Final Report
for the
Sheridan Raw Water Supply Project
(Cemetery Irrigation)
Level II

Prepared for:
Wyoming Water Development Commission
Herschler Building, 4th Floor-West
122 W. 25th Street
Cheyenne, WY 82002

and

City of Sheridan
P.O. Box 848
Sheridan, WY 82801

Prepared by:
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Sheridan, WY 82801

October, 1998
Final Report

WITHDRAWN

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1.0 Introduction

1.01 PURPOSE OF STUDY

The purpose of this study is to perform a Level II investigation of the potential for developing a raw water irrigation supply for the Sheridan city cemetery.

This raw water supply study (1) determines the diversion requirements to meet the needs of the cemetery, (2) prepares conceptual level designs and cost estimates, (3) addresses subsurface/geotechnical considerations, (4) completes an economic study and ability to pay analysis, and (5) determines permitting and environmental constraints.

This Report provides the Wyoming Water Development Commission (WWDC) and the City of Sheridan results of the investigation performed on this study. It also provides recommendations for the implementation of proposed improvements as well as background information which was used in this investigation. It is intended that this report be used to allow this project to proceed into Level III in 1999. Once funding is finalized, design and construction would then proceed with the new system anticipated to be operational for the year 2000 irrigation system.

If the irrigation of the city cemetery with raw water diverted from Big Goose Creek is feasible, the following benefits will be achieved:

• Improved Use of Water Resources

By converting the water source for the irrigation of the cemetery from Sheridan’s treated water system to this untreated source, improved utilization of water resources will be achieved. Part of the Corps of Engineers 404 Permit process for Twin Lakes Dam, which was constructed as part of the WWDC funded Sheridan Area Water Project and provides stored water for the City of Sheridan, required the development of a water conservation plan. This plan requires the per capita water usage for the Sheridan Area Water System be reduced. Converting the irrigation of the cemetery to an alternative source is one means of complying with this order.

• Improved Water Supply Pressures Within the City

The Sheridan Area Water System consists of multiple pressure zones and distribution systems. The cemetery is within a distribution system called the South Hill Area. This area was recently studied to evaluate options for improving pressures during peak demand times, which occur during the summer when irrigation is the heaviest. The cemetery is the largest water user within this distribution system. Converting the cemetery to this alternate irrigation source would reduce the peak demand requirements for this area, thus providing some improvement in pressures for the residents of the area. This study was partially funded by the WWDC through the Sheridan Area Water Supply Joint Powers Board.

• Water Rights

In August 1996 the State Board of Control completed a hearing process involving the existing water rights for the City of Sheridan. That process was initiated by a ranch which
filed an abandonment petition against a portion of the City's water rights, which are proposed for reactivation through this project. The order established by the Board of Control at the conclusion of this matter stated that the majority of the City's direct flow water rights would continue to be located at a diversion point approximately 12 miles west of Sheridan. It further ordered that 3.0 cubic feet per second (cfs) be allowed to be diverted at three points closer to the City of Sheridan for purposes which include irrigation of the cemetery.

• Improved Operation and Maintenance

The current system which irrigates the cemetery is generally in poor condition. Also, irrigating of the cemetery is restricted due to the pressure problems discussed above. Part of this project would involve the reconstruction of the irrigation facilities for the cemetery. These improved facilities would reduce the maintenance requirements associated with the current system. By establishing a separate source of water for the cemetery, the operators would be able to irrigate the cemetery much more efficiently, without usage restrictions currently associated with irrigation practices through the City's treated water system. Thus, a savings in limited operation and maintenance resources for this facility would be achieved.

1.02 AUTHORIZATION

The Sheridan Raw Water Supply Level II Study was authorized by the Wyoming Water Development Commission in a contract with MSE-HKM, Inc. of Sheridan, Wyoming dated June 4, 1998. The contract authorizes two phases for the project. The scope of each phase (Phase 1 - Analysis of Alternatives and Phase 2 - Conceptual Design and Cost Estimates) are presented in the contract. All work is to be completed by November 1, 1998.

1.03 PROJECT LOCATION

The project is located in the west central part of the City of Sheridan. Both the cemetery and the proposed diversion point are within the Sheridan city limits (see Figure 1). This location is in the NW¼ S34 T56N R84W. Figure 1 also shows the South Hill Area distribution system.

1.04 CONSULTANT TEAM

The study team for this Level II project includes the prime consultant MSE-HKM, Inc. of Sheridan, Wyoming. Subconsultants include Pilch Engineering (geotechnical aspects and assessment of an infiltration gallery water source), Carl Thuesen (landscape architecture, planning and cost estimates for the irrigation distribution system), and Prestfeldt Surveying (project surveying).
1.05 CURRENT IRRIGATION OF THE CEMETERY

The city cemetery is currently irrigated from the City of Sheridan municipal water system. Connections to the existing water system are located at Ash and Meridian, Birch and Meridian, and the west end of Huntington (see Figure 2). The cemetery is located within the South Hill Area distribution system of the city (see Figure 1). The South Hill Area is a separate distribution system which is fed by water transmission mains from both the Sheridan and Big Goose water treatment plants. Transmission mains in the vicinity of the cemetery are primarily in the 6-inch size. These pipe sizes and the limitation of supplying the South Hill Area in general, limit both the irrigation practices at the cemetery and the amount of water which can be applied. As discussed under the Purpose of Study, resolving this issue is one of the primary project objectives.

Distribution main lines throughout the cemetery are shown in Figure 2. These distribution lines are primarily 3 to 6-inch in size. Again, their size limits flows and the effectiveness of the irrigation system. These lines are also quite old and in poor condition due to corrosion. Repairs must frequently be made. Again, one objective is to upgrade the existing deteriorated distribution system to allow the operation and maintenance of the system to become more efficient.

Since the irrigation distribution system carries treated water, all usage points coming off this system are potable. The proposed improvement plan calls for replacement of the existing undersized and deteriorated distribution (sprinkler) system. The new system will be fed from the raw water source. Certain potable water mains will need to remain in place or be replaced as appropriate, to provide potable water as desired.

The hydraulic gradeline of this city water pressure zone is 4,038' under static conditions, however under peak demand days this gradeline reduces considerably in the cemetery area. The elevations shown in Figure 3 can be used to calculate pressures at various points in the cemetery. If the system hydraulic gradeline has reduced to 4,010' under a heavy demand condition, pressures at an elevation of 3,875' will be approximately 58 psi. This, of course, is prior to any losses in the distribution piping, piping to the sprinkler heads, and the heads themselves. Design pressures for the new system will be reviewed.

All water entering the cemetery is metered at the three meter points on the west end of Huntington and at the Birch and Ash connection points to the main on Meridian (see Figure 2). At these latter two points, upstream pressure sustaining valves are used to maintain a certain minimum pressure in the city distribution system. If the pressure drops below the level set on this valve (approximately 40 psi at Birch and slightly higher at Ash) the valve will not open. Therefore, the water is preserved for usage in the residential area and no water is delivered to the cemetery. The city periodically adjusts these valves to maintain pressures in the South Hill Area. These adjustments result in frequent loss of irrigation water, particularly for the higher areas in the cemetery during the peak demand days of the summer. It is, of course, on the hotter, drier days where water needs to the cemetery are also at their greatest; currently, irrigation is frequently curtailed at these times.

It is the higher areas of the cemetery that are particularly under watered because of their elevations. The caretakers report that during hot weather, brown spots will develop despite their best efforts.
Many of the laterals to the sprinkler heads consist of galvanized steel pipe. The condition of this pipe is very poor due to corrosion. Leaks frequently occur, resulting in the need for repairs. Rust from inside of the pipe also accumulates in sprinkler heads requiring removal. The condition of this pipe contributes significantly to the maintenance of this system.

The cemetery has been in use for burials since about 1890. Much of the existing water distribution piping was installed in the 1930s. Four inch and larger pipe is generally cast iron while 3-inch and smaller pipe is generally galvanized steel. At more than 60-years old, this metallic pipe has reached the end of its useful life.

1.06 CURRENT OWNERSHIP, OPERATION AND MAINTENANCE

Ownership of property in the cemetery is shown in Figure 4. The City of Sheridan owns the majority of the area. Various lodges (Elks, Eagles, Masons, and Odd Fellows) have title to certain areas throughout the cemetery. The City of Sheridan performs all burials in all areas. City staff performs the irrigation, mowing, and all other maintenance for the city areas. The lodges have their own caretakers for operating their irrigation systems, mowing and other maintenance. Exceptions to the lodges performing their own irrigation are the two small areas near the maintenance shop which are owned by the Eagles and the Masons. These areas are incorporated into the city irrigation systems and watered with the city areas. Individuals periodically perform watering and mowing on their family lots if they so choose.

Contacts for information on the lodge areas are as follows: Elks, John Mitchell 674-7297; Masonic #8, Bob Foss 674-9429; Eagles, Bob Foss 674-9429; Masonic #43, Gene Rexroat 674-9584; Odd Fellows, Joyce Forry 672-2238.

Most of the lodges water their areas at night. City watering can occur either during the day or at night, depending on schedules and the availability of water. Since the city facilities are not automated, irrigation at night is not easily performed and day watering is generally used.

The city owns adjacent areas for future expansion. The Elks also owns vacant land contiguous to the cemetery into which expansion is proposed. One small contiguous area on the east side of the cemetery with expansion potential is privately owned. These expansion areas are included in the planning for future irrigation by the proposed improvements.

The cemetery was recently replatted by Prestfeldt Surveying, therefore current information exists on property lines.

1.07 WATER DEMAND PROJECTIONS

Historical Usage

Water meters were installed on the three mains which supply water to the cemetery in 1996. Table 1 shows the readings from these three meters for the period from mid-May to mid-September. During this time period, an average of approximately 10.5 million gallons were supplied to the cemetery each year. This results in an average day use of about 86,000 gallons and an average day use during the peak two month period of 142,000 gallons.

Daily meter readings were taken during August and early of September, 1998. These show a peak day of 335,000 gallons, with several days running close to 200,000 gallons.
<table>
<thead>
<tr>
<th>Period</th>
<th>From</th>
<th>To</th>
<th>Ash (gal)</th>
<th>Birch (gal)</th>
<th>Huntington (gal)</th>
<th>Total Usage (gal.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/17/96*</td>
<td>7/18/96*</td>
<td></td>
<td>2,948,443</td>
<td>1,893,136</td>
<td>178,261</td>
<td>5,019,840</td>
</tr>
<tr>
<td>7/19/96</td>
<td>9/17/96</td>
<td></td>
<td>2,061,720</td>
<td>2,397,870</td>
<td>372,753</td>
<td>4,832,343</td>
</tr>
<tr>
<td>5/14/97</td>
<td>7/18/97</td>
<td></td>
<td>3,088,845</td>
<td>1,983,285</td>
<td>186,750</td>
<td>5,258,880</td>
</tr>
<tr>
<td>7/19/97</td>
<td>9/17/97</td>
<td></td>
<td>1,568,700</td>
<td>1,942,200</td>
<td>590,130</td>
<td>4,101,030</td>
</tr>
<tr>
<td>5/15/98</td>
<td>7/24/98</td>
<td></td>
<td>2,319,435</td>
<td>1,863,765</td>
<td>263,691</td>
<td>4,446,891</td>
</tr>
<tr>
<td>7/25/98</td>
<td>9/18/98</td>
<td></td>
<td>6,107,000</td>
<td>1,261,000</td>
<td>593,000</td>
<td>7,961,000</td>
</tr>
</tbody>
</table>

Peak Monthly Demand (gal/month) 4,265,000
Average Day During Peak Month (gal/day) 142,000
Average Day 5/15-9/15(gal/day) 86,400

* Values shown for this time period were estimated from 1997 data from the same period.

July 1998 is a good example of a relatively hot, dry period where cemetery usage was significantly restricted. The pressure sustaining valve did not allow watering on many days during July 1998; at other times, valves to the irrigation distribution systems were simply closed. Water usage during July 1998 averaged approximately 150,000 gallons per day even though total rainfall for the month was less than 1-inch and daytime high temperatures frequently exceeded 90°.

Historical usage is not a good indicator of projected needs. Frequently the city restricts water usage to the cemetery because of high demands in the South Hill Area and the need to preserve more of the water for domestic usage. Irrigation is also limited by the facility, since much of the system is manually operated and in poor condition, resulting in the need for frequent repairs. The limited staff cannot accomplish optimum irrigation during times when water is available.

Table 1 shows the July 25 to September 18, 1998 period was the highest two-month usage period by far. Still, when the operators of the various systems were contacted about this study, they commented on the lack of adequate water supply this past summer because of the restrictions on use.

The supply of potable water to the maintenance building is not separately metered.

Soils, Grass and Weather

The soil at the cemetery consists primarily of sand and sandy gravel, generally overlaid with 1 to 2-feet of topsoil. In the southeastern area of the cemetery, topsoil is 6-inches or less. Five test holes were dug to a depth of about 36-inches. The topsoil was classified as a clay loam, typically a medium clay loam, but heavier in the north and west. At 24-36 inches, a lighter clay loam was generally found, with a sand/gravelly loam in the southerly and westerly areas.

The grass at the cemetery is categorized as turf grass. Daily consumptive rates for this grass are based upon maximum evapotranspiration (ET) values for turf grass in Sheridan as published
by the Wyoming Water Resource Center in *Consumptive Use and Consumptive Irrigation Requirements in Wyoming*. According to this document, the highest ET conditions occurred in June when 0.29 inches per day are needed. July and August follow closely at 0.28 inches per day. These values are used to represent design conditions for turf irrigation systems.

These ET values might be considered a "worst case". This rate of application is not needed at all times during all years. It is more of a design rate to assure the supply system is adequate to meet needs in drier years.

Table 2 summarizes temperature, precipitation, and wind data from the National Weather Service. Averages are based on a 30-year period.

<table>
<thead>
<tr>
<th>TABLE 2</th>
<th>SHERIDAN WEATHER DATA</th>
</tr>
</thead>
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<tr>
<td></td>
<td>APR</td>
</tr>
<tr>
<td>TEMPERATURE °F</td>
<td></td>
</tr>
<tr>
<td>Normals</td>
<td></td>
</tr>
<tr>
<td>- Daily Maximum</td>
<td>57.1</td>
</tr>
<tr>
<td>- Daily Minimum</td>
<td>30.4</td>
</tr>
<tr>
<td>- Monthly</td>
<td>43.8</td>
</tr>
<tr>
<td>Extremes</td>
<td></td>
</tr>
<tr>
<td>- Record Highest</td>
<td>87</td>
</tr>
<tr>
<td>- 90° and above (# days)</td>
<td>0.0</td>
</tr>
<tr>
<td>MEAN NUMBER OF DAYS:</td>
<td></td>
</tr>
<tr>
<td>- Clear</td>
<td>5.3</td>
</tr>
<tr>
<td>- Partly Cloudy</td>
<td>9.1</td>
</tr>
<tr>
<td>- Cloudy</td>
<td>15.6</td>
</tr>
<tr>
<td>RELATIVE HUMIDITY (%)</td>
<td></td>
</tr>
<tr>
<td>Hour 05</td>
<td>74</td>
</tr>
<tr>
<td>Hour 11</td>
<td>49</td>
</tr>
<tr>
<td>Hour 17</td>
<td>44</td>
</tr>
<tr>
<td>Hour 23</td>
<td>67</td>
</tr>
<tr>
<td>PRECIPITATION (ins):</td>
<td></td>
</tr>
<tr>
<td>- Normal</td>
<td>1.72</td>
</tr>
<tr>
<td>- Maximum Monthly</td>
<td>4.80</td>
</tr>
<tr>
<td>- Minimum Monthly</td>
<td>0.18</td>
</tr>
<tr>
<td>WIND:</td>
<td></td>
</tr>
<tr>
<td>Mean Speed (mph)</td>
<td>9.8</td>
</tr>
</tbody>
</table>

Proposed Irrigation Quantities

Figure 4 shows the cemetery areas to be irrigated initially and those areas set aside for future growth. A total of approximately 57 acres are proposed for initial irrigation. This includes roads, therefore ultimately this area will be slightly smaller however, 57 acres is being used for planning. Areas will be irrigated in zones as discussed in Section 3.05. These 57 acres will be broken down into about ten separate watering zones.

At this time it is assumed approximately 20 additional acres will eventually be irrigated. Some of the area in the Elks tract on the west side of the cemetery is too steeply sloped for burial sites. Therefore, the exact amount of additional area to be irrigated will depend on the extent of the areas eventually converted into cemetery. Twenty acres are used in this planning study to size supply facilities, so approximately 77 acres may be eventually served. Adjustments will be needed as these areas are designed with the automated irrigation system. Actual water application quantities will depend not only on the area being served, but ET rates and the length of time used to complete irrigation for the day.
Table 3 shows the maximum water consumption based on ET. These quantities will be the design quantities for this project. This shows that during the June through August period, approximately 440,000 gallons of water are required daily based on the area and ET rates. The design flow rates and, therefore, the sizing of the system components depend on the amount of time allowed to apply this water. As discussed on page 36, an 8-hour period is recommended for application of the daily irrigation water.

1.08 EXISTING FACILITIES

Existing water mains which serve the cemetery are shown in Figure 2. Most of these lines were installed in the 1930s and will be replaced as part of the improvements proposed under this study. As discussed in the following section, potable water will be maintained and even upgraded to the maintenance building area. The fire hydrant on Ash Street, within the cemetery north of Meridian, will also remain in place. All other distribution lines will either be abandoned in place or removed. New transmission and distribution supply lines will all be connected to the new raw water supply system.

The condition of the systems installed, owned and operated by the lodges are described in the following narratives. Information on each system was obtained from the respective caretakers for each system. Since the lodges actually own these facilities, they will not necessarily be replaced with the proposed project. Any improvements to the distribution system in areas owned by the lodges would be done at their cost. At their discretion, the lodges may want to take advantage of the economy of scale and timing of this construction project to upgrade facilities at a reasonable cost. Upgrading would be beneficial to the overall system, as it will result in a more uniform system including pipe materials and sprinkler heads. It is believed at this time that the existing sprinkler heads used in the lodge areas will be compatible with the new supply system, however some adjustments may be required by the lodges. It will also be recommended they standardize their heads and move toward a larger nozzle, again for uniformity with the new system. The existing lodge systems will be connected to the new mains as appropriate. Currently lodges set the times of the watering of these systems and perform this work. Under the proposed programmable automatic system, all of this will be done through the central controller. Figure 5 illustrates the system in each lodge area as discussed below.

Elks: The Elks' system connects to the city main which leads to the maintenance building on the east side of the Elks' property. Their distribution system extends from this point throughout their area currently being used. The system in the eastern portion of this area is reportedly approximately 50-years old, however they believe it is still in acceptable condition. The western portion of this area is newer and reportedly in good condition. Their distribution system consists of three controllers which operate approximately 26 different watering zones. The area south of their currently used area does not have an irrigation system.

Eagles: The Eagles' area adjacent to the city maintenance building is included with the city distribution system. This piping is in poor condition and is proposed for replacement. The Eagles' area near the main gate is reportedly in good condition and is not proposed for replacement as part of this project.

Masonic #43: The Masonic #43 area near the main gate has an irrigation system installed from their maintenance shed to the east. This system is on electronic timers for automatic watering. One connection on Ash Street serves this system. This
<table>
<thead>
<tr>
<th></th>
<th>Unit</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max ET</td>
<td>IN</td>
<td>5.65</td>
<td>6.76</td>
<td>8.62</td>
<td>8.64</td>
<td>8.76</td>
<td>6.09</td>
<td>4.25</td>
<td>48.77</td>
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<tr>
<td>Daily ET</td>
<td>IN</td>
<td>0.19</td>
<td>0.22</td>
<td>0.29</td>
<td>0.28</td>
<td>0.28</td>
<td>0.20</td>
<td>0.14</td>
<td></td>
</tr>
<tr>
<td>Daily ET</td>
<td>FT</td>
<td>0.016</td>
<td>0.018</td>
<td>0.024</td>
<td>0.023</td>
<td>0.024</td>
<td>0.017</td>
<td>0.011</td>
<td></td>
</tr>
<tr>
<td>Cemetery Area</td>
<td>AC</td>
<td>57</td>
<td>57</td>
<td>57</td>
<td>57</td>
<td>57</td>
<td>57</td>
<td>57</td>
<td></td>
</tr>
<tr>
<td>Daily Consumption</td>
<td>CF</td>
<td>39,000</td>
<td>45,100</td>
<td>59,500</td>
<td>57,700</td>
<td>58,500</td>
<td>58,500</td>
<td>42,000</td>
<td>48,77</td>
</tr>
<tr>
<td>Daily Consumption</td>
<td>GAL</td>
<td>291,500</td>
<td>337,500</td>
<td>444,500</td>
<td>431,500</td>
<td>437,500</td>
<td>314,000</td>
<td>212,000</td>
<td>2,468,500</td>
</tr>
<tr>
<td>Monthly Consumption</td>
<td>GAL</td>
<td>8,744,000</td>
<td>10,462,000</td>
<td>13,341,000</td>
<td>13,372,000</td>
<td>13,558,000</td>
<td>9,425,000</td>
<td>6,578,000</td>
<td>75,480,000</td>
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<tr>
<td>8 HR Daily Flow</td>
<td>GPM</td>
<td>610</td>
<td>700</td>
<td>930</td>
<td>900</td>
<td>910</td>
<td>650</td>
<td>440</td>
<td></td>
</tr>
<tr>
<td>16 HR Daily Flow</td>
<td>GPM</td>
<td>300</td>
<td>350</td>
<td>460</td>
<td>450</td>
<td>460</td>
<td>330</td>
<td>220</td>
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<tr>
<td>24 HR Daily Flow</td>
<td>GPM</td>
<td>200</td>
<td>230</td>
<td>310</td>
<td>300</td>
<td>300</td>
<td>220</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Future Expansion</td>
<td>AC</td>
<td>20</td>
<td>21</td>
<td>22</td>
<td>23</td>
<td>24</td>
<td>24</td>
<td>25</td>
<td>26</td>
</tr>
<tr>
<td>Daily Consumption</td>
<td>CF</td>
<td>13,700</td>
<td>15,800</td>
<td>20,900</td>
<td>20,200</td>
<td>20,500</td>
<td>14,700</td>
<td>10,000</td>
<td>115,800</td>
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<tr>
<td>Daily Consumption</td>
<td>GAL</td>
<td>102,500</td>
<td>118,500</td>
<td>156,000</td>
<td>151,500</td>
<td>153,500</td>
<td>110,000</td>
<td>74,500</td>
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<td>Monthly Consumption</td>
<td>GAL</td>
<td>3,068,000</td>
<td>3,671,000</td>
<td>4,681,000</td>
<td>4,692,000</td>
<td>4,757,000</td>
<td>3,307,000</td>
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<td>8 HR Daily Flow</td>
<td>GPM</td>
<td>210</td>
<td>250</td>
<td>330</td>
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<td>230</td>
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<tr>
<td>16 HR Daily Flow</td>
<td>GPM</td>
<td>110</td>
<td>120</td>
<td>160</td>
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<td>160</td>
<td>110</td>
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<tr>
<td>24 HR Daily Flow</td>
<td>GPM</td>
<td>70</td>
<td>80</td>
<td>110</td>
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<td>110</td>
<td>80</td>
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<td>8 HR Daily Flow</td>
<td>GPM</td>
<td>820</td>
<td>950</td>
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<td>1,210</td>
<td>1,230</td>
<td>880</td>
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<tr>
<td>16 HR Daily Flow</td>
<td>GPM</td>
<td>410</td>
<td>470</td>
<td>630</td>
<td>610</td>
<td>620</td>
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<tr>
<td>24 HR Daily Flow</td>
<td>GPM</td>
<td>270</td>
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<td>410</td>
<td>290</td>
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<td>Monthly Total</td>
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<td>12,732,000</td>
<td>8,886,000</td>
<td>101,964,000</td>
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</table>
system is reportedly in good condition and it is not anticipated that it will be replaced. The western portion of this tract is not watered.

Masonic #8: The western portion of the Masonic #8 area near the main entrance has underground piping and sprinkler heads installed in it. This is reportedly in good condition. There is no underground system throughout the eastern portion. Pipe has been installed through the middle of this section and hoses are periodically used to manually water this section. The Masonic area within the big circle has a 1-inch line installed in a circle with a total of 13 heads to provide watering (Rainbird #33 heads with 1/4-inch nozzles). Risers are installed on these heads when they are used because of the high monuments for the graves. The system allows three heads to be used at a time, therefore this is a manual watering system. The fringe area of this circle is not adequately watered and shadowing results from the large trees within this circle. The small Masonic area north of the maintenance building is incorporated into the city system in this area and is in poor condition. This will be replaced as part of the overall improvements in this area.

Odd Fellows: The Odd Fellows area adjacent to the main gate has an existing underground system installed and is reportedly in good condition. The second area north of the big circle is in poor condition and needs to be replaced. There have been rumors of the Odd Fellows possibly asking the city to take over their areas, however this has not yet occurred. This issue will need to be followed up on prior to the design of the improvements.

While the lodges do not currently pay for water, it is proposed in Section 6 to begin metering water for each of these areas and assess them for the amount they use.

The lodges own slightly more than 14-acres at this site (not counting the Elks area designated in Figure 4 as a future use area). It is assumed at this time that approximately 8.5 of these acres have existing systems and will not be replaced. The other 6-acres will have a new system installed to either replace deteriorated systems or serve areas that are not currently being watered.

1.09 POTABLE WATER

With the conversion of the irrigation of the cemetery to raw water, certain potable water needs must be met with separate piping. Potable water will continue to be supplied from the City of Sheridan system off existing mains entering the cemetery on Birch and Ash. It is proposed to maintain a main line leading to the maintenance building. A fire hydrant will be installed on the end of this line for flushing purposes and fire protection. Fire protection is somewhat limited because of the size of this line and the distance from the 10-inch supply main on Absaraka. This source will provide potable water to the maintenance building and a point of connection for possible future public bathrooms. This fountain will be clearly labeled as potable. The location of any hose bib for use in hand watering or other maintenance which comes off the raw water system will be labeled as "NON-POTABLE WATER - DO NOT DRINK".

1.10 WATER RIGHTS

Water rights are a significant issue with the development of this raw water supply. As discussed in Section 1.01, this is one of the primary objectives of this study. The Sheridan water rights are
very complex and recently underwent a comprehensive review. A petition for the abandonment of a portion of Sheridan's water rights was filed in 1995. This was settled in 1996 and the State Board of Control issued a determination which clarified city water rights including those relating to the irrigation of the cemetery. Sheridan's water rights are discussed extensively in the June, 1998 City of Sheridan Utilities Master Plan (Section 3.7). That document needs to be referred to for further detail relating to the history of these water rights. This section summarizes the February 28, 1997 Board of Control Order relating to water rights which are pertinent to this project. Figure 6 shows the four diversion locations allowed for Sheridan water rights and the amount which can be diverted from these four locations during the May 1 to September 30 period. Refer to Section 3.02 of this study for recommendations relating to water rights.

The order issued by the State Board of Control in February, 1997 is found under Docket No. 11-96-1-2, Minute Book 21, page 294, Order No. 48, page 43. It states as follows:

"IT IS HEREBY ORDERED THAT this petition be and the same is GRANTED without loss of priority and subject to the condition that the changes shall not affect the rights of other appropriators in good standing at the time the changes are made.

IT IS FURTHER ORDERED THAT the petitioner be allowed a change of point of diversion and means of conveyance of 2.0 cfs from a point 2,538 feet East of the West Quarter Corner of Section 19, Township 55 North, Range 85 West; to the primary point of diversion of the Sheridan Town Ditch and Pipeline located at a point described as South 51° 27' 27" West, 4,233.04 feet distant from the Northeast Corner of Section 35, Township 55 North, Range 86 West, and situated in the SE1/4NW1/4 of Section 35.

IT IS FURTHER ORDERED THAT the petitioner be allowed a change of point of diversion in Section 33, Township 56 North, Range 84 West; to the primary point of diversion of the Sheridan Town Ditch and Pipeline located at a point described as South 51° 27' 27" West, 4,233.04 feet distant from the Northeast Corner of Section 35, Township 55 North, Range 86 West, and situated in the SE1/4NW1/4 of Section 35.

IT IS FURTHER ORDERED THAT the petitioner be allowed to maintain an alternate point of diversion from Big Goose Creek at a point upstream of its primary point of diversion described as North 22° 13' 30" West, 2,776 feet distant from the South Quarter Corner of Section 35, Township 55 North, Range 86 West, and situated in the NE1/4SW1/4 of Section 35. This alternate point of diversion is to be used when the primary point of diversion is closed for maintenance or is closed from ice or for on-site purposes at the intake location.

IT IS FURTHER ORDERED THAT for the period of October 1 to April 30 of each year, the City of Sheridan be allowed to divert the entire 16.0 cubic feet per second (cfs) of the Town of Sheridan Appropriation, Territorial Appropriation, Proof No. 788, from Big Goose Creek, at the primary point of diversion located South 51° 27' 27" West, 4,233.04 feet distant from the Northeast Corner of Section 35, Township 55 North, Range 86 West, and situated in the SE1/4NW1/4 of Section 35, provided however that up to, but not to exceed 3.0 cfs of the Town of Sheridan Appropriation from the natural flow of Big Goose Creek shall be attributable to the Veterans's Administration by virtue of City Ordinance No. 94 (1903) and the Order of the State Board of Control recorded in Minute Record 3, pages 473 through 474, or so much thereof as may be necessary to supply its works, will be used by the Veteran's Administration.
To the extent any portion of said 3.0 cfs is not utilized by the Veteran’s Administration, the city may use the same in accordance with city Ordinance No. 94.

**IT IS FURTHER ORDERED THAT** during the period of May 1 to September 30 of each year, under non-surplus conditions, if a call for regulation has been placed on Big Goose Creek and its tributaries or if storage water is being released into Big Goose Creek, the petitioner and the Veteran’s Administration shall limit their combined direct flow diversions from Big Goose Creek under the Town of Sheridan Appropriation at their point of diversion in Section 35, Township 55 North, Range 86 West, to 13.0 cfs and may take the remainder of the appropriation (3.0 cfs) at their alternate points of diversion.

**IT IS FURTHER ORDERED THAT** the petitioner be allowed during the period from May 1 to September 30 of each year, to divert 3.0 cfs of flow at alternate points of diversion downstream from the primary point of diversion located at a point described as South 51° 27' 27" West, 4,233.04 feet distant from the Northeast Corner of Section 35, Township 55 North, Range 86 West, and situated in the SE½NW½ of Section 35. These alternate points of diversion are described as follows:

a. 0.50 cfs at the Big Goose Creek Beckton alternate point of diversion, located at a point described as 2,538 feet east of the West Quarter Corner of Section 19, Township 55 North, Range 85 West;

b. 1.17 cfs at the Big Goose Creek Municipal Golf Course alternate point of diversion located at a point described as South 51° 33' 48" West, 1,189.68 feet distant from the Northeast Corner of Section 1, Township 55 North, Range 85 West, and situated in Lot 1 of Section 1;

c. 1.33 cfs at the Big Goose Creek Cemetery alternate point of diversion located at a point described as North 4° 19' 38" East, 2,585.27 feet distant from the West Quarter Corner of Section 34, Township 56 North, Range 84 West, and situated in the NW¼NW½ of Section 34.

**IT IS FURTHER ORDERED THAT** the petitioner will notify the Superintendent of Water Division Number Two at least 72 hours in advance of use of the alternate points of diversion."

As shown, the alternate diversion point for the city cemetery of 1.33 cfs from Big Goose Creek is located in the extreme northwest corner of Section 34. The other two alternate diversion points shown in Figures 6 may also be pertinent to the cemetery. The one designated as the golf course diversion located in NE¼ S1 T55N R85W can be developed to provide water to the golf course, however a creek intake, pumping station and connection to an existing raw water transmission main are required. Since the golf course has alternate and less expensive means of receiving their irrigation water, transferring this water right to the cemetery diversion point may result in a more beneficial use of this water. The Beckton diversion connects to an existing pipeline which also leads to the golf course. This diversion does not work very effectively and requires relatively high operation and maintenance. It is easier to bring water from the main intake facility for the golf course, than to utilize the Beckton diversion. Again, transferring this water right to the cemetery diversion point may result in a more beneficial use of this water.
Based on the application rates presented in Table 3, combining the 1.33, 1.17 and 0.5 cfs (3 cfs total or 1,346 gpm) at the cemetery diversion will result in valuable use of this water. As this table shows, under “Ultimate Development”, almost 1,300 gpm is needed to supply the design irrigation quantity in an 8-hour period. If the design quantities are to be used as is recommended, either the existing 1.33 cfs (598 gpm) water right will need to be increased or a pond used to receive the water over a 24-hour period and then apply it during the shorter time frame. Another option is to extend the irrigation time beyond the nighttime hours, however as discussed in Section 3.05 this is less than an ideal irrigating time.

The order presented above requires that when the stream goes into regulation (non-surplus conditions) the city must reduce their diversion at the intake facility to 13 cfs, with the remaining 3 cfs taken at the alternate diversion points. After September 30th the alternate diversion points can continue to be used for diversion from Big Goose Creek, however the total instream flow diversion cannot exceed 16 cfs. For example, if 2 cfs continued to be diverted at the cemetery after October 1st, the intake facility could not divert more than 14 cfs.

Big Goose Creek at the cemetery diversion point appears to have a reliable flow. The creek at this point does not appear to be as dewatered during dry years as much as it may be further upstream. Little irrigation of farmland occurs in the extreme eastern end of this Big Goose Valley. Most of the return flows are back in the creek at this point, therefore it is believed that even if the total 3 cfs is diverted at this point, this water should be available in almost all years. While Sheridan’s direct flow water rights have a high priority, they are not the most senior rights on Big Goose Creek (see Utilities Master Plan).
2.0 Diversion Point

2.01 INTRODUCTION

The diversion point for the city cemetery as established by the 1997 State Board of Control Order relating to Sheridan water rights is shown in Figure 1. This 1.33 cfs water right can be used from May 1st through September 30th each year. This point is in general close proximity to the cemetery. A transmission main approximately 2,500-feet long is needed to connect the diversion point and the cemetery at the city maintenance building.

There are several advantages to this particular diversion point. These include:

- Located in close proximity to the cemetery
- Located in public right-of-way
- An acceptable routing for the transmission main from this diversion point
- The stability of the creek channel at this location
- Relatively easy access to this location

2.02 LOCATION AND CREEK CHANNEL

The proposed diversion point lies within the platted NB Avenue right-of-way (see Figures 7 and 8). The pictures on the following page illustrate this location. NB Avenue is not developed at this point, however a relatively short (approximately 150-foot) access road can be constructed to the proposed point of diversion from the intersection of NB Avenue and Lynx Street. This access road, diversion point, and pumping station all should lie within the street right-of-way, eliminating the need to acquire any property or permanent easements. A temporary construction easement for the diversion and pump station will be required.

The cross section of the creek channel in this area and a review of historical aerial photos show that the west side of the channel where the pumping station is proposed is much higher and more stable than the east side (see Figure 9). The elevation at this location will result in flood waters generally extending more to the east than the west. This location on the creek should be relatively stable over a long period of time.

A review of historical aerial photos from the National Resource Conservation Service (formerly U.S. Soil Conservation Service) show the current creek channel is in the same location as was seen in 1954 and 1967 aerial photos (See Appendix). An on-site inspection of this location confirms that the channel has not appeared to have moved in recent years.

Federal Emergency Management Agency (FEMA) has established the 100 and 500-year flood plains for this area. The proposed diversion point and pumping station location are within the 100-year flood plain. This flood should reach an elevation of approximately 3767' at this location, based on the cross sections shown on the FEMA map. This would result in the water being approximately 1.5-feet deep at the location of the proposed pumping station. It is proposed to raise the floor of the pumping station 2-feet above this elevation for a total fill of approximately 3.5-feet. This amount of fill is not excessive and should allow a permanent pumping station to be constructed without excessive costs for flood protection.
BIG GOOSE CREEK AT PROPOSED DIVERSION SITE. LOOKING UPSTREAM. PUMPING STATION WILL BE TO THE LEFT.

PROPOSED PUMPING STATION LOCATION NEAR CENTER OF PHOTOGRAPH. CREEK ON OTHER SIDE OF RAIL FENCE.

BIG GOOSE CREEK AT PROPOSED DIVERSION SITE. LOOKING DOWNSTREAM.
EXTENSION OF CITY WATER MAIN TO PROVIDE BACK FLUSHING WATER TO THE INFILTRATION GALLERY

NOTE: ELEVATION OF 100 YEAR FLOOD PLAIN IS APPROXIMATELY 3767'.
LOG OF SOILS FROM BORING BY PILCH ENGINEERING

TOPSOIL

SILTY TO SANDY BROWN CLAY

SILTY TO SANDY GRAVEL

CLAYEY GRAVEL

GRAY HARD CLAYSTONE

PUMP HOUSE FLOOR ELEV = 3769'

100 YEAR FLOOD ELEV = 3767'

ISOLATION VALVE

TEE WITH BLIND FLANGE

WATER LEVEL ELEV = 3759.5' 7/27/98

12" PERFORATED COLLECTION PIPE (EXTENDS UPSTREAM AND DOWNSTREAM)

IE = 3753.7'

IE = 3756.6'

32' OF 12" SOLID PVC PIPE AT 1% SLOPE

BOTTOM OF SUMP ELEV = 3748.0'

BOTTOM OF MANHOLE BASE ELEV = 3747.0'

(12") 3/4" CRUSHED STONE AGAINST THE CLAYSTONE

CONNECTION POINT FOR 4" PIPE FROM CITY WATER MAIN FOR BACK FLUSHING INFILTRATION GALLERY
2.03 STREAM FLOWS

No U.S. Geological Survey (USGS) stream gauging stations exist in a close proximity to the proposed diversion point. The closest stream gauging stations are located immediately below the City of Sheridan primary diversion near the Big Horn Mountains (approximately 12-miles to the west) and approximately 5-miles below the confluence of Big Goose and Little Goose Creeks. The distant locations of the two gauging stations, and the impact of irrigation diversions and return flows, result in little value of the monitoring data from these two gauging stations. Therefore this information was not used in this analysis.

Stream elevation measurements were taken for this study during July, August and early September of 1998. The stream flow was measured on two occasions. On July 27, 1998 a flow of 24 cfs was measured at an elevation of 3759.8. On August 10th the flow was approximately 64 cfs at an elevation of 3760.2. These measurements were taken about 30-feet upstream from the cross section depicted in Figure 9. The elevation on July 27 was one of the lowest elevations measured. Elevations during the July through early September time period varied from 3759.4 to 3761.0.

2.04 METHOD OF DIVERSION

Three different methods of diversion were considered for this project. These methods are listed in order of priority:

- Infiltration gallery adjacent to Big Goose Creek
- Infiltration gallery below the bed of Big Goose Creek
- Surface diversion

An infiltration gallery is basically a horizontal well constructed adjacent to or below the bed of a stream to receive the surface water; the water filters through the alluvial sands and gravels to remove debris found in the stream. The infiltration gallery would generally consist of a slotted pipe (similar to a well screen) surrounded by either imported or natural gravels (again, similar to the gravel pack in a well). Natural sands and gravels would typically then exist between the gravel pack around the screen and the stream itself. Infiltration galleries must be designed to produce a low velocity of the water entering the collection piping. The velocity must be kept low to minimize the amount of sediment brought into these sands and gravels. Over time, sediment can plug off this material, reducing the capacity of the infiltration gallery source.

Infiltration galleries may typically be more expensive to construct than a surface diversion, however their advantage is that they reduce the amount of both organic (algae, moss, leaves, pine needles, etc.) and inorganic (sand and sediment) material in the water which is diverted to the irrigation system. With a surface diversion, screens are required to remove much of this material, keeping it out of the irrigation distribution system. Too much debris can plug sprinkler heads resulting in higher operation and maintenance of the system. While self-cleaning screens are available, the screening unit itself also results in increased operation and maintenance over the infiltration gallery. Therefore, in general, an infiltration gallery will result in lower life cycle costs than a surface diversion.

The possibility of constructing an infiltration gallery adjacent to the creek was investigated by Pilch Engineering. A report summarizing those findings is included in the appendix. Three drill holes were installed adjacent to the creek for this evaluation. The subsoil conditions found generally consisted of 1 to 2-feet of dark brown topsoil overlying silty to sandy brown clay.
silt and sand within the clay increased with depth. At about 7 feet this material was classified as a clayey sandy gravel. The gravel becomes very clayey at approximately 12 feet. At approximately 13.5 to 15 feet, a gray, hard claystone bedrock is encountered. This indicates the bottom of the alluvium. The sandy and gravelly materials contain sufficient clay and clay lenses that overall permeability was unacceptably low. During the pumping test, the pumping well would only produce approximately 1 gallon per minute. Because of the low permeability of these materials, the development of an infiltration gallery adjacent to the stream is not an option.

The possibility of installing the collection piping directly below the streambed was then considered. Samples of the river gravel were collected 1 to 1.5-feet below the streambed. Results of the gradations performed on these samples indicate the gravels are fairly clean and should readily support collection piping installed approximately 2 feet below the streambed (see Appendix B). The proposed layout and cross section of such a system are shown in Figures 7 and 9. Calculations show that 1,350 gpm (assuming the 1.17 cfs and 0.5 cfs water rights are transferred to this site) can be produced with approximately 50-feet of collection piping. As a conservative estimate, 80-feet of collection pipe are used during this conceptual planning period.

Proposed collection piping is 12-inch PVC slotted well screen. The Certainteed Certa-lok design is proposed, as this results in a totally restrained system for increased strength. The preliminary design and cost estimate is based on this approach. It is proposed to surround the perforated piping with approximately 2-feet of imported clean sand. This sand will be graded to match the natural sand present and the slot size of the collection pipe. Installation is proposed during the low water time of the year with coffer dams used to construct the collection piping beneath the streambed. For sizing, it will be assumed water will only come down through the top of the collection piping. Some water should also come through the sides and even the bottom, however this will not be included in the calculations.

Since the infiltration gallery installed beneath the streambed appears viable, the direct diversion is not proposed. If a surface diversion was constructed, a sump similar to that shown in Figure 9 would be used along with the pumping station mounted over the top of the sump. A diversion pipe for surface diversion would probably consist of 12-inch stainless steel well screen installed so that approximately half of the screen is located above the streambed and the other half is buried. While there is sufficient water depth at this location for a direct diversion, this depth is not sufficient to install an intake which extends much above the streambed. Also, intake facilities which extend above the streambed would be susceptible to damage during icing and flooding conditions. Another concern is potential injury to people who may be using the creek in the summer. The use of a stainless steel well screen installed so it extends above the streambed should address all concerns relating to protection of the facilities from damage, and preventing potential injury to users of the stream.

A diversion dam would not be proposed if a surface diversion was to be used for the following reasons: (1) the seasonal nature of the diversion; (2) non-domestic use of the water means the supply is less critical; (3) the creek depth at the proposed location appears to be acceptable for the quantity of water to be diverted; (4) a surface diversion would require a more significant permitting effort in terms of time and cost; and (5) the initial capital cost of a diversion dam may be higher than for an infiltration gallery and does not appear to be warranted.
3.0 Irrigation Facilities
3.0 Irrigation Facilities

3.01 INTRODUCTION

This section discusses the proposed facilities downstream of the diversion. These facilities include the pumping station, transmission main, distribution system, and control system. Assistance with the development of the planning, design, and cost estimate with these facilities was provided by Carl Thuesen, ASLA, a subconsultant to MSE-HKM. The proposed approach outlined in this section was discussed with the WWDC and City of Sheridan, at the completion of Phase I of this study.

3.02 WATER RIGHTS

Recommendations for modifying the existing water rights for this project are outlined in this section. The existing water rights (including the February 1997 Board of Control Order), and these recommendations were discussed with Mike Whitaker of the State Engineer’s Office in Sheridan. Because of the difficulty and expense associated with developing the two other alternate points of diversion, it is recommended a petition be presented to change these points of diversion to the designated cemetery location and that an associated change in place of use of this water be included. This process would need either the consent of all intervening water users between these locations or would be presented in a public hearing. The public hearing would allow any intervening water users who feel they may be injured by this change to address their concerns. It is anticipated existing water users will not be injured, as these changes are being made downstream rather than upstream. This would allow more water to remain in the stream for the intervening users, therefore it is anticipated this change in point of diversion and place of use should be allowed.

Mr. Whitaker also commented that it would be very difficult to move the Beckton point up to the main intake (see Figure 6), as the Alliance Ditch diversion is between the intake and the Beckton point. This is a major diversion, which diverts much of the flow in the stream during low flow times. Because of low flow periods which occur during the irrigation season, movement of additional diversion to a point above the Alliance Ditch diversion would not be allowed.

The August 21, 1996 hearing before the State Board of Control which clarified the Sheridan water rights, including the alternate points of diversion, started the clock on the 5-year period where these water rights are to be placed in use. Therefore, the direct flow water right for the alternate points should be in use by August 21, 2001. If it is decided to petition to change the other two diversion points, it is recommended this process be commenced in early 1999. This schedule should allow this change to take place and the system be designed for use of 3.0 cfs.

Mr. Whitaker also clarified that this water right can be used to provide irrigation throughout the designated cemetery area. The fact that lodges own portions of this cemetery does not affect the use of this water right for those areas. Irrigation of the entire cemetery is appropriate use for this City of Sheridan water right. It is not acceptable however to use this right in areas other than the cemetery.

3.03 PUMPING STATION

A pumping station is proposed to be located atop the wet well which receives water from Big Goose Creek. The floor of the pumping station is proposed to be 2-feet above the 100-year
flood plain. This station will be made permanent, as opposed to a portable pumping station, which could be relocated during flooding events. Vertical turbine pumps are proposed. Vertical turbine pumps meet the suction lift, flow and pressure output, and pump curve requirements for this facility. The pumps are also more readily accessible for operation and maintenance than are submersible pumps. This pump station will be a self-governing station, capable of automatically delivering constant pressure at variable flows in response to sensed pressure and flow conditions in the irrigation system. The pump station will maintain a constant downstream pressure regardless of flow. The size and cycling of the control zones will be designed to match pump output. A design pressure of approximately 60 psi will be maintained at the sprinkler heads. For sprinkler heads at the lower elevations, pressure reducing valves may be required to deliver the same pressure throughout the system.

The pump station will be designed for flows up to 1,346 gpm (3 cfs) with a discharge pressure of approximately 140 psi. A triplex station will be used to provide flexibility in the pump output to better match discharge requirements. For example, if the full 1,346 gpm is not needed at all times, especially prior to expansion of the cemetery, two pumps will be able to meet these needs without the third pump. The third pump will then be available as a backup. All three pumps will be required to deliver the full water right. With three pumps and the pressure control features installed with this station, it is anticipated variable frequency drives will not be required. This will result in a cost savings. It will not be confirmed that variable frequency drives are not required until final design when the sprinkler system zones are laid out, including designing for the connections to the existing system for the lodge areas which are saved and incorporated into the new system. If these zones can be designed to require approximately equal quantities, the variable frequency drives will not be included. These particular pumps can be provided with or without the VFD, therefore this is not a substantial design change issue but rather requires consideration for the additional cost and operational flexibility.

This conceptual design is developed around the Watertronics pump station. These stations are especially built for irrigation applications similar to this. The features of this station include:

- A 5 to 10 HP pressure maintenance ("jockey") pump which will maintain the pressure on the distribution system at times when the irrigation pumps are not operating. This pump will also be able to meet the low flow requirement involved with minor manual watering with hoses.
- Three 60-HP (or possibly two 60-HP and one 40-HP) vertical turbine pumps and motors.
- Electrically operated butterfly valves for pressure regulation of each of the two primary pumps.
- Microprocessor sequencing for each pump.
- Controls and programming for output flow and pressure, cumulative flow, pump run time, pump run status indicators. Pressure controls to match the discharge pressure with the irrigation system demand curve.
- Alarms for certain conditions.
- Pressure relief valves, check valves, and isolation valves.
- Various other appurtenances and controls.
Power Considerations

There are several considerations with respect to providing electrical power to the proposed station. Because of the size of the pumps under consideration for this project, it is desirable to utilize 480-volt, 3-phase power to operate the pumps. Montana-Dakota Utilities (MDU) has 480-V, 3-phase, 60-hertz power available at the corner of Leopard Street and NB Avenue, which can be bought to the proposed point of diversion. The project would be responsible for the cost (estimated at $6,000 for a 550-foot extension) of overhead power lines to the proposed pump station. However, depending on the estimated annual revenue derived from an extension of electrical power to the proposed pump station, MDU may defer some or all of the cost of the extension.

MDU has an electrical rate schedule set up specifically for irrigation power service. This rate schedule, effective February 1, 1998, is based on several separate charges as outlined below.

**Demand Charge** The demand charge is $1.09 per month per horsepower of connected load. Based on a total of 180 horsepower for pumps, the monthly demand charge would be $196.20.

**Energy Charge** The energy charge is $0.03977 per Kwh for all energy consumed. Full pump capacity usage (180 horsepower) would result in energy charges of approximately $5.34 per hour.

**Seasonal Charge** The seasonal charge is $17.17 per horsepower of connected load, based on maximum horsepower. Based on a total of 180 horsepower for pumps, the seasonal charge would be $3,091 per irrigation season (May 1st through September 30th). The seasonal charge is used by MDU to assure they recover their investment in the particular electrical service in the part of the year where this service is being used. If at the end of the season (October 1st) $3,091 worth of power has not been used at this location, any remaining amount up to this minimum level will be billed. MDU wants their transformers for irrigation systems shutdown around October 1st. If the city desires to irrigate for a few days after October 1st, it might be possible to negotiate this with MDU.

**Power Factor Charge** There is a power factor charge ($1.75 per Kvar) which may be incurred under certain conditions. This charge can be avoided or reduced by proper electrical design of the pump system.

3.04 TRANSMISSION MAIN

The primary transmission main will extend approximately 2,500-feet from the pumping station at the creek to a point near the maintenance building at the cemetery. There it will split into smaller transmission mains which will lead to the areas served by each individual controller.

Several issues relating to the transmission main need to be considered. These include:

- Route
- Size
- Pipe materials
- Depth of bury
- Soils, groundwater, slope stability
Figure 8 shows two possible routes for the main between the pumping station and cemetery. The pictures on the following page illustrate the transmission main route. Alternative No. 1 follows NB Avenue right-of-way and an existing easement along Lot 2 of the Zowada Subdivision. It then enters the Elks' property as it approaches the cemetery. This route will allow the pipeline to reach the cemetery with no additional easement acquisition, other than through the Elks, which of course will be served by this irrigation system, and a temporary construction easement through the Zowada Subdivision. Figure 10 shows land ownership in the vicinity of the proposed transmission main route. While Alternative No. 1 is a workable route, Alternative No. 2 has some advantages. These advantages include:

- Slightly shorter route (about 180')
- Route avoids almost all trees
- Route avoids swampy area in NB Avenue between Blocks 31 and 32
- Route ascends the slope in an easier area. Slope reclamation will probably be more successful.

Routing alternatives and their advantages and disadvantages were discussed with Robert Culligan, the property owner. Mr. Culligan recognized the advantages to Alternate No. 2, and there is a possibility of obtaining an easement from him. Mr. Culligan is in the process of working with the City of Sheridan to abandon NB Avenue and the alleys in the location. If this is completed, he would assume ownership over what is currently platted as NB Avenue southeast of Leopard Street. This abandonment will not be finalized until the issue regarding the routing of this water main is completed.

Mr. Culligan did request two taps on this pipeline in exchange for the easement. These taps would be used for watering horses and lawn irrigation. From discussions with the city and WWDC representatives, trading taps for an easement is not an option. The city cannot reestablish this precedent and significant concerns would exist in allowing raw water taps which may be mistaken for treated water. Most importantly, the water rights established for this diversion point by the Board of Control hearing is for irrigation of the cemetery. This water right could not be used at any other location. When this was presented to Mr. Culligan, he indicated we would need to follow Alternative #1. Therefore this conceptual design assumes Alternative #1 will be utilized. It is anticipated this can be changed during final design. Further discussions will be held with Mr. Culligan in the design stage in an attempt to negotiate the preferable route. Since Alternative #2 is a shorter route, there is an economic advantage and hopefully a settlement can be reached which will benefit both parties economically.

The two sizes considered for this transmission main were 10 and 12-inch. The issues regarding pipeline size are:

- design flow
- head loss
- velocity
- pipe materials
- cost
- future flows

Current design flow for the system is 1.33 cfs (598 gpm). If the 1.17 and 0.5 cfs water rights are transferred to this location, the design flow becomes 3.0 cfs (1,346 gpm). It is assumed these other water rights will be transferred prior to system start-up, and this pipeline should be sized
SLOPE ON PROPOSED TRANSMISSION MAIN ROUTE FROM WEST BOUNDARY OF LOT 2 OF ZOWADA SUBDIVISION.

SLOPE ON PROPOSED TRANSMISSION MAIN ROUTE ON CULLIGAN PROPERTY.

SLOPE ON PROPOSED TRANSMISSION MAIN ROUTE FROM SW CORNER OF LOT 2 OF ZOWADA SUBDIVISION. CEMETERY ACROSS FENCE AT HORIZON.

NB AVENUE SOUTH OF LEOPARD STREET. SWAMPY AREA. IF PROPOSED TRANSMISSION MAIN STAYS ON NB AVENUE, ROUTE WILL PASS THROUGH TREES.
for the higher flow. It is also assumed 1,346 gpm will be the ultimate flow of this pipeline, therefore there will be no additional sizing for even higher future flows.

With a design flow of 3.0 cfs, the difference in head loss between a 10 and 12-inch line over the length of this transmission main is 16-feet (7 psi). At 3.0 cfs, the velocity in 10 and 12-inch pipe is 5.5 and 3.8 feet per second (fps) respectively. While the head loss in the 10-inch pipe is not excessive, considering the total dynamic head for these pumps will be approximately 350-feet and this pump station will not always be pumping at 3.0 cfs, it is still recommended that the 12-inch transmission main be used to assure it is adequately sized. The cost difference between 10 and 12-inch pipe depends on the materials, however it is probably in the $3.00 per foot range. Sizing of the transmission main should be reviewed again at final design.

Pipeline material is a significant selection criteria. The pressure at the booster station will approach 150 psi. It is desirable to utilize PVC pipe, if possible, because of cost and corrosion considerations. At this pressure the primary alternative material would be ductile iron. Ductile iron will cost more per foot for the pipe itself plus the cost of any corrosion protection measures. Therefore, PVC material which can accommodate this pressure, will be recommended.

The types of PVC considered for this study were AWWA C900 DR18 and DR14, and ASTM D2241 SDR21 and SDR26. In public water supply projects, AWWA approved pipe is used almost exclusively. Since this is a raw water irrigation project, ASTM D2241 can be considered as well. AWWA C900 DR18 has a nominal pressure rating of 150 psi, while the SDR21 has a nominal rating of 200 psi. Even though the SDR21 has a higher nominal pressure rating, it has a thinner wall and cannot be subjected to as high a pressure as the DR18 because it is not constructed to AWWA standards, which utilizes higher safety factors. For example, the wall thickness on 12-inch pipe is 0.607 and 0.733 inches respectively for SDR21 and DR18. AWWA standards require a 4:1 safety factor for a sustained pressure test, therefore the DR18 must pass a sustained pressure test of 600 psi. The DR18 pipe also has a slightly larger inside diameter. Considering a minimal cost differential (about $1.50 per foot), it is recommended AWWA C900 pipe be used for the transmission main from the pump station to the cemetery. For the smaller transmission mains throughout the cemetery where lower pressures are seen, it is recommended to use ASTM D2241 pipe.

The transmission pipeline up to the cemetery will primarily consist of bell and spigot pipe, however in the more steeply sloped areas, restrained joint pipe is recommended. Certainteed manufactures a restrained joint PVC pipe which meets the above specifications (Certa-lok). It is further recommended that DR14 (non-restrained joint) pipe be used from the pump station across Leopard Street and up to the platted Ermine Street. This heavier walled pipe is recommended both due to the higher pressure in this stretch and the live loadings for the Leopard Street crossing and potentially NB Avenue. Since a 4-foot depth of cover is recommended (see below) live loading has a greater affect on the pipe than would a deeper bury. This depth of cover may also be reduced during the construction phase of a future reconstruction of Leopard Street. With support bedding beneath the pipe haunches, DR14 can accommodate the anticipated live loads under these conditions without being significantly impacted. The DR14 PVC is recommended over ductile iron or another material for consistency throughout the project and because of corrosion concerns with metallic pipe.

When considering the design flow, head loss, velocities, material selection, and cost issues discussed above, it is recommended that 12-inch pipe be used and that the pipe material be AWWA C900 DR14 throughout NB Avenue, and DR18 up the slope and to the maintenance building.
The depth of bury, and therefore, the method of installation must also be considered. Water mains are typically buried with 6-feet of cover in Sheridan. Irrigation lines are frequently buried with only 3-feet of cover, if they are drained in the winter. Irrigation lines are occasionally installed with a trencher (or narrow bucket on a backhoe) rather than an excavator. The shallower cover will aid in trench installation, if that method is acceptable. Trencher installation also results in a cost savings when compared to excavator installation. Ground water will probably be encountered in the area southeast of Leopard Street.

It is recommended this transmission main be installed with a minimum of 4-feet of cover and that a drain(s) be installed on the pipeline to allow it to be dewatered for the winter. The 4-feet of cover should provide ample protection to the pipeline from normal surface disturbances and it will be less expensive to install than the typical 6-feet of cover, particularly in higher ground water areas. It is recommended standard trench installation (with a backhoe) be used for installing the DR14 portion of the transmission main and any non-restrained DR18 areas. This heavier walled pipe does not bend easily and joining the pipe above ground and inserting it into the trench is not as effective as with the restrained joint pipe or the SDR pipe proposed within the cemetery itself. This approach also allows better placement of the bedding beneath the pipe haunches for support. This support is particularly important in areas of potentially high live loadings.

It is recommended a trencher or narrow bucket installation be considered for the restrained joint portion ascending the hill (to reduce the impacted area and therefore area requiring reclamation) and for the SDR transmission and distribution piping within the cemetery itself. Utilizing the natural soil for bedding will need to be considered to assure adequate support is provided for the pipe. This is similar to a typical rural water system design and it is believed this will be adequate for this installation.

The only known conflict with Alternative No. 2 is the water service line which runs up the hillside to the Zowada residence in Lot 1 of the Zowada Subdivision. It is believed Alternative No. 2 will conflict with that service line for a portion of the route. This conflict can be addressed or the service line rerouted for that portion of the line. Alternative No. 2 ascends a gentler slope and is a more direct route to the top. Alternative No. 1 is adjacent to a fence line, therefore reclamation may be more difficult as the horses in this pasture tend to follow the fence line, reducing the growth of grass.

Alternative No. 2 is recommended for issues relating to slope stability, reclamation, soils, trees, and other surface obstructions.

3.05 SPRINKLER AND CONTROL SYSTEM

Smaller transmission mains and distribution lines will branch off of the 12-inch transmission main within the cemetery (see Figure 11). All transmission mains, distribution lines and laterals will be PVC. Due to the lower pressures and smaller size, ASTM D2241 PVC is recommended for all pipelines except the 12-inch main line. Either SDR21 or SDR26 pipe will be used as most appropriate. Many lines within the cemetery will be looped so pipe size and friction loss can be minimized. Gate valves will be installed throughout the system to provide isolation capabilities to facilitate repairs, extensions and general operation without affecting large segments of the cemetery. The pumping station is designed to maintain a constant downstream pressure, therefore pressures throughout the distribution system will be fairly consistent despite changes in flow or areas being irrigated.
A system of drains must be designed into the distribution system to dewater the piping during the winter. With the cemetery located on a hilltop it is believed daylight drains to the side hill are more appropriate than using air pressure to dewater the system.

Cemeteries are very difficult to fit with underground irrigation systems due to the fixed dimensional requirements imposed by the grave plot size, roads, block sizes and alley and walkway locations. Often large trees and monuments interrupt the spray patterns, resulting in less than optimal coverage uniformity. For these reasons we recommend closer head spacing intervals and higher precipitation rates to assure more even precipitation application. Sprinkler heads will be set at a spacing of approximately the spray radius. This head to head coverage will result in a more thorough application of water.

Rainbird Falcon gear driven rotor sprinkler heads have proven to be a good selection for cemetery irrigation purposes. These durable commercial grade heads are available with a number of nozzle combinations to adjust radius and precipitation. Additionally they are fitted with a diffuser adjustment which can be used to decrease the radius by up to 25% from the published nozzle rating, allowing fine adjustment of radius once the heads are installed. As rotors, these heads produce a quiet constant swishing sound when in operation, not the interrupted "pssst" "pssst" of impact driven heads, which is often objectionable to neighbors. The same sprinkler is also available in adjustable arc part circle for use along roads and adjacent properties, and in odd shaped turf areas.

The conceptual design is based on the Falcon F4-FC-NP-10 head. This is a full circle head with non-potable marking delivering 52 feet of radius at 10 gpm and 60 pounds per square inch (psi) pressure. In square spacing the precipitation rate is 0.71 inches per hour. It is anticipated that the number of zones may increase in the final design, due to the use of part circle equipment.

Sprinkler heads would be optimally grouped 10 to a zone, or controller station. Full circle and part circle heads must be zoned separately so that matched precipitation can be achieved through adjustment of the run times. Each of these lateral zones would be controlled through a 2" electric solenoid operated control valve, such as the Rainbird PESB series valves. These valves are desirable in raw water applications, since they have a stainless steel diaphragm screen with self cleaning nylon scrubber mechanism and are very resistant to failure due to clogging of the diaphragm ports. The valves are also available with built-in pressure regulation. Since elevation changes across the existing cemetery exceed 40 feet, pressure regulation will be needed to provide uniform pressure to the sprinkler heads.

Each valved zone of 10 heads will cover about one half acre, one quarter acre for part circle zones. Approximately 123 full circle zones will be needed to cover the existing cemetery area and approximately another 40 full circle zones will be needed for the cemetery expansion area, for a total of approximately 163 full circle zones. The design evapotranspiration (ET) is 0.29 inches per day. Dividing ET by the sprinkler precipitation rate of 0.71 inches per hour, each head or zone would need to operate 0.41 hours per day, or about 25 minutes, to achieve the needed precipitation application. Through the control system, the precipitation could be applied in several doses consistent with soil percolation rates, to eliminate runoff and water waste.

In groomed landscape settings such as cemeteries, parks and golf courses, which are subject to public use, it is usually desirable to complete all irrigation at night within a cycle time of 8 hours or less. This results in more efficient application of precipitation since evaporation is lower at night than during daylight hours. Coverage uniformity is also generally enhanced by irrigating at night, when winds are usually not as strong. Also, conflicts with public use of the facility are
minimized and daylight hours are available for maintenance activities without restrictions due to irrigation. Eight hour daily flows of approximately 930 gpm and approximately 330 gpm are projected for the existing and future cemetery areas respectively. Approximate pumping rates for 16 hour and 24 hour daily flows are also shown in Table 3. Flows are adjustable depending on areas covered and watering needs up to the 3 cfs capacity of the water source.

To control the 163 zones, 10 satellite controllers are recommended. These satellite controllers will each serve approximately equal sized areas. In order to achieve the scheduling window goal of cycle completion in 8 hours or less, each controller would operate 16 to 17 stations. These controllers will operate in parallel for a flow demand of 100 gpm per satellite controller and a total system flow of 1,000 gpm (100 gpm per satellite controller × 10 controllers = 1,000 gpm). By multiplying the calculated station run time of 25 minutes each by 17 stations per controller per cycle the total cycle time will be 425 minutes, or 7 hours and 5 minutes, meeting the watering schedule goal. Note that by extending the scheduling window time, it is theoretically possible to reduce system input flows.

Some of the portions of the lodge area are reported to be in good condition and the lodges wish to maintain these distribution systems. The design of the distribution system will be set-up to accommodate these requests as possible. Portions of some of these systems may not be compatible with the final design of the distribution system and replacement may be necessary. This will be addressed during the final design phase. Items to consider regarding compatibility are pipe size, sprinkler head nozzle size, pressure available at the sprinkler head, condition of materials, and how the portion of the distribution system being saved incorporates into the new system with the 10 satellite controllers.

By incorporating some of the existing lodge areas into the new sprinkler system, the design is actually made more complex. All of the satellite zones may not be of equal size. The master control system is a "smart" system however. In order to match the output from the pump station (assuming variable frequency drives are not used), the system will pick zones to be watered as appropriate based on their flow requirements. As previously stated, water application for a zone may occur at three times during the eight hour application period. This is done to minimize runoff. Therefore, to match the pump output, the controller will select zones to be watered which have not yet received their full allocation for the watering period.

A golf course type master satellite control system is recommended as the control system for this application. The Rainbird Maxi Nimbus is an example of such a control platform. This flexible system would employ a central computer communicating with satellite controllers via hardware to provide independent station access, ease of programming and true water management. Manual operation of the satellite controllers for spot watering and other needs is also provided. The control system must have flow management software to optimize energy conservation through control of pumping and scheduling times, and to protect the piping system from inappropriate hydraulic loads due to operator programming errors. Such a control system will also provide the best possible water conservation. Options and upgrades are available for these systems to provide automatic scheduling adjustment based on weather station input, radio communication to satellites for remote operation. Expansion capabilities could enable all city park system watering within the city to be controlled from this single, central location.

The master control system will also control watering of the lodge areas. Adjustments can be made in the individual satellite controllers, however the city will need to maintain control over all settings on the controllers once the new system is installed. Measurement of the volume of water applied to the lodge areas must also be incorporated into the new system. Since the
lodges own their portions of the cemetery, the amount of water applied to this property must be determined. The city may then wish to charge for this water. Flow sensors will be incorporated into the satellite controllers to measure the quantity of flow delivered through each controller. Another method of calculating water applied to any given area is utilizing the application rates which are available through the computer capability of the master controller and the area in question. By using the application rates over a period of time and the area owned by the lodge, the approximate water quantity supplied is calculated. Not being proposed is the use of traditional mechanical meters at every entry point into the areas owned by the lodges. The time and cost required to install, maintain and read these meters is not believed to be warranted. Also, locating these meters complicates the layout of the satellite zones.

The flow sensor in each satellite controller is also used to compare expected flow rates to actual flow rates. If the actual flow rate is more than expected, the system will shutdown and provide an alarm to the master control system for investigation. This is done to help prevent water loss through a leak, programming error, or other problem.

In addition to the automatic sprinkler irrigation system, hose bibs will be provided throughout the cemetery for manual watering. These hose bibs can be accessed by both the maintenance staff and general public who may want to apply additional water to a particular grave site. These taps will be labeled "nonpotable water - do not drink". The small "jockey" pump in the pump station will maintain pressure on the distribution system and meet the needs of these taps during the day, when the irrigation system is not operating. Therefore, the distribution system will always be fully pressurized.

The current area requiring irrigated totals approximately 57-acres. Lodges occupy slightly more than 14-acres, with the remainder being the City of Sheridan. It is estimated that the distribution system in approximately 8.5-acres of the lodges' area and 2.6-acres of the city's area are reportedly in acceptable condition and may not require replacement, if the new supply facilities are compatible with the existing piping and sprinkler heads. Therefore, approximately 46-acres of the sprinkler system would be replaced initially. Approximately 20 additional acres are available for future expansion.

3.06 POND

As discussed above, a pond could be installed to allow the source to deliver the water at a lower rate than is being applied through the irrigation system. This pond could receive water over a 24-hour period. The complete irrigation of the cemetery could still be accomplished over an 8-hour nighttime period, even though the water source was designed for a lower than peak hour flow rate.

The primary advantages to a pond include:

- A lower yield from the source is acceptable.
- Water supply is available should the source be temporarily out of service.

The primary disadvantages to the pond include:

- Construction costs for the pond.
- The need for a second pumping station, as the first pumping station only delivers water to the pond.
• Possible algae growth in the pond resulting in more debris reaching the sprinkler heads than would be present in the raw water source, if the infiltration gallery option is utilized.
• Operation and maintenance concerns with the pond and second pumping station.
• Mosquito habitat

Another possible advantage to a pond would be to develop it into an aesthetic feature. This does not appear very likely at the cemetery, due to the limited available area and the need to reserve as much area as possible for future grave sites.

The preliminarily identified tentative location for a pond is the drainage in the northeast corner of the future expansion area located west of the current Elks' area (see Figure 4). This location would not interfere with expansion areas and would be relatively easily constructed by building a dike across the drainage. With the sandy soils in this area, lining would be required to control exfiltration from the pond.

With a future maximum 24-hour application rate of 420 gpm (1.9 acre-feet over 24 hours) a pond size of at least 5 acre-feet would probably be required to allow cycling of the pumping times, minimum pond levels and emergency storage.

If the 1.17 and 0.5 cfs water rights currently established west of the cemetery diversion point are transferred to the cemetery, it is not recommended that a pond be constructed. This combined flow will be adequate to meet peak water requirements over an 8-hour period. With this water availability, the needs will be met and the water right utilized without additional storage. If it is not possible to relocate the additional water rights, a storage pond should be considered.

From discussions with WWDC and City of Sheridan officials at the conclusion of Phase 1, it was decided the optimal use of the three alternate diversion point water rights would be to transfer them to the cemetery location and utilize them for this purpose. Therefore, this is the plan at this time. Based on this approach and the negative aspects related with the pond as presented above, it is recommended that the pond not be included in project planning and budgeting and the source be developed to satisfy all water requirements.

3.07 POTABLE WATER SUPPLY

Modifications will be required to the potable water piping within the cemetery. As the irrigation system is converted to the treated water source, many of the older distribution lines throughout the cemetery will be either removed or abandoned in-place (see Figure 2). The piping system conveying city water from the South Hill Area pressure zone will be continued into the southern end of the cemetery and to serve the maintenance building area. The two connections on Ash and Birch will remain. The 6-inch main on Birch to the east side of the Elks' area is relatively new and this will remain in place. It is recommended the meters and pressure sustaining valves located just off Meridian Street on Ash and Birch be removed to reduce any pressure losses through these facilities that would occur at high flows such as a fire flow. With the conversion to the raw water system, use of potable water will be greatly reduced, thus eliminating the need for the pressure sustaining valves. Metering would be done at the service lines or point of use, therefore the meters on the main lines can also be removed.

The potable water system will serve the following purposes with the installation of the new irrigation system.

• Deliver potable water to the maintenance building location.
• Provide potable water for usage within the maintenance building.
• Serve a drinking fountain for the public just outside of the maintenance building.
• Provide a fire hydrant at this location for flushing the main.
• Provide fire protection at the maintenance building.
• Provide a point of connection for a possible future public rest room near the maintenance building.
• Allow the possibility of a future temporary above ground connection (fire hydrant to fire hydrant) to the irrigation system. This would be used only in the rare event where the new irrigation source is out of service for a period of time.

Proposed improvements in the potable water system are shown in Figure 12. The Wyoming Department of Environmental Quality requires dead-end lines longer than 250-feet be 8-inch. It is therefore recommended that the replacement line from the connection point to the existing 6 and 4-inch mains on the east side of the Elks property to the maintenance building be 8-inch. It is also recommended that the 350-feet of 4-inch to the east be upgraded to a new 6-inch line. This will allow two 6-inch mains to supply the 8-inch main leading to the maintenance building. A breakout of the potable water system improvements and their cost estimate is shown in Table 5.

Static hydraulic gradeline of this pressure zone is 4,038’. The estimated hydraulic gradeline under a peak day demand condition is 4,010’. With an elevation at the maintenance building of 3,875’, the pressure under the peak day demand condition is 58 psi. It is estimated this fire hydrant can supply 1,000 gpm while maintaining a residual pressure above 30 psi at this point.

If the potable water system is ever used to supply the irrigation system on a temporary basis, an appropriate backflow preventer can be mounted on the discharge port of the fire hydrant to protect the potable water system from potential cross contamination with the raw water irrigation system.
SERVICE LINE TO MAINTENANCE BUILDING

300' OF NEW 8"

CONNECT TO EXISTING 6"

350' OF REPLACEMENT 6"

REMOVE METERS AND PRESSURE SUSTAINING VALVES
4.0 Geotechnical/Permitting/Easements
4.0 Geotechnical/Permitting/Easements

4.01 GEOTECHNICAL

There are several geotechnical issues that must be considered as part of this study. These are summarized in this section.

The first geotechnical issue relates to the diversion itself. Borings were conducted adjacent to the creek and this information was used to assess the method of diversion, the location of the infiltration gallery, and the construction of the concrete wet well adjacent to the creek (see Sections 2.04 and 3.03).

The second area of concern is the routing of the transmission main. As discussed in Section 3.04, slope stability and other geotechnical concerns (e.g. areas of high ground water) exist in the vicinity of the transmission main route and the slope which leads up to the cemetery. The alternative routes identified in Figure 8 are located in an area of stable slope. Soils in these locations appear to contain gravel and cobbles and should be able to be ascended with the new pipeline without stability problems. As a precautionary measure, it is proposed to use restrained joint pipe and periodically spaced concrete anchors to help hold the pipe on the slope. While there is no indication of past slope stability problems in this area, these measures should provide an additional safety factor.

The third area is the cemetery itself. As discussed in Section 1.07, the soil at the depth where the proposed piping system will be installed should be sandy gravel or sandy loam. These soils should provide excellent bedding conditions for the pipe. PVC pipe and fittings will be used to eliminate corrosion concerns with the pipe and fitting materials.

At this time it is not believed there are geotechnical problems associated with the improvements proposed by this project.

4.02 PERMITTING

The following agencies have been contacted regarding possible permitting associated with this project.

• State Board of Control (State Engineers Office) (water rights issues)
• U.S. Army Corps of Engineers (permitting for work in Big Goose Creek)
• State Department of Environmental Quality (permitting for work in Big Goose Creek)
• State Department of Game and Fish (permitting for work in Big Goose Creek)
• State Historical and Preservation Office (all excavation activities)

With the water rights changes proposed in Section 3.02, all water rights issues should be addressed. Again, it is recommended a petition be filed for change in point of diversion and change in place of use for the other two alternate diversion points.

The work within Big Goose Creek will require permitting by the Army Corps of Engineers. A Nationwide permit which includes the requirements of Fact Sheets #13 and #33 will apply. These fact sheets are included in Appendix D. A summary of some of the key requirements of this nationwide permit are as follows:

• No material is to be placed in excess of the minimum needed for erosion protection.
• Permanent fill placed will not exceed an average of one cubic yard per running foot along the bank below the plain of the ordinary high water mark.
• No material is to be placed in any location so as to permanently impair surface water flow.
• No material is to be placed where it will be eroded by normal or expected high flows.
• Appropriate erosion and siltation controls must be used and maintained during construction. All exposed soil and fills must be permanently stabilized at the earliest practical date.
• The activity may not substantially disrupt the movement of species of aquatic life. No activity may jeopardize threatened or endangered species.
• No discharge of dredged material may consist of unsuitable material. These discharges must be minimized to the extent practical for the project site.
• Discharges may not occur into spawning areas during the spawning season.
• After construction, the streambed is to be returned to its pre-existing form so as not to permanently restrict or impede expected high flows. Any temporary fills must be removed.

Chapter 2 of the Wyoming Department of Environmental Quality Water Quality Division Rules and Regulations states that owners or operators of any point source within the State of Wyoming who proposes to commence discharging into waters of the state must obtain an appropriate discharge permit. Discharges from this project are only associated with the construction phase. Big Goose Creek in this location is a Class II stream. Discharge of construction dewatering will be regulated by a turbidity standard. The turbidity cannot increase more than 10 turbidity units when compared to the upstream water quality after an appropriate mixing zone. The discharge of construction dewatering falls under the general permit for temporary construction sites. A specific permit for this project is not required. A notice of intent for a temporary discharge is required however. DEQ requirements are also included in Appendix D. It is possible the contractor may be able to avoid discharge and turbidity issues if he pumps the water from the construction site onto the land adjacent to the creek for infiltration back into the soil, rather than the stream itself.

Runoff from construction sites adjacent to a stream must include a Pollution Prevention Plan, if they exceed one acre. It is not anticipated that this construction site will exceed one acre.

The Wyoming Department of Game and Fish would like construction activities completed prior to October 1st so as to not interfere with spawning brown trout. Since it is planned to perform the construction within the creek during the low water time of the year (late July to early September) this requirement should not present a problem.

The State Historic and Preservation Office (SHPO) requirements apply only if there is federal involvement in the project through either a permit or funding. Since an Army Corps of Engineers permit is required, SHPO requirements apply. A file search was conducted through the SHPO office in Cheyenne. They indicated in 1984 prehistoric mammoth bones were encountered while excavating for a new grave. Because of this, they are requiring an archeologist be on-site during digging operations, particularly those within the cemetery area itself. Therefore, it appears the cost of having an archeologist on-site during this excavation will need to be added to the project budget. This is included under the "permitting and mitigation" item of the cost estimate. Their letter outlining this issue is also included in Appendix D.
4.03 EASEMENTS

The primary easement issues involved with this project pertain to the routing of the transmission main between Leopard Street and the cemetery. The two alternate routes for this transmission main are shown in Figure 8 and this matter is discussed in Section 3.04. Because the property owner in this area has requested taps in exchange for the use of the more desirable route, which would involve an easement, and the City of Sheridan cannot grant taps in exchange for an easement, it is proposed at this time to follow Alternative route #1 (see Figure 8). This route will not require additional permanent easements other than through the Elks area. Additional construction easements will probably be required where the pipeline adjoins Lot 2 of the Zowada Subdivision. It is anticipated that further negotiations with the property owner will allow Alternative route #2 to be used, therefore easements will need to be obtained from this property owner for this pipeline route. These discussions are currently proposed to occur during the design phase. If these negotiations are successful, an easement description will be prepared and this will be secured prior to completing the design phase.

A temporary construction easement will also be required adjacent to the proposed diversion and pump station.
5.0 Recommendations
5.0 Recommendations

This section summarizes the recommendations for this Level II Study. These recommendations are developed following completion of the assessment of the needs for this irrigation project, analysis of alternatives, and development of the conceptual design. It also includes input from the WWDC and City of Sheridan officials from the Phase 1 review meeting and other discussions. The proposed improvements outlined in the project cost estimate (Table 4) reflect these recommendations.

The following summarizes the recommendations for this Level II Study:

• Transfer both the 1.17 cfs originally designated for the golf course and the 0.5 cfs Beckton diversion to this location. Prepare a petition for this change and present it to the State Engineer.

• Install the creek diversion on NB Avenue as shown in Figure 7.

• Construct an infiltration gallery below the bed of Big Goose Creek and connect this gallery to a concrete wet well adjacent to the creek. Provide a means of backflushing the infiltration gallery from the city water system.

• Utilize a triplex vertical turbine pump station with a small pressure maintenance pump to deliver water. This pump station will automatically adjust to maintain a constant downstream pressure.

• Utilize a 12-inch PVC transmission main from the intake to the cemetery maintenance building. Continue negotiations with the property owner to utilize Alternative Route No. 2. At this point Alternative Route No. 1 is anticipated, however Alternative Route No. 2 is the preferred route.

• Utilize a master satellite control system with a central computer communicating to satellite controllers for programming and water management.

• Design the distribution system to cover approximately 10 control zones operated by satellite controllers. These controllers as well as the pump station will be adjustable and operate automatically.

• Design the application of irrigation water to occur during the 8-hour nighttime period (no pond).

• Provide approximately 46-acres of new distribution system and attempt to incorporate the existing distribution system where possible.

• Contact the lodges to verify their desires to upgrade any portions of their distribution systems at this time. Encourage their participation in the project by explaining the plan, estimated costs, schedules, and the opportunity to benefit from economies of scale if they upgrade their system in conjunction with the overall improvement project.

• Provide potable water system improvements to the maintenance building area as presented in Section 3.07.
• Pursue WWDC grant funds to pay 60% of the construction costs of this project.
• Finalize budgeting, planning, and design so construction can commence in late 1999 with system operation to occur in the summer of 2000.
6.0 Economic Analysis
6.0 Economic Analysis

6.01 INTRODUCTION

This section presents the project cost estimates, funding options, project budget, and considers other economic and ability to pay issues. Construction cost estimates presented are the engineer's opinion at this time based on the work completed under this Level II Study. The cost estimates need to be reviewed and revised during final design.

The recommended plan consists of an infiltration gallery diversion, pump station, transmission mains, and reconstruction of approximately 46-acres of the 57-acre cemetery area. Based on discussions with the WWDC and City of Sheridan officials during the development of this Level II Study, there are no options presented to this particular plan as it is believed this plan best addresses the project goals stated in Section 1.01.

6.02 COST ESTIMATES

Table 4 presents a summary of the cost estimate for this project. Improvements summarized in the "Cost of Project Components" of Table 4 are as discussed in Section 2.0 and 3.0 of this report. Table 4 also includes other project costs per the requested WWDC format. Table 5 presents a more detailed breakout on the cost estimates for the construction of the project components. Each subtotal from Table 5 is brought into Table 4.

### TABLE 4
COST ESTIMATE SUMMARY

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation of Final Designs and Specifications</td>
<td>$81,200</td>
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<tr>
<td>Permitting and Mitigation</td>
<td>$28,000</td>
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<tr>
<td>Legal Fees</td>
<td>$2,500</td>
</tr>
<tr>
<td>Acquisition of Access and Rights-of-Way</td>
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<tr>
<td>Cost of Project Components</td>
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<tr>
<td>Infiltration Gallery</td>
<td>$22,000</td>
</tr>
<tr>
<td>Backflushing System</td>
<td>$11,900</td>
</tr>
<tr>
<td>Wet Well &amp; connecting piping</td>
<td>$17,900</td>
</tr>
<tr>
<td>Pumping Station, power, access</td>
<td>$120,500</td>
</tr>
<tr>
<td>Transmission Main to cemetery</td>
<td>$85,500</td>
</tr>
<tr>
<td>Transmission Mains throughout Cemetery</td>
<td>$117,400</td>
</tr>
<tr>
<td>Sprinkler System &amp; Controllers</td>
<td>$406,800</td>
</tr>
<tr>
<td>Potable water improvements</td>
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</tr>
<tr>
<td><strong>Construction Cost Subtotal #1</strong></td>
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<tr>
<td><strong>Engineering Costs = CCS#1 x 10%</strong></td>
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<tr>
<td><strong>Subtotal #2</strong></td>
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<td><strong>Contingency = Subtotal #2 x 15%</strong></td>
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<td>Item</td>
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</tr>
<tr>
<td>Infiltration Gallery</td>
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<tr>
<td>Mobilization/Bonding/Insurance</td>
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<tr>
<td>12&quot; Slotted PVC Pipe</td>
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<tr>
<td>Coffer Dam</td>
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**Extension of City Water to Infiltration Gallery for Back Flushing**

<table>
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<tr>
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<th>Extended Price</th>
</tr>
</thead>
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<td>$1,000</td>
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<td>Connection to Existing 4&quot;</td>
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<td>$500</td>
<td>$500</td>
</tr>
<tr>
<td>4&quot; Tee, plug to west</td>
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<td>$500</td>
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<tr>
<td>4&quot; Gate Valve</td>
<td>EA</td>
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<td>$500</td>
<td>$1,000</td>
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<tr>
<td>4&quot; DR18 C900 PVC</td>
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<td>$24</td>
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<td>4&quot; Check Valve in MH</td>
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<td>$600</td>
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<tr>
<td>Connection to Infiltration Gallery</td>
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<tr>
<td>Subtotal</td>
<td></td>
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<td></td>
<td>$11,900</td>
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</table>

**Piping to Infiltration Gallery and Wet Well**

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<th>Quantity</th>
<th>Unit Price</th>
<th>Extended Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobilization/Bonding/Insurance</td>
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<td>$1,300</td>
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<td>End Connections</td>
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<td>Subtotal</td>
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<td>Quantity</td>
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<td>-------------------------------------------</td>
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<tr>
<td><strong>Pumping Station</strong></td>
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<td>Pumps/Piping/Controls</td>
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<tr>
<td><strong>Transmission Main to Cemetery</strong></td>
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<td><strong>Subtotal</strong></td>
<td></td>
<td></td>
<td></td>
<td>$ 85,500</td>
</tr>
<tr>
<td><strong>Transmission Mains Throughout Cemetery</strong></td>
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<td></td>
<td></td>
</tr>
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<td>$117,400</td>
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### Potable Water Improvements within Cemetery

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<tr>
<th>Item</th>
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<th>Unit Price</th>
<th>Extended Price</th>
</tr>
</thead>
<tbody>
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<td>Mobilization/Bonding/Insurance</td>
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<td>1</td>
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<td>$2,500</td>
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<tr>
<td>Connect to Existing Mains</td>
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<td>$1,500</td>
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<tr>
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<td>$8,750</td>
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<td>$700</td>
<td>$700</td>
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<td>6&quot; Gate Valve</td>
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<td>$500</td>
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<tr>
<td>Fittings</td>
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### Controllers and Sprinkler System

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<th>Item</th>
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<th>Quantity</th>
<th>Unit Price</th>
<th>Extended Price</th>
</tr>
</thead>
<tbody>
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<td>$18,000</td>
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<td>$12,500</td>
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<tr>
<td>CCU 28</td>
<td>LS</td>
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<td>$8,500</td>
<td>$8,500</td>
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<tr>
<td>Satellite Controllers</td>
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<td>$2,200</td>
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<td>Wire and Connections</td>
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<td>Flow Sensors</td>
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<td>$1,000</td>
<td>$14,000</td>
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<tr>
<td><strong>Subtotal</strong></td>
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<td></td>
<td></td>
<td><strong>$406,800</strong></td>
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</tbody>
</table>

#### 6.03 FUNDING PLAN

This project is proposed to be funded by the City of Sheridan and the WWDC. No other grant funding sources are proposed at this time other than WWDC. Other state funding programs such as the State Land and Investment Board (SLIB), Abandoned Mine Lands (AML) Program, and Community Development Block Grant (CDBG) Program are not proposed to be used on this project because this project either does not fit well with those programs (and, therefore, probably will not be funded by them) or are not available for the City of Sheridan in the proposed time frame for this project because of previous commitments on other projects (e.g. SLIB).

The City of Sheridan is proposing to fund their share of this project from two sources. These are the Water and Sewer Fund (an enterprise fund) and by the Engineering Department. Each source will fund 50% of the city's share of the project cost. The Engineering Department's share
is scheduled to be funded by revenue from the 1% Optional Sales Tax. This tax is up for renewal at the November 3, 1998 election. If this tax is renewed, the 50% share from the Engineering Department will continue to come from this source. If it is not renewed, many city budgets will require careful review and revision, therefore the alternate source for this money is not known at this time.

The recently adopted 5-year Capital Improvements Funding Plan plans the city's proposed matching funds for this project from the above two sources over the current and next two fiscal years. Funding from the 1% Optional Sales Tax for the current fiscal year for this project is $42,000. The Engineering Department also subsidizes the annual operation and maintenance of the cemetery. Revenue from cemetery operations only pays approximately one-third of the annual operation and maintenance costs (see 6.04).

Since the city is proposing to pay their portion of the construction of this project from their Water and Sewer Fund and Engineering Department, no loans or bonds are proposed. If borrowing money was required to pay the capital costs, one source is the U.S. Department of Agriculture's Rural Development Program. Rural Development does not typically fund projects for cities larger than 10,000, however their Community Facility Loan Program is an exception and is available for the City of Sheridan. This can provide low interest loans for projects such as the irrigation of the city cemetery. Since it is not currently proposed to borrow money to fund this project, this program will not be presented in detail in this report, however the Rural Development office in Casper (261-6319) can be contacted for further information, should conditions change and a loan be desired.

Another funding option for the initial capital costs should debt be required, are municipal bonds. Municipal bond interest rates are currently in the 5.0% to 5.5% range, therefore relatively low interest money is available for these improvements if this is necessary.

With the current subsidy of the annual operation and maintenance costs for the cemetery from the Engineering Department, it is not practical to use debt to finance a portion of the construction costs of this project. Debt repayments would only require additional subsidy from another source, therefore it is proposed to match anticipated WWDC grants with the two city funds as discussed above.

The removal of the cemetery from the treated water system is an important part of the water conservation program required by the Corps of Engineers for the permit to construct improvements to Twin Lakes Reservoir. Therefore, even though this project involves constructing an alternate irrigation source, it benefits the Sheridan Area Water System. With this benefit, it is recommended the WWDC participate in the cost of all project components outlined in Table 4. The participation level for WWDC grant funding is typically 60% for a new construction project such as this. Table 6 provides a breakout of the project components between the WWDC and City of Sheridan. This table illustrates the proposed 60% share of the costs by the WWDC. Again, the city costs will be split between the Engineering Department and Water and Sewer Fund. If the city's share is to be raised over three fiscal years to spread out the costs, approximately $76,000 will need to be budgeted annually from each of the two funds over the three-year period.
The lodges will need to pay a proportional share for the construction cost of the sprinkler system on their property, should they want a new system installed. Currently the lodges indicate most of their systems are in acceptable condition and they do not want them to be replaced. Some areas will require replacement and these costs will need to be worked into the final project budget. Lodges will be contacted during the design phase and encouraged to take advantage of the economy of scale with the overall project and upgrade their systems. Reconstructed areas will not only require less operation and maintenance, but will enhance overall system compatibility.

### TABLE 6
COST ESTIMATE ALLOCATION
(Costs from Table 4)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>WWDC</th>
<th>CITY</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Costs</td>
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</tr>
<tr>
<td>Infiltration Gallery</td>
<td>$13,200</td>
<td>$8,800</td>
<td>$22,000</td>
</tr>
<tr>
<td>Backflushing</td>
<td>$ 7,140</td>
<td>$ 4,760</td>
<td>$11,900</td>
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<td>Wet Well</td>
<td>$10,740</td>
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<td>$17,900</td>
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<td>Pumping Station</td>
<td>$ 72,300</td>
<td>$ 48,200</td>
<td>$120,500</td>
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<td>Transmission Main to Cemetery</td>
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<td>$ 34,200</td>
<td>$ 85,500</td>
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<td>Transmission Mains in Cemetery</td>
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<td>40%</td>
<td>100%</td>
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</tbody>
</table>

### 6.04 REVENUE

Current revenue for the operation of the Sheridan cemetery comes from three sources. These are as follows:

- Sale of burial sites
  - $300 each for city residents
  - $450 each for out of town residents
- Burial (opening and closing of the grave)
  $225 ($337.50 on Saturdays)

- Transfers from other city funds

When an individual buys a burial site, they receive maintenance such as watering and lawn mowing in perpetuity. The city performs all burials at the cemetery. Income is received from burials on the lodge areas as stated above. Currently the lodges do not pay for the water received. Transfers are made from the Engineering Department as necessary to balance the annual budget. The transfer for the current fiscal year was $111,250. With a budget of $161,250 for this fiscal year, transfers from the Engineering Department support 69% of the total operating costs.

There is no debt associated with the cemetery at this time.

6.05 OPERATION AND MAINTENANCE

The estimated annual operation and maintenance costs for the cemetery are shown in Table 7. This table also breaks out the estimated annual costs associated with the water system. The first four items in this table come from the current city budget for this fiscal year. The remaining four items reflect the estimated costs associated with the operation and maintenance of the proposed water supply facilities. As Table 7 shows, there is an estimated annual cost of $52,000 associated with the irrigation system for the cemetery. This cost does not include any debt repayment. Therefore funding would have to be as presented in Section 6.03.

### TABLE 7
ESTIMATED ANNUAL OPERATION AND MAINTENANCE COSTS

<table>
<thead>
<tr>
<th>Item</th>
<th>Annual Cost</th>
<th>Cost Associated with Water System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel</td>
<td>$120,000</td>
<td>$30,000</td>
</tr>
<tr>
<td>Supplies</td>
<td>$12,000</td>
<td>$4,000</td>
</tr>
<tr>
<td>Services and Charges</td>
<td>$8,000</td>
<td>$2,000</td>
</tr>
<tr>
<td>Capital Outlays</td>
<td>$10,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>Power</td>
<td>$4,500</td>
<td>$4,500</td>
</tr>
<tr>
<td>Pumping Station O&amp;M</td>
<td>$1,800</td>
<td>$1,800</td>
</tr>
<tr>
<td>Pumping Station Replacement</td>
<td>$3,200</td>
<td>$3,200</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>$3,500</td>
<td>$1,500</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$163,000</strong></td>
<td><strong>$52,000</strong></td>
</tr>
</tbody>
</table>

The replacement of system components (a depreciation reserve) are reflected in the following items: supplies, capital outlays, and pumping station replacement. The pumping station replacement cost was determined by taking the $64,000 estimated cost for the pumping system
package (materials only) and dividing it by a 20-year life. If $3,200 is set aside each year, these funds would be available to replace pump station components.

6.06 CHARGES FOR WATER

This study proposes a charge for water used at the cemetery be developed and incorporated into the annual budget for the operation of the cemetery. It also proposes the five lodges be billed based on the amount of water they use. The approximate breakout of the 57-acre cemetery is shown in Table 8. Table 3 presents maximum water application rates based on evapotranspiration. This shows 73,000,000 gallons may be applied annually to the cemetery under the design maximum application rates. On average, annual application rates will be less. Table 8 is developed assuming 50,000,000 gallons are applied per year. This rate assumes no application in April or October and a lesser application in the May through September period than the maximum rate shown in Table 3. Based on the areas owned by the separate entities and 50,000,000 gallons total application, the water applied to each of the areas within the cemetery is shown in Table 8.

The City of Sheridan currently charges $0.80 per thousand gallons ($0.60 per 100 cubic feet) for treated water. If the annual budget presented in Table 7 is to be recovered by selling 50,000,000 gallons of water per year, the rate per thousand gallons will exceed $0.80. It is proposed to maintain the same $0.80 per thousand gallon rate for raw water applied through this system. Switching to the infiltration gallery source on Big Goose Creek will result in as good a quality of water for irrigation as is the current treated water. Therefore, not discounting this rate is justifiable. The lodges will benefit from the improvements as a much more dependable supply is being made available to them. They will also benefit from the automatic control systems that will be used to water their areas, thus reducing the operation and maintenance they need to perform. Therefore, it is recommended $0.80 per thousand gallons be used to charge the lodges for the water they use and to allocate a portion of the operating costs of this system to the city. The city will then need to continue to subsidize the cemetery through the Engineering Department or some other source.

As discussed in Section 3.05, it is not proposed to meter the water to each of the lodges. The quantity applied to the area owned by the lodges would be calculated based on their area and the flow sensors in the satellite controllers of the system control software.

TABLE 8
ESTIMATED ANNUAL PAYMENTS

<table>
<thead>
<tr>
<th>ENTITY</th>
<th>AREA</th>
<th>WATER APPLIED</th>
<th>ANNUAL COST</th>
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<tr>
<td>City</td>
<td>42.2 acres</td>
<td>37.1 MG</td>
<td>$29,680</td>
</tr>
<tr>
<td>Elks</td>
<td>7.8 acres</td>
<td>6.8 MG</td>
<td>$5,440</td>
</tr>
<tr>
<td>Eagles</td>
<td>0.5 acres</td>
<td>0.4 MG</td>
<td>$320</td>
</tr>
<tr>
<td>Masonic #8</td>
<td>3.2 acres</td>
<td>2.8 MG</td>
<td>$2,240</td>
</tr>
<tr>
<td>Masonic #40</td>
<td>2.3 acres</td>
<td>2.0 MG</td>
<td>$1,600</td>
</tr>
<tr>
<td>Odd Fellows</td>
<td>1.0 acres</td>
<td>0.9 MG</td>
<td>$720</td>
</tr>
<tr>
<td>TOTAL</td>
<td>57.0 acres</td>
<td>50 MG</td>
<td>$40,000</td>
</tr>
</tbody>
</table>
Appendices
WWDC LEVEL II - CEMETERY DIVERSION

GROUNDWATER INVESTIGATION

PREPARED FOR
MSE-HKM ENGINEERING
DAYTON ALSAKER, P.E.
P.O. BOX 7010
SHERIDAN, WYOMING 82801

PREPARED BY
PILCH ENGINEERING
THOMAS J. PILCH, P.E., P.G.
P.O. BOX 6498
SHERIDAN, WYOMING 82801

JULY 1998
July 10, 1998

MSE-HKM
Attn. Dayton Alsaker, P.E.
P.O. Box 7010
Sheridan, Wyoming 82801

Subject: WWDC Level II Study, Cemetery Diversion.

Dear Dayton:

The following letter report summarizes the field work and conclusion/recommendation on the groundwater investigation for the above subject. The work was performed in general accordance with the submitted proposal.

Drilling - Well Construction

Drilling was performed by Maxim Technologies utilizing a CME-75 hollow stem auger drilling rig. A total of three wells were installed at the subject site. The general layout of the wells are presented on Figure 1. One well was installed as a pumping well and two other wells were installed as monitoring wells. The pumping well is 4 inch I.D., Schedule 40 pvc pipe with 10 feet of .02 mill slotted screen. The monitoring wells are 2 inch I.D., Schedule 40 pvc pipe with 10 feet of .02 mill slotted screen. All wells were set at approximately 13.5 to 14 feet below the ground surface. The screened interval, bottom 10 feet, and 1.0 feet above the screen on all wells were sand packed with 8-12 silica sand. The annular space on the pumping well is approximately 3 inches and approximately 2.5 inches on the monitoring wells. A bentonite seal was place in the annular space from the sand pack to approximately 1 foot below the ground surface. This top foot was backfilled with drill cuttings.

Subsurface Conditions

During drilling auger cuttings and split spoon samples were collected to field identify the subsoils. The subsoil conditions generally consisted of 1-2 feet of dark brown top soil overlying silty to sandy brown clay. The silt and sand within the clay increased with depth. The clay is moist to wet at approximately 4 feet. The clay grades into a silty to clayey sandy gravel at
approximately 7 feet in the pumping well and monitor well 1. In
monitor well 2 the clay grades into a silty-clayey sand with
occasional gravel at approximately 4 feet, and a gravel is
encountered at approximately 7 feet. The gravel is clayey to silty
and becomes very clayey at approximately 12 feet. In monitor well
2, the gravel contains higher percentages of clay, silt and sand.
At approximately 13.5 to 15 feet a gray hard claystone bedrock is
encountered. A drive sample of the claystone at approximately 15
feet was obtained and the sample was slightly moist, indicating the
claystone is minimizing any groundwater migration.

Static groundwater levels within the wells immediately after
drilling were measured a approximately 4 feet below the ground
surface.

Groundwater Pump Tests

The pumping well was developed by surging the well and pumping
water until the water was virtually free of silty sediment. The
monitoring wells were also developed by surging the well and
bailing water until the water was virtually free of silty sediment.

During development of the pumping well it was noted that the well
did not produce the anticipated amount of water. Therefore, a slug
test was performed on the pumping well. The slug test consisted of
quickly removing water from the well and monitoring the water level
recovery. Two slug tests were performed. Also, during the slug
tests the water level in the monitoring wells were checked. Monitor
well 1 showed a .25 to .5 inch drop in the static water
level during the tests and there wasn’t any change in monitoring
well 2. These tests were analyzed and it was determined that the
pumping well could only produce approximately 1 gallon per minute,
and therefore, a long term pump test was not warranted. Rather,
slug tests would be performed on the two monitoring wells.

Slug test data sheets are contained in Appendix A. The slug test
data was evaluated using the Bouwer and Rice Slug Test - 1989
Update method. The tests indicate that the hydraulic conductivity
of the subsoil in the area of the wells ranges between $1 \times 10^{-7} -
3.8 \times 10^{-7}$ meters/second. These test results indicate that the
subsoil classifies as a silty-sand to silty-clayey gravel.

Conclusion/Recommendation

The reason for this groundwater analysis was to determine the
applicability of an infiltration gallery to supply approximately
1.5 cfs of groundwater. Based on the tested hydraulic
conductivity, an non-enhanced infiltration gallery thousands of
feet long would be needed to supply this volume. This length is excessive and would extend well beyond the area of investigation. The saturated thickness of gravel and silty/clayey nature of the gravel in this area hinders the volume of water transmitted through it. It is possible that there would be other gravel zones in this area that would contain higher hydraulic conductivity’s, but as a rule, these conductivity’s would not be substantially greater.

There are alternative artificial infiltration gallery designs that could utilize groundwater filter the river water. An enhanced infiltration structure in combination with an river intake structure could be designed. This structure would add some clean groundwater to the system and filter some of the river water. If there is an interest, I would be happy to go over this with you.

If there are any questions, please call.

Sincerely,

Thomas J. Pilch, P.E., P.G.
APPENDIX A

GROUNDWATER PUMP TEST DATA
Geometry and symbols for slug test on partially penetrating, partially screened well in unconfined aquifer with gravel pack and/or developed zone around screen.

Values of $R_e$ were determined with an electrical resistance network analog for different values of $r_w$, $L_e$, $L_w$, and $H$ (see Figure 1 for meaning of geometry symbols). The value of $r_w$ is the radius of the screened or open section of the well plus the thickness of a sand or gravel pack and/or of the developed zone around the well. Thus, $r_w$ is the radial distance from the center of the well to normal $K$ of the aquifer. Because the thickness of the developed zone is almost never known, the tendency is to ignore it and take only gravel or sand packs into account.

The rate of rise $dy/dt$ of the water level in the well after the water level has been quickly lowered some distance is

$$\frac{dy}{dt} = -\frac{Q}{\pi r_c^2} \quad (2)$$

where $r_c$ is the radius of the casing or other section of the well where the rise of the water level is measured. If the water level rises in the screened or open section of the well with a gravel pack around it, the thickness and porosity of the gravel envelope should be taken into account when calculating the equivalent value of $r_c$ for the rising water level. This calculation is based on the total free-water surface area in the well and sand or gravel pack, calculated as $\pi r_c^2 + \pi (r_w^2 - r_c^2)n$, where $n$ is the porosity, and $r_w - r_c$ is the thickness of the envelope. The equivalent radius of a circle giving this total area is then calculated as $[(1 - n)r_c^2 + nr_w^2]^{1/2}$. For example, if the radius of the screen or perforated casing is 20 cm and there is 8 cm gravel pack with a porosity of 30 percent, $r_c$ should be taken as 25.9 cm, while $r_w$ is 28 cm.

Solving equation (2) for $Q$, equating the resulting expression to equation (1), integrating, and solving for $K$ yields

$$K = \frac{r_c^2 \ln (R_e/r_w)}{2L_e} \left(\frac{1}{t} \ln \frac{y_0}{y_t}\right) \quad (3)$$

where $y_0 = y$ at time zero; and $y_t = y$ at time $t$.

The results of the analog analyses to evaluate $R_e$ for various system geometries were expressed in terms of the dimensionless ratio $\ln (R_e/r_w)$. The data could be fitted into two equations, one for the case where $L_w < H$, and one where $L_w = H$. The resulting equations were, respectively,

$$\ln \frac{R_e}{r_w} = \left[\frac{1.1}{\ln (L_w/r_w)} + \frac{A + B \ln [(H - L_w)/r_w]}{L_e/r_w}\right]^{-1} \quad (4)$$

and

$$\ln \frac{R_e}{r_w} = \left[\frac{1.1}{\ln (L_w/r_w)} + \frac{C}{L_e/r_w}\right]^{-1} \quad (5)$$

where $A$, $B$, and $C$ are dimensionless numbers plotted in Figure 2 as a function of $L_e/r_w$. 

![Figure 2. Dimensionless parameters A, B, and C as a function of $L_e/r_w$ for calculation of $\ln (R_e/r_w)$.](image-url)
\[ K = \frac{v^2}{B} \left( \frac{1}{C_1} + \frac{1}{C_2} \right) \]

\[ C_1 = \frac{2L_e}{\phi^2} \]

\[ C_2 = \frac{2L_c}{\phi} \]

From graph, \( C_1 = 1.1 \)

\[ \ln \frac{B e}{C_w} = \left[ \frac{1}{\ln \frac{C_w}{C_m}} + \frac{1}{B C_w} \right]^{-1} \]

\[ L_e = 9.3 \quad 2C_w = 18 \]

\[ L_c = 9.3 \quad 2C_m = 33 \]

\[ H = 9.3 \quad L = 0 \]

\[ \ln \frac{B e}{C_w} = \left[ \frac{1}{\ln \frac{C_w}{C_m}} + \frac{1}{B C_w} \right]^{-1} = 2.30 \]

\[ K = \frac{(2.1)^2 (2.3 \Phi)}{(2) (9.33)} \]

\[ 111 = \frac{10003.6 - 44 \frac{m}{s^2} \cdot 1.8 \times 10^{-6} m^2}{\text{sec}^2} \]
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<th>ΔH</th>
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<td>-</td>
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<tr>
<td>11</td>
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<td>2.83</td>
<td>-</td>
<td>540/937</td>
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\[
\frac{100W-1}{k} = \frac{r_e^2}{\ln} \frac{Re}{RU} \left( \frac{1}{\frac{L}{Re}} \right)^{1.1}
\]

\[L = 15.3 - 6.82 = 8.42 \text{ m} \text{ From graph} \]

\[r_e \approx 1 = 0.083 \]

\[r_e = 1.42 = 100W \]

\[r_w = 1.37 \]

\[l_w = 100W \quad \therefore c = \frac{l_e}{l_w} = 30 \quad \text{From chart} \]

\[\ln \frac{Re}{RU} = \frac{1}{\ln} \left( \frac{l_w}{l_w} + \frac{c}{r_w} \right)^{-1} = \left( \frac{1.1}{\ln \frac{r_w}{131}} + \frac{2}{9.42} \right)^{-1} \]

\[= 2.6 \]

\[k = \left( \frac{0.083}{2.6} \right)^2 \times 10^{-7} \text{ m/s} \text{ min}^{-1} \]

\[= 7.5 \times 10^{-5} \text{ m/s} \text{ min}^{-1} \]

\[= 3.8 \times 10^{-7} \text{ m/ sec} \]
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<th>Measure</th>
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<th>Error</th>
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<tr>
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<tr>
<td>8</td>
<td>2.74</td>
<td>16.42</td>
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</tr>
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</table>
\[ k = \frac{L^2}{10 \cdot \frac{r_w}{L}} \begin{cases} \frac{1}{r_w} + \frac{\zeta}{r_w} \\ \zeta = \frac{L_e}{r_w} \cdot \frac{2}{\zeta} \end{cases} \]

\[ L_e = 10.42 \text{ ft} \]

\[ r_w = 31 \]

\[ \frac{L_e}{r_w} = \left( \frac{1}{10} \cdot \frac{10.42}{1/31} \right) = 2.68 \]

\[ k = \frac{(10.42)^2 \cdot (2.68)}{2 \cdot (10.42) \cdot 0.23} = 2 \times 10^{-5} \text{ ft/lbf}, \]

\[ 1 \times 10^{-7} \text{ m/sec} \]
GRAIN SIZE DISTRIBUTION TEST DATA  
Test No.: 1

Date: July 20, 1998
Project No.: 10M183.140
Project: WWDC Level II - Cemetery

Sample Data

Location of Sample: Creek Bottom
Sample Description: Poorly graded gravel with sand
SCS Class: GP  Liquid limit: -
AASHTO Class: -  Plasticity index: -

Notes

Remarks: Sampled and Submitted by Alsaker on 7-17-98
Test Completed by Mike Graves on 7-20-98

Mechanical Analysis Data

<table>
<thead>
<tr>
<th>Sieve Size, mm</th>
<th>Percent finer</th>
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</thead>
<tbody>
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<td>100.0</td>
</tr>
<tr>
<td>38.10 inches</td>
<td>79.0</td>
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<tr>
<td>25.40 inches</td>
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<tr>
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<td>0.075 # 200</td>
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Fractional Components

Gravel/Sand based on #4 sieve
and/Fines based on #200 sieve

+ 3 in. = 0.0  % GRAVEL = 67.0  % SAND = 31.2
% FINES = 1.8

85 = 47.81  D60 = 20.091  D50 = 14.060
D30 = 1.8535  D15 = 0.69663  D10 = 0.52845
Cc = 0.3236  Cu = 38.0189
### GRAIN SIZE DISTRIBUTION TEST REPORT

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<th>% +3&quot;</th>
<th>% GRAVEL</th>
<th>% SAND</th>
<th>% SILT</th>
<th>% CLAY</th>
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<td>67.0</td>
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<table>
<thead>
<tr>
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<th>PI</th>
<th>D85</th>
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<td>0.528</td>
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### MATERIAL DESCRIPTION

- Poorly graded gravel with sand

### Project Details

- **Project No.:** 10M183.140
- **Project:** WWDC Level II - Cemetery
- **Location:** Creek Bottom

### Remarks:

- Sampled and Submitted by Alsaker on 7-17-98
- Test Completed by Mike Graves on 7-20-98

### Date:

- **Date:** July 20, 1998
Sample Data

Location of Sample: Creek Bottom
Sample Description: Poorly graded sand with gravel
SCS Class: SP
AASHTO Class: -
Liquid limit: -
Plasticity index: -

Notes

Remarks: Sampled and Submitted by Alsaker on 7-17-98
Test Completed by Mike Graves on 7-20-98

Mechanical Analysis Data

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<td>.063 inches</td>
<td>12.70</td>
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<tr>
<td># 30</td>
<td>0.600</td>
</tr>
<tr>
<td># 50</td>
<td>0.300</td>
</tr>
<tr>
<td># 100</td>
<td>0.150</td>
</tr>
<tr>
<td># 200</td>
<td>0.075</td>
</tr>
</tbody>
</table>

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
+ 3 in. = 0.0 % GRAVEL = 35.0 % SAND = 62.6 % FINES = 2.4

85 = 32.36 D60 = 3.428 D50 = 1.950
-30 = 0.4955 D15 = 0.22131 D10 = 0.16982
Cc = 0.4217 Cu = 20.1837
**GRAIN SIZE DISTRIBUTION TEST REPORT**

### Grain Size Distribution - mm

<table>
<thead>
<tr>
<th>GRAIN SIZE</th>
<th>% +3&quot;</th>
<th>% GRAVEL</th>
<th>% SAND</th>
<th>% SILT</th>
<th>% CLAY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.0</td>
<td>35.0</td>
<td>62.6</td>
<td>2.4</td>
<td></td>
</tr>
</tbody>
</table>

### LL, PI, D85, D60, D50, D30, D15, D10, Cc, Cu

<table>
<thead>
<tr>
<th></th>
<th>LL</th>
<th>PI</th>
<th>D85</th>
<th>D60</th>
<th>D50</th>
<th>D30</th>
<th>D15</th>
<th>D10</th>
<th>Cc</th>
<th>Cu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project</td>
<td>-</td>
<td>-</td>
<td>32.4</td>
<td>3.43</td>
<td>1.95</td>
<td>0.495</td>
<td>0.221</td>
<td>0.170</td>
<td>0.42</td>
<td>20.2</td>
</tr>
</tbody>
</table>

### Material Description

- Poorly graded sand with gravel

### Remarks

- Sampled and Submitted by Alsaker on 7-17-98
- Test Completed by Mike Graves on 7-20-98

**Project No.: 10M183.140**

**Project:** WWDC Level II - Cemetery

**Location:** Creek Bottom

**Date:** July 20, 1998

**MSE-HKM, INC**
GRAIN SIZE DISTRIBUTION TEST DATA

Date: July 20, 1998
Project No.: 10M183.140
Project: WWDC Level II - Cemetery

Sample Data

Location of Sample: Creek Bottom
Sample Description: Well graded gravel with sand
SCS Class: GW Liquid limit: -
AASHTO Class: - Plasticity index: -

Notes

Remarks: Sampled and Submitted by Alsaker on 7-17-98
Test Completed by Mike Graves on 7-20-98

Test No.: 3

Mechanical Analysis Data

<table>
<thead>
<tr>
<th>Sieve</th>
<th>Size, mm</th>
<th>Percent finer</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>inches</td>
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<tr>
<td>.5</td>
<td>inches</td>
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<td>inches</td>
<td>25.40</td>
</tr>
<tr>
<td>&gt;.75</td>
<td>inches</td>
<td>19.05</td>
</tr>
<tr>
<td>&gt;.5</td>
<td>inches</td>
<td>12.70</td>
</tr>
<tr>
<td>&gt;.375</td>
<td>inches</td>
<td>9.53</td>
</tr>
<tr>
<td># 4</td>
<td></td>
<td>4.750</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>2.360</td>
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<tr>
<td>16</td>
<td></td>
<td>1.180</td>
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<td># 30</td>
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<td>0.600</td>
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<td># 50</td>
<td></td>
<td>0.300</td>
</tr>
<tr>
<td># 100</td>
<td></td>
<td>0.150</td>
</tr>
<tr>
<td># 200</td>
<td></td>
<td>0.075</td>
</tr>
</tbody>
</table>

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
+3 in. = 0.0 % GRAVEL = 62.0 % SAND = 34.9
% FINES = 3.1

I'5' = 38.02 D60 = 16.312 D50 = 10.777
D30 = 2.3578 D15 = 0.41928 D10 = 0.27071
Cu = 1.2589 Cu = 60.2560
GRAIN SIZE DISTRIBUTION TEST REPORT

<table>
<thead>
<tr>
<th>% +3&quot;</th>
<th>% GRAVEL</th>
<th>% SAND</th>
<th>% SILT</th>
<th>% CLAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>62.0</td>
<td>34.9</td>
<td>3.1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LL</th>
<th>PI</th>
<th>D85</th>
<th>D60</th>
<th>D50</th>
<th>D30</th>
<th>D15</th>
<th>D10</th>
<th>Cc</th>
<th>Cu</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>-</td>
<td>38.0</td>
<td>16.3</td>
<td>10.8</td>
<td>2.36</td>
<td>0.419</td>
<td>0.271</td>
<td>1.26</td>
<td>60.3</td>
</tr>
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</table>

MATERIAL DESCRIPTION

- Well graded gravel with sand

USCS | AASHTO
-----|------
GW   | -    

Project No.: 10M183.140
Project: WWDC Level II - Cemetery
Location: Creek Bottom

Date: July 20, 1998

Remarks:
Sampled and Submitted by Alsaker on 7-17-98
Test Completed by Mike Graves on 7-20-98

Figure No. 3
GRAIN SIZE DISTRIBUTION TEST DATA

Date: July 20, 1998
Project No.: 10M183.140
Project: WWDC Level II - Cemetery

Sample Data

Location of Sample: Creek Bottom
Sample Description: Poorly graded sand with gravel
SCS Class: SP
AASHTO Class: -
Liquid limit: -
Plasticity index: -

Notes

Remarks: Sampled and Submitted by Alsaker on 7-17-98
Test Completed by Mike Graves on 7-20-98

Mechanical Analysis Data

<table>
<thead>
<tr>
<th>Sieve size</th>
<th>Size, mm</th>
<th>Percent finer</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 inches</td>
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<td>.5 inches</td>
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<tr>
<td>.375 inches</td>
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<tr>
<td># 4</td>
<td>4.750</td>
<td>52.0</td>
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<tr>
<td># 8</td>
<td>2.360</td>
<td>36.0</td>
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<tr>
<td>16</td>
<td>1.180</td>
<td>20.0</td>
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<tr>
<td># 30</td>
<td>0.600</td>
<td>13.0</td>
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<tr>
<td># 50</td>
<td>0.300</td>
<td>6.0</td>
</tr>
<tr>
<td>100</td>
<td>0.150</td>
<td>3.0</td>
</tr>
<tr>
<td>200</td>
<td>0.075</td>
<td>1.8</td>
</tr>
</tbody>
</table>

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
+ 3 in. = 0.0  % GRAVEL = 48.0  % SAND = 50.2
% FINES = 1.8

D35 = 46.77  D60 = 9.441  D50 = 4.217
Lj0 = 1.8621  D15 = 0.74131  D10 = 0.44668
Cc = 0.8222  Cu = 21.1349
GRAIN SIZE DISTRIBUTION TEST REPORT

<table>
<thead>
<tr>
<th>% +3&quot;</th>
<th>% GRAVEL</th>
<th>% SAND</th>
<th>% SILT</th>
<th>% CLAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>48.0</td>
<td>50.2</td>
<td>1.8</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LL</th>
<th>PI</th>
<th>D85</th>
<th>D60</th>
<th>D50</th>
<th>D30</th>
<th>D15</th>
<th>D10</th>
<th>Cc</th>
<th>Cu</th>
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<tbody>
<tr>
<td>-</td>
<td>-</td>
<td>46.8</td>
<td>9.44</td>
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<td>0.447</td>
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</table>

MATERIAL DESCRIPTION

- Poorly graded sand with gravel

Project No.: 10M183.140
Project: WWDC Level II - Cemetery
- Location: Creek Bottom

Date: July 20, 1998

Remarks:
- Sampled and Submitted by Alsaker on 7-17-98
- Test Completed by Mike Graves on 7-20-98

Figure No. 4
Sample Data

Location of Sample: Creek Bottom
Sample Description: Well graded gravel with sand
SCS Class: GW
AASHTO Class: -
Liquid limit: -
Plasticity index: -

Notes

Remarks: Sampled and Submitted by Alsaker on 7-17-98
Test Completed by Mike Graves on 7-20-98

Mechanical Analysis Data

<table>
<thead>
<tr>
<th>Sieve Size, mm</th>
<th>Percent finer</th>
</tr>
</thead>
<tbody>
<tr>
<td>76.20 inches</td>
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<td>38.10 inches</td>
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<tr>
<td>25.40 inches</td>
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<td>12.70 inches</td>
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<td>9.53 inches</td>
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<tr>
<td>4.750 inches</td>
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<td>2.360 inches</td>
<td>33.0</td>
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<tr>
<td>1.180 inches</td>
<td>28.0</td>
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<td>23.0</td>
</tr>
<tr>
<td>0.300 inches</td>
<td>15.0</td>
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<tr>
<td>0.150 inches</td>
<td>8.0</td>
</tr>
<tr>
<td>0.075 inches</td>
<td>4.9</td>
</tr>
</tbody>
</table>

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
+ 3 in. = 0.0 % GRAVEL = 58.0 % SAND = 37.1
% FINES = 4.9

I = 5: 25.38 D60 = 12.148 D50 = 7.320
D30 = 1.6014 D15 = 0.29819 D10 = 0.18815
Cu = 1.1220 Cu = 64.5654
### Grain Size Distribution Test Report

**GRAIN SIZE DISTRIBUTION**

- **PERCENT FINER**
  - 100
  - 90
  - 80
  - 70
  - 60
  - 50
  - 40
  - 30
  - 20
  - 10
  - 0

- **GRAIN SIZE - mm**
  - 0.2
  - 0.1
  - 0.01
  - 0.001

<table>
<thead>
<tr>
<th>% +3&quot;</th>
<th>% GRAVEL</th>
<th>% SAND</th>
<th>% SILT</th>
<th>% CLAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>58.0</td>
<td>37.1</td>
<td>4.9</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LL</th>
<th>PI</th>
<th>D85</th>
<th>D60</th>
<th>D50</th>
<th>D30</th>
<th>D15</th>
<th>D10</th>
<th>Cc</th>
<th>Cu</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>-</td>
<td>25.4</td>
<td>12.1</td>
<td>7.32</td>
<td>1.60</td>
<td>0.298</td>
<td>0.188</td>
<td>1.12</td>
<td>64.6</td>
</tr>
</tbody>
</table>

**MATERIAL DESCRIPTION**

- Well graded gravel with sand

**USCS**

- GW

**AASHTO**

- -

**Remarks:**

- Sampled and Submitted by Alsaker on 7-17-98
- Test Completed by Mike Graves on 7-20-98

**Project No.:** 10M183.140

**Project:** WWDC Level II - Cemetery

**Location:** Creek Bottom

**Date:** July 20, 1998

**Figure No. 5**
GRAIN SIZE DISTRIBUTION TEST DATA  

Test No.: 6  

ate: July 23, 1998  
Project No.: 10M183.140  
Project: WWDC Level II - Cemetery  

---

Sample Data  

Location of Sample: Creek Bottom  
Sample Description: Well graded gravel with sand  
SCS Class: GW  
AASHTO Class: -  
Liquid limit: -  
Plasticity index: -  

Notes  

Remarks: Sampled and Submitted by Hines on 7-22-98  
Test Completed by Kim Hager on 7-23-98  

---

Mechanical Analysis Data  

<table>
<thead>
<tr>
<th>Sieve Size, mm</th>
<th>Percent finer</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 inches</td>
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</tr>
<tr>
<td>.5 inches</td>
<td>96.0</td>
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<td>.375 inches</td>
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<td># 4</td>
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<td># 8</td>
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<tr>
<td>100</td>
<td>7.0</td>
</tr>
<tr>
<td>.200</td>
<td>4.6</td>
</tr>
</tbody>
</table>

Fractional Components  

Gravel/Sand based on #4 sieve  
Sand/Fines based on #200 sieve  

+ 3 in. = 0.0  % GRAVEL = 63.0  % SAND = 32.4
% FINES = 4.6

D35 = 26.00  D60 = 14.077  D50 = 9.517
D30 = 2.8412  D15 = 0.38770  D10 = 0.21553
Cc = 2.6607  Cu = 65.3131
GRAIN SIZE DISTRIBUTION TEST REPORT

% +3" % GRAVEL % SAND % SILT % CLAY
0.0 63.0 32.4 4.6

LL PI D85 D60 D50 D30 D15 D10 Cc Cu
- - 26.0 14.1 9.52 2.84 0.388 0.216 2.66 65.3

MATERIAL DESCRIPTION
Well graded gravel with sand

USCS AASHTO
GW -

Remarks:
Sampled and Submitted by Hines on 7-22-98
Test Completed by Kim Hager on 7-23-98

Date: July 23, 1998

GRAIN SIZE DISTRIBUTION TEST REPORT
MSE-HKM, INC.

Figure No. 6
Appendix D
33 CFR Section 330.6 Nationwide Permits

(b) **Authorized Activities:**

(13) **Bank stabilization.** Bank stabilization activities necessary for erosion prevention provided:

a. No material is placed in excess of the minimum needed for erosion protection;
b. The bank stabilization activity is less than 500 feet in length;
c. The activity will not exceed an average of one cubic yard per running foot placed along the bank below the plane of the ordinary high water mark or the high tide line;
d. No material is placed in any special aquatic site, including wetlands;
e. No material is of the type or is placed in any location or in any manner so as to impair surface water flow into or out of any wetland area;
f. No material is placed in a manner that will be eroded by normal or expected high flows (properly anchored trees and treetops may be used in low energy areas); and,
g. The activity is part of a single and complete project.

Bank stabilization activities in excess of 500 feet in length or greater than an average of one cubic yard per running foot may be authorized if the permittee notifies the district engineer in accordance with the "Notification" general condition and the district engineer determines the activity complies with the other terms and conditions of the nationwide permit and the adverse environmental impacts are minimal both individually and cumulatively. (Sections 10 and 404)

(c) **General Conditions:** The following general conditions, where applicable, must be complied with for the Nationwide Permit authorization to remain valid:

(1) **Navigation.** No activity may cause more than a minimal adverse effect on navigation.

(2) **Proper maintenance.** Any structure or fill authorized shall be properly maintained, including maintenance to ensure public safety.

(3) **Erosion and siltation controls.** Appropriate erosion and siltation controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills must be permanently stabilized at the earliest practicable date.

(4) **Aquatic life movements.** No activity may substantially
disrupt the movement of those species of aquatic life indigenous to the waterbody, including those species which normally migrate through the area, unless the activity's primary purpose is to impound water.

(5) **Equipment.** Heavy equipment working in wetlands must be placed on mats or other measures must be taken to minimize soil disturbance.

(6) **Regional and case-by-case conditions.** The activity must comply with any regional conditions which may have been added by the division engineer and any case specific conditions added by the Corps.

(7) **Tribal Rights.** No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

(8) **Endangered Species.** No activity is authorized under any Nationwide Permit which is likely to jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act, or which is likely to destroy or adversely modify the critical habitat of such species. Non-federal permittees shall notify the district engineer if any listed species or critical habitat might be affected or is in the vicinity of the project and shall not begin work on the activity until notified by the district engineer that the requirements of the Endangered Species Act have been satisfied and that the activity is authorized. Information on the location of threatened and endangered species and their critical habitat can be obtained from the U. S. Fish and Wildlife Service and National Marine Fisheries Service.

(9) **Historic properties.** No activity which may affect Historic properties listed, or eligible for listing, in the National Register of Historic Places is authorized, until the district engineer has complied with the provisions of 33 CFR 325, appendix C. The prospective permittee must notify the district engineer if the authorized activity may affect any historic properties listed, determined to be eligible, or which the prospective permittee has reason to believe may be eligible for listing on the National Register of Historic Places, and shall not begin the activity until notified by the District Engineer that the requirements of the National Historic Preservation Act have been satisfied and that the activity is authorized. Information on the location and existence of historic resources can be obtained from the State Historical Preservation Office and the National Register of Historic Places.
SECTION 404 ONLY CONDITIONS

In addition to the General Conditions, the following conditions apply only to activities that involve the discharge of dredged or fill material and must be followed in order for authorization by the nationwide permits to be valid:

(1) **Water Supply Intakes.** No discharge of dredged or fill material may occur in the proximity of a public water supply intake except where the discharge is for repair of the public water supply intake structures or adjacent bank stabilization.

(2) **Suitable material.** No discharge of dredged or fill material may consist of unsuitable material (e.g., trash, debris, car bodies, etc.) and material discharged must be free from toxic pollutants in toxic amounts.

(3) **Mitigation.** Discharges of dredged or fill material into waters of the United States must be minimized or avoided to the maximum extent practicable at the project site (i.e. on-site), unless the district engineer has approved a compensation mitigation plan for the specific regulated activity.

(4) **Spawning areas.** Discharges in spawning areas during spawning seasons must be avoided to the maximum extent practicable.

(5) **Obstruction of high flows.** To the maximum extent practicable, discharges must not permanently restrict or impede the passage of normal or expected high flows or cause the relocation of the water (unless the primary purpose of the fill is to impound waters).

(6) **Adverse impacts from impoundments.** If the discharge creates an impoundment of water, adverse impacts on the aquatic system caused by the accelerated passage of water and/or the restriction of its flow shall be minimized to the maximum extent practicable.

(7) **Waterfowl breeding areas.** Discharges into breeding areas for migratory waterfowl must be avoided to the maximum extent practicable.

(8) **Removal of temporary fills.** Any temporary fills must be removed in their entirety and the affected areas returned to their preexisting elevation.
Nationwide Permit Notification Procedures

The Corps nationwide permit program was described in the November 22, 1991, edition of the Federal Register. The nationwide permits and their application in Wyoming were further described in a Public Notice issued on January 21, 1992, by the Omaha District Office.

Several of the Corps' nationwide permits pertaining to the discharge of dredged or fill material into Wyoming waterbodies and/or wetlands have a condition which requires that the Corps be officially notified before the proposed work can begin.

This condition requires that the applicant notify the District Engineer of the proposed project in writing and provide the following information:

1. Name, address, and telephone number of the prospective permittee;

2. Location of the proposed project;

3. Brief description of the proposed project, the project's purpose, direct and indirect adverse environmental effects the project would cause, any other NWPs, regional general permits or individual permits used or intended to be used to authorize any part of the proposed project or any related activity;

4. Where required by the terms of the NWP, a delineation of affected special aquatic sites, including wetlands, and;

5. A statement that the prospective permittee has contacted:

   A. The U.S. Fish and Wildlife Service (USF&WS) regarding the presence of any federally listed, or proposed for listing, endangered or threatened species or critical habitat in the permit area that may be affected by the proposed project; and any available information provided by that agency. The address and phone number for the USF&WS in Wyoming is:

      U.S. Fish and Wildlife Service
      4000 Morrie Avenue
      Cheyenne, Wyoming 82001
      Phone: (307) 772-2374

   B. The State Historical Preservation Office (SHPO) regarding the presence of any historic properties in the permit area that may be affected by the proposed project; and
the available information, if any, provided by that agency. The address and phone number for the State of Wyoming SHPO is:

State Historic Preservation Office
Barrett Building
2301 Central
Cheyenne, Wyoming 82002
Phone: (307) 777-7697

A simple letter or the standard individual permit application form (ENG Form 4345) may be used as the notification document, but must clearly indicate that it is a Predischarge Notification and must include all of the information described above.

The information outlined is to be sent to:

Corps of Engineers
Cheyenne Regulatory Office
2232 Dell Range Blvd.
Suite 210
Cheyenne, Wyoming 82009
Phone: (307) 772-2300
Fax: (307) 772-2920
33 CFR Section 330.6 Nationwide Permits

(b) Authorized Activities:

(33) Temporary Construction, Access and Dewatering. Temporary structures and discharges, including cofferdams, necessary for construction activities or access fills or dewatering of construction sites; provided the associated permanent activity was previously authorized by the Corps of Engineers or the U.S. Coast Guard, or for bridge construction activities not subject to Federal regulation. Appropriate measures must be taken to maintain near normal downstream flows and to minimize flooding. Fill must be of materials and placed in a manner that will not be eroded by expected high flows. Temporary fill must be entirely removed to upland areas following completion of the construction activity and the affected areas so as to change their use. Structures left in place after cofferdams are removed require a section 10 permit if located in navigable waters of the United States. The permittee must notify the district engineer in accordance with the "Notification" general condition. The notification must also include a restoration plan of reasonable measures to avoid and minimize impacts to aquatic resources. The district engineer will add special conditions, where necessary, to ensure that adverse environmental impact are minimal. Such conditions may include; limiting the temporary work to the minimum necessary; requiring seasonal restrictions; modifying the restoration plan; and requiring alternative construction methods (e.g. construction mats in wetlands where practicable). This nationwide permit does not authorize temporary structures or fill associated with mining activities or the construction of marina basins which have not been authorized by the Corps. (Sections 10 and 404)

(c) General Conditions: The following general conditions, where applicable, must be complied with for the Nationwide Permit authorization to remain valid:

(1) Navigation. No activity may cause more than a minimal adverse effect on navigation.

(2) Proper maintenance. Any structure or fill authorized shall be properly maintained, including maintenance to ensure public safety.

(3) Erosion and siltation controls. Appropriate erosion and siltation controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills must be permanently stabilized at the earliest practicable date.

(4) Aquatic life movements. No activity may substantially disrupt the movement of those species of aquatic life indigenous to the waterbody, including those species which normally migrate
through the area, unless the activity's primary purpose is to
impound water.

(5) **Equipment.** Heavy equipment working in wetlands must be
placed on mats or other measures must be taken to minimize soil
disturbance.

(6) **Regional and case-by-case conditions.** The activity must
comply with any regional conditions which may have been added by
the division engineer and any case specific conditions added by the
Corps.

(7) **Tribal Rights.** No activity or its operation may impair
reserved tribal rights, including, but not limited to, reserved
water rights and treaty fishing and hunting rights.

(8) **Endangered Species.** No activity is authorized under any
Nationwide Permit which is likely to jeopardize the continued
existence of a threatened or endangered species or a species
proposed for such designation, as identified under the Federal
Endangered Species Act, or which is likely to destroy or adversely
modify the critical habitat of such species. Non-federal
permittees shall notify the district engineer if any listed species
or critical habitat might be affected or is in the vicinity of the
project and shall not begin work on the activity until notified by
the district engineer that the requirements of the Endangered
Species Act have been satisfied and that the activity is
authorized. Information on the location of threatened and
endangered species and their critical habitat can be obtained from
the U. S. Fish and Wildlife Service and National Marine Fisheries
Service.

(9) **Historic properties.** No activity which may affect
Historic properties listed, or eligible for listing, in the
National Register of Historic Places is authorized, until the
district engineer has complied with the provisions of 33 CFR 325,
appendix C. The prospective permittee must notify the district
engineer if the authorized activity may affect any historic
properties listed, determined to be eligible, or which the
prospective permittee has reason to believe may be eligible for
listing on the National Register of Historic Places, and shall not
begin the activity until notified by the District Engineer that the
requirements of the National Historic Preservation Act have been
satisfied and that the activity is authorized. Information on the
location and existence of historic resources can be obtained from
the State Historical Preservation Office and the National Register
of Historic Places.
SECTION 404 ONLY CONDITIONS

In addition to the General Conditions, the following conditions apply only to activities that involve the discharge of dredged or fill material and must be followed in order for authorization by the nationwide permits to be valid:

(1) Water Supply Intakes. No discharge of dredged or fill material may occur in the proximity of a public water supply intake except where the discharge is for repair of the public water supply intake structures or adjacent bank stabilization.

(2) Suitable material. No discharge of dredged or fill material may consist of unsuitable material (e.g., trash, debris, car bodies, etc.) and material discharged must be free from toxic pollutants in toxic amounts.

(3) Mitigation. Discharges of dredged or fill material into waters of the United States must be minimized or avoided to the maximum extent practicable at the project site (i.e. on-site), unless the district engineer has approved a compensation mitigation plan for the specific regulated activity.

(4) Spawning areas. Discharges in spawning areas during spawning seasons must be avoided to the maximum extent practicable.

(5) Obstruction of high flows. To the maximum extent practicable, discharges must not permanently restrict or impede the passage of normal or expected high flows or cause the relocation of the water (unless the primary purpose of the fill is to impound waters).

(6) Adverse impacts from impoundments. If the discharge creates an impoundment of water, adverse impacts on the aquatic system caused by the accelerated passage of water and/or the restriction of its flow shall be minimized to the maximum extent practicable.

(7) Waterfowl breeding areas. Discharges into breeding areas for migratory waterfowl must be avoided to the maximum extent practicable.

(8) Removal of temporary fills. Any temporary fills must be removed in their entirety and the affected areas returned to their preexisting elevation.
Nationwide Permit Notification Procedures

The Corps Nationwide Permit program was described in the November 22, 1991, edition of the Federal Register. The nationwide permits and their application in Wyoming were further described in a Public Notice issued on January 21, 1992, by the Omaha District Office.

Several of the Corps' nationwide permits pertaining to the discharge of dredged or fill material into Wyoming water bodies and/or wetlands have a condition which requires that the Corps be officially notified before the proposed work can begin.

This condition requires that the applicant notify the District Engineer of the proposed project in writing and provide the following information:

1. Name, address, and telephone number of the prospective permittee;

2. Location of the proposed project;

3. Brief description of the proposed project, the project's purpose, direct and indirect adverse environmental effects the project would cause, any other NWPs, regional general permits or individual permits used or intended to be used to authorize any part of the proposed project or any related activity;

4. Where required by the terms of the NWP, a delineation of affected special aquatic sites, including wetlands, and;

5. A statement that the prospective permittee has contacted:

   A. The U.S. Fish and Wildlife Service (USF&WS) regarding the presence of any federally listed or proposed for listing endangered or threatened species or critical habitat in the permit area that may be affected by the proposed project; and any available information provided by that agency. The address and phone number for the USF&WS in Wyoming is:

   U.S. Fish and Wildlife Service
   2617 E. Lincolnway, Suite A
   Cheyenne, Wyoming 82001
   Phone: (307) 772-2374
B. The State Historical Preservation Office (SHPO) regarding the presence of any historic properties in the permit area that may be affected by the proposed project; and the available information, if any, provided by that agency. The address and phone number for the State of Wyoming SHPO office is:

State Historic Preservation Office
Barrett Building
2301 Central
Cheyenne, Wyoming 82002
Phone: (307) 777-7697

A simple letter or the standard individual permit application form (Form ENG 4345) may be used as the notification document but must clearly indicate that it is a Predischarge Notification and must include all of the information described above.

The information outlined is to be sent to:

Corps of Engineers
Cheyenne Regulatory Office
504 West 17th Street
Cheyenne, Wyoming 82001
Phone: (307) 772-2300
Fax: (307) 772-2920

or

Corps of Engineers
Riverton Regulatory Office
P.O. Box 809
Riverton, Wyoming 82501
Phone: (307) 856-5283
Fax: (307) 856-1941

-2-
In 1972, the federal Clean Water Act (CWA) was amended to provide that the discharge of any pollutants from a point source into surface waters of the United States had to be regulated through the issuance of a National Pollutant Discharge Elimination System (NPDES) permit. Under the CWA, states were given the authority to assume "primacy" to administer the NPDES program and issue such permits. The State of Wyoming obtained primacy in 1974.

Chapter 2 of the Wyoming Department of Environmental Quality, Water Quality Division Rules and Regulations states that owners or operators of any point source within the State of Wyoming who proposes to commence discharging wastes into the waters of the state must file an NPDES permit application and obtain an NPDES permit. Surface waters of the state have been broadly defined as all permanent and intermittent defined drainages and lakes, reservoirs, and wetlands which are not manmade retention ponds used for the treatment of municipal, agricultural, or industrial waste; and all other bodies of surface water, either public or private, which are wholly or partially within the boundaries of the state. Discharging pollutants to areas, such as fields or roads, which do not satisfy the definition of a surface water of the state are not regulated under the NPDES program but may fall under the jurisdiction of another program.

It has been determined that several types of short-term activities require coverage under an NPDES permit. In order to permit these temporary discharges in a timely manner, the Wyoming Department of Environmental Quality (DEQ) has issued a general permit for temporary discharges. The general permit is an administrative "tool" which can be used to issue a large number of permits with a relatively small administrative burden. Under the general permitting approach, a single generic permit is issued to cover a large number of facilities conducting similar activities within a common geographic area.

This general permit for temporary discharges authorizes the discharge of wastewaters to surface waters of the state associated with: hydrostatic testing of pipes, tanks or other similar vessels, disinfection of potable water lines, pump tests of water wells, construction dewatering, treatment of gasoline or diesel contaminated ground water and the discharge of wastewater from swimming pools.

The general permit does not cover activities such as discharges of sanitary wastewater, acids, toxic pollutants, hazardous substances, de-icing chemicals, and wastewater associated with washing of mixing drums or chutes on concrete or asphalt trucks. In addition, flushing, testing, and dewatering of water mains
do not require coverage under this permit provided the water is not superchlorinated or no additional chemicals are added. However, the DEQ strongly suggests that Best Management Practices (BMPs) be implemented when flushing the water mains to lower potential chlorine concentrations in the wastewater. Suggested BMPs include detaining or aerating the wastewater prior to discharge to the surface. Part I.A.1 and Part I.A.5 of the general permit clearly state the activities that are and are not covered under the general permit.

In order to request coverage under the general permit for temporary discharges, the applicant must complete and submit a "Notice of Intent" (NOI) to the DEQ. The DEQ will review the NOI and determine if the proposed activity is eligible for coverage under this permit or if the activity must be covered under an individual permit. If the proposed activity is eligible for coverage under the general permit, the DEQ will send the operator notification, through a written facility certification form, that coverage has been granted. The facility certification form will also establish effluent limitations and monitoring requirements.

Depending upon the type of wastewater discharged, the quality of the effluent discharged shall, at a minimum, meet the limitations listed below. For a complete listing of the effluent limitations, refer to Part I.B.1 of the general permit. It may be determined that more stringent effluent limitations must be imposed in order to protect the beneficial uses of the stream. This will be determined on a case by case basis and will be established in the facility certification form.

**Effluent associated with disinfection of potable water lines.**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Effluent Limitation</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, gpm</td>
<td>N/A</td>
<td>Daily</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>Total Suspended Solids, mg/L</td>
<td>The concentration shall not exceed a monthly average of 30 mg/l, a weekly average of 45 mg/l or a daily maximum of 90 mg/l.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>pH, s.u.</td>
<td>The pH shall not be less than 6.5 nor more than 9.0 standard units.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
<tr>
<td>Total Residual Chlorine, mg/L</td>
<td>The concentration shall be determined on a case by case basis but will not exceed 1.0 mg/l.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
</tbody>
</table>
**Effluent associated with pump testing of water wells.**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Effluent Limitation</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, gpm</td>
<td>N/A</td>
<td>Daily</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>Total Suspended Solids, mg/L</td>
<td>The concentration shall not exceed a monthly average of 30 mg/l, a weekly average of 45 mg/l or a daily maximum of 90 mg/l.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total Dissolved Solids, mg/L</td>
<td>The concentration shall not exceed 5000 mg/l unless the discharge is to the Colorado River Basin. In that case, the salt load may not exceed one ton per day or 350 tons per year.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>pH, s.u.</td>
<td>The pH shall not be less than 6.5 nor more than 9.0 standard units.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
</tbody>
</table>

**Effluent associated with construction dewatering.**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Effluent Limitation</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, gpm</td>
<td>N/A</td>
<td>Daily</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>Total Suspended Solids, mg/L</td>
<td>The concentration shall not exceed a monthly average of 30 mg/l, a weekly average of 45 mg/l or a daily maximum of 90 mg/l.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>pH, s.u.</td>
<td>The pH shall not be less than 6.5 nor more than 9.0 standard units.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
<tr>
<td>Oil and Grease (2)</td>
<td>The concentration shall not exceed 10 mg/l.</td>
<td>Daily</td>
<td>Visual</td>
</tr>
<tr>
<td>Turbidity</td>
<td>A discharge to Class 2 water shall not result in a turbidity net increase of 10 nephelometric turbidity units (NTUs). A discharge to Class 2ww or Class 3 waters shall not result in a turbidity net increase of 15 NTUs.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
</tbody>
</table>
Wastewater produced from the draining, cleaning and filter backwash of swimming pools, spas, hot tubs, and similar structures including water slides and water theme amusement parks.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Effluent Limitation</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, gpm</td>
<td>N/A</td>
<td>Daily</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>pH, s.u.</td>
<td>The pH shall not be less than 6.5 nor more than 9.0 standard units.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
<tr>
<td>Total Residual Chlorine, mg/L</td>
<td>The concentration shall be determined on a case by case basis but will not exceed 1.0 mg/L.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Turbidity</td>
<td>A discharge to Class 2 water shall not result in a turbidity net increase of 10 NTUs. A discharge to Class 2ww or Class 3 waters shall not result in a turbidity net increase of 15 NTUs.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
</tbody>
</table>

Wastewater produced from the treatment of gasoline or diesel contaminated ground or surface water from LAUST remediation activities.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Effluent Limitation</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, gpm</td>
<td>N/A</td>
<td>Monthly</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>pH, s.u.</td>
<td>The pH shall not be less than 6.5 nor more than 9.0 standard units.</td>
<td>Quarterly</td>
<td>Grab</td>
</tr>
<tr>
<td>Benzene, ug/L</td>
<td>For direct discharges, the concentration shall not exceed 5 ug/l. For discharges to storm sewers, the concentration shall not exceed 50 ug/l.</td>
<td>Quarterly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total BETX, ug/L (3)</td>
<td>For direct discharges, the concentration shall not exceed 100 ug/l. For discharges to storm sewers, the concentration shall not exceed 750 ug/l.</td>
<td>Quarterly</td>
<td>Grab</td>
</tr>
<tr>
<td>Parameter</td>
<td>Effluent Limitation</td>
<td>Frequency</td>
<td>Sample Type</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Oil and Grease (2)</td>
<td>The concentration shall not exceed 10 mg/l.</td>
<td>Monthly</td>
<td>Visual</td>
</tr>
<tr>
<td>Specific Conductance</td>
<td>The concentration shall not exceed 7500 mg/l.</td>
<td>Quarterly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total Petroleum Hydrocarbons (4)</td>
<td>The concentration shall not exceed 10 mg/l.</td>
<td>Quarterly</td>
<td>Grab</td>
</tr>
</tbody>
</table>

Hydrostatic test water from testing of pipes, tanks or other vessels.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Effluent Limitation</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, gpm</td>
<td>N/A</td>
<td>Daily</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>Total Suspended Solids, mg/L</td>
<td>The concentration shall not exceed a monthly average of 30 mg/l, a weekly average of 45 mg/l or a daily maximum of 90 mg/l.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total Dissolved Solids, mg/L</td>
<td>The concentration shall not exceed 5000 mg/l unless the discharge is to the Colorado River Basin. In that case, the salt load may not exceed one ton per day or 350 tons per year.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>pH, s.u.</td>
<td>The pH shall not be less than 6.5 nor more than 9.0 standard units.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
<tr>
<td>Benzene, ug/L (1)</td>
<td>For direct discharges, the concentration shall not exceed 5 ug/l. For discharges to storm sewers, the concentration shall not exceed 50 ug/l.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total BETX, ug/L (1X3)</td>
<td>For direct discharges, the concentration shall not exceed 100 ug/l. For discharges to storm sewers, the concentration shall not exceed 750 ug/l.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Oil and Grease (2)</td>
<td>The concentration shall not exceed 10 mg/l.</td>
<td>Daily</td>
<td>Visual</td>
</tr>
<tr>
<td>Parameter</td>
<td>Effluent Limitation</td>
<td>Frequency</td>
<td>Sample Type</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>Total Residual Chlorine, mg/L (5)</td>
<td>The concentration shall be determined on a case by case basis but will not exceed 1.0 mg/L.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total Petroleum Hydrocarbons (1)(4)</td>
<td>The concentration shall not exceed 10 mg/l.</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
</tbody>
</table>

**FOOTNOTES:**

1. This parameter shall be analyzed if the discharge is from hydrostatic test water from the testing of used pipes, tanks, or other similar vessels which have or may have contained petroleum products.

2. In the event that an oil sheen or floating oil is observed in the discharge, a grab sample shall be immediately taken, analyzed and reported. The sample shall not exceed 10 mg/L.

3. BETX shall be measured as the sum of benzene, ethyl benzene, toluene, and xylene. EPA methods 602, 624, or 1624 shall be used for the measurement of benzene, ethyl benzene, and toluene. EPA method 8260 or an equivalent method shall be used for the measurement of xylene including ortho-, meta-, and para-xylene. (Note: Depending on Regional/State policy, EPA method 8260 may be used as a substitute or equivalent for the CWA methods 602, 624, or 1624 required under the CWA in 40 CFR Part 136.)

4. EPA method 8015 shall be used for the measurement of total petroleum hydrocarbons.

5. Total residual chlorine shall be analyzed if chlorinated water is used during the hydrostatic test.

Once the temporary discharge has ceased, a Notice of Termination must be submitted to the DEQ.

Water Quality Division
Department of Environmental Quality
April 24, 1997
Modified October 21, 1997
AUTHORIZATION FOR TEMPORARY DISCHARGES UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Water Pollution Control Act, (hereinafter referred to as "the Act"), and the Wyoming Environmental Quality Act, facilities located within the State of Wyoming which are or may discharge wastewater from temporary discharges associated with hydrostatic testing, disinfection of potable water lines, pump testing of water wells, construction dewatering, wastewater associated with swimming pools and wastewater associated with LAUST remediation projects, are hereby authorized to discharge to surface waters of the State of Wyoming in accordance with the requirements of this permit.

This general NPDES permit is issued under the provisions of Wyoming Water Quality Rules and Regulations Chapters 1, 2, and 18.

This permit becomes effective on the date of issuance.

This permit shall expire November 2, 2002.

Administrator - Water Quality Division

Director - Department of Environmental Quality

November 3, 1997

Date

November 3, 1997

Date
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PART I

A. AUTHORIZATION TO DISCHARGE

1. Coverage Under This Permit

   a. Permit Area

       This permit covers all areas within the State of Wyoming except areas within the Wind River Indian Reservation where the state does not have jurisdiction.

   b. Activities Covered Under This Permit

       Under this general permit, facilities may be granted authorization to discharge process generated wastewaters, as defined in Part I.A.1.b.(1) through (7), into surface waters of the State of Wyoming. The water discharged from any of these activities must be relatively uncontaminated and must not have the potential to contribute non-conventional or toxic pollutant loadings to the receiving stream. The discharge must be of short duration, lasting no longer than one year, except for Part I.A.1.b.(6) which is authorized for the duration of the remediation activities or until this general permit expires.

       (1) Discharge of hydrostatic test water from the testing of new or used pipes, tanks, or other similar vessels, subject to the conditions of this permit.

       (2) Discharge of effluent associated with disinfection of potable water lines, subject to the conditions of this permit.

       (3) Discharge of effluent associated with pump testing of water wells, subject to the conditions of this permit.

       (4) Discharge of effluent associated with construction dewatering, subject to the conditions of this permit.

       (5) Wastewater produced from the draining, cleaning and filter backwash of swimming pools, spas, hot tubs, and similar structures including water slides and water theme amusement parks, subject to the conditions of this permit.

       (6) Wastewater produced from the treatment of gasoline or diesel contaminated ground or surface water from leaking aboveground and underground storage tanks, provided no other contaminants are present, subject to the conditions of this permit.
(7) Discharge of wastewaters, other than the types listed above, when negligible pollution concerns are present, subject to the discretion of the Administrator and subject to the conditions of this permit.

2. Request for Authorization

a. Notice of Intent

In order to be considered eligible for authorization to discharge wastewater under the terms and conditions of this permit, the owner, operator, and/or authorized agent of any facility desiring to discharge wastewater must submit a Notice of Intent (NOI) to the Administrator on a form provided by the Administrator (See Appendix A). The NOI must be submitted at least 30 days prior to the first anticipated date of discharge and at a minimum must contain the following information:

(1) Name, address, and descriptive location of the facility, including quarter section, township and range, or latitude and longitude;

(2) Name, address and phone number of principal in charge of operation of the facility and the owner;

(3) Names of the drainage and water body receiving or potentially receiving the discharge (including irrigation ditches, intermittent streams and dry drainages);

(4) Distance the effluent must travel before reaching the live waters (live water is any stream, lake or other water body which contains water year-around);

(5) A brief description of the type of activity resulting in the discharge, including the anticipated date for commencement of the discharge, expected duration of the discharge, expected termination date of the discharge, average and maximum flow rate of the discharge, the source of water which is to be discharged and the total expected volume of the discharge;

(6) A brief description of the type of water treatment process to be employed (including recycling or reuse);

(7) A map and/or schematic diagram showing the area of the activity, location of the discharge, and the location of any treatment system employed;

(8) A list of all potential pollutants and the expected concentrations in the wastewater to be discharged;

(9) If the discharge is to a storm sewer system, ditch, or other man made conveyance, approval from the owner of the system must be obtained, and attached to the NOI;
A description of the erosion control measures that will be implemented to prevent significant damage to or erosion of the receiving water channel.

In addition, for Hydrostatic Testing Related Discharges, the following must be included:

11. The type of vessel being tested (e.g., pipe, tank, etc.);
12. The type of material from which the vessel is constructed;
13. Whether the vessel has been previously used or is of virgin material; and,
14. If used, a description of the fluid material normally contained and/or transported through the vessel.

The NOI and any supplemental information shall be submitted to:

Wyoming Department of Environmental Quality
Water Quality Division - NPDES Program
122 West 25th Street (4th Floor)
Cheyenne, Wyoming 82002

The Administrator shall provide the applicant written confirmation of approval or disapproval for coverage under this permit. In the case of disapproval, the Administrator shall specify in writing the reason(s) for the disapproval and action(s) that the applicant must take to gain approval.

An NOI must be filed and coverage must be granted under this permit prior to the start of the discharge.

3. Criteria for Coverage Under General Permit

a. Evaluation of whether or not an individual permit may be required instead of a general permit, or whether stricter and/or additional effluent limits and/or monitoring are required is subject to one or more of the following criteria:

1. Will the discharge result in exceedence of the Total Maximum Daily Load (TMDL) established for any pollutant in the receiving water;
2. Is the receiving water listed as an impaired waterbody in need of TMDL development on the most recent 303(d) list;
3. Beneficial uses of the receiving water may be adversely impacted;
4. The need to preserve high quality waters;
(5) Addition of chemicals (such as chlorine or flocculent) to water prior to discharge;

(6) Failure of the effluent to pass a Whole Effluent Toxicity (WET) test, when required;

(7) Potential for the effluent to cause a violation(s) of water quality standards in the receiving water(s);

(8) Differences in ambient water quality, including temperature and flow, between the effluent and receiving waters;

(9) An anti-degradation review showing that the discharge would cause unacceptable degradation of the receiving waters;

(10) Total anticipated volume of the discharge;

(11) Surface water classification (discharges to Class 1 surface waters are not authorized under this permit); and/or

(12) Coverage under a more specific permit (those facilities already covered under a more specific general permit and/or an individual permit will not be granted coverage under this permit).

4. Definitions

Concentration Values

a. "Daily Maximum (mg/l)" - The highest single reading from any grab or composite sample collected during the reporting period.

b. "Monthly Average (mg/l)" - The arithmetic mean of all composite and/or grab samples collected during a calendar month.

c. "Weekly Average (mg/l)" - The arithmetic mean of all composite and/or grab samples collected during any week. A week begins at 12:01 a.m. Sunday morning and ends at 12:00 midnight Saturday evening.

Quantity Values

d. "Daily Maximum" - The highest single daily quantity reading (See Calculations below) recorded during the reporting period.

e. "Monthly Average" - The arithmetic mean of all the daily quantity readings (See Calculations below) recorded during a calendar month.
f. “Weekly Average” - The arithmetic mean of all the daily quantity readings (See Calculations below) recorded during a week. A week begins at 12:01 a.m. Sunday morning and ends at 12:00 midnight Saturday evening.

Flow Values

g. “Daily Flow” - The flow volume recorded on any single day. The daily flow volume may be determined by using an instantaneous reading (if authorized by this permit) or a continuous recorder.

h. “Daily Maximum Flow” - The highest single daily flow reading recorded during a reporting period.

I. “Monthly Average Flow” - The arithmetic mean of all daily flow values recorded during a calendar month.

j. “Weekly Average Flow” - The arithmetic mean of all daily flow values recorded during a week. A week begins at 12:01 a.m. on Sunday morning and ends at 12:00 midnight Saturday evening.

Calculations

k. “Daily Quantity (kg/day)” - The quantity, in kilograms per day, of pollutant discharged on a single day. The daily quantity shall be calculated by multiplying the composite or grab sample concentration value for that day in milligrams/liter (mg/l) times the flow volume (in millions of gallons per day - MGD) for that day times 3.78. If a flow volume reading for the day the sample is collected is not available, the average flow volume reading for the entire reporting period shall be used.

l. “Daily Quantity (#/day)” - The quantity, in number per day, of bacteria or other pollutants discharged on a single day. The number per day shall be calculated by multiplying the composite or grab sample result for that day, in number per 100 milliliters (#/100 ml), times the flow volume (in millions of gallons per day - MGD) times $3.78 \times 10^7$. If a flow volume reading for the day the sample is collected is not available, the average flow volume reading for the entire reporting period shall be used.

Miscellaneous

m. “Administrator” means the Administrator of the Water Quality Division (WQD), Wyoming Department of Environmental Quality or his or her authorized agent.

n. “Best Management Practices” (BMPs) means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the state. BMPs also include treatment requirements,
operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

o. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.

p. A "composite" sample, for monitoring requirements, is defined as a minimum of four grab samples collected at equally spaced two hour intervals and proportioned according to flow.

q. "CWA" means the federal Clean Water Act or the Federal Water Pollution Control Act.

r. "Ephemeral Stream" means a stream which flows only in direct response to precipitation in the immediate watershed or in response to snow melt, and which has a channel bottom that is always above the prevailing water table.

s. "GPM," for monitoring requirements, is defined as gallons per minute.

t. A “grab” sample, for monitoring requirements, is defined as a single “dip and take” sample collected at a representative point in the discharge stream.

u. "Hazardous Constituents" is defined as those constituents listed in Chapter 2, Appendix H of the Wyoming Department of Environmental Quality Hazardous Waste Rules and Regulations or any approved subset thereof.

v. "Hazardous Substance" is defined as any substance, other than oil, which, when discharged in any quantities into waters of the U.S., presents an imminent and substantial danger to the public health or welfare, including but not limited to fish, shellfish, wildlife, shorelines and beaches (Section 311 of the CWA); identified by EPA as the pollutants listed under 40 CFR Part 116.

w. An "impaired waterbody" is defined as a waterbody in which the beneficial uses are not fully attained.

x. An "instantaneous" measurement for monitoring requirements is defined as a single reading, measurement, or observation.

y. An “intermittent stream” means a stream or part of a stream that is below the local water table for some part of the year, but is not a perennial stream.

z. "MGD," for monitoring requirements, is defined as million gallons per day.

aa. "Net" value, if noted under Effluent Characteristics, is calculated on the basis of the net increase of the individual parameter over the quantity of that same parameter present in the intake water measured prior to any contamination or use in the process of this fa-
bb. "Non-conventional Pollutants" are all pollutants that are not included in the list of conventional or toxic pollutants as described in 40 CFR Part 401.

cc. "Surface Waters of the State of Wyoming" is defined as all permanent and intermittent defined drainages and lakes, reservoirs, and wetlands which are not manmade retention ponds used for the treatment of municipal, agricultural, or industrial waste; and all other bodies of surface water, either public or private, which are wholly or partially within the boundaries of the state. Nothing in this definition is intended to expand the scope of the Environmental Quality Act as limited in W.S. 35-11-1104.

dd. "Toxic Pollutant" is defined as pollutants or combination of pollutants, including disease-causing agents, which after discharged and upon exposure, ingestion, inhalation or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will, on the basis of information available to the Administrator of EPA, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions, (including malfunctions in reproduction) or physical deformations, in such organisms or their offspring. Toxic pollutants also include those pollutants listed by the Administrator under CWA Section 307 (a)(1) or any pollutant listed under Section 405(d) which related to sludge management.

ee. "Total Maximum Daily Load (TMDL)" is defined as the amount of pollutant, or property of a pollutant, from point, nonpoint, and natural background sources, that may be discharged to a water quality-limited receiving water. Any pollutant loading above the TMDL results in violation of applicable water quality standards.

5. Terms, Conditions and Specific Limitations

a. General Limitations

(1) Discharges are not allowed that include soaps, degreasers, detergents, surfactants, antifreeze, deicers, or any hazardous constituents and hazardous substances under this permit unless the permit establishes an effluent limit for that constituent.

(2) No chemicals are to be added to the discharge unless permission for the use of a specific chemical is granted by DEQ/WQD. It is the responsibility of the applicant to provide this information. Additional limitations and monitoring may be imposed in these cases.
(3) Discharges are not allowed that include solvents, acids, caustics, halogenated hydrocarbons, biocides, or chemicals which are not readily biodegradable and which could adversely affect water quality or aquatic life.

(4) Discharges from permanent dairy operations, livestock or poultry production operations, animal feeding operations, permanent or long term stable or kennel facilities, or animal waste storage or handling facilities are not covered under this permit.

(5) Discharges are not allowed which contain wastewater from washing of the interior of bulk tanker trucks, areas in which aircraft de-icing chemicals are used, in-stream boat washing, washing the mixing drums or chutes on concrete or asphalt trucks, or hydro blasting (the use of abrasive slurries for cleaning purposes or the removal of paint).

(6) There shall be no discharge of sanitary wastewater from toilets, septic tanks, or related facilities.

(7) There shall be no discharge of solid animal waste, food waste or vegetative wastes (grass, leaves, manure, garbage, etc.).

(8) There shall be no discharge of floating solids or visible foam in other than trace amounts.

(9) Bulk storage structures for fuels and other chemicals shall have adequate protections so as to contain all spills and prevent any spilled material from entering the effluent stream or waters of the State.

(10) This permit does not constitute authorization under 33 U.S.C. 1344 (Section 404 of the Clean Water Act) of any stream dredging or filling operations.

(11) All waters shall be discharged in a manner to prevent erosion, scouring, or damage to stream banks, stream beds, or ditches.

(12) In the case of a hydrostatic discharge, the permittee shall provide telephone notification to DEQ/WQD at (307) 777-7093 at least 24 hours prior to any testing discharge.

(13) This permit does not authorize discharges associated with dewatering activities that contain toxic pollutants or hazardous substances.

(14) The discharge of chlorinated water (including potable tap water) shall not be allowed unless it can be demonstrated that the chlorine substantially dissipates prior to discharge and/or possesses no potential for toxic impacts to live waters.
(15) The permittee must notify the permitting authority of the termination of the discharge by submitting a Notice of Termination (Appendix B).

(16) The permitting authority may, if conditions warrant it, place stricter and/or additional limits and/or monitoring requirements in an individual discharger’s authorization to discharge under this general permit to assure appropriate protection of the receiving waters.

(17) There shall be no further water quality degradation by point source discharges, other than from dams, to Class 1 waters.

B. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

Effective immediately the quality of effluent discharged by the facility shall, at a minimum, meet the limitations as set forth below. The Administrator may impose additional or more stringent effluent limitations as decided on a case by case basis.

1. Effluent Limitations
   
   a. The concentration of total suspended solids (TSS) shall not exceed a monthly average of 30 mg/L, a weekly average of 45 mg/L, or a daily maximum of 90 mg/L.

   b. The pH of the discharged waters shall not be less than 6.5 nor more than 9.0 standard units.

   c. The concentration of oil and grease in any single sample shall not exceed 10 mg/L nor shall there be a visible sheen in the discharge.

   d. The concentration of total petroleum hydrocarbons in any single sample shall not exceed 10 mg/L.

   e. For direct discharges to surface waters of the State of Wyoming, the concentration of benzene and total BTEX (benzene, toluene, ethyl benzene, and xylene) in any single sample shall not exceed 5 ug/L and 100 ug/L respectively.

   f. For discharges to a storm sewer system which will not result in an in-stream concentration of benzene, toluene or ethyl benzene in excess of 1.2 ug/L, 6.8 mg/L and 3.1 mg/L respectively, the concentration of benzene and BTEX in any single sample shall not exceed 50 ug/L and 750 ug/L respectively.

   g. For discharges to Class 2 waters the discharge shall not result in a turbidity increase of more than 10 nephelometric turbidity units (NTUs).

   h. For discharges to Class 2 WW and all Class 3 waters the discharge shall not result in a turbidity increase of more than 15 NTUs.
I. The concentration of total dissolved solids (TDS) shall not exceed 5000 mg/L unless the discharge is to the Colorado River Basin. In that case, the salt load may not exceed one ton per day or 350 tons per year.

j. For discharges to all streams, except dry draws, intermittent streams, and ephemeral streams that do not contain water, the chlorine concentration shall be evaluated and established by the DEQ but will never exceed 1.0 mg/l. The effluent limitation for total residual chlorine will be established based upon information that is submitted by the applicant and reported on the NOI, data provided by the U.S. Geological Survey, Chapter 1 of the Wyoming Department of Environmental Quality Rules and Regulations, and other pertinent information. The effluent limit for total residual chlorine shall be specified in the written facility certification from the DEQ.

k. The concentration of specific conductance in any grab sample shall not exceed 7500 micromhos/cm.

2. Self-Monitoring Requirements

Samples shall be taken as often as necessary to provide representative information as to the nature and volume of the discharge(s). At a minimum, the following constituents shall be monitored at the frequency indicated for each type of discharge. For discharges of shorter duration than the listed sampling frequency, a minimum of one sample of each constituent must be collected during the discharge. The Administrator may impose additional monitoring requirements as decided on a case by case basis. The self monitoring requirements will be specified in the facility certification.

Samples taken in compliance with monitoring requirements shall be taken following the final treatment unit and prior to admixture of the effluent with any other waste stream, body of water, or substance.

a. Hydrostatic test water from the testing of pipes, tanks, or other similar vessels.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, gpm</td>
<td>Daily</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>Total Suspended Solids, mg/L</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total Dissolved Solids, mg/L</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>pH, s.u.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
<tr>
<td>Benzene, ug/L (1)</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total BETX, ug/L (1)(3)</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Oil and Grease (2)</td>
<td>Daily</td>
<td>Visual</td>
</tr>
<tr>
<td>Parameter</td>
<td>Frequency</td>
<td>Sample Type</td>
</tr>
<tr>
<td>-----------------------------------------</td>
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</tr>
<tr>
<td>Total Residual Chlorine, mg/L (5)</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total Petroleum Hydrocarbons (1)(4)</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
</tbody>
</table>

b. Effluent associated with disinfection of potable water lines.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, gpm</td>
<td>Daily</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>Total Suspended Solids, mg/L</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total Residual Chlorine, mg/L</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>pH, s.u.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
</tbody>
</table>

c. Effluent associated with pump testing of water wells.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, gpm</td>
<td>Daily</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>Total Suspended Solids, mg/L</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total Dissolved Solids, mg/L</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>pH, s.u.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
</tbody>
</table>

d. Effluent associated with construction dewatering.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, gpm</td>
<td>Daily</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>Total Suspended Solids, mg/L</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>Oil and Grease (2)</td>
<td>Daily</td>
<td>Visual</td>
</tr>
<tr>
<td>pH, s.u.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
<tr>
<td>Turbidity</td>
<td>Daily</td>
<td>Visual</td>
</tr>
</tbody>
</table>
e. Wastewater produced from the draining, cleaning and filter backwash of swimming pools, spas, hot tubs, and similar structures including water slides and water theme amusement parks.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, gpm</td>
<td>Daily</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>Turbidity</td>
<td>Daily</td>
<td>Visual</td>
</tr>
<tr>
<td>Total Residual Chlorine, mg/L</td>
<td>Weekly</td>
<td>Grab</td>
</tr>
<tr>
<td>pH, s.u.</td>
<td>Daily</td>
<td>Grab</td>
</tr>
</tbody>
</table>

f. Wastewater produced from the treatment of gasoline or diesel contaminated ground or surface water from LAUST remediation activities.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, MGD</td>
<td>Monthly</td>
<td>Instantaneous or Continuous</td>
</tr>
<tr>
<td>pH, s.u.</td>
<td>Quarterly</td>
<td>Grab</td>
</tr>
<tr>
<td>Benzene, ug/L</td>
<td>Quarterly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total BETX, ug/L&lt;sub&gt;(3)&lt;/sub&gt;</td>
<td>Quarterly</td>
<td>Grab</td>
</tr>
<tr>
<td>Total Petroleum Hydrocarbons&lt;sub&gt;(4)&lt;/sub&gt;</td>
<td>Quarterly</td>
<td>Grab</td>
</tr>
<tr>
<td>Specific Conductance</td>
<td>Quarterly</td>
<td>Grab</td>
</tr>
<tr>
<td>Oil and Grease&lt;sub&gt;(2)&lt;/sub&gt;</td>
<td>Monthly</td>
<td>Visual</td>
</tr>
</tbody>
</table>

FOOTNOTES:

1. This parameter shall be analyzed if the discharge is from hydrostatic test water from the testing of used pipes, tanks, or other similar vessels which have or may have contained petroleum products.

2. In the event that an oil sheen or floating oil is observed in the discharge, a grab sample shall be immediately taken, analyzed and reported. The sample shall not exceed 10 mg/L.

3. BETX shall be measured as the sum of benzene, ethyl benzene, toluene, and xylene. EPA methods 602, 624, or 1624 shall be used for the measurement of benzene, ethyl benzene, and toluene. EPA method 8260 or an equivalent method
shall be used for the measurement of xylene including ortho-, meta-, and para-xylene. (Note: Depending on Regional/State policy, EPA method 8260 may be used as a substitute or equivalent for the CWA methods 602, 624, or 1624 required under the CWA in 40 CFR Part 136.)

EPA method 8015 shall be used for the measurement of total petroleum hydrocarbons.

Total residual chlorine shall be analyzed if chlorinated water is used during the hydrostatic test.

3. **Daily Logs**

For all activities covered under this permit, with the exception of the activity listed in Part I.A.1.b.(6), the permittee shall maintain a daily log relating to the authorized discharge(s). The log shall contain:

a. Flow information and data;

b. Sample results;

c. Records of visual observations;

d. Notations on any problems relating to treatment of the discharge; and

e. A brief description of any actions taken with regard to problems identified.

The permittee shall maintain the log in accordance with proper record retention procedures that are described in Part I.B.9 and shall make the log available for inspection, upon request, by authorized representatives of the Wyoming Department of Environmental Quality, Water Quality Division.

4. **Reporting**

For all activities listed in Part I.A.1.b (1) through (7), except Part I.A.1.b (6), copies of all effluent monitoring results obtained during the discharge shall be submitted to the Wyoming Department of Environmental Quality after the completion of the discharge.

For activities listed in Part I.A.1.b.(6) only, effluent monitoring results obtained during the previous three months shall be summarized and reported on a Discharge Monitoring Report Form and submitted to the Wyoming Department of Environmental Quality.

Legible copies of these, and all other reports required herein, shall be signed and certified in accordance with the Signatory Requirements (see Part II.A.11), and submitted to:
If no discharge occurs during the reporting period, “no discharge” shall be reported. If the discharge is intermittent during the reporting period, sampling shall be done while the facility is discharging.

Nothing in this permit in any way relieves the permittee from complying with water quality standards as defined in Wyoming Department of Environmental Quality Rules and Regulations and/or the Environmental Quality Act or any other local, state, or federal regulations.

5. **Representative Sampling**

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken at the monitoring points specified in this permit and, unless otherwise specified, before the effluent joins or is diluted by any other waste stream, body of water, or substance. Monitoring points shall not be changed without notification to and approval by, the permit issuing authority.

6. **Test Procedures**

Test procedures for the analysis of pollutants, collection of samples, sample containers, sample preservation, and holding times, shall conform to regulations published pursuant to 40 CFR, Part 136, unless other test procedures have been specified in this permit.

7. **Recording of Results**

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. The exact place, date and time of sampling;

b. The dates and times the analyses were performed;

c. The person(s) who performed the analyses and collected the samples;

d. The analytical techniques or methods used; and

e. The results of all required analyses including the bench sheets, instrument readouts, computer disks or tapes, etc., used to determine the results.
8. **Additional Monitoring by Permittee**

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Daily Logs and/or the Discharge Monitoring Report Form. Such increased frequency shall also be indicated.

9. **Records Retention**

The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of the sample, measurement, report or application. This period may be extended by request of the Administrator at any time. Data collected on site, copies of Discharge Monitoring Reports and/or Daily Log and a copy of this NPDES permit must be maintained on site during the duration of activity at the permitted location.

10. **Penalties for Tampering**

The Act provides that any person who falsifies, tampers with or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two years per violation, or both.
PART II

A. MANAGEMENT REQUIREMENTS

1. Changes

The permittee shall give notice to the Administrator as soon as possible of any physical alterations or additions to the permitted facility. Notice is required when:

a. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source as determined in 40 CFR 122.29(b); or

b. The alteration or addition could change the nature or increase the quantity of pollutants discharged.

2. Noncompliance Notification

a. The permittee shall give advance notice of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

b. The permittee shall report any unanticipated noncompliance which may seriously endanger health or the environment as soon as possible, but no later than 24 hours from the time the permittee first became aware of the circumstances. The report shall be made to the Water Quality Division, Wyoming Department of Environmental Quality at (307) 777-7781.

c. The following occurrences of unanticipated noncompliance shall be reported by telephone to the Water Quality Division, NPDES Section, (307) 777-7781 by the first workday following the day the permittee became aware of the circumstances.

   (1) Any unanticipated bypass which exceeds any effluent limitation in the permit;

   (2) Any upset which exceeds any effluent limitation in the permit; or

   (3) Violation of a maximum daily discharge limitation for any of the pollutants listed in the permit.

d. A written submission shall be provided within five days of the time that the permittee becomes aware of a noncompliance circumstance as described in item c. above.

The written submission shall contain:

(1) A description of the noncompliance and its cause;
The period of noncompliance, including exact dates and times;

The estimated time noncompliance is expected to continue if it has not been corrected; and

Steps taken or planned to reduce, eliminate and prevent reoccurrence of the noncompliance.

e. The Administrator may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the Water Quality Division, NPDES Section, (307) 777-7781.

f. Reports shall be submitted to the addresses in Part I under Reporting.

3. Facilities Operation

The permittee shall, at all times, properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back up or auxiliary facilities or similar systems which are installed by the permittee only when the operation is necessary to achieve compliance with the conditions of the permit. However, the permittee shall operate, as a minimum, one complete set of each main line unit treatment process whether or not this process is needed to achieve permit effluent compliance.

4. Adverse Impact

The permittee shall take all reasonable steps to minimize any adverse impact to waters of the state resulting from noncompliance with any effluent limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

5. Bypass of Treatment Facilities

a. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs b. and c. of this section. Return of removed substances to the discharge stream shall not be considered a bypass under the provisions of this paragraph.

b. Notice:

(1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice at least 60 days before the date of the bypass.
(2) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required under Part II.A.2.

c. Prohibition of bypass.

Bypass is prohibited and the Administrator may take enforcement action against a permittee for a bypass, unless:

(1) The bypass was unavoidable to prevent loss of life, personal injury or severe property damage;

(2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back up equipment should have been installed to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

(3) The permittee submitted notices as required under paragraph b. of this section.

d. The Administrator may approve an anticipated bypass, after considering its adverse effects, if the Administrator determines that it will meet the three conditions listed above in paragraph c. of this section.

6. Upset Conditions

a. An upset constitutes an affirmative defense to an action brought for noncompliance with technology-based permit effluent limitations if the requirements of paragraph b. of this section are met.

b. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs or other relevant evidence that:

(1) An upset occurred and that the permittee can identify the cause(s) of the upset;

(2) The permitted facility was at the time being properly operated;

(3) The permittee submitted notice of the upset as required under Part II.A.2; and

(4) The permittee complied with any remedial measures required under Part II.A.4.

c. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.
7. **Removed Substances**

Solids, sludges, filter backwash or other pollutants removed in the course of treatment or control of wastewaters or intake waters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering waters of the state.

8. **Power Failures**

In order to maintain compliance with the effluent limitations and prohibitions of this permit, the permittee shall take such precautions as are necessary to maintain and operate the facility under its control in a manner that will minimize upsets and ensure stable operation until power is restored.

9. **Duty to Comply**

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the federal act and the Wyoming Environmental Quality Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. The permittee shall give the Administrator advance notice of any planned changes at the permitted facility or of any activity which may result in permit noncompliance.

10. **Duty to Mitigate**

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

11. **Signatory Requirements**

All applications, reports or information submitted to the Administrator shall be signed and certified.

a. All permit applications shall be signed as follows:

   (1) For a corporation: by a responsible corporate officer;

   (2) For a partnership or sole proprietorship: by a general partner or the proprietor, respectively;

   (3) For a municipality, state, federal or other public agency: by either a principal executive officer or ranking elected official.
b. All reports required by the permit and other information requested by the Administrator shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

(1) The authorization is made in writing by a person described above and submitted to the Administrator; and

(2) The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility or an individual or position having overall responsibility for environmental matters for the company. A duly authorized representative may thus be either a named individual or any individual occupying a named position.

c. If an authorization under paragraph II.A.11.b. is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph II.A.11.b. must be submitted to the Administrator prior to or together with any reports, information or applications to be signed by an authorized representative.

d. Any person signing a document under this section shall make the following certification:

"I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

B. RESPONSIBILITIES

1. Inspection and Entry

The permittee shall allow the Administrator or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
c. Inspect, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices or operations regulated or required under this permit; and

d. Sample or monitor, at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by the federal act, any substances or parameters at any location.

2. Transfer of Ownership or Control

In the event of any change in control or ownership of facilities from which the authorized discharges emanate, the permittee shall notify the succeeding owner or controller of the existence of this permit by letter, a copy of which shall be forwarded to the Administrator.

3. Availability of Reports

Except for data determined to be confidential under Section 308 of the federal act, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Wyoming Department of Environmental Quality and the Regional Administrator of the Environmental Protection Agency. As required by the federal act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the federal act.

4. Toxic Pollutants

The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the federal act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

5. Changes in Discharge of Toxic Substances

Notification shall be provided to the Administrator as soon as the permittee knows of, or has reason to believe:

a. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

   (1) One hundred micrograms per liter (100 ug/l),

   (2) Two hundred micrograms per liter (200 ug/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/l) for 2, 4-dinitrophenol and for 2-methyl-4, 6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;
(3) Five times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or

(4) The level established by the director of the Environmental Protection Agency in accordance with 40 CFR 122.44(f).

b. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

(1) Five hundred micrograms per liter (500 ug/l);

(2) One milligram per liter (1 mg/l) for antimony;

(3) Ten times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or

(4) The level established by the Director of the Environmental Protection Agency in accordance with 40 CFR 122.44(f).

6. Civil and Criminal Liability

Except as provided in permit conditions on "Bypassing" (Part II.A.5) and "Power Failures" (Part II.A.8), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

7. Need to Halt or Reduce Activity not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

8. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities or penalties to which the permittee is or may be subject under Section 311 of the federal act.

9. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities or penalties established pursuant to any applicable state or federal law or regulation.
10. **Property Rights**

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights nor any infringement of federal, state or local laws or regulations.

11. **Duty to Reapply**

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. The application should be submitted at least 180 days before the expiration date of this permit.

12. **Duty to Provide Information**

The permittee shall furnish to the Administrator, within a reasonable time, any information which the Administrator may request to determine whether cause exists for modifying, revoking and reissuing or terminating this permit or to determine compliance with this permit. The permittee shall also furnish to the Administrator, upon request, copies of records required by this permit to be kept.

13. **Other Information**

When the permittee becomes aware that it failed to submit any relevant facts in a permit application or submitted incorrect information in a permit application or any report to the Administrator, it shall promptly submit such facts or information.
PART III

A. OTHER REQUIREMENTS

1. **Flow Measurement**

At the request of the Administrator, the permittee must be able to show proof of the accuracy of any flow measuring device used in obtaining data submitted in the monitoring report. The flow measuring device must indicate values of within plus or minus ten percent of the actual flow being measured.

2. **208(b) Plans**

This permit may be modified, suspended or revoked to comply with the provisions of any 208(b) plan certified by the Governor of the State of Wyoming.

3. **Reopener Provision**

This permit may be reopened and modified (following proper administrative procedures) to include the appropriate effluent limitations (and compliance schedule, if necessary) or other appropriate requirements if one or more of the following events occur:

   a. The water quality standards of the receiving water(s) to which the permittee discharges are modified in such a manner as to require different effluent limits than contained in this permit;

   b. A wasteload allocation is developed and approved by the state and/or the Environmental Protection Agency for incorporation in this permit;

   c. A revision to the current water quality management plan is approved and adopted which calls for different effluent limitations than contained in this permit;

4. **Permit Modification**

After notice and opportunity for a hearing, this permit may be modified, suspended or revoked in whole or in part during its term for cause including, but not limited to, the following:

   a. Violation of any terms or conditions of this permit;

   b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts;

   c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge, or
d. If necessary to comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C) and (D), 304(b)(2) and 307(a)(2) of the federal act, if the effluent standard or limitation so issued or approved:

(1) Contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or

(2) Controls any pollutant not limited in the permit.

5. Toxicity Limitation - Reopener Provision

This permit may be reopened and modified (following proper administrative procedures) to include a new compliance date, additional or modified numerical limitations, a new or different compliance schedule, a change in the whole effluent protocol or any other conditions related to the control of toxicants if one or more of the following events occur:

a. Toxicity was detected late in the life of the permit near or past the deadline for compliance;

b. The Toxicity Reduction Evaluation (TRE) results indicate that compliance with the toxic limits will require an implementation schedule past the date for compliance and the permit issuing authority agrees with the conclusion;

c. The TRE results indicate that the toxicant(s) represent pollutant(s) that may be controlled with specific numerical limits and the permit issuing authority agrees that numerical controls are the most appropriate course of action;

d. Following the implementation of numerical controls on toxicants, the permit issuing authority agrees that a modified whole effluent protocol is necessary to compensate for those toxicants that are controlled numerically;

e. The TRE reveals other unique conditions or characteristics which, in the opinion of the permit issuing authority, justify the incorporation of unanticipated special conditions in the permit.

6. Severability

The provisions of this permit are severable and if any provision of this permit, or the application of any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this permit, shall not be affected thereby.

7. Penalties for Falsification of Reports

The federal act provides that any person who knowingly makes any false statement, representation or certification in any record or other document submitted or required to be
maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation or by imprisonment for not more than two years per violation or both.
APPENDIX A
NOTICE OF INTENT
FOR
TEMPORARY DISCHARGES

1. This Notice of Intent is being filed for:
   □ A temporary discharge which does not currently have coverage under a general permit for
temporary discharges; or
   □ A temporary discharge which currently does have coverage under general permit for
temporary discharges. Permit Number WYG__________.

2. Name, address, and telephone number of the company, individual, or organization which will have
   responsibility for the temporary discharge and which will be the permit holder.
   
   Name: ____________________________________________________________
   Address: __________________________________________________________
   _________________________________________________________________
   Telephone: _________________________________________________________

3. Name, address, and telephone number of the owner of the property in which the wastewater is to be
   discharged.
   
   Name: ____________________________________________________________
   Address: __________________________________________________________
   _________________________________________________________________
   Telephone: _________________________________________________________

4. Name, address, county, legal description or latitude and longitude of the temporary discharge for
   which this notice is being filed.
   
   Project Name: _____________________________________________________
   Address: __________________________________________________________
   _________________________________________________________________
   Quarter: _____ Section: _____ Township: _____ Range: _____ County: ____________
5. Briefly describe the type of activity resulting in the discharge.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

6. The anticipated date for commencement of the discharge, expected duration of the discharge and expected termination date of the discharge.

Commencement Date:________________________________________________________________________

Duration of Discharge:________________________________________________________________________

Termination Date:________________________________________________________________________

7. The average and maximum flow rate of the discharge, the total expected volume of the discharge and the source of water which is to be discharged.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

8. Description of the type of water treatment process to be employed (i.e. recycling, reuse, and detention).

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

9. List all potential pollutants and the expected concentrations in the wastewater to be discharged.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
10. Description of the erosion control measures that will be implemented to prevent significant damage to or erosion of the receiving water channel.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

11. What is/are the name(s) of the nearest defined drainage(s) or water body receiving or potentially receiving the temporary discharge and the distance the water must travel before reaching live water?

Name:________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Distance:______________________________________________________________________
________________________________________________________________________
________________________________________________________________________

12. A map and/or schematic diagram showing the area of the activity, location of the discharge, location of any treatment units, and the location of all receiving waters must be attached.

13. If the discharge is to a storm sewer system, ditch, or other man made conveyance, approval from the owner of the system must be obtained and attached to the NOI.

Discharges Associated With Hydrostatic Testing

14. Type of vessel being tested.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
15. Type of material from which the vessel is constructed.


16. Has the vessel been previously used or is it of virgin material?


17. If the vessel is used, provide a description of fluid material normally contain and/or transported through the vessel.


Discharges Associated With LAUST Remediation Projects

18. Detailed description of the type of remediation system.


19. List the source of contamination.


30
20. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Printed Name of Person Signing ___________________________ Title ___________________________

Signature of Applicant ___________________________ Date ___________________________ Telephone ___________________________

Section 35-11-901 of Wyoming Statutes provides that:

"Any person who knowingly makes any false statement, representation, or certification in any application ... shall, upon conviction, be fined not more than $10,000 per day for each violation or imprisoned for not more than one (1) year, or both."

Mail this application to:
NPDES Permits Section
DEQ/WQD
Herschler Building - 4 W
122 West 25th Street
Cheyenne, WY 82002

FOR AGENCY USE ONLY

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APPENDIX B
TERMINATION NOTICE

1. Name, address, and telephone number of the company, individual, or organization which received authorization for a temporary discharge under the attached general permit.

   Name: _____________________________________________________________

   Address: __________________________________________________________
            ___________________________________________________________
            ___________________________________________________________
   Telephone: _______________________________________________________

2. Identification number assigned to this temporary discharge: WYG ________

3. Project Name: ____________________________________________________

4. Certification:

   I certify under penalty of law that the temporary discharge identified above has been completed and that the discharge locations have been returned to approximate pretest conditions. I understand that by submitting this notice I am terminating coverage under Wyoming’s general NPDES permit for temporary discharges. I also understand that if, at a later date, it is determined that the site was inadequately reclaimed and pollutant discharge results, I may be liable for discharging pollutants without a permit.

   ___________________________________________________________________
   Printed Name of Person Signing

   __________________________________________  ________________
   Signature                                      Date

Section 35-11-901 of Wyoming Statutes provides that:

"Any person who knowingly makes any false statement, representation, or certification in any application ... shall, upon conviction, be fined not more than $10,000 per day for each violation or imprisoned for not more than one (1) year or both."

Upon completion, remove this notice from the permit and mail to:

NPDES Permits Section
DEQ/WQD
Herschler Building - 4 W
122 West 25th Street
Cheyenne, WY 82002
September 23, 1998

Mr. Dayton Alsaker, P.E.
Project Manager
MSE-HKM Engineering, Inc.
1842 Sugarland Drive, Suite 103
P.O. Box 7010
Sheridan, WY 82801-7010

RE: West Sheridan Irrigation Diversion From Big Goose Creek to the Cemetery; SHPO #0998RLC050

Dear Mr. Alsaker:

Richard Currit of our staff has received information concerning the aforementioned project. Thank you for allowing us the opportunity to comment.

A file search by our staff on September 22, 1998 indicates that one site, 46SH633, which may be eligible for the National Register of Historic Places may be in the proposed project area. The area has not been surveyed for cultural resources. Due to the unusual nature of site 46SH633, and the previous disturbance to the majority of the project area, a Class III survey is not warranted. However, we do request that construction activities be monitored by a qualified archaeologist.

We recommend the Army Corp. of Engineers (COE) allow the project to proceed in accordance with state and federal laws subject to the conditions stipulated above and the standard stipulation that if any cultural materials are discovered during construction, work in the area should halt immediately and the COE staff and SHPO staff must be contacted. Work in the area may not resume until the materials have been evaluated and adequate measures for their protection have been taken.

In accordance with the above requested monitor stipulation, we further request that a monitoring report and/or follow up correspondence be submitted to our office so that we may be informed of the results of the monitoring. This will also serve to notify us that the Section 106 compliance process for the project has been concluded.
This letter should be retained in your files as documentation of our conditional determination of "no effect" for this project.

Please refer to SHPO project control number #0998RLC050 on any future correspondence dealing with this project. If you have any questions contact Richard Currit at 307-777-5497 or me at 307-777-6311.

Sincerely,

Judy K. Wolf
Deputy State Historic Preservation Officer
for
John T. Keck
State Historic Preservation Officer

JTK:RLC:jh