BRIDGER VALLEY REGIONAL WASTEWATER PLAN  
TECHNICAL MEMORANDUM NO. 4  
SCOPING MEETING AND DEFINITION OF TREATMENT METHODS

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APPENDICES

Appendix A: Scoping Meeting Invitation Letter, Attendance Sheet, and Power Point Presentation
1. INTRODUCTION

Technical Memorandum No. 3 detailed the existing conditions of the wastewater collection and treatment facilities in the key areas of the planning region. It also detailed the future conditions of each facility. It demonstrated the urgent need that the communities have to come together as a group and provide a regional solution to the multiple problems that exist with wastewater collection and treatment in the valley.

The first part of this technical memorandum defines wastewater collection system repair methods and wastewater treatment methods that could be part of a regional wastewater plan. This section also provides initial screening of these methods. The remaining methods of treatment that are possible candidates to be part of the regional wastewater plan will be analyzed in detail in Technical Memorandum No. 5.

The second part of this technical memorandum is a report of the scope direction process and results of meetings with the stakeholders to determine possible regionalized solutions to the wastewater problems in the valley. Among these meetings was a general scoping meeting followed by discussions at the Joint Powers Water Board Meetings held on the second Wednesday of every month. The results of these meetings provided direction in which to proceed with the recommended alternative in this regional wastewater plan.
2. COLLECTION REPAIR METHODS FOR REGIONAL PLAN

The main purpose of this wastewater plan is to provide a regional solution to the existing wastewater problems that exist in the valley. The first step in a regional solution is making sure the communities are able to efficiently collect their wastewater.

Technical Memorandum No. 3 detailed the need for Mountain View and Fort Bridger to repair their existing collection systems to reduce the significant amount of inflow and infiltration that is occurring in their systems. Lyman also has a need to discover the sources of their storm drainage infiltration and make repairs as needed. Various methods exist for collection system repair. These methods will be evaluated in this section. The cost to reduce the inflow and infiltration will be included in the regional wastewater plan cost analysis. The methods of reducing inflow and infiltration that will be considered for this plan are described in this Section.

2.1. Video Inspection and Localized Replacement

This method of collection system repair includes video inspection of the collection system pipes followed by a localized fix or replacement of a section of the system. The video inspection identifies broken pipes, roots in pipes, pipe collapse, and any other problems in the pipe causing inflow and infiltration. Once the problem areas are identified, they can be fixed through pipe repair or replacement of sections of pipe.

Mountain View currently owns video inspection equipment and can perform the video inspection in house. Another video inspection option is to hire an outside company to video inspect the collection system and also clean out the system. Some companies offer services such as root removal and pipe replacement.

Lyman is currently in the process of obtaining video inspection equipment for their system. This will give them the option of performing in-house inspection of their system. The other alternative would be to hire an outside company to video inspect and clean out the system. This appears to be a viable and economically feasible method of system evaluation for Lyman as most of their collection system is made up of relatively new PVC pipe.

This method is a viable alternative in the Town of Mountain View and Town of Lyman. This method is not a viable alternative for Fort Bridger because the pipes are flowing too full. Video inspection is possible in full pipes, but the video is often unclear and useless due to lack of clarity of the camera equipment under the wastewater.

2.2. Replacement of Collection Lines

This method of reducing inflow and infiltration involves replacing the old components of the collection system with new components. This involves excavating and removing the old collection system and replacing it with a new one. It also involves disconnecting and reconnecting all of the service laterals on the system. Depending on condition of manholes, it may involve replacement of manholes as well.

The pros to this method are that the replaced collection system can be used for the next 30 to 50 years, and will result in substantial improvement in infiltration and inflow. The cons to this method are the associated costs and the inconveniences associated with construction of the new collection system. Sewer pipe prices and construction costs are always increasing and the capital costs to replace an entire system are high relative to other methods.
2.3. Pipe Lining

This method of reducing inflow and infiltration involves contracting with a pipe rehab company to evaluate and repair the collection system. A proven method of pipe rehab is through pipe lining. There are many pipe lining companies and each uses similar technology to line the inside of pipes reducing inflow and infiltration. One technology used is cured-in-place pipe. The following claim has been made regarding cured-in-place pipe:

“Insituform® cured-in-place pipe (CIPP) technology restores structural integrity to your damaged sewer pipes. The design models used, independent test results, and 35 years of service all confirm that Insituform® CIPP is a structural product with a 100-year design life.” [Insituform®]

The advantages to this method of repair are that it can be accomplished without excavation and replacement of existing pipe, and that the product has a long design life. Due to the comparative ease of installation, this alternative is also less expensive per linear foot than replacing the pipe. It also minimizes the inconveniences to the community that are related to construction and excavation of existing pipe. This method will be considered for Fort Bridger as a replacement.

2.4. Screening of Collection System Repair Methods

It is necessary that Fort Bridger, Lyman, and Mountain View reduce their inflow and infiltration into their wastewater systems. For the purpose of this wastewater regional plan, it will be assumed that Mountain View and Lyman will use their existing inspection equipment to inspect their system and repair and replace damaged pipe in a localized method. They may also choose to line their pipes where damage has occurred. The cost of inspection and repair to the Town of Mountain View and Lyman will be included in the cost estimate of the regional plan. The cost estimate will include the cost to hire new personnel specifically for this job, along with a lump sum that may be used for repairs.

Fort Bridger is in need of replacing their entire sewer collection system. The method of replacement for this study will be through pipe lining with a product that has a minimum 50 year design life. The cost of lining the whole system will be included in the cost estimate of the regional plan. The cost estimate will be based off of linear feet quotes from Insituform®.

Repairing the collection systems in Mountain View, Lyman, and Fort Bridger will reduce inflow and infiltration significantly, and is a necessary part of the regional wastewater plan. This ensures that the wastewater that will be treated will have a minimum amount of inflow and infiltration.

If the infiltration and inflow problems are not resolved, the treatment system and any additional collection required in the plan will have to be designed for the existing flows. This will result in inefficiencies in treatment and increased operations and maintenance costs.
3. TREATMENT METHODS

This section introduces existing wastewater treatment methods that may be used in this wastewater plan and screens methods that do not warrant further consideration. The remaining treatment methods that are candidates for a treatment facility will be analyzed in detail along with collection systems in Technical Memorandum No. 5.

3.1. Future Discharge Permit Requirements

One of the main initial screening tools for determining a method of treatment for a mechanical facility is to determine if the treatment method can produce a high enough quality effluent to comply with the WYPDES discharge permit. Roland Peterson, with WYPDES, has projected what the discharge requirements will be for the planning region in the future. These projections are shown in Table TM4-2. These are projections and may change in the future. Along with being able to meet these discharge requirements, the facility also needs to be able to handle the flow into the facility.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Monthly Average</th>
<th>Weekly Average</th>
<th>Daily Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemical Oxygen Demand (BOD) mg/l</td>
<td></td>
<td>30</td>
<td>45</td>
<td>90</td>
</tr>
<tr>
<td>Fecal Coliforms #/100 ml</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Ecoli Bacteria #/100 ml</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>Total Suspended Solids (TSS) mg/l</td>
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<td>45</td>
<td>90</td>
<td></td>
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<tr>
<td>Ammonia mg/l</td>
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<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Total Residual Chlorine (TRC) mg/l</td>
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<td>N/A</td>
<td>0.011 (non-detect)</td>
<td></td>
</tr>
<tr>
<td>Total Dissolved Solids (TDS) Increase mg/l</td>
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<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

*TBD = To Be Determined

Table TM4-2: Projected Discharge Requirements for Bridger Valley

The Wyoming DEQ is currently implementing an E coli standard into their discharge permits. The E coli standard is yet to be determined for this area. The E coli standard will replace the fecal coliform standard from the past. E coli is actually a subset of fecal coliform.

3.2. Facultative Lagoons

The current method of treatment for the communities in the planning region is through lagoon systems. The two main types of lagoon systems are facultative lagoons and aerated lagoons, which may either discharge to surface water or be defined as non-surface water discharging lagoons.

In a facultative lagoon, suspended solids contained in the wastewater settle to the pond bottom where an anaerobic layer develops. An anaerobic layer is a layer without dissolved oxygen. A facultative zone develops just above the anaerobic zone. Molecular oxygen is not available in the region at all times. Generally, the zone is aerobic during the daylight hours and anaerobic during the hours of darkness. An aerobic zone with molecular oxygen present at all
times exists above the facultative zone. Some oxygen is supplied from diffusion across the pond surface, but the majority is supplied through algal photosynthesis. Dissolved oxygen is used by microorganisms in the lagoons to decompose the pollutants in the wastewater in aerobic processes.

The problem associated with facultative lagoons is that in order to effectively treat wastewater, an extremely large volume relative to the inflow is required. Because of this, facultative lagoons are generally not used in areas that can experience significant growth and are not a good solution for a regional treatment plant of the size that will be required in the Bridger Valley. These types of ponds are typically located in very small communities. Even then, sizing of the lagoons requires careful planning and consideration of future conditions. It was shown in Technical Memorandum No. 3 that the Bluemel Subdivision facultative lagoon in Urie is organically overloaded and close to its hydraulic capacity. Also, a discharging facultative lagoon will have difficulty meeting the projected ammonia limit requirement, especially during harsh Wyoming winter months.

Collecting all of the wastewater in the valley and sending it to facultative lagoons is not an option for this regional plan. The reasons are that the stakeholders have indicated that they do not want another lagoon system, lagoon systems in the area have proven inconsistent in meeting discharge requirements, the footprint of a facultative lagoon system for a valley wide facility is too large and costly to obtain, and facultative lagoons are not a good method to deal with the projected growth in the valley that is expected due to periodical energy booms in the region.

3.3. Aerated Lagoons

Aerated lagoons function similar to facultative lagoons but are generally deeper and have shorter detention times than facultative lagoons. The shorter detention times are attributed to more effective treatment in the lagoon system. The right amount of oxygen in the lagoon allows the biodegrading bacteria to quickly biodegrade the incoming organic matter. In the absence of dissolved oxygen, degradation must occur under septic conditions which are slow, odorous and yield incomplete conversions of pollutants. Mixing of the lagoons is important as well so that incoming pollutants and wastewater are better distributed throughout the lagoon, resulting in more uniform treatment. Currently, Lyman and Mountain View are mixing their ponds using Solarbee™ mixers.

Aeration can be accomplished through surface aerators or diffusers typically located at the bottom of the lagoon. Currently, Fort Bridger has a non-operative diffused aerator in its primary lagoon, and Lyman and Mountain View are running surface aerators in their primary ponds.

Aerated lagoons are a common method of treatment in rural areas of the country and the state of Wyoming. Although they are common and exist in abundance, the trend of new facilities is moving towards mechanical plants. This is due to our increasing knowledge of wastewater treatment and the increasingly stringent standards for discharging treated wastewater to surface waters. Also, during cold winter months, lagoon systems are inefficient at treating wastewater for ammonia. The nitrifying bacteria responsible for oxidizing ammonia tend to go dormant in cold temperatures. Dr. Michael Richard stated,

“A coming problem in the Rocky Mountain region is the requirement for ammonia removal during municipal wastewater treatment. Many small communities in the Rocky Mountain region that use aerated lagoons are getting
effluent ammonia limits in their renewed NPDES permits. A major problem exists in that aerated lagoons in the Rocky Mountain region have to operate at a low winter time temperature where ammonia removal by nitrification is minimal or ceases. This makes meeting low effluent ammonia standards almost impossible for these systems. A great need exists to find a way for the continued use of small community aerated lagoons to meet effluent ammonia limits in the cold time of the year.

Concerns about cold temperature nitrification usually arise when water temperature in the biological treatment system drop to 5 degrees Celsius (41 degrees Fahrenheit) or below. At this temperature the nitrifying bacteria responsible for oxidizing ammonia tend to go dormant. If this happens, it usually means effluent violations for those plants with ammonia limits.” [Richard, Hutchins, 1995]

Throughout the wastewater industry, several studies have been conducted to evaluated different techniques to increase ammonia removal in lagoon and aerated lagoon systems during cold times of the year. Most of these techniques are not recognized as solutions to reducing ammonia limits in lagoon type systems at this time. However, Nelson Environmental Inc. states that ammonia removal in winter months is possible:

“In order to improve the rate of ammonia removal in water temperatures below 5°C, three major factors (dissolved oxygen, surface area, and beneficial bacteria) can be modified to ensure that removal continues in cold weather conditions. Through combinations of Nelson Environmental technologies, aerated or stabilization pond system upgrades to facilitate ammonia removal are possible.

Nitrifying bacteria require aerobic conditions. A minimum dissolved oxygen (D.O.) concentration of 2 mg/l must be present for the process to occur. In un-aerated facultative lagoons, nitrification cannot occur in ice covered, winter conditions, because dissolved oxygen levels are reduced to 0 mg/l (anaerobic conditions) which stops growth of all nitrifying bacteria. ADS or MAT aeration are cost effective ways of retrofitting existing lagoons (no dewatering required for installation) for the purpose of increasing dissolved oxygen levels throughout the year, including ice covered conditions. Although nitrification can occur with D.O. concentrations down to 2 mg/l, the aeration system should have the ability to maintain 3 to 5 mg/l at the final lagoon discharge to provide buffering for any variations in oxygen demand. Maintaining 3 to 5 mg/l of dissolved oxygen at the lagoon discharge point is easily done with ADS or MAT aeration.” [Nelson Environmental, Inc., 2007]

According to this statement from Nelson Environmental Inc., the way to treat wastewater for ammonia during the winter months is to retrofit the lagoon system with ADS or MAT aeration.

Ideally, for this regional plan, a new facility or facilities will be constructed. A possible facility alternative would be to construct aerated lagoons with ADS or MAT aeration.

From the initial funding of this regional wastewater plan, the stakeholders have been adamant against building additional lagoon systems. The two major lagoon systems that exist are having difficulty meeting discharge requirements and are not easily controllable. As
explained in Technical Memorandum No. 3, their existing systems are having problems and these systems are high on the WYDEQ revolving fund priority list for needed funds to improve their systems. Because of the history and difficulties they have experienced in the past, the stakeholders will not approve a regional plan with a lagoon system as the treatment facility. For this reason, this method as an alternative for regional treatment will not be examined any further.

3.4. Mechanical Treatment Plant Using Suspended Growth Technology

In suspended-growth processes, microorganisms are cultivated in basins where they are suspended within the wastewater. These microorganisms break down the organic matter in the wastewater. The microorganisms are then removed from the water through clarification and may be re-used in the system or removed as bio solids. Different types of technology exist for suspended growth treatment. The main difference in the technologies is in the biological process and how the microorganisms used to break down the organic matter are cultivated. Four main types of suspended growth process technology exist for mechanical treatment plants. They include conventional activated sludge, sequencing batch reactors (SBR), or membrane bio reactors (MBR). Each of these methods will be discussed in this section.

3.4.1. Conventional Activated Sludge

Conventional activated sludge systems are one of the most common technologies for treating wastewater. These systems typically consist of a series of tanks or separate zones for their biological processes. These systems are proven to remove nitrogen to low levels. A flow diagram of a typical activated sludge process is shown in Figure TM4-1.

The wastewater flows through the head works first, where material harmful to the process and equipment is screened and removed. The head works consists of a screen, and grit removal. The screening process removes larger deleterious materials for compaction. Grit is small, coarse particles of sand gravel, eggshells, or other minute pieces of mineral matter. The screened material is sent to the local landfill.

From the head works, the wastewater flows or is pumped to a primary sedimentation basin, where the large particles are settled out. Following the sedimentation basin the wastewater is mixed with the returned activated sludge to produce what is known as a mixed liquor in the aeration basin. The suspended growth process occurs in the aeration basins. The mixed liquor produced during this oxidation process contains an extremely high concentration of aerobic bacteria, most of which are near starvation. This condition makes the sludge an ideal medium for the destruction of any organic material in the mixture. Since the bacteria are voraciously active, the sludge is called activated sludge [Lindeburg, 2003]. Activated sludge organisms will remove the bulk of the pollutants in the wastewater and nitrify the ammonia.

The wastewater is then sent to a final (secondary) clarifier. This is where the activated sludge is separated from the treated wastewater and either returned to the process as return activated sludge (RAS) or sent to waste as waste activated sludge (WAS). After leaving the clarifier, the treated wastewater is sent through a disinfection process, which is typically chlorine treatment or UV disinfection. After disinfection, the effluent is discharged to surface waters or prepared for reuse.

Reuse of treated effluent is a potential benefit from a mechanical wastewater treatment plant. For reuse purposes, wastewater effluent is classified as Class A, B, or C. The authorized reuse for each class is shown in Table TM4-2. In order to achieve Class A status, final filtration must be added to the processes. Also, a reuse pump station and pressure piping would be
required to pump the water to its point of use. The amount of water that would be available for reuse would be determined by the State Engineer’s evaluation of the consumptive use of the underlying water right. This would be determined after a reuse application is filed with the state engineer. Costs for reuse are not part of this analysis.

<table>
<thead>
<tr>
<th>Authorized Reuse</th>
</tr>
</thead>
</table>
| Class A          | Irrigation of land with a high potential for public exposure  
|                  | Irrigation of direct human consumption food crops |
| Class B          | Irrigation of land with a moderate potential for public exposure  
|                  | Irrigation of direct human consumption food crops |
| Class C          | Irrigation of land with a low potential for public exposure  
|                  | Irrigation of indirect human consumption food crops |

[WyDEQ, Ch. 21, Sec 12]

Table TM4-2: Wyoming Reuse Classification & Authorized Uses

After removal from the clarifier, the waste activated sludge (WAS) is pumped to the aerobic digesters, where it undergoes about 30 days of further biological treatment before it is pumped to the sludge dewatering press. This press will remove water from the sludge, changing the amount of solids from 1 or 2 percent to about 20 percent. This is thickened enough that it can then be handled by conveyors and composted for reuse or shipped to a landfill for final disposal.

The by-product of treated water at this type of plant is the biosolids. Biosolids may be used for composting and sold as fertilizer for lawns and gardens. This would require additional treatment in order for them to reach a treated level called “stabilized sludge”. In order to be stabilized, the stabilized sludge shall be composted or stabilized and stored for a period of at least one year. Stabilized sludge shall have less than 60 lb of BOD$_5$ per 1,000 lb of dry weight sludge solids [WyDEQ, Ch. 11, Sec 20]. This would add an additional cost to the plant. Due to the relatively small amount of biosolids that would be generated, it appears that final disposal of biosolids in a landfill is the most cost-effective method at present. Sludge processed for incorporation into a landfill shall be a solid or semisolid material that will not release water upon standing and that has been subjected to anaerobic or aerobic digestion, or chemically treated with lime to a pH of 12.0 or chemically treated with chlorine to a chlorine free residual [WyDEQ, Ch. 11, Sec 20].

Traditional conventional activated sludge processes typically have a large footprint. This can result in a high capital cost. Conventional activated sludge is a proven technology that is used all over and will be able to meet the projected discharge permit requirements. Conventional activated sludge processes tend to have high operation costs due to the large number of blowers involved in the system. Because of the large footprint required for this type of plant, the high capital costs associated with multiple basins and processes, the high operations and maintenance costs, and the fact that newer technology exists that has a similar quality of effluent, traditional oxidation ditch conventional activated sludge method of treatment will not be evaluated in further detail as a viable option for a regional treatment plant. However, newer technology exists that is similar to a conventional activated sludge process that will be evaluated in further. This technology uses simple control of the air flow distribution in the biological
process to create oxic and anoxic zones in the same basin. The specific technology is a Wave Oxidation© process in a Biolac® system.

### 3.4.1.1. Biolac® System Wave Oxidation© Process

The process diagram for this technology is similar to the conventional activated sludge process. The difference is that instead of having separate anoxic and oxic basins, the anoxic and oxic processes occur in the same basin, using a unique oxidation technology. The flow of wastewater through a plant with this technology is shown in Figure TM4-2.

The wave oxidation process works through rows of aerators located in the wave oxidation basin. The flow of air is controlled into the basin in alternating sequences producing moving aeration chains of oxic and anoxic zones within a long sludge age basin. When coupled with the proper basin dissolved oxygen control, this systematic cycling of these environments nitrifies and denitrifies the wastewater without recycle pumping or additional external basins [Parkson, 2007]. This process is considered a long sludge age biological treatment method. Following this biological process, the wastewater flows to the final clarifier and undergoes the same process as described for the conventional activated sludge process.

### 3.4.2. Sequencing Batch Reactors (SBR)

A Sequencing Batch Reactor Plant consists of sequencing batch reactors (SBRs) used for biological treatment of the wastewater. Using this type of mechanical plant, the wastewater is treated in a controlled environment with results which are very consistent and well within the allowed parameters of the expected discharge permit.

The flow of the wastewater through the plant is described as follows and is shown in Figure TM4-3. The wastewater flows through the head works first, the details of which were described in the section above.

After passing the head works, the wastewater flows to the sequencing batch reactors which are concrete tanks that utilize two tanks for continuous flow. One tank receives flow while the other completes its treatment cycle. Treatment in the sequencing batch reactors occurs in the following operational steps: fill, react, settle, decant/sludge waste, and idle. These steps are shown in an Aqua Excel™ phases of operation diagram shown in Figure TM4-4 [Aqua Aerobics, 2007].

During the fill operation, wastewater enters the SBR reactor. Initially, a complete mix of the contents occurs without the use of aeration, which assists in control of filamentous organisms, and is essential for systems requiring phosphorus removal. Eventually, during the filling process, aeration using mechanical blowers is introduced to promote biological reactions with the influent wastewater, promoting nitrification and de-nitrification.

During the react period, the wastewater flow is stopped while the mixing and aeration continue. During this process, nitrification and de-nitrification continues. In this process, the biomass existent in the reactors consumes the substrate under controlled environmental conditions.

When the mixing and aeration cease, the settling process begins. During this process the solids are allowed to separate from the liquid under calm conditions, resulting in a treated wastewater that can be discharged as effluent.

Following settling, the decanting/sludge waste process begins in which the treated wastewater is discharged to the disinfection process and a small amount of the sludge waste is removed as waste activated sludge (WAS). The remaining sludge stays in the reactor and is immediately ready to receive the next batch of raw wastewater. After removal, the waste
activated sludge is treated and disposed of as described in the conventional activated sludge process.

The idle period is used in a multi reactor system to provide time for one reactor to complete its fill phase before switching to another unit. Because idle is not a necessary phase, it is sometimes omitted.

After leaving the sequencing batch reactors, the treated wastewater is sent through a disinfection process, which is typically either chlorine treatment or UV disinfection. After disinfection, the effluent is discharged to surface waters or prepared for reuse.

The advantage to an SBR mechanical plant is that all of the treatment processes occur in the same tank, thus reducing the size of the footprint required for treatment. A disadvantage to this is that it requires more power and mechanical parts than other methods which results in higher operations and maintenance costs. Treatment using a regional SBR mechanical plant will be considered as a viable method and will be analyzed in further detail in the next technical memorandum.

3.4.3. Membrane Bio Reactors (MBR)

Membrane bio reactor technology involves a biological reactor integrated with an ultrafiltration membrane system. The process is similar to a conventional activated sludge plant, except that the clarifiers and settling basins are replaced with the ultrafiltration system. In an MBR plant, a high concentration of mixed liquor suspended solids is maintained within the biological treatment system. This is due to the fact that these suspended solids will not have to be settled out in a future process. They will be filtered by the ultrafiltration system. The MBR process is shown in Figure TM4-5.

The process begins when the wastewater enters the head works. The head works was described in the previous section and performs the same function for all processes.

After passing through the head works, the wastewater is sent to the biological treatment system which consists of an anoxic basin and aeration basin. This is where the mixed liquor occurs in the system. The mixed liquor is a well-aerated mixture of wastewater and sludge. The sludge is a mixture of water, organic and inorganic solids.

Following the biological treatment in the aeration basins, the wastewater is passed through the ultrafiltration system. There are many manufacturers of membranes in the ultrafiltration system. Each manufacturer’s system is proprietary. Basically, the ultrafiltration system filters the wastewater separating the water from the sludge present in the mixed liquor. The sludge from the ultrafiltration process can be returned to the system as return activated sludge (RAS) or can be wasted as waste activated sludge (WAS) using the same process described in the previous alternatives.

After passing through the ultrafiltration system, the wastewater passes through either a chlorine or UV disinfection system. This is the last stage of the process before the wastewater is discharged into surface waters or used as a reuse source.

The advantage to the MBR plant is that the ultrafiltration system provides a high level of treatment for the wastewater. Effluent concentrations of less than 5 mg/l for BOD$_5$ and TSS are possible with this type of plant. Also, the footprint of the plant is typically half to a quarter size of a conventional activated sludge system, making it easier to enclose or cover.

The disadvantage to this type of plant is that the operations and maintenance costs are high due to the cost of replacement for membranes in the ultrafiltration system. MBR plants are typically located where BOD$_5$ and TSS discharge permit levels are extremely low and difficult to meet with the other processes. For the Brider Valley, the BOD$_5$ and TSS levels that will be...
required are not extremely low and can be easily met with other cheaper technologies. For this reason, this method of treatment will not be evaluated further in this wastewater plan. An MBR plant is over-kill for this area based off of projected discharge permit standards.

3.5. Mechanical Treatment Plant Using Fixed Film Technology

The types of fixed film technology that will be considered for this study are rotating biological contactors (RBC) and trickling filters. Fixed film technology involves growing microorganisms on a media over which the wastewater passes for treatment. The growing microorganisms feed off of the organic material in the wastewater.

3.5.1. Rotating Biological Contactor (RBC)

A rotating biological contactor is a system in which microorganisms are grown on large disks rotating on horizontal shafts. The disks rotate in and out of the wastewater, both providing oxygen and food for the microorganisms. This process also eliminates the need for expensive blowers to pump air into a basin to provide air for the microorganisms. A schematic of a proprietary rotating biological contactor is shown in Figure TM4-6 [Westech, 2007]. Figure TM4-7 is a flow diagram of a rotating biological contactor process.

The wastewater flows through the headwork first. This process was described in detail in the section on conventional activated sludge. The head works serves the same function for all processes.

In the rotating biological contactor (RBC) process, biological treatment typically occurs in two parallel tanks where the environmental conditions are controlled to produce an active population of bacteria. The bacteria use the oxygen in the water to feed on the pollutants. The wastewater is detained in these tanks for 8 to 12 hours. Oxygen is provided by slowly rotating tubes or discs above the water and below the water. The fixed film is grown on the rotating parts. For some proprietary technologies, the rotating tubes also trap air while out of the water which is then released under the water which creates and activated sludge process working in combination with the fixed film. Activated sludge organisms will remove the bulk of the pollutants in the wastewater and nitrify the ammonia. The fixed film organisms produce excellent sludge-settling characteristics for the next step.

The effluent from those tanks, which consists of treated wastewater and bacteria flocculent, flows into a clarifier. In this tank, the sludge and bacteria flocculent settle to the bottom, and the treated water flows out through the top, over a weir. The water then passes through the disinfection process, and out of the plant as effluent.

Part of the sludge and flocculent which settles out in the clarifier is returned to the STM Aerotor tanks to help maintain a heavy inventory of bacteria (Return Activated Sludge or RAS). The remainder of the sludge (Waste Activated Sludge or WAS) is treated and disposed of as described previously.

Reuse of the treated effluent is common with this type of technology. In order to achieve Class A status, final filtration must be added to the processes. Also, a reuse pump station and pressure piping would be required to pump the water to its point of use. The amount of water that would be available for reuse would be determined by the State Engineer’s evaluation of the consumptive use of the underlying water right. This would be determined after a reuse application is filed with the state engineer. Costs for reuse are not part of this analysis.

This method of treatment is a highly efficient method which has low operations and maintenance costs due to the fact that there are no blowers in the activated sludge portion of the plant. Power costs are required for the rotating biological contactors, but this is less than for
blowers. Also, the footprint is smaller than a conventional activated sludge process. This method of treatment is proven in the neighboring state of Utah and will be evaluated further in this wastewater plan.

3.5.2. Trickling Filter

Trickling filter technology is a technology in which microorganisms are grown on a fixed media, such as rocks or plastic, located in a bed several feet deep. Wastewater is trickled from the primary sedimentation process intermittently over the bed. The biological and microbial slime growth attached to the bed purifies the wastewater as it trickles down. Typically, the water is introduced into the filter by rotating arms that move by virtue of spray reaction or motors. The treated water is collected by a sump beneath the bed that acts as a clarifier.

This technology is advantageous in areas of low flow and for small communities. The wastewater is sprayed over the filters, thus for higher flows, more filters are required. Typically, trickling filters are used as one stage in combined process plants. The disadvantages to this system are that the filters can be clogged by excess media growth, and if the flow is low, the water has to be re-circulated through the filter. Also, due to the low concentration of carbonaceous material in the water near the bottom of the filter, nitrogenous bacteria produce a highly nitrified effluent from low rate filters. Filter flies are a major problem with low-rate filters, since fly larvae are provided with an undisturbed environment in which to breed [Lindeburg, 2003]. For these reasons, a trickling filter plant will not be considered as a treatment method any further in this wastewater plan.

3.6. Pre-Packaged Mechanical Treatment Plants

Pre-packaged treatment plants are mechanical treatment plants that are in self contained units that are pre-manufactured off-site and shipped to their location. They typically consist of a metal container that contains a wide variety of options for the conventional process components of primary settling, biological treatment, and final clarification. For high quality effluent requirements, tertiary treatment using sand filtration, membrane filtration, dissolved air flotation and UV disinfection are available in these types of plants. The disadvantage to these plants is that they are designed for low-flow application, such as a subdivision or a very small community. Maximum flow for these units is approximately 250,000 gallons per day [Corix, 2007]. This method of treatment will be evaluated further for this master plan, due to the fact that the purpose of the plan is to unite the communities and provide one or two regional treatment facilities.

3.7. Screening of Treatment Methods

The sections above detail possible methods of treatment for the Bridger Valley. Preliminary screening has narrowed the methods down to three methods that will be evaluated in detail in Technical Memorandum No. 5. These methods include Biolac® Wave Oxidation© activated sludge, sequencing batch reactors, or rotating biological contactor technology. These methods of treatment will be evaluated in detail using economic and non-economic criteria.
4. SCOPING MEETING

As determined in Technical Memorandum No. 1, the planning region for this wastewater study includes most of the Bridger Valley. This area is significant in size and consists of many different communities along with widely dispersed county residents. The main purpose of this wastewater plan is to provide a regional solution to the existing wastewater problems that exist in the valley.

Initial examination of the planning region and all of the communities and areas involved demonstrate that there exists several different possible solutions for the wastewater collection and treatment problems in the valley. A thorough analysis of every solution is not in the scope of work for this wastewater plan. Due to this fact and in looking at preliminary alternatives for the valley as a whole, it was determined that a scoping meeting should be held with the stakeholders of the project to determine the primary direction to proceed with this plan and to screen alternatives based on the direction of the stakeholders. This scoping meeting was followed by discussions with the stakeholders at the Joint Powers Water Board Meetings that were held in August, November, and December.

The scoping meeting was held on May 30, 2007. The meeting was attended by the mayor of Lyman, Ralph Bradshaw, the mayor of Mountain View, Doug Smith, a representative from the Fort Bridger Sewer District, Jarrol H. Jepperson Sr., a representative from Lower Bench Water, Jim Levine, and by other stakeholders and members of the community. The attendance list from the meeting is shown in Appendix A along with the invitation letter that was sent out prior to the meeting.

The first part of the meeting was a discussion regarding the existing conditions and problems of the river systems and wastewater treatment systems in the valley. The information discussed in the meeting is the basis for Technical Memorandum No. 3.

After the initial discussion, possible solutions for each community in the valley were discussed. The solutions included solutions that were both localized and part of a regional wastewater solution. The power point presentation that was used to aid discussion in the meeting is included in Appendix A.

4.1. Regional Solution vs. Local Solutions

Two prevailing attitudes exist amongst the residents in the planning region. The first is an attitude that the many local wastewater problems are actually the small pieces of a larger valley wide problem that can only be resolved through a regionalized collection and treatment solution. The second is an attitude that local wastewater problems are best solved by local solutions.

Because these two attitudes exist, it was important to discuss regionalization versus localized solutions at the scoping meeting and determine whether or not regionalization is the direction in which the stakeholders want to proceed.

The following table shows a general comparison of a regional solution to local solutions pertaining to the Bridger Valley and the wastewater problems that exist.


## Comparison of Regionalization vs. Localization

<table>
<thead>
<tr>
<th>#</th>
<th>Issue</th>
<th>Regional Solution</th>
<th>Local Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Impaired Rivers</td>
<td>Provides regional clean up of rivers</td>
<td>Provides clean up in localized places</td>
</tr>
<tr>
<td>2</td>
<td>Public Health</td>
<td>Valley wide public health protection</td>
<td>Limited public health protection to localized portions of valley</td>
</tr>
<tr>
<td>3</td>
<td>Capital Cost</td>
<td>High initial capital costs</td>
<td>Lower capital costs initially</td>
</tr>
<tr>
<td>4</td>
<td>Cost to Users</td>
<td>Economy of scale (shared cost for projects)</td>
<td>Each community to fend for themselves</td>
</tr>
<tr>
<td>5</td>
<td>Receiving Funding</td>
<td>More funding available</td>
<td>Less funding available</td>
</tr>
<tr>
<td>6</td>
<td>State Support</td>
<td>WYDEQ in support of regional solution</td>
<td>Less support from WYDEQ</td>
</tr>
<tr>
<td>7</td>
<td>Environmental Awareness</td>
<td>Demonstrate pro-active solution</td>
<td>Solutions based on urgent needs</td>
</tr>
<tr>
<td>8</td>
<td>Sustainability</td>
<td>Eliminate future contamination issues</td>
<td>Localized contamination will occur in future</td>
</tr>
<tr>
<td>9</td>
<td>Economic Effect</td>
<td>Stimulate economic growth in area</td>
<td>Deter economic growth in area</td>
</tr>
</tbody>
</table>

### Table TM4-1: Comparison of Regionalization to Local Solutions

Technical Memorandum No. 1 and No. 3 detailed the impaired status of the river systems in the Bridger Valley. Wastewater collection and treatment on a regional level would decrease the contaminants entering the river systems and would be a global step to cleaning up the river systems. Local solutions would clean up the river systems in localized areas, leaving some areas in the same state that they are in until they are forced to do something. The regional solution would also promote valley wide public health protection by reducing the contaminants that could possibly enter drinking water sources and by providing safer recreation activities in the rivers in the valley.

Providing a regional solution will not be cheap and will require high initial capital costs. A majority of these capital costs will be incurred in collection lines due to the rural nature of the valley. Construction costs are constantly increasing and the cost of materials is increasing daily. The advantage to a regional solution is economy of scale. What this means is that by joining together to pay for projects, the cost per connection will be reduced. In all actuality, unless the communities join together and agree to pay for the improvement projects as a group, many of the required improvements are not financially possible. This is especially true in the lower bench area where the improvements are most needed. Leaving the communities in the valley to fend for themselves is not a good way to provide for the urgent wastewater needs that exist in the valley, and will result in nothing being done.

The Wyoming DEQ is in support of a regional solution and more funding will be available for a regional solution rather than individual local projects. Mountain View is ranked number one for need of funding on the WYDEQ FY2007 Clean Water State Revolving Fund Wastewater Treatment Priority List. Lyman is number 15 on that list.

Providing a regional collection and treatment system in the valley shows that the communities are concerned with cleaning up the environment and are pro-active in providing solutions to increase the health of the environment around them. This pro-active attitude results in temporary leniency from the DEQ during the planning process and during construction of
the project. The alternative to a pro-active solution is to do nothing until the state mandates it, and at that time it will end up costing the users more.

The great thing about a regional collection and treatment solution is that it provides a long term valley wide solution. If providing solutions is left at a local level, only urgent needs get addressed and the valley wide problems get worse. A regional treatment plant for the communities in the valley provides a solution now that will last for many years into the future. Many localized solutions are “band aid” solutions that are not long term. This is one of the most convincing arguments for regionalization.

A regional wastewater collection and treatment system will promote economic growth in the region. Along with economic growth comes more money from taxpayers that can go back into the communities to improve quality of life for those who live there. Local solutions to the existing problems could possibly promote economic growth on a local level, but the impacts would not be as substantial. Local solutions to the existing problems will also deter economic growth in some of the communities.

4.2. Scoping Meeting Results

The results of the scoping meeting were that the stakeholders recognize that serious problems exist with the impaired rivers and wastewater facilities in the valley and that the solution to these problems can only be accomplished if the communities unite and pursue a regional plan, preferably a plan that includes one regional treatment plant for the entire valley. All of the participants concurred in the meeting that this should be the objective for this regional wastewater plan.

From the scoping meeting, the author of this regional wastewater plan was given direction to proceed with a plan that provided collection from the key areas of the planning region to a regional facility for wastewater treatment. It was also determined that the facility should be some sort of a treatment plant, and that the communities did not want to deal with another lagoon system. Based off of this meeting, some treatment methods will be screened immediately and will not be considered further in this regional treatment plan.

4.3. Joint Powers Water Board Discussions

Following the scoping meeting, the authors of this document proceeded to develop a plan to provide wastewater collection to the key areas of the planning region and to treat the waste at a regional treatment facility. At the Joint Powers Board Meeting held on August 8th, 2007, this preliminary plan was presented to the stakeholders. The stakeholders agreed to continue with the plan of providing one regional treatment plant for the entire valley.

At the Joint Powers Water Board Meeting held on November 14, 2007 the projected capital costs and user rates were presented to the stakeholders using an ideal funding scenario. The stakeholders then decided that they wanted to take a look at two other alternatives that actually provided separate treatment plants in Mountain View and Lyman.

The results of the other alternatives were presented at the Joint Powers Water Board Meeting on December 12, 2007. Following a discussion with the stakeholders, an alternative was selected as the recommended alternative for this master plan. Selection of this plan is provided in Technical Memorandum No. 5.
5. SUMMARY

This document introduced and defined collection system repair and treatment methods. It is necessary that Mountain View, Lyman, and Fort Bridger reduce their inflow and infiltration into their wastewater systems.

Fort Bridger is in need of replacing their entire sewer collection system. Through preliminary screening of collection system repair methods, it is recommended that the method of replacement in this plan will be through pipe lining with a product that has a minimum 50 year design life. The cost of lining the whole system will be included in the cost estimate of the regional plan and will be based off of linear feet quotes from Insituform®.

It is recommended that Mountain View and Lyman use their existing inspection equipment to inspect their system and repair and replace damaged pipe in a localized method. They may also choose to line their pipes where damage has occurred. The cost of inspection and repair to the Town of Mountain View and Lyman will be included in the cost estimate of the regional plan. The cost estimate will include the cost to hire new personnel specifically for this job, along with a lump sum that may be used for repairs.

Through preliminary screening of treatment methods for wastewater treatment in the Bridger Valley, it was determined that a Biolac® Wave Oxidation© activated sludge sequencing batch reactors, and rotating biological contactor technology will be further evaluated as treatment methods for this regional plan. These methods for wastewater treatment will be evaluated using economic and non-economic criteria in Technical Memorandum No. 5.

Because of the rural nature of the valley, many possibilities for treatment and many different recommendations are possibilities for a regional plan. For this reason, a scoping meeting was held with the stakeholders of this project to determine a direction and focus for this plan. The results of the scoping meeting were that the stakeholders recognize that the river systems in the valley are seriously impaired due to fecal coliform and that serious problems exist with the individual wastewater facilities in the communities of the valley. The stakeholders determined that a solution to the existing problems could only be accomplished if the communities unite and pursue a regional plan that includes one regional treatment plant for the entire valley. All of the participants in the meeting were in favor of this decision.

The author of this regional wastewater plan was given direction to proceed with a plan that provided collection from the key areas of the planning region to a regional facility for wastewater treatment. It was also determined that the facility should be some sort of a treatment plant, and that the communities did not want to deal with another lagoon system.

Follow-up discussions regarding the scope of the master plan and regionalization were held at the Joint Powers Water Board meetings in August, November, and December. From these meetings, after costs were considered, it was determined that one regional treatment plant may not be the best solution for the valley. Other alternatives were discussed as possible regional solutions. The results of the other alternatives were presented at the Joint Powers Water Board Meeting on December 12, 2007. Following a discussion with the stakeholders, an alternative was selected as the recommended alternative for this master plan. Selection of this plan is provided in Technical Memorandum No. 5.
6. REFERENCES

Insituform®, Insituform® CIPP- Sanitary Sewer/Storm
http://www.insituform.com/content/342/cipp_technology.aspx

Lindeburg, Michael R., 2003, Civil Engineering Reference Manual for the PE Exam; Ninth Edition, Chapter 30-2: Activated Sludge and Sludge Processing, pp. 30-2 & Figure 30.1, Chapter 29-2: Trickling Filters, pp. 29-8

Wyoming Department of Environmental Quality (WDEQ), Water Quality Division, Rules and Regulations, Chapter 11, Section 20(f)(i) Sludge Handling, Treatment, and Disposal, Disposal, Degree of Stabilization

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http://www.corix.com/index.htm

Aqua Aerobics PDF Literature, Aqua Excel Brochure, 2007


http://www.lagoonsonline.com/richard.htm

Nelson Environmental Inc., Ammonia Reduction…The Solution
http://www.nelsonenvironmental.com/projecttypes/ammoniareduction.htm

Parkson Corporation, Processes, Biological Nutrient Removal (BNR)
Figure TM4-1: Conventional Activated Sludge Flow Diagram
Figure TM4-2: Biolac® Wave Oxidation© Flow Diagram
Figure TM4-3: Sequencing Batch Reactor Flow Diagram
The time-managed concept of the AquaExcel™ system promotes direct process control with outstanding operational flexibility to assure superior performance.

**Mix Fill**
- Influent enters reactor
- Complete mix of contents is achieved without use of aeration
- Controls filamentous organisms
- Essential for systems requiring phosphorus removal

**React Fill**
- Influent flow continues under mixed and aerated conditions
- Aeration may be intermittent to promote aerobic or anaerobic conditions
- Nitrification and denitrification is easily managed
- Aeration source may also be turned down during low flow conditions to conserve energy

**React**
- Influent flow is terminated
- Mixing and aeration continue in absence of raw waste
- Dissolved oxygen probes can be used to deliver oxygen on "as needed" basis without loss of mixing
- Provides a treatment barrier that separates the Fill phases from the Satta and Decant Non-Fill phases

**Satta**
- Influent flow does not enter reactor
- Mixing and aeration cease
- Ideal solids/liquid separation is achieved due to perfectly quiescent conditions
- Adjustable time value allows settling time to match prevailing process needs

**Decant/Sludge Waste**
- Influent flow does not enter reactor
- Mixing and aeration remain off
- Decantable volume removed by subsurface withdrawal
- Reactor is immediately ready to receive next batch of raw influent
- A small amount of sludge is wasted near end of each cycle

*Figure TM4-4: Phases of Operation of Aqua Excel™ SBR [Aqua Aerobics, 2007]*
Figure TM4-5: Membrane Bio Reactor Flow Diagram
Mechanical Simplicity

Influent Feed
The influent to the STM is the combination of raw wastewater and RAS.

Simple Roller Chain
The drive chain is constructed of hardened steel components.

Low HP Drive Unit
The simple drive unit is easily accessible and is controlled by a VFD. Drive lubrication is the only routine maintenance item in this process.

Steel Center Shaft
The center shaft provides connecting points for the STM frame assembly.

Steel Structural Frame
The steel structural frame is designed to transfer the loads from the media to the supports at the wall.

STM Media
The special STM media discs maximize the surface area for the fixed film, while optimizing the captured air volume and release depth for efficient aeration.

STM Effluent
The effluent from the STM will flow to a secondary clarifier for further treatment.

Return Activated Sludge
The RAS will be returned to the head of the STM where it is combined with the raw influent.

Nylon Bearings
The specially designed nylon bearing assemblies are designed for no maintenance. The bearings include a 10-year guarantee.

Mixing Paddle
To allow the system to be deep enough to develop zones that are oxygen limited, a mixing paddle is added to ensure mixing.

Figure TM4-6: Schematic of STM-Aerator™ RBC [Westech, 2007]
Figure TM4-7: Rotating Biological Contactor Flow Diagram
APPENDICES
APPENDIX A
SCOPING MEETING INVITATION LETTER, ATTENDANCE SHEET, AND
POWER POINT PRESENTATION
Bridger Valley Regional Sewer Master Plan

To:    Doug Smith: Mayor, Town of Mountain View – PO Box 249, Mt. View, WY 82939
               Gerry Zimney: Chairman, BVJPB – PO Box 1150, Lyman, WY 82937
               Ralph Bradshaw: Mayor, Town of Lyman – PO Box 300, Lyman, WY 82937
               Curt Bindl: Fort Bridger Water & Sewer District – PO Box 99, Ft. Bridger, WY 82933
               Bruce Bluemel: Owner, Urie Wastewater System – PO Box 1229, Lyman, WY 82937
               Bob Stoddard: Commissioner, Uinta County – 225 9th Street, Evanston, WY 82930
               Craig Welling: Commissioner, Uinta County – 225 9th Street, Evanston, WY 82930
               Mick Powers: Commissioner, Uinta County – 225 9th Street, Evanston, WY 82930
               Kerri Sabey: Director, Uinta County Conserv. Dist. – PO Box 370, Lyman, WY 82937
               Julie Bluemel: Representative, Lower Bench Water and Sewer District –
               Leah Craft: Wyoming DEQ – 122 W. 25th St., Herschler 4 West, Cheyenne, WY

From: Steve Hansen; P.E. Project Manager, Sunrise Engineering, Inc.

Date: 5/16/2007

RE: Announcement of Scoping and Information Gathering Meeting to be held May 30, 2007 at 7:00 p.m. – Mountain View Town Hall

The purpose of this letter is to invite Stakeholders of the Bridger Valley Regional Sewer Master Plan to a meeting to receive an update of the progress of the Master Plan Project. There will be a brief presentation of the Master Plan Study; after which, input will be gathered and questions will be addressed. The results of this meeting will form the basis for the scope and extent of the Master Plan, and ultimately, the design parameters of future Bridger Valley Sewer Systems.

A key objective of the meeting will be to better define what areas and facilities of the valley are to be included in the valley-wide wastewater collection and/or treatment system planning. Environmental issues, land development, existing individual system capacities, and potential treatment options will be discussed. Each entity should invite interested people from their group.

Your input would be appreciated.

12227 South Business Park Dr., Ste 220, Draper, Utah 84020 – TEL 801-523-0100 FAX 801-523-0990
Bridger Valley Regional Wastewater Master Plan

Scoping Meeting Presentation

Meeting Purpose

- Update progress
- Discuss ideas
- Determine high priority scenarios for cost analysis
- Answer questions
Project Purpose

- Bridger Valley High on DEQ priority list
- Public health
- Drinking water protection
- Environmental protection

Key Issues Driving Master Plan

1. Condition of Smiths Fork and Blacks Fork
2. Condition of lower bench
3. Performance of Mountain View wastewater treatment system
4. Performance of Lyman wastewater treatment system
5. Performance of Fort Bridger wastewater treatment system
6. Performance of Urie wastewater treatment system
Condition of Smiths Fork/Blacks Fork Rivers

- Currently on 303(d) List for impairment due to fecal coliform bacteria
- Existing agriculture contamination issues
- High surface runoff
- Existing failing septic tanks/mound systems
- High ground water
E-Coli Impairment

(Diagram from Black's Fork/Smith Fork Watershed Report)

Lower Bench

- Area extends from county property outside of Fort Bridger to north of Lyman below the upper bench
- Existing treatment by septic system, mound system, or direct discharge to streams and rivers
- Main subdivisions
  - Hegal/Brinton subdivisions: approx. population = 220
  - Subdivision #1: approx. population = 100
  - Subdivision #2: approx. population = 200
  - K.O.A campgrounds = 18 hookups
Condition of Lower Bench

- Failing septic systems & mound systems due to saturated, impervious soils
- Direct wastewater discharge to surface waters
- High ground water
- Surface water contamination due to agriculture

Mountain View Lagoon Treatment System

- Three cell aerated lagoon treatment system with chlorination prior to discharge
- Discharge to class 2AB waters
- 2007 population on system = 1323
- 2027 projected population =1966 (assumed 2% growth)
- Design criteria: 100 gallons/person/day
Mountain View Lagoon Treatment System Performance

- Currently at 133% of hydraulic capacity (i.e. insufficient detention time in system)
- Currently at 85% of organic capacity
- 100% organic capacity expected in 2012
- In compliance with discharge permit after installing diffuser
- Historical non-compliance with discharge permit

Lyman Treatment System

- Three cell aerated lagoon treatment system with chlorination prior to discharge
- Discharge to class 3B waters
- 2007 population on system = 2080
- 2027 projected population = 3091 (Assuming 2% Growth)
- Design criteria: 100 gallons/person/day
Lyman Lagoon Treatment System Performance

- Currently at 51% of hydraulic capacity (i.e. sufficient detention time in system)
- Currently at 47% of organic capacity
- Non-compliant with discharge permit- residual chlorine & TDS influent recording

Fort Bridger Treatment System

- Two cell aerated lagoon treatment system with chlorination prior to discharge
- Discharge to class 2AB waters
- 2007 population on system = 525
- 2027 projected population = 779 (assumed 2% growth)
- Design criteria: 100 gallons/person/day
Fort Bridger Lagoon Treatment System Performance

- Currently at 30% of hydraulic capacity (i.e. sufficient detention time in system)
- Currently at 13% of organic capacity
- Possible non-compliance due to < 85% BOD removal

Urie Treatment System

- One cell non-aerated non-discharging lagoon
- 2007 population on system = 250
- 2027 projected population = 373 (assumed 2% growth)
- Design criteria: 100 gallons/person/day
Urie Lagoon Treatment System Performance

- Currently at 125% of hydraulic capacity (i.e. insufficient detention time in system)
- Currently at 155% of organic capacity
- Non-compliance due to proximity to existing houses (23 houses within 500 ft.)

Treatment Options

- Localized community treatment options
- Regionalized treatment options
Hegal/Brinton Subdivision Treatment Options

1. Install collection system
2. Construct localized lagoon system
3. Localized packaged treatment plant
4. Pump to Lyman lagoons
5. Gravity flow to regionalized treatment plant

Map of Hegal/Brinton Treatment Options
Mountain View Treatment Options

1. Expand existing lagoon system
2. Pump all or part to Lyman lagoons
3. Construct sewer treatment plant
   a. In M.V. for only M.V.
   b. Packaged treatment plant in M.V.
   c. Regionalize and locate at lowest point in the valley

Map of Mountain View Treatment Options
Lyman Treatment Options

1. Do nothing - apply for re-classification of receiving stream or add de-chlorination after chlorination process
2. Accept waste from lower bench & Urie
3. Accept waste from M.V. and expand lagoons in 2016
4. Gravity flow to new regionalized treatment plant

Map of Lyman Treatment Options
Urie Treatment Options

1. Expand lagoon system and implement maintenance program
2. Install localized packaged treatment plant
3. Gravity flow to Lyman for treatment at lagoon system
4. Gravity flow to Lyman collection and then to regionalized treatment plant

Map of Urie Treatment Options
Fort Bridger Treatment Options

1. Do nothing- maintain lagoons
2. Expand lagoons in future
3. Install localized packaged treatment plant
4. Gravity flow to regionalized treatment plant
   and pick up high density areas

Map of Fort Bridger Treatment Options
Pros of Regionalization

- Improve quality of impaired rivers
- Economy of scale (capital & operational costs)
- Bridger valley is high on Wyoming DEQ list of need
- Lots of funding available for projects
- Support future growth
- Being pro-active in providing solutions to treatment problems
- Public health protection

Cons of Regionalization

- Capital costs
- Local politics
- Topography and geography
- Additional collection infrastructure needed for regionalized treatment plant