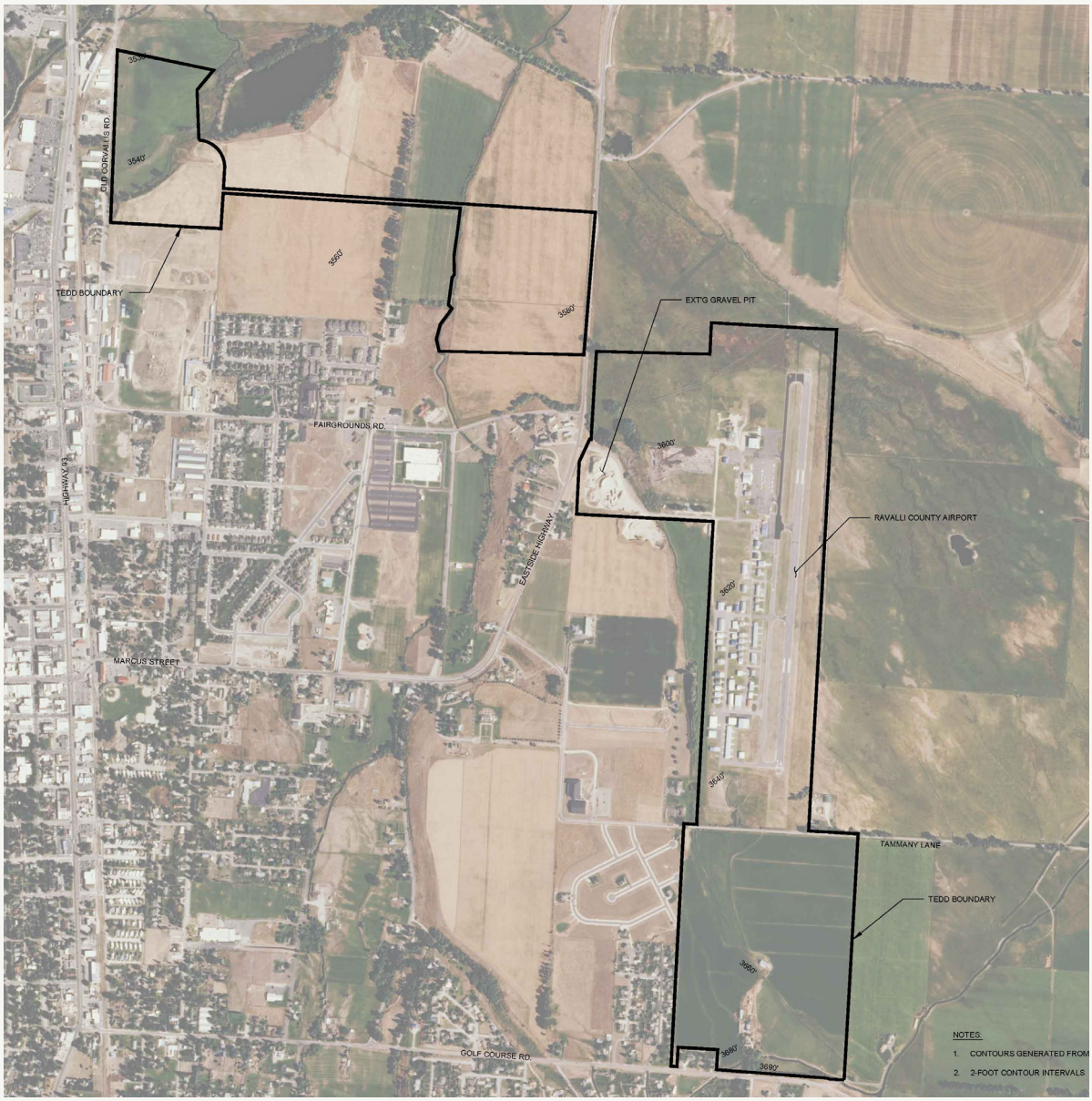
PRELIMINARY ENGINEERING REPORT

Ravalli County Targeted Economic Development District (TEDD) - Water, Wastewater, Roads, Telecommunications



Prepared By:

Professional Consultants Inc.
Unmatched Experience. Uncompromising Standards.

170 S. 2nd Street, Suite C
Hamilton, MT 59840
www.pcimontana.com

November 2015

PRELIMINARY ENGINEERING REPORT

RAVALLI COUNTY TARGETED ECONOMIC DEVELOPMENT DISTRICT (TEDD) – WATER, WASTEWATER, ROADS & TELECOMMUNICATION

TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

APPENDICES

1. EXECUTIVE SUMMARY

Ravalli County and the Ravalli County Economic Development Authority (RCEDA) have partnered to create a Targeted Economic Development District (TEDD) which includes the Ravalli County Airport and adjacent, contiguous areas. Ravalli County intends to use tax increment financing to provide infrastructure to support the development of secondary, value adding industries in Ravalli County. The TEDD is located adjacent to the City of Hamilon.

The Ravalli County Commissioners have contracted with Professional Consultants, Inc. to develop a Preliminary Engineering Report (PER) for the TEDD, which addresses water, wastewater, communications, power, natural gas and transportation. The bulk of the PER will address water and wastewater infrastructure. Based on correspondence with power, gas and communications providers, this infrastructure will follow development as a more detailed development plan is generated by the property owners within the TEDD. At this point it is also premature to propose alternatives to improve the intersection of Fairgrounds Road and Eastside Highway and the Airport Entrance on Eastside Highway. Plans for transportation improvements will also be addressed as property is developed within the TEDD.

The TEDD is anticipated to have a mixture of business and workforce housing, with various densities and employees per business. Based on discussions with Julie Foster at the Ravalli County Economic Development Authority and an evaluation of Ravalli County employment trends, the following mix of business and workforce housing is expected in the TEDD over a 30-40 year planning period:

Proposed Land Use	Area (Gross Acres)	Estimated New Businesses	Estimated Employees/ Business	Estimated Population
Commercial	21	20	8	160
Technology/Office	42	20	20	400
Lt. Industrial - Manufacturing	14	3	20	60
Lt. Industrial - Warehousing	14	3	5	15
Airport Improvements	36	18	4	72
Existing Land Use	141	-	-	75
Airport Improvements South of Tammany Ln.	108	0	0	0
Workforce Housing	44	80	2.5	200
TOTALS	**420**	64		**982**

Water

This report investigates several options to serve water to the businesses in the TEDD. The most obvious option is the connection to the City of Hamilton public water system. At the writing of this PER there was no definitive answer on the ability to connect to the City of Hamilton infrastructure or what costs would be associated with those connections. Additional options explored include: Individual Private Wells, Small Public Water Systems, and Single Public Water System.

Wastewater

Options for wastewater evaluated in this report include the following: Individual Subsurface Wastewater Treatment Systems, Multiple Small Public Subsurface Wastewater Treatment Systems, Single Public Subsurface Wastewater Treatment Systems, and Public Wastewater Treatment Facility, including Sequencing Batch Reactor, Membrane Bioreactor, SepticNET and wastewater treatment ponds. Should connection to the City of Hamilton become a possibility in the future, connection to city wastewater infrastructure should be evaluated.

Power and Natural Gas

Power and natural gas service was documented in and around the TEDD. Based on conversations with the utility providers power and natural gas service are best extended at the time of development by each property owner within the TEDD. At this point the lot sizes are known and a better estimate of business power and gas needs are usually available. Power and natural gas are installed by the developer and can be paid back on a seven year buy-back by NorthWestern Energy for each lot that connects in the first seven years.

Communications

Communication is also best installed at the time of development by each property owner. Communications is usually installed in the same trench as power and natural gas. At the time of development a better estimate of business needs will usually be available.

Transportation

The primarily transportation needs in the TEDD have been identified as the intersections of Fairgrounds Road and Eastside Highway and the Airport entrance onto Eastside Highway. These intersections have poor visibility and are not located across from each other. Based on conversations with the Montana Department of Transportation (MDT), these intersections could be mitigated in a number of ways including; sensor activated warning signals, traffic signal, or intersection relocation. All of these improvements would be best completed when a development plan is completed for the area adjacent to these intersections. The intersection of Fairgrounds Road and Eastside Highway could qualify for Urban Route funding through MDT.

Based on the recommendations of this PER the preferred alternative for water and wastewater have an overall construction cost estimated at **$3,868,524.00** including construction contingency, engineering design services, construction contracting and inspection. Additional administrative costs associated with funding of these improvements are not included in this cost.

A detailed evaluation of the above listed items follows in this report.

2. PROBLEM DEFINITION

2.1 Project Planning

2.1.1 Location

The proposed Targeted Economic Development District (TEDD) is located just east of beautiful Hamilton, MT. The western-most boundary parallels Old Corvallis Road, the northern-most boundary is approximately the same latitude as the historical Daly Mansion, the eastern-most boundary is the Ravalli County Airport, and the southern-most boundary is Golf Course Road. The City of Hamilton is located in the Bitterroot Valley approximately 42 miles south of the City of Missoula in western Montana. It is positioned between the Bitterroot River to the west and the Sapphire Mountains to the east. The legal description of the TEDD is Township 6 North, Range 20 West; Sections 19, 20, 29 & 32. The latitude and longitude of the approximate center of the TEDD is N46 degrees 15 minutes 27 seconds and W114 degrees 08 minutes 4 seconds respectively. **Appendix A** shows the location and topography of the TEDD.

The PER planning area for this report will be delineated by the boundaries of the TEDD. More specifically, the TEDD encompasses about 420 acres. Approximately 242 acres is undeveloped property and 178 acres is developed property. The developed property consists of the Ravalli County Airport, the Hamilton Trap Club/Gravel Pit, and the property leased to the United States Forest Service (USFS). Property identification is shown on the vicinity map in **Appendix A**.

2.1.2 Physical Characteristics of the Area

Geology

According to the *Surficial Geologic Map of the Bitterroot Valley* from the *Montana Bureau of Mines and Geology*, there are a few different formations underlying the area. The areas that are closest to Hamilton and Riverside consist of alluvial deposits of both the Hamilton and Riverside Terraces (Qath & Qatr). The area more west within the TEDD consists of ancestral Bitterroot River gravel (Tbg), older alluvial fan deposits (Qafo) as well as younger alluvial fan deposits (Qafy) from Gird Creek oriented from south east to north west. A copy of the geologic map is located in **Appendix A**.

Topography

Ground contours using Light Detection And Ranging (LiDAR) Technology are available for the area within the TEDD. According to the LiDAR data, the ground surface has varying slopes, but for the most part is relatively flat sloping from southeast to northwest towards the Bitterroot

River averaging about one (1) to one-in-a-half (1.5) percent. The highest elevation is 3,688 feet located near the southern boundary. The lowest elevation is 3,530 feet located near the western boundary. Some areas in the southern part of the TEDD reach slopes between 8 and 12 percent. The existing gravel pit located on the west side of the airport also has some steep slopes.

Soil Types

Soils within the TEDD's 420 acres varies. USDA-NRCS shows fifteen (15) different soil classifications: Riverside-Tiechute-Curlew Complex (16E), Holloron loam (120B), Losttrail-Wimper complex (102B), Wimper sandy loam (105B), Riverside-Losttrail complex (105C), Riverside-Losttrail complex (105D), Holloron-Tiechute complex (122B), Hamilton silt loam (130B), Quast silt loam (135C), Fairway, sodic-Overwhich complex (145A), Riverrun complex (150A), Gash, occasionally flooded-Riverrun, rarely flooded complex (153A), Overwhich-Bandy complex (154A), Overwhich-Holloron, sodic complex (155A), Overwhich loam (156A).

For the most part, loamy soils exist combined with coarser material such as sand and gravel. The finest soils present are soil types 130B and 135C, which make up a small percentage of the project area. According to information gleaned from well logs and soil type descriptions; there are no restrictive layers or bedrock.

The USDA-NRCS soil identification map of the area and other soils information is included in **Appendix A**.

Groundwater

Groundwater depths within the TEDD vary. Based on Ground Water Information Center (GWIC), higher groundwater levels are typically seen in Section 19 and 29 than in Section 20 and 32. A review of well logs in Section 19B, C & D indicates that typical depths to groundwater are in the range of 10 to 18 feet below the ground surface (BGS). The average depth to groundwater within the entire area of Section 19 is 22 feet. Well logs in Section 20C indicate that typical depths to groundwater are in the range of 12 to 30 feet BGS. The average depth to groundwater within the entire area of Section 20 is 34.50 feet. Well logs in Section 29 B & C indicate that typical depths to groundwater are in the range of 10 to 20 feet BGS. The average depth to groundwater within the entire area of Section 29 is 21.50 feet. Well logs in Section 32 indicate that typical depths to groundwater are in the range of 14 to 95 feet BGS. The average depth to groundwater within the entire area of Section 32 is 67 feet. Brief well log information can be found in **Appendix B**.

Since there are irrigation ditches in the vicinity, it is likely that the depth to groundwater varies during the irrigation season. Dewatering of pipeline trenches and structure foundations will

likely be required during construction due to the anticipated high ground water in the area. The general direction of groundwater flow underlying the area is pointed northwest towards the Bitterroot River. The river surface generally represents the governing "line sink" relative to groundwater levels and localized hydrogeology.

Surface Water

The Bitterroot River is the primary surface water body in the area and is located at the western fringe of Hamilton. Waters in this river are classified by MDEQ as "B-1" and are considered suitable for drinking after conventional treatment. Other suitable uses under this classification include bathing, swimming and aquatic recreation, growth and propagation of salmonid fishes and aquatic life, waterfowl and furbearer habitat, and agricultural and industrial water supply. Flows in the river vary primarily in response to rainfall and snowmelt from the surrounding mountains. In addition, flows in the river are regulated to a considerable extent by the Painted Rocks Reservoir, located on the West Fork of the Bitterroot River upstream of Conner, Montana. In addition to this base flow, three (3) other major tributary streams (Sleeping Child Creek, Skalkaho Creek, and Blodgett Creek) contribute substantial flows to the Bitterroot River near Hamilton.

Flows from the river and some of the primary tributary streams are diverted into irrigation ditches to support agricultural activities in the valley. There are three (3) irrigation ditches within the TEDD. The Hedge Ditch and the Republican Ditch begin at the Bitterroot River near the confluence of Sleeping Child Creek and meander in a northerly direction. The Hedge Ditch enters into the TEDD at the southern boundary. The Republican Ditch is on the border of the TEDD boundary in the eastern part of Section 19, T6N, R20W. Finally, the Daly Ditch company has irrigation laterals within the TEDD. The USGS topographic map does not display these clearly, however, the most prominent lateral runs in a northerly direction beginning in NW1/4 of Section 32 (southern part of TEDD) and meandering in a northwesterly direction past the gravel pit (west of the airport) and then meanders to the northeast. According to the aerial map, it appears that the lateral connects into the Gird Creek drainage just north of the TEDD.

Climate Information

Climatological information for Hamilton is summarized in **Table 2-1.** The information in this table was obtained from the Western Regional Climate Center (wrcc@dri.edu) and covers the period from 1895 to 2004. Average annual precipitation is 12.21 inches, which places Hamilton in the "semiarid" category. On an annual average basis, the average maximum temperature is 58.9°F and the average minimum temperature is 33.3°F.

Table 2.1.2-1 - LOCAL CLIMATOLOGICAL SUMMARY FOR HAMILTON, MONTANA (243885)
Period of Record Monthly Climate Summary
Period of Record : 6/1/1895 to 10/31/2004

Average	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Max. Temp. (F)	34.8	40.5	49.1	59.3	67.9	74.9	84.7	83.1	72.3	60.0	44.9	36.0	58.9
Min. Temp. (F)	16.6	20.2	26.4	32.9	39.7	45.9	50.5	48.9	41.6	33.4	24.8	18.6	33.3
Total Precip. (in.)	0.95	0.79	0.74	0.89	1.56	1.71	0.82	0.86	1.06	0.89	1.00	0.94	12.21
Total SnowFall (in.)	7.1	4.1	4.4	0.5	0.3	0.0	0.0	0.0	0.0	0.2	3.1	6.0	25.7
Snow Depth (in.)	2	2	1	0	0	0	0	0	0	0	1	1	1

Percent of possible observations for period of record. Max. Temp.: 89.6%, Min. Temp.: 89.6%, Precipitation: 90.5%, Snowfall: 36%, Snow Depth: 40.8%

Floodplains

According to FEMA's DFIRM 30081C0494D (1-16-2015), which was gathered from the FEMA website, the TEDD is located outside of the 100-year floodplain of the Bitterroot River. The FEMA floodplain map is located in **Appendix A**.

Vegetation and Wetlands

Most, if not all of the original native vegetation within the TEDD boundary has been replaced with cultivated varieties of trees, shrubs and grasses. Outside of the TEDD boundary, the land is a mix of developed urban and large amounts of pasture and hay fields, areas used for the production of graminoid crops (wheat, barley, oats, etc), and grasslands/herbaceous areas.

Wetlands are generally found within the floodplain of the Bitterroot River and immediately adjacent to area creeks, ponds and irrigation ditches. These wetlands are generally confined to the edges of these streams or in isolated pockets where groundwater levels are at or near the surface. According the National Wetland Inventory map, there are a few wetlands scattered throughout the TEDD.

The primary wetlands within the TEDD boundary are associated with the existing irrigation ditches. Disturbance to these ditches will be minimized during any construction in the TEDD boundary. Disturbance, if any is expected to be minimal and primarily limited to ditch crossings with utilities and roads.

2.1.3 Environmental Resources Present

Uniform Environmental Checklist

As part of this PER, information on the environmental resources present in the PER planning area/TEDD boundary were collected, and anticipated impacts to the resources due to the proposed project(s) were summarized in the *Uniform Environmental Checklist* (UEC). Included with the checklist was a narrative summary of the proposed project(s) which is further detailed in this PER. This information was then submitted to local, regional, state and federal agencies for comments on the project. A copy of the checklist with the accompanying narrative and agency comments received are included in **Appendix C**. This information is used in part to determine if any environmental resources will be impacted by the project. Potential impacts along with any mitigation measures, where pertinent, are discussed in the following.

Letters from the following agencies have still not been received: Montana Department of Environmental Quality, Montana Fish Wildlife and Parks, Montana Department of Natural Resources & Conservation, and from the US Department of Agriculture – Natural Resource Conservation Service. The Uniform Environmental Checklist will be completed upon receipt of responses from the above agencies.

Cultural Resources

According to the State Historic Preservation Office any structure over fifty (50) years old is considered historic. Construction of underground utilities such as water and sewer usually occur within rights-of-way or easements, which are in-place to allow for such construction. No structures are proposed to be altered as part of this project. Should any structures need to be altered, the State Historic Preservation Office shall be contacted to evaluate the significance of the structure. Prior to ground disturbance the SHPO should also be contacted to search their records for the areas being disturbed.

Fish, Wildlife and Endangered Species

The animal species of concern in Sections 19, 20, 29 & 32 of T06N, R20W from the *Montana Natural Heritage Program* database shows fourteen (14) species of concern. These species include the Great Blue Heron, Bald Eagle, Peregrine Falcon, Lewis's Woodpecker, Pileated

Woodpecker, Clarks Nutcracker, Bobolink, Westslope Cutthroat Trout, Bull Trout, Little Brown Myotis, Fringed Myotis, Skink, and Bat Roost. However, the US Fish and Wildlife Service believes project related adverse effects to threatened and endangered species in Ravalli County are unlikely.

Letters from the following agencies have still not been received: Montana Department of Environmental Quality, Montana Fish Wildlife and Parks, Montana Department of Natural Resources & Conservation, and from the US Department of Agriculture – Natural Resource Conservation Service. This section will be completed after responses are received from the above agencies

Land Resources

The principal agriculture activities conducted within the PER planning area are the raising and pasturing of livestock, primarily cattle and horses, and hay cropping on irrigated lands. It is the hope that portions of the agricultural area in the TEDD boundary will eventually become industrial businesses. For the time being, construction of underground utilities and infrastructure will not significantly impact the agricultural lands or uses.

Water Resources, Floodplains, and Wetlands

The improvements proposed will not adversely impact any surface waters, groundwater, floodplains or wetlands. All work will be conducted away from surface water, outside of the 100-year flood boundary and away from wetland areas. Construction inspection of the proposed improvements will assure that proper construction techniques and storm water management practices are followed.

Letters from the following agencies have still not been received: Montana Department of Environmental Quality, Montana Fish Wildlife and Parks, Montana Department of Natural Resources & Conservation, and from the US Department of Agriculture – Natural Resource Conservation Service. This section will be completed after responses are received from the above agencies

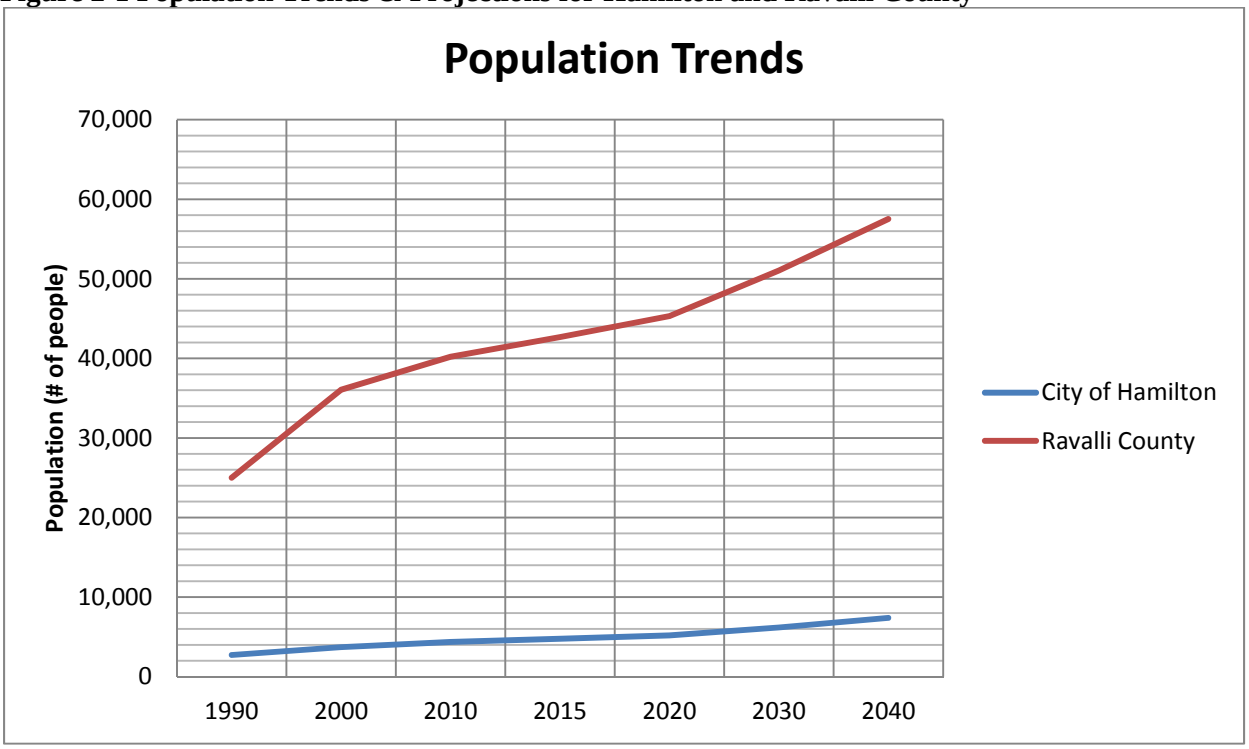
2.1.4 Growth Areas and Population Trends

In order to determine the population projections of the TEDD, a variety of methods were used. Since the TEDD is currently within Ravalli County and also adjacent to the City limits of Hamilton both entities were used as examples for population trends. The U.S. Census Bureau, USA.com, and the *Hamilton, MT Growth Policy* (2009) were used to help determine populations of previous years and observed trends. In addition, estimated land development was figured

based on a list of acceptable developments/businesses that can be established within the TEDD. Projections listed in this section using the methods described generate only an approximate idea of growth.

According to U.S. Census Bureau statistics, the City of Hamilton had an estimated population of 4,348 persons in 2010. The year 2000 census population was 3,705 and the year 1990 census population was 2,727. There was a 35.86 percent increase in population over the decade from 1990 to 2000. The next decade (2000 to 2010) slowed slightly to a 17.35 percent increase or 1.78 percent compounded annual growth. Ravalli County had an estimated population of 40,212 persons in 2010. The year 2000 census population was 36,070 and the year 1990 census population was 25,010. There was a 44.2 percent increase in population over the decade from 1990 to 2000. The next decade (2000 to 2010), similar to Hamilton's trend, dropped to an 11.48 percent increase or 1.20 percent compounded annual growth.

Figure 2-1 Population Trends & Projections for Hamilton and Ravalli County



The TEDD is anticipated to have a mixture of uses with various densities of building and employees per business. Based on discussions with Julie Foster at the Ravalli County Economic Development Authority, the following mix of business and workforce housing is expected in the TEDD over a 30-40 year planning period:

Table 2.1.4-1 Estimated Land Use, Business Development and Employment

Proposed Land Use	Area (Gross Acres)	Estimated New Businesses	Estimated Employees/ Business	Estimated Population
Commercial	21	20	8	160
Technology/Office	42	20	20	400
Lt. Industrial - Manufacturing	14	3	20	60
Lt. Industrial - Warehousing	14	3	5	15
Airport Improvements	36	18	4	72
Existing Land Use	141	-	-	75
Airport Improvements South of Tammany Ln.	108	0	0	0
Workforce Housing	44	80	2.5	200
TOTALS	**420**	64		**982**

1. Airport Improvements consist of a mixture of 80% hangars and 20% commercial facilities. Density is considered for people/net acre.
2. Proposed airport improvements (36 Acres) subtracted from airport land (177 Acres).
3. It is likely that the land south of Tammany Ln. was purchased for "approach protection" with FAA money. This area will remain agricultural unless a release is obtained from the FAA. Since the particular land use is unknown for this area a population of 0 people/gross acre was utilized for planning purposes.
4. Workforce housing units are limited to 35% of the jobs created within the TEDD. Based on the probable employment generated in the TEDD, and assuming some employees will not live in the TEDD, an estimate of 10% of the estimated employment in the TEDD is being used for housing at 2.5 persons/unit

The population in Table 2-2 is an estimate for a 30-40 year buildout based on local population and employment trends. Build out will likely occur over the next 30 to 40 years. It was assumed that the population of Hamilton and Ravalli County would continue to grow at the same rates from 2000 to 2010. Employment would continue to grow at 1% per year based on the 2015-2024 Employment Projections from the Montana Department of Labor and Industry, and the proportion of jobs in Hamilton would follow the population percentage in Hamilton vs. Ravalli County.

A large business moving into the TEDD may change these numbers drastically, but following local population and employment trends, the above number is most likely a realistic expectation for growth over the planning period.

2.1.5 **Community Engagement**

Multiple public hearings have been held on the TEDD and the associated Comprehensive Development Plan. Proof of advertisement, meeting minutes and copies of written or oral comments will be included in Appendix F.

2.2 Evaluate Condition of Existing Facilities

Limited water, sewer, road and dry utilities exist within the TEDD boundary. The primary concentration of utilities exists at the Ravalli County Airport. Based on past communication from Ravalli County Environmental Health the wastewater system at the airport is currently undersized and in need of expansion or replacement.

Although public water and sewer mains are located adjacent to the TEDD boundary, the conditions of connection to them have not been clearly identified by the City of Hamilton. Options for "Contract Water & Sewer" and annexation to the City of Hamilton have been explored, but no clear answer has been given on what the costs and requirements of these options would be. Some areas of the TEDD would be served easiest by adjacent water and sewer infrastructure. However, without the guaranteed ability to connect to these systems, other alternatives are being considered. At the time of development by the individual property owners, connection to the City of Hamilton should be reevaluated for the properties adjacent to City facilities, to determine the costs and requirements of connection compared the cost of the preferred alternatives in this report.

Adjacent Facilities

The "Old Corvallis Road Area III—Plan" was initiated as a neighborhood plan through an inter-local agreement between the City of Hamilton and Ravalli County. The plan was completed in 2006 and was adopted as an amendment to the County Growth Policy Plan but was not adopted by the City. Although the Plan has no legal authority, it demonstrates the nearly decade old knowledge of where growth is likely to flow. The plan included a mix of commercial development uses on both sides of Old Corvallis Road. The lift station required by the City to serve "Area III" received funding through the efforts and direct financial contribution of Ravalli County Economic Development Authority, Montana Department of Commerce and US Department of Commerce. Construction was completed in late 2009. To date, the Ravalli County Council on Aging and the Ravalli County Economic Development Authority are the only connections to the $585,000 lift station. Although requests for annexation have been made the city has declined. At some point in the future a connection to city services would make sense for the District.

2.2.1 **Schematic Layout**

Exhibits showing existing water, wastewater, power, gas, roadways, and communication infrastructure are located in **Appendix E**.

2.2.2 **History**

The Ravalli County Airport was constructed in 1934. According to Ravalli County, they are one of the busiest GA airports in the state because it is located near some of the best recreation areas in Western Montana and Idaho. A memo from former Ravalli County Environmental Health Director, Lea Guthrie, gives a good idea of the existing wastewater systems for the airport. "On record, there are 12 permitted holding tanks in addition to the engineered wastewater treatment system. All holding tanks permitted at the airport are required to be of a specific design to facilitate a connection to a community wastewater treatment system in the future and were designed to be temporary" (Guthrie, 2012). The 15-year-old engineered wastewater treatment system is an elevated sand mound (ESM) that provides treatment to four commercial facilities: the Hangar Café, USFS building, Northstar Aviation, and Mission Mountain Helicopters. Back in 1999, John Horat, with Bitterroot Engineering and Design, provided a preliminary sewer study for the airport. The report addressed collection and treatment alternatives and costs for the airport. To our knowledge the engineered wastewater treatment system was designed and built as a result of this report. Currently, this system is undersized and there is no existing policy for operation or maintenance of the system.

The existing water system, according to an Airport Board member, consists of 30 to 40 individual wells serving the hangars and commercial facilities. The locations of these wells were not established at the time of this report. These wells are supplying domestic use, but are most likely not supplying fire protection.

2.2.3 **Condition of Existing Facilities**

The current infrastructure in the TEDD boundary is deficient to support the current uses at the airport, let alone additional commercial or industrial development in the area. On August 5, 2015 the Ravalli County Commissioners approved a resolution declaring the land within the TEDD boundary as an infrastructure deficient area. **See Resolution 3267 (Appendix D)**

2.2.4 **Financial Status of Facilities**

The Interoffice Memo from Lea Guthrie mentions that there is no policy established for maintenance or replacement of the engineered wastewater system. In 2012 the Ravalli County Environmental Health Department recommended that the County establish a septic system

maintenance policy setting up users fees in order to repair, and eventually replace, the wastewater system. To our knowledge, this policy has not been created yet and thus no record is available for the financial status of the wastewater facility. The same goes for the existing water system(s) as well.

2.2.5 **Water/Energy/Waste Audits**

To our knowledge, there have been no water/energy/waste audits on the existing facilities at the time of this report.

2.3 **Describe and Document the Need for the Project and the Problems to be Solved**

2.3.1 **Health, Sanitation and Security**

It has been historically documented that the area within the TEDD boundary and specifically the Ravalli County Airport are in need of infrastructure improvements for water, sewer, roads and communications.
The engineered septic system at the airport is currently undersized, and the temporary holding tanks are not a viable long term solution. The high groundwater table combined with numerous shallow wells serving the businesses at the airport, including a restaurant, gives probable concern that future health and sanitation issues may arise at the airport.

The 2015 Ravalli County Resolution identifying and declaring the area an infrastructure deficient area also highlights this problem.

2.3.2 **Aging Infrastructure**

The minimal infrastructure that exists in the TEDD Boundary is limited in capacity and service life.

Water
Water infrastructure is limited to non-existent within the TEDD boundary. Although some portions of the TEDD are adjacent to City of Hamilton infrastructure, there has been no agreement to allow connection to City water. Water infrastructure is primarily limited to shallow private water wells.

Sewer
The engineered septic system that was installed for the airport in 1999 was designed for the needs of the airport at that time. The system is currently heavily overused due to growth at the airport, and sewer in limiting commercial development and expansion at the airport.

Roads

Transportation improvements in the area are needed. Additional roads serving the airport could mitigate or eliminate potential traffic and safety issues. Improved access would also benefit future industrial and commercial growth.

Utilities

The power and communication infrastructure in the TEDD boundary exists, but is dated. Improved power, phone and data infrastructure would provide a higher level of service and promote business and industrial expansion in the area.

2.3.3 **Reasonable Growth**

Any improvements in the area need to accommodate for reasonable growth. Ravalli County and the City of Hamilton have grown on an average of 1.2-1.78 percent compounded annual growth from 2000 to 2010. It is expected that growth in the TEDD will closely match the projected growth of Hamilton. The planning period for this project is 30 to 40 years for full build out.

3. ALTERNATIVES CONSIDERED

This section describes the alternatives considered for economical water and wastewater solutions for the TEDD.

3.1 Alternatives Screening Process

3.1.1 Water

3.1.1.1 No Action

Limited infrastructure exists within the TEDD. Ravalli County is interested in developing this property for technology, light industrial and commercial businesses. This cannot be accomplished if existing infrastructure is left in-place without modifications or additions. This alternative will not be considered in the Alternative Analysis in Section 3.2.

3.1.1.2 Individual Private Wells

Individual private wells allow for each business to provide their own water, remove costs associated with maintaining and operating a public distribution system, and reduce potential water rights issues associated with a large consolidated well field. Groundwater is readily available in the TEDD boundary and construction of individual wells should not be cost prohibitive. However, water rights complications may occur for businesses that require flows in excess of 35 GPM or an annual volume greater than 10 acre-ft (3,258,510 gallons) per year. Fire protection may also be an issue with individual private wells, but may be resolved by having dedicated fire protection wells in place. This alternative will be considered in the Alternative Analysis in Section 3.2.

3.1.1.3 Multiple Small Public Water Systems

Multiple well fields are also a common approach to supplying water to small communities. The elements discussed in the "Individual Private Wells" and "Single Well Field" sections apply to this section too. This alternative will be considered in the Alternative Analysis in Section 3.2.

3.1.1.4 Single Public Water System

A single well field is common for supplying water to small communities. This alternative consists of several drilled wells manifolded together in a well house. The well house will enclose water system components such as pump/electrical controls, chemical treatment systems,

specialized valves, and sampling locations. An office for the water system operator will also be included within the well house. To prevent operation failure during power outages, a back-up generator will be installed outside of the well house. To prevent unauthorized visitors and vandalism, a security fence will be installed around the well field and well house. Additional requirements based on the size of the TEDD, the additional costs associated with a single well field would include items such as water rights, distribution system piping and finished water storage. This alternative will be considered in the Alternative Analysis in Section 3.2.

3.1.1.5 Connect to City of Hamilton Water System – Annex

From meetings with RCEDA, the Ravalli County Commissioners and the City of Hamilton, annexation does not appear to be a viable option. Annexation of the TEDD or a portion of the TEDD into the City of Hamilton would remove it from the County TEDD. This alternative will not be considered in the Alternative Analysis in Section 3.2.

3.1.1.6 Connect to City of Hamilton Water System – Contract Services

The option of connection to the City of Hamilton water system under contract services would be good option to serve part or all of the TEDD. However, through discussions with the City of Hamilton, there does not appear to be an interest on the part of the City in providing contract water service without annexation. This alternative will not be considered in the Alternative Analysis in Section 3.2. However, if contract services from the City of Hamilton become available in the future this option should be investigated further.

3.1.1.7 Upgrade Existing Infrastructure

Existing water infrastructure within the TEDD is only located at the Ravalli County Airport. The age, condition, and capacity of the individual wells, pumps, pipe, and other fixtures are unknown. Existing private wells may be adequate to serve their current purpose, but expansion of the existing private wells to serve additional businesses in unlikely. This alternative will not be considered in the Alternative Analysis in Section 3.2.

3.1.1.8 Surface Water

There are a few bodies of surface water located within the TEDD. Several irrigation ditches and a large pond near the western boundary. Other viable surface water bodies are located outside the TEDD. The Corvallis Canal (irrigation) just north of the western boundary and the Bitterroot River located about half a mile from the western boundary. An expensive treatment plant, the potential to destroy the aesthetic nature of the present surface waters, and the potential to wreak

havoc on the existing network of irrigation and irrigators is cause for not considering this alternative in the Alternative Analysis in Section 3.2.

3.1.2 **Wastewater**

3.1.2.1 No Action

There is limited infrastructure that exists within the TEDD. Ravalli County is interested in developing this property for technology, light industrial and commercial businesses. This cannot be accomplished if existing infrastructure is left in-place without modifications or additions. This alternative will not be considered in the Alternative Analysis in Section 3.2.

3.1.2.2 Individual Subsurface Wastewater Treatment Systems

Individual septic systems could be installed for each new business. However, Montana Department of Environmental Quality requires that commercial subsurface wastewater treatment systems require a 500-foot mixing zone. These mixing zones may not cross existing or proposed wells, and in Ravalli County, may not cross property lines without a mixing zone easement from adjacent property owners. Due to the fact that portions of the TEDD are known to have high groundwater, this option may also make some portions of the TEDD ineligible for development if the groundwater table is less than 48-inches from the ground surface. Based on these concerns this alternative will not be considered in the Alternative Analysis in Section 3.2.

3.1.2.2.1 Elevated Sand Mounds

An elevated sand mound is the typical wastewater treatment system when located in areas where groundwater levels are between 48 inches and 60 inches below the ground surface. These systems can be used for almost any size drainfield. Since high ground water is likely to be encountered in areas of the TEDD this alternative will be considered in the Alternative Analysis in Section 3.2.

3.1.2.2.2 Recirculating Media Trickling Filter Systems

Circular DEQ 4 – *Montana Standards for Subsurface Wastewater Treatment Systems* – identifies these systems as advanced treatment systems which discharge a total nitrogen effluent concentration of 24 mg/L or less, which allows a reduction in drain-field area.

3.1.2.2.2.1 Eliminite

The Eliminite system utilizes MetaRocks® as their treatment media. "MetaRocks® are the patented, proprietary biological treatment media found exclusively in Eliminite Advanced Wastewater Treatment Systems. Coated with a custom blend of sand and crushed recycled glass, MetaRocks® contoured, hydrophilic surface promotes the controlled, uniform microorganism growth which optimizes the advanced treatment process" (Eliminite website). This treatment system has the same treatment results as Advantex, but it is cheaper and has a smaller footprint. This alternative will be considered in the Alternative Analysis in Section 3.2.

3.1.2.2.2.2 Advantex

The Advantex system utilizes an engineered textile media during its treatment process. These are located in separate pods installed next to the septic and dosing/recirculating tanks. This is a good product, but more expensive than the Eliminite system. For financial reasons this alternative will not be considered in the Alternative Analysis in Section 3.2.

3.1.2.3 Single Public Subsurface Wastewater Treatment System

Subsurface wastewater systems are commonly used for multi-user and public wastewater systems for residences and businesses. There are a variety of systems available. To maximize space and properly treat wastewater in areas of high ground water, we have proposed using a combination of elevated sand mounds and recirculating media tricking filters, preliminary calculations show that it will be hard to meet nondegradation limits using conventional treatment. Two recirculating media tricking filter alternatives are the Eliminite System and the Advantex System. These will be discussed below. Based on land available and preliminary nondegradation calculations, it will be hard to meet nondegradation requirements for nitrate using the standard 500-foot mixing zone utilizing a single public septic system and Level 2 advanced treatment (reduction of total nitrogen in effluent to <24 mg/L). However, the harder nondegradation requirement to meet would be the 50 year phosphorus breakthrough limit. Based on the likelihood of not passing nondegradation requirements, this alternative will not be considered in the Alternative Analysis in Section 3.2.

3.1.2.4 Multiple Small Public Subsurface Wastewater Treatment Systems

Clustered subsurface wastewater systems are also commonly used for multi-user and public wastewater systems for residences and businesses. The elements discussed in the "Single Multi-user/Public Septic System" section apply to this section too. This alternative will be considered in the Alternative Analysis in Section 3.2.

3.1.2.5 Public Wastewater Treatment Facility

Other systems of wastewater treatment are available that provide higher levels of nutrient removal and more complete treatment. Some of these systems reduce nitrogen and phosphorus enough that they have reduced requirements for calculating non-degradation to groundwater and some are suitable for discharge to surface water or land application of effluent. The systems below may be used individually or in series with another treatment system.

Based on operational characteristics most of these systems require wastewater flows of at least 5,000 gallons per day and some require a part/full time operator. These systems are generally more expensive to operate. In general the larger these systems get the cheaper they are to operate on a gallons per day basis. These systems will be discussed below.

3.1.2.5.1 Sequencing Batch Reactor (SBR)

A sequencing batch reactor (SBR) is an activated sludge wastewater treatment system that uses oxygen to reduce organic matter present in the wastewater. The primary purpose of a sequencing batch reactor is the removal of nitrogen and phosphorus from the wastewater stream utilizing a biological nutrient removal system. SBRs have a rather large footprint and require a trained operator and are not easily scalable. Additionally, SBRs usually require filtration prior to discharge of effluent which adds additional cost. (Phone call with Craig Caprara at HDR) Based on the high cost, additional treatment requirements and lack of scalability this option will not be considered in the Alternative Analysis in Section 3.2.

3.1.2.5.2 Membrane BioReactor (MBR)

A membrane bioreactor (MBR) is a combination wastewater treatment system that combines a suspended growth bioreactor with microfiltration or ultrafiltration to produce high quality effluent that is suitable for discharge to surface or groundwater or can be utilized for irrigation. These systems are technologically advanced and require a high initial investment compared to other systems. These systems also require a part/full time operator. HDR has a DEQ approved Activated Sludge/Biological Nutrient Removal/Membrane Filtration system. This system reduces total effluent nitrogen to <7.5 mg/L, and requires no nitrate mixing zone for discharge to groundwater. MBR systems are easily scalable, however based on conversations with Craig Caprara at HDR the economic threshold is around 400 homes or 100,000 gallons per day (GPD) of wastewater flow. Based on calculations at full build out the final estimated wastewater flow is under the 100,000 GPD economic threshold. Based on economic considerations, this alternative will not be considered in the Alternative Analysis in Section 3.2.

3.1.2.5.3 SepticNET

SepticNET is a Montana designed system that uses aerobic treatment (nitrification), clarification, denitrification and settling to treat wastewater from a single family home to small community systems. The SepticNET system uses a traditional septic tank for primary treatment. This system treats wastewater to a level that the effluent has a total nitrogen concentration of <7.5 mg/L and requires no nitrate mixing zone for discharge to groundwater. These systems are very expensive, with a 5,000 gallon per day system costing over $170,000. Based on the high cost of these systems, this alternative will not be considered in the Alternative Analysis in Section 3.2.

3.1.2.5.4 Wetland Treatment

Wetland treatment of wastewater in Montana is still in the experimental phase. At this point it is not a viable primary treatment option, but can be utilized to provide final clarification prior to groundwater or surface water discharge to reduce total nitrogen, phosphorus and organic compounds. Based on its experimental nature, this alternative will not be considered in the Alternative Analysis in Section 3.2.

3.1.2.5.5 Lagoon with Land Application

Lagoons with land application or discharge to groundwater have historically been the standard for small community wastewater treatment systems in Montana. These systems are simple to operate and maintain and have many advantages compared to subsurface wastewater treatment. However, these systems require a large land area and a collection system to bring all wastewater to a central location. Lagoons are very effective at removal of pathogens from the wastewater with proper detention times. Combined with land application a lagoon system could be an effective way to provide wastewater treatment to the TEDD. This alternative will be considered in the Alternative Analysis in Section 3.2.

3.1.2.6 Connect to City of Hamilton Wastewater System – Annex

From meetings with RCEDA, the Ravalli County Commissioners and the City of Hamilton, this does not appear to be a viable option. Annexation of the TEDD or a portion of the TEDD into the City of Hamilton would remove it from the County TEDD. This alternative will not be considered in the Alternative Analysis in Section 3.2.

3.1.2.7 Connect to City of Hamilton Wastewater System – Contract Services

The option of connection to the City of Hamilton wastewater system under contract services would be good option to serve part or all of the TEDD. However, through discussions with the

City of Hamilton, there does not appear to be an interest on the part of the City in providing contract water service without annexation. This alternative will not be considered in the Alternative Analysis in Section 3.2. However, if contract services from the City of Hamilton become available in the future this option should be investigated further.

The "Old Corvallis Road Area III—Plan" was initiated as a neighborhood plan through an inter-local agreement between the City of Hamilton and Ravalli County. The plan was completed in 2006 and was adopted as an amendment to the County Growth Policy Plan but was not adopted by the City. Although the Plan has no legal authority, it demonstrates the nearly decade old knowledge of where growth is likely to flow. The plan included a mix of commercial development uses on both sides of Old Corvallis Road. The lift station required by the City to serve "Area III" received funding through the efforts and direct financial contribution of Ravalli County Economic Development Authority, Montana Department of Commerce and US Department of Commerce. Construction was completed in late 2009. To date, the Ravalli County Council on Aging and the Ravalli County Economic Development Authority are the only connections to the $585,000 lift station. Although requests for annexation have been made the city has declined. At some point in the future a connection to city services would make sense for the District.

3.1.2.8 Upgrade Existing Infrastructure

Based on research of the existing water and wastewater systems that exist in the TEDD, total replacement with new water and wastewater systems is preferred over upgrading the existing undersized wastewater treatment system at the airport or trying to upgrade the existing private wells to serve additional businesses. This alternative will not be considered in the Alternative Analysis in Section 3.2.

3.1.3 Transportation Improvements

Since minimal road improvements exist within the TEDD, internal roads will not be addressed in this report. Internal roads will be developed as each landowner develops their property, as business type and lot size will have a major impact on internal road layout.

The primary concern raised during development of the TEDD has been the intersections of Fairgrounds Road and Eastside Highway as well as the entrance to the Ravalli County Airport. These intersections have been identified as dangerous and in need of mitigation for further development of the airport and TEDD.

From discussions with Shane Stack at the Montana Department of Transportation (MDT), improvements could range from installing active warning signs and sensors alerting traffic on

Eastside Highway that someone has pulled onto the road from Fairgrounds Road or the Airport, to a traffic signal at the intersection, to road relocation. Based on the currently unknown impacts to the intersections at Fairgrounds Road and Eastside Highway and the airport entrance, the above listed options will not be evaluated at this time. As the TEDD is developed the possibility of incorporating a road relocation of the two intersections in question is highly likely and all options will be explored at that time with the input of the City of Hamilton, Ravalli County, MDT and adjacent landowners.

3.1.4 **Power, Natural Gas and Communications**

Existing dry utilities in the TEDD are insufficient to meet the needs at full build out capacity. A map showing the existing dry utilities is included in **Appendix A**. These utilities are all specific to the needs of each individual business. Underground power, natural gas and communications are usually installed after a development plan is generated for the property, but prior to the installation of hardscaping. By the time of development, there is usually a more accurate estimate of what needs to be installed. Seeing as the overall development of the TEDD is still in its preliminary phase, the installation of electric, gas and communications infrastructure is premature at this point, although it should be known that improvements and extensions will be needed in the future.

3.2 Alternative Analysis

3.2.1 **Water System**

From the alternative screening process, three alternatives were identified for further investigation. These alternatives are: Individual Private Wells, Multiple Small Public Water Systems, and a Single Public Water System. The details of each of these options will be described in the following sections.

3.2.2 **Individual Private Wells**

A. Description

The individual private well option provides a simple approach to serve water to new and existing businesses in the TEDD. Individual wells allow each business to be in control of how much water they need and the cost associated with their water system operation. Due to the large size of the TEDD district and uncertainty about water demands for potential incoming businesses, this option provides flexibility for new businesses.

Wells exempt from a Beneficial Water Use Permit may be drilled that do not exceed 10 acre-feet of water per year at a flowrate not to exceed 35 gallons per minute (GPM), with some

limitations. Flows in excess of the 35 GPM allowed for an exempt well would need to apply for a water right from the Montana Department of Natural Resources and Conservation (DNRC). With the Bitterroot basin currently classified as a closed groundwater basin, this process would most likely require existing irrigation and/or stock water rights to be transferred as mitigation for the new groundwater rights.

Fire flow for hydrants or fire suppression systems would have to be designed on an individual basis, or could be accomplished through dedicated fire suppression wells or individual storage tanks and booster pumps.

B. Design Criteria

Individual wells would be located as each landowner prepares to divide or develop their property, and would be located as part of the subdivision process with DEQ. It is assumed that the lot sizes would be adequate to provide adequate well spacing. Well construction and design would be dependent on the business and structure that was built on each lot and their individual water demand. If more than 25 persons were served for more than 60 days of the year, the system must be built in accordance with Montana DEQ public water standards (DEQ Circular 1&3)

From the Montana Bureau of Mines Ground Water Information Center records, in the four sections that encompass the TEDD the average well depth is 106.27 feet with an average static water level of 47.65 feet and an average pump test yield of 42.22 gallons per minute.

The DNRC combined appropriation rule may require that a beneficial use permit be obtained, if more than 10 acre-fee and 35 gallons per minute is required for each subdivision. Since the Bitterroot is currently a closed basin, this would require mitigation by transfer of irrigation or stock water rights. However, the DNRC rules regarding combined appropriation are currently being revised and may change many times during the build out of the TEDD.

C. Map

Individual wells would be located as businesses and homes were developed in the TEDD. Wells would need to be laid out for DEQ subdivision review as each parcel was developed. No map is included for this option.

D. Environmental Impacts

This option would have minimal impact on the environment. Smaller wells spread throughout the TEDD would have less concentrated impact on the Bitterroot aquifer and would minimize

impacts to surrounding wells. However, additional energy and construction disturbance would be required to drill the large number of wells required to serve the TEDD.

E. Land Requirements

Source

100-foot radius well protection zone would be required around each well. It is assumed that the commercial lots to be developed in this area would have adequate room to provide this well protection zone.

Storage

Storage may be required for fire protection, but most small systems can easily be accommodated with hydropneumatic storage tanks for domestic and irrigation use.

Distribution

The distribution system for this option would be minimal. A well service line connecting each business to their well would be required.

F. Potential Construction Problems

No construction problems are foreseen with this option.

G. Sustainability Considerations

i. Water and Energy Efficiency

This option would not be the most efficient use of water or energy. Unmetered individual systems do not promote water conservation, and the additional energy required to drill the large number of individual wells would be greater than other options.

H. Cost Estimates

Based on the average drilling depth for the TEDD, the average cost per well is shown below. Engineering is not included since the engineering costs associated with individual wells would be covered under the subdivision of land within the TEDD.

Table 3.2.2-1 Individual Private Well Cost Estimate

Individual Private Wells					
ITEM	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT COST	TOTAL
1	Mobilization/Demobilization	1	LS	$500.00	$ 500.00
2	Payment and Performance Bonds	1	LS	$500.00	$ 500.00
3	6" Domestic Well Drilled to Public Water Standards	120	FT	$35.00	$ 4,200.00
4	1-2 HP well pump and electrical	1	LS	$2,000.00	$ 2,000.00
5	1" HDPE Well Serive Line to Building	150	LF	$35.00	$ 5,250.00
SUBTOTAL CONSTRUCTION COST				**$**	**12,450.00**
	10% Contingency			**$**	**1,245.00**
	Individual Well Cost			**$**	**13,695.00**
	Total Individual Wells				**144**
	Total Project Cost			**$**	**1,972,080.00**

These costs would be expended by the constructing building owner over time. These costs do not include costs associated with production, storage and pumping of fire suppression system water, which would add additional costs to this option. Operation and maintenance costs for exempt wells would consist primarily of the electrical costs to run the well pump and periodic maintenance including well pump replacement, pressure tank replacement and pump starter relay replacement.

Table 3.2.2-2 Annual Operation and Maintenance Cost

Description	Quantity	Unit	Unit Cost	Total
Electric Power	2326.9	kW-hr	$ 0.12	$ 279.23
Short Lived Assets	1	LS	$ 92.50	$ 92.50
Annual Operation and Maintenance Costs				$ 371.73
Inflation Rate	3%			
Present Worth (40 Years each well)				**$8,592.41**
Total for 144 Individual Wells				**$1,237,306.75**

The present O&M cost would be approximately $30.98 per month per well.

3.2.3 **Multiple Small Public Water Systems**

A. Description

A multi-user water system would consist of small decentralized water system serving water to each area of potential development within the TEDD. This setup would allow small public water systems to be developed as an area of the TEDD was ready to be constructed. Small water systems would minimize the construction of an expansive distribution system covering areas that may have little development.

These systems could be designed to handle moderate fire flow or to pressure fire suppression systems in the buildings. Distribution systems would be limited to a cluster of buildings in one area. Provisions could be made for connection of each clustered system in the future to provide redundancy, additional capacity, or connection to another public water system, such as the City of Hamilton.

B. Design Criteria

The small water systems would need to be designed in accordance with Montana DEQ Circular-1&3. As part of the design the source, treatment, storage, pumping and distribution would all need to be addressed. Estimated water demand for the TEDD is outlined below:

Table 3.2.3-1 Estimated Water Demand

Proposed Land Use	Area (Gross Acres)	Estimated New Businesses	Estimated Employees/ Business	Estimated Population	Estimated water demand (GPD) (Hamilton)	Peak water demand (GPD) (1.95 PF)
Commercial	21	20	8	160	15,360	29,952
Technology/Office	42	20	20	400	38,400	74,880
Lt. Industrial - Manufacturing	14	3	20	60	5,760	11,232
Lt. Industrial - Warehousing	14	3	5	15	1,440	2,808
Airport Improvements	36	18	4	72	6,912	13,478
Existing Land Use	141	-	-	75	7,200	14,040
Airport Improvements South of Tammany Ln.	108	0	0	0	-	-
Workforce Housing	44	80	2.5	200	31,200	60,840
TOTALS	**420**	144		**982**	**106,272**	**207,230**

Water demand was estimated from the 2010 Hamilton Water Facility Plan, which estimated Commercial water use at 96 gallons per day per capita and residential water demand at 156 gallons per day per capita. Multi-user systems water could be divided into three separate areas; the airport, Eastside Highway Area, and Old Corvallis Road Area. If water demand was distributed equally through these three zones, each system would need to be capable of

delivering approximately 35,424 gallons per day of water on an average day and 69,077 gallons per day for peak day.

Based on DEQ Circular-1 Section 3.2.1.1, the total developed groundwater source capacity must be able to exceed the design maximum day demand with the largest well out of service. The peak day demand based on the numbers above is 72 gallons per minute based on a 16-hour pumping day. This would require two wells at 72 gallons per minute or three wells at 36 gallons per minute, and so on.

Systems of this size could be designed using hydropneumatic storage to meet peak instantaneous demands. Using the Uniform Plumbing Code method for sizing water supply systems, a 144 gpm system would be capable of supporting up to approximately 625 fixture units. Assuming an average fixture count of 10-15, a system of this size would be capable of supporting approximately 41 to 62 structures.

Fire suppression could be supported by fire suppression systems installed in each building, or by providing fire storage for each water system. The Hamilton Fire Chief has been contacted to give a desired fire flow for the TEDD, with the estimated uses in Table 2.1.4-1.

The distribution system for these small water systems would be concentrated in each area. The distribution system would need to be designed and constructed in accordance with Montana Department of Environmental Quality Circular DEQ-1. Clustered distribution systems would minimize distribution construction costs, while providing a means for expansion of the system or connection to another public water system in the future, such as City of Hamilton.

C. Map

Please see the attached proposed multi-user water system map.

D. Environmental Impacts

Environmental impacts from clustered multi-user water systems would be minimal. Smaller wells spread throughout the TEDD would have less concentrated impact on the Bitterroot aquifer and would minimize impacts to surrounding wells. Fewer wells drilled would cause less environmental impact than individual wells.

E. Land Requirements

Public wells require a 100-foot radius well protection zone that should be protected through ownership or easement. A small section of land would be required for each clustered development, which would include the wells, well protection zones and well house. If required, storage for fire suppression could also be located at this site. A two to five acre site should be adequate to provide sufficient well spacing and keep well protection zones on the property.

F. Potential Construction Problems

No construction problems are anticipated with this option.

G. Sustainability Considerations

i. Water and Energy Efficiency

Clustered systems would minimize distribution system size and construction cost. Variable speed, constant pressure pumping systems could be utilized to minimize energy costs and provide more consistent pressure to each water system.

H. Cost Estimates

Table 3.2.3-2 Small Public Water System Cost Estimate

MULTIPLE SMALL PUBLIC WATER SYSTEMS					
ITEM	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT COST	TOTAL
1	Mobilization/Demobilization	1	LS	$25,000.00	$ 25,000.00
2	Traffic Control	1	LS	$1,200.00	$ 1,200.00
3	Payment and Performance Bonds	1	LS	$850.00	$ 850.00
4	8" Public Water Supply Well (120 feet deep - 75 GPM)	2	EA	$30,000.00	$ 60,000.00
5	Well House (Building, Plumbing & Electrical)	1	LS	$125,000.00	$ 125,000.00
6	Construction Dewatering	1	LS	$10,000.00	$ 10,000.00
7	8" Water Distribution System (Pipe, Valves & Fittings)	2000	LF	$100.00	$ 200,000.00
8	10,000 Gallon Fire Storage Tank	1	LS	$30,000.00	$ 30,000.00
9	Fire Hydrant	1	EA	$3,500.00	$ 3,500.00
10	Beneficial Water Use Permit - Application &Approval	1	LS	$30,000.00	$ 30,000.00
SUBTOTAL CONSTRUCTION COST EACH SYSTEM				**$**	**485,550.00**
SUBTOTAL CONSTRUCTION COST (3 SYSTEMS)				**$**	**1,456,650.00**
	10% Contingency			**$**	**145,665.00**
	Engineering, Surveying, Construction Inspection			**$**	**320,463.00**
	Total Project Cost			**$**	**1,922,778.00**

These costs would be expended by the developers within the TEDD over time. Operation and maintenance costs for this option would consist of monthly operation costs, electrical costs to run the well pumps and periodic maintenance including well pump replacement, pressure tank replacement and pump starter relay replacement.

Table 3.2.3-3 Small Public Water System Operation and Maintenance Costs

Description	Quantity	Unit	Unit Cost	Total
Electric Power	14067	kW-hr	$ 0.12	$ 1,688.04
Water Operator	12	Month	$ 500.00	$ 6,000.00
Short Lived Assets	1	LS	$ 410.00	$ 410.00
Annual Operation and Maintenance Costs				$ 8,098.04
Inflation Rate	3%			
Present Worth (40 Years)				**$187,184.35**
Total (3 Water Systems)				**$561,553.04**

The present O&M cost would be approximately $14.06 per month per business in the TEDD assuming a build out of 144 businesses.

3.2.4 **Single Public Water System**

A. Description

A single well field source would provide the best service and economy of scale to serve the TEDD. However factors such as water rights, finished water storage, distribution system size and operation and maintenance, may make this option financially unfeasible. A number of wells located at a consolidated well field and manifolded together into a common well house could provide adequate water for the users of the TEDD.

This option also provides a means for future connection to the City of Hamilton if the area is ever annexed into the city.

B. Design Criteria

A single well field would need to be designed in accordance with Montana DEQ Circular-1. As part of the design the source, treatment, storage, pumping and distribution would all need to be addressed. Based on the estimated 40-year build out population of 982 for the TEDD, an average of approximately 106,272 gallons per day of water would be required to meet average day commercial demand (based on the 2010 City of Hamilton Water Facility Plan Estimated Water Demand). Using the peak day peaking factor from the City of Hamilton 2010 water facility plan, the estimated peak day demand would be approximately 207,230 gallons per day.

Based on DEQ Circular-1 Section 3.2.1.1, the total developed groundwater source capacity must be able to exceed the design maximum day demand with the largest well out of service. The peak day demand based on the numbers above is 216 gallons per minute based on a 16-hour pumping day. This would require two wells at 216 gallons per minute or three wells at 108 gallons per minute, and so on.

Storage for this alternative will need to meet the requirements of DEQ Circular-1 Section 7.0.1.a., which requires that storage be equal to the average day demand plus fire flow. Based on the commercial nature of this project it is assumed that the fire flow requirements will be approximately 2,500 gallons per minute for a 2-hour fire event, for a total of 300,000 gallons. Adding the average day demand at build out a total of 406,272 gallons of storage could be required.

Storage size could be reduced if additional source capacity was developed and a storage sizing analysis was completed. However, based on the difficulty of obtaining a groundwater right with the current basin closure in the Bitterroot, a smaller source with larger storage capacity may ultimately be easier to permit and complete.

C. Map

Please see the attached proposed water system map.

D. Environmental Impacts

Effects on the aquifer from concentrated groundwater removal would be the primary environmental impact of this option. However, the aquifer in the greater Hamilton area is prolific and should be able to sustain the additional withdrawal of groundwater with mitigation from the abandonment of existing irrigation and/or stock water rights.

Construction of the well field, pump house, storage facility and distribution system will cause temporary dust, disturbance and possibly increased storm water runoff, which will be mitigated through proper construction techniques, storm water management during construction and proper equipment maintenance.

E. Land Requirements

Source

Public wells require a 100-foot radius well protection zone that should be protected through ownership or easement. A consolidated well field for this option could be constructed on as little

three to five acres, depending on the lithology of the aquifer. A setback of at least 100 feet from property lines should be maintained by the wells within the consolidated well field.

Storage

The storage capacity for this system could be easily accommodated at the well field. Maximum tank radius would be less than 100 feet. Locating the storage tank at the well field would minimize pumping costs from the wells to the storage tank.

Distribution

Distribution system installation would occur within public utility easements within the TEDD. These easements would be identified and created during the preliminary design phase of the distribution system.

F. Potential Construction Problems

Areas of the TEDD have been identified as having high groundwater, less than 48-inches below the ground surface. Construction dewatering would be a significant expense during construction of the distribution system.

Areas of fine sand are known to occur in the Bitterroot aquifer. Fine sand in the aquifer could lead to additional well development expenses or additional treatment requirements for higher capacity wells.

Construction of the distribution system in high groundwater would also require dewatering during construction.

G. Sustainability Considerations

i. Water and Energy Efficiency

Due to consistent grade changes across the TEDD, pumping will most likely be required to meet pressure requirements for the upper portion of the TEDD. Locating the well field and storage facility at the upper end of the distribution system will minimize pumping energy and allow for gravity service for the lower portion of the TEDD.

H. Cost Estimates

Table 3.2.4-1 Single Public Water System Cost Estimate

Single Public Water System					
ITEM	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT COST	TOTAL
1	Mobilization/Demobilization	1	LS	$75,000.00	$ 75,000.00
2	Traffic Control	1	LS	$2,200.00	$ 2,200.00
3	Payment and Performance Bonds	1	LS	$850.00	$ 850.00
4	10" Production Well (120 Feet Each - 216 GPM)	2	EA	$36,000.00	$ 72,000.00
5	Well House Complete	900	SF	$300.00	$ 270,000.00
6	Storage Tank	400000	Gal	$2.00	$ 800,000.00
7	8" Distribution System Piping & Valves	7000	LF	$100.00	$ 700,000.00
8	Construction Dewatering	1	LS	$30,000.00	$ 30,000.00
9	Booster Station	1	EA	$80,000.00	$ 80,000.00
10	Bore under Eastside Highway	100	LF	$500.00	$ 50,000.00
11	Water Treatment (Chlorine and Orthophosphate)	1	LS	$25,000.00	$ 25,000.00
12	Backup Generator	1	LS	$45,000.00	$ 45,000.00
13	Fire Hydrants	12	EA	$3,750.00	$ 45,000.00
14	Benefical Water Use Permit (Application to Approval)	1	LS	$60,000.00	$ 60,000.00
SUBTOTAL CONSTRUCTION COST				**$**	**2,255,050.00**
	10% Contingency			**$**	**225,505.00**
	Engineering, Surveying, Construction Inspection			**$**	**496,111.00**
	Total Project Cost			**$**	**2,976,666.00**

Table 3.2.4-2 Single Public Water System Operation & Maintenance

Description	Quantity	Unit	Unit Cost	Total
Electric Power	28134	kW-hr	$ 0.12	$ 3,376.08
Water Operator	12	Month	$ 1,500.00	$ 18,000.00
Water Treatment Chemicals	12	Month	$ 260.00	$ 3,120.00
Short Lived Assets	1	LS	$ 2,980.00	$ 2,980.00
Annual Operation and Maintenance Costs				$ 27,476.08
Inflation Rate	3%			
Present Worth (40 Years)				**$635,103.32**

The present O&M cost would be approximately $15.83 per month per business assuming a full build out of 144 businesses.

3.2.5 **Wastewater Treatment System**

From the alternative screening process, two wastewater treatment alternatives were identified for further evaluation. The two wastewater treatment options that will be evaluated are: Multiple Small Public Subsurface Wastewater Treatment Systems and A Public Wastewater Treatment Facility utilizing wastewater treatment ponds.

3.2.6 **Multiple Small Public Subsurface Wastewater Treatment Systems**

A. Description

Clustered wastewater system will be developed in the same method as the clustered multi-user water systems. Clustered systems will allow for an optimal location to be selected for the wastewater treatment system and drainfields, and will minimize the conflict between water and wastewater systems.

Once an area is identified as suitable for a waste water treatment system, land can be reserved to provide adequate area to serve the expected uses. These systems can be designed and constructed to be easily expandable and handle a range of wastewater flows. Small systems would help minimize upfront costs and provide higher quality wastewater treatment from the first business built to full build out. Different treatment options may also be used depending on the wastewater characteristics for each system, soil condition and groundwater level.

The clustered system could include any of the following systems:

- Pressure Dosed Septic System
- Elevated Sand Mound
- Advanced Treatment System (Total nitrogen effluent concentration of 24 mg/L or less)
    - Recirculating Media Trickling Filter System
- Advanced Treatment Nitrate Reducing System (Total nitrogen effluent concentration of 7.5 mg/L or less)
    - SepticNet (will be covered under Public Subsurface Wastewater Treatment System)

The wastewater systems will be divided to cover three areas, the airport, Eastside Highway, and Old Corvallis Road. The collection system for each system would be concentrated in each area. The collection system would need to be designed and constructed in accordance with Montana Department of Environmental Quality Circular DEQ-2. Clustered collection systems would minimize construction costs, while providing a means for expansion of the system or connection to another public water system in the future, such as City of Hamilton.

B. Design Criteria

Design for these systems will be covered under Montana Department of Environmental Quality Circular 2&4. Factors such as design flow, soil type, and depth to groundwater will be the primary drivers of final design. For preliminary purposes we will assume that each system is divided similar to the clustered water system option previously mentioned in this report.

Table 3.2.6-1 Estimated Wastewater Flow

Proposed Land Use	Area (Gross Acres)	Estimated New Businesses	Estimated Employees per Business	Estimated Population	Estimated Wastewater Demand (GPD/PERSON)	Estimated Wastewater Flow (GPD)
Commercial	21	20	8	160	13	2,080
Technology/Office	42	20	20	400	13	5,200
Lt. Industrial - Manufacturing	14	3	20	60	13	780
Lt. Industrial - Warehousing	14	3	5	15	13	195
Airport Improvements	36	18	4	72	13	936
Existing Land Use	141	-	-	75	13	975
Airport Improvements South of Tammany Ln. [3]	108	0	0	0	13	-
Workforce Housing[4]	44	80	2.5	200	100	20,000
TOTALS	**420**			**982**		**30,166**

Assuming that these flows are divided equally between the three areas of the TEDD, a wastewater system capable of handling 10,055 gallons per day of wastewater would need to be designed for each clustered unit.

The best way to handle this would be to phase the wastewater systems in increments of 2,000 to 5,000 gallons per day. The final phasing would be dependent on what businesses moved into each area and the overall flow required in each area. For preliminary sizing an application rate of 0.5 gpd/ft^2 will be used based off of soils found in the area. For a 10,055 gallon per day system and an application rate of 0.5 gpd/ft^2, the required drainfield area would be as follows:

$$Required\ Trench\ Area = Daily\ Wastewater\ Flow\ \div Application\ Rate$$

$$Required\ Trench\ Area = \frac{10{,}055\ gpd}{0.5\ gpd/ft^2} = 20{,}110\ ft^2$$

Preliminary calculations show that conventional treatment will not meet nondegradation requirements at the end of the standard 500-foot mixing zone. Past experience has shown that Eliminite systems have been the most cost effective advanced treatment system for reducing effluent nitrate concentrations below 24 mg/L. Eliminite systems are also easily scalable and utilize modular construction to easily expand system capacity over time.

Utilizing 3-foot wide pressure dosed trenches; the required drainfield length would work out to 6,703 linear feet. An advanced wastewater treatment system allows for a reduction of 50% in final absorption area, resulting in a total 3,352 linear feet of absorption trench. Assuming a standard spacing of 7-feet between laterals, the drainfield will have an estimated area of approximately 23,000 square feet. With a dedicated replacement are of twice that size. It is recommended that a 2 to 3 acre minimum site be reserved for a drainfield area.

Depending on the distance to surface water and the depth to groundwater, it may be hard to pass phosphorus breakthrough limits of 50 years. During subdivision of property within the TEDD, the layout of the drainfields should check both Nitrate Sensitivity and Phosphorus breakthrough.

The Montana Department of Environmental Quality will also require that each of these systems have a groundwater discharge permit, and monitor groundwater quality at the end of the mixing zone to insure that the wastewater treatment system is performing as designed. These permits range from $5,000 - $10,000 to obtain and renewal fees would run around $3,000 per year for each system.

C. Map

Please see the attached proposed wastewater system map.

D. Environmental Impacts

All wastewater treatment projects will impact the environment. The clustered wastewater treatment systems will minimize but not alleviate environmental impacts. There will be temporary ground disturbance during installation of the collection system and drainfield for each system.

The system will be reviewed by the Montana Department of Environmental Quality for nondegradation of groundwater based on the soil conditions, depth to groundwater and wastewater characteristics for each system. Degradation of the groundwater will be limited by the choice of treatment alternatives.

Construction of the system will cause temporary dust, disturbance and possibly increased storm water runoff, which will be mitigated through proper construction techniques, storm water management during construction and proper equipment maintenance.

E. Land Requirements

Ravalli County requires that non-degradation mixing zone stays on the property or an easement is provided for the mixing zone. Commercial systems require a 500' mixing zone. Assuming a 400 ft wide drainfield this mixing zone encompasses an additional 4.6 acres. For the combined drainfield and mixing zone, it is recommended that a 7 to 10 acre site be reserved for each wastewater treatment system.

F. Potential Construction Problems

High groundwater and soils unsuitable for drainfield construction such as silts and clays could present construction problems. However, due to the large size of the TEDD, these issues can be avoided by proper planning and system layout during development of each property.

G. Sustainability Considerations

i. Water and Energy Efficiency

The phased approach of building each clustered system will minimize pumping costs and maximize the efficiency of each wastewater treatment system.

H. Cost Estimates

Table 3.2.6-2 Multiple Small Public Subsurface Wastewater Treatment Cost Estimate

MULTIPLE SMALL PUBLIC SUBSURFACE WASTEWATER SYSTEMS					
ITEM	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT COST	TOTAL
1	Mobilization/Demobilization	1	LS	$25,000.00	$ 25,000.00
2	Traffic Control	1	LS	$1,200.00	$ 1,200.00
3	Payment and Performance Bonds	1	LS	$850.00	$ 850.00
4	5000 Gallon Septic Tank	5	EA	$7,500.00	$ 37,500.00
4	5000 Gallon Dose Tank	3	EA	$7,500.00	$ 22,500.00
5	2000 GPD Eliminite System	5	EA	$40,000.00	$ 200,000.00
6	Pressure Dosed Drainfield Lateral in 3' Wide Trench	3400	LF	$15.00	$ 51,000.00
7	8" SDR 35 PVC Sanitary Sewer Pipe	1500	LF	$35.00	$ 52,500.00
8	48" I.D. Concrete Manhole - 5.0' Depth	5	EA	$2,100.00	$ 10,500.00
9	48" I.D. Concrete Manholes - Additional Vertical Feet	12	VF	$125.00	$ 1,500.00
10	6" Sch. 40 PVC Sanitary Sewer Services	1440	LF	$35.00	$ 50,400.00
11	Sanitary Sewer Pipe and Manhole Acceptance Testing	1	LS	$400.00	$ 400.00
12	Control Panel and Alarm System	1	LS	$15,000.00	$ 15,000.00
13	Force Main	2000	LF	$35.00	$ 70,000.00
14	Groundwater Discharge Permit	1	LS	$10,000.00	$ 10,000.00
15	Groundwater Monitoring Well	1	LS	$2,500.00	$ 2,500.00
17	System Startup	1	LS	$5,000.00	$ 5,000.00
17	Restoration & Seeding	5000	SY	$0.50	$ 2,500.00
SUBTOTAL CONSTRUCTION COST (1 SYSTEM)				**$**	**558,350.00**
SUBTOTAL CONSTRUCTION COST (3 SYSTEMS)				**$**	**1,675,050.00**
	10% Contingency			**$**	**167,505.00**
	Engineering, Surveying, Construction Inspection			**$**	**368,511.00**
	Total Project Cost			**$**	**2,211,066.00**

Table 3.2.6-3 Multiple Small Public Subsurface Wastewater Treatment System O&M

Description	Quantity	Unit	Unit Cost	Total
Electric Power	7035	kW-hr	$ 0.12	$ 844.20
Annual Maintenance & Pumping	1	LS	$ 5,000.00	$ 5,000.00
Groundwater Discharge Permit	1	LS	$ 3,000.00	$ 3,000.00
Short Lived Assets	1	LS	$ 675.00	$ 675.00
Annual Operation and Maintenance Costs				$ 9,519.20
Inflation Rate	3%			
Present Worth (40 Years)				**$220,034.14**
Total for 3 systems				**$ 660,102.41**

The present O&M cost would be approximately $16.53 per month per business assuming a full build out of 144 businesses.

3.2.7 Public Wastewater Treatment Facility – Wastewater Treatment Ponds

A. Description

A central public wastewater treatment system would provide the highest level of treatment for wastewater coming from businesses and houses within the TEDD. A facultative or aerated lagoon system could be discharged into infiltration bed with a groundwater discharge permit, or land applied.

Lagoon systems use physical, chemical and biological action to treat wastewater by breaking down solids and utilize aerobic, anaerobic processes and solar to remove pathogens. Lagoons naturally stratify into three layers, an aerobic zone at the top, an anaerobic zone at the bottom and an aerobic/anaerobic zone in the middle. Bacteria in all of these layers provide treatment of the wastewater. Lagoons are usually made up of one or more cells depending on treatment requirements and effluent discharge standards.

B. Design Criteria

This system will be designed in accordance with Montana Department of Environmental Quality Circular DEQ-2. Utilizing the full flows as outlined in Table 3.2.6-1 the system would be just over the recommended maximum for two cells. It is recommended that two primary cells and one secondary cell be utilized to treat the wastewater. The state of Montana requires a minimum 180 day detention time for continuous and controlled discharge ponds, but land application can reduce detention time to 90-120 days. Land application does not require a State discharge

permit, since if properly designed and applied, no effluent should be discharged to surface or groundwater.

Assuming a facultative pond, the primary cells shall have a detention time of 40 to 80 days. Assuming an 80 day detention time and an inflow of 30,166 gallons per day and estimated area of 2-acres would be required for primary treatment ponds. The secondary treatment cell with a holding time of 40 days would need to be approximately 1-acre in size. An assumed total depth of 10 feet is assumed for each pond (2-feet freeboard, 8 foot water depth)

Based on the phased and most likely slow buildout of the TEDD, it is proposed that the wastewater treatment ponds start as facultative ponds, with provisions to add aeration at a later date, if needed for treatment or odor reasons.

For land application a net irrigation demand of 20 inches is assumed for grass hay and a 200 day irrigation season. This would result in an irrigated acreage of approximately 11 acres required for land application.

C. Map

Please see the attached proposed wastewater system map.

D. Environmental Impacts

All wastewater treatment projects will impact the environment. Wastewater Treatment Ponds with land application will help minimize the impacts to groundwater. Odor and mosquitos can be a problem with improperly maintained wastewater treatment pond systems.

Construction of the system will cause temporary dust, disturbance and possibly increased storm water runoff, which will be mitigated through proper construction techniques, storm water management during construction and proper equipment maintenance.

E. Land Requirements

Montana Department of Environmental Quality Circular-2 recommends that wastewater treatment ponds be located as far as practical from human habitation with a recommended minimum distance of 1/4 mile. Consideration should be given prevailing winds, odor, public safety, topography and tree cover. Property owners within the TEDD have said that land outside the TEDD boundary may be available for wastewater treatment purposes. This could allow land application to occur outside the TEDD boundary.

A minimum separation from groundwater of at least 4 feet is also required between the bottom of the pond and the maximum high groundwater elevation.

F. Potential Construction Problems

High groundwater would be the primary construction problem associated with this option. 4 feet of separation must exist between the bottom of the treatment ponds and high groundwater.

Construction of the collection system in high groundwater would also require dewatering during construction.

G. Sustainability Considerations

i. Water and Energy Efficiency

Facultative lagoon systems use the least amount of energy compared to other large scale wastewater treatment systems. Energy savings make wastewater treatment ponds and attractive alternative for long term operations savings.

H. Cost Estimates

Table 3.2.7-1 Public Wastewater Treatment Facility Cost Estimate

PUBLIC WASTEWATER TREATMENT FACILITY - WASTEWATER TREATMENT PONDS					
ITEM	**DESCRIPTION**	**ESTIMATED QUANTITY**	**UNIT**	**UNIT COST**	**TOTAL**
1	Mobilization/Demobilization	1	LS	$75,000.00	$ 75,000.00
2	Traffic Control	1	LS	$1,200.00	$ 1,200.00
3	Payment and Performance Bonds	1	LS	$2,500.00	$ 2,500.00
4	Clear and Grub	1	LS	$5,500.00	$ 5,500.00
5	Strip and Stockpile Topsoil	1	LS	$20,000.00	$ 20,000.00
6	Lagoon Excavaton & Embankment	20000	CY	$12.00	$ 240,000.00
7	Lagoon Liner Subgrade	1	LS	$35,000.00	$ 35,000.00
8	PVC Lagoon Liner	1	LS	$200,000.00	$ 200,000.00
9	Lagoon Inlet and Outlet Structures	1	LS	$50,000.00	$ 50,000.00
11	Lagoon Level Control Structures	1	LS	$45,000.00	$ 45,000.00
11	Irrigation Connection	1	LS	$20,000.00	$ 20,000.00
19	Irrigation Electrical	1	LS	$20,000.00	$ 20,000.00
12	Fencing	1	LS	$25,000.00	$ 25,000.00
13	Topsoil Replacement and Seeding	1	LS	$15,000.00	$ 15,000.00
14	Land Application Irrigation System	1	LS	$30,000.00	$ 30,000.00
15	8" SDR 35 PVC Sanitary Sewer Pipe	12000	LF	$40.00	$ 480,000.00
16	48" I.D. Concrete Manhole - 5.0' Depth	19	EA	$2,100.00	$ 39,900.00
17	48" I.D. Concrete Manholes - Additional Vertical Feet	58	VF	$125.00	$ 7,250.00
18	6" Sch. 40 PVC Sanitary Sewer Services	4320	LF	$35.00	$ 151,200.00
20	Provisions for Future Aearation	1	LS	$10,000.00	$ 10,000.00
21	Restoration & Seeding	3000	SY	$0.50	$ 1,500.00
SUBTOTAL CONSTRUCTION COST (1 SYSTEM)				**$**	**1,474,050.00**
	10% Contingency			**$**	**147,405.00**
	Engineering, Surveying, Construction Inspection			**$**	**324,291.00**
	Total Project Cost			**$**	**1,945,746.00**

Table 3.2.7-2 Public Wastewater Treatment Facility O&M Costs

Description	Quantity	Unit	Unit Cost	Total
Electric Power	48400	kW-hr	$ 0.12	$ 5,808.00
Annual Maintenance & Sludge Removal	1	LS	$ 5,000.00	$ 5,000.00
Plant Operator	1	LS	$ 15,000.00	$ 15,000.00
Short Lived Assets	1	LS	$ 4,550.00	$ 4,550.00
Annual Operation and Maintenance Costs				$ 30,358.00
Inflation Rate	3%			
Present Worth (40 Years)				**$701,718.25**

The present O&M cost would be approximately $17.57 per month per business assuming a full build out of 144 businesses. However, O&M costs would most likely be lower during the initial phases of construction, due to minimal pumping costs.

4. SELECTION OF AN ALTERNATIVE

4.1 Life Cycle Cost Analysis

Water

Assuming a 40 year planning period for the project, the life cycle costs associated with each analyzed Water System option are shown below: A service life of 50 years and a discount rate of 3% will be assumed for all options; however, some equipment, especially water mains, will have a service life in excess of the assumed 50 year service life.

Table 3.2.7-1 Water System Life Cycle Cost Analysis

Option	Construction Cost	O&M Cost	Salvage Value	Total Present Cost
Individual Wells	$ 1,972,080.00	$ 1,237,306.75	$120,910.92	$ 3,088,475.83
Multiple Public Water Systems	$ 1,922,778.00	$ 561,553.04	$117,888.15	$ 2,366,442.89
Single Public Water System	$ 2,976,666.00	$ 635,103.32	$182,503.46	$ 3,429,265.86

From the life cycle cost analysis, the Multiple Public Water System option appears to have the lowest present cost.

Wastewater

The same assumptions will be made to evaluate the Wastewater Treatment Systems.

Table 3.2.7-2 Wastewater System Life Cycle Cost Analysis

Option	Construction Cost	O&M Cost	Salvage Value	Total Present Cost
Multiple Subsurface Wastewater Systems	$2,211,066.00	$ 660,102.41	$135,563.48	$ 2,735,604.93
Public Wastewater Treatment Facility	$1,945,746.00	$ 701,718.25	$119,296.35	$ 2,528,167.90

From the life cycle cost analysis, Public Wastewater Treatment Facility appears to have the lowest present cost.

4.2 Non-Monetary Factors

Factors outside of monetary considerations play into the selection of a preferred alternative. All of the options considered for water and sewer would most likely be constructible; however some options have higher risk and higher impacts to the environment.

Water

The matrix below will be used to evaluate non-monetary factors for each of the analyzed water system options.

RATING SYSTEM

Less Impact → Greater Impact

1 2 3

Table 3.2.7-1 Water System Non-Monetary Factors

	Individual Wells	Multiple Public Water Systems	Single Public Water System
Operational Requirements	1	2	3
Energy Requirements	3	2	1
Regulatory Requirements	1	2	3
Land Requirements	1	2	2
Air Quality	1	1	1
Water Quality	1	1	1
Reliability/Redundancy	3	2	1
Fire Protection	3	2	1
Noise	1	1	2
Biological Resources	1	1	1
Construction Problems	1	2	2
TOTALS	17	18	18

Wastewater

The matrix below will be used to evaluate non-monetary factors for each of the analyzed wastewater system options.

RATING SYSTEM

Less Impact	→	Greater Impact
1	2	3

Table 3.2.7-2 Wastewater System Non-Monetary Factors

	Multiple Subsurface Wastewater Systems	Public Wastewater Treatment Facility	
Operational Requirements	3	2	
Energy Requirements	2	1	
Regulatory Requirements	2	1	
Land Requirements	2	1	
Air Quality/Odor	1	2	
Water Quality	2	1	
Reliability/Redundancy	2	1	
Noise	1	1	
Biological Resources	1	1	
Construction Problems	2	2	
TOTALS	18	13	

5. PROPOSED PROJECT – RECOMMENDED ALTERNATIVE

Based on the results of the alternative analysis, life cycle cost analysis and evaluation of non-monetary factors; the following systems are recommended to provide service to the TEDD.

Water

Although the individual private well option seems appealing from the non-monetary factor analysis, based on the life cycle cost analysis the recommended alternative to serve water to the TEDD is through Multiple Small Public Water Systems. Based on current Department of Natural Resources and Conservation (DNRC) regulations, water rights issues are likely to be encountered with any water system option.

Wastewater

Based on the results of the alternative analysis, life cycle cost analysis and the evaluation of non-monetary factors, the recommended wastewater alternative to serve the TEDD is a public wastewater treatment facility utilizing wastewater detention ponds and land application of effluent. This option provides a high level of wastewater treatment and helps protect groundwater quality by land applying the effluent over an irrigated crop such as grass hay. This option also minimizes the risks associated with high groundwater and nondegradation requirements associated with a subsurface wastewater treatment system.

Communications/Internet

From discussions with Centurylink and Charter Communications, the area included in the TEDD is ready to be connected to high speed internet and communications. Fiber optic communication lines are available just north of the TEDD boundary on Old Corvallis Road and at the intersection of Kurtz Lane and Fairgrounds Road.

Both utilities have stated that upon development the needs of each development will be evaluated and service will be extended to the property based on the development plan. Should a business move in that required high speed internet connection, the fiber optic lines could be easily extended into the TEDD from the North or South.

Power/Gas

Power and natural gas are available in and around the TEDD. At the time of development or subdivision the power and gas needs of the development will be evaluated and power and gas will be extended and upsized as necessary to serve the new businesses in the TEDD. These services are usually installed at a cost to the developer, but are paid back as connections to the power and gas are made, as long as they are made within the first seven (7) years.

Transportation

Due to the preliminary nature of the TEDD and the lack of an overall development plan, transportation improvements will not be proposed at this time. It is recognized that the intersection with Fairgrounds Road and Eastside Highway and the Ravalli County Airport entrance and Eastside Highway will require mitigation as traffic volumes increase at these intersections. From discussions with the Montana Department of Transportation, these intersections could be improved with warning lights controlled by sensors, traffic signals or intersection relocations.

As property within the TEDD is developed, consideration for relocation of these intersections will be evaluated.

5.1 Preliminary Project Design

Water

The preliminary water project design consists of three (3) separate small public water systems scattered through the TEDD. At this early stage in the TEDD development it is hard to pinpoint exactly where these systems would be located; however it is anticipated that there would be one system serving the area along Old Corvallis Road, one on the west side of Eastside Highway, and one serving development north of the airport. The final layout and sizing of the systems will be completed in the preliminary design phase during subdivision or development of the property.

Sewer

The preliminary wastewater project design consists of a three (3) cell facultative wastewater treatment pond with two primary treatment cells and one secondary cell with land application of effluent on grass hay on approximately 15 acres. Provisions for adding aeration at a later date shall be incorporated into the design to enhance treatment or deal with odor issues if they arise. A wastewater collection system will be installed through the TEDD which will carry wastewater from the upper end of the airport to the wastewater treatment ponds, which will be located at the lower end of the TEDD.

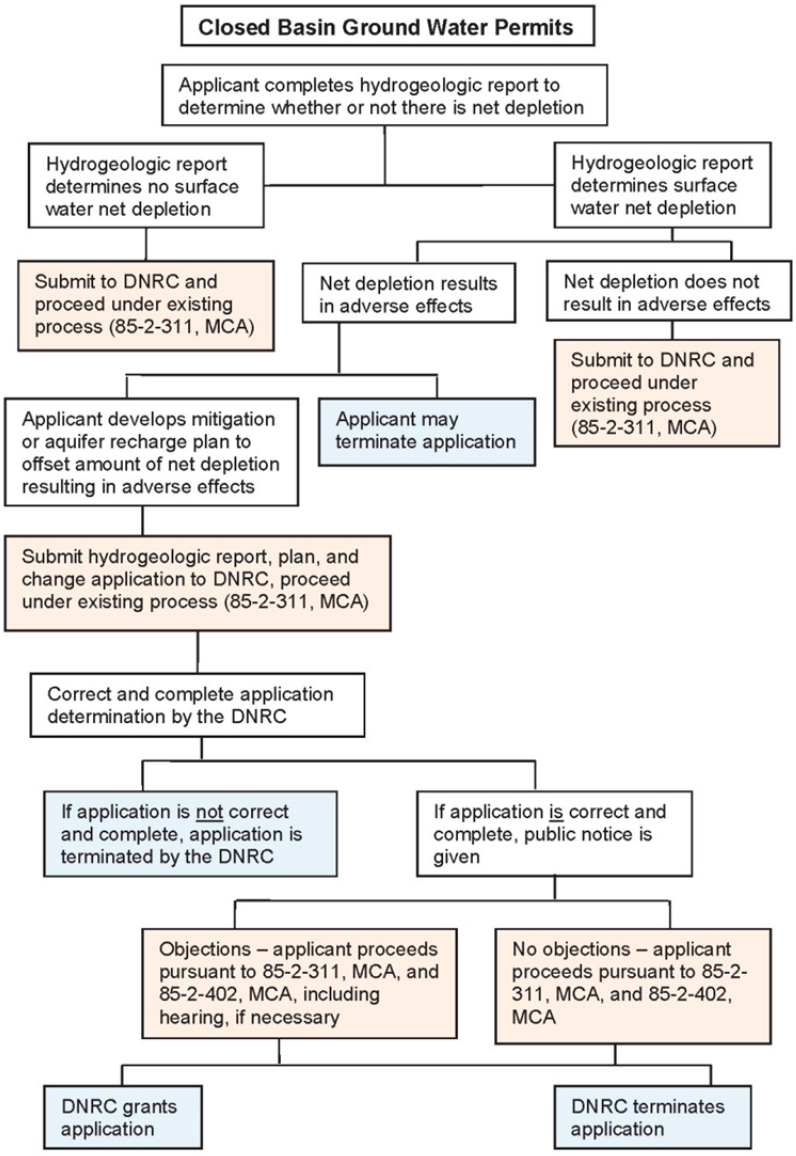
5.2 Project Schedule

The project schedule will be largely driven by the property owners within the TEDD. Once the TEDD is finalized, the property owners will be able to start advertising for businesses to move into the TEDD and start development plans for their property. The input of the landowners will be crucial to the overall design of the water and wastewater infrastructure that will be installed in the TEDD.

5.3 Permit Requirements

The water and sewer systems will all need to be approved by the Montana Department of Environmental Quality (DEQ) prior to construction beginning.

A beneficial water use permit will be required for the water systems serving the TEDD. After a well is drilled and pump tested in accordance with the DNRC requirement a hydrogeologic report will be prepared and a beneficial water use permit will be submitted. Currently in the Bitterroot Basin, the procedure for applying for a new groundwater appropriation is as follows:



The wastewater treatment facility will need to be approved by the Montana DEQ prior to construction. If land application of effluent is used, a groundwater discharge permit is not required since if properly applied no effluent will enter ground or surface water.

5.4 Sustainability Considerations

5.4.1 Water and Energy Efficiency

It is recommended that all connections to the new water and wastewater systems in the TEDD be metered to properly allocate water and sewer cost, promote water conservation and provide sufficient data to monitor the heath of the water and sewer systems.

5.5 Total Project Cost Estimate

The total project cost estimate including construction, construction contingency. design engineering services, and construction contract administration and inspection from the recommended alternative is **$3,868,524.00**

5.6 Annual Operating Budget

The Ravalli County TEDD will be a new water and wastewater system. The annual operating budget will need to be determined based on the number of users on the systems and will adjust as the district grows. Initially operating costs will be fairly low.

5.6.1 Income

Income will be generated from user rates, which will be established by the district.

5.6.2 Annual O&M Costs

Annual O&M Costs will be covered by user rates, which will be established by the district

5.6.3 Debt Repayment

Debt repayment will be funded through tax dollars generated by the TEDD

5.6.4 Reserves

Water and sewer rates will include both a debt reserve and short lived asset reserve.

6. CONCLUSIONS AND RECOMMENDATIONS

This Preliminary Engineering Report (PER) addresses water, sewer, power, communications, and transportation for the Ravalli County Targeted Economic Development District (TEDD). In general this PER is a broad evaluation of the services required to promote business development in the TEDD. At the writing of this report no master plan or development plans were proposed by the landowners in the TEDD. There are several factors that could affect the recommended alternatives proposed in this report.

The primary factor that could change the recommended alternatives for water and wastewater are the ability to connect to the City of Hamilton public water and wastewater systems. At the writing of this PER there was no definitive answer on the ability to connect to the City of Hamilton infrastructure or what costs would be associated with those connections. Should connection to the City of Hamilton become available in the future the option of connecting to water and wastewater should be further evaluated.

A second factor that should be considered is the mix of businesses assumed to make up the TEDD at full build out. It was assumed that a mixture of small businesses would move into the TEDD over an assumed 30-40 year build out. One large business moving into the TEDD could drastically change the assumed design requirements of the water and wastewater systems. Should the mix of businesses moving into the TEDD start to shift dramatically from the assumptions in this report, the water and wastewater options should be re-evaluated.

Water rights will be a factor in the construction of the recommended water system alternative. However, with the recently reinstated combined appropriation rules in effect, water rights will be a factor in any proposed water system alternative. The ability to minimize the number of wells drilled, provide redundant water sources, and provide a means to expand and connect the water systems in the future was the primary driver in the recommended alternative for the water system.

The recommended wastewater treatment system was chosen for multiple reasons. Although technically feasible, utilizing a subsurface wastewater treatment system for a development of this size would pose significant difficulty in construction and in obtaining a groundwater discharge permit. Other systems in Ravalli County that have applied for groundwater discharge permits have faced significant public objection. The selection of a wastewater treatment pond with land application of effluent will help protect groundwater in the area, and due to the abundant land available for land application outside the TEDD boundary is an attractive option.

Overall this report should provide direction for the landowners within the TEDD to begin planning development of their property knowing that water, wastewater, power, gas, communication and transportation options have been evaluated. The overall timing for the start of construction is closely tied to the planning of these landowners and should be a priority if the recommended water and wastewater infrastructure is to be installed. Any changes in information or regulations during planning within the TEDD that may affect the recommended alternatives in this report should be carefully evaluated to make sure they do not change the assumptions used in developing this report.

7. REFERENCES

City of Hamilton. (n.d.). *Hamilton, MT Growth Policy (June 2009).* Retrieved July 6, 2015, from City of Hamilton: http://www.cityofhamilton.net/living/city_plans/growth_policy.html

United States Census Bureau. (2015). *State & County QuickFacts*. Retrieved July 6, 2015, from http://quickfacts.census.gov/qfd/states/30/30081.html

USA.com. (2015). *Hamilton, MT Population and Races*. Retrieved July 6, 2015, from http://www.usa.com/hamilton-mt-population-and-races.htm

USA.com. (2015). *Ravalli County*. Retrieved July 6, 2015, from http://www.usa.com/ravalli-county-mt.htm

City of Hamilton. (2010-2015). *Hamilton, MT Growth Policy (June 2009)*. Retrieved July 6, 2015, from http://www.cityofhamilton.net/living/city_plans/growth_policy.html

City of Minneapolis. (2006). *Industrial Land Use Study and Employment Policy Plan*. Retrieved July 6, 2015, from http://www.minneapolismn.gov/www/groups/public/@cped/documents/webcontent/convert_273197.pdf

Fresno County Department of Public Works and Planning. (2006). *Water and Sewer System Master Plan Update*. Retrieved July 6, 2015, from http://www.co.fresno.ca.us/View Document.aspx?id=4278

Duchon, et al. (1991). *Use of Land Use Coefficients to forecast Utility System Demand.* Retrieved July 6, 2015, from http://www.gwri.gatech.edu/sites/default/files/files/ docs /1991/DuchonK-91.pdf

Prins, J.D. Dr. (1998). *Building Land Use Plans for Water and Wastewater Master Plans: A Case Study.* Retrieved July 6, 2015, from http://proceedings.esri.com/library/userconf/proc00 /professional/papers/PAP123/p123.htm

Lea Guthrie, Ravalli County Environmental Health, Memo RE: Airport Septic System, October 4, 2012.

Eliminite Website. Retrieved October 28, 2015, from http://www.eliminite.com/

City of Hamilton. *2010 Water Facility Plan Update (as Amended April 22, 2010).* Retrieved October 28, 2015, from http://www.cityofhamilton.net/living/city_plans/docs/Hamilton_2010_Facility_Plan_Update.pdf

Montana Department of Labor & Industry. *State of Montana Employment Projections 2015-2024 (May 2015).* Retrieved October 29, 2015, from http://ourfactsyourfuture.org/media/97995/projections-analysis-2015.pdf?=Montana%20Employment%20Projections%202015-2024

Montana Department of Natural Resources and Conservation. *Combined Appropriation Guidance (Updated 9/18/15).* Retrieved October 30, 2015, from http://dnrc.mt.gov/divisions/water/water-rights/docs/external-ca-9-18-2015-final.pdf

Montana Bureau of Mines and Geology. Ground Water Information Center, Well logs for T06N R20W, Sections 19, 20, 29 & 32. Retrieved October 30, 2015, from http://mbmggwic.mtech.edu/sqlserver/v11/data/dataGeographic.asp?pagename=&report=w10&Township=06N&Range=20W&section=19&section=20&section=29&section=32&SortOrder=trs&repLink=ON&Submit1=Retrieve

Montana Department of Natural Resources and Conservation, Water Rights in Montana, April 2014. Retrieved November 17, 2015, from http://dnrc.mt.gov/divisions/water/water-rights/docs/2014-water_rights_in_mt_handbook.pdf