EXECUTIVE SUMMARY

HANNA MASTER PLAN LEVEL I STUDY

FOR THE

WYOMING WATER DEVELOPMENT COMMISSION

AND THE

TOWN OF HANNA

September 2012

PREPARED BY:

AVI. PROFESSIONAL CORPORATION
1103 OLD TOWN LANE, SUITE 101
CHEYENNE, WYOMING 82009

IN ASSOCIATION WITH:

TST, INC.
WESTERN ECOSYSTEMS TECHNOLOGY, INC
UTILITY TECHNICAL SERVICES, INC.
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I hereby certify that I have prepared or directly supervised the preparation of these reports and that I am a duly registered professional in the State of Wyoming.

Bruce H. Perryman, P.E.L.S.
Wyoming P.E. and P.L.S. No. 5488
Report Summary by Task

Task 1. Scoping and Project Meetings

The Scoping Meeting was held in conjunction with a Hanna Town Council meeting on July 12, 2011. Several informal meetings were held with the Town’s utility staff as the study progressed.

AVI and subcontractors made several trips to Hanna in conjunction with fieldwork necessary to evaluate system operation, review available records, and consult with Town staff on project issues.

On July 28, 2011 AVI and Robert Takeda of TST Inc. met with Water Treatment Plant (WTP) operator Jack Heck and Public Works Superintendent Larry Korkow. AVI staff met with WTP operator Jack Heck on August 16, 2011 to review records kept at the plant. On February 16, 2012 AVI staff met with Larry Korkow and reviewed records of system operation. AVI surveyors were on site February 28, 2012 to determine accurate hydrant locations for the model and the GIS layer.

During the course of the study, multiple meetings were held between AVI and WWDO project personnel as technical issues developed.

Representatives of AVI and TST attended a regular meeting of the Hanna Town Council on July 10 to discuss the draft report, answer questions, and take input. Comments received from the Town and WWDO were incorporated into the final report.

Task 2. Review of Existing Information

The following documents and reports were reviewed and information incorporated into the study process:


Executive Summary


Records maintained by the Town including budgets, income/expenditure reports, WTP records, repair/maintenance records, and other relevant information.

Task 3. Inventory, Evaluate, and Map Existing Water Systems

Inventory and evaluation of the Hanna water system was based on the current hard copy system map, maintenance/replacement/repair records, and accounts kept by the Water Treatment Plant Operator and Public Works Superintendent. With the exception of repairs to correct leaks, replace broken main lines, fix valves and hydrants, there have been no major changes or upgrades to the existing distribution system over the past 20 years.

This inventory and mapping effort identified significant issues with deteriorating water lines, operation of the WTP and storage tank, and the PRV on the line between the WTP and the distribution system.

Survey and mapping work provided the basis for the GIS deliverable and the hydraulic model. Mapping work was compromised because the location of many system valves and curb stops were unknown.

Task 4. Leak Investigation

A technical leak detection survey was attempted but terminated when personnel were unable to locate valves and lines needed to complete the work. Subsequent analysis indicated that leaks and line breaks were readily identified by Water Department staff, and that the Town’s estimate of 50% water loss was probably inaccurate. Several methods were used to estimate water loss, but records and measuring devices were inadequate to achieve an accurate figure.

Task 5. Water Source Data Collection

Hanna’s water source is a diversion from Rattlesnake Creek 12 miles southwest of the Water Treatment Plant. The Town has senior rights of 1.67 cfs on Rattlesnake Creek supplemented by 0.2 cfs of later-day rights for a total diversion right of 1.87 cfs. The dependability of Rattlesnake Creek and the senior rights give the Town a reliable source to meet both current and projected demands. Water quality in the
Rattlesnake Creek basin is excellent with a low potential for contamination.

**Task 6. Water Quality**

Hanna owns and operates a direct filtration plant that provides treated surface water to end users, serving approximately 840 residents through 425 water service connections. Operation of the WTP and use of the 1 MG storage tank will be impacted by pending installation of a sophisticated SCADA system. The system will assist in management of the plant and can be used to implement recommendations in this report to fluctuate tank levels to prevent “water age” quality problems.

A review of EPA records and Town files show that Hanna has no significant water quality violations. The report contains recommendations to assist the WTP operator to prepare for anticipated changes in treatment, monitoring, testing, and reporting requirements.

**Task 7. Review of Water Rights**

Hanna has valid senior water rights of 1.87 cfs, equal to approximately 840 gallons per minute or 1.2 million gallons per day. The Town’s rights are based on the enlargements of an initial filing for the Rattlesnake Creek Pipeline by the Union Pacific Railroad for 1.07 cfs with a priority date of May 1, 1881 (T410D) and a subsequent filing for a transfer from the Crone Ditch of 0.57 cfs (224) with a priority date of Summer 1884 (Later modified to September 21, 1884). Research with assistance from the staff of the State Engineer’s Office (SEO) could not confirm the existence of the 224 Territorial Permit, although the SEO assumed both rights had been transferred to the Town for Municipal use. Further investigation in the SEO e-Permit System located the Crone Ditch permit T422.D with documentation that the 0.57 cfs had in fact been transferred to Hanna. Barring low flows in Rattlesnake Creek, the Town’s senior rights will provide a reliable supply for current demands and projected future population growth.

**Task 8. Evaluation of System Operations**

The AVI Team conducted a thorough examination of the existing infrastructure and operational procedures of the Hanna water system. The Town has expended considerable effort and capital investment in keeping the water treatment plant well maintained and efficiently operated. Much of the plant’s key infrastructure has been upgraded, including the replacement of the filter underdrain system, filter media, and the addition of air scour to the backwash process. With these improvements the evaluation focused on the facility as presently configured and development of recommendations to optimize efficient operation.
In contrast, investment in the distribution system has been overlooked because of other priorities, budgetary constraints, limited resources, and a small customer base. The Town has focused funding on the WTP to remain in compliance with changing regulatory requirements. Consequently, preventative maintenance in the distribution system such as exercising valves, cleaning the storage tank, and implementing a schedule for component replacement has not occurred. This deferral, and the subsidy of the water system from the general fund, is common in small towns with a restricted customer base.

Major recommendations for operational improvements are:

- Increase base water rate to cover 100% of operating costs. Implement a tiered rate system that charges an increasing amount per 1,000 gallons of use. Recommended base rate is $55 for the first 7,500 gallons.

- Develop an operations manual for the water system which includes a schedule for flushing hydrants, exercising gate valves in the distribution system, flushing dead end lines, and other routine tasks.

- Schedule fluctuation of water levels in the 1 MG storage tank to avoid “water age” water quality issues.

- Inspect the interior of the 1 MG storage tank and perform maintenance if necessary.

- Provide technical training of operators when new SCADA system is installed.

**Task 9. Population Growth and Water Demand Projections**

Accurate forecasting of future demand in Hanna is constrained by two components. First, population predictions in communities with potential energy impact are difficult to make with certainty, as witnessed by the wildly inaccurate estimates made for Hanna during the 1980s. The second component is an accurate determination per capita water use by current residents.

The Wyoming Department of Administration and Information (A&I) provided population projections for Hanna through the year 2030. Predictions are for the population to fluctuate moderately from the current level of 840, but at no point exceed 1000 residents through 2030. The projection for 2010 exceeded the population recorded by the U.S. Census Bureau.
Using best estimates of current day water use, the source and system are adequate to serve a population of 2250 assuming 200 gallons per capita per day (gpcpd) and a 2.6 multiplier for maximum day demand. At a population of 2250 using 200 gpcpd, total demand is 450,000 gallons per day. The peaking factor of 2.6 yields a peak day demand of 1,170,000 gallons.

Given population projections, including the potential for development of the Medicine Bow Fuel & Power Project, all components of the water system are capable of accommodating the present population and anticipated increases over the next 25 years.

**Task 10. Water System Financing**

For efficient system budgeting, all fixed costs of operating the Water Department and the Water Treatment Plant should be covered by the base rate charged to system customers for water service. Incremental additional water use above the amount covered by the base rate should be charged at an increasing rate per 1000 gallons of use to encourage water conservation. The following rate structure is recommended for both residential and commercial users:

- Fifty-five ($55) dollars for the first seven thousand five hundred (7,500) gallons consumed per month, then

- One dollar ($1.00) per thousand gallons for the next five thousand (5000) gallons consumed per month, then

- One dollar and fifty cents ($1.50) per thousand gallons for the next ten thousand (10,000) gallons consumed per month, then

- One dollar and seventy-five cents ($1.75) per thousand gallons consumed in excess of twenty-two thousand five hundred (22,500) gallons in any month; or a

- Minimum charge of Fifty-Five ($55.00) dollars per month.

Spreadsheet financial models were developed according to WWDO specifications and include calculations addressing anticipated 20-year replacement/repair/maintenance requirements, current fixed water system costs based on Hanna’s 2013 water system budget, costs for infrastructure improvements including the Town’s priorities and report recommendations, and loan/grant information for the most likely funding sources. A separate spreadsheet contains information on those funding sources and
includes contact information, application information, loan/grant conditions, and the types of projects eligible for funding.

**Task 11. Creation of Geographic Information System**

Creation of Geographic Information System (GIS) for the Town was complicated by the absence of an accurate map of the existing distribution system. The majority of system valves are buried in pavement and the locations unknown. The study budget did not include a program to locate or excavate valves. AVI and TST developed the GIS using the 1994 hard copy map and the electronic data in the hydraulic model created by PMPC of Saratoga. The first step in this task was incorporating the existing map and water model to generate a CAD-based drawing of the system. Next, the system was geo-referenced to the correct location in the world using control points recorded in the Hanna area by AVI surveyors. Data was matched to these known control point locations on the water model and existing map. The base drawing was established in NAD 1983 and NAVD 1988 datum to transition into the GIS platform. The transition was completed by converting the CAD file into shape files, which were referenced into the GIS platform (Esri ArcGIS Desktop version 10), to be displayed with background imagery, DOQQ’s - Digital Ortho Quarter Quads for Elmo and Hanna, along with Carbon County parcel data. The background layers were provided by the Carbon County, Wyoming GeoLibrary and WyGISC.

**Task 12. Prioritization of Recommendations**

Following is a summary of priority recommendations for infrastructure improvements. Details are provided in the report.

1. Replace lines, valves, and hydrants in the water distribution system. Lines smaller than 6” in the old town area and Elmo should be scheduled for replacement as funding is available. A new line to loop the Elmo system is recommended, but is optional. A new service line to the Rec Center is recommended at the Town’s request. The Town should develop a schedule and financing plan to accomplish these improvements. Maintenance costs and consumer complaints will be reduced when new lines and valves replace failing components. Town staff members maintaining the system are the best source of priorities for line replacement. They know the location of weak points in the system.

2. Replace end user meters and install meters on unmetered taps at Town buildings and parks. Working water meters are important for several reasons. Customers pay for the amount of water they use. Accurate water use information, including unbilled meters on Town facilities and the Rec Center, will allow operators to determine the amount of water lost in the system.
Treatment and storage management will be enhanced, especially if accurate water use is correlated with management upgrades made possible by the SCADA system.

3. Remove the existing PRV which restricts flows from the WTP to the storage tank and complicates operation of the plant. The hydraulic model indicates that the PRV imposes a 10 psi restriction on flows between the WTP and the distribution system. This restriction contributes to operational issues (automatic plant shutdown) when the storage tank approaches 90-95% of capacity. The hydraulic model also identifies areas of excessive pressure in the system. Installation of three new PRVs at the location specified in the report will reduce pressures to acceptable levels and diminish the incidence of line breaks and leaks.

Task 13. WWDC Discretionary Task

No work was performed in this Task.

Task 14. Environmental Report

Western Ecosystems Technology, Inc. of Cheyenne was subcontracted to prepare the environmental report for areas of potential disturbance during water line replacement construction activities. The Environmental Report is necessary to accompany applications to the Drinking Water State Revolving Fund (DWSRF), Community Development Block Grants (CDBG), and the U.S. Department of Agriculture Rural Development Program. The Environmental Report will be submitted as a separate document.

Task 15. Cost Estimates

Cost estimates were developed for recommended improvements. Component prices were derived from bid tabulation averages for construction projects in southeast Wyoming in 2012. Total costs included WWDO formulas for final design, permitting/mitigation, access and rights of way, construction engineering, and contingencies. While all cost estimates are conservative, inflation between the dates of this report and actual construction were not included in the total. If the Town decides to apply for assistance from the funding agencies identified in the report, an inflation factor should be included in the total amount requested. The following cost estimate sheets are provided for the priority components eligible for WWDC funding, and as an example of the format used in the full report for components not eligible for WWDC assistance. Hanna can use this information selectively to prepare applications to any of the funding sources listed in Task 10.
### Table 15.1 Cost Estimates WWDO Eligible - 1st Priority

<table>
<thead>
<tr>
<th>Cost Item</th>
<th>Item Description</th>
<th>Estimated Cost</th>
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<tbody>
<tr>
<td></td>
<td><strong>Pre-Construction Costs</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Final Designs and Specifications</td>
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</tr>
<tr>
<td>2</td>
<td>Permitting and Mitigation</td>
<td>$5,000</td>
</tr>
<tr>
<td>3</td>
<td>Legal Fees</td>
<td>$2,500</td>
</tr>
<tr>
<td>4</td>
<td>Acquisition of Access and ROW</td>
<td>$5,000</td>
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<tr>
<td></td>
<td><strong>Pre-Construction Costs (Sub Total #1)</strong></td>
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<tr>
<td></td>
<td><strong>Cost of Project Components</strong></td>
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</tr>
<tr>
<td>1</td>
<td>2610 feet 6” Transmission Line</td>
<td>$75,000</td>
</tr>
<tr>
<td>2</td>
<td>2675 feet 8” Transmission Line</td>
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</tr>
<tr>
<td>3</td>
<td>8 Gate Valves, 6” and 8”</td>
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<td></td>
<td><strong>Component Cost Total (Subtotal #2)</strong></td>
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<td></td>
<td>Construction Engineering Cost (Subtotal #2 x 10%)</td>
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<td></td>
<td>Components and Engineering Cost (Subtotal #3)</td>
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<td>Contingency (Subtotal #3 x 15%)</td>
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<td>Construction Cost Total (Subtotal #4)</td>
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<td><strong>Total Project Cost (Subtotal #1 + Subtotal #4)</strong></td>
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<td><strong>Use</strong></td>
<td>$250,000</td>
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### Table 15.2 - Cost Estimates, Not WWDO Eligible 1st Priority

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<th>Cost Item</th>
<th>Item Description</th>
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<td>Final Designs and Specifications</td>
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<td>Legal Fees</td>
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<tr>
<td>4</td>
<td>Acquisition of Access and ROW</td>
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<td></td>
<td><strong>Pre-Construction Costs (Sub Total #1)</strong></td>
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<td>$65,398</td>
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<tr>
<td>1</td>
<td>Install 8960 feet of 6&quot; PVC water line (replace 4&quot;</td>
<td>$250,880</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>lines)</td>
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<tr>
<td>3</td>
<td>Install ten 6&quot; gate valves</td>
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<tr>
<td>4</td>
<td>Replace 20 fire hydrants</td>
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<tr>
<td>5</td>
<td>Install three new PRVs, remove existing PRV</td>
<td>$75,000</td>
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<td>6</td>
<td>Replace 425 end use meters, 8 for Town Facilities</td>
<td>$129,900</td>
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<td>7</td>
<td>Replace four 8&quot; gate valves</td>
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<td><strong>Component Cost Total (Subtotal #2)</strong></td>
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<td><strong>Construction Engineering Cost (Subtotal #2 x 10%)</strong></td>
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<td><strong>Components and Engineering Cost (Subtotal #3)</strong></td>
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<td><strong>Contingency (Subtotal #3 x 15%)</strong></td>
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<td><strong>Construction Cost Total (Subtotal #4)</strong></td>
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<td>USE</td>
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<td>$775,000</td>
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</table>
Task 16.  Reports

Project reports were prepared according to WWDO guidelines. The draft report was delivered to WWDO on July 2, 2012 and copies sent to Hanna. The final report and executive summary were submitted to WWDO in September 2012.

Task 17.  Report Presentations

Representatives of AVI and TST met with the Hanna Town Council on July 10, 2012 to discuss the draft report, answer questions, and receive comments from the Town.