these soils is alluvial fans and stream terraces. They are well drained, have moderately high to high saturated hydraulic conductivities, with a depth to limiting layers in excess of seven feet. Typical profiles for both Hyalite and Beaverton consist of a loam (0”-5”), clay/silty-clay loam (6”-20”), very cobbly sandy clay loam (21”-26”), underlain by very cobbly to extremely cobbly loamy sand (27”-60+”). The most distinct difference between the two types is that the Beaverton tends to contain coarser sands with more gravel throughout. These soils are supportive of many different types of septic applications and are not likely to be the limiting factor for wastewater treatment alternatives.

2.3.3 Groundwater

Groundwater research was concluded via Montana's Ground-Water Information Center (GWIC) online data base of well logs[3], and from the 2006 study completed by Nicklin Earth & Water, Inc. Depth to groundwater varies across the District and planning area, but generally gets shallower from east to west. This is typical in areas like this where higher ground steps down toward a river channel. Depth to groundwater is 30 to 40-feet below ground surface on the bench east of the highway, and only 5 to 10-feet below ground surface in the western portion of the District along the Gallatin River. The groundwater flow direction is approximately 24-degrees north of west at a gradient of 0.013 ft/ft. Refer to Appendix B.

Groundwater will likely be encountered during construction of proposed collection system. The amount and elevation of groundwater encountered will be dependent on the time of year that construction takes place and the specific location of the work. Any construction of the proposed wastewater improvements will be planned to avoid encountering groundwater as much as possible. If needed, a detailed geotechnical assessment of the area will be completed prior to design.

2.3.4 Surface Water

Surface water is an important natural resource for Gallatin Gateway. The Gallatin River runs directly adjacent to town. The Gallatin River is used extensively in this area for agricultural

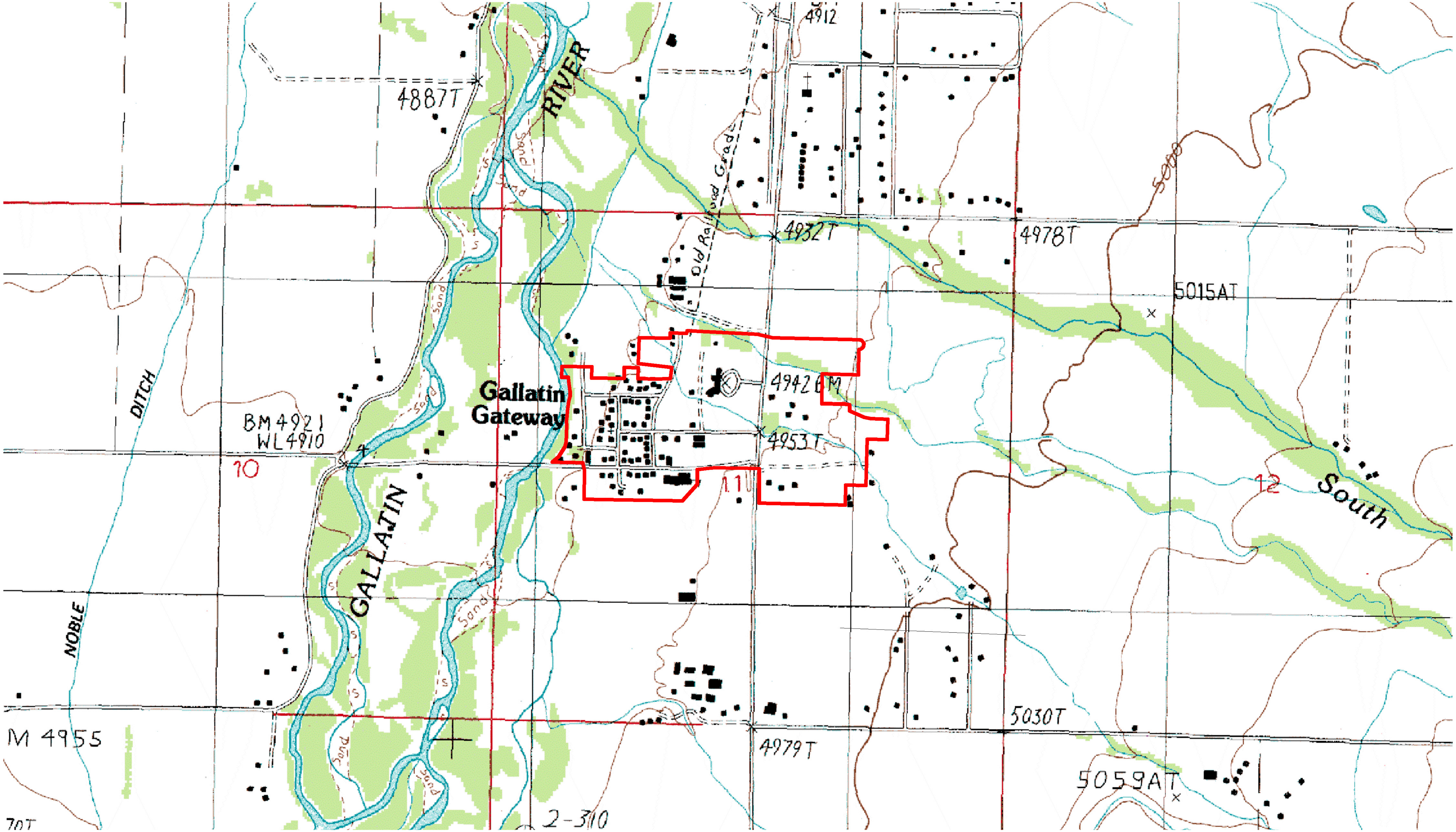

IMAGE SOURCE: USGS 24K SERIES, GALLATIN GATEWAY QUADRANGLE

0 500 1000
SCALE IN FEET

NORTH

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FIGURE 2.3.1A
USGS QUAD MAP

GALLATIN GATEWAY COUNTY WATER AND SEWER DISTRICT
2010 PRELIMINARY ENGINEERING REPORT (PER)

C:\Documents and Settings\rfillbach\Desktop\CADD 1-08159\Exhibits\PER\1-08159-Fig 2-3-1A USGS Quad Map.dwg

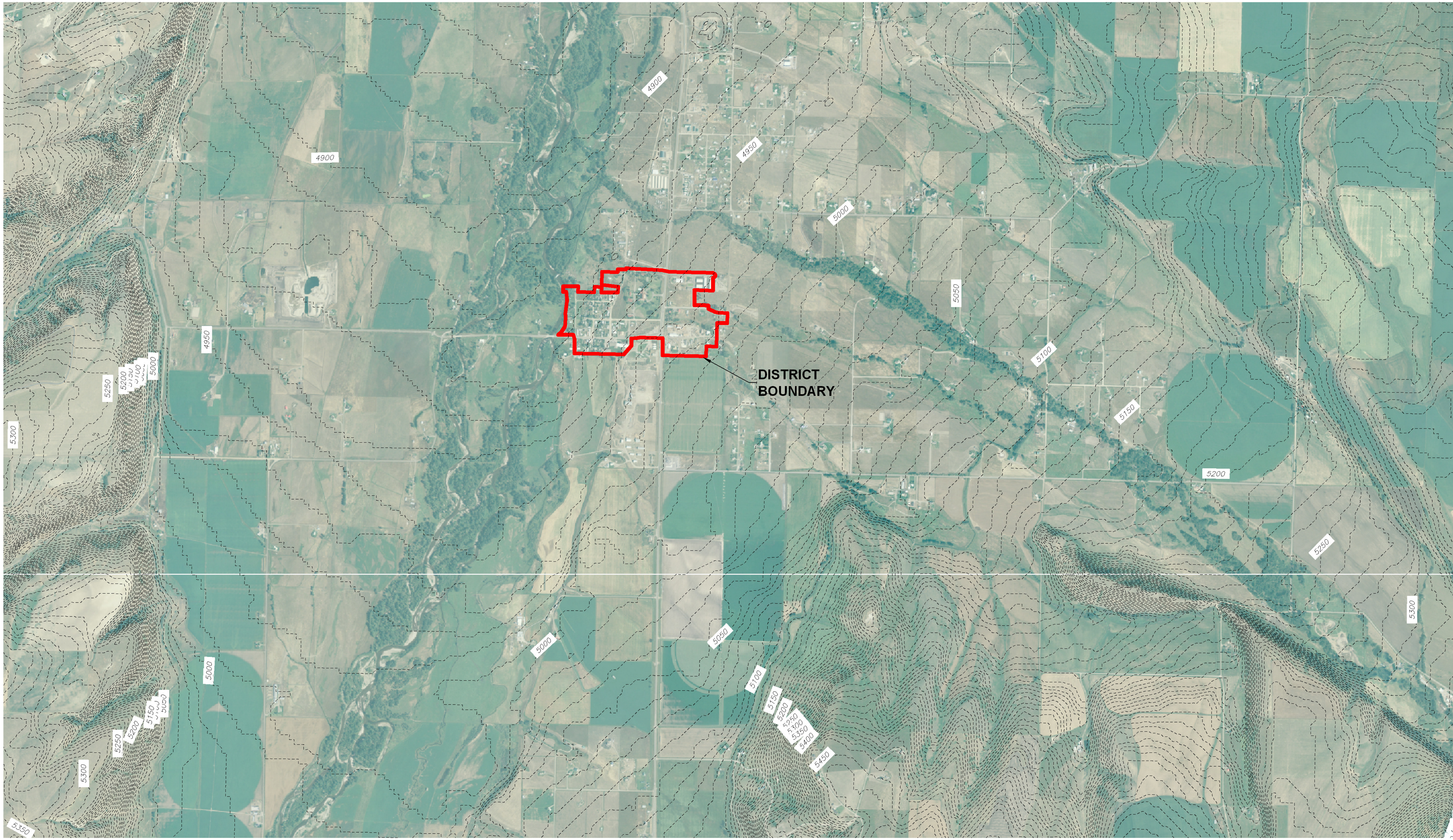


IMAGE SOURCE: USDA NAIP ORTHOPHOTOS, 2005
CONTOUR SOURCE: USGS DEM, 30-METER, 2000

0 1000 2000
SCALE IN FEET

NORTH

FIGURE 2.3.1B
TOPOGRAPHICAL MAP

GALLATIN GATEWAY COUNTY WATER AND SEWER DISTRICT
2010 PRELIMINARY ENGINEERING REPORT (PER)

C:\Documents and Settings\rfillbach\Desktop\CADD 1-08159\Exhibits\PER\1-08159-Fig 2_3_1B Topographical Map.dwg irrigation needs and recreation for both local residents and tourists alike. Other major water bodies within the area include Wortman Creek, which bisects the District flowing to the northwest; South Cottonwood Creek just north of the District also flows to the northwest; and the Farmers Canal, which has a point of diversion from the Gallatin River just north of town. The Farmers Canal conveys large volumes of irrigation water northeast toward Bozeman and is a vital water supply for many farmers in Gallatin County.

Water features are shown on Figure 2.3.4 located on the following page.

Under the Federal Clean Water Act, the DEQ maintains a list of water bodies that fail to meet water quality standards, called the 303(d) list after the section of the act, and develops total maximum daily loads (TMDL's) for water bodies on the list. The TMDL planning area for this section of the Gallatin River is referred to as the *Lower Gallatin* (Refer to Appendix C). At this point in time, the Water Quality Category for this area is 4C – TMDL's are not required and no pollutant-related use impairment is identified. Once established, a TMDL may have a significant impact to a centralized sanitary sewer system discharging to surface water because of high nutrient levels in the effluent discharge. The local water quality district has collected samples along this stretch of the Gallatin River and their testing results can be found in Appendix D.

The 7Q10 flow for the Gallatin River, at Gallatin Gateway (Williams Bridge) was calculated to be 218 cubic feet per second (cfs) or 140.9 million gallons per day (mgd). The 7Q10 flow is defined as the lowest 7-day average flow that occurs (on average) once every 10 years. This calculation of flow is common for dilution calculations, which help determine the viability of a surface water (river) type of discharge. 7Q10 flow calculations are in Appendix E.

2.3.5 Vegetation

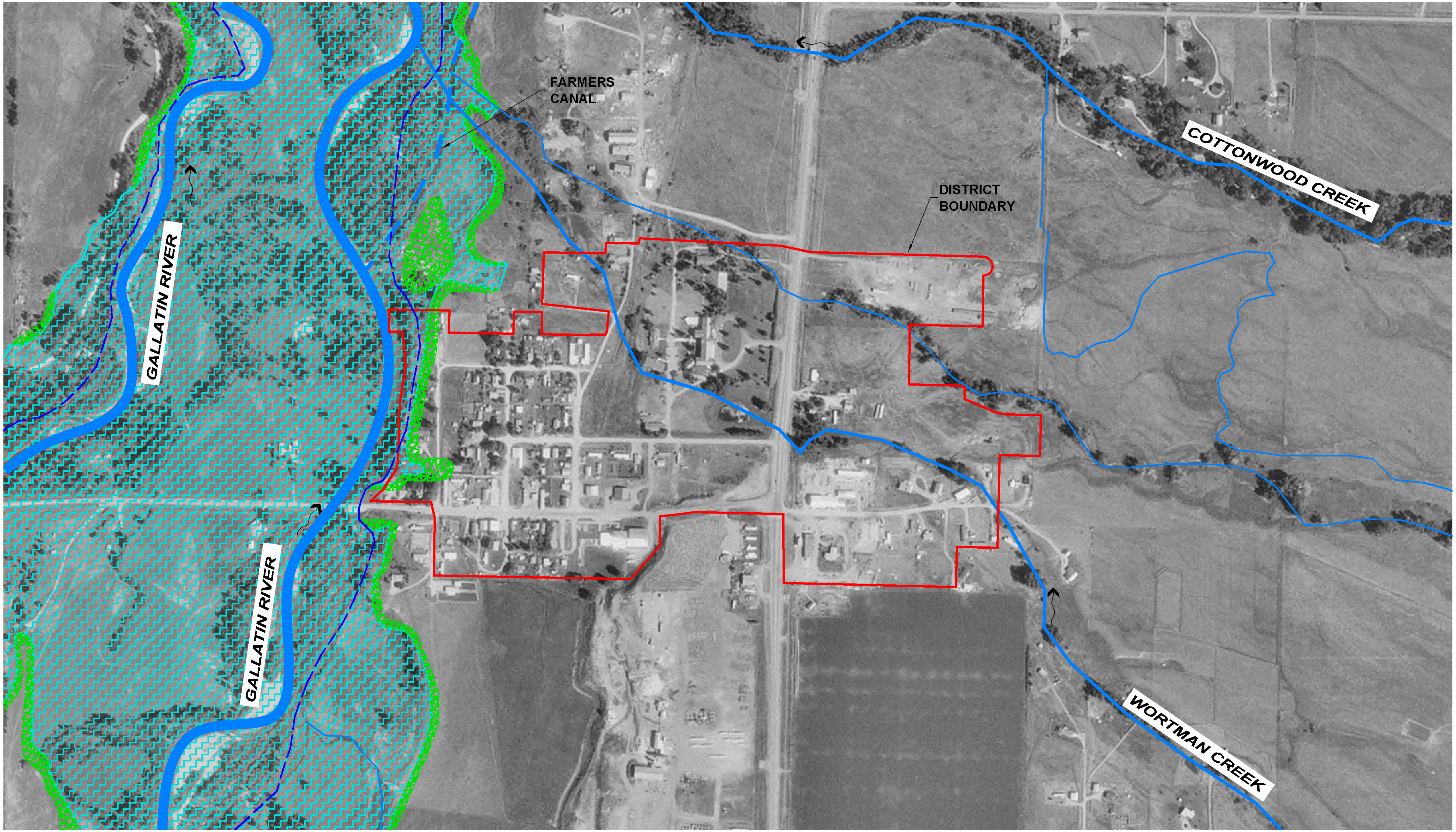
The vegetation within the District and planning area is typical of rural Ag communities. Native Montana grasses common to the area[i] are found in the undisturbed areas along with corridors of cottonwood trees and willows adjacent to the streams and river. Areas under cultivation typically produce alfalfa hay, with some occasional grain production, and smaller amount grass hay. The most suitable areas for disposal of treated wastewater effluent are the irrigated crop lands along the eastern portion of the planning area. Any areas disturbed by construction of a new facility will be re-vegetated upon completion of the project, and noxious weed control measures shall be employed.

2.4 Environmental Resources Present

As part of any major construction project, the impacts of the project on the surrounding environment should be considered, and provisions made to mitigate any negative impacts. The Uniform Application streamlines the process by utilizing a standard procedure called the Uniform Environmental Checklist (UEC)[ii]. As part of quantifying the impacts to various

[i] *Timothy grass, Brome grass, Rye grass, etc.*

[ii] *Environmental Checklist established by the MEPA and NEPA required in the Uniform Application.*



LEGEND

- 100-YEAR FLOODPLAIN
- FLOODWAY
- 500-YEAR FLOODPLAIN

IMAGE SOURCE: USGS ORTHOPHOTOS, 1995

FLOODPLAIN SOURCE: FLOOD INSURANCE RATE (FIRM) MAP, GALLATIN COUNTY, MT; PANEL905 OF 1725

0 250 500
SCALE IN FEET

NORTH

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FIGURE 2.3.4
WATER FEATURES

GALLATIN GATEWAY COUNTY WATER AND SEWER DISTRICT
2010 PRELIMINARY ENGINEERING REPORT (PER)

C:\Documents and Settings\rfillbach\Desktop\CADD 1-08159\Exhibits\PER\1-08159-Fig 2-3-4 Water Features_recover.dwg environmental resources, the UEC process includes sending letters to pertinent local, state, and federal agencies requesting comments on any potential environmental impacts as a result of potential improvements. A completed UEC for the potential sanitary sewer improvements is included in Appendix F.

2.4.1 Land Resources

Prime farmland is defined by the United States Department of Agriculture (USDA)[4] as the land best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban and built-up land or water areas. It either is used for food or fiber crops, or is available for those crops. Land use within the town of Gallatin Gateway includes residential homes, commercial businesses, motels, gas stations, churches, schools, parks, community center, post office, etc. Land use adjacent to the town of Gallatin Gateway in the planning area is dominated by agricultural uses, and a few residential homes. Most of the adjacent open space consists of croplands or pasture. The proposed wastewater collection system will primarily be in already disturbed areas within the town core; conversely, the wastewater treatment and disposal area will most likely be located in one of the nearby open areas and will in all likelihood affect croplands. However, the proposed subsurface treatment and disposal system will preserve the open space and maintain the rural character of the land.

2.4.2 Biological Resources

In general, wildlife in the area consists of deer, coyote, fox, bobcat, rabbit, porcupine, skunk, raccoon, mice, other small mammals, and waterfowl. A Montana Natural Resources and Information System (NRIS)[5] search was conducted and revealed several species of concern in the planning area: Wolverine, Canada Lynx, Grizzly Bear, Great Blue Heron, and the Westslope Cutthroat Trout. The search also revealed one potential animal of concern: Uinta Ground Squirrel. There were no plants of concern found in the search. Refer to Appendix X for the NRIS search results. Since all proposed wastewater system construction will take place within the existing town streets, alleys, and within previously disturbed areas, little adverse impacts are anticipated for the listed species of concern.

The U.S. Fish and Wildlife service stated, "*We support any viable wastewater treatment option(s) that are likely to result in improved quality of the waters in the State of Montana, as this is generally beneficial to fish, wildlife, and habitat resources…*" This letter of support is included in Appendix I.

2.4.3 Water Resources

Both groundwater and surface water were discussed in detail in Sections 2.3.3 and 2.3.4, respectively. The proposed improvements will in all probability improve the quality of groundwater within the region due to eliminating the congested and failing individual septic systems. Quantity of groundwater will not be impacted because the proposed method of discharge through groundwater infiltration will recharge the groundwater supply.

Surface water quality is not anticipated to change by any notable degree since the preferred alternative discharges to groundwater. Temporary impacts from construction activity are likely, although this project will require a Storm Water Pollution Prevention Plan (SWPPP) for surface water runoff related to construction activity. This permit is part of the Montana Pollutant Discharge Elimination System (MPDES) program administered by the DEQ. Quantity of surface water will not be impacted.

2.4.4 Floodplains

The Federal Emergency Management Agency (FEMA) has released drafts of revised floodplain maps for Gallatin County. These preliminary Flood Insurance Rate Maps (FIRM)[6] are intended to replace maps that were published in the 1980's with better data from more recent studies. The map relevant to this project is panel 905 of 1725, Gallatin County, Montana, and incorporated areas. This FIRM map is included in Appendix G and the floodplain boundaries are also shown on Figure 2.3.4 in the previous section.

The entire project is outside of the 100-year floodplain, although precautions shall be taken for the western most portions of the proposed system, as they are within close proximity of the defined boundary. This will be especially true for the centralized lift station. A small portion of the collection pipe in Lynde Street is within the 500-year floodplain, which is defined by FEMA as Zone X[iii] on the FIRM map.

2.4.5 Wetlands

Wetlands are common along the streams and rivers in the area, and also some small freshwater emergent wetlands can be found in the Gallatin Gateway area. The National Wetlands Inventory (NWI)[7] showed a few wetlands in this area consistent with the prior statement. A map of the NWI wetlands is included in Appendix H.

There are no major wetlands expected to be disturbed during this project; however, a site specific wetlands inventory will be conducted at all stream crossings, and low lying areas with any presence of wetland plant species. The only named creek crossing associated with this project is Wortman Creek. The Department of Natural Resources and Conservation (DNRC) provides a list of permits associated with stream and wetland crossing in Montana. The likely permits, if necessary, for this project will be the Montana Natural Streambed and Land Preservation Act (310 Permit) and Federal Clean Water Act (404 Permit) permits.

2.4.6 Cultural Resources

Cultural resources include historic and prehistoric archaeological sites, historic architecture, engineering features and structures, and resources of significance to Native Americans. The Montana State Historic Preservation Office (SHPO) was given a map of our planning area and the proposed improvements in order for them to determine whether there are significant historical and cultural resources in this area. SHPO identified two recorded historic sites; the Gallatin Gateway Inn, and a historic irrigation ditch. Since there will be no disturbance of these

[iii] *Zone X: Areas of 0.2% annual chance flood; Areas of 1% annual chance flood with average depths less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.*

structures with the proposed project, their recommendation is that a cultural resource inventory is unwarranted at this time. Please refer to Appendix I for documentation.

2.4.7 Socio-economic and Environmental Justice Issues

The proposed improvements will be impacting the entire community equally; favorable to both human health and environmental resources. Temporary disproportionate effects could be perceived with construction activities due to the fact that the majority of the collection system is located in the town core.

Gallatin Gateway is not an incorporated community or Census Designated Place (CDP), so 2000 census income information is not available for this project specifically. The population information is reasonably accurate because it was gathered utilizing much smaller blocks. In order to get reasonable income data an income survey was prepared[iv] and is being conducted with the help of Midwest Assistance Program.

Gallatin Gateway is not considered a minority or low-income community according to the U.S. Department of Commerce, based on the 2000 Census information. Research in order to determine the MHI for Gallatin Gateway yielded the following results:

- Gallatin County MHI = $38,120
- School District Demographics System (SDDS)[8] MHI = $40,172
- Census and Economic Information Center (CEIC)[9]
  - Tract 12, Block Group[v] 1 MHI = $36,933
  - Tract 12, Block Group 2 MHI = $47,841

It should be noted that all the defined areas listed above extend well beyond the Gallatin Gateway County Water and Sewer District boundary, which appears to be an area with significantly lower income levels than the remainder of the Block Group. Of the MHI's presented above, the closest fit (geographically) to the District is Block Group 1 at $36,933. However, this income level is still thought to be too high for the District. A map showing the above mentioned Block Groups is attached in Appendix T.

According to the Midwest Assistance Program income survey administrator Sandy Kust, as of April 1, 2010 there have been 45 income survey responses returned out of 67 total. This equates to a 67% return and the MHI at this point is roughly $29,000. This qualifies the District for the TSEP grant application. Additionally, the LMI is at 66%, which qualifies the District for the CDBG grant application. The income survey will continue in order to try and get an 85% return

[iv] *The income survey form was reviewed and approved by the Montana Department of Commerce and Rural Development.*

[v] *Block Group is a group of census blocks and the smallest area from which MHI information is available through the CEIC. Block Groups form larger areas known as Tracts.*

to qualify for Rural Development (RD) funding. However, Jim Edgcomb with TSEP and Gus Byrom with CDBG, confirmed that the income survey results at this point in time can be used for their applications (assuming they meet all the criteria) with the understanding that the survey is ongoing.

2.5 Growth Areas and Population Trends

Historically, Gallatin Gateway was called Salesville and the original town plat was entirely west of the highway in the flats adjacent to the river. The town grew primarily to the east because of the commercial uses next to the highway and more recently because of health concerns with individual septic and well separation distances, and impacts to groundwater. Development and enforcement regulations through MDEQ and Gallatin County Health Department have nearly stopped growth west of the highway. Installing a centralized wastewater system is expected to define the growth pattern to a certain degree. It is anticipated that once the immediate health concerns are alleviated with the existing users in the town core area connecting into the system, growth will be most prominent with infill of the remaining vacant lots in this area. Subsequently, new developments projects are expected, especially in the southeast portion of the District.

Figure 2.5 illustrates the “town core” as talked about in this PER and can be found on the following page.

The current population of the District is estimated at 168 persons. Many different sources were looked at to determine the past and present population including: the Census and Economic Information Center (CEIC), American Fact Finder – U.S. Census Bureau (AFF)[10], School District Demographics System (SDDS), etc. However, for this project a physical count of livable dwellings with an applied average number of persons per household (2.5) was used to get the most reasonable current population estimate. The average number of persons per household was determined by reviewing: School District data – (2.43 persons per home), Gallatin County Growth Policy – (2.5 persons per home), Results from Harrison, MT survey (similar community) – (2.5 persons per home), and the average number of beds from the county web tax information – (2.6 persons per home).

The projected population for the 20-year planning period of the District is 336 persons. This is double the current population or 100% growth over the next 20-years. This growth was rationalized by looking at the past two decades of economic trends, and looking forward based on the desirability of this area in conjunction with the past growth limitations from water resource related health concerns. Additionally, the Gallatin County Growth Policy states the County is growing at 3% per year. Back calculating the annual growth rate for this planning area yields approximately 3.5% per year, compounded annually. It is very reasonable to assume that Gallatin Gateway would grow at a slightly higher rate than the County as a whole.

The following Table 2.5 illustrates past population trends, current estimated population, and projected populations for the District compared with Gallatin County and the State of Montana. It should be noted that the population of the District in 2000 (183) is from the 2000 Census data blocks, which are not consistent with the District boundary. See map in Appendix T.

GreatWest engineering

SCALE:

0 125 250
SCALE IN FEET

NORTH

LEGEND:

EXISTING DISTRICT BOUNDARY

TOWN CORE AERA (ORIGINAL PLAT OF SALESVILLE)

FIGURE 2.5
GALLATIN GATEWAY
PER TOWN CORE AREA (SALESVILLE)

GALLATIN GATEWAY COUNTY WATER AND SEWER DISTRICT
2010 PRELIMINARY ENGINEERING REPORT (PER)

C:\Documents and Settings\rfillbach\Desktop\CADD 1-08159\Exhibits\PER\1-08159-Fig 2-5 Town Core.dwg

Table 2.5 - Population Data			
YEAR	**Gallatin Gateway Population (District)**	**Gallatin County Population**	**Montana Population**
1980	-	42,865	786,690
1990	-	50,463	799,065
2000	183	68,358	903,283
2010	168*	95,166	981,778
2020	234	-	-
2030	336**	-	-

*Current Estimated Population in District

**20-year Design Population for Gallatin Gateway County Water and Sewer District

Note: Gallatin County and Montana Populations for 2010 are projections estimated from the most current CEIC information (July 1, 2008).

3.0 EVALUATION OF EXISTING SYSTEM

The existing wastewater system consists of individual onsite septic systems. There is no existing centralized wastewater or water system for this community. The specific locations of the individual systems are also largely unknown because they were installed prior to any health regulations or permitting systems being in place.

3.1 Analysis of Existing System

Many of the existing system(s) are in poor condition, and most cannot meet current standards ie. Safe Drinking Water Act, Clean Water Act, and other federal, state, local, requirements. The majority of these systems are not suitable for continued use and are jeopardizing the public's health by groundwater contamination. Additionally, no growth can occur without addressing the issue of wastewater treatment and disposal. The Gallatin City-County Health Department (GCCHD) has been documenting the various system failures and requested septic system variances for this area. The main type of variance request is with setback distances from wells and property lines. According to the GCCHD information there have been at least five variances for setbacks to property lines and at least eight variances for setbacks to wells in the town core area. Attached in Appendix J is a diagram illustrating the GCCHD findings. Additionally, the Local Water Quality District (WQD) has commented on the health concerns in this area given the existing systems in place. The WQD's primary concerns are the close proximity of septic systems to drinking water wells, shallow water table, and coarse sand and gravel aquifer materials allowing "…bacteria and viruses to travel further and faster, increasing the risk of contamination of wells in the community." A letter from the WQD is also included in Appendix J.

3.1.1 Existing Flows

Existing wastewater flows within the District were calculated to be 26,000 gallons per day (gpd) based on the estimated population of the District. State design standards require a minimum wastewater flow of 100 gallons per day per capita (gpdc) unless flow monitoring demonstrates otherwise. In this case, the 100 gpdc guideline was used to calculate the residential flows. The non-residential and commercial flows were calculated by utilizing the DEQ-4[11] Tables 5-1 and 5-2 for uses such as: gas station, bar, restaurant, fire station, post office, etc. The flow generated from the school was determined from an independent study conducted by Gaston Engineering, Inc. (see Appendix R). In order to utilize flow information strictly from a quantity (gallons) perspective; all the flows were converted to Equivalent Dwelling Units (EDU). An EDU is equal to 250 gpd.

→ 100 gpdc X 2.5 persons per residence = 250 gpd = 1 EDU

In addition to existing flows, it is important to calculate the projected flows for the planning period as well. For this analysis, the flows were projected based on the same rationale as the population growth; 100-percent growth over the 20-year planning period.

Table 3.1.1 - Existing / Design Flows and EDU's				
TYPE	**Existing Count**	**Existing EDU's**	**Existing Flow (gpd)**	**Design Flow (gpd)**
Residential	67	67	16,750	33,500
Non-Residential	6	15	3,750	7,500
Commercial	8	22	5,500	11,000
Total		**104**	**26,000**	52,000
Design			**30,000**	**50,000**

gpd – Gallons Per Day
EDU = Equivalent Dwelling Unit

- Residential line-item includes all types of currently occupied residences; ie. single family homes, rental units, apartments, duplex, cabin, etc.

- Non-Residential line-item accounts for all uses that are not residential or commercial. This count includes:

  1. Fire Station
  2. Post Office
  3. Community Center
  4. School
  5. Church
  6. The Fort

- Commercial line-item is all the businesses within the District boundary, and includes the following:

  1. Gateway Store / The Game
  2. Big Timber Works
  3. Amend Shop
  4. Renneberg Hardwoods Inc.
  5. Rocky Mountain Choppers
  6. Stacy's Bar and Steakhouse
  7. Pizzeria
  8. Gallatin Gateway Inn

3.1.2 Hydraulic and Organic Loading

Wastewater loads are based on the existing EDU's of 104. Wastewater load multipliers are published within Circular DEQ-2[12]. Table 3.1.2 details the estimated design wastewater loads for the District.

Table 3.1.2A - Organic Loading for Domestic Waste (Existing Flow)			
Pollutant	**Design (EDU)**	***Load Multiplier (lbs/day/cap)***	**Design Waste Load (lb/day)**
BOD_5	104	0.50	52.0
TSS	104	0.55	57.2
Phosphorus, Total (as P)	104	0.025	2.6
Nitrogen, Total (as N)	104	0.10	10.4

Table 3.1.2B - Organic Loading for Domestic Waste (Design Flow)			
Pollutant	**Design (EDU)**	***Load Multiplier (lbs/day/cap)***	**Design Waste Load (lb/day)**
BOD_5	208	0.50	104.0
TSS	208	0.55	114.4
Phosphorus, Total (as P)	208	0.025	5.2
Nitrogen, Total (as N)	208	0.10	20.8

*Waste load multipliers are per capita equivalents of the values published within Circular DEQ-2, Chapter 10.

3.1.3 Treatment Standards

Individual onsite septic systems (and individual wells) are not required to be tested, therefore it is unknown if treatment standards within DEQ-4 are being met. Conversations with both the Local Health Department and Local Water Quality District have revealed their strong concerns of health risks for this very reason. Unfortunately, there is no way to implement a monitoring program. To further investigate, a search within the MDEQ database for public water supply (PWS) wells was conducted from 2000 to 2010. PWS well for the Gateway Cafe and Market (MT0001284) tested positive for fecal coliform on June 12, 2002. Although there have been no other significant violations with the PWS wells in the area, none of them are located on the down-gradient side of the town core area. See Appendix W for well information.

3.1.4 Operational and Management Practices

Individual onsite septic systems are managed solely by the individual home or business owner. The majority of people responsible for this often neglect to maintain their system unless a problem arises. Typical problems are back-up of the system due to an obstruction in the outfall line or a full septic tank or a failed drainfield area.

3.2 Financial Status of Existing System

As mentioned in Section 3.1.4, individual systems are managed entirely by each homeowner and/or business owner. Therefore, the financial status is directly associated with each owner. Although onsite systems are inexpensive to operate and maintain, they will fail at some point in time causing the large instantaneous financial burden of a replacement system. In Gallatin Gateway, it is quite possible that many homes are either already using a replacement area, no replacement area exists, or no other permitable site is available for construction of a new system.

4.0 NEED FOR THE PROJECT

4.1 Health and Safety

Without a doubt, the town core area presents the biggest concern for public health and safety in Gallatin Gateway. Currently, wastewater treatment for the area is provided for the most part by individual septic systems that pre-date any septic regulations. For many years, it has been known that the seepage pits, cesspools, and metal septic tanks with drainfields have been failing. Documentation of this is illustrated by the Gallatin City-County Health Department variance map located in Appendix J. This is a very serious concern as most of these residents are also supplied by individual water wells that are in close proximity of the failing septic systems. The soils in this particular area consist of coarse grained sands and gravels, so when a system fails, there is an increasingly high probability of quickly contaminating the groundwater and water supply wells. Since the wells are not PWS systems, they are not required to be tested or disinfected. As discussed in Section 3.1.3, the only PWS wells monitored in the area are up-gradient of the town core area, but they do show positive test results for fecal coliform (See Appendix W).

At a public meeting held on March 22, 2010, a resident living in the town core area, Brooke Savage 214 Adams Street, came forth and proclaimed that she had gotten sick from her well water and doctors diagnosed her with having large volumes of parasites living in her digestion system. She stated that once she switched to bottled water, the symptoms went away. At one point, she witnessed her neighbor's septic system, which is in close proximity to her well head, overflowing and they were pumping it out by hand. Please refer to Appendix Z for documentation of well contamination.

The above described situation is one example of many rumors talked about in Gallatin Gateway. Unfortunately, in most cases there is no documentation for fear that the individual's property value will decrease, or that they may be required to install an expensive replacement septic system that is not affordable for them.

4.2 System O&M

The operation and maintenance responsibilities associated with individual onsite septic systems are left up to each homeowner and/or business owner. This usually includes cesspool sludge removal or septic tank pumping, and occasional unclogging of effluent lines when obstructions cause the systems to back-up. There is no enforcement in this type of situation so negligence is often unnoticed, but potentially harmful to groundwater quality and nearby residents.

4.3 Growth

Gallatin Gateway is a community that has experienced a very slow growth rate and perhaps even a slight decline in the town core area within the last decade or so. A key factor for this has been the difficulty in permitting of new or replacement individual septic systems. Implementing a centralized wastewater treatment system will relieve the community of this problem, and encourage growth. Growth is not perceived as a negative. Gallatin Gateway is designated as a growth receptor within the Gallatin County Growth Plan. Growth of the District was also discussed in Section 2.5 along with population projections.

The sizing of the collection system and lift station will handle flows for the anticipated growth over the planning period. The projected flow of 50,000 gpd was used for the design and alternative analysis. This flow was discussed in more detail in Section 3.1.1. It is important not to under-size these parts of a wastewater system because they have a long design life and cause the most disturbances and interruption of service to the community during new construction and/or replacement. For this project, the extent of the collection system is limited to users within the District. Phasing is not part of this design other than incremental expansion of the treatment system from 30,000 gpd to the 20-year design flow of 50,000 gpd. However, future annexations and connections into the system are anticipated, and therefore were considered with the system layout.

The initial wastewater treatment and disposal facility is sized (30,000 gpd) to handle all the current estimated flow (26,000 gpd) and allow for some growth (4,000 gpd), but is not sized for the full planning period (50,000 gpd). The reason for this is based on the financial feasibility of the project. To justify this approach, the type of system selected can be easily expanded as needed to 20-year design flow. An annexation based system impact fee will fund any system expansions caused by annexations into the District, or subdivision of property already within the District. An important factor incorporated with this plan is procurement of the land required to facilitate expansion to at least the 20-year design flow of 50,000 gpd. The District will buy enough land initially to accommodate disposal of 50,000 gpd. Nondegradation calculations were also performed using the 20-year design flow to ensure that the dimensions of the land set aside will work for discharge permitting in the future. It should be noted that the current estimated flow, also discussed in Section 3.1.1, is likely a conservative estimate because many of the residences in this area probably do not have dishwashers and other appliances that help generate typical average flows used for estimating total wastewater flow generated by a single family home.

4.4 Unresolved Problems

Problems facing the community unresolved by this project are contamination of individual drinking water wells by sources other than septic. Since there is no community water system, there is potential for contamination from agricultural fertilizer, chemical spills, etc. Also, this project will not ensure that the ±80 old septic systems (cesspools, seepage pits, drainfields, etc.) are found and properly abandoned.

5.0 GENERAL DESIGN REQUIREMENTS

Alternatives identified to meet the needs and requirements for Gallatin Gateway will need to be sized to handle existing and anticipated future wastewater flows. Additionally, any improvements to the system will need to comply with applicable local, state, and federal regulations as well as accepted industry standards for the design of wastewater facilities. This section addresses some of the regulations and design criteria that will be considered as part of the alternative analysis.

5.1 Montana Department of Environmental Quality (DEQ)

The Montana Public Water Supply Act establishes design standards for public water and wastewater equipment and processes. The law requires the Department of Environmental Quality to review and approve all plans and specifications for wastewater facilities prior to construction. Upon completion of the construction of water and wastewater systems, the owner must certify to DEQ that the facilities were constructed in conformance with public health, sanitary, and design standards. The law applies to public systems (15 or more service connections) as defined by this act.

Hundreds of design standards and policy requirements are promulgated under this law. These requirements must be considered in characterizing the condition of existing facilities, developing and evaluating alternatives for wastewater improvements, and in the final design of the selected plan of improvements. The state design standards enforced under this law are described in DEQ Circulars DEQ-2, DEQ-4, and DEQ-7.

5.1.1 Circular DEQ-2: Design Standards for Wastewater Facilities

Circular DEQ-2 provides the minimum state requirements for wastewater system facilities. Chapter 30 is of particular significance for the proposed alternatives as it covers the design of sewers. Also applicable is Chapter 100, which covers disinfection. Many specific sections of Circular DEQ-2 are referenced in the alternative analysis, as appropriate. All improvements will require review by the state for compliance with Circular DEQ-2. Any deviations from the standards in DEQ-2 would require a written request and justification for the deviation to be submitted along with the plans.

5.1.2 Circular DEQ-4: Standards for Subsurface Wastewater Treatment Systems

Circular DEQ-4 provides the minimum state requirements for subsurface wastewater treatment systems. Chapter 8, which defines the sizing for subsurface treatment though the soil matrix by providing applications rates based on soil types, is especially important. Also applicable is Chapter 5, which lists recommended flows for a variety of uses in order to develop current and projected design flows for all alternatives considered. All treatment and disposal elements with standard or Level 2 treatment will require review by the state for compliance with Circular DEQ-

4. Any deviations from the standards in DEQ-4 would require a written request and justification for the deviation to be submitted along with the plans.

5.2 Existing and Design Flows

Existing wastewater flows and projected design flows were presented in Section 3.1.1. Existing flows are estimated at 26,000 gpd and the 20-year projected design flow was calculated to be 50,000 gpd. All improvements considered in the alternative development will take into account both existing and projected flows. Only with the selected alternative will the design consider a phased (or incremental) design flow. The 20-year design flow is the ultimate goal with any alternative considered, and is the wastewater flow basis for used for comparison. The ability to incrementally expand is an interim cost advantage only.

5.3 Hydraulic and Organic Loading

Hydraulic and organic loading was presented in Section 3.1.2. All improvements considered in the alternative development will take into account both existing and anticipated hydraulic and organic loading.

5.4 Regulatory Requirements and Permits

In addition to the Montana Public Water Supply Act, any improvements must also be compliant with the local, state, and federal regulations. Public systems are defined by the State of Montana as having 15 or more service connections and serving 25 or more persons for 60 days or more during the year. The federal regulations for public systems are often enforced through state agencies which have been delegated primary enforcement authority. The laws of primary importance with respect to wastewater management for Gallatin Gateway are:

- U.S. Clean Water Act; PL 92-500, PL 95-217, PL 97-117, PL 100-4 (Federal Authority)
- Montana Water Quality Act; 75-5-101 through 641, MCA (State Authority)
- Montana Wastewater Treatment Revolving Fund Act; 75-5-1101 through 1106, MCA (State Authority)
- Public Water Supply Act; 75-6-101 through 121, MCA (State Water and Wastewater Design Standards)
- Public Health Law; 50-2-116, MCA (County Authority)

5.4.1 U.S. Clean Water Act

This law was originally passed by the U.S. Congress in 1972 as the Water Pollution Control Act. Since then, the law has been amended numerous times and is now referred to as the Clean Water Act. The law is quite comprehensive. It regulates point and non-point sources of pollution such as industrial and mine discharges, municipal sewage, construction and agricultural runoff, sludge storage and disposal, storm water runoff, and many other potential sources of water pollution. The law also establishes in-stream, water quality based standards and requires that streams and rivers be classified according to existing water quality and potential uses.

Specific to municipal wastewater management, this law is applicable to central wastewater systems that serve 15 or more connections, which under the law are defined as public wastewater systems. The law established the National Pollution Discharge Elimination System (NPDES) permitting process. The NPDES process requires each public wastewater system to obtain a discharge permit if that system discharges municipal wastewater to a surface water source or to groundwater. The NPDES discharge permit defines specific concentration limits for contaminants that must not be exceeded prior to discharge to the surface water or reaching the end of the mixing zone. These permit discharge requirements largely establish the design requirements for wastewater treatment facilities.

The Clean Water Act is administered by the Environmental Protection Agency (EPA). However, in many states, including Montana, the enforcement authority for the U.S. Clean Water Act is delegated to state agencies. In Montana, the Montana Department of Environmental Quality (MDEQ) has enforcement authority and issues discharge permits to public wastewater systems.

5.4.2 Montana Water Quality Act

To qualify for primacy of the U.S. Clean Water Act, the Montana Legislature passed the Montana Water Quality Act. As would be expected, this state legislation is tailored after the U.S. Clean Water Act and, therefore, its basic requirements are very similar. Although it is important to point out that the definition of a public system under Montana law is a wastewater system that has 15 or more service connections and serves 25 or more persons 60-days of the year.

Under the authority of this law and associated rules, the state establishes surface water quality standards (letter code for each river and stream) based on beneficial uses and existing water quality; implements the nondegradation policy; issues surface water discharge permits; implements a groundwater protection program; conducts inspections of wastewater facilities; and generally prohibits pollution of state waters. The language of the law is very general and therefore fairly broad in scope with regard to preventing the pollution of state waters. The law applies to both surface water and groundwater.

On a specific note, in 1994 Montana passed new rules under the authority of this law that address nondegradation of water resources. Under the new nondegradation rules, it is the policy of the State of Montana to prohibit further degradation of state waters. To accomplish this, the state has established nondegradation load limits (lbs/day) for wastewater effluent pollutants such as BOD, TSS, nitrogen, and phosphorous. Once established in the permit, the load limits will not be changed with time even though the community may grow and the pollution load increases. Accordingly, the treatment efficiency must improve with time if the community is growing. This trend makes nondegradation load limits a very important consideration in the selection and design of wastewater treatment facilities.

For new facilities requesting wastewater discharge permits, the discharge concentration limits for various pollutants will be based on the new trigger limits specified in the rules. For communities attempting to discharge into low-flowing creeks, permit limits based on nondegradation trigger limits will likely be more stringent than the permit limits required for most communities that already have a discharge permit.

5.4.3 Montana Wastewater Treatment Revolving Fund

This law allows the State of Montana to create a revolving loan fund to provide financial assistance to municipalities, Districts and private concerns for the construction and rehabilitation of wastewater improvement projects. The initial capital for the loan fund is provided by the federal government through appropriations authorized under the previously discussed U.S. Clean Water Act. The goal of the act is to develop a self-sustaining revolving loan fund administered by the State of Montana. Currently, the loans are offered at 3.75% interest and the term is 20 to 30 years. To qualify, the applicant must complete a PER for review and approval by the DEQ and must meet certain other financial, administrative, and operational obligations.

5.4.4 Montana Public Water Supply Act

The Montana Public Water Supply Act was discussed in detail in Section 5.1.

5.4.5 Public Health Laws

Currently, Gallatin County, under the authority of Section 50-2-116(2)(j) Montana Code Annotated, regulates the construction and repair of individual on-site wastewater treatment systems (standard septic tanks and drainfields and, in some cases, sand filters) within the County. DEQ wastewater design standard DEQ-4 has been adopted as minimum standards. The County requires that each new or replacement on-site system apply to the County for a permit prior to construction. The County must also inspect the construction of the new or replacement system prior to placing the system in service.

5.4.6 Construction Permits

During the construction of improvements, a storm water discharge permit will also be necessary if more than one acre of land is disturbed. In addition, this project will involve work completed within the state right-of-way, so a permit will be required from the Montana Department of Transportation.

5.4.7 Numeric Nutrient Water Quality Standards

The Montana Department of Environmental Quality (MDEQ) is in the process of developing numeric nutrient water quality criteria. This criteria is intended to control excessive nutrient (nitrogen and phosphorus) pollution in Montana's streams, rivers, and lakes. The intent of numeric nutrient criteria is to assure a level of water quality that will protect the beneficial uses of these water-bodies.

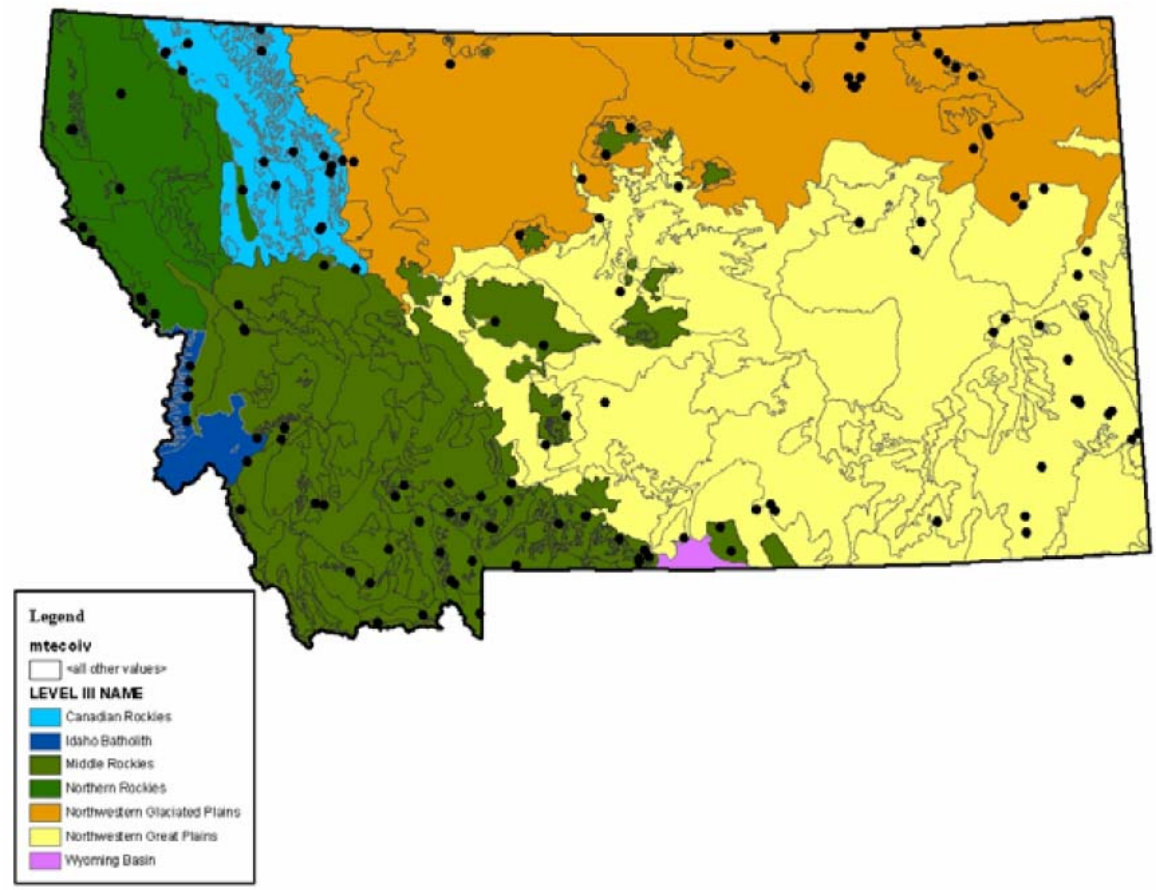
The MDEQ has developed a section within the Department specifically charged with the task of developing numeric nutrient standards. The development of the numeric nutrient standards is a process that is separate, but coordinated with the development of TMDL's within the MDEQ. MDEQ initiated the process by first performing a review of existing available science on the subject. MDEQ has strived to base the numeric nutrient criteria on the best available science and data. The development of the numeric nutrient standards is being closely coordinated with the EPA and MDEQ is using EPA guidance in the development of the standards. MDEQ has also formed several advisory committees to provide input. These committees will be discussed in more detail later in this section.

The MDEQ has reached the point where they are now moving into the beginning of the rule-making phase. Rule making will involve not only the numeric nutrient criteria themselves, but also how they will be implemented. The public will be afforded opportunities to provide comment to MDEQ and the Board of Environmental Review both before and during rule making. The numeric nutrient standards will become instream water quality standards much like ammonia and other standards and will also be used as a target in the development of future TMDL's. Based on discussions with the NPDES permit section; the numeric nutrient standard compliance will likely be determined using a mass balance much like other instream water quality standards. The flow utilized for mass balance is likely to be the 15 day, 10 year low flow of the receiving stream. To date the MDEQ has proposed numeric nutrient criteria for wadable streams for each ecoregion and those are presented in the table below; a map of ecoregions is also presented herein.

Table 5.4.7 - Recommended Numeric & Benthic Algae Criteria for Different Ecoregions of MT

Level III Ecoregion	Period when criteria apply	Nutrient Criteria			Benthic Algae Criteria
		Total P	Total N	NO_{2+3}	
Northern Rockies	July 1 – Sept 30	0.012	0.233	0.081	150 mg Chl *a*/m^2
Canadian Rockies	July 1 – Sept 30	0.006	0.209	0.020	150 mg Chl *a*/m^2
Middle Rockies	July 1 – Sept 30	0.048	0.320	0.100	150 mg Chl *a*/m^2
Idaho Batholith	July 1 – Sept 30	0.011	0.130	0.049	150 mg Chl *a*/m^2
Northwestern Glaciated	June 16 – Sept 30	0.123	1.311	0.020	n/a
Northwestern Great	July 1 – Sept 30	0.124	1.358	0.076	n/a

Figure 5.4.7 - Omerick Level III Ecoregions in Montana



It is important to note that rule making has not yet been completed. Numeric nutrient criteria for large rivers are in the process of being developed and will likely utilize the water quality model Qual2-K. Numeric nutrient standards for lakes have not been developed yet and will follow the development of standards for large rivers.

MDEQ has also formed the Numeric Nutrient Working Group to provide guidance. This working group consists of representatives of Cities and Towns, various agricultural and industry groups, engineers and funding agencies. To date, this group has reviewed the science presented by MDEQ and is in the process of reviewing regulations for the implementation of the standards. The group has commented extensively on the standard criteria proposed and the waivers being considered.

Two waivers were developed by a previous advisory group to DEQ. The first waiver was an affordability waiver that established a criteria of 1% of Median Household Income (HMI) for affordability. The 1% threshold was coordinated with EPA, but must still be approved by EPA in the final rulemaking process. The likelihood of EPA approval is not yet known. This waiver also included criteria for substantial and widespread economic impact. The use of these waivers was made law in Senate Bill 95. This bill allows the use of temporary numeric nutrient criteria on a case-by-case basis when substantial and widespread economic impacts precluded the attainment of the base numeric nutrient criteria for nitrogen, phosphorous and nitrates plus nitrites. The law also allows the use of temporary numeric nutrient standards when the limits of technology limit the attainment of the base numeric nutrient standards.

A second waiver currently referred to as the limits of technology waiver was also developed by the advisory board. This waiver established three thresholds of treatment as outlined below:

1. Standard Biological Nutrient Removal=7 to 10 mg/l TN and 1 mg/l TP
2. Enhanced Biological Nutrient Removal = 4mg to 6mg/l TN and 0.25 to 0.50 mg/ TP
3. Limits of Technology = 3 to 4mg/l TN and 0.05 to 0.07 mg/l

This waiver will be combined with the affordability waiver to determine the level of treatment required to satisfy the numeric nutrient criteria and TMDL compliance. The numeric nutrient criteria will serve as a TMDL target when adopted by rule. MDEQ has a website that should be referenced to keep up with the development of the numeric nutrient criteria.

5.4.8 TMDL Considerations

A Total Maximum Daily Load (TMDL) is a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards. Section 303(d) of the US Clean Water Act establishes the water quality standards and TMDL program. Sections 75-5-101 MCA and 75-5-701 MCA of the Montana Clean Water Act describe the TMDL process in Montana.

TMDLs are a water quality based approach that emphasizes the overall quality of water within a water body and provides a mechanism through which the amount of pollution entering a water body is controlled based on the inherent conditions of that body of water and the standards set to protect it. This approach begins with the determination of waters not meeting, or expecting to meet, water quality standards after the implementation of technology based controls. Waters identified through this process are considered water quality limited and must be prioritized and listed. This list is called the 303(d) list and is updated every two years by the state. An overall plan to manage the excess pollutants in each water body is then developed. The necessary limitations on the introduction of pollutants to the water body are identified through the development of a TMDL.

Montana has been documenting water quality conditions since the 1970's. This information has been submitted to the EPA on a regular basis as part of the federally required 305(b) reporting. In 1992 this information became officially termed a 303(d) list.

In 1997 the legislature required DEQ to use "sufficient, credible data" in making beneficial use determinations on the 303(d) list. As a result of the new definition of sufficient, credible data, 486 water bodies were removed from the 2000 303(d) list pending reassessment. However, a federal judicial order requires EPA and DEQ to complete "all necessary TMDLs" for all water bodies based on the 1996 303(d) list by May 5, 2007. The court further specified that no new or increased discharge permits may be granted for a "water quality limited segment" of a water body until the appropriate TMDLs are established.

A TMDL consists of the sum of individual wasteload allocations for point sources and load allocations for both non-point sources and natural background levels for a given water body. The TMDL must also include a margin of safety that accounts for the uncertainty in the relationship between pollutant loads and the quality of the receiving water body.

To establish a TMDL an acceptable combination of allocations that adequately protects water quality standards must be established. Issues that affect allocations include: Economics, political considerations, feasibility, equitability, types of sources and management options, public involvement, implementation, limits of technology and variability in loads.

The Montana Pollutant Discharge Elimination System (MPDES) permit is the mechanism for translating TMDL waste load allocations into enforceable requirements for point sources. The MPDES permit authorizes a point source facility to discharge. The permit also subjects the permitee to legally enforceable requirements set forth in the permit. 40 CFR 122.44(d)(1)(vii)(B) requires effluent limits to be consistent with wasteload allocations in an approved TMDL. One way wasteload allocations are translated into permits is through effluent limitations. Effluent limitations impose restrictions on the quantities of discharge, rates of discharges, and concentrations of specified pollutants in the point source discharges. Effluent limitations reflect either minimum federal or state technology-based guidelines or levels needed to protect water quality, whichever is more stringent. By definition, TMDLs involve wasteload allocations more stringent then technology-based limits to protect water quality standards, and are therefore used to establish appropriate effluent limitations.

The objective of a TMDL is to allocate allowable loads among different pollutant sources so that the appropriate control actions can be taken and water quality standards achieved. The TMDL provides an estimate of pollutant loadings from all sources and predicts the resulting pollutant concentrations. The TMDL determines the allowable loads and provides the basis for establishing or modifying controls on pollutant sources.

Three common methods for allocating loads are recommended by the EPA. The first method is "equal percent removal" and exists in two forms. In one, the overall removal efficiencies of the sources are set so they are all equal. This method is appropriate when the incremental removal efficiencies are relatively small, so that the necessary improvement in water quality can be obtained by minor improvement in treatment at each point source, at little cost. The second common allocation method specifies equal effluent concentrations. This is similar to equal percent removal if influent concentrations at all sources are approximately the same. However, if one source has substantially higher influent concentration levels for a parameter in question, the equal effluent concentrations method will require higher overall treatment levels for the discharges with the higher concentration.

The third commonly used method of allocating loads can be termed a hybrid method. With this method, the criteria for waste reduction may not be the same from one source to the next. One source may be allowed to operate unchanged while another may be required to provide the entire load reduction. More generally, a proportionality rule may be assigned that requires the percent removal to be proportional to the input source loading or flow rate.

5.4.9 Surface Water Discharge

A new discharge to surface water would have to fully comply with nondegradation trigger limits. New surface water discharges are not allowed to raise the background level of nitrogen more than 0.01 mg/L and 0.001 mg/L for phosphorus at the rivers seven year, ten day low flow (7Q10). The nearest surface water available as a receiving water is the Gallatin River. According to the United States Geological Survey (USGS) gauging station on the Gallatin River near Spanish Creek (Station MT06043500)[13] the 7Q10 flows are 204 cfs for a drainage basin with 825 square miles. The additional drainage basin from the gauging station to the bridge at Gallatin Gateway is 56 square miles, and the calculated 7Q10 flows are 218 cfs (see Appendix E).

Based on a wastewater flow of 50,000 gallons per day and the 7Q10 flow of 218 cfs, a mass balance calculation was performed to determine the discharge permit limits for surface water discharge to the Gallatin River (See Appendix E for these calculations). These calculations predict that the treated effluent, prior to discharge, would need to have a concentration of 28 mg/L or less to meet the trigger limit of 0.01 mg/L. The potential nitrogen and phosphorus limits are attainable by a number of treatment processes. Consideration of all of the above issues makes surface water discharge a technically feasible option for Gallatin Gateway.

The Montana Department of Environmental Quality (MDEQ) is also in the process of developing numeric nutrient water quality criteria as described above. This criteria is intended to control excessive nutrient (nitrogen and phosphorus) pollution in Montana's streams, rivers, and lakes. The intent of numeric nutrient criteria is to assure a level of water quality that will protect the beneficial uses of these water-bodies. Waivers from this standard maybe an option but again, these nutrient criteria have not been established and potential waivers are not yet finalized.

The DEQ’s TMDL planning area for the reach of the Gallatin River adjacent to this project is referred to as the *Lower Gallatin*, which flows from Spanish Creek (located near the mouth of Gallatin Canyon) to the mouth of the Missouri River near Three Forks, MT. As of the 2008 assessment, this reach of the Gallatin River had no pollutant-related impairment. However, as described above, TMDL's are relatively new in terms of regulation, so they should still be considered when analyzing the wastewater alternatives. Refer to Appendix C for site specific TMDL information.

Surface water discharge to the Gallatin River would also likely be a very controversial action. The Gallatin River is considered pristine and one of the best fly fishing rivers in the United States. Water Sewer District 363 at Big Sky applied for a discharge permit a few years ago to discharge 15 million gallons of highly treated sewage effluent into the Gallatin River each year during the height of spring runoff when background river flows are the highest and background water quality is the lowest. MDEQ approved the discharge permit because it met nondegradation criteria but before WSD 363 could implement the new permit they were hit by a staggering number of lawsuits from nearly every active environmental group in the region. Clearly, even though a new discharge to surface water was technically feasible and met the nondegradation criteria the public was not ready to allow a new surface water discharge of treated effluent into the Gallatin River without a fight.

Due to the yet undetermined TMDLs, numeric nutrient criteria and high potential of litigation over a surface water discharge, the Gallatin Gateway County Water and Sewer District is dismissing the alternative to discharge treated effluent to surface water and it will no longer be considered.

5.4.10 Groundwater Discharge

Disposal to the groundwater could consist of rapid infiltration cells (ponds or laterals) or a community drainfield. Groundwater discharging systems that exceed 5,000 gallons per day (gpd) require a groundwater discharge permit with nondegradation trigger limits of 5.0 mg/L of nitrogen for standard systems and 7.5 mg/L of nitrogen for Level 2 systems at the end of a mixing zone (typically 500 feet for a public system), and satisfy the 50-year phosphorus breakthrough analysis (see Appendix P for nondegradation calculations).

Any discharge to groundwater is required to meet ARM 17.30.701-718 (Nondegradation of Water Quality). In general, these rules establish annual average load limits (lb/day) for BOD_5, TSS, total inorganic nitrogen, inorganic phosphorus, fecal coliform, and chlorine residual. These loads are based on the approved system design criteria and permit limits in effect on April 29, 1993, the date the rules went into effect. The rules prohibit any loadings that exceed these established load limits. If there was no approved design flow prior to April 29, 1993 the wastewater discharge is considered nonsignificant. If any resulting downstream concentration exceeds the nondegradation trigger value established in DEQ 7 for that particular parameter the pollution is considered significant and will need a variance from the Board of Environmental Health. The Board has never issued such a variance.

5.4.11 Land Application

Another type of wastewater disposal is through land application. With this method of disposal, spray irrigation equipment, such as center pivots, wheel lines, and drip irrigation systems are utilized to irrigate crops with treated wastewater. However, in order for this process to meet nondegradation rules and avoid groundwater permit requirements, the wastewater must be applied to the crop at agronomic rates. This ensures that all of the nitrogen in the wastewater will be consumed by the crop and will not impact the groundwater. Hydraulic overloading and minimum irrigation needs to support a healthy crop are also considerations when designing land application systems. The design requirements associated with land application are primarily climate and agricultural based, and requires a detailed water balance. Climate data for this area used in the comparative analysis can be found in Appendix K. A complete land application analysis was completed for this project when evaluating the storage and irrigation alternative and can be found in Appendix N and in Appendix O.

5.5 Treatment

Wastewater treatment systems would need to comply with Circular DEQ-2 requirements and in the case of Level 2 systems with disposal to groundwater, DEQ-4 would also apply. Plans would be reviewed by DEQ for compliance and any deviations would require a written request to be submitted with justification for the deviation along with the plans. Sections 5.1.1 and 5.1.2 goes into more detail with respect to the DEQ Circulars and Section 5.4 describe other defining water quality laws.

The following Table 5.5 shows several different types of treatment and the approximate water quality attained from each:

Table 5.5	
Treatment type	**Attainable Wastewater Quality**
Total Retention Lagoons (evaporation)	Non-Discharging
Facultative Lagoon with Irrigation	Non-Discharging
Mechanically aerated lagoon with Irrigation	Non-Discharging
Activated sludge mechanical plant with Irrigation	Non-Discharging
NITROGEN REMOVING TECHNOLOGY- BIOLOGICAL NUTRIENT REMOVAL (BNR)	
Oxidation ditch mechanical plant	8-10 mg/l - Total Nitrogen
Biolac (proprietary) activated sludge process	10-15 mg/l – Total Nitrogen
Fixed film Activated Sludge	10 mg/l Total Nitrogen
Sequencing batch reactor mechanical plant (SBR)	5-8 mg/l Total Nitrogen
Oxic/Anoxic advanced treatment plant	3-8 mg/l Total Nitrogen
Membrane Bioreactor (MBR)	3-5 mg/l Total Nitrogen (Excellent BOD and TSS Removal)
Wetland ponds/Floating Islands	Winter limitations

* There are many types of fixed film systems, including rotating biological contractor, trickling filters, etc.

5.6 Collection

The new collection system would need to comply with Circular DEQ-2 requirements. Plans would be reviewed by DEQ for compliance and any deviations would require a written request to be submitted with justification for the deviation along with the plans. The most pertinent section to the District's collection system for the alternatives considered is Chapter 30: Design of Sewers.

5.7 Lift Stations

The new lift station (pump station) would need to comply with Circular DEQ-2 requirements. Plans would be reviewed by DEQ for compliance and any deviations would require a written request to be submitted with justification for the deviation along with the plans. The most pertinent section to the District's pump stations is Chapter 40: Wastewater Pumping Stations.

5.8 Sludge

The EPA Region 8 Biosolids Permit governs sludge handling and processing. The required sludge handling and/or disposal would also need to comply with Circular DEQ-2 requirements for the new system. Plans would be reviewed by DEQ for compliance and any deviations would require a written request to be submitted with justification for the deviation along with the plans. The most pertinent section of the DEQ to the District's sludge handling and disposal system is Chapter 80: Sludge Processing, Storage, and Disposal.

Septic pumping of the abandoned individual systems would most likely be completed by contracting a certified septic pumping service, which would be governed by the EPA Region 8 Biosolids Permit.

6.0 ALTERNATIVE SCREENING PROCESS

Numerous alternatives exist that would provide adequate wastewater treatment for the District's new system. The purpose of this alternative screening process is to scrutinize the available alternatives, and determine which ones are the most viable for Gallatin Gateway. Then, the most pertinent alternatives will be examined in more detail in the following Section (Section 7) entitled Alternatives Analysis.

6.1 Collection System Alternatives

The proposed centralized wastewater system for Gallatin Gateway is an entirely new system, so the collection system layout alternatives are relatively straightforward. The alternatives in this section are evaluated based on general knowledge of the site and are subject to modification during the design stages of the project when more accurate topographical information is available and a thorough assessment of other existing buried utilities is complete. In general, the collection system for this project can either be operated by gravity or pressurized systems with various alignment options that depend on availability of land and efficiency of the system.

6.1.1 Gravity Collection – Street Layout

This alternative is a complete gravity system with the main lines located in the existing street right-of-ways, and typically located directly underneath the street itself. This is probably the most common system layout in municipalities. For this project, easements will be most obtainable with this option and there is plenty of grade to work with, so this alternative will be evaluated further in this report.

6.1.2 Gravity Collection – Alley Layout

This alternative is a complete gravity system with the main lines located primarily in the existing alley ways. This type of system layout is not as common in general, but perhaps more common for project such as this that are installing infrastructure after full build-out of the lots and/or retrofit projects. Easements can be harder to obtain with this option and there is normally less room available for construction purposes often leading to higher construction costs. However, the majority of existing onsite systems are located in the back portions of lots which makes new service connections shorter, easier and more feasible. For this reason, this alternative will be evaluated further in this report.

6.1.3 Pressurized Collection System

This alternative is a network of smaller diameter piping that utilizes pressure to transport effluent verses gravity. These systems are less common than gravity, but can be effective in areas with less grade to work with, and often work well in rural communities and/or residential areas with tight soils and long distances to treatment sites. This type of system is commonly referred to as a

STEP system, which is an acronym for Septic Tank Effluent Pumping. The use of this type of system can be beneficial in areas where many existing homes already have septic tanks, and it is easier to install pressurized pipe in already developed areas because the construction parameters are more flexible. The downside of these systems in a community application is that the individual owners are typically responsible for the operation and maintenance of each septic tank and pumping station.

In Gallatin Gateway, it is unknown how many residences have pre existing useable septic tanks. In fact, many of the septic systems may not have septic tanks at all, so the advantage mentioned above is not clear with this application. Additionally, the ease of construction is far outweighed by the additional operation and maintenance and burden on the individual owner. For these reasons, and for the simple fact that the existing topography of Gallatin Gateway has plenty of grade to utilize a gravity system, this alternative will not be further evaluated in this report.

6.1.4 Gravity / Pressurized Hybrid System

This alternative can have many different combinations of gravity and pressure piping depending on the specific objective of the system. For this project, the thought with this alternative would be to utilize gravity wherever practical, and individual grinder pumps only for service connections that would require excessive lengths of gravity main to collect a small flow. Individual grinder pumps can be feasible in combination with primary gravity systems, but each pump needs to be evaluated on a case by case basis during the design of the system. For this reason, this alternative will be further evaluated in combination with the street and/or alley gravity systems mentioned above.

6.2 Lift Station Alternatives

Pumping station(s) will be necessary for this project since the only suitable locations for treatment are up gradient from the majority of the collection system. Below are three general alternatives considered to transport raw wastewater to a treatment and disposal site. It should be noted that *lift stations* are commonly referred to as *pump stations*, and these terms are used interchangeably throughout this report.

6.2.1 Single Centralized Lift Station

This alternative is the simplest option for any sizeable wastewater collection system that needs to be pumped to a treatment location. Most centralized systems try for this alternative if the site grading will allow. Operation and maintenance is most convenient when mechanical features of a system are located in one place. In the case of Gallatin Gateway, the topology will allow for a single lift station site and therefore this alternative shall be further evaluated in this report.

6.2.2 Multiple Lift Stations

This alternative is typically implemented in very large systems, in systems that are unable to gravity flow to a single site, and for systems that have multiple treatment locations. Multiple lift station sites require more operation and maintenance, more land acquisition, and simply create a more complex system. Given that the projected design flows for this project can be easily handled by a single lift station, and can utilize gravity flow to a central site, there is no apparent reason to further evaluate this alternative. It is a possibility that after thorough surveying and mapping of the District an additional lift station may be warranted, but is considered to be very unlikely.

6.2.3 Individual Grinder Pumps

This alternative was discussed in Section 6.1.3 and is commonly referred to as a STEP system, where all the users pump individually rather than having one (or a few) larger pumping stations. The individual grinder pump system, from a lift station alternative perspective, is directly related to pressurized collection systems which were dismissed in Section 6.1.3. Thereby, this alternative will not be further evaluated except on an individual case by case basis.

6.3 Treatment Alternatives

There are several treatment alternatives to consider for this type of wastewater project. Below is a summary of the most applicable alternatives discussed in this Section, and either dismissed or recommended for further evaluation. Multiple variations exist with many of these alternatives, and recognized throughout this initial screening process.

1. No Action Alternative
2. Connection to Utility Solutions Wastewater Treatment Plant in Four Corners
3. Total Retention Ponds (Evaporation)
4. Storage and Irrigation (Low Rate Land Application)
5. Naturally Aerated Facultative Lagoons with Discharge
6. Mechanically Aerated Lagoons with Discharge
7. Septic Tank/Pressure Dosed Drainfield
8. Septic Tank/Level 2 Treatment/Pressure Dosed Drainfield
9. Constructed Wetlands
10. Biological Nutrient Removal (BNR) Mechanical Treatment Plant with Discharge to either Surface Water or Groundwater

6.3.1 No Action Alternative

The No Action Alternative means no improvements would be made and the existing individual onsite treatment systems would continue as the only means of septic disposal. Without centralized wastewater management facilities, degradation of groundwater and surface water resources will continue. With dated and failing individual septic systems, marginally treated to untreated wastewater is undoubtedly reaching the groundwater aquifers. Over time, the nutrients and fecal coliforms in the discharge will contaminate and degrade the water quality in the groundwater and surrounding surface waters.

The No Action Alternative will continue to be an alternative in this report solely due the financial burdens from the other options considered.

6.3.2 Connection to the Utility Solutions Wastewater Treatment Plant

Due to the relatively close proximity (4 miles) of Utility Solutions wastewater treatment plant to the District, the private utility was contacted regarding the potential for this community to connect to their plant. Information received (Appendix L) indicates that their treatment plant has sufficient capacity and therefore this alternative will be evaluated further.

6.3.3 Total Retention Ponds (Evaporation)

A non-discharging treatment system (total retention pond) consists of large shallow ponds (4 - 6 feet deep) that rely on evaporation to eliminate the wastewater effluent. Solids are periodically removed and properly disposed of via land farming or licensed solid waste facilities. These systems require considerably more land area than a non-aerated discharging facultative or aerated lagoon systems due to their reliance on evaporation for effluent disposal. An arid climate and high evaporation rate is needed to successfully apply this technology.

The ponds must be lined to prevent wastewater seepage into the groundwater. The ponds should provide sufficient control structures and piping to allow some redirection of flows to prevent odors. Treated effluent is disposed by evaporation so no discharge permit is required. The ponds are extremely simple to operate and maintain, they are reliable, and are not heavily regulated because they do not require a discharge permit. For these reasons they can be very good for small communities and subdivisions with readily available, inexpensive land. Gallatin Gateway has some available land, but this type of system for the projected design flows would require approximately 30-acres of lagoons. A preliminary design of a total retention system was completed and is attached in Appendix M. Prevailing winds can present problems in areas like Gallatin Gateway where the surrounding area is inhabited. Another common concern with this type of treatment is with increased propagation of mosquitoes and the increased potential for West Nile virus.

Since land is an especially valuable commodity in this area, and there is a higher potential for odors to create problems, this treatment and disposal alternative will not be evaluated further in this report.

6.3.4 Storage and Irrigation (Low Rate Land Application)

Low-rate systems (irrigation) apply wastewater to the soil much less intensively than high rate systems (rapid infiltration ponds) and require much more land area. Typically, the wastewater is treated in primary cells, stored in 4 - 8 feet deep storage cells during the winter months, and then applied to cropland or pasture during the summer months using sprinkler irrigation equipment.

Secondary treatment must be achieved prior to irrigation so lagoon technologies prior to irrigation are adequate. The wastewater must also be disinfected and filtered prior to irrigation if the public will utilize the irrigated site (golf course or park). When the irrigation site is not public (cropland or pasture), disinfection is not required, but a 200 foot buffer area is required around the irrigated acreage to minimize public access. Disinfection is required if the 200 foot buffer zone requirement cannot be satisfied. Remote locations are preferred.

In northern climates, where the growing season is limited, sufficient storage (180 to 230 days) is required during the non-growing season. This treatment technology has been excluded from the nondegradation rules if the system is designed for 100 percent nitrogen uptake by the irrigated crops. Since there is suitable land for irrigation in the vicinity of the District, this alternative is viable and will be evaluated in more detail in this report.

6.3.5 Naturally Aerated Facultative Lagoons with Surface Water or Groundwater Discharge

Facultative lagoons are medium depth ponds (typically 6 ft) that have both aerobic and anaerobic zones. These lagoons depend on natural biological, chemical and physical processes to stabilize the wastewater. Oxygen for biological stabilization is provided by natural aeration at the water surface and by algae through photosynthesis.

The treatment process is entirely natural and requires no mechanical aeration equipment. The only operation required is to direct flow from series to parallel operation should odors become a problem and to watch the pond level to ensure adequate storage is available should spring turnover temporarily suspend discharge. As with all wastewater ponds, the operator must periodically mow embankment vegetation, monitor effluent quality and exercise valves. Sludge removal is required every 10 to 20 years. Operation and maintenance of this technology is very simple and inexpensive.

This type of treatment process often disposes of treated effluent by discharging to a nearby stream or lake. A discharge permit from DEQ is required. The permit establishes contaminant concentration and load limits that cannot be exceeded. Monthly wastewater effluent samples are required. The operator that takes the samples must be properly licensed by the State of Montana and the samples must be analyzed by a certified lab in order to provide results to DEQ for review.

The biggest disadvantage with this process is the large pond area and volume required. A large pond area is required to provide sufficient oxygen by surface re-aeration. Also, the rate of organic decomposition is slower than other treatment processes because of poor mixing characteristics and the slower rate of oxygenation. This slower rate requires more detention time and therefore more volume. In addition, ice and snow cover can limit sunlight penetration needed for photosynthesis and the cold winter temperatures can greatly inhibit treatment capacity. The winter performance of facultative ponds is marginal and state design standards require sufficient storage for 180 days of detention and also require that the system have a 3-cell configuration.

Small communities often have less money available for maintenance and operation, which makes simpler systems more appealing. Lagoons typically have the lowest O&M costs of most public wastewater treatment facilities and effluent is typically disposed of by spray irrigation. These systems are considered “non-discharging” as long as effluent is applied at application rates where the crop will utilize the nitrogen in the effluent as fertilizer. If spray irrigation is not utilized, then effluent is typically discharged to either surface or groundwater and Montana’s nondegradation rules will apply.

Discharge to groundwater in excess of 5,000 gpd will require a discharge permit from DEQ. All new groundwater discharges must meet nondegradation standards, which typically will require the predicted level of nitrogen at the end of a mixing zone of 5 mg/L or less for conventional treatment. If Level 2 treatment is utilized, the nitrogen level at the end of the mixing zone can be as much as 7.5 mg/L.

Lagoon effluent can be highly variable with respect to both phosphorus and nitrogen concentrations and lagoons typically have difficulty meeting today’s discharge permit standards (often 10 mg/L total nitrogen at the end of the pipe). Winter temperatures will often slow a lagoon facilities ability to process nitrogen to the point where the effluent may have as much as 45 mg/L total nitrogen, which makes compliance with the terms of a discharge permit very difficult. As discussed in Section 5.4.9, the surface water discharge dilution calculation would require a minimum of 28 mg/L on a consistent basis, which is marginal with this alternative (See Appendix E). Additionally, lagoons commonly have odor problems, especially early in the spring during “turnover”, a phenomenon where the coldest water is right at the surface as the ice melts. This coldwater is heavier, and settles to the bottom of the lagoon displacing sediments, etc and bringing those materials to the surface creating the odor problem.

Given the above described treatment requirements, consideration of the numeric nutrient standards and TMDL’s described in Section 5.4, and wintertime treatment limitations, this alternative will not be evaluated further in this report with surface water discharge. Although, this technology can be used in conjunction with crop irrigation of wastewater effluent, and will therefore be evaluated further in combination with the Storage and Irrigation alternative (Alternative 6.3.4) mentioned above.

6.3.6 Mechanically Aerated Lagoons with Surface Water or Groundwater Discharge

This discharging lagoon technology uses some mechanical means for diffusing air into the wastewater. The upper zone of the pond is aerated and therefore in an aerobic environment and the lower portion is in an anaerobic environment. This process is known as a partial mix mechanically aerated facultative lagoon. Mechanical aeration may be accomplished by blowers and subsurface diffusers or by mechanical agitation at the surface using various forms of surface aerators. Pond depths typically vary between 10 – 15 feet. The operator must maintain the blower and aerators, monitor dissolved oxygen in the ponds, periodically mow embankment vegetation, and monitor effluent quality and exercise valves. Sludge removal is required every 10 to 20 years.

This type of treatment process often disposes of treated effluent by discharging to a nearby stream or lake. A discharge permit from DEQ is required. The permit establishes contaminant concentration and load limits that cannot be exceeded. Monthly wastewater effluent samples are required. The operator that takes the samples must be properly licensed by the State of Montana and the samples must be analyzed by a certified lab in order to provide results to DEQ for review.

Mechanically aerated ponds provide better mixing of organics and oxygen than the previously discussed facultative lagoon. Also, the mechanical equipment provides oxygen at a greater rate and to a greater depth. These process improvements over naturally aerated facultative ponds increase the rate of decomposition of organics and allow for shorter detention times and smaller ponds. The state design standards require 20 days of detention time and the systems are often designed with 30 days of detention time. Pond volumes may be 1/6 to 1/10 the size of the naturally aerated facultative ponds discussed previously.

Capital cost savings are often realized with the smaller ponds. The primary disadvantage is the need for mechanical equipment to accomplish these process improvements and the associated increase in operation and maintenance time and expense. Like the discharging facultative pond treatment alternative previously discussed, mechanically aerated ponds are designed to meet traditional secondary standards and are not designed to meet more stringent standards for nitrogen and phosphorous. Therefore, as with naturally aerated facultative ponds, mechanically aerated ponds have more uncertainty with their ability to meet the requirements for surface water or groundwater discharge as outlined in Section 5.4.9 and 5.4.10, and will not be evaluated further in this report. Although, this technology can be used in conjunction with crop irrigation of wastewater effluent, and will therefore be evaluated further in conjunction with the Storage and Irrigation Alternative mentioned above.

6.3.7 Septic Tank/Pressure Dosed Drainfield

The standard septic tank/drainfield type of treatment system is typically applied to individual residences or small subdivisions, but is occasionally applied to very small communities. This system consists of two primary components; the septic tank and the drainfield. Wastewater is delivered to the septic tank from the collection system. The septic tank size is based on the amount of flow generated by the users. The septic tank is typically made of concrete with a baffled inlet and outlet. The function of the septic tank is to separate solids from liquids and provide anaerobic treatment of the solids.

The partially treated liquid wastewater is then pumped from the septic tank to the drainfield. The drainfield consists of a series of distribution pipes with holes through which the wastewater is uniformly distributed. The distribution pipes discharge the wastewater into buried seepage trenches or beds designed to spread the wastewater out and facilitate seepage into the subsoil. The sewage is only partially treated in the septic tank, therefore the system relies on the soil to provide both treatment and disposal. The treatment is accomplished by the formation of a biomat at the interface of the trench bottom and existing ground surface and is largely aerobic in nature. Experience has shown that four feet of soil depth under unsaturated flow conditions is necessary for proper treatment.

Sometimes the soil can be neither too coarse such that a biomat is not formed or too fine such that the wastewater will not drain. With the majority of wastewater treatment and disposal taking place together in the soil matrix, there is also potential for insufficient treatment prior to disposal. Therefore, careful consideration must be given to site conditions including soil texture, groundwater depth and bedrock depth, groundwater flow direction, and potential contamination impacts. Properly sited, designed, constructed and maintained, the standard septic tank/drainfield type of treatment system can provide adequate wastewater treatment and is an accepted wastewater management method.

This alternative would require the community to obtain a groundwater discharge permit. This technology does not provide significant nitrogen removal and may have difficulty in some cases satisfying the nitrate requirements of the nondegradation regulations in aquifers with low hydraulic conductivities. As described in Section 5.4.10, this technology would require the most stringent nondegradation nitrogen limit (5.0 mg/L) to be met.

More importantly, for the design wastewater flows in this community, it would require impractically large drainfields – approximately 9.82 acres. For these reasons, the standard septic tank and drainfield treatment alternative will not be considered further in this report. Nondegradation calculations and drainfield sizing spreadsheets are included in Appendix P.

6.3.8 Septic Tank / Level 2 / Pressure Dosed Drainfield

This alternative is identical to the standard septic tank/pressure distribution drainfield system previously described, except it also incorporates an additional treatment process between the septic tank and drainfield. This additional process is to improve the quality of the effluent discharged to the pressure distribution drainfield. There are several different types of approved Level 2 treatment systems in Montana (accepted as a nutrient reducing treatment system) which provide some nitrogen removal and will improve the treatment systems ability to satisfy the more stringent nondegradation regulatory requirements.

Level 2 systems have the advantage of providing better effluent quality and more control over the treatment process when compared to standard septic tank and drainfield systems but are more expensive. Although, the added expense of treatment pods is partially offset by a 50-percent reduction in draindfield area required. This option also requires a groundwater discharge permit. As documented with nondegradation calculations in Appendix P, this type of treatment is feasible in the planning area. More importantly, for the design wastewater flows in this community, this type of system is incrementally expandable. For these reasons, this treatment alternative will be further evaluated in this report.

6.3.9 Constructed Wetlands

Constructed wetlands are emerging as an easily operated, efficient alternative to conventional treatment systems. The most common uses are municipal wastewater and acid mine drainage. This technology is relatively new (mid-1980s), but has been applied to several municipal facilities throughout North America and Europe. Europe tends to use the technology more for primary treatment. In North America wetlands often follow some form of primary treatment such as lagoons and septic tanks.

Constructed wetlands are artificially created wetlands using either subsurface or surface flow. Surface flow constructed wetlands consist of a basin or channels with some type of lining to prevent seepage. Soil is added to the bottom of these basins or channels to support emergent vegetation. The wastewater in these systems is exposed to the surface and therefore called free water surface wetlands.

Subsurface wetlands are basins or channels that are lined to prevent seepage and are filled with coarse grained material such as sand and gravels. These coarse grained materials allow wastewater to flow through the system, but below the free surface. The coarse grained material also supports the aquatic vegetation planted throughout the basin or channels. Typical vegetation planted in constructed wetlands include cattails, bulrushes, and reeds.

These systems rely on both aerobic and anaerobic biological processes to remove nutrients. The flow path through these systems is horizontal and the final effluent is generally collected at the end by an effluent manifold. These systems may discharge to groundwater or surface water. This technology is not feasible for discharge to surface waters based on the discharge permit requirements discussed in Section 5. Given the significant pretreatment and storage requirements, this technology has generally been more expensive than many of the other technologies. Additionally, there is less data available to support this type of treatment in our climate. Due to these facts, this technology will not be evaluated further in this report.

6.3.10 Biological Nutrient Removal (BNR) Mechanical Treatment Plant with Discharge to either Surface Water or Groundwater

Activated sludge is a biological treatment process that takes place in an aerobic and anaerobic atmospheres whereby waste is stabilized by aerobic microorganisms. The aerobic environment is achieved by means of diffused or mechanical aeration in a concrete basin. After being aerated, the biological mass is separated from the liquid in a settling tank or clarifier which acts as an anaerobic environment. A portion of the biological mass is then recirculated to the aeration basin to maintain a continuous colony of microorganisms. The liquid stream coming off the clarifier is typically disinfected and discharged to nearby surface water or groundwater.

There are a number of variations of the activated sludge treatment process, including but not limited to, extended aeration (high introduction of oxygen and long detention times), contact stabilization (raw wastewater contacted with activated sludge), complete mix-activated sludge (homogeneous mixing with uniform organic loadings), oxidation ditches, sequencing batch reactors (SBR), Bio-Wheel systems, and Membrane Batch Reactors (MBR). The treatment plants are complex mechanically and require power and operator skill. Systems may be provided as pre-manufactured package plants for smaller flows and as custom designed and constructed facilities for the larger flows. Surface water discharge is common with mechanical plants, but as discussed in Section 5.4, the numeric nutrient limits and TMDL's create more uncertainty, so surface water discharge will not be further evaluated. Surface water discharge may be feasible technically but any new surface water discharge to the Gallatin River will likely be subject to endless litigation by environmental groups as demonstrated in the past by Big Sky, MT (also see Section 5.4.9).

Groundwater disposal will require that a groundwater discharge permit be obtained. This permit will require satisfaction of Montana nondegradation regulation and the removal of nitrates to less than 7.5 mg/l at the end of a 500-foot mixing zone. Groundwater disposal using a mechanical plant is very feasible, given that some of the plant processes produce effluent meeting nondegradation standards without needing dilution by groundwater. Options include a modified oxidation ditch; Sequencing Batch Reactor (SBR), Membrane Bioreators (MBR), and custom build single stage MLE process. The oxidation ditch treatment system is typically more expensive with a larger foot print than the SBR. The MBR is also typically more expensive for both capital and O&M costs than the SBR. MBR utilize a smaller foot print than the SBR, but this is only important in the most severe land limited sites. A custom built MBR will also be more expensive. For these reasons an SBR plant is thought to be the most appropriate mechanical treatment technology for Gallatin Gateway at this stage of planning. During the design stage each of the above technologies will be investigated again prior to finalizing the design concept.

A sequencing batch reactor (SBR) is a biological nutrient removal system that would treat the wastewater to the high level required to meet nondegradation limits, and allow continued discharge by ground water via infiltration chambers. SBR's have been implemented in a few Montana communities, one of which (RAE Water & Sewer District) is located in the Gallatin County not too far from Gallatin Gateway.

An SBR is a batch process that has been used extensively in wastewater treatment. A single reactor is used for all treatment processes including aeration, biologic treatment, and clarification. Since the SBR treats wastewater in batches, a minimum of two tanks are required. The tanks operate 180 degrees out of phase, so while one tank is filling, the second tank is going through the aeration, clarification, and decanting cycles. The operational cycles of each tank are switched after each batch. When treatment is complete the treated effluent is decanted via floating decanters to an equalization basin for follow up treatment. An equalization basin allows any downstream process units, like disinfection, to be sized for system design flows rather than the higher flow rate of the decanter. Also after each batch, some of the sludge must be wasted from the SBR tank and sent to a sludge digester. Digested sludge is dewatered and stored until it can be disposed of through land application or in a landfill. In the final step, the treated wastewater will be disinfected with UV disinfection and discharged to the ground water.

The SBR type of mechanical treatment plant has proven effective within the Gallatin Valley, provides flexibility for expansion, and treats to high standard so this Alternative will be evaluated further in this report.

7.0 ALTERNATIVE ANALYSIS

7.1 Collection System Alternatives

Two collection systems were evaluated in this Section. Both systems are gravity flow and governed by the same regulations. The only significant difference is the alignments of the pipe network.

7.1.1 Alternative CS-1: Gravity Collection – Street Layout

The standard gravity collection system is the most commonly used municipal wastewater collection system. Several of the laterals are interconnected to eventually form a complex network of pipes that transport the raw sewage to a central location. From this central location, the raw sewage is then either pumped (lift station) or fed by gravity to the treatment site.

There is no septic tank between the home and the central collection system and therefore, no interception of solids prior to reaching the central sewer. Because this type of collection system handles both the solid and the liquid portions of raw sewage, larger pipe sizes must be used and manholes must be located at every change in alignment and slope. These design features are necessary to prevent plugging and to facilitate cleaning. The minimum pipe diameter allowed by state design standards is 8-inches and manholes must be located every 400 ft. State design standards also specify minimum slopes for each pipe diameter.

This type of collection system relies entirely on gravity for the transport of the raw sewage and therefore must be laid out in accordance with the topography of the area. Obviously, the less undulating and hilly the topography, the less complex and expensive the gravity collection system. At slopes greater than 20-percent, it is much more difficult to install a standard gravity collection system.

As discussed in Section 6.1.4, there are certain instances where some homes may require grinder pumps to pump raw sewage to the central sewer. For the grinder pump homes, flows from the homes would be transported to a smaller chamber where specially constructed pumps transport raw sewage through a pressure line that dumps the sewage into the gravity main. No solids separation takes place with the grinder pump concept. The size of each grinder vault is dependent on the flows generated by the particular user. Most residential homes would require a residential sized packaged grinder system. The grinder systems are more complicated than the standard gravity service lines because grinder pumps and controls are required for each grinder station. While generally reliable, the pumps and controls do fail requiring periodic repair. The use of grinder pumps is not the goal or intentions with this alternative, but could prove feasible in certain situations and is therefore noted.

A disadvantage of a gravity collection system is that it is susceptible to groundwater infiltration if the pipe and services are not properly installed. This is a concern in an area that experiences high groundwater. Groundwater infiltration may increase as the pipe joints degrade and if future services are not properly installed. Extra care needs to be taken in the design and construction of this type of system to prevent initial infiltration. To prevent future degradation, the installation of future services needs to be closely regulated by the District.

Schematic Layout

This alternative is unique to this analysis based on the system layout primarily within the street corridor. Individual services will convey effluent toward the street in front of each lot. It should be noted that although the street network was emphasized with this layout, there are certain areas where this was not practical; therefore, some of the alignment is along lot lines, creek corridors, and in alley ways. Figure 7.1.1 illustrates this collection system alternative and can be viewed on the following page.

Operational Requirements

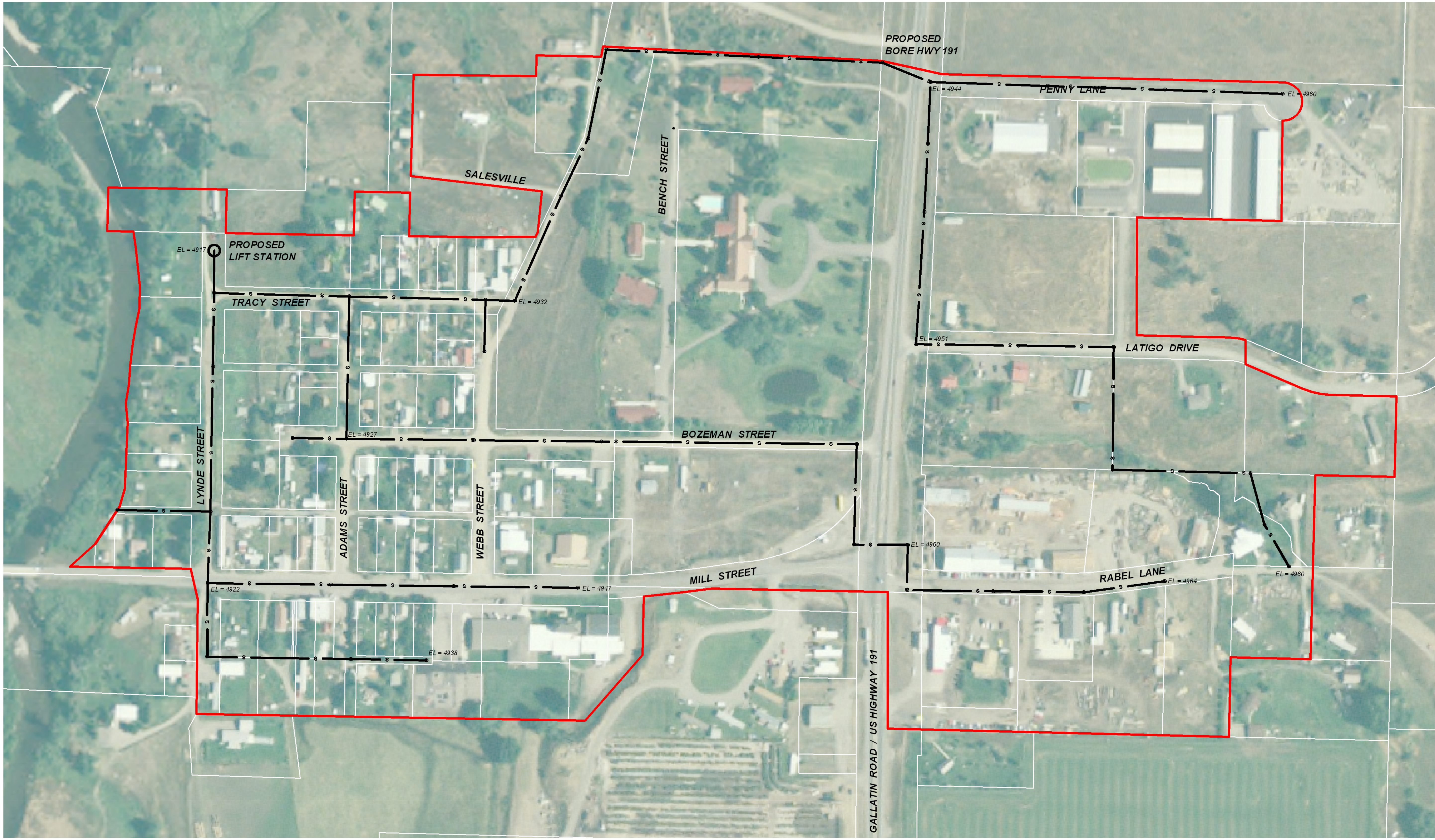
The primary advantage of the standard gravity collection system is its simple and inexpensive operation and maintenance. This is because it does not rely on numerous small pumping and control facilities that not only require ongoing maintenance but can also fail. The standard gravity collection system is a tried and true technology that has generally proven to be reliable if properly operated and maintained. The systems should be set up on a periodic flushing and cleaning schedule that results in the cleaning of each pipe segment in the system every five years. The system may experience periodic plugging that must be corrected by the system operator. These duties are important to manage though the operator skill level and manpower required with this technology is minimal, especially when compared with pressurized systems. These systems generally have a very long service life and can be expected to last 50 years or more.

Energy Requirements

This type of collection system operates via gravity and will therefore have no energy requirement. There could be a very slight increase in pumping power costs at the lift station with this collection system alternative due to a greater potential of inflow infiltration (I/I) creating more flow volume to pump. The additional energy consumption, if any, will be negligible.

Regulatory Compliance and Permits

The proposed alternative would be designed and constructed in compliance with Circular DEQ-2 regulations. Plans would need to be reviewed and approved by the Montana Department of Environmental Quality before bidding and construction could begin. Because of the total length of the pipeline placement, more than one acre of land would likely be disturbed; thus, a storm water discharge permit would be needed during construction. The selected contractor would be responsible for obtaining a storm water permit, as would be indicated in the project specifications. Environmental permits from the state and army corps are likely to be required with this alternative, but at this point in the process it is not known for sure. There are two stream crossing with potential for associated wetlands that may require permitting based on wetland classifications and amount of disturbance. Additionally, there will be Montana Department of Transportation (MDT) and Gallatin County Road and Bridge Department encroachment permits required.



Scale:

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SCALE IN FEET

NORTH

Legend:

EXISTING DISTRICT BOUNDARY (APPROX. 100 ACRE SERVICE AREA)

PROPOSED 8-INCH SEWER MAIN (APPROX. 11,500 LINEAL FEET)

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FIGURE 7.1.1
ALTERNATIVE CS-1
GRAVITY COLLECTION - STREET LAYOUT

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C:\Documents and Settings\rfillbach\Desktop\CADD 1-08159\Exhibits\PER\1-08159-Fig 7-1-1 Street Collection-A.dwg

Land Requirements

This alternative would be almost entirely constructed in existing right-of-ways, so very little land acquisition and/or easements would be necessary. The one area where an easement may be required is the collection lateral directly south of (and parallel to) Mill Street, which is located at the far southwest portion of the system. Another area an easement is necessary is along Wortman Creek. There are no anticipated conflicts with respect to land requirements with this alternative.

Environmental Considerations

Although large areas may be disturbed as a result of open-trench digging, virtually all areas will be within existing rights-of-way and easements that have been previously disturbed by development. There will be no changes in land use after completion of the project. Some air quality problems with dust may arise during the actual construction period because the majority of the streets are unpaved; however, it would be temporary and the contract documents would require that the Contractor provide dust control. Similarly, there will be some temporary noise during construction. Once construction is complete, there will be no noise or dust problems arising as a result of the improvements. The contract documents shall also require that Best Management Practices (BMP) be employed before, during, and after construction until all areas of disturbance have been fully reclaimed and/or re-vegetated. For these reasons, environmental impacts are considered minimal and no permanent, negative environmental impacts are anticipated.

Construction Problems

Pipe construction would include placing pipelines using a typical open-trench method involving excavation, shoring, bedding materials, dewatering as necessary and installation of new pipe. Trench width is somewhat dependent on the size of pipe being replaced and the size of the equipment used to excavate. For this project it is estimated that the trench width would be approximately ten feet at a maximum. The depth of the trench will vary dependent upon the design depth of the sewer line. Most depths are expected to be approximately 5 – 8 feet deep.

Some disadvantages of pipe placement in the streets are the disturbance of existing road surfacing, and the traffic control nuisance to area residents. Construction can sometimes be difficult especially when working at peak hours, sections of deep pipelines, or in areas with high groundwater. Each of these is a concern for Gallatin Gateway.

Cost Estimates

The direct construction cost estimate for collection system Alternative CS-1 is shown below on Table 7.1.1. The lift station cost has been included as part of the collection system.

Table 7.1.1 - Opinion of Probable Cost Gallatin Gateway Wastewater Treatment Project Alternative CS-1 - Gravity Collection - Street Layout (w/ Lift Station)					
#	**BID ITEM**	**QTY**	**UNITS**	**UNIT PRICE[1]**	**TOTAL**
1	Exploratory Excavation	40	HR	$ 150.00	$ 6,000
2	Erosion Control	1	LS	$ 5,000.00	$ 5,000
3	8" PVC SDR 35 Sewer Main	11,500	LF	$ 52.00	$ 598,000.00
4	48-inch Standard Manhole	50	EA	$ 3,000.00	$ 150,000
5	4" Gravity Service Line	9,000	LF	$ 28.00	$ 252,000.00
6	Service Connection	81	EA	$ 1,000.00	$ 81,000.00
7	Abandon Existing Septic Tank in Place	81	EA	$ 750.00	$ 60,750.00
8	Bore and Jack Hwy 191 (x2)	240	LF	$ 300.00	$ 72,000.00
9	Asphalt Removal & Replacement	80	SY	$ 36.00	$ 2,880
10	Lift Station & Emergency Power	1	LS	$ 140,000.00	$ 140,000
11	Chain Link Fencing Around Lift Station	140	LF	$ 25.00	$ 3,500
	Direct Construction Subtotal				**$ 1,371,000**

[1] *Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.*

Other costs associated with this construction are shown in Section 7.3 along with the treatment alternatives and include items such as: operation and maintenance, mobilization, traffic control, financial, land acquisition and/or easements, permitting, engineering, legal, and administrative. Given that the collection system cost estimates are purely based on preliminary design and the margin between these non-construction items is relatively small among the two collection system alternatives considered, they will not be part of this collection system comparative analysis.

Capital costs for this alternative (CS-1) are $1,371,000. The O&M costs are $2,000 with a present worth value of $29,997. The salvage value at the end of 20 years is $693,900 with a present worth value of $216,400. The overall present worth cost for this alternative is $1,184,597. This analysis is also shown on Table 8.2.3.

The quantities used in Table 7.1.1 were calculated from the preliminary design layout for this alternative. The unit costs are based upon estimates from suppliers and bid tabs from similar projects throughout Montana. Careful consideration was given to each line item regarding project location and any site specific information available at this time.

7.1.2 Alternative CS-2: Gravity Collection – Alley Layout

The standard gravity collection system is the most commonly used municipal wastewater collection system. Several of the laterals are interconnected to eventually form a complex network of pipes that transport the raw sewage to a central location. From this central location, the raw sewage is then either pumped (lift station) or fed by gravity to the treatment site.

There is no septic tank between the home and the central collection system and therefore, no interception of solids prior to reaching the central sewer. Because this type of collection system handles both the solid and the liquid portions of raw sewage, larger pipe sizes must be used and manholes must be located at every change in alignment and slope. These design features are necessary to prevent plugging and to facilitate cleaning. The minimum pipe diameter allowed by state design standards is 8-inches and manholes must be located every 400 ft. State design standards also specify minimum slopes for each pipe diameter.

This type of collection system depends entirely on gravity for the transport of the raw sewage and therefore must be laid out in accordance with the topography of the area. Obviously, the less undulating and hilly the topography, the less complex and expensive the gravity collection system. At slopes greater than 20%, it is much more difficult to install a standard gravity collection system. Where the topography is very hilly and steep, it may be more functional and cost effective to install a collection system that utilizes force mains and pumps.

As discussed in Section 6.1.4, there are certain instances where some homes may require grinder pumps to pump the raw sewage to the central sewer. For the grinder pump homes, flows from the homes would be transported to a smaller chamber where specially constructed pumps transport raw sewage through a pressure line that dumps the sewage into the gravity main. No solids separation takes place with the grinder pump concept. The size of each grinder vault is dependent on the flows generated by the particular user. Most residential homes would require a residential sized packaged grinder system. The grinder systems are more complicated than the standard gravity service lines because grinder pumps and controls are required for each grinder station. While generally reliable, the pumps and controls do fail requiring periodic repair. The use of grinder pumps is not the goal or intentions with this alternative, but could prove feasible in certain situations and is therefore noted.

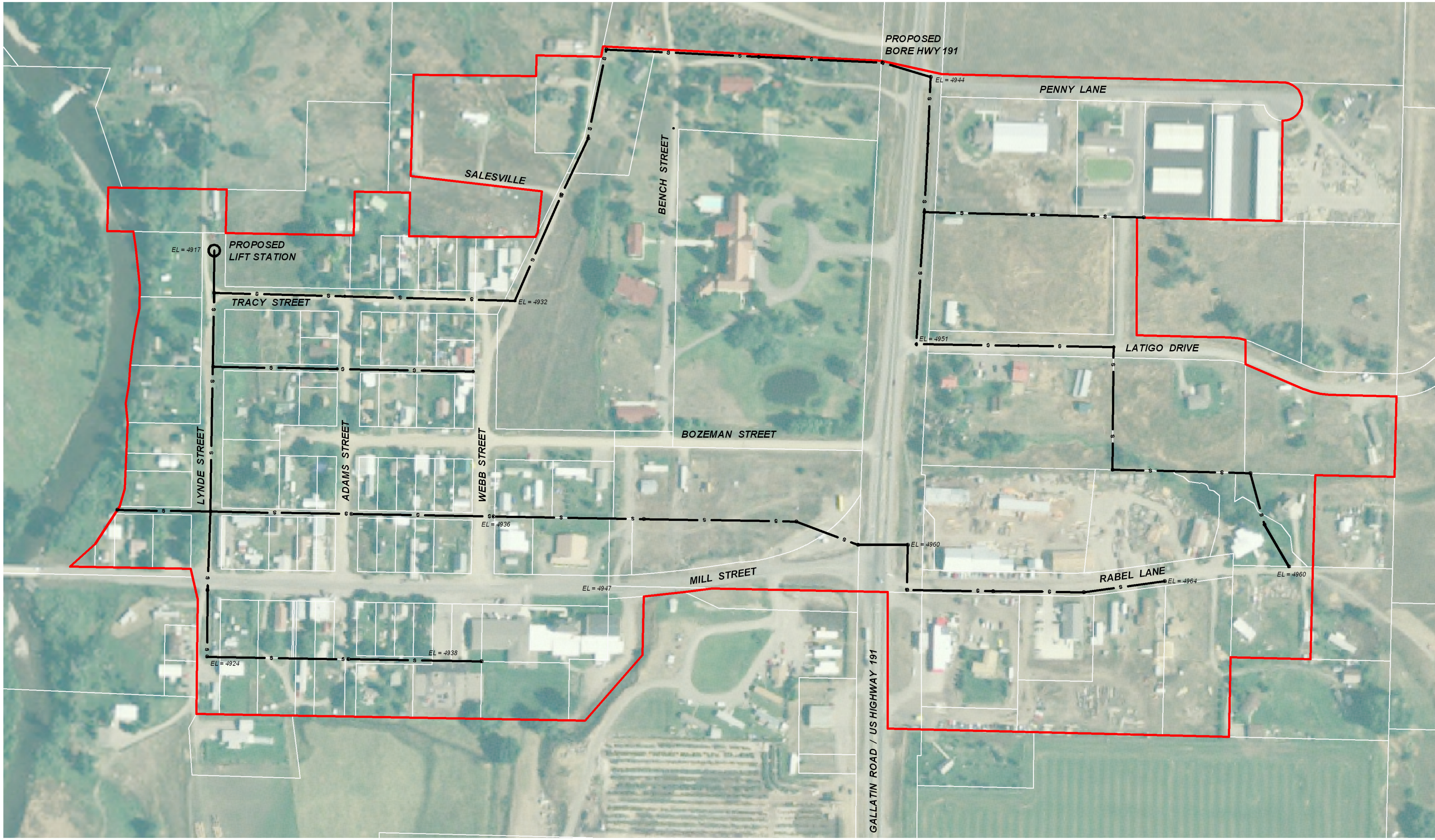
A disadvantage of a gravity collection system is that it is susceptible to groundwater infiltration if the pipe and services are not properly installed. This is a concern in an area that experiences high groundwater. Groundwater infiltration may increase as the pipe joints degrade and if future services are not properly installed. Extra care needs to be taken in the design and construction of this type of system to prevent initial infiltration. To prevent future degradation, the installation of future services needs to be closely regulated by the District.

Schematic Layout

This alternative is unique to this analysis based on maximizing the amount of collection pipe placed within the alley ways verses the streets. Individual services will convey effluent toward the back of each lot. However, there are certain areas with this layout where locating collection pipe outside of the alley way was unavoidable. For example, areas with no existing alley, areas on the edge of District, and at road crossings. Figure 7.1.2 illustrates this collection system alternative and can be viewed on the following page.

Operational Requirements

The primary advantage of the standard gravity collection system in general is its simple and inexpensive operation and maintenance. This is because it does not rely on numerous small



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SCALE:

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SCALE IN FEET

NORTH

LEGEND:

EXISTING DISTRICT BOUNDARY (APPROX. 100 ACRE SERVICE AREA)

PROPOSED 8-INCH SEWER MAIN (APPROX. 10,500 LINEAL FEET)

FIGURE 7.1.2
ALTERNATIVE CS-2
GRAVITY COLLECTION - ALLEY LAYOUT

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C:\Documents and Settings\rfillbach\Desktop\CADD 1-08159\Exhibits\PER\1-08159-Fig 7-1-2 Alley Collection-A.dwg pumping and control facilities that not only require ongoing maintenance but can also fail. The standard gravity collection system is a tried and true technology that has generally proven to be reliable if properly operated and maintained. The systems should be set up on a periodic flushing and cleaning schedule that results in the cleaning of each pipe segment in the system every five years. The system may experience periodic plugging that must be corrected by the system operator. These systems generally have a very long service life and can be expected to last 50 years or more.

Energy Requirements

This type of collection system operates via gravity and will therefore have no energy requirement. There could be a very slight increase in pumping power costs at the lift station with this collection system alternative due to a greater potential of inflow infiltration (I/I) creating more flow volume to pump.

Regulatory Compliance and Permits

The proposed alternative would be designed and constructed in compliance with Circular DEQ-2 regulations. Plans would need to be reviewed and approved by the Montana Department of Environmental Quality before bidding and construction could begin. Because of the total length of the pipeline placement, more than one acre of land would likely be disturbed; thus, a storm water discharge permit would be needed during construction. The selected contractor would be responsible for obtaining a storm water permit, as would be indicated in the project specifications. Environmental permits from the state and army corps are likely to be required with this alternative, but at this point in the process it is not known for sure. There are two stream crossing with potential for associated wetlands that may require permitting based on wetland classifications and amount of disturbance. Additionally, there will be Montana Department of Transportation (MDT) and Gallatin County Road and Bridge Department encroachment permits required.

Land Requirements

The alternative would be mostly constructed in existing rights-of-way, so very little land acquisition and/or easements would be necessary. The same as with the street layout, the area where an easement may be required is the lateral directly south of (and parallel to) Mill Street, which is located at the far southwest portion of the system, and also the collection pipe along Wortman Creek. There are no anticipated conflicts with respect to land requirements with this alternative.

Environmental Considerations

Although large areas may be disturbed as a result of open-trench digging, virtually all areas will be within existing rights-of-way and easements that have been previously disturbed by development. There will be no changes in land use after completion of the project. Some air quality problems with dust may arise during the actual construction period because the majority of the streets are unpaved; however, it would be temporary and the contract documents would require that the Contractor provide dust control. Similarly, there will be some temporary noise during construction. Once construction is complete, there will be no noise or dust problems arising as a result of the improvements. The contract documents shall also require that Best Management Practices (BMP) be employed before, during, and after construction until all areas of disturbance have been fully reclaimed and/or re-vegetated. For these reasons, environmental impacts are considered minimal and no permanent, negative environmental impacts are anticipated.

Construction Problems

Pipe construction would include placing pipelines using a typical open-trench method involving excavation, shoring, bedding materials, dewatering if necessary and installation of new pipe. Trench width is somewhat dependent on the size of pipe being replaced and the size of the equipment used to excavate. For this project it is estimated that the trench width would be approximately ten feet at a maximum. The depth of the trench will vary dependent upon the design depth of the sewer line. Most depths are expected to be approximately 5 to 8 feet deep.

The biggest disadvantage of pipe placement in an alley is the lack of space to work in, and haul trucks typically have longer routes. There is also disturbance of existing road surfacing, and the traffic control nuisance to area residents. Construction can sometimes be difficult especially when working at peak hours, sections of deep pipelines, or in areas with high groundwater. Each of these is a concern for Gallatin Gateway.

Cost Estimates

The direct construction cost estimate for collection system Alternative CS-2 is shown below on Table 7.1.2. The lift station cost has been included as part of the collection system.

Table 7.1.2 - Opinion of Probable Cost
Gallatin Gateway Wastewater Treatment Project
Alternative CS-2 - Gravity Collection - Alley Layout (w/ Lift Station)

#	BID ITEM	QTY	UNITS	UNIT PRICE [1]	TOTAL
1	Exploratory Excavation	40	HR	$ 150.00	$ 6,000
2	Erosion Control	1	LS	$ 5,000.00	$ 5,000
3	8" PVC SDR 35 Sewer Main	10,500	LF	$ 52.00	$ 546,000.00
4	48-inch Standard Manhole	45	EA	$ 3,000.00	$ 135,000
5	4" Gravity Service Line	5,700	LF	$ 28.00	$ 159,600.00
6	Service Connection	81	EA	$ 1,000.00	$ 81,000.00
7	Abandon Existing Septic Tank in Place	81	EA	$ 750.00	$ 60,750.00
8	Bore and Jack Hwy 191 (x2)	240	LF	$ 300.00	$ 72,000.00
9	Asphalt Removal & Replacement	80	SY	$ 36.00	$ 2,880
10	Lift Station & Emergency Power	1	LS	$ 140,000.00	$ 140,000
11	Chain Link Fencing Around Lift Station	140	LF	$ 25.00	$ 3,500
	Direct Construction Subtotal				**$ 1,212,000**

[1] *Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.*

Other costs associated with this construction are shown in Section 7.3 along with the treatment alternatives and include items such as: operation and maintenance, mobilization, traffic control, financial, land acquisition and/or easements, permitting, engineering, legal, and administrative.

Given that the collection system cost estimates are purely based on preliminary design and the margin between these non-construction items is relatively small among the two collection system alternatives considered, they will not be part of this collection system comparative analysis.

Capital costs for this alternative (CS-2) are $1,212,000. The O&M costs are $2,000 with a present worth value of $29,997. The salvage value at the end of 20 years is $598,260 with a present worth value of $186,500. The overall present worth cost for this alternative is $1,055,497. This analysis is also shown on Table 8.2.3.

The quantities used in Table 7.1.2 were calculated from the preliminary design layout for this alternative. The unit costs are based upon estimates from suppliers and bid tabs from similar projects throughout Montana. Careful consideration was given to each line item regarding project location and any site specific information available at this time.

7.2 Lift Station Alternatives

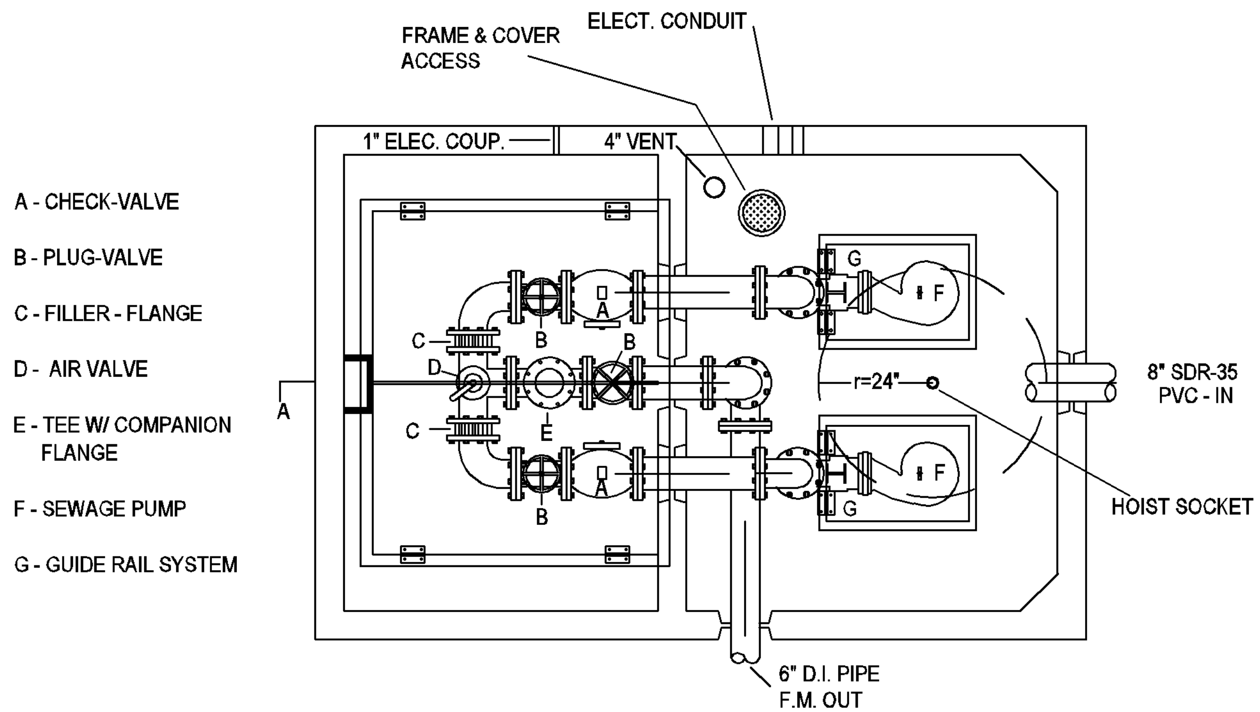
The alternative screening process looked at various lift station systems that could be used to convey raw wastewater to the treatment site. The only system recommended for further evaluation was a single centralized lift station. Different variations of this type of lift station are examined in Section 7.2.1 below.

7.2.1 Alternative L-1: Single Centralized Lift Station

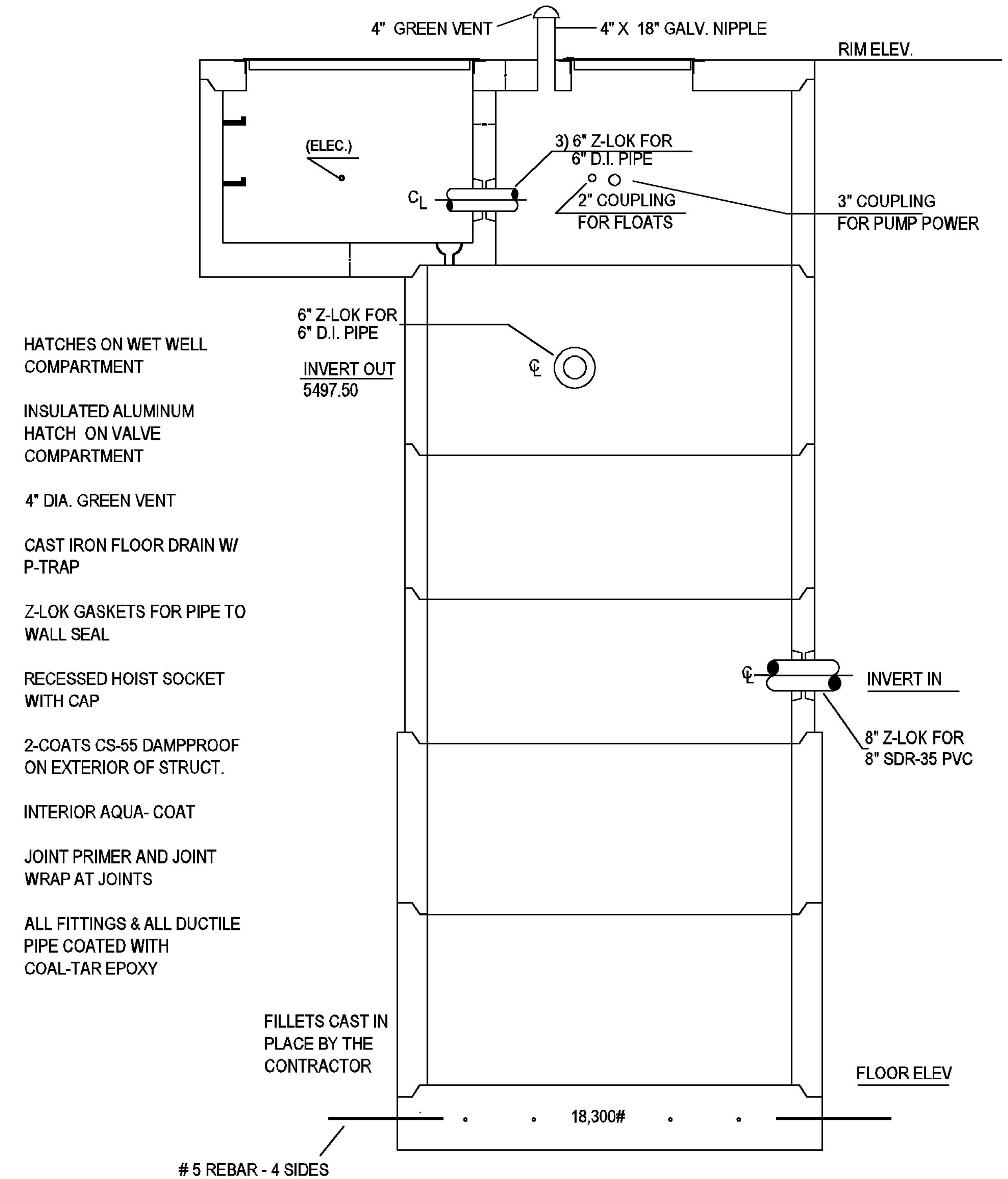
The single centralized lift station is the end point for the entire collection system and is designed to pump untreated wastewater to the treatment site. This type of lift station is often referred to as a *raw sewage* lift station. Three types of lift stations were examined for this application that included: 1) Packaged Submersible Lift Station, 2) Wet Well/Dry Well Lift Station and 3) Suction Lift Station.

1) Package submersible lift stations typically consist of two submersible pumps placed within a wet well. The discharge lines (force mains) extend up into an above ground insulated structure which sits on top of the wet well. The above ground structure houses the valves and control equipment for the station. The force main then goes back down through the floor and out through the wall of the wet well so that the force main is approximately 5 to 6 feet underground for frost protection. A typical detail of a package submersible lift station is shown of Figure 7.2.1. The pumps are attached to guide rails which allow the pumps to be removed for maintenance without entering the wet well. These stations are economical and have relatively low operation and maintenance requirements. Another advantage is that the operator should rarely need to enter the wet well and therefore; standard operation and maintenance tasks can be completed without entering a confined space. A package submersible lift station does not require a dry well. Capital costs for this alternative are included in Tables 7.1.1 and 7.1.2.

2) Wet well/dry well lift stations were the most common lift station design for many years until package stations became widely accepted for smaller communities. These stations can be designed with either submersible or centrifugal pumps. The wet well is where wastewater is



PLAN VIEW OF VALVE VAULT/WET WELL STRUCTURE W/PLUMBING



PROFILE VIEW OF STRUCTURE

SCHEMATIC DRAWING
PACKAGED SUBMERSIBLE LIFT STATION

FIGURE 7.2.1
CENTRALIZED LIFT STATION
ALTERNATIVE L-1

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stored for pumping. When submersible pumps are used, the submersible pumps are located in the wet well and are connected to the force main that leaves the wet well and enters the dry well. The dry well houses the valves and control equipment. Both the wet well and dry well are located in below ground concrete structures. When centrifugal pumps are used, the pumps are in the dry well with the valves and control equipment. The suction line typically goes through the wall of the wet well into the dry well. These stations are typically more expensive than package submersible stations because they require an additional below ground structure (the dry well). Also, the dry well needs to be entered on a regular basis to perform regular operational and maintenance duties. This requires a mechanical ventilation system meeting state standards. The dry well needs to be treated as a confined space; therefore, entry to this area should be conducted in accordance with OSHA regulations. Normally, this option has higher costs associated with it than a typical package submersible lift station making it cost prohibitive. This option will cost approximately 100% more than a new package submersible system. Therefore, this alternative will not be evaluated in further detail.

3) Suction lift pump stations typically consist of centrifugal solids handling pumps constructed on grade within an above ground structure. They have suction lines which drop into a wet well located below the structure. The pumps are designed to provide the necessary suction head and re-prime themselves automatically after each cycle. There are several advantages to suction lift stations. The pumps, valves, and control equipment are easily accessed within an above ground ventilated structure. This improves the quality of maintenance performed on the station. Also, since the structure is above ground and ventilated it does not have to meet confined space entry requirements mandated by OSHA. Unfortunately, the commercially available suction lift stations are generally designed for communities with larger flows than this lift station will experience. Also, a suction lift station would cost 75% to 125% more than a submersible package system. Therefore, construction of a new suction lift station is not the recommended alternative for this project.

- As described above, the Packaged Submersible Lift Station provides the least capital cost alternative, and the amount of operation and maintenance would be similar for all the alternative.

Similarly to the type of lift station, backup power could be provided through different means. The two most common sources of backup power are a stationary generator or a portable generator set mounted on a trailer. A stationary generator could be linked to the control system of the lift station to automatically start and run periodically and to automatically switch over to the generator during a power failure. A portable generator would need to be transported to the lift station during a power outage and manually connected to the lift station and started. Since most power outages occur during inclement weather and/or during the night, and an undetected power outage can lead to back-ups in the sewer system, the stationary generator is a more desirable option for the District. Backup power costs are included with the lift station cost in Tables 7.1.1 and 7.1.2.

Schematic Layout

Figure 7.2.1 is a schematic drawing of an example packaged submersible type lift station and can be viewed on the following page. Others will be examined during the design phases of the project. This example is very representative and was used for cost estimating purposes.

Operational Requirements

The operational requirements for a new packaged lift station will vary to some degree based on the specifics of the system and how the controls are set up. Most of the packaged lift stations utilized new technologies and are user friendly. Many of the operations can be automated and even remotely managed via telemetry equipment. If basic controls are used, the operator checks the lift station and records the meter readings on a daily basis during the week.

Energy Requirements

Energy consumption for the size and type of lift stations considered will be virtually the same for any of the single lift station options. By nature, raw sewage pumps are not very efficient because they need at least a 3-inch diameter impeller to pass solids. At a minimum, 15-horsepower pumps will be required for this application, based on a conservative value of total dynamic head (TDH) of 100 feet. Three-Phase power is a requirement to operate the size of pumps necessary for this lift station.

Regulatory Compliance and Permits

The design and construction of a new lift station would need to comply with the requirements of Circular DEQ-2 and approval of the plans and specifications would be necessary before construction could begin.

Land Requirements

The new lift station would be relatively small and should easily fit within the existing right-of-way of Lynde Street, so no land acquisition will be necessary. Refer to Figure 7.1.1 or 7.1.2.

Environmental Considerations

The proposed lift station site will be constructed in a road right-of-way so there will be no adverse impacts to undisturbed areas or farm grounds. However, the contractor will still be required to file and erosion control plan and secure a construction permit to prevent pollution of State surface waters due to construction activities. This area is not in a delineated floodplain, but is in close proximity to the Gallatin River, so precautions are necessary.

The lift station will most likely extend into the seasonal groundwater table, so water proofing the wet well basin will be especially important in order to protect groundwater quality. Generally speaking, the implementation of a lift station implies that the entire centralized system is constructed, which will greatly reduce contamination of groundwater by placing wastewater into newly constructed sealed components throughout the area rather than the current situation of failing cesspools, and drainfields.

Construction Problems

The only construction problem foreseen at this time are issues associated with construction below the groundwater table. This type of construction problem is not out of the ordinary and the magnitude of the problem will depend on the time of year construction is taking place. Traffic and access issues will be minimal given the location of the project.

Cost Estimates

Construction cost estimates for the lift station with backup power are included with the collection system alternative cost Tables 7.1.1 and 7.1.2 found in the previous Section of this report. The operation and maintenance, mobilization, traffic control, financial, land acquisition and/or easements, permitting, engineering, legal, and administrative costs are included with the treatment alternative cost estimates in Section 7.3. In addition, present worth and salvage value estimates are also included with the treatment alternative cost estimates in Section 7.3, and on Table 8.4.3 in Section 8. The lift station estimates were based on several comparable applications of past projects completed by Great West Engineering.

7.3 Treatment Alternatives

Several treatment alternatives were discussed in the alternative screening process and the follow 5 alternatives were selected for a detailed analysis in this Section:

- → T-1: No Action Alternative
- → T-2: Connection to Utility Solutions Wastewater Treatment Plant
- → T-3: Storage and Irrigation (Low Rate Land Application)
- → T-4: Septic Tank / Level 2 Treatment / Pressure Dosed Drainfield
- → T-5: Biological Nutrient Removal (BNR) Mechanical Treatment Plant

7.3.1 Alternative T-1: No Action Alternative

The no action alternative would consist of simply that, no improvements, repairs or replacements to the existing onsite individual septic systems. For the most part, the existing systems are out of compliance with current regulations and there is essentially a moratorium on new systems in the town core area.

Schematic Layout

There is no schematic layout of the existing septic system(s) in this report. Some of the existing systems are identifiable from old record drawings, discussions with local installers and engineers, infrared photography, or simply by looking for physical evidence on each lot.

However, the locations of many of these systems are unknown because they were installed prior to health regulations with no record drawings and/or have been completely buried.

Operational Requirements

There are no operational requirements for this alternative other than the standard homeowner and/or business owner maintenance for onsite systems.

Energy Requirements

Energy consumption with this alternative would not change from the current situation. There are very little energy requirements because most of the systems are presumably completely gravity operated. There could be a few more recent systems with individual effluent pumps or pressurized drainfields. These would be limited to renovated houses or replacement systems approved through the local health department, which would have most likely included a variance for approval.

Regulatory Compliance and Permits

The No Action alternative will not bring any systems that are out of compliance, into compliance. This alternative relies on the local health department granting variances for any existing system that fails or any new system proposed. The variance process puts the local health department, county officials, and state reviews in a difficult position, especially when it comes to grandfathered dwellings operating below current standards.

Land Requirements

No land requirements are necessary with this alternative. Individual replacement systems (if granted) may require additional space, but would be limited to the subject parcel.

Environmental Considerations

This alternative will have negative impacts on the surrounding area since the identified water quality problem would not be corrected. Contamination of the groundwater supply from out-of-compliance septic systems will continue to threaten the public health and safety in this area.

Construction Problems

Construction problems with this alternative are primarily based on replacement of existing systems. The main concern is separation distance from septic systems to water supply wells. There can also be problems locating the old systems and keeping a home livable during the time of construction.

Cost Estimates

The No Action alternative is the least expensive alternative, and that is the only reason for continued consideration of this alternative. There is no cost estimate associated with this alternative in this report. It should be noted that although there is no capital cost for construction or no user rate for operation and maintenance, the individual septic systems will fail at some point in time. When a system fails it causes an excessive monetary burden at one time often with no warning, and the home/business will not be livable/operational until the problem is resolved. The cost associated with this is often under estimated in areas like this because they usually require more engineering design, the most technological advanced systems, and higher permitting costs in addition to the cost of construction.

7.3.2 Alternative T-2: Connection to Utility Solutions Wastewater Treatment Plant

This alternative consists of constructing a new force main from the centralized lift station to Utility Solution's wastewater treatment plant facility located near Four Corners, Montana. This facility is a private utility that was constructed in 2001 primarily to serve a development project (Elk Grove Subdivision), but incorporated a facility plan to serve more of the surrounding area. The system was later purchased by Utility Solutions, and has since grown to service much of the Four Corners area. The wastewater is treated by the use of an Oxidation Ditch Mechanical Treatment Plant that discharges to groundwater through infiltration/percolation galleries. After discussions with Utility Solutions, it appears there is sufficient capacity in their plant to connect the community of Gallatin Gateway. See Appendix L for documentation of correspondence with Utility Solutions.

The proposed route for the force main is presented in Figure 7.3.2A and will take advantage of the public right-of-way to the maximum extent possible. The force main diameter will be 6-inches and the length will be approximately 23,700 lineal feet, or 4.5 miles. The force main sizing is primarily based upon DEQ-2 Chapter 10 and is also directly related to the lift station design in Chapter 40.

Section 11.243 of Circular DEQ-2 states:

> *The 100 gpcd figure must be used which, in conjunction with a peaking factor from Figure 1, is intended to cover normal infiltration for systems built with modern construction techniques.*

Section 42.38 of Circular DEQ-2 states:

> *…The station design peak hourly flow capacity must be determine in accordance with Section 11.24 and should be adequate to maintain a minimum velocity of 2 feet per second (0.61 m/s) in the force main. Refer to Section 48.1.*

Section 48.1 of Circular DEQ-2 requires:

> *At design pumping rates, a cleaning velocity of at least 2 feet per second (0.61 m/s) must be maintained. The minimum force main diameter for raw wastewater is 4 inches (102 mm). It is desirable to have cleaning velocities of at least 3 feet per second (0.91 m/s).*

The design flow (50,000 gpd) is multiplied by a peaking factor (4) determined from Figure 1 in DEQ-2 Chapter 10, in order to determine the minimum flow for pipe sizing. A 6-inch diameter force main requires a flow of approximately 180 gallons per minute to maintain a minimum velocity of two feet per second. The lift station pumps shall be sized accordingly.

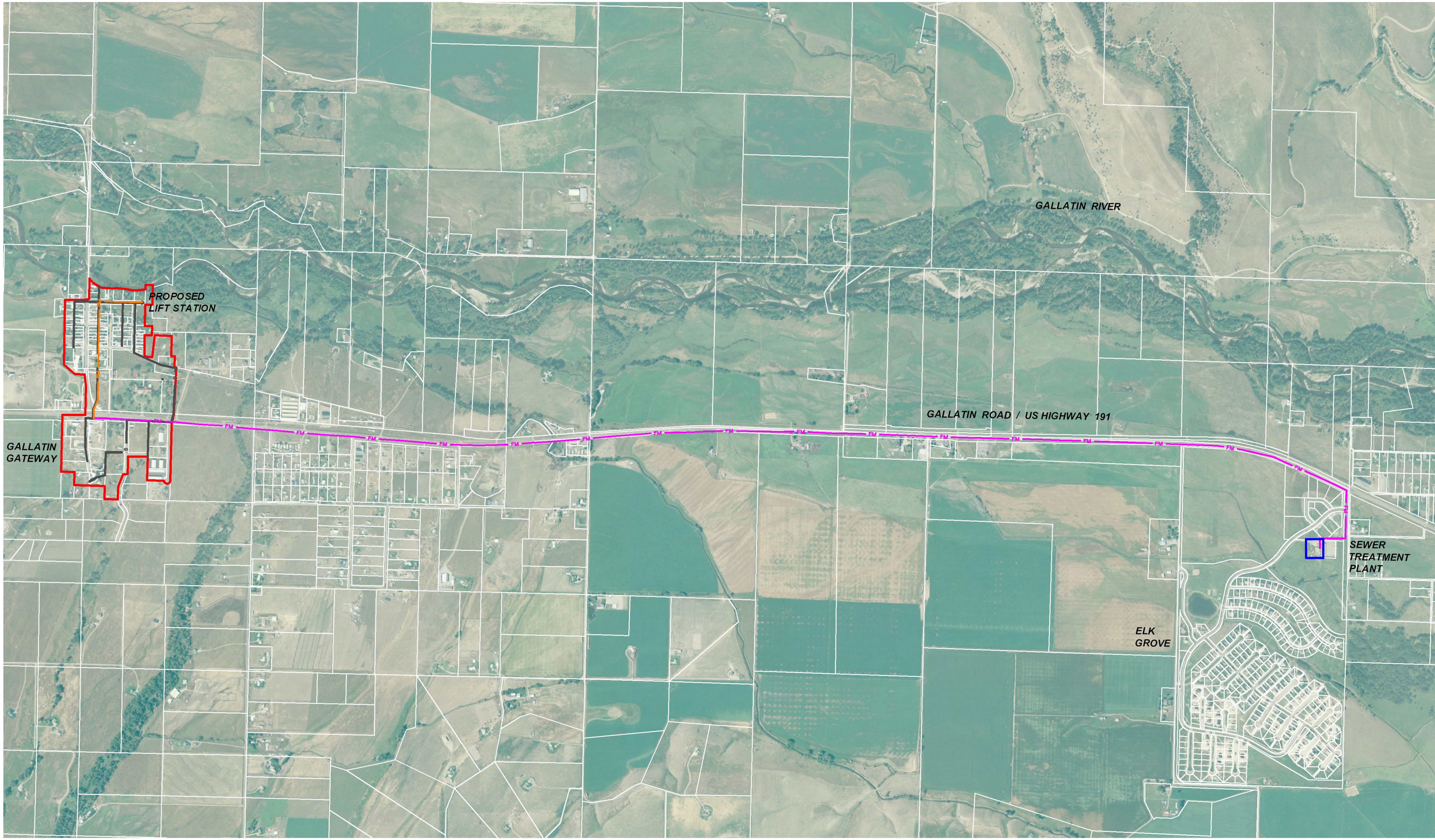
The force main alignment within the District boundary is parallel to the gravity collection system to minimize construction disturbance, and because it offers more feasible installation. Where the force main extends beyond the collection system (District), it follows the US Highway 191 public right-of-way most of the way to the treatment facility. As the force main approaches the treatment facility, it bends and follows Violet Road for approximately 750-feet before extending into the treatment plant facility property. The alignment near the connection point is preliminary and would likely be adjusted in the design phases of the project. It is anticipated that this part of the design would entail a considerable amount of correspondence and coordination with Utility Solution's engineers.

A gravity trunk main was also considered during the analysis rather than a force main. This option still utilized a force main (with the same alignment) to get from the lift station to the highway right-of-way. At that point it would discharge into a gravity trunk main that followed the same alignment along the highway right-of-way until a point at which it needed to cut across properties prior to Violet Road in order to maintain a positive gravity flow. Although gravity systems are typically preferred, in this particular instance it proved to be more problematic and had a higher capital cost. The main problems would be crossing South Cottonwood creek, maintaining grade without having excessively deep trenches, and procurement of easements toward the end of the pipe before reaching the treatment facility. At the time of design, a gravity sewer main can be reevaluated. If other potential users along the outfall route are willing to participate in the cost of construction of the outfall main, the added expense of gravity main may be eliminated and become a more feasible alternative. At this time the more cost effective force main alternative will be used. The operation cost would most likely be cheaper with the gravity main, but the monthly rate charged by Utility Solutions is expected to be the same. The cost estimating section below shows both the gravity trunk main, and the force main options.

There are three main issues that create a higher level of uncertainty with this alternative that should be noted. First, throughout this PER process the Four Corners Water and Sewer District (FCWSD) was actively trying to purchase Utility Solutions. A negotiated purchase price of $24.9M was established, but the FCWSD's funding did not succeed. Secondly, the Public Service Commission (PSC) is currently intervening with the private utility to establish rates of the original customer, Elk Grove Subdivision. Third, Utility Solution's overall system is considered over-built from the standpoint that there are less than 50-percent of the connections currently in service. Since the District's correspondence with Utility Solutions has been somewhat limited and preliminary in nature, and because of the dynamic nature of Utility Solutions current status, this alternative will be continually re-evaluated throughout the process and into the preliminary design phases.

Schematic Layout

Attached are two figures showing the schematic layout for this alternative. The first, Figure 7.3.2A, shows the alternative as proposed with a force main connection. The second, Figure 7.3.2B, shows the option of this alternative with the gravity trunk main that was dismissed.



SCALE:

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SCALE IN FEET

NORTH

LEGEND:

- EXISTING DISTRICT BOUNDARY
- EXISTING WASTEWATER TREATMENT PLANT (UTILITY SOLUTIONS)
- FM — PROPOSED 6-INCH EFFLUENT FORCE MAIN (23,700 LF)

FIGURE 7.3.2A
TREATMENT ALTERNATIVE T-2
FORCE MAIN TO UTILITY SOLUTIONS

GALLATIN GATEWAY COUNTY WATER AND SEWER DISTRICT
2010 PRELIMINARY ENGINEERING REPORT (PER)

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SCALE:

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SCALE IN FEET

NORTH

LEGEND:

- EXISTING DISTRICT BOUNDARY
- EXISTING WASTEWATER TREATMENT PLANT (UTILITY SOLUTIONS)
- PROPOSED 6-INCH EFFLUENT FORCE MAIN (2,600 LF)
- PROPOSED 8-INCH GRAVITY TRUNK MAIN (20,500 LF)

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FIGURE 7.3.2B
TREATMENT ALTERNATIVE T-2
GRAVITY MAIN TO UTILITY SOLUTIONS

GALLATIN GATEWAY COUNTY WATER AND SEWER DISTRICT
2010 PRELIMINARY ENGINEERING REPORT (PER)

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Operational Requirements

Discussions with Utility Solutions on January 15, 2010 resulted in an understanding that the only way they would be willing to treat Gallatin Gateway's wastewater is to have full control over the entire system. They expressed their concern that the best way for them to manage their treatment facility, and ultimately their discharge permit requirements, is to control what goes into the system. The operational requirements for this alternative are deferred to Utility Solutions.

Generally, the operational requirements associated with an Oxidation Ditch Mechanical Plant are much more elaborate as compared to the other alternatives in this analysis. However, Utility Solutions does employ at least one full-time operator and an engineer. The proportionate costs for these operations will be passed onto the District through a user fee, which is described in more detail below.

Energy Requirements

Similar to the operational requirements described above, the energy requirements would be deferred to Utility Solutions with this alternative. From an overall perspective, there would be no significant energy savings with this alternative as compared with the other treatment alternatives. The additional cost of pumping through a force main would be offset by not having to operate recirculation pumps, distribution pumps, lagoon aerators and/or pressurized irrigation systems, as required with the other treatment alternatives.

Regulatory Compliance and Permits

An advantage for this alternative is that it does not require a new discharge permit. Utility Solution's would assume this responsibility by incorporating the additional flow into their existing discharge permit.

The proposed alternative would be designed and constructed in compliance with Circular DEQ-2 regulations. Plans would need to be reviewed and approved by the Montana Department of Environmental Quality before bidding and construction could begin. Since more than one acre of land would to be disturbed during construction, a stormwater discharge permit is necessary. The selected contractor would be responsible for obtaining a stormwater permit, as would be indicated in the project specifications. 310 and 404 permits for stream crossings will also be required. Additionally, this alternative will also largely rely on obtaining encroachment permits form the Montana Department of Transportation, and from the Gallatin County Road and Bridge department.

Land Requirements

No land requirements are necessary with this alternative other than easements within the existing public right-of-ways. This is another advantage of this alternative because the District would not need to purchase a treatment and disposal site.

Environmental Considerations

Although large areas may be disturbed as a result of open-trench digging, virtually all areas will be within existing rights-of-way and easements that have been previously disturbed by development. There will be no changes in land use after completion of the project. Some air quality problems with dust may arise during the actual construction period because the majority of the streets are unpaved; however, it would be temporary and the contract documents would require that the Contractor provide dust control. Similarly, there will be some temporary noise during construction. Once construction is complete, there will be no noise or dust problems arising as a result of the improvements. The contract documents shall also require that Best Management Practices (BMP) be employed before, during, and after construction until all areas of disturbance have been fully reclaimed and/or re-vegetated. For these reasons, environmental impacts are considered minimal and no permanent, negative environmental impacts are anticipated.

Trenching will almost certainly extend into the seasonal groundwater table at various locations, thus water tight gaskets and seals are especially important in order to protect groundwater quality.

Construction Problems

The installation of sewer force mains is typically a standard and straightforward construction activity. Rights-of-way and/or easements would be obtained prior to construction. This area is relatively open so no problems are anticipated with regard to access during construction. Groundwater will almost certainly be encountered, especially if construction takes place during the irrigation season when the irrigation canals are running and the groundwater table is at its highest. However, groundwater is not uncommon to this type of construction and would be accounted for as part of the project costs. The alignment follows the road network so there will be disturbance of existing road surfacing, and traffic control issues. Highway 191 is considered to be one of the more dangerous sections of highway in the state, so construction along this route is therefore considered to be more dangerous as well. Traffic control/safety plans will be reviewed and approved prior to construction. Each of these, and the creek crossings, are concerns for Gallatin Gateway.

Cost Estimates

There are two opinions of probable costs for this alternative; one for a force main connection (Table 7.3.2A), and the other is for a gravity trunk main connection (Table 7.3.2B).

Table 7.3.2A - Opinion Of Probable Cost Gallatin Gateway Wastewater Treatment Project Alternative T-2 - Connect to Utility Solutions with Force Main					
#	**BID ITEM**	**QTY**	**UNITS**	**UNIT PRICE [1]**	**TOTAL**
1	6-inch PVC Effluent Force Main	23,700	LF	$ 38.00	$ 900,600
2	6-inch Force Main Fittings	30	EA	$ 500.00	$ 15,000
3	Force Main Air Relief Valves (Vacuum)	4	EA	$ 3,000.00	$ 12,000
4	Force Main Surge Protection Chamber	2	EA	$ 3,000.00	$ 6,000
5	Directional Drill Force Main	200	LF	$ 200.00	$ 40,000
6	Asphalt Removal & Replacement	250	SY	$ 36.00	$ 9,000
7	Seed & Fertilizer	10	AC	$ 1,500.00	$ 15,000
8	Exploratory Excavation	40	HR	$ 150.00	$ 6,000
9	Erosion Control	1	LS	$ 20,000.00	$ 20,000
	Treatment System Subtotal				**$ 1,024,000**
10	Collection System and Lift Station (Table 7.1.2)	1	LS	$ 1,212,000.00	$ 1,212,000
	Direct Construction Subtotal				**$ 2,236,000**
	Mobilization	10.0%			$ 224,000
	Traffic Control	4%			$ 89,000
	Contingency	10%			$ 224,000
	Construction Subtotal				**$ 2,773,000**
	2012 Construction Cost [2]	3.1%			$ 2,948,000
	Four Corners Connection Fee	104	EDU	$ 5,000.00	$ 520,000
	Water Rights				$ -
	Right-of-Way & Permits				$ 40,000
	Hydrogeologic Investigation				$ -
	Geotechnical Investigation				$ -
	Engineering, Legal & Administrative	25%			$ 693,000
	TOTAL				**$ 4,201,000**

[1] *Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.*

[2] *The ENR 20 year average Construction Cost Index is +3.1% (as of November 2009), so capital costs are projected to an anticipated construction date in 2012 using a 3.1% inflation rate.*

Table 7.3.2B - Opinion Of Probable Cost Gallatin Gateway Wastewater Treatment Project Alternative T-2 - Connect To Utility Solutions With Gravity Main					
#	**BID ITEM**	**QTY**	**UNITS**	**UNIT PRICE [1]**	**TOTAL**
1	8-inch PVC Gravity Main	20,500	LF	$ 52.00	$ 1,066,000
2	48-inch Standard Manhole (Trunk Main)	65	EA	$ 3,000.00	$ 195,000
3	6-inch PVC Force Main	2,600	LF	$ 38.00	$ 98,800
4	6-inch Force Main Fittings	7	EA	$ 500.00	$ 3,500
5	Bore & Jack under Cottonwood Creek	100	LF	$ 275.00	$ 27,500
6	Asphalt Removal & Replacement	250	SY	$ 36.00	$ 9,000
7	Seed & Fertilizer	10	AC	$ 1,500.00	$ 15,000
8	Exploratory Excavation	40	HR	$ 150.00	$ 6,000
9	Erosion Control	1	LS	$ 20,000.00	$ 20,000
	Treatment System Subtotal				**$ 1,441,000**
10	Collection System and Lift Station (Table 7.1.2)	1	LS	$ 934,000.00	$ 934,000
	Direct Construction Subtotal				**$ 2,375,000**
	Mobilization	10.0%			$ 238,000
	Traffic Control	4%			$ 95,000
	Contingency	10%			$ 238,000
	Construction Subtotal				**$ 2,946,000**
	2012 Construction Cost [2]	3.1%			$ 3,132,000
	Four Corners Connection Fee	104	EDU	$ 5,000.00	$ 520,000
	Water Rights				$ -
	Right-of-Way & Permits				$ 40,000
	Hydrogeologic Investigation				$ -
	Geotechnical Investigation				$ -
	Engineering, Legal & Administrative	25%			$ 737,000
	TOTAL				**$ 4,429,000**

[1] *Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.*

[2] *The ENR 20 year average Construction Cost Index is +3.1% (as of November 2009), so capital costs are projected to an anticipated construction date in 2012 using a 3.1% inflation rate.*

Per the January 15, 2010 meeting with Utility Solutions, they would charge a system development fee per hookup (EDU) of $5,000, and an average monthly user fee of $50 – $82 per EDU. For the purposes of this analysis, the $82/month/EDU user fee was used. Based on 104 EDU's the average fee for the District equates to $8,528 per month or $102,336 per year. This user fee is the operation and maintenance cost for this alternative and covers the entire collection system, lift station and force main.

Capital costs for this alternative (force main connection) are $4,201,000. The O&M costs are $102,336 with a present worth value of $1,534,874. The salvage value at the end of 20 years is

$1,182,420 with a present worth value of $368,700. The overall present worth cost for this alternative is $5,367,174. Table 8.4.3 in Section 8 lists these costs in tabular form along with the other alternatives considered.

Capital costs for this alternative (gravity main connection) are $4,429,000. The O&M costs are $102,336 with a present worth value of $1,534,874. The salvage value at the end of 20 years is $1,266,420 with a present worth value of $368,700. The overall present worth cost for this alternative is $5,595,174.

From the above cost Tables and present worth analysis, it is evident that the force main option is financially more feasible in addition to more straightforward and easier construction. Thereby, Table 7.3.2B is only included for direct comparison and is not a part of this alternative.

7.3.3 Alternative T-3: Storage and Irrigation (Low Rate Land Application)

The storage and irrigation alternative consists of primary treatment lagoon(s), storage lagoon(s) and a spray irrigation system for effluent disposal. The storage and irrigation portions of this type of system are virtually the same; however, there are two options for the primary treatment lagoons. They can either be non-aerated (facultative) or aerated. The treatment lagoons are designed to treat to secondary treatment standards prior to discharge to the larger storage lagoons. The storage lagoons are necessary to store wastewater during the winter months until it can be disposed by irrigation on crop land during the summer months. Please note that the lagoons are often referred to as ponds and/or cells, and these terms will be used interchangeably throughout this document. The following description will concentrate on the non-aerated system first, then the aerated option.

Non-Aerated Facultative Primary Treatment Lagoon

A single non-aerated facultative treatment lagoon with a surface area of 3.3 acres would be required. This cell would provide secondary treatment prior to discharge to the storage cell. The water level in this cell would remain constant to provide 40 days of detention time. Another cell would be constructed to provide storage and have a surface area of 4.1 acres. The level in this cell would be reduced to only one foot depth each fall to provide the maximum amount of winter storage.

The wastewater would be land applied through spray irrigation during the summer months. A groundwater discharge permit is not required for irrigation and it is excluded from the nondegradation rules if the system is designed for 100-percent nitrogen uptake by the irrigated crops. With this option the wastewater would be applied to crop land using a center pivot irrigation system. The District would need to contact landowners to purchase, or obtain a long-term lease (minimum 20 years), for an irrigation site. Approximately 12 acres of crop land are needed for irrigation. The treated effluent would be applied in accordance with DEQ requirements from mid May through September.

The evaluation performed for this system demonstrates the need to irrigate about 14.4 million gallons annually. To determine the irrigation acreage requirements, a nitrogen uptake and hydraulic analysis was employed and is presented in Appendix N. State design standards require that a hydraulic loading methodology and a nitrogen uptake methodology be prepared in accordance with EPA formulas. The lowest application rate from these two evaluations shall govern during the design phase. Nitrogen uptake typically requires the lowest application rate and subsequently the greatest land requirement. These calculations showed that a minimum of 34 acres of grass hay, or 12 acres of alfalfa hay would need to be irrigated to satisfy nitrogen uptake levels. Although this analysis evaluated both types of hay, alfalfa hay is proposed because there is a smaller land requirement. This makes it a more cost effective choice, and the existing farming in the area attests that the area can grow sustainable alfalfa crops.

A large irrigation pump and new force main would be required to deliver water to the crop sprinkler system. The pump would most likely be a floating pump on the storage cell with the controls housed in a weather proof enclosure. Three-phase power would have to be extended to the irrigation pump.

In northern climates, where the growing season is limited, storage cells must be sized to retain all wastewater flows generated during the non-irrigation season. A detailed water balance for the treatment and storage ponds was performed and is presented in Appendix N.

Pond piping and control structures would allow the operator operational flexibility. A valved piping system would control flow to each of the lagoon cells for series, parallel or bypass operational modes. An inlet structure for each pond and a level control structure for the primary pond would be necessary to provide the flexibility for both series and parallel operation. The facility would also have the flexibility to allow an individual cell to be taken out of service for de-watering, repair or sludge removal. Emergency overflow pipes would be provided to protect the pond embankments during extreme inflow events.

State design standards specify a maximum pond seepage rate of 6-inches per year. To accomplish this, the ponds will be lined with either a PVC or Polypropolene liner. The PVC liner would need to be covered with 12-inches of clean native soil to protect the liner. Rip rap would be placed from the top of the dike to two feet below the operating level of the lagoons to prevent erosion from wave action in the pond. The Polypropylene liner could be exposed and would not need to be rip-rapped. A pre-design investigation would finalize which liner would be used. The cost estimating associated with this alternative assumes a PVC liner.

Aerated Primary Treatment Lagoon

This alternative is very similar to the non-aerated system described above. The primary difference is that secondary treatment is provided by mechanical aerated ponds rather that non-aerated facultative ponds. The storage component is nearly identical, except the storage pond has to be larger due to the loss of storage capacity in the primary non-aerated facultative pond. The irrigation requirements are practically the same, although this option requires one acre more for irrigation; 13-acres. This is mostly due to the smaller pond configuration having less seepage and evaporation which creates more stored irrigation water.

A mechanically aerated primary pond was sized at 0.5 acres, which is considerably smaller than the 3.3 acre non-aerated facultative pond, due to the increased efficiency associated with the addition of aeration. Aeration is provided by mechanical blowers and aerators in the ponds. However, the storage pond was sized at 5.1 acres which is one acre larger than with the non-aerated facultative option. Overall there is less land required with the aeration option, and a more consistent performance. The disadvantage of this alternative is the increased O&M costs and power costs associated with the blowers. A preliminary design of this alternative is located in Appendix O.

After analyzing both options, the advantages of the aerated primary lagoon out weighted the disadvantages primarily from a land requirement and consistency of treatment standpoint. The system described above meets all the DEQ-2 standards for wastewater treatment facilities.

Schematic Layout

Figure 7.3.3 illustrates a schematic design layout of an aerated lagoon system low rate land application discharge by way of spray irrigation.

Operational Requirements

One part-time state-certified operator would be required to run this system. The operator would need to check the lagoons daily and periodically perform pump maintenance (change oil, lubricate the pump, etc.) and inspect equipment operation (diffuser operation, pressure gauges, operation temperature, etc.). Other periodic O&M work includes mowing the dikes, changing the treatment path, draining the force main to the irrigation site, etc. During the irrigation season, additional operator time would be required to inspect the irrigation equipment and perform any needed maintenance. An experienced crop manager is necessary to ensure a sustainable crop that is meeting the nutrient uptake requirements.

Energy Requirements

An aeration system would have significant energy requirements, and using the manufacturer's recommendation, the blower energy consumption calculation for this application should be based on a 10-horsepower (hp) motor:

- (10 hp) x (0.7457 kW/hp) x (365 day) x (24 hr/day) = 65,323 kW-hr/yr

The estimated usage charge for 3-Phase power is $0.12 per kW-hr. Current rates are in the range of $0.09 to $0.10 per kW-hr, but energy costs are anticipated to increase, especially within the design period of this system. Multiplying the energy consumption by the usage rate yields an annual cost to run the aeration system of approximately $7,839.

The same methodology can be used for the Ultra Violet (UV) disinfection and irrigation pump operation. Both of these system components are directly related to the volume of water used for irrigation. A preliminary design report for this alternative in located in Appendix O, and calculated 15.3 million gallons of irrigation water annually. In order to accurately estimate the energy consumption, the irrigation location and configuration would need to be identified. In this instance where the design is not that far along, the assumption will be to irrigate an average of quarter-time, which equates to 200 gpm, or 1,275-hours of operation time. Likewise, this amount of operation time equates to 3.5-months. The irrigation season is 4.5-months (mid May through September), so considering rain events, this assumption seems reasonable. An estimated irrigation pump is 10-hp, and the UV disinfection system uses 10kW. There are two irrigation pumps; one floating in the lagoon, and another at the center pivot. Energy consumption calculations:

- Irrigation Pump(s): 2[(10 hp) x (0.7457 kW/hp) x (1,275 hr)] = 19,014 kW-hr/yr = $2,282/yr

- UV Disinfection: (10 kW) x (1,275 hr) = 12,750 kW-hr/yr = $1,530/yr

The total energy consumption for this treatment and disposal alternative is approximately 87,500 kWh.

Regulatory Compliance and Permits

The proposed alternative would be designed and constructed in compliance with Circular DEQ-2 regulations. Plans would need to be reviewed and approved by the Montana Department of Environmental Quality before bidding and construction could begin. Since more than one acre of land would to be disturbed during construction, a stormwater discharge permit is necessary. The selected contractor would be responsible for obtaining a stormwater permit, as would be indicated in the project specifications.

No discharge permit is required with land application.

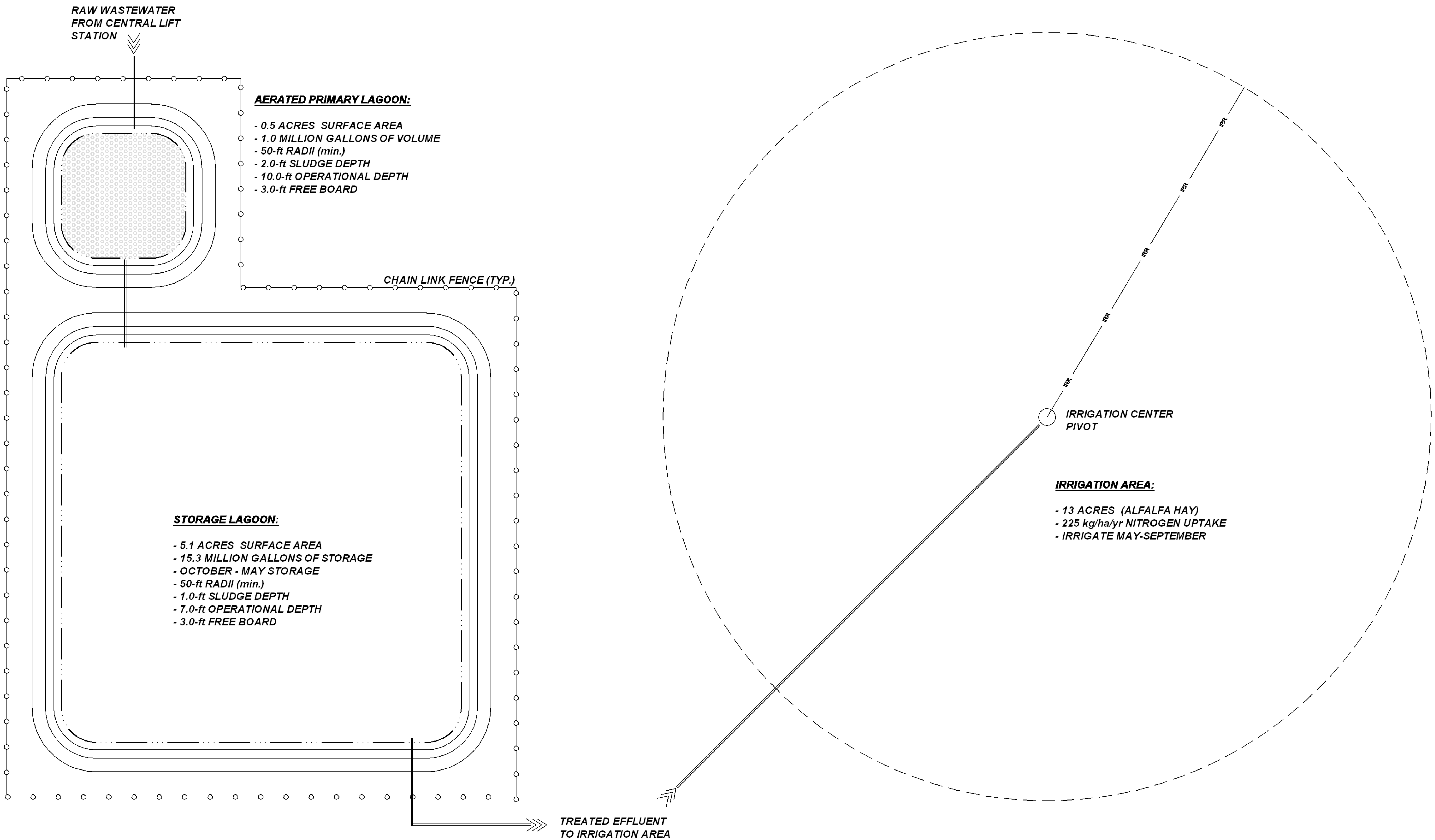
Land Requirements

A schematic layout for this alternative is presented in Figure 7.3.3. This layout consists of a 0.5 acre mechanically aerated lagoon for treatment followed by a 5.1 acre storage pond. 13 acres is required for effluent disposal by irrigation. Calculations supporting the above pond sizing and required irrigation land are presented in Appendix O.

Environmental Considerations

Large areas would be disturbed as a result of constructing this system. Some air quality problems with dust may arise during the actual construction period; however, it would be temporary and the contract documents would require that the Contractor provide dust control. Similarly, there will be some temporary noise during construction. Once construction is complete, there will be no noise or dust problems arising as a result of the improvements. The contract documents shall also require that Best Management Practices (BMP) be employed before, during, and after construction until all areas of disturbance have been fully reclaimed and/or re-vegetated. There will be a significant change of landscape in a previously undisturbed and/or farmed area of approximately ten acres, not including the irrigation area. For these reasons, environmental impacts are a prominent concern with this alternative.

Adding a pond can have positive effects on the environment as well. This would preserve the area from development and add another aquatic feature.



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SCHEMATIC DRAWING
STORAGE & IRRIGATION

FIGURE 7.3.3
TREATMENT ALTERNATIVE T-3
AERATED LAGOON & SPRAY IRRIGATION

GALLATIN GATEWAY COUNTY WATER AND SEWER DISTRICT
2010 PRELIMINARY ENGINEERING REPORT (PER)

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Construction Problems

No major construction problems are anticipated with this alternative. Pond construction is relatively straightforward excavation project. The pond will be designed such that the excavation will not encounter groundwater, and all dike radii will be large enough to utilize the most efficient equipment.

One potential problem that is unique to pond construction is proper separation of fines vs. gravels. The liner needs to be installed over a *cushion* of fine material to avoid puncture. If the native materials are not properly separated at the beginning of the construction project, problems can arise from additional expenses meeting the liner specification later in the project.

Cost Estimates

The following Table 7.3.3 shows the opinion of probable costs for constructing the aerated lagoon with storage and irrigation of alfalfa hay. Operation and maintenance costs for this alternative are shown on Table 7.3.3A. These estimates incorporate a detailed cost proposal for aeration system components for a supplier of the equipment. (Appendix O).

Table 7.3.3 - Opinion of Probable Cost
Gallatin Gateway Wastewater Treatment Project
Alternative T-3 - Aerated Lagoons - Storage & Spray Irrigation

#	BID ITEM	QTY	UNITS	UNIT PRICE [1]	TOTAL
1	Exploratory Excavation	10	HR	$ 150.00	$ 1,500
2	Seed & Fertilize	10	AC	$ 1,500.00	$ 15,000
3	Erosion Control	1	LS	$ 10,000.00	$ 10,000
4	Topsoil Removal, Stockpile	9,000	CY	$ 2.00	$ 18,000
5	Earthwork for Lagoons	39,000	CY	$ 4.00	$ 156,000
6	Liner	315,000	SF	$ 0.55	$ 173,250
7	Liner Cushion Material	6,000	CY	$ 2.00	$ 12,000
8	Liner Earthen Cover (incl. Topsoil)	12,000	CY	$ 2.00	$ 24,000
9	Rip Rap	2,900	CY	$ 40.00	$ 116,000
10	Rip Rap Fabric	8,500	SY	$ 1.50	$ 12,750
11	Lagoon Splash Pads & Pump Ramp	1	LS	$ 10,000.00	$ 10,000
12	6-inch Effluent Force Main	5,000	LF	$ 38.00	$ 190,000
13	Signing	1	LS	$ 3,000.00	$ 3,000
14	Inlet Structures	2	EA	$ 8,000.00	$ 16,000
15	Lagoon Staff Gauges	2	EA	$ 2,000.00	$ 4,000
16	Level Control Structure	1	EA	$ 28,000.00	$ 28,000
17	Bypass Control Structure	1	EA	$ 12,000.00	$ 12,000
18	Emergency Overflow Piping	1	LS	$ 7,500.00	$ 7,500
19	Flow Measurement	1	EA	$ 10,000.00	$ 10,000
20	Aeration System	1	LS	$ 120,000.00	$ 120,000
21	Steel Air Main	240	LF	$ 50.00	$ 12,000

Table 7.3.3 - Opinion of Probable Cost (continued)
Gallatin Gateway Wastewater Treatment Project
Alternative T-3 - Aerated Lagoons - Storage & Spray Irrigation

#	BID ITEM	QTY	UNITS	UNIT PRICE [1]	TOTAL
22	Aeration Blower Building	1	LS	$ 85,000.00	$ 85,000
23	Blower Building HVAC/Lighting	1	LS	$ 25,000.00	$ 25,000
24	Power/Electrical Service (Treatment Site)	1	LS	$ 30,000.00	$ 30,000
25	Irrigation Site Fencing	3,600	LF	$ 10.00	$ 36,000
26	Chain-link Fencing Treatment Site	2,600	LF	$ 25.00	$ 65,000
27	Irrigation Power/Electrical	1	LS	$ 25,000.00	$ 25,000
28	Floating Irrigation Pump & Appurtenances	1	LS	$ 50,000.00	$ 50,000
29	Irrigation Pivot	1	LS	$ 65,000.00	$ 65,000
30	Irrigation Force main	2,000	LF	$ 38.00	$ 76,000
31	Irrigation Force main Fittings	10	EA	$ 250.00	$ 2,500
32	Irrigation Force main Pumpouts	3	EA	$ 500.00	$ 1,500
33	UV Disinfection System	1	EA	$ 120,000.00	$ 120,000
34	UV Building	1	LS	$ 60,000.00	$ 60,000
35	Directional Drill Effluent Force Main	200	LF	$ 200.00	$ 40,000
36	Irrigation Pump Station	1	LS	$ 70,000.00	$ 70,000
	Treatment System Subtotal				**$ 1,702,000**
37	Collection System and Lift Station (Table 7.1.2)	1	LS	$ 1,212,000.00	$ 1,212,000
	Direct Construction Subtotal				**$ 2,914,000**
	Mobilization	10.0%			$ 291,000
	Traffic Control	1%			$ 29,000
	Contingency	10%			$ 291,000
	Construction Subtotal				**$ 3,525,000**
	2012 Construction Cost [2]	3.1%			$ 3,747,000
	Land Acquisition - Lagoons (10 acres)				$ 300,000
	Land Acquisition - Irrigation (15 acres)				$ 450,000
	Water Rights				$ -
	Right-of-Way & Permits				$ 40,000
	Hydrogeologic Investigation				$ -
	Geotechnical/Agricultural Investigation				$ 15,000
	Engineering, Legal & Administrative	25%			$ 881,000
	TOTAL				**$ 5,433,000**

[1] Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.

[2] The ENR 20 year average Construction Cost Index is +3.1% (as of November 2009), so capital costs are projected to an anticipated construction date in 2012 using a 3.1% inflation rate.

Table 7.3.3A - Opinion of Probable Annual Operation & Maintenance Costs Gallatin Gateway Wastewater Treatment Project Alternative T-3 - Aerated Lagoons - Storage & Spray Irrigation					
#	**ITEM**	**QTY**	**UNITS**	**UNIT PRICE**	**TOTAL**
1	Salaries/Benefits	0.25	LS	$ 45,000.00	$ 11,250.00
2	Administration	100	HR	$ 15.00	$ 1,500.00
3	Lift Station Power	17,000	KWH	$ 0.12	$ 2,040.00
4	Irrigation & UV Power	32,000	KWH	$ 0.12	$ 3,840.00
5	Blower Power (Aerator)	65,500	KWH	$ 0.12	$ 7,860.00
6	Monitoring & Testing	1	LS	$ 500.00	$ 500.00
7	Office Expenses/Training	1	LS	$ 2,500.00	$ 2,500.00
8	Spare Parts/Repair/Maintenance	1	LS	$ 3,000.00	$ 3,000.00
9	Contract Services/Trades	1	LS	$ 2,000.00	$ 2,000.00
10	Clean 20% of Collection System	2000	LF	$ 1.00	$ 2,000.00
11	Reserve	1	LS	$ 5,000.00	$ 5,000.00
	TOTAL				**$ 41,500.00**

Capital costs for this alternative are $5,433,000. The O&M costs are $41,500 with a present worth value of $622,433. The salvage value at the end of 20 years is $1,333,410 with a present worth value of $415,800. The overall present worth cost for this alternative is $5,639,633. Table 8.4.3 in Section 8, lists these costs in tabular form along with the other alternatives considered.

7.3.4 Alternative T-4: Septic Tank / Level 2 Treatment / Pressure Dosed Drainfield

This Septic Tank/Level 2 Treatment/Pressure Dosed Drainfield alternative will be referred to as just *Level 2* for simplicity. One of the most common septic systems is a standard septic tank and drainfield combination. A discussed in Chapter 6, the reason for the addition of Level 2 technology is based upon the need for a higher level of treatment ability and to reduce the overall size of the drainfield (infiltration gallery). Circular DEQ-4 allows for a 50-percent reduction in disposal area with the use of a Level 2 system. The significance of this is greatly emphasized when applied to a community verses an individual system because the flows are much bigger and therefore the reduction of required land can be several acres.

This alternative consists of three primary components; a centralized septic tank, Level 2 treatment system, and a pressure dosed drainfield.

Septic Tank

Wastewater is delivered to a centralized septic tank from the lift station. Septic tanks are typically made of concrete with a baffled inlet and outlet. However, for larger community systems it is often more cost effective to utilize a pre manufactured fiberglass tank, or a series of multiple tanks. The function of the septic tank is to separate solids from liquids and provide anaerobic treatment of the solids. The anaerobic condition is called "septic." As raw wastewater enters the septic tank, the flow slows and the heavy solids settle to the bottom and form a layer commonly referred to as sludge. Lighter solids rise to the top and form a scum layer. The remaining liquid, or effluent, is then pumped to the Level 2 treatment system.

Level 2 Treatment

Level 2 treatment is defined by the system's ability to meet certain criteria for the removal of constituents in wastewater. The following is the definition as written in the Administrative Rules of Montana, Chapter 17.30.702:

> (11) "Level 2 treatment" means a subsurface wastewater treatment system (SWTS) that:
>
> (a) removes at least 60% of total nitrogen as measured from the raw sewage load to the system; or
>
> (b) discharges a total nitrogen effluent concentration of 24 mg/L or less. The term does not include treatment systems for industrial wastes.

There are several different types of approved Level 2 treatment systems in Montana (accepted as a nutrient reducing treatment system) that will provide some nitrogen removal and will improve the treatment systems ability to satisfy the more stringent nondegradation regulatory requirements. Pre-approved Level 2 systems include: AdvanTex, Eliminite, IWS, Santec, Bio-Microbcs, HDR, Norweco, and Fluidyne ISAM. For the purposes of this report, only one type of system was analyzed in detail. The AdvanTex system was chosen over other Level 2 systems because of the performance data available, longevity of the manufacturer and local supplier, and readily available design information. However, the preliminary design phase of the project will explore all the Level 2 options in more detail to ensure the best possible outcome for the community of Gallatin Gateway.

Effluent from the septic tank is pumped to the AdvanTex system where a distribution valve and piping network evenly disperses the effluent across synthetic textile media filter(s), called pods. The effluent is filtered, collected by an under drain system, and then pumped to a recirculation tank. The effluent is recirculated through the system several times. This process is an oxygen-rich aerobic environment where microorganisms can remove impurities from the effluent. Once the desired level of treatment is achieved, the clean effluent is pumped to the drainfield.

Drainfield

The drainfield, or infiltration gallery, consists of a series of distribution pipes with holes through which the wastewater is uniformly distributed. The distribution pipes discharge the wastewater into buried seepage trenches designed to spread the wastewater out and facilitate seepage into the subsoil. Although the wastewater is substantially treated in the Level 2 system, the overall system is still dependent on the soil matrix to provide continued treatment. The treatment is accomplished by the formation of a biomat at the interface of the trench bottom and existing ground surface and is largely aerobic in nature. Experience has shown that four feet of soil depth under unsaturated flow conditions is necessary for proper treatment.

The soil can be neither too coarse such that a biomat is not formed or too fine such that the wastewater will not drain. Therefore, careful consideration must be given to site conditions including soil texture, groundwater depth and bedrock depth, groundwater flow direction, and potential contamination impacts. Properly sited, designed, constructed and maintained, this treatment and disposal alternative can provide adequate wastewater treatment.

Level 2 systems have the advantage of providing better effluent quality and more control over the treatment process when compared to standard septic tank and drainfield systems but are more expensive. Even though this alternative produces a higher quality effluent, a groundwater discharge permit is required. As documented with nondegradation calculations in Appendix P and soils information in Appendix A, this type of treatment is feasible in the planning area. Additionally, this alternative is easily expandable and perhaps the best suited alternative for that reason alone.

Schematic Layout

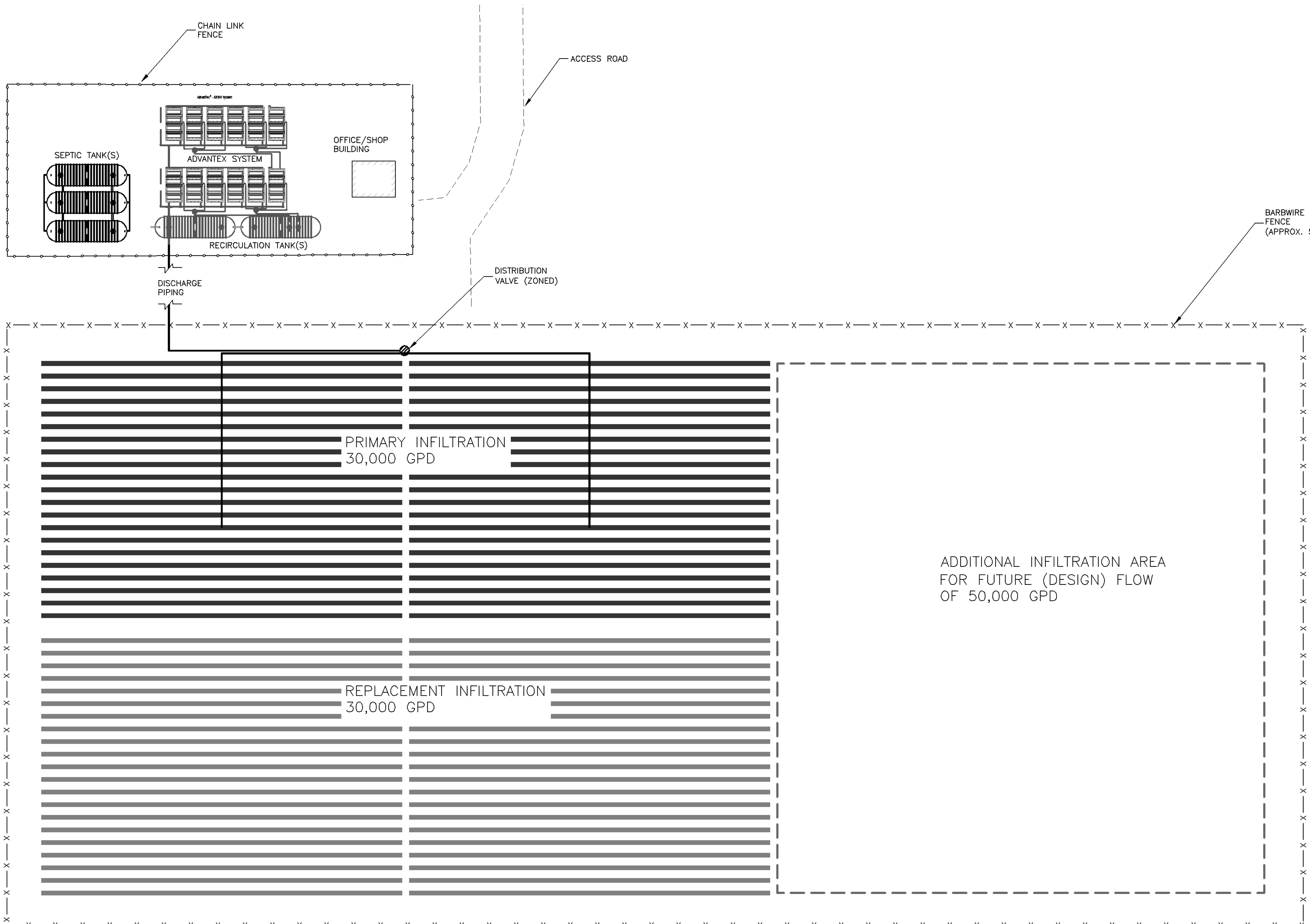
Figure 7.3.4 illustrates a schematic design layout of a Level 2 treatment system with groundwater disposal via infiltration galleries.

Operational Requirements

The proposed Level 2 treatment plant will require minimal onsite maintenance as much of the monitoring of the system is done remotely by the supplier via a telephone line. The operator will still be required to perform some tasks, including noting any alarms or signs of system inactivity. Because local suppliers have invested a great deal of time and effort towards gaining Level 2 status, they are eager to have systems operate properly, and in cases where the local operator does not have the time or technical capability to monitor the system, the supplier prefers to enter into a maintenance agreement with the owners of the system for the required maintenance.

Whether the labor is in-house, or is contracted out, the following tasks are required:

- Annually clean pumping packages
- Annually clean biotube filters
- Annually clean splitter valves
- Inspect splitter valve every three months
- Inspect ventilation fan assembly every three months
- Check telemetry panel monthly
- Visually check the system in detail every two weeks
- Measure sludge levels in the primary treatment tanks annually
- Measure sludge levels in the recirculation tank annually
- Measure filter pod inlet pressures annually
- Flush distribution system laterals annually
- Clean nozzles annually
- Visually inspect drainfield laterals monthly



NOTES:

30,000 GPD
1. DRAINFIELD WIDTH APPROX. 404ft
2. MIXING ZONE 500ft
3. NITRATES 6.54 mg/L AT END OF MIXING ZONE
4. PHOSPHORUS BREAK THROUGH ESTM 61.4 YEARS

50,000 GPD
1. DRAINFIELD WIDTH APPROX. 678ft
2. MIXING ZONE 500ft
3. NITRATES 6.83 mg/L AT END OF MIXING ZONE
4. PHOSPHORUS BREAK THROUGH ESTM 61.8 YEARS

*NONDEGRADATION AND DRAINFIELD SIZING CALCULATIONS ARE LOCATED IN APPENDIX P

C:\Documents and Settings\rfillbach\Desktop\CADD 1-08159\Exhibits\PER\1-08159-Fig 7-3-4 Level 2 (AdvanTex).dwg

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SCHEMATIC DRAWING
ADVANTEX LEVEL 2 TREATMENT
GROUNDWATER DISPOSAL INFILTRATION GALLERY

FIGURE 7.3.4
TREATMENT ALTERNATIVE T-4
LEVEL 2 TREATMENT (ADVANTEX)
WITH GROUNDWATER DISPOSAL

GALLATIN GATEWAY COUNTY WATER AND SEWER DISTRICT
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Energy Requirements

Energy consumption for the Level 2 AdvanTex alternative is minimal in comparison with the other alternatives considered. The power usage is primarily from the internal pumping system (recirculation pumps), distribution pumps/valves, and from the ventilation fans. Back calculating energy consumption based on the suppliers O&M estimating worksheet, yields roughly 47,000 kWh.

Regulatory Compliance and Permits

The proposed alternative would be designed and constructed in compliance with Circular DEQ-2 regulations, and the subsurface infiltration gallery (drainfield) would need to be in accordance with Circular DEQ-4. Plans would need to be reviewed and approved by the Montana Department of Environmental Quality before bidding and construction could begin.

A monitoring well is typically located 500 feet down gradient of the infiltration gallery and is monitored for total nitrogen, usually in the form of nitrate. Montana's nondegradation rules typically require nitrogen levels to be less than 5 mg/L at the end of the mixing zone unless Level 2 treatment is used. This threshold is extended to 7.5 mg/L for Level 2 systems. The Montana Water Quality Act requires nitrogen levels be less than 10 mg/L in groundwater. In this case, the more conservative value of 7.5 mg/L shall be used as the design basis. A Baumann Schafer groundwater model developed by Great West Engineering showed that nitrate levels in groundwater will be at or below the 7.5 mg/L limit at the end of the 500-foot mixing zone.

Since more than one acre of land would to be disturbed during construction, a stormwater discharge permit is necessary. The selected contractor would be responsible for obtaining a stormwater permit, as would be indicated in the project specifications.

Land Requirements

The proposed Level 2 AdvanTex system will easily fit on a 0.5 acre parcel and the infiltration galleries require a minimum of five acres based on the soils data available. This area will include a 100-percent replacement area as required by DEQ-4 regulations. The infiltration area would be totally subsurface and keep the openness of this rural area. In some instances these subsurface infiltration areas can be approved such that an active park can exist directly above grade.

Environmental Considerations

The proposed Level 2 system will have minimal environmental impacts. The treatment pods (filters) and tanks would all be placed underground with only access hatches above ground. This alternative has the most minimal odor and visual impacts. Groundwater quality will be improved because of the nitrogen removal in the effluent by the Level 2 system.

Construction Problems

No major construction problems are known to exist with this alternative. The AdvanTex systems are modular with manageable sized components. It is anticipated that the septic tank(s) and recirculation tank(s) for this application will most likely be fiberglass, which are easier to handle and install than the traditional concrete or metal tanks.

The infiltration gallery laterals could potentially be problematic if the soils are too gravelly. This situation causes the trench walls to slough. However, infiltrator chambers are proposed and the trench depth is shallow (two feet).

Cost Estimates

The following Table 7.3.4 shows the opinion of probable costs for constructing the Level 2 Treatment AdvanTex option. Operation and maintenance costs for this alternative are shown on Table 7.3.4A. These estimates incorporate a detailed cost proposal for system components and operations and maintenance by a local supplier of the AdvanTex equipment. (Appendix P)

Table 7.3.4 - Opinion of Probable Cost
Gallatin Gateway Wastewater Treatment Project
Alternative T-4 - Level 2 (AdvanTex) With Groundwater Discharge

#	BID ITEM	QTY	UNITS	UNIT PRICE [1]	TOTAL
1	Erosion Control	1	LS	$ 6,500.00	$ 6,500
2	Access Road	1	LS	$ 10,000.00	$ 10,000
3	Office / Shop Building (20' x 24')	480	SF	$ 150.00	$ 72,000
4	Recirculation Tanks (2)	1	LS	$ 143,000.00	$ 143,000
5	Centralized Septic Tank(s)	1	LS	$ 287,000.00	$ 287,000
6	Tank Access Equipment	1	LS	$ 7,500.00	$ 7,500
7	Pumping Equipment	1	LS	$ 34,000.00	$ 34,000
8	Control Panel	1	LS	$ 16,000.00	$ 16,000
9	Misc. Piping/Fittings/Glue/Etc.	1	LS	$ 4,000.00	$ 4,000
10	Recirculating Valve	1	LS	$ 1,300.00	$ 1,300
11	Heater/Ventilation Fan Assembly	1	LS	$ 19,000.00	$ 19,000
12	AdvanTex Equipment (AX100 Pods)	1	LS	$ 450,000.00	$ 450,000
13	Plant Water System & Well Construction	1	LS	$ 30,000.00	$ 30,000
14	Signing	1	LS	$ 3,000.00	$ 3,000
15	Discharge Piping Into GW Infiltration Gallery	400	LF	$ 32.00	$ 12,800
16	Groundwater Infiltration System	13,800	LF	$ 12.00	$ 165,600
17	Groundwater Monitoring Well	4	EA	$ 2,500.00	$ 10,000
18	Emergency Power Generator	1	LS	$ 80,000.00	$ 80,000
19	Disposal Site Fencing	2,500	LF	$ 10.00	$ 25,000
20	Chain Link Fencing Treatment Site	350	LF	$ 25.00	$ 8,750
21	Site Grading/Parking/Seeding	1	LS	$ 6,000.00	$ 6,000
22	Directional Drill Force Main	200	LF	$ 200.00	$ 40,000
23	Power/Electrical Service (Treatment Site)	1	LS	$ 30,000.00	$ 30,000
24	6-inch Effluent Force Main to Treatment	5,000	LF	$ 38.00	$ 190,000
	Treatment System Subtotal				**$ 1,651,000**
25	Collection System and Lift Station	1	LS	$ 1,212,000.00	$ 1,212,000
	Direct Construction Subtotal				**$ 2,863,000**
	Mobilization	10.0%			$ 286,000

Table 7.3.4 - Opinion of Probable Cost (continued) Gallatin Gateway Wastewater Treatment Project Alternative T-4 - Level 2 (AdvanTex) With Groundwater Discharge					
#	**BID ITEM**	**QTY**	**UNITS**	**UNIT PRICE [1]**	**TOTAL**
	Traffic Control	1%			$ 29,000
	Contingency	10%			$ 286,000
	Construction Subtotal				**$ 3,464,000**
	2012 Construction Cost [2]	3.1%			$ 3,682,000
	Land Acquisition (10 acres)				$ 300,000
	Water Rights				$ -
	Right-of-Way & Permits				$ 40,000
	Hydrogeologic Investigation				$ 5,000
	Geotechnical Investigation				$ 15,000
	Engineering, Legal & Administrative	25%			$ 866,000
	TOTAL				**$ 4,908,000**

[1] Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.

[2] The ENR 20 year average Construction Cost Index is +3.1% (as of November 2009), so capital costs are projected to an anticipated construction date in 2012 using a 3.1% inflation rate.

Table 7.3.4A - Opinion of Probable Annual Operation & Maintenance Costs Gallatin Gateway Wastewater Treatment Project Alternative T-4 - Level 2 (AdvanTex) with Groundwater Discharge					
#	**ITEM**	**QTY**	**UNITS**	**UNIT PRICE**	**TOTAL**
1	Administration	100	HR	$ 15.00	$ 1,500.00
2	Lift Station Power	17,000	KWH	$ 0.12	$ 2,040.00
3	AdvanTex Power (Pumps/Fans)	1	LS	$ 4,200.00	$ 4,200.00
4	Monitoring & Testing	1	LS	$ 6,000.00	$ 6,000.00
5	Sludge Disposal	1	LS	$ 4,500.00	$ 4,500.00
6	Office Expenses/Training	1	LS	$ 2,000.00	$ 2,000.00
7	AdvanTex Componet Maintenance	1	LS	$ 2,200.00	$ 2,200.00
8	AdvanTex System Maintenance	1	LS	$ 16,600.00	$ 16,600.00
9	Clean 20% of Collection System	2000	LF	$ 1.00	$ 2,000.00
10	Reserve	1	LS	$ 5,000.00	$ 5,000.00
	TOTAL				**$ 46,000.00**

Capital costs for this alternative are $4,908,000. The O&M costs are $46,000 with a present worth value of $689,925. The salvage value at the end of 20 years is $1,102,020 with a present worth value of $343,600. The overall present worth cost for this alternative is $5,254,325. Table 8.4.3 in Section 8, lists these costs in tabular form along with the other alternatives considered.

7.3.5 Alternative T-5: Biological Nutrient Removal (BNR) Mechanical Treatment Plant

After a review of several possible wastewater treatment plant options, as presented Section 6.3.10, a sequencing batch reactor (SBR) with groundwater disposal was selected as the type of treatment plant to be evaluated further. An SBR is a mechanically aerated activated sludge system with the capability to adjust the treatment process to remove both nitrogen and phosphorous. This capability will allow the SBR to easily meet the nondegradation limits, and allow the entire flow to be discharged to the groundwater under Circular DEQ-2 guidelines. Because there is no existing groundwater discharge permit, nondegradation criteria would apply and the permit limit would be 10 mg/l for total nitrogen based on the Montana Water Quality Act.

The treatment system would include pretreatment (grit chamber and trash screens), two reactor tanks, sludge and effluent pumps, sludge digesters, sludge re-circulating pumps, sludge wasting pumps, sludge storage, equalization basin, and disinfection.

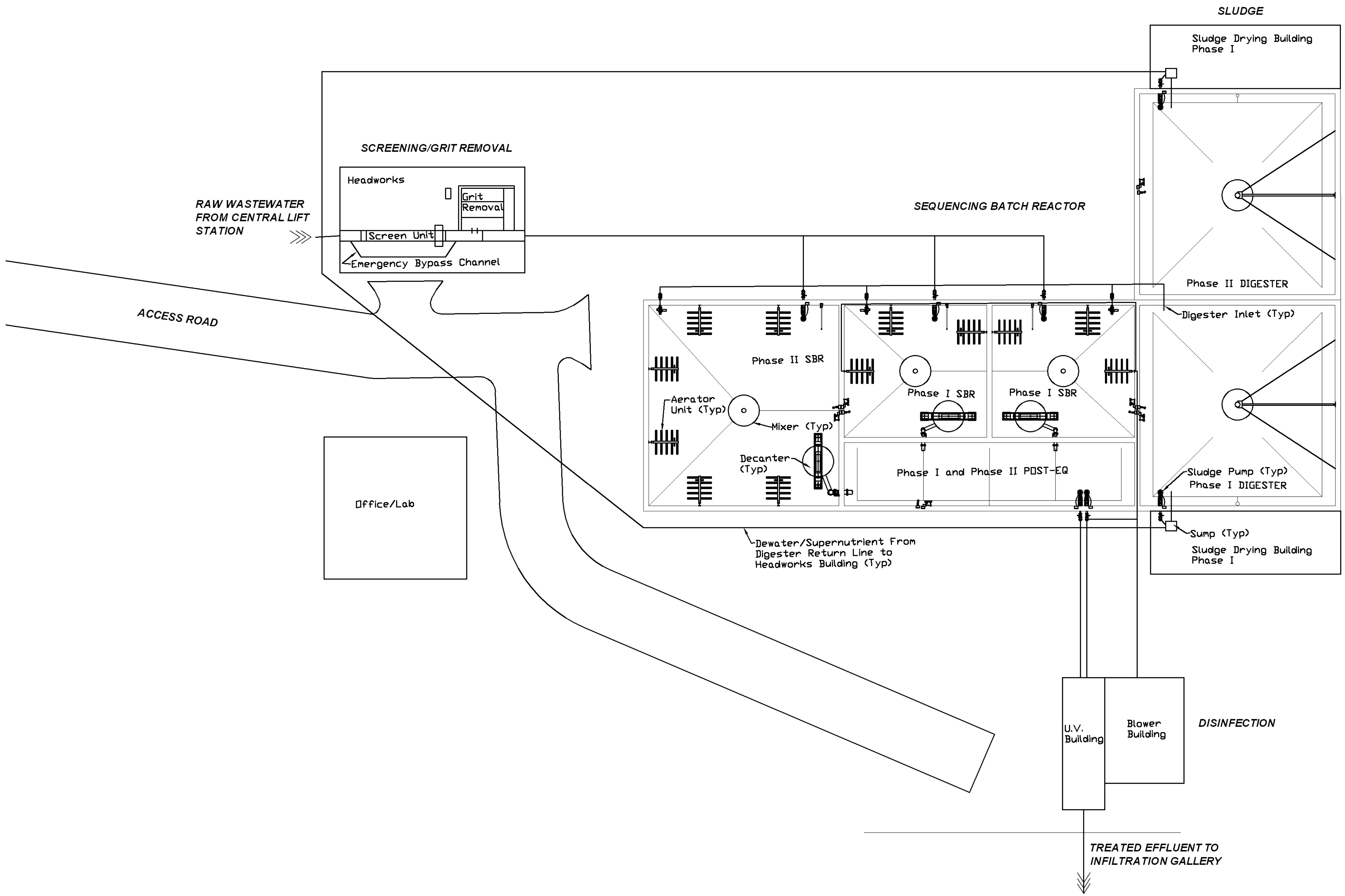
An SBR is a batch process that has been used extensively in wastewater treatment. A single reactor is used for all treatment processes including aeration, biologic treatment, and clarification. Since the SBR treats wastewater in batches, a minimum of two tanks are required. The tanks operate 180 degrees out of phase, so while one tank is filling, the second tank is going through the treatment, clarification, and decanting cycles. The operational cycles of each tank are switched after each batch. Four batches per day per SBR tank is recommended (six hours per cycle). After each batch the treated effluent is removed from the tank via a floating decanter to an equalization basin for follow up treatment. An equalization basin allows any downstream process units, like disinfection, to be sized for system design flows rather than the higher flow rate of the decanter. Also after each batch, some of the sludge must be wasted from the SBR tank and sent to a sludge digester. Digested sludge is dewatered and stored until it can be disposed of through land application or in a landfill. In the final step, the treated wastewater will be disinfected with UV disinfection and discharged to groundwater through a subsurface disposal system using infiltrator chambers (infiltration gallery).

Schematic Layout

Figure 7.3.5 presents a schematic layout of a typical SBR mechanical treatment plant.

Operational Requirements

A full-time, state-certified operator would be required to run this system. Daily operations completed by the operator include equipment inspection, process monitoring and influent and effluent testing. Periodic O&M work includes changing oil in the blowers, changing air filters on the blower intake, pump maintenance, sludge disposal, trash disposal, building maintenance, etc. The operational requirements of the proposed system are substantially higher than for other alternatives considered. The District must make a long-term commitment to operations and operator training and certification. It is recommended a backup operator be trained and certified to provide relief to the primary operator for regularly scheduled time off.



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SCHEMATIC DRAWING
SEQUENCING BATCH REACTOR (SBR)
MECHANICAL TREATMENT PLANT

FIGURE 7.3.5
TREATMENT ALTERNATIVE T-5
SBR MECHANICAL TREATMENT PLANT

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2010 PRELIMINARY ENGINEERING REPORT (PER)

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C:\Documents and Settings\rfillbach\Desktop\CADD 1-08159\Exhibits\PER\1-08159-Fig 7-3-5 SBR Treatment Plant.dwg

Energy Requirements

This alternative will have the highest energy impacts due to the high level of operations and maintenance at the treatment site. Energy consumption for a 50,000 gpd SBR treatment plant would be approximately 110,000 kW-hrs. This estimation of energy consumption is based from the known usage of the RAE Water and Sewer District plant, and adjusted accordingly by size. RAE is located just west of Bozeman and currently treats about 100,000 gpd on average.

Regulatory Compliance and Permits

A groundwater discharge permit is required with this alternative. The SBR treatment system would be designed and constructed in compliance with Circular DEQ-2 regulations, including the groundwater discharge infiltration galleries (drainfield). It should be noted that the infiltration galleries associated with the Level 2 treatment alternative were sized using DEQ-4. Both nondegradation calculation methods are attached in Appendix P. Plans would need to be reviewed and approved by the Montana Department of Environmental Quality before bidding and construction could begin. Since more than one acre of land would to be disturbed during construction, a stormwater discharge permit is necessary. The selected contractor would be responsible for obtaining a stormwater permit, as would be indicated in the project specifications.

Land Requirements

This alternative requires the least amount of land, although it is comparable to treatment alternative T-4, Level 2 treatment with groundwater disposal. The actual SBR treatment system has a small footprint, yet this system does require approximately two acres for groundwater disposal. The disposal area is less than half the size compared with the Level 2 system, because it is sized according to DEQ-2 and not DEQ-4. The system provides a greater level of treatment and the DEQ-2 design guidelines reduce the lateral spacing, which in turn reduces the overall size of the infiltration galleries. It should be noted that this sizing advantage is still reliant upon site specific soil characteristics. Please refer to Appendix P for drainfield sizing calculations.

Environmental Considerations

There will be only minor changes in land use after completion of the project. The SBR footprint is relatively small, and the disposal area will be below ground surface. As with most construction, there would be temporary dust and noise problems to consider, but upon completion of the system these problems would go away. The contract documents shall also require that Best Management Practices (BMP) be employed before, during, and after construction until all areas of disturbance have been fully reclaimed and/or re-vegetated. For these reasons, environmental impacts are considered minimal and no permanent, negative environmental impacts are anticipated.

Construction Problems

No significant construction problems are expected with the construction of an SBR treatment system. These systems do require large concrete tanks to be buried which could pose dewatering and buoyancy problems in areas of high groundwater. However, the treatment site will be placed in close proximity to the disposal area, which will be an area where groundwater is not a concern. The above grade building construction and the infiltration gallery construction should be straightforward.

Cost Estimates

The following Table 7.3.5A shows the opinion of probable costs for constructing the SBR. Operation and maintenance costs for this alternative are shown on Table 7.3.5B. This estimate incorporates a detailed cost proposal by a supplier of the SBR equipment. The capital costs for this alternative are the most expensive and the system also has the highest operation and maintenance (O&M) costs.

Table 7.3.5A - Opinion of Probable Cost
Gallatin Gateway Wastewater Treatment Project
Alternative T-5 - Sequencing Batch Reactor (SBR) Groundwater Discharge

#	BID ITEM	QTY	UNITS	UNIT PRICE [1]	TOTAL
1	Site Excavation (Basins/Buildings)	2,500	CY	$ 6.00	$ 15,000
2	Erosion Control	1	LS	$ 6,500.00	$ 6,500
3	Access Road	1	LS	$ 10,000.00	$ 10,000
4	Headworks Building (30' x 16') & Basin	480	SF	$ 250.00	$ 120,000
5	Screening	1	LS	$ 50,000.00	$ 50,000
6	Influent Flow (Mag Meter)	1	LS	$ 10,000.00	$ 10,000
7	Pre-Equalization Basin	35	LS	$ 900.00	$ 31,500
8	SBR Basins	110	CY	$ 900.00	$ 99,000
9	Aerobic Digester Basin	65	CY	$ 900.00	$ 58,500
10	Post Equalization Basin	70	CY	$ 900.00	$ 63,000
11	Pre-Equalization/Aeration/SBR/Digester Equipment & Controls	1	LS	$ 380,000.00	$ 380,000
12	Electrical/Mechanical (Treatment)	1	LS	$ 75,000.00	$ 75,000
13	Plant Piping	500	LF	$ 90.00	$ 45,000
14	Sludge Dewatering Container	1	LS	$ 100,000.00	$ 100,000
15	Sludge Dewatering Building	760	SF	$ 150.00	$ 114,000
16	Blower/Disinfection Building	400	SF	$ 150.00	$ 60,000
17	Disinfection System	1	LS	$ 45,000.00	$ 45,000
18	Office/Laboratory Building (27' x 27')	700	SF	$ 150.00	$ 105,000
19	Laboratory Equipment	1	LS	$ 7,500.00	$ 7,500
20	Plant Water System & Well Construction	1	LS	$ 30,000.00	$ 30,000
21	Signing	1	LS	$ 3,000.00	$ 3,000
22	Effluent Flow Measurement	1	EA	$ 6,500.00	$ 6,500
23	Discharge Piping Into GW Infiltration Gallery	400	LF	$ 32.00	$ 12,800
24	Groundwater Infiltration System	13,000	LF	$ 12.00	$ 156,000
25	Groundwater Monitoring Well	4	EA	$ 2,500.00	$ 10,000
26	Power/Electrical Service (Treatment Site)	1	LS	$ 30,000.00	$ 30,000
27	Emergency Power Generator	1	LS	$ 80,000.00	$ 80,000

Table 7.3.5A - Opinion of Probable Cost (continued) Gallatin Gateway Wastewater Treatment Project Alternative T-5 - Sequencing Batch Reactor (SBR) Groundwater Discharge					
#	**BID ITEM**	**QTY**	**UNITS**	**UNIT PRICE [1]**	**TOTAL**
28	Chain Link Fencing Treatment Site	7,500	LF	$ 25.00	$ 187,500
29	Disposal Site Fencing	1,700	LF	$ 10.00	$ 17,000
30	Landscaping/Sidewalks/Parking	1	LS	$ 20,000.00	$ 20,000
31	Directional Drill Force Main	200	LF	$ 200.00	$ 40,000
32	Force Main to Treatment Site	5,000	LF	$ 32.00	$ 160,000
	Treatment System Subtotal				**$ 2,148,000**
33	Collection System and Lift Station (Table 7.1.2)	1	LS	$ 1,212,000.00	$ 1,212,000
	Direct Construction Subtotal				**$ 3,360,000**
	Mobilization	10.0%			$ 336,000
	Traffic Control	1%			$ 34,000
	Contingency	10%			$ 336,000
	Construction Subtotal				**$ 4,066,000**
	2012 Construction Cost [2]	3.1%			$ 4,322,000
	Land Acquisition (5 acres)				$ 175,000
	Water Rights				$ -
	Right-of-Way & Permits				$ 40,000
	Hydrogeologic Investigation				$ 5,000
	Geotechnical Investigation				$ 15,000
	Engineering, Legal & Administrative	25%			$ 1,017,000
	TOTAL				**$ 5,574,000**

[1] *Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.*

[2] *The ENR 20 year average Construction Cost Index is +3.1% (as of November 2009), so capital costs are projected to an anticipated construction date in 2012 using a 3.1% inflation rate.*

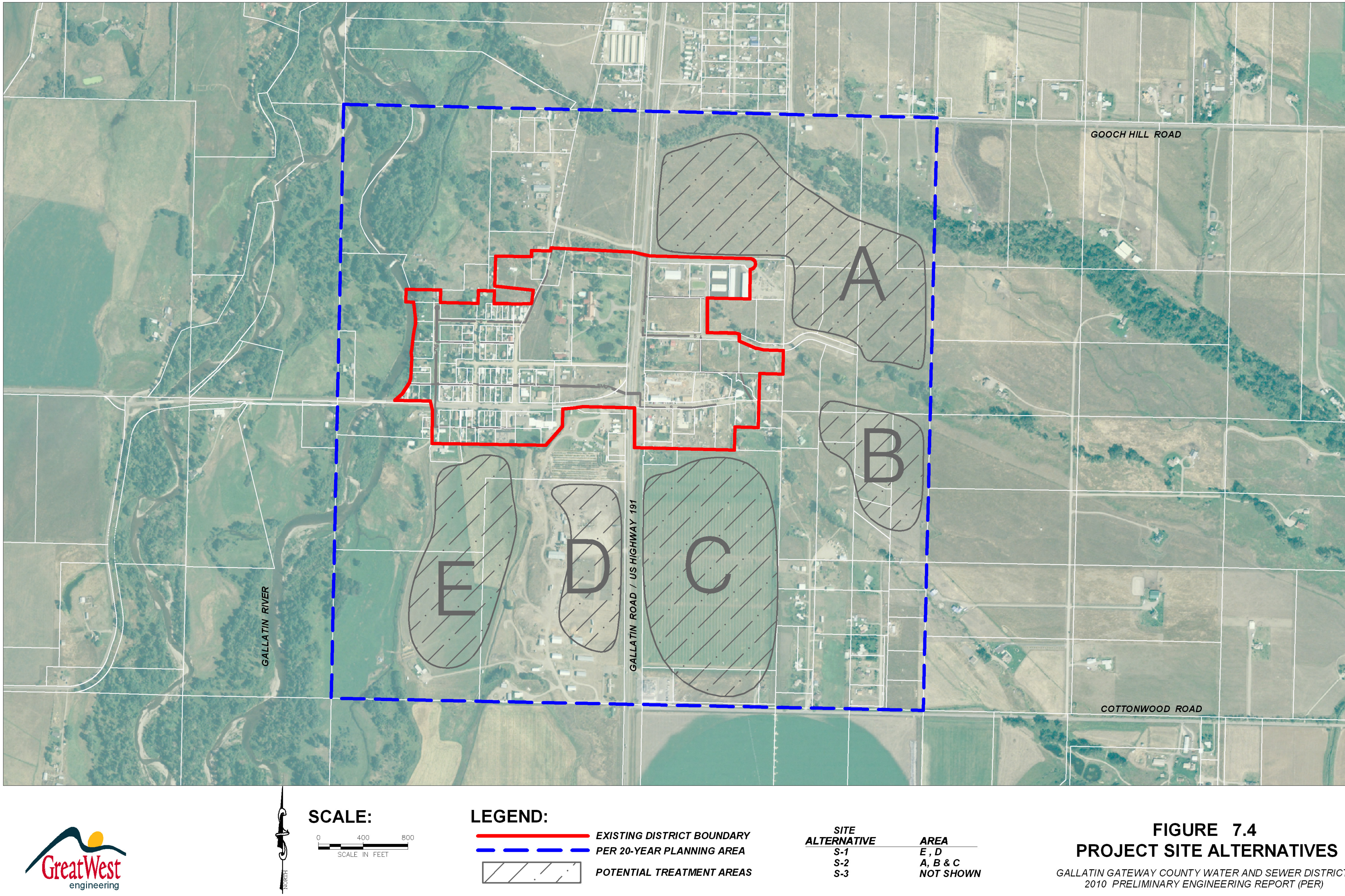
Table 7.3.5B - Opinion of Probable Annual Operation & Maintenance Costs Gallatin Gateway Wastewater Treatment Project Alternative T-5 - Sequencing Batch Reactor (SBR) Groundwater Discharge					
#	**ITEM**	**QTY**	**UNITS**	**UNIT PRICE**	**TOTAL**
1	Salaries/Benefits	0.75	LS	$ 45,000.00	$ 33,750.00
2	Administration	100	HR	$ 15.00	$ 1,500.00
3	SBR, Filter, Digesters, & Centrifuge	110000	KWH	$ 0.12	$ 13,200.00
4	Lift Station Power	1	LS	$ 500.00	$ 500.00
5	Monitoring & Testing	1	LS	$ 7,000.00	$ 7,000.00
6	Sludge Disposal	1	LS	$ 5,000.00	$ 5,000.00
7	Office Expenses/Training	1	LS	$ 5,000.00	$ 5,000.00
8	Spare Parts/Repair/Maintenance	1	LS	$ 20,000.00	$ 20,000.00
9	Contract Services/Trades	1	LS	$ 5,000.00	$ 5,000.00
10	Clean 20% of Collection System	2000	LF	$ 1.00	$ 2,000.00
11	Reserve	1	LS	$ 5,000.00	$ 5,000.00
	TOTAL				**$ 98,000.00**

Capital costs for this alternative are $5,574,000. The O&M costs are $98,000 with a present worth value of $1,469,841. The salvage value at the end of 20 years is $1,264,140 with a present worth value of $394,200. The overall present worth cost for this alternative is $6,649,641. Table 8.4.3 in Section 8, lists these costs in tabular form along with the other alternatives considered.

7.4 Project Site Alternatives

The District has had preliminary discussions with land owners (Ron Page, David Loseff, Rick Hargrove) in proposed treatment sites C, D and E (Figure 7.4). Owners within these locations have all indicated that locating treatment site on their land or purchasing their land for that purpose is viable. Treatment site locations will continue and be ongoing until funding is received. At that time, a land purchase/lease options will be completed. Final purchase/lease will be after site evaluations indicate that the land is appropriate for the purpose.

The site alternatives described in this report are limited to the treatment and disposal areas only. The collection system and lift station are situated in existing right-of-ways and based on logical and available space. Since the District boundary encompasses mostly developed properties, the suitable sites for the new treatment and disposal system are outside the District boundary in the 20-year planning area, or potentially beyond. There are no specific sites selected at this time, so this analysis is broad in scope and it is possible that the end result is a combination of site alternatives. For example, the treatment location could be in S-2, and the disposal system in S-1. The following sub sections will address the basic issues associated with each site alternative.



SITE ALTERNATIVE	AREA
S-1	E , D
S-2	A, B & C
S-3	NOT SHOWN

GreatWest engineering

FIGURE 7.4
PROJECT SITE ALTERNATIVES

GALLATIN GATEWAY COUNTY WATER AND SEWER DISTRICT
2010 PRELIMINARY ENGINEERING REPORT (PER)

C:\Documents and Settings\rfillbach\Desktop\CADD 1-08159\Exhibits\PER\1-08159-Fig 7-4 Site Alternatives.dwg

7.4.1 Alternative S-1: West of Highway 191

The potential sites west of highway 191 were evaluated from a general perspective when considering the treatment, and more importantly, the disposal alternatives. This area is lower in elevation and the groundwater table gets increasingly higher as you approach the river. In addition, the distance from these potential sites to the surface water is marginal at best with respect to nondegradation requirements from groundwater disposal. This limits the viability of the groundwater disposal option. If surface water discharge were being considered, then this site would be preferred due to a shorter distance to possible discharge locations. Land application (spray irrigation) method of disposal would be more or less equal on the west side of the highway (S-1) as compared to the east side (S-2).

Schematic Layout

Attached is Figure 7.4 showing the potential areas west of highway 191.

Operational Requirements

From an operational standpoint the areas west of highway 191 would work great simply because they are closer to the lift station and the overall system would be slightly more condensed. There would likely be less force main to maintain, and the lift station pumps would probably be smaller. However, the small difference in operational requirements is considered to be insignificant to the overall site selection.

Energy Requirements

Energy consumption would likely be less with this site alternative because there would be a lesser amount of total dynamic head (TDH) to overcome, and the lift station pumps would potentially be smaller. The estimated TDH is 73, and pump size would be 15 hp. Similar to the operational requirements, this energy savings would be small enough that it is not a key factor for site selection.

Regulatory Compliance and Permits

This site alternative would have a much more difficult time with permitting of groundwater disposal, and most of the potential sites west of the highway would not meet the phosphorus breakthrough nondegradation requirements because of the shorter distance to surface water.

Land Requirements

All the land options with this site alternative are privately owned and would need to be purchased or leased. The likelihood of this site being suitable for groundwater disposal is poor; therefore, the only remaining alternative is lagoons with land application. Using this logic, this site alternative is limited to the lagoon alternative which requires the largest amount of land.

Environmental Considerations

The potential areas west of the highway have more environmental concerns that on the east side. This area is in closer proximity to the river corridor where the environment is more sensitive for wildlife and their travel patterns. Additionally, a greater diversity of plants and animals are found near river corridor. Water quality concerns are also more pronounced because there is less room for natural cleansing though the soil matrix. The same is true for surface water where there is less travel distance through vegetation. Although these are concerns, any treatment and disposal option selected will be required to mitigate all associated environmental impacts.

Construction Problems

Construction problems with this site alternative are high groundwater concerns and areas of contaminated soils. The closer the construction is to the river, the greater the potential for groundwater issues during construction. The hydraulic gradient points toward the river and the ground surface drops toward the river as well. Also, the area immediately north of the District boundary, and west of the highway, has supposedly had issues with creosote contamination. This particular area would have been one of the better sites with this alternative given that it has maximum distance to surface water, relatively high elevation, and is not as prime of agricultural land.

Cost Estimates

A standard cost estimate of $30,000 per acre was used for land purchase estimates for all of the alternatives considered. A force main length of 5,000 feet was used in all the alternative cost tables.

7.4.2 Alternative S-2: East of Highway 191

The potential sites east of highway 191 were evaluated from a general perspective when considering the treatment, and more importantly, the disposal alternatives. This area is higher in elevation and the distance to the groundwater table gets increasingly higher as you move to the east. In addition, the distance to the surface water is greater allowing more opportunity to meet nondegradation requirements from groundwater disposal. This increases the viability of the groundwater disposal option. Land application (spray irrigation) method of disposal would be more or less equal on the east side of the highway (S-2) as compared to the west side (S-1).

Schematic Layout

Figure 7.4 shown previously illustrates the potential areas east of highway 191, and is attached with the previous Section (7.4.1).

Operational Requirements

From an operational standpoint, the areas east of highway 191 are not as desirable because they are further from the lift station and the overall system would be slightly more spread-out. There would likely be more force main to maintain, and the lift station pumps would probably be larger. However, the small difference in operational requirements is considered to be insignificant to the overall site selection.

Energy Requirements

Energy consumption would likely be more with this site alternative because there would be a greater amount of TDH to overcome, and the lift station pumps would likely be larger. The estimated TDH is approximately 30-perent greater (103 vs. 73). Similar to the operational requirements, this energy savings would be small enough that it is not a key factor for site selection. An example calculation of the increased energy consumption that assumes an increase in pump size by 30-percent (or 5-hp), and a pumping rate of 200 gpm.

- (50,000 gpd) ÷ (200 gpm) x (60 min/hr) = 4.17 hrs pump run time per day
- (5 hp) x (0.7457 kW/hp) x (365 day) x (4.17 hr/day) = 5,675 kW-hr/yr
- (5,675 kW-hr/yr) x ($0.12/kW-hr) = $681.00/yr pumping cost increase

Regulatory Compliance and Permits

This site alternative is much more conducive for permitting of groundwater disposal, primarily due to the longer distance to surface water. Therefore, if utilizing a continuous discharge system, the better fit for this site would be groundwater discharge.

Land Requirements

All the land options with this site alternative are privately owned and would need to be purchased or leased. This site is more accommodating for the treatment alternative with groundwater disposal, which requires less land than the lagoon option with land application. Using this logic, this site alternative is favorable for the Level 2 treatment alternative (T-4), and the BNR treatment plant alternative (T-5).

Environmental Considerations

The potential areas east of the highway have arguably less environmental concerns that on the west side. This area is further away from the river corridor where the environment is more sensitive for wildlife and their travel patterns. Water quality concerns are minimized because there is more travel distance for natural cleansing though the soil matrix. The same is true for stormwater runoff where there is more overland travel distance through vegetation. Although there may be fewer concerns east of the highway, there are still concerns. However, any treatment and disposal option selected will be required to mitigate all associated environmental impacts.

Construction Problems

There are no abnormal construction problems expected with this site alternative.

Cost Estimates

A standard cost estimate of $30,000 per acre was used for land purchase estimates for all of the alternatives considered. A force main length of 5,000 feet was used in all the alternative cost tables.

7.4.3 Alternative S-3: Utility Solutions Treatment Facility

This site alternative only applies to treatment Alternative T-2, Connection to Utility Solutions Wastewater Treatment Plant near Four Corners, Montana.

Schematic Layout

This treatment site was shown previously on Figure 7.3.1 and 7.3.2 in Section 7.3 of this report.

Operational Requirements

The operation requirements with this site are deferred to Utility Solutions. They will operate and maintain the entire system if this alternative is selected. Although there are more operational requirements with a force main nearly 4.5-miles long and a mechanical treatment plant, there is an economy of scale to consider with an established system and full-time operator already on hand.

Energy Requirements

Energy consumption would increase by way of lift station pumps forcing wastewater a greater distance. However, the energy requirements associated with treatment and disposal would be intermingled with a much larger system and presumably be less due to economies of scale, which would offset the additional energy consumption from larger lift station pumps. The pumps would need to be sized for an additional 60 to 70 feet of TDH for a 6-inch force main 4.5 miles long.

Regulatory Compliance and Permits

This site alternative is already permitted for treatment and disposal, and compliance would be the responsibility of Utility Solutions. There is a substantial increase in total length of the pipeline placement, so more environmental permits are expected due to more stream crossings and associated wetlands that may require permitting. Additionally, there will be increased construction activity in the Montana Department of Transportation (MDT) right-of-way, causing a higher degree of encroachment permit(s).

Land Requirements

There are no new or additional land requirements for the treatment and disposal with this alternative. However, this alternative requires substantially more easements with the force main connection.

Environmental Considerations

Although large areas will be disturbed as a result of open-trench digging, virtually all areas will be within existing rights-of-way and highway easements that have been previously disturbed by development. There will be no changes in land use after completion of the project. Since this alternative will cause a large amount of construction related disturbance, Best Management Practices (BMP) shall be employed before, during, and after construction until all areas of disturbance have been fully reclaimed and/or re-vegetated. Environmental impacts after construction are considered minimal and no permanent, negative environmental impacts are anticipated.

Trenching will almost certainly extend into the seasonal groundwater table at various locations, thus water tight gaskets and seals are especially important in order to protect groundwater quality.

Construction Problems

The installation of sewer force mains is typically a standard and straightforward construction activity. Rights-of-way and/or easements would be obtained prior to construction. This area is relatively open so no problems are anticipated with regard to access during construction. Groundwater will almost certainly be encountered, especially if construction takes place during the irrigation season when the irrigation canals are running and the groundwater table is at its highest. However, groundwater is not uncommon to this type of construction and would be accounted for as part of the project costs. The alignment follows the road network so there will be disturbance of existing road surfacing, and traffic control issues. Again, these construction related problems are common to this type of work and traffic control plans will be reviewed and approved prior to construction. Each of these is a concern for Gallatin Gateway.

Cost Estimates

There is no land purchase cost associated with this alternative. The costs in acquiring easements in estimated at $40,000 and is included in Tables 7.3.2A and 7.3.2B.

8.0 SELECTION OF PREFERRED ALTERNATIVE

Each of the alternatives reviewed in the Alternative Analysis is designed to meet the design criteria and applicable regulations identified in the Alternative Development. This section will examine advantages and disadvantages of each in terms of technical feasibility, environmental impacts, financial feasibility, public health and safety, operational and maintenance considerations, and public comment.

8.1 Ranking Criteria

A matrix to compare each alternative objectively against the other will be developed to select the preferred alternative. Each alternative will be given a score ranging from 0 to 10 for a number of criteria, with 0 representing a negative impact and 10 representing the maximum benefit to the community. The alternatives will begin with a score of 5 for each criteria, and then the score will be adjusted up or down relative to the benefit of the particular alternative in relation to the other alternatives.

In addition to scoring each alternative, the criteria themselves with be weighted in relation to one another. Weighting factors ranging from 1 to 10 will be used to give greater importance to items such as cost. This is appropriate, as often times higher investments are made to overcome many other problems such as reliability or to mitigate problems with technical feasibility or environmental concerns.

8.1.1 Technical Feasibility

Alternatives that were not technically feasible were removed from consideration during the Alternative Development. Consequently, the alternatives discussed in the Alternative Analysis would be scored very similarly in a decision matrix based solely on engineering.

However, issues with land acquisition often supersede the black-and-white world of engineering. This ranking category will include the feasibility of acquiring sufficient land in terms of lease, right-of-way, and/or land purchases. Although these are not strict engineering issues, problems with land acquisition can greatly impact a project’s overall feasibility and require that land issues be given a very serious consideration.

This criterion will be provided with a weighting factor of **5**.

8.1.2 Environmental Impacts

Considerations for stormwater runoff and impacts to groundwater from construction will need to be considered, but long term, detrimental environmental impacts are relatively low for all the alternatives.

This criterion will be provided with a weighting factor of **3**.

8.1.3 Financial Feasibility

The cost of extensive capital improvements is a great concern to small communities with limited budgets and resources. Costs also reflect measures to meet minimum health and safety requirements, applicable regulations, and environmental impacts in order to make an alternative viable in the first place. In addition, life cycle costs include both the estimated capital cost of the alternatives and the associated increase to O&M costs.

Accordingly, this criterion will be provided with the maximum weighting factor of **10**. This represents over 30% of the total weighting, and Public Opinion is closely tied to cost also, giving the cost for each alternative even more weight.

In addition to providing the maximum emphasis on costs, a method must be utilized to provide an objective comparison of costs for each alternative relative to one another and not just an overall comparison. Given a range of costs for various alternatives, the relative cost of any alternative can be determined using the lowest cost and the highest cost from the range of costs and the following equation.

5 x [(Lowest Cost) / (Cost) + (Highest Cost – Cost) / (Highest Cost)]

For example, if a number of alternatives were compared having costs of $500,000, $1,000,000 and $2,000,000, the above equation would provide scores of 8.8, 5.0, and 1.3, respectively. The utilization of a formula to score the 20 year life cycle costs in the matrix eliminates any subjectivity and provides a consistent, relative comparison of costs.

8.1.4 Public Health and Safety

Alternatives that do not meet the public health and safety requirements as required by the state and federal governments were eliminated during the Alternative Development. The alternatives retained for the Alternative Analysis are designed to meet public health and safety laws, so the scoring for each alternative under this criterion would be expected to be fairly high.

This criterion will be provided with a weighting factor of **7**.

8.1.5 Operational and Maintenance Considerations

Operation and maintenance is an important issue when considering any large capital improvements within a small community. The costs for O&M associated with the alternatives is included in the 20 year life cycle costs compared under the financial feasibility, but there are other considerations that must be weighed for the O&M associated with each alternative.

The Town has limited resources and manpower, and some alternatives may have O&M requirements that drastically tax those limited resources creating deficiencies in other areas. Town personnel also have a much more intrinsic knowledge of the sewer system than the average resident or even Council members. Priorities identified by the operators to facilitate the efficient operation of the system must be given some weight.

This criterion will be provided with a weighting factor of **4**.

8.1.6 Public Comments

Efforts such as public hearings are ways to identify public opinion and perceptions. Costs are always a concern with consumers, but the health and safety of their families is just as important.

This criterion will be provided with a weighting factor of **5**.

8.2 Scoring of Collection System Alternatives

Two collection system alternatives were retained from the Alternative Screening for more detailed analysis and consideration in the Alternative Analysis. The two alternatives to be scored in this section are:

- Alternative CS-1: Gravity Collection – Street Layout
- Alternative CS-2: Gravity Collection – Alley Layout

8.2.1 Technical Feasibility

Both alternatives are technically feasible and can be constructed within existing rights-of-way or easements, eliminating the need for any land acquisition. Consequently, the alternatives will be given a median score of **5**.

8.2.2 Environmental Impacts

The collection system alternatives would have minimal environmental impacts, and are very much alike in this regard. Therefore, both alternatives will be given a median score of **5**.

8.2.3 Financial Feasibility

Alternative CS-1 has a life cycle cost of $1,184,597 and Alternative CS-2 has a life cycle cost of $1,055,497. This results in scores of 4.5 and 5.5, respectively.

Table 8.2.3 - Gallatin Gateway Wastewater Treatment
Preferred Collection System Alternatives
Present Worth Analysis

ITEM	ALTERNATIVE CS-1 Gravity Collection Street Layout	ALTERNATIVE CS-2 Gravity Collection Alley Layout
Capital Costs	$1,371,000	$1,212,000
Annual O&M Costs	$2,000	$2,000
20-Year Salvage Value	$693,900	$598,260
Present Worth of Salvage Value	$216,400	$186,500
Present Worth of Annual O&M Cost	$29,997	$29,997
Present Worth Cost[1]	**$1,184,597**	**$1,055,497**

[1]Present worth based upon a 20 year life cycle using calculated discount rate.

8.2.4 Public Health and Safety

Both alternatives will improve the public health and safety and neither alternative more than the other, so both alternative will be given the median score of **5**.

8.2.5 Operational and Maintenance Considerations

Both alternatives will have similar operations and maintenance. Alternative CS-1 will provide more direct access to manholes with less chance of obstruction; however, this advantage is offset by the fact that manhole in the streets will require more traffic control issue during maintenance. Perhaps a more important factor to consider is that Alternative CS-2 will have shorter and more direct services to operate and maintain. Since there are offsetting advantages and disadvantages with CS-1, and a clear advantage with CS-2, Alternative CS-2 shall be ranked higher. Thus, Alternative CS-1 will be given a score of **4** while Alternative CS-2 is given a higher score of **7**.

8.2.6 Public Comments

The District board meetings, that were open to the public, described verbally and presented schematic drawings representing each of the collection system alternatives. Based on the amount of disturbance during construction, the favorable service connections, and the cost savings, the preferred alternative was Alternative CS-2. Thereby, Alternative CS-1 will be given a score of **3** while Alternative CS-2 is given a higher score of **8**.

8.3 Scoring of Lift Station Alternatives

Only one Lift Station alternative was retained from the Alternative Screening for more detailed analysis and consideration in the Alternative Analysis. Therefore, no scoring or decision matrix is necessary.

8.4 Scoring of Treatment Alternatives

Five treatment system alternatives were retained from the Alternative Screening for more detailed analysis and consideration in the Alternative Analysis. The five alternatives to be scored in this section are:

- Alternative T-1: No Action Alternative
- Alternative T-2: Connection to Utility Solutions Wastewater Treatment Plant
- Alternative T-3: Storage and Irrigation (Low Rate Land Application)
- Alternative T-4: Septic Tank / Level 2 Treatment / Pressure Dosed Drainfield
- Alternative T-5: Biological Nutrient Removal (BNR) Mechanical Treatment Plant

8.4.1 Technical Feasibility

As discussed under the ranking criteria development, all the alternatives are technically feasible from an engineering standpoint but may not be practically feasible.

T-1: The No Action Alternative is the most technically feasible both from and engineering standpoint and also from the fact that no land is required. This Alternative shall receive a score of **10**.

T-2: The connection to Utility Solutions is more technically feasible than the other alternatives (except the No Action Alternative) both from an engineering standpoint and from a land acquisition standpoint. The advantage of not needing to purchase a treatment or disposal site is somewhat countered by the fact that getting almost 4-miles of right-of-way access from MDT is not expected to be easy. This Alternative shall receive a score of **7**.

T-3: The storage and irrigation alternative is the least feasible with respect to land acquisition, as it requires the most land and the majority of it needs to be able to sustain a viable crop. Although all the alternatives are feasible form and engineering perspective, it should be taken into consideration at this point that there is no discharge permit required. For these reasons, this Alternative shall receive a score of **4**.

T-4: The Level 2 Alternative requires a modest amount of land that is constrained to specific geometric dimensions and other factors in order to meet nondegradation requirements. This Alternative shall receive a score of **5**.

T-5: The BNR Mechanical Plant options selected in the analysis was the SBR system. This system requires just slightly land than the Level 2 systems, but for the purposes of this comparison it is insignificant and will therefore be ranked equal to the Level 2 system. Consequently, this Alternative will receive a score of **5** also.

8.4.2 Environmental Impacts

T-1: The No Action Alternative is the worst case scenario for the environment. Even though there is no major disturbance from construction related activity, this is far out-weighted by the water quality problems with the existing situation of failing individual onsite septic systems. This Alternative will be scored a **0**.

T-2: The connection to Utility Solutions will cause a modest amount of construction related disturbance with the installation of the force main. All of the disturbance will occur in previously disturbed areas. The treatment capabilities of their Oxidation Ditch Mechanical Plant are superior to all the other alternatives, other than T-5, which is equal. This Alternative shall receive a score of **5**.

T-3: The storage and irrigation alternative has a large impact during construction of the lagoon system. Once built, this Alternative still has a more substantial effect on the environment simply because it takes more land to operate. An Advantage of the alternative is that the land application of treated wastewater to crops could present a beneficial environmental impact in a somewhat arid area. This logic assumes that the irrigation site selected would be pre existing Ag ground. Alternative shall receive a score of **5**.

T-4: The Level 2 Alternative disturbs a modest amount of land during construction, but recharges the local groundwater supply with the treated effluent. This Alternative shall receive a score of **6**.

T-5: The BNR Mechanical Plant Alternative disturbs a modest amount of land during construction, but recharges the local groundwater supply with the treated effluent. This Alternative shall receive a score of **6**.

8.4.3 Financial Feasibility

First, Table 8.4.3A presents the life cycle cost (present worth cost) associated with each alternative. The collection system and lift station costs are included capital costs. Then, Table 8.4.3B is a list of each alternative life cycle cost with the corresponding financial feasibility score.

Table 8.4.3A - Gallatin Gateway Wastewater Treatment Preferred Alternatives Present Worth Analysis

ITEM	ALTERNATIVE T-2 Connection To Utility Solutions	ALTERNATIVE T-3 Aerated Lagoons & Irrigation	ALTERNATIVE T-4 AdvanTex Groundwater Discharge	ALTERNATIVE T-5 SBR With Groundwater Discharge
Capital Costs	$4,201,000	$5,433,000	$4,908,000	$5,574,000
Annual O&M Costs	$102,336	$41,500	$46,000	$98,000
20-Year Salvage Value	$1,182,420	$1,333,410	$1,102,020	$1,264,140
Present Worth of Salvage Value	$368,700	$415,800	$343,600	$394,200
Present Worth of Annual O&M Cost	$1,534,874	$622,433	$689,925	$1,469,841
Present Worth Cost[1]	**$5,367,174**	**$5,639,633**	**$5,254,325**	**$6,649,641**

[1]*Present worth based upon a 20 year life cycle using calculated discount rate.*

The financial parameters used in the present worth analysis are as follows:
- 3.10% Construction Cost Index
- 3.00% Inflation
- 6.00% Interest Rate
- 2.91% Discount Factor

Table 8.4.3B - Financial Ranking			
	TREATMENT ALTERNATIVE	**LIFE CYCLE COST**	**FINANCIAL FEASIBILITY**
T-1	No Action	$0	10.0
T-2	Connection to Utility Solutions	$5,367,174	5.9
T-3	Storage and Irrigation	$5,639,633	5.4
T-4	Level 2 Treatment	$5,254,325	6.0
T-5	BNR – Mechanical Treatment Plant	$6,649,641	4.0

8.4.4 Public Health and Safety

T-1: The No Action Alternative is the worst case scenario for public health and safety. Even though there is no major disturbance from construction related activity, this is far out-weighted by the water quality problems with the existing situation of failing individual onsite septic systems. There is a serious health risk with inadequate separation distances between water supply wells and septic disposal areas. This Alternative will be scored a **0**.

T-2: The primary public health and safety concern with the connection to Utility Solutions is during construction. Highway 191 is one of the most dangerous sections of highway in the state, so any construction in and around this highway is a concern. After construction, this alternative has hardly any concerns. This Alternative shall receive a score of **6**.

T-3: With the storage and irrigation alternative, an argument could be made that the lagoon system could propagate mosquito reproduction due to the large water surface area and relatively stagnate nature of the system. This would be a concern for public health and safety due to the potential spread of the West Nile Virus. Additionally, this is the only alternative that has the entire system exposed, which is a concern even though the system will be fenced. Consequently, Alternative T-3 will be scored a **2**.

T-4: The Level 2 Alternative has virtually no public health and safety concerns, other than the modest level of treatment prior to groundwater disposal. This Alternative shall receive a score of **8**.

T-5: The BNR Mechanical Plant also has virtually no public health and safety concerns, and treats to a higher standard than the Level 2 system. This Alternative shall receive a score of **9**.

8.4.5 Operational and Maintenance Considerations

The cost for O&M associated with the various alternatives was included in the 20 year life cycle costs considered under financial feasibility, but O&M considerations must go beyond cost. The Town has limited manpower and must take this into account when considering the alternatives.

T-1: The No Action Alternative could be viewed as having no O&M. However, each individual septic system has O&M that needs to be done. The problem is that there is no enforcement, so more often than not it is neglected. Consequently, this Alternative will looked as neutral and scored a **5**.

T-2: The connection to Utility Solutions defers all the O&M. This is made up in the monthly service fees, but those are factored in the feasibly section. This Alternative shall receive a score of **10**.

T-3: The storage and irrigation alternative is relatively simple O&M for the lagoon treatment and storage. In addition there needs to be a good crop manager to ensure a viable crop and that the required amount of nitrogen uptake is taking place. This alternative will be slightly scored down for the fact that there needs to be two types of operators involved. Consequently, Alternative T-3 will be scored a **4**.

T-4: The Level 2 Alternative has very simple and straightforward O&M. This Alternative shall receive a score of **8**.

T-5: The BNR Mechanical Plant (SBR option) requires the most skilled operator of all the alternatives. This Alternative shall receive a score of **1**.

8.4.6 Public Comments

The District board facilitated a public meeting that described, and presented schematic drawings, representing each of the treatment system alternatives. Based on the public's comments from the meeting, the alternatives were ranked as shown on the following Table 8.4.6.

Table 8.4.6 - Public Comments Ranking

	ALTERNATIVE	SCORE	COMMENTS
T-1	No Action	0	Community wants to correct the water quality issues
T-2	Connection to Utility Solutions	3	Additional risk and uncertainty perceived by the public and the District board
T-3	Storage and Irrigation	5	No specific comments
T-4	Level 2 Treatment	7	Easily allow for incremental expansion; financially feasible
T-5	Mechanical Treatment Plant - BNR	5	No specific comments

8.5 Scoring of Project Site Alternatives

Three site alternatives were retained from the Alternative Screening for more detailed analysis and consideration in the Alternative Analysis. The three alternatives to be scored in this section are:

- Alternative S-1: West of Highway 191

- Alternative S-2: East of Highway 191
- Alternative S-3: Utility Solutions Treatment Facility

8.5.1 Technical Feasibility

Alternative S-1 is limited to only treatment alternative T-3, which requires the most land, so this alternative will be downgraded a couple points for a score of **3**. Alternative S-2 has more potential land available for meeting nondegradation limits with groundwater discharge systems, but since no specific site has been identified this alternative it will be given a median score of **5**. Alternative S-3 is a very feasible option and will be scored as such; however, it is only valid with treatment alternative (T-2). Alternative S-3 shall be given a score of **10**.

8.5.2 Environmental Impacts

Site Alternative S-1 is more prone to negative environmental impacts because it in closer proximity to the river corridor and will be scored accordingly at **3**. Site S-2 is further away from the river corridor and creates more separation from any potential groundwater or surface water concerns and is therefore given a score of **6**. Site S-3 will be scored the highest because it is entirely on previously disturbed and developed areas. Alternative S-3 shall be scored at **9**.

8.5.3 Financial Feasibility

The financial feasibility is difficult with these alternatives because there are no specific sites selected. Alternatives S-1 and S-2 should be very similar, except that S-2 will likely be chosen with an alternative that requires less land, so it will be scored slightly higher. The scores for alternatives S-1 and S-2 are **5** and **6**, respectively. Alternative S-3 is feasible from the standpoint that no land purchases for treatment and disposal are necessary, except there is large impact fee attached with this option. These items oppose each other and the score for Alternative S-3 shall be a median value of **5**.

8.5.4 Public Health and Safety

Public Health and Safety concerns are equal for Alternatives S-1 and S-2. There are more public health and safety concerns with Alternative S-3 because it requires a lengthy amount of construction in a busy highway corridor. It is recognized that although this is a disadvantage for Alternative S-3, it is only temporary. Alternatives S-1, S-2 and S-3 will be scored as **6**, **6**, and **4**, respectively.

8.5.5 Operational and Maintenance Considerations

Operations and maintenance associated with alternative sites S-1 and S-2 are similar. S-1 is possibly more advantageous simply do to the fact that it is closer to the centralized lift station. Alternatives S-1 and S-2 shall be given scores of **6** and **5**, respectively. Site S-3 will be scored higher because the O&M for this site is deferred to Utility Solutions, and the cost applied through user fees will be accounted for in the financial feasibility section above. Alternative S-3 is given a score of **9**.

8.5.6 Public Comments

Without specific site selected, the alternatives S-1 and S-2 are neutral. There were some comments that supported a system further away from the river, so S-2 will be scored higher to reflect this. Also, Alternative S-3 is preferred because it has the least impact on land in and around the District. Alternatives S-1, S-2 and S-3 will be scored as **5**, **6**, and **8**, respectively.

8.6 Decision Matrix and Selection of Preferred Alternative

Using the criteria, scoring and weighting factors previously described, Table 8.6 was established to provide a concise comparison of the alternatives.

Table 8.6 - Decision Matrix

Alternative	Technical Feasibility		Environmental Impacts		Financial Feasibility		Public Health and Safety		Operation and Maintenance		Public Comments		TOTAL
	Weight:	5	Weight:	3	Weight:	10	Weight:	7	Weight:	4	Weight:	5	
	Score	Wtd.	Score	Wtd.	Score	Wtd.	Score	Wtd.	Score	Wtd.	Score	Wtd.	
CS-1	5.0	25	5.0	15	4.5	45	5.0	35	4.0	16	3.0	15	**151**
CS-2	5.0	25	5.0	15	5.5	55	5.0	35	6.0	24	8.0	40	**194**
T-1	10.0	50	0.0	0	10.0	100	0.0	0	5.0	20	0.0	0	**170**
T-2	9.0	45	5.0	15	5.9	59	6.0	28	10.0	40	3.0	25	**216**
T-3	4.0	20	5.0	15	5.4	54	2.0	14	4.0	16	5.0	25	**144**
T-4	5.0	25	6.0	18	6.0	60	8.0	56	8.0	32	7.0	35	**226**
T-5	5.0	25	6.0	18	4.0	40	9.0	63	1.0	4	5.0	25	**175**
S-1	3.0	15	3.0	9	5.0	50	6.0	42	6.0	24	5.0	25	**165**
S-2	5.0	25	6.0	18	6.0	60	6.0	42	5.0	20	6.0	30	**195**
S-3	10.0	50	9.0	27	5.0	50	5.0	35	9.0	36	8.0	40	**238**

It is important to note that the above scoring and weighting are subjective. Alternatives that score overall within 10 pts of each other may essentially hold the same degree of preference.

The preferred centralized wastewater collection, treatment and disposal alternative for Gallatin Gateway County Water and Sewer District is as follows:

- Alternative CS-2: Gravity Collection – Alley Layout
- Alternative L-1: Single Centralized Lift Station – Packaged Submersible
- Alternative T-4: Septic Tank / Level 2 treatment / Pressure Dosed Drainfield
- Alternative S-2: East of Highway 191

CS-2: This alternative ranked the highest and will be the design basis for this project. As stated in previous sections of this report, individual grinder pumps may be considered on a case by case basis in conjunction with this layout.

L-1: This alternative was selected during the Alternative Analysis (Section 7) process and was therefore not part of the decision matrix.

T-4: This alternative ranked the highest and will be the design basis for this project. The analysis of this alternative focused on the AdvanTex type of Level 2 treatment for simplicity; however, other types of Level 2 systems should be considered during the design phases of this project.

S-2: Although this alternative did not rank the highest, it was the highest ranking alternative that will work with the selected treatment alternative. Alternative S-3 was only an option in conjunction with treatment alternative T-2. It should be noted that this site is general, and no specific parcel has been identified at this point in time.

A detailed description of this preferred alternative is described in the following Section.

9.0 DETAILED DESCRIPTION OF PREFERRED ALTERNATIVE

This section will provide a detailed description of the Preferred Alternative including: site and location characteristics, operational requirements, impacts on existing facilities, design criteria, environmental impacts and mitigation, and a cost summary.

9.1 Site Location and Characteristics

The wastewater collection pipe network is situated within the existing alley ways wherever practical. For the most part, this system layout works well in the western portions of the District where the town is on a grid system. These alleys are typical of small rural towns in that they are narrow and used as a catch-all for residences and businesses alike. The exceptions to the alley way alignments are where the District boundary on the north and the Gallatin River to the west, force collection pipe to be located within the street rather than the alley. These street alignments, Lynde Street and Webb to Tracy Street, are approximately 20-foot wide gravel surface roads that are moderately maintained. The collection pipe network in the eastern part of the District (east of Highway 191) is intended to employ the alley way concept even though this part of the town does not have alleys. As a result, roughly half the collection laterals are positioned along the back of lots. A portion of the lateral servicing Latigo Street follows Wortman Creek, and crosses the creek just behind the lumber mill. This alignment in necessary to service the far southeast lot in the District and maintain a complete gravity flow collection system. This is one location where a grinder pump will be analyzed in more detail during the design phases of the project.

The centralized lift station is located in the far northwest corner of the District. More specifically, the site is just north of the Lynde and Tracy Street intersection, and is within the public right-of-way of Lydne Street. Even though this site is in public right-of-way, it is in an open area at the end of the street past all intersections that receives very minimal traffic. This is an ideal location that also happens to be the low point of the system. This area is within a couple hundred feet of the river, but is outside of the 100-year flood plain. See Figure 2.3.4 and Appendix G for floodplain delineation. As with any low lying area, there is a concern with groundwater, but this concern is overshadowed by the fact that this is the only location that would enable the desired gravity collection system.

The selected treatment site(s) is the suitable land within the planning area that is east of Highway 191. The main reason for this site selection is due to the physical properties of this area being conducive to disposal of treated effluent through groundwater infiltration (drainfield). These potential areas are labeled A, B and C on Figure 7.4, which is attached in Section 7.4 of this report. The three areas are all relatively flat with slopes ranging from 1.5 to 2.5-percent, and according to the NRCS soils data, the soils are consistent throughout. The southernmost area (C) is a large agricultural property, the central area (B) consists of a group of smaller properties that are mostly used for agricultural purposes, and the north area (A) is also mostly used as agricultural property and is adjacent to South Cottonwood Creek. There are six different parcels within these sites that have favorable site conditions for the Level 2 treatment system with groundwater disposal. All these areas are suitable from an engineering perspective, and have good access. The property owner of area C is David Loseff, who has been contacted with regards to this project, and is supportive.

9.2 Operational Requirements

Level 2 wastewater treatment systems have a manageable amount of operational requirements, and the level of expertise required is reasonable for a rural community with minimal manpower and resources. Once set-up, most Level 2 systems are somewhat self-sufficient and controllable by way of telemetry systems along with the lift station. In general, cleaning, measuring and sampling will be the standard operations performed for the entire system. Additionally, the back-up power source with the new lift station would also provide a benefit as power outages typically occur during stormy weather conditions, or in the middle of the night.

Level 2 treatment systems offer much better effluent quality than conventional septic systems, yet require far less O&M than a conventional mechanical treatment plant which often requires a full time operator, or a lagoon and spray irrigation system where both operator and farmers are required.

Specific duties required to operate the AdvanTex Level 2 system include:

- Annually clean pumping packages
- Annually clean biotube filters
- Annually clean splitter valves
- Inspect splitter valve every three months
- Inspect ventilation fan assembly every three months
- Check telemetry panel monthly
- Visually check the system in detail every two weeks
- Measure sludge levels in the primary treatment tanks annually
- Measure sludge levels in the recirculation tank annually
- Measure filter pod inlet pressures annually
- Flush distribution system laterals annually
- Clean nozzles annually
- Visually inspect drainfield laterals monthly

9.3 Impact on Existing Facilities

Gallatin Gateway does not have any existing utility facilities other than the array of individual water supply wells and onsite septic systems. The impact from this project on these existing individual facilities will be very positive. The new wastewater system will eliminate the need for the individual septic systems, which are mostly out of compliance with current health regulations and contaminating the groundwater supply. Consequently, the impact to water supply wells will be positive from the standpoint that they should be pumping from a cleaner water source. The proposed system will eliminate the concerns of well and septic separation distances within the District.

9.4 Design Criteria

The proposed project will have to comply with standards in both Circular DEQ-2 and DEQ-4. Circular DEQ-2 will address design criteria for public systems and includes sections for the new lift station and collection system. Circular DEQ-4 specifically addresses requirements for Level 2 systems regarding nondegradation and drainfield sizing.

The most applicable Chapters in DEQ-2 are:

- Chapter 10 Engineering Reports And Facility Plans
- Chapter 20 Engineering Plans And Specifications
- Chapter 30 Design of Sewers
- Chapter 40 Wastewater Pumping Stations
- Chapter 50 Wastewater Treatment Works

Applicable design standards from DEQ-4 include:

- Chapter 3 Site Evaluation
- Chapter 5 Wastewater Flow
- Chapter 7 Septic Tanks
- Chapter 9 Dosing System
- Chapter 13 Gravelless Absorption Trenches
- Chapter 17 Recirculating Trickling Filters
- Chapter 23 Absorption Beds

The entire system shall be designed for the 20-year design flow of 50,000 gpd as used throughout this report. However, to save on the initial capital cost and minimized the O&M, the AdvanTex treatment portion and drainfield will be initially installed to handle only 30,000 gpd. This is an advantage of this type of system, but it is important to recognize that land acquisition, engineering calculations, system layout, pipe sizing, etc. are all designed to allow for expansion to the 50,000 gpd flow.

A summary of key project specific design criteria is as follows:

- 20ft x 24ft office/shop building
- (12) AdvanTex AX100 Pods (fixed film treatment)
- 45,000 gallon capacity recirculation tank(s)
- 90,000 gallons septic tank(s) capacity
- 8,333 lineal feet of infiltration chambers
- 1.5 acres of primary drainfield area
- (1) Packaged Submersible Lift Station with dual 15-hp effluent pumps
- Emergency backup power generator
- 10,500 lineal feet of 8-inch PVC sewer main collection pipe
- 5,000 lineal feet 6-inch effluent force main
- ±80 sewer service connections

9.4.1 Treatment

DEQ describes Level 2 treatment as a wastewater treatment process that removes at least 60-percent of total nitrogen as measured from the raw sewage load to the system, or discharges a total nitrogen effluent concentration of 24 mg/L or less. For a system to gain the Level 2 designation it must undergo a very rigorous testing and sampling regime before DEQ will allow the systems to be permitted and installed in Montana.

Level 2 designated systems are designed specifically to remove nutrients from wastewater effluent, especially nitrogen. There are several different systems approved for installation in Montana, including the AdvanTex system manufactured by Orenco Inc., which is the option used in this analysis as discussed in Section 7.3.4.

Most Level 2 systems consist of a primary treatment chamber (septic tank) where solids settle out, while fats, oils and grease rise to the surface of the chamber as a floating scum layer. Effluent is then routed to the Level 2 treatment system and channeled through a series of processes that covert most of the nitrogenous wastes to ammonia, and then converts ammonia to nitrates. Nitrates are fairly inert, and the final stage of the treatment process is to convert as much of the nitrates as possible to nitrogen gas which is discharged to the atmosphere. This is probably the most difficult part of the treatment process. The remaining nitrates are discharged in the effluent, usually by percolation through soils to groundwater, where it is diluted. It is unknown how much additional nitrate is converted to nitrogen gas during this process and therefore compliance with Montana’s nondegradation rules relies heavily on the initial treatment processes.

Recirculating sand filters, intermittent sand filters and sand mounds were the first wastewater treatment systems given the Level 2 designation in Montana, and further research has shown that a single pass through a sand medium will not typically remove 60-percent of the nitrogen in wastewater. Intermittent sand filters and sand mounds are no longer considered approved Level 2 treatment systems.

The AdvanTex packed bed synthetic textile filter systems were one of the first non-granular Level 2 systems to be approved in Montana. This system utilize a media bed of woven (fuzzy) fabric that provides the surface area necessary for an adequate microbe population (bugs) to be established. These “bugs” are typically called “fixed film” microbes because they are physically attached to treatment media. Other systems rely on “suspend growth” microbe populations where the “bugs” are suspended in a wastewater medium.

The AdvanTex system was chosen over other Level 2 systems for this analysis because of the performance data available, longevity of the manufacturer and local supplier, and readily available design information. The treatment system is a synthetic textile based packed bed filter and the associated porosity, attached growth surface area, and water-holding capacity contributes to the textile media treatment performance.

Packed bed textile based filter beds offer the following advantages when used for wastewater treatment:

- Quick startup
- Efficient performance with highly variable wastewater strengths and flows, including occasional hydraulic and biologic overloads
- No release of untreated sewage if a malfunction occurs
- Consistent trouble-free operation; low maintenance (e.g. annual service call recommended; on-site routine service time approximately one hour)
- Ease of maintenance (components should be easily accessible and serviceable)
- Low energy consumption
- Adequate storage during power outages (normally 24 hours or more at typical flows)
- Recoverable and expandable
- Reliability in providing the level of treated water required to final dispersal treatment processes
- Easy removal and cleaning of media in case of upset (compared with having to remove huge chunks of perhaps frozen sand media in a recirculating sand filter)

The Level 2 treatment systems offer a low O&M alternative for wastewater treatment systems where biological nutrient removal process are required and the capital and operating cost of a full scale mechanical treatment plant is not viable.

9.4.2 Lift Stations

A single centralized Packaged Submersible Lift Station was selected for this project, and is located at the far northwest corner of the District. This type of lift station is typically the most modern design and presents the fewest operational issues. The lift station building or structure usually sits on top of a wet well, there are no confined space entry issues, and no dry well is required. Generally, there are only minimal operation and maintenance requirements and the controls can be connected to a back-up generator. These packaged submersible lift stations easily meet DEQ-2 Chapter 40 requirements.

The initial planning for a lift station structure (packaged submersible) is a concrete valve vault/wet well, that shall be sized according to the design flows and requirements form DEQ-2. A typical footprint for a lift station of this style and magnitude would be approximately 8-feet wide by 12-feet long with half of that used for the valve vault and the other half for the wet well. The wet well will extend at least ten feet below ground surface. Since the lift station will protrude well into the groundwater, waterproofing and buoyancy calculations are essential.

Pumps shall be sized such that they are capable of pumping wastewater to the treatment and disposal site while maintaining a minimum flow of two feet per second. The rough design criteria for this application are between 55-feet and 85-feet elevation head and 5,000 lineal feet of 6-inch diameter force main, depending on selected treatment site. Accordingly, the calculated TDH would be between 73 and 103 TDH. The minimum flow for this application would be approximately 180 gallons per minute, so the target design flow will be closer to 200 gpm. Preliminary pump sizing calculations are included in Appendix S and indicate the need for a minimum of 15- horsepower variable drive pumps. Standard 3-Phase power is required to operate this type of lift station, and should be easily connected at this site.

9.4.3 Collection System Layout

Figure 7.1.2 in Section 7.1 shows the collection system layout as proposed with this preferred project alternative. The collection system is designed to efficiently reach all areas of the District and consists of approximately 10,500 lineal feet of gravity main. Considerations of gravity flow, service lengths, number of manholes, bury depth, and several other factors contributed to this layout.

A key factor for the design of the collection system is crossing highway 191. This is a busy highway that without question warrants the need for a bore and jack crossing underneath the highway. There is one existing buried pipe immediately north of the Mill Street intersection that was installed along with a pedestrian tunnel project (plan sheet included in Appendix Q). Since the pipe was installed with future utilities crossings in mind, it is anticipated that this pipe be able to serve this project. However, the entire collection system east of the highway is not able to gravity flow to this point; therefore, a new bore and jack is planned near the Penny Lane intersection located at the north edge of the District. If complications arise during the design phases of the project, the new crossing could service the entire east side of the District.

All the gravity mains will be 8-inch PVC pipe with standard 48-inch diameter manholes to meet the requirements of Circular DEQ-2. This is the minimum size for gravity mains and there are no reaches of pipe in this network that require anything larger. Services will be designed according to DEQ-2 and for the most part are expected to be 4-inch PVC.

9.4.4 Hydraulic Calculations

Existing wastewater flows within the District were calculated to be 26,000 gallons per day (gpd) based on the estimated population of the District. State design standards require a minimum wastewater flow of 100 gallons per day per capita (gpdc) unless flow monitoring demonstrates otherwise. In this case, the 100 gpdc guideline was used to calculate the residential flows. The non-residential and commercial flows were calculated by utilizing the DEQ-4 Tables 5-1 and 5-2 for uses such as: gas station, bar, restaurant, fire station, post office, etc. The flow generated from the school was determined from an independent study conducted by Gaston Engineering, Inc. In order to utilize flow information strictly from a quantity (gallons) perspective, all the flows were converted to Equivalent Dwelling Units (EDU). An EDU is equal to 250 gpd.

→ 100 gpdc X 2.5 persons per residence = 250 gpd = 1 EDU

Included in Appendix R is a key map with attached spreadsheet that illustrates the existing flow estimate. Table 3.1.1 below shows the existing flow and the projected flows for the District.

Table 3.1.1 - Existing / Design Flows and EDU's

TYPE	Existing Count	Existing EDU's	Existing Flow (gpd)	Design Flow (gpd)
Residential	67	67	16,750	33,500
Non-Residential	6	15	3,750	7,500
Commercial	8	22	5,500	11,000
Total		**104**	**26,000**	**52,000**
Design			**30,000**	**50,000**

gpd = Gallons Per Day EDU = Equivalent Dwelling Unit

The gravity collection mains are all sized per DEQ-2 and will be 8-inch PVC. In order to ensure that 8-inch mains would be adequate throughout the pipe network, the section of pipe that receives the most flow was checked for capacity requirements. This section of pipe is the lowest part of the entire system and is located immediately prior to the lift station. At this point, the pipe would need to handle the full design flow of 50,000 gpd plus a peaking factor of four (4) (DEQ-2, Chapter 10, Section 11.243), which equates to 200,000 gpd. An 8-inch PVC gravity main has a manning roughness coefficient of n=0.013. The minimum slope per DEQ-2 (Chapter 30, Section 33.4) is 0.004 ft/ft, and will convey 452,422 gpd (0.7 ft^3/sec or 314 gpm) at 75% pipe capacity. This would also allow for an instantaneous peaking factor of more than nine (9).

The minimum size of force main allowed by DEQ for raw sewage is 4-inch diameter and cleaning velocities of at least two feet per second are required. A 4-inch pipe needs to operate at 80 gallons per minute (gpm) to maintain the minimum cleaning velocities. Although a 4-inch force main could be conceivable for this project, the proposed force main shall be 6-inch diameter. Minimum operating flow for this size of pipe is 180 gpm. A 6-inch pipe will meet all the design criteria of DEQ-2 and is the most conservative design. The design life of pipe usually exceeds treatment, and if this community grows more than expected the larger pipe will function whereas the smaller pipe would quickly reach scour velocities and degrade at a much quicker rate.

9.5 Environmental Impacts and Mitigation

Although large areas may be disturbed as a result of open-trench digging, virtually all areas will be within existing rights-of-way and easements that have been previously disturbed by development. There will be no changes in land use after completion of the project. Some air quality problems with dust may arise during the actual construction period because the majority of the streets are unpaved; however, it would be temporary and the contract documents would require that the Contractor provide dust control. Similarly, there will be some temporary noise during construction. Once construction is complete, there will be no noise or dust problems arising as a result of the improvements. The contract documents shall also require that Best Management Practices (BMP) be employed before, during, and after construction until all areas of disturbance have been fully reclaimed and/or re-vegetated. For these reasons, environmental impacts are considered minimal and no permanent, negative environmental impacts are anticipated.

Specific to treatment and disposal, the Level 2 system will have minimal environmental impacts because the treatment pods (filters) and tanks would all be placed underground with only access hatches above ground. Groundwater quality will be improved because of the nitrogen removal in the effluent by the Level 2 system. Additionally, water quality concerns minimized with this alternative because there is more travel distance for natural cleansing though the soil matrix. The same is true for surface water where there is more overland travel distance through vegetation.

Attached in Appendix F is the required environmental checklist, and Appendix I contains the agency response letters received to-date. In addition to the standard environmental checklist, Appendix J has letters from the local water quality district and health department which both state the current groundwater quality concerns and feel that any type of centralized wastewater system that is properly design and construction will improve the environmental water quality.

9.6 Cost Summary

9.6.1 Project Cost Estimate

Table 9.6.1A below shows an all-inclusive opinion of probable cost for the preferred alternative utilizing initial flow of 30,000 gpd. The Table includes the proposed Level 2 system (AdvanTex), collection system, lift station, land purchase, and associated soft costs. Table 9.6.1B illustrates the breakdown of engineering, legal and administrative costs. Table 9.6.1C is a present worth analysis of the project cost estimate.

Table 9.6.1A - Opinion of Probable Cost Gallatin Gateway Wastewater Treatment Project Alternative T-4 - 30,000 GPD Level 2 (AdvanTex) with Groundwater Discharge					
#	**BID ITEM**	**QTY**	**UNITS**	**UNIT PRICE [1]**	**TOTAL**
1	Erosion Control	1	LS	$ 5,000.00	$ 5,000
2	Access Road	1	LS	$ 10,000.00	$ 10,000
3	Office / Shop Building (20' x 24')	480	SF	$ 150.00	$ 72,000
4	Recirculation Tanks (2)	1	LS	$ 96,000.00	$ 96,000
5	Centralized Septic Tank(s)	1	LS	$ 192,000.00	$ 192,000
6	Tank Access Equipment	1	LS	$ 5,000.00	$ 5,000
7	Pumping Equipment	1	LS	$ 23,000.00	$ 23,000
8	Control Panel	1	LS	$ 18,000.00	$ 18,000
9	Misc. Piping/Fittings/Glue/Etc.	1	LS	$ 3,000.00	$ 3,000
10	Recirculating Valve	1	LS	$ 2,000.00	$ 2,000
11	Heater/Ventilation Fan Assembly	1	LS	$ 13,000.00	$ 13,000
12	AdvanTex Equipment (AX100 Pods)	1	LS	$ 303,000.00	$ 303,000
13	Plant Water System & Well Construction	1	LS	$ 30,000.00	$ 30,000
14	Signing	1	LS	$ 3,000.00	$ 3,000
15	Discharge Piping Into GW Infiltration Gallery	400	LF	$ 32.00	$ 12,800
16	Groundwater Infiltration System	8,333	LF	$ 12.00	$ 99,996
17	Groundwater Monitoring Well	2	EA	$ 2,500.00	$ 5,000
18	Emergency Power Generator	1	LS	$ 80,000.00	$ 80,000
19	Disposal Site Fencing	2,000	LF	$ 10.00	$ 20,000
20	Chain Link Fencing Treatment Site	350	LF	$ 25.00	$ 8,750
21	Site Grading/Parking/Seeding	1	LS	$ 6,000.00	$ 6,000
22	Directional Drill Force Main	200	LF	$ 200.00	$ 40,000
23	Power/Electrical Service (Treatment Site)	1	LS	$ 30,000.00	$ 30,000
24	6-inch Effluent Force Main to Treatment	5,000	LF	$ 38.00	$ 190,000
	Treatment System Subtotal				**$ 1,268,000**
25	Collection System and Lift Station (Table 7.1.2)	1	LS	$ 1,212,000.00	$ 1,212,000
	Direct Construction Subtotal				**$ 2,480,000**
	Mobilization	10.0%			$ 248,000
	Traffic Control	1.0%			$ 25,000
	Contingency	10.0%			$ 248,000
	Construction Subtotal				**$ 3,001,000**
	2012 Construction Cost [2]	3.1%			$ 3,205,000
	Land Acquisition (10 acres)				$ 300,000
	Water Rights				$ -
	Right-of-Way & Permits				$ 40,000
	Hydrogeologic Investigation				$ 5,000
	Geotechnical Investigation				$ 15,000
	Engineering, Legal & Administrative[3]	25%			$ 750,000
	TOTAL				**$ 4,315,000**

[1] *Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.*

[2] *The ENR 20 year average Construction Cost Index is +3.1% (as of November 2009), so capital costs are projected to an anticipated construction date in 2012 using a 3.1% inflation rate.*

[3] *Cost breakdown on Table 9.6.1B*

Table 9.6.1A differs from Tables 7.3.4 only in the fact that the design flow is 30,000 gpd in this section. The 50,000 gpd design flow in Section 7 allowed for consistent comparison of alternatives while the 30,000 gpd design flow in this section allows for phasing of the treatment infrastructure thereby offering more flexible financing terms.

Table 9.6.1B - Opinion of Probable Cost Engineering, Legal & Administrative
Gallatin Gateway Wastewater Treatment Project
Alternative T-4 - 30,000 GPD Level 2 (AdvanTex) with Groundwater Discharge

#	ITEM	QTY	UNITS	UNIT PRICE	TOTAL
1	Personnel	1	LS	$ 4,000.00	$ 4,000.00
2	Office	1	LS	$ 8,000.00	$ 8,000.00
3	Grant Administration	1	LS	$ 45,000.00	$ 45,000.00
4	Training & Travel	1	LS	$ 7,000.00	$ 7,000.00
5	Legal	1	LS	$ 25,000.00	$ 25,000.00
6	Interim Interest	1	LS	$ 30,000.00	$ 30,000.00
7	Loan Fees & Reserves	1	LS	$ 10,000.00	$ 10,000.00
8	Bond Counsel	1	LS	$ 16,000.00	$ 16,000.00
9	Engineering	1	LS	$ 600,000.00	$ 600,000.00
10	Audit	1	LS	$ 5,000.00	$ 5,000.00
	TOTAL				**$ 750,000.00**

Table 9.6.1C - Gallatin Gateway Wastewater Treatment
Preferred Alternative
Present Worth Analysis

ITEM	ALTERNATIVE T-4 AdvanTex with Groundwater Discharge (30k GPD)
Capital Costs	$4,315,000
Annual O&M Costs	$32,000
20-Year Salvage Value	$1,012,740
Present Worth of Salvage Value	$315,800
Present Worth of Annual O&M Cost	$479,948
Present Worth Cost[1]	**$4,479,148**

[1] *Present worth based upon a 20 year life cycle using calculated discount rate.*

9.6.2 Annual Operating Budget

The Gallatin Gateway County Water and Sewer District is a new District so no previous income or reserves are available.

Income

The current estimated flow for the District is equivalent to 104 EDU's as presented in Section 3.1.1. The next section provides funding scenarios that calculate the user rate from this number of EDU's. Additionally, the estimated O&M includes a contribution to a reserve which is an important part of any rate structure in case an emergency repair is needed.

O&M Costs

Table 9.6.2 below is an opinion of probable cost of the proposed O&M costs for the District, after the project is complete. The present worth of this cost is shown on Table 9.6.1A in the previous section.

Table 9.6.2 - Opinion of Probable Annual Operation & Maintenance Costs
Gallatin Gateway Wastewater Treatment Project
Alternative T-4 30,000 GPD Level 2 (AdvanTex) Groundwater Discharge

#	ITEM	QTY	UNITS	UNIT PRICE	TOTAL
1	Administration	100	HR	$ 15.00	$ 1,500.00
2	Lift Station Power	17,000	KWH	$ 0.12	$ 2,040.00
3	AdvanTex Power (Pumps/Fans)	1	LS	$ 2,100.00	$ 2,100.00
4	Monitoring & Testing	1	LS	$ 6,000.00	$ 6,000.00
5	Sludge Disposal	1	LS	$ 2,000.00	$ 2,000.00
6	Office Expenses/Training	1	LS	$ 2,000.00	$ 2,000.00
7	AdvanTex Component Maintenance	1	LS	$ 1,100.00	$ 1,100.00
8	AdvanTex System Maintenance	1	LS	$ 8,300.00	$ 8,300.00
9	Clean 20% of Collection System	2000	LF	$ 1.00	$ 2,000.00
10	Reserve	1	LS	$ 5,000.00	$ 5,000.00
	TOTAL				**$ 32,000.00**

Capital Improvements

The District has no major asset acquisition plans at the present time since it is an entirely new system, and is solely focused on the initial construction. Once established, more information will be available to adequately address a capital improvements plan.

Debt Repayments and Coverage Requirements

The funding strategy for the District will be discussed in detail in the next section, which will provide a summary of each proposed source of funding.

9.6.3 Reserves

Reserve requirements for loan funds are considered as part of the funding strategies presented in the next section. In addition, short-lived assets were included as part of the O&M costs. Therefore, there are no additional reserve requirements to be included as part of the project costs.

10.0 RECOMMENDATIONS AND IMPLEMENTATION

The previous sections of this report have focused on the need for the project, physical and socio-economic characteristics of the community, project costs, and more extensively the technical viability. This section will focus on the financial strategy and implementation schedule. The District has no existing system(s); therefore, there are no funds available, or attainable through existing fee structures. One of the main goals of a comprehensive PER is to provide a workable funding plan for recommended improvements included in the Preferred Alternative. This section will discuss available funding sources as well as develop various funding scenarios. Ultimately, a preferred funding scenario will be selected and further analyzed along with an associated implementation plan.

10.1 Funding

Due to the high cost of the proposed improvements, the District will need to obtain outside assistance to fund the project. The outside assistance may be in the form of a grant and/or loan. Possible sources of funding are:

- Treasure State Endowment Program (TSEP)
- Renewable Resource Grant and Loan Program (RRGL)
- Community Development Block Grant (CDBG)
- State Revolving Fund (SRF)
- USDA Rural Development (RD)
- Montana Coal Board
- Economic Development Administration (EDA)
- INTERCAP
- State & Tribal Assistance Grant (STAG) Program and Water Resource Development Act (WRDA) Grant Program (595 Program)
- Revenue Bonds

The funding programs have different eligibility requirements. Community income levels are considered as part of the eligibility review for most of the grant programs, either as a primary qualifier or, as in the case of CDBG and TSEP, as a basis for determining the level of financial responsibility the applicant must meet before they qualify for grant funds.

The median household income (MHI) is used by the agencies to make the grant eligibility determination. Target monthly water and sewer rates have been established by the funding agencies as a percentage of the median household income. The MHI for Gallatin County is

$38,120 per year based on the 2000 census. The user target sewer rate, based on 0. 9% of the MHI, is $28.59 per month (see Appendix T). The income survey as of April 1, 2010, shows the MHI of the District is roughly $29,000 per year according to Midwest Assistance Program. The user target sewer rate for the District would then be approximately $21.75.

The equivalent dwelling unit (EDU) methodology is used in grant applications to determine the user rates from which the percentage of target rate can be calculated. The user rate calculated based on the EDU method, with Funding Scenario Option #1 shown in Section 10.1.2 below, is $79.50 per month. This is 278.1% of Gallatin County's target rate, and 365.5% of the current estimated District target rate, which will make them eligible for all the grant funding agency target rate thresholds.

10.1.1 Funding Sources

The following sections provide a brief description of the potential funding sources and whether or not the Gallatin Gateway County Water and Sewer District would be eligible for those funds.

Treasure State Endowment Program (TSEP)

TSEP is a state funded grant program, which is administered by the Montana Department of Commerce (MDOC). TSEP provides financial assistance to local governments for infrastructure improvements. Grants can be obtained from TSEP for up to $500,000 if the projected user rates are less than 125% of the target rate, for up to $625,000 if projected user rates are between 125% and 150% of the target rate, and for up to $750,000 if the projected user rates are over 150% of the target rate. TSEP grant recipients are required to match the grant dollar for dollar, but the match may come from a variety of sources including other grants, loans, or cash contributions. There is also a limit of $20,000 per household, and only one application per project is permitted each application cycle.

Since the proposed improvements will result in an increase in user rates to a rate above the target rate by more than 150%, Gallatin Gateway is eligible to apply for up to $750,000 of TSEP funds.

Renewable Resource Grant and Loan Program (RRGL)

RRGL is a state program that is funded through interest accrues on the Resource Indemnity Trust Fund and the sale or Coal Severance Tax Bonds and is administered by the Montana Department of Natural Resources and Conservation (DNRC). The primary purpose of the RRGL is to enhance Montana's renewable resources. For public facilities projects that conserve, manage, develop, or protect renewable resources, grants of up $100,000 are available.

The District would be managing and protecting a renewable resource, which makes them eligible for funding of up to $100,000 through the DNRC-RRGL program. In this case, the resource is groundwater and surface water contributing to the Gallatin River watershed and eco-system.

Community Development Block Grant (CDBG)

CDBG is a federally funded program that is also administered by the Montana Department of Commerce (MDOC). The primary purpose of CDBG funds is to benefit low to moderate income

(LMI) families. Hence, a municipality must have an LMI of 51% or greater. This is usually determined by the current Census. However, under certain circumstances, the MDOC may allow an income survey to be completed (such as there have been major economic changes since the Census or if a community is only slightly under the required LMI percentage).

The CDBG grant funds can be applied for in an amount of up to $450,000 with a limit of $15,000 per LMI household, so a community needs 30 LMI households to apply for the maximum grant funds. The use of CDBG funds requires a 25% local match that can be provided through cash funds, loans, or a combination thereof.

This year (2010) Gallatin County has a CDBG grant for Rae Water and Sewer District that is still currently being used. The CDBG program will not fund anymore grants to Gallatin County until the existing open grant is utilized. It is anticipated that the District can, and will, apply to CDBG in 2011.

The Town of Gallatin Gateway was not listed in the 2000 Census as a census designated place (CDP), and a CDP is what the census bureau goes by to determine LMI. Since Gallatin County as a whole has a 38.7% LMI, an income survey is necessary to determine the eligibility for the District. The MDOC allowed an income survey to be completed for this project, and as of April 1, 2010 67% have been returned with a 66% LMI. The income survey is planned to continue in order to achieve an 85% return for RD eligibility. Based on the current knowledge and characteristics of the District, it is anticipated that the District will maintain an LMI of 51% or greater and will be eligible to apply for up to $450,000 of CDBG funds.

State Revolving Fund (SRF)

SRF provides low-interest loan funds for both water and wastewater projects through the Drinking Water State Revolving Fund (DWSRF) and the Water Pollution Control State Revolving Fund (WPCSRF), respectively. The SRF program is administered by the Montana Department of Environmental Quality. Current loan terms include an interest rate of 3.75% for a 20-year period, and 3.25% for a 30-year period. However, the SRF program does offer an additional subsidy for *disadvantaged* communities. A disadvantaged community is one where the combined annual water and sewer rates are 2.3% or greater of the MHI. The additional subsidy is a partial waiver of the loan loss reserve fee, which equates to a 1.0% interest rate reduction. Thus, the interest rate used in funding calculations for a disadvantaged community is 2.75%.

Currently, the SRF program (2010) is proposing a principle forgiveness of 15% with a maximum of $500,000 or 30% of the project costs. It is uncertain if this will be available when this project is ready and is therefore not included at this time.

This funding source is considered to be a practical option for Gallatin Gateway, especially since it would likely qualify as a disadvantaged community. The loan terms are shorter with SRF than Rural Development (described below) so rates are higher.

USDA Rural Development (RD)

RD provides grant and loan funding to municipalities for water and wastewater projects that improve the quality of life and promote economic development in Rural America. Municipalities with a population of less than 10,000 are eligible to apply; although, priority is given to those with a population of less than 5,500.

Grant eligibility and loan interest rates are based on the community's median household income (MHI) and user rates. If the area to be served has a MHI of $26,452 or lower and the project is necessary to alleviate a health and/or sanitation concern, up to 75% of the project costs are grant eligible. Up to 45% of the project costs are grant eligible if the planning area has an MHI between $26,452 and $33,065.

The MDOC's Census and Economic Information Center (CEIC) provided MHI information for the Gallatin Gateway area – refer to Appendix T. Unfortunately, the most site specific information available (Block Groups) is still too expansive, and not a fair representation of the District. Additionally, the District area happens to be bisected by two different Block Groups with substantially different MHI projections. The MDOC did allow an income survey to be completed for this project that would determine a specific MHI; however, as of April 1, 2010 only 67% have been returned. In order to meet RD guidelines, the income survey will continue until at least 85% have been returned. At this point in time (67% returned) the MHI is roughly $29,000. Based on the information to-date and the current knowledge and characteristics of the District, it is anticipated that the District will have an MHI between $26,452 and $33,065, and will be eligible to apply for a 45% grant. Thus, the remaining 55% would be funded by RD's 40-year 3.375% low interest rate loan.

Montana Coal Board

The Coal Board provides grant funding to municipalities to adequately provide for the expansion of public services or facilities needed as a direct consequence of coal development activities. There is no maximum limit to the amount the Coal Board can fund, but available funding is very limited so it can be difficult to receive any funds from the Coal Board, especially large sums.

Gallatin Gateway is located outside of the eligible Coal Board boundaries and cannot show a direct impact from coal development. Therefore, it is very unlikely that they would receive any Coal Board funding.

Economic Development Administration (EDA)

EDA provides grant funding for projects that are demonstrated to be needed for the placement of a new business. The amount of grant is dependent on the number of jobs created.

This funding source is not applicable to this project.

INTERCAP

INTERCAP provides loan funds at a low cost, variable interest rate to local governments. INTERCAP is administered by the Montana Board of Investments and is very flexible in the variety of funding which would include both water and wastewater projects. There is no funding cycle (funds are always available); however, the maximum loan term is 10 years.

Due to the rather large amount of financing required, an INTERCAP loan with the shorter loan term would cause extremely high user rates for the District and is not recommended for long-term financing. Should the District be in need of interim financing at any point during the project, INTERCAP would be an excellent source.

State & Tribal Assistance Grant (STAG) Program and Water Resource Development Act (WRDA) Grant Program (595 Program)

STAG and WRDA grants are federal fiscal appropriations that are approved by the U.S. House of Representatives and the U.S. Senate. STAG and WRDA grants are available for infrastructure improvements for municipalities, among other governmental agencies. The program generally requires a 45% match for the STAG funds and 25% match for WRDA funds. State grant and loan funds are eligible to meet the matching requirement as well as federal funds from the Rural Development Program and the Community Development Block Grant Program. STAG and WRDA grant applications are accepted by Montana's Congressional delegation in January/February of each year. Results of the appropriation requests are not known until the following summer or fall.

Gallatin Gateway County Water and Sewer District applied for $600,000 from STAG/WRDA in February 2010, with help from Midwest Assistance Program (MAP). The amount requested was advised by MAP who directly contacted representatives of Montana congressional delegations.

10.1.2 Funding Strategy

Numerous options have been identified as potential funding sources for Gallatin Gateway. By knowing the options available and having a thorough knowledge of the criteria associated with each funding source, many different possible funding scenarios were considered. This process is import in order to fully understand the details and sensitivity of these funding sources over time. For example, one scenario may have a slightly better user rate, but the interest paid over the life of the loan is much higher.

After calculating rates and weighing-out the likelihood of District's eligibility, two options are considered and shown below on Table 10.1.2A. Option #1 is more aggressive and utilizes RD for grants and low interest rate loans. This option is preferred and is considered the best case scenario for the District. Option #2 is a more modest approach and utilizes the SRF loan program. Additionally, it is somewhat conservative from the standpoint that SRF offers slightly better rates and a longer term loans than what was used in the calculations, and there is potential for loan forgiveness that was not factored in because of its current uncertainty.

Table 10.1.2A - Funding Strategy for Preferred Alternative		
DESCRIPTION	**SCENARIOS**	
	OPTION #1	**OPTION #2**
TOTAL PROJECT COST	**$4,315,000**	**$4,315,000**
TSEP Grant	$750,000	$750,000
DNRC Grant	$100,000	$100,000
CDBG Grant	$450,000	$450,000
STAG/WRDA Grant	$600,000	$250,000
RD Grant	$1,086,750	$0
RD Loan (40 Years @ 3.375%)	$1,328,250	$0
SRF Loan (20 Years @ 3.00%)	$0	$2,765,000
Principal + Interest + Reserve on Loans (Annual)	$67,098	$204,437
Estimated O&M (Annual)	**$32,000**	**$32,000**
Effective Annual System Cost	**$99,098**	**$236,437**

There are a several ways to determine user rates based on the project cost and selected funding package. The recommended methodology for Gallatin Gateway is by special assessment bonds. In order to develop this type of assessment research was completed using the Gallatin County database to get tax record information of property values and square-feet estimates (see Appendix T). The following Table 10.1.2B lists the assumptions used in the analysis. The number of lots is notably higher than the number of EDU's and what is described in Section 3.1. This is due to the fact that many of the residents own groups of smaller lots in order to meet setback requirements for onsite well and septic systems.

Communities have three primary mechanisms by which Montana Statures allow the incurrence of and securing of debt. The SRF program and a more traditional issuance of debt through the public bond markets both rely on the following methods to secure debt:

GO Bonds – This type of debt requires an election and approval by 60% or more if 30% turnout and approval by 50% or more if 40% turnout of the electorate. There is a debt limitation based on taxable value of property. This type of financing does not require a debt reserve placed on deposit or the collection of debt coverage. The rate of charges is based on taxable value of the property and all property owners would pay the tax, whether connected to the new utility or not.

Revenue Bonds – This typed of debt is secured by the pledging of user charges and, in the case of a water/sewer District, requires a debt election. This type of debt generally requires the collection of coverage which means that 10-25% of the annual debt service must be collected and that one principal and interest payment must be placed in reserve. The rates and charges for revenue bonds would apply only to connected users and would be based on actual use although recent legislation allowed revenue bonds to be supported by an assessment placed upon measurable property values such as square footage. These bonds, in some cases, can be backed by the general obligation of the taxpayers (i.e. double barreled bonds).

Special Improvement Districts – Available to cities, districts and counties, this type of financial district can be created by a local government for the purpose of building a water, sewer or road systems within the community. A specific process must be followed to create the district and the process can be stopped by a protest of 75% or more of the property owners, unless overridden by the majority of the council. All properties in the district benefited by the improvements will be assessed for costs. Portions of the assessment goes into a revolving fund to act as security for the debt. This is the method chosen by the District board.

Table 10.1.2B - Assumptions for Funding Strategy Analysis

DISTRICT ASSUMPTIONS	AMOUNT
Number of Lots	174
Number of Initial EDU's	104
Total Taxable Value	$364,751
Total Square-Feet	3,896,679
EXAMPLE LOT ASSUMPTIONS	**AMOUNT**
Square-Feet of Salesville Lot	7,000
Taxable Value for Vacant Lot	$500
Taxable Value for Lot with House	$2,130
Taxable Value for Vacant 1-Acre Lot	$3,000
Taxable Value for 1-Acre with House	$4,500

The next step is to determine the estimated user rates with the preferred alternative and proposed funding package. As mentioned above, there are two scenarios considered in this PER with the intention of providing estimates for what the community is striving for, and to illustrate a more modest approach. The primary rational for this approach is based on an unstable and rather unpredictable economy. The amount of funding available has reached the extremes over the past couple years and therefore the outcome is not as predictable. The following Table 10.1.2C presents the estimated monthly user fee which is based on the number of EDU's (104) and the annual O&M costs. The Table also shows the tax assessment for the debt service in two different ways. The first way is a 50/50 split of taxable value and parcel size. The second way is an equal tax assessment of all the lots.

Table 10.1.2C - Costs Estimates with Proposed Funding Strategy Using Property Assumptions		
MONTHLY BILL	**SCENERIOS**	
	OPTION #1	**OPTION #2**
Vacant Lot in Salesville	$0	$0
Salesville Lot with House	$25.64	$25.64
Vacant 1-Acre Lot	$0	$0
1-Acre Lot with House	$25.64	$25.64
ANNUAL TAX (50% TAXABLE VALUE, 50% SQUARE-FEET)		
Vacant Lot in Salesville	$106	$324
Salesville Lot with House	$256	$781
Vacant 1-Acre Lot	$651	$1,983
1-Acre Lot with House	$789	$2,404
ANNUAL TAX (EQUAL ASSESSMENT OF LOTS)		
Vacant Lot in Salesville	$386	$1,175
Salesville Lot with House	$386	$1,175
Vacant 1-Acre Lot	$386	$1,175
1-Acre Lot with House	$386	$1,175

10.2 Implementation

Before the project can be implemented, the funding must first be in place. As noted earlier, the best funding strategy for the District would be to utilize TSEP, DNRC, CDBG, STAG/WRDA grant funds as well as RD grant and loan funds. The STAG/WRDA grant applications have already been submitted, the TSEP grant application is due in April 16, 2010, and the grant applications for DNRC, and CDBG are due in May of 2010. Thus, it is recommended that the District submit the TSEP and DNRC applications accordingly. It is very unlikely that the District will be able to submit their CDBG application this spring because the county has not reached substantial completion of their previously sponsored project, RAE Water and Sewer District. Therefore, it is recommended that the District submit the CDBG Application by May of 2011. Applications for RD funds are available anytime and do require this preliminary engineering report (PER) and any environmental reports to be included. The RD applications for this project will be submitted in summer/fall 2010 also.

Upon securing all funding, the project start-up for the grant program is expected to be about a two month process. All environmental work will need to be complete, including the environmental assessment as required by CDBG. The engineering could begin once a contract is completed between the grant agencies and the District, likely in June of 2011.

Design is anticipated to be completed in December 2011, with the anticipation of bidding the project as early as February, 2012. Actual construction would not be expected to begin until late March or April of 2012, primarily dependent upon weather, which should allow the Contractor ample time to coordinate his startup. Table 10.2 provides a summary of the implementation schedule.

Table 10.2
Projected Implementation Schedule

ACTION	DATE	NOTES
Submit STAG/WRDA grant applications	March, 2010	Complete; MAP
Submit TSEP grant application	April, 2010	
Submit DNRC grant application	May, 2010	
Select Bond Council, hold Bond Election	Sept, 2010	
Hire Engineer/Administrator	Sept, 2010	
Apply to RD for loan	Oct, 2010	
Results of TSEP and DNRC grant known	April – June, 2011	If insufficient funding, re-apply or phase project to meet available project funding
Begin Design Phase	June, 2011	
Start-Up, FONSI Clearance	June, 2011	All environmental research already complete
Submit CDBG grant application	May, 2011	
Submit Plans to DEQ	Dec, 2011	
DEQ approval	Feb, 2012	Allows 2 full months for review
Advertise and Bid Project	Feb – Mar, 2012	Allows Contractor 3 months to get crew and materials ready
Construction	Apr – Aug, 2012	
Final Walk-Through	Aug, 2012	
Close-out	Oct, 2012	Conditional for TSEP and CDBG pending audits
Audit	Jan, 2013	Need special single act - audit due to high amount of state and federal funds
Audit and Final CDBG/TSEP Close-out	Jan, 2013	
11 month Walk-Through	Oct, 2013	

10.3 Public Participation

The Preliminary Engineering Report (PER) process included an extensive public participation effort that began nearly three years ago with the development of Gallatin Gateway's Neighborhood Plan, which was initiated in February 2007. The efforts to gather input from the community included the distribution of a survey to 650 landowners that announced the beginning of the planning process and included five questions related to land use, community values, and issues of importance to the community. One hundred twenty surveys were returned, and listed among the top issues of concern were protecting groundwater, water quality, and wastewater treatment. Public meetings were also held on May 18, 2007, August 15, 2007, October 17, 2007, November 7, 2007, January 25, 2008, January 30, 2008, March 13, 2008, April 30, 2008, June 4, 2008, and October 8, 2008. The culmination of the public participation in the planning of the proposed project was the hearing held by the District's Board of Directors on March 22, 2010 to take public comment on the Preliminary Engineering Report. See Appendix U for copies of the planning documents, survey results, and public participation. Newspaper articles can be found in Appendix Z.

During the development of the Neighborhood Plan the threats posed by Gallatin Gateway's individual septic systems to its water supply were frequently discussed. From those discussions emerged a decision to form a county water and sewer district and pursue funding for the preparation of a PER. A mail ballot election was held on January 13, 2009 for the purpose of voting on the question of whether or not the Gallatin Gateway Water and Sewer District shall be incorporated as a County Water and Sewer District. Of the 42 people that voted, 71-percent voted for the creation of the District.

The Neighborhood Plan was adopted by the Gallatin County Commissioners as the Gallatin Gateway Community Plan Chapter of the Gallatin County Growth Policy on March 17, 2009. The preparation of the Neighborhood Plan was coordinated by the Gallatin Gateway Community Planners, a volunteer committee that collaborated with Gallatin County to guide the process that enjoyed the participation of a significant number of Gallatin Gateway residents, as well as extensive coverage by the Bozeman Daily Chronicle and the Belgrade News.

A public meeting was held on March 22, 2010 at the local community center hosted by the District board where Great West Engineering presented the preliminary engineering report findings to the community. The meeting was advertised with: a notice in the Bozeman Daily Chronicle on March 14 and again on March 22; notices posted at the local post office, community center, and gas station; two mailings to all landowners/residents in the District; two email notifications spammed out to approximately 100 community members; and a notice on the sandwich board erected on road to post office. A sign in sheet at the entrance to the meeting listed 37 people, but a head count at the peak of attendance revealed 44 people in the audience with another 7 people accounting for the presenting engineer and District board, for a total of 51. A petition of support was also posted at the meeting and 32 people signed in support of the project after the presentation was heard. At the meeting there were several comments pertaining to the process in general, but the main discussion was centered on the income survey process and potential for funding sources. As the petition shows, there was overwhelming support for the project from the community members in attendance. Documentation of the public meeting is attached in Appendix Y.

11.0 REFERENCES

The following references were utilized in the compilation of the PER:

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[5] mt.gov, Natural Resources Information System, Montana Geographic Information Clearinghouse, http://nris.state.mt.us/gis/

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[13] United States Geological Survey (USGS), *NWIS Web Data for Montana, Station 06043500, Gallatin River near Gallatin Gateway, MT*, http://waterdata.usgs.gov/nwis/uv?06043500

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