PINE HAVEN
MASTER PLAN
LEVEL 1
RECONNAISSANCE STUDY

EXECUTIVE SUMMARY

SUBMITTED TO THE
WYOMING WATER
DEVELOPMENT COMMISSION
AND
TOWN OF PINE HAVEN
NOVEMBER 2000

STETSON
ENGINEERING, INC.
PINE HAVEN MASTER PLAN
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WYOMING WATER DEVELOPMENT COMMISSION
AND
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PREPARED BY

STETSON
ENGINEERING, INC.
P.O. Box 457
Gillette, WY. 82717
307-682-8936
“EXECUTIVE SUMMARY”

PROJECT HISTORY AND UNDERSTANDING

The Town of Pine Haven is located in Crook County in the northeast corner of Wyoming adjacent to Keyhole Reservoir as shown in Figure 1.0. The community is approximately 17 years old and has evolved into a regional recreational area, whose property owners are a combination of full and part time residents.

The majority of those residents receive their domestic water supply from the Pine Haven municipal water system as shown schematically in Figure 1.2. The remaining residents haul their domestic water from an outside source. As development is occurring within the incorporated limits of Pine Haven the residents are requesting to connect to the municipal water system. It became a concern of the Town’s governing body whether the existing system had sufficient supply or delivery capacity to accommodate additional expansion. It became evident that a Master Plan for the development of the communities water distribution system would be invaluable.

PROJECT STUDY AREA

The area to be included in analysis for this study is all land within the incorporated limits of the Town of Pine Haven and one subdivision adjacent to the Town. All current recorded subdivisions within the corporate limits were included in the analysis.

STUDY OBJECTIVES AND METHODS

This Level I study is intended to evaluate the performance of the existing water system and explore the potential to provide potable water the areas within the corporate limits of the Town and adjacent subdivision. Additionally, the study will provide preliminary design with associated construction cost estimates.

Clearly, the addition of new service areas will influence the operation of the existing system. The existing system along with proposed long range expansions were computer-modeled to insure that any such proposed improvements not be detrimental to existing system operation. Additional system components such as looping lines, additional storage facilities, and an increased number of rate payers could be viewed as a benefit to the over-all system operation and reliability. There are, however, potential adverse impacts associated with increased water consumption that must be carefully considered relative to existing (and planned) water supply.
Figure 1.0
Project Location
SUBDIVISIONS

1) BRIMMER
2) BUCK'S
3) CEDER HILLS
4) GLENN VISTA ESTATES
5) HARWOOD
6) HAYS
7) HILLTOP ACRES
8) JANIES ACRES
9) KNAPP
10) LAKEVIEW ESTATES
11) LAKEVIEW SUBDIVISION
12) MITCHELL NO. 1
13) PINE CREST
14) PINE HAVEN
15) SHATTUCK HILLS
16) T-J
17) WHISPERING PINES
18) WINDSOCK ADDITION
19) WOODLAND ACRES
20) WOODLAND FIRST EXTENTIION
21) PINE HOLLOW

LEGEND

LOT NUMBER

BLOCK NUMBER

SUBDIVISION BOUNDARY

TOWN CORPORATE LIMITS

SECTION LINES

SECTION CORNER

BOUNDARY OF DE-ANNEXATION

HOUSE

CORPORATE LIMITS

SUBDIVISION BOUNDARY

NOTE:
THIS IS NOT A SURVEY PLAN. IT IS INTENDED TO BE SUCH. IT IS A REPRESENTATION OF THE RELATIVE POSITION OF THE PRESENT TOWN LIMITS AND THE SUBDIVISIONS WITHIN THE TOWN.
TOWN OF PINE HAVEN
MASTER PLAN
LEVEL 1 - RECONNAISSANCE STUDY

FIGURE 1.2
EXISTING WATER SYSTEM CONFIGURATION

NOTE:
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IT IS A REPRESENTATION OF THE RELATIVE POSITION
OF THE PRESENT TOWN LIMITS AND THE SUBDIVISIONS WITHIN
THE TOWN.

LEGEND
LOT NUMBER
BLOCK NUMBER
SUBDIVISION BOUNDARY
TOWN CORPORATE LIMITS
SECTION LINES
SECTION CORNER
BOUNDARY OF DE-ANNEXATION
HOUSE

LEGEND
WATER LINE SIZE
- 4-inch Diameter
- 6-inch Diameter
- 3-inch Diameter
- 2-inch Diameter
- 1 1/2-inch DIA

EXISTING WATER SYSTEM CONFIGURATION

LEVEL 1 - RECONNAISSANCE STUDY
SERVICE AREA POPULATION

The Wyoming Department of Administration and Information - Economic Analysis Division was contacted to obtain the 1990 Census of Population and Housing. Currently population of Pine Haven is approximately 330 people with 137 water users on the Pine Haven water system. The annual growth over the last ten years has been approximately 2% for the community. State estimates for annual growth in the Northeast Wyoming area to be typically 0.5% to 1.0%. It is felt that the 1.0% annual growth indicative of communities in Northeast Wyoming may not be applicable to a newly developing community being established close to a regional recreational area such as Pine Haven. Therefore, for the future population estimates of Pine Haven, a 2% annual growth was assumed. Utilizing this numerical value, the population estimate for Pine Haven in the year 2030 are 662 persons.

ASSESSMENT OF INTEREST

To determine interest in connecting to a domestic water system, an individual survey questionnaire was mailed to each owner of record for the subdivided lots of Pine Haven. The survey contained the question, “Would you be interested in connection to a municipal water system?” In those areas indicating an interest in connecting to a municipal water system, various alternatives for system expansion were examined along with associated costs and potential rate impacts.

IDENTIFICATION OF WATER USE

The operator of the Pine Haven water system maintains master meter records on a daily and monthly basis for water being pumped into the distribution system. Water usage for various demand periods were calculated and presented in the following table;

<table>
<thead>
<tr>
<th>SUMMARY OF SYSTEM DEMANDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEMAND TYPE</td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td>AADD</td>
</tr>
<tr>
<td>AWDD</td>
</tr>
<tr>
<td>ASDD</td>
</tr>
<tr>
<td>PDD</td>
</tr>
</tbody>
</table>

1990 census - 2.71 persons per connection

SYSTEM CONFIGURATION

The basic configuration of the piping within the distribution system is a “branched” system and not looped to create a network of pipes. The present configuration has
minimal system redundancies for operational reliability and raises health and safety concerns due to dead end lines and the possibility of stagnant water. The pipes are primarily constructed of PVC material with sizes 6-inch and smaller in diameter.

A copy of the Consumer Confidence Report dated April 14, 2000 under the US EPA (8P-W-MMS) was obtained during this study. Statements in the report announced to consumers that the drinking water is safe and meets Federal and State requirements.

WATER SYSTEM COMPONENTS

Keyhole Well No. 1

The Town of Pine Haven receives its water from a groundwater source of the Madison Formation. The Keyhole No. 1 Well serves as the sole water supply source for the Town. The well was tested at approximately 130 gallons per minute upon its completion in 1980. Recently, falling production prompted the town to have the well re-entered to determine why this drop occurred and to perform remedial procedures to remedy the problem. It was found that a significant amount of scale had built up in the well over its life, causing the pump to plug and restricting flow in the casing. Remedial efforts were performed, and the well is functioning satisfactorily at this time.

System Storage

In 1986 the Town of Pine Haven, in conjunction with the Wyoming Water Development Commission issued a contract to design and construct a .25 MG welded steel storage tank. The tank is 30 foot in diameter and 50 foot tall. The tank was constructed with a common inflow/outflow pipe. No telemetry control to monitor tank level or remotely operate pumps exist on the tank

The tank visually appears to be in good condition. The protective coating seems to remain intact. The system operator indicated that the tank was drained and inspected as part of the 1-year warrantee walk through with the contractor and found the interior to be fairly clean inside.

A second smaller tank exists within the Pine Haven water system that provides suction storage for a booster pump station. The well supplies water to this intermediate tank prior to the booster pump station pressurization to adequate system working pressures. The tank has insufficient elevation to directly serve the distribution system. The tank is a bolted steel structure with a 16,000-gallon capacity, is in a deteriorated condition, and has to be routinely repaired for leaks. Since this tank is within the chain of appurtenances of the only supply source for the community and is at or beyond its design life, it is recommended that this “weak” link be bypassed and abandoned.
Booster pump station

A booster station pumps directly into the distribution system. Three pumps are present in the station. Two are routinely used during normal system operation and the third is a larger capacity pump exclusively utilized for fire demand conditions.

According to the system operator, the larger capacity pump was installed per a DEQ requirement for fire protection as part of the .25 MG tank construction project. The pump is supplied directly from the adjacent 16,000-gallon storage reservoir. With the imbalance of pump capacity versus tank supply volume it would take a very short period of time before the pump would drain the tank and would have to be shut off during the emergency situation. According to the system operator the control valve of the pump has frozen and broke in the past and has not been replaced. The pump has not been operated since its installation and questionable whether it will operate at all.

All pumps in the booster pump station are manually operated including the larger capacity fire pump. The system operator turns pumps on or off according to system pressure directly read from a gauge inside the station. Through his experience and familiarity with the system, pumps are operated until the system pressure within the station reaches 34 psi that translates to a full tank.

Water Disinfection

Presently the water supplied from the groundwater well is disinfected by a chlorine solution. Chlorine is injected into the discharge piping system inside the booster pump station. After disinfectant introduction the booster pump station discharges directly into the Town’s distribution system. The time chlorine is in contact with the water for disinfection prior to reaching the first customer is dependent upon the pumping rate and system demands.

System Condition

Discussions with the system operator revealed that pipes in the older portions of town are experiencing mainline breaks requiring routine maintenance. The pipes experiencing problems are typically 3-inch and smaller in diameter. As the number of houses serviced by these aged pipes increase, the stress placed on them may be causing the failures.

Water Accountability

System integrity was investigated as part of this study in an attempt to determine the amount of water that is “unaccounted for” within the system. Calculations for the amount of water entering the distribution system, master meter records plus or minus the quantity entering or exiting the storage tank, when compared to
individual billing records, indicates approximately a 1% discrepancy. This discrepancy is presumed to be leakage or accuracy of analysis. Whichever the reason it is felt to be within acceptable parameters.

WATER RIGHTS

The intent of this section is to discuss appropriated water supply available to the Town of Pine Haven. The Town supplied Stetson Engineering with the legal description of the community’s corporate limits. This description was used as the basis for the Wyoming State Engineers Office to perform the water right research. Water rights for both groundwater and surface rights were researched. The status of water rights as reported is as follows:

Groundwater Rights

The Town of Pine Haven receives water from one source, Keyhole No. 1. The well was originally drilled and permitted by Jesse Dale & Margorie G. Ruby and transferred to the Town of Pine Haven for 400 gpm. The permit was enlarged for additional use and area of use only. The water right has a priority date of April 18, 1979. Currently the permits are not adjudicated. It is advised that the permits are adjudicated.

Surface Rights

According to the State Engineers Office, the Keyhole Reservoir is the only surface water right within the legal description of the Town of Pine Haven. They did not report that the Town of Pine Haven had any water right in the reservoir.

RECOMMENDATIONS AND CONCLUSIONS

When considering recommended improvements to a water system, three major issues are considered as follows:

a) Public Health and Safety
b) Fire Protection
c) System Reliability

do) Wells pump directly to storage reservoirs.
e) Wells automatically controlled by tank levels.
f) Looping distribution lines were economically feasible.
g) Elimination of aged or high maintenance structures and piping
WATER SUPPLY NEEDS

Well

To meet DEQ requirements, a redundant back-up source of supply is recommended for the Town of Pine Haven. Initial site location places the well in close proximity to the .25 MG tank for optimal chances for a well with sufficient capacity and operational efficiencies. It is recommended that the Town of Pine Haven approach the Wyoming Water Development Commission at this time and request a Level II project to install a “test well” in the location indicated.

SUMMARY OF SYSTEM ALTERNATIVES

The Pine Haven proposed water system inclusive of all alternatives is graphically shown in Figure 5.1. This system is configured to meet the needs of the community for a 30-year period assuming a 2% rate of growth. The configuration and size of pipes will deliver a 500gpm fire flow capacity to the community.

A summary of alternatives proposed with approximate rate schedule for each subdivision is presented in Table 5.1. The cost of the improvement was assigned to each subdivision that it benefited as denoted by the “X”. The approximate anticipated rates were then summed in two ways. The first summation was performed on a “per connection” basis of the current probable possible connections. Project costs were included that were felt to be benefiting the most residents and also totaled the approximate willingness to pay according to the Resident Survey Questionnaire.

A second summation of cost was developed with an approximate rate schedule on a “per lot” basis assuming ALL alternatives presented were constructed. The costs were assigned to the lots within each subdivision according to the subdivisions receiving benefit from the improvement. This assessment of anticipated rates presumes everyone in Pine Haven would benefit from installation of a municipal water system, whether connected or not, in one way or another, whether it be from fire protection, community development, or community growth. Its is anticipated that if this approach is taken that individual improvement districts would be formed and costs allocated to each accordingly. The Town council shall decide the method of appropriating costs.

WHERE DO WE GO FROM HERE?

WWDC Level II - Study:

It is recommended that a “Level II” project be pursued with the Wyoming Water Development Commission in their November 2000 annual meeting to drill a test
### TABLE 5.1

#### PINE HAVEN MASTER PLAN

**SUMMARY OF ESTIMATED COSTS**

<table>
<thead>
<tr>
<th>Subdivision</th>
<th>Total Number of Lots</th>
<th>Estimated Monthly Cost</th>
<th>Projected Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brimmer Subd.</td>
<td>6</td>
<td>$218.18</td>
<td>$144,882.80</td>
</tr>
<tr>
<td>Buck's Subd.</td>
<td>39</td>
<td>$35.50</td>
<td>$2,180.35</td>
</tr>
<tr>
<td>Cedar Hills Subd.</td>
<td>75</td>
<td>$21.11</td>
<td>$1,583.30</td>
</tr>
<tr>
<td>Glenn Vista Estates</td>
<td>30</td>
<td>$4.48</td>
<td>$27,288.00</td>
</tr>
<tr>
<td>Hanwood Subd.</td>
<td>19</td>
<td>$1.48</td>
<td>$27,288.00</td>
</tr>
<tr>
<td>Hills Subd.</td>
<td>13</td>
<td>$0.50</td>
<td>$6,527.00</td>
</tr>
<tr>
<td>Hilltop Acres</td>
<td>4</td>
<td>$1.48</td>
<td>$6,527.00</td>
</tr>
<tr>
<td>Janes Acres</td>
<td>11</td>
<td>$1.28</td>
<td>$13,884.00</td>
</tr>
<tr>
<td>Knapp Subd.</td>
<td>9</td>
<td>$1.28</td>
<td>$13,884.00</td>
</tr>
<tr>
<td>Lakeview Subd.</td>
<td>10</td>
<td>$2.43</td>
<td>$24,340.00</td>
</tr>
<tr>
<td>Lakeview Estates</td>
<td>51</td>
<td>$8.43</td>
<td>$429,308.00</td>
</tr>
<tr>
<td>Mitchell No. 1</td>
<td>6</td>
<td>$15.00</td>
<td>$90,000.00</td>
</tr>
<tr>
<td>Pine Crest</td>
<td>13</td>
<td>$15.00</td>
<td>$195,000.00</td>
</tr>
<tr>
<td>Pine Haven</td>
<td>45</td>
<td>$15.00</td>
<td>$675,000.00</td>
</tr>
<tr>
<td>Pine Hollow</td>
<td>6</td>
<td>$15.00</td>
<td>$90,000.00</td>
</tr>
<tr>
<td>T-J Subd.</td>
<td>19</td>
<td>$15.00</td>
<td>$285,000.00</td>
</tr>
<tr>
<td>Whispering Pines</td>
<td>6</td>
<td>$15.00</td>
<td>$90,000.00</td>
</tr>
<tr>
<td>Winslow Addition</td>
<td>5</td>
<td>$15.00</td>
<td>$75,000.00</td>
</tr>
<tr>
<td>Woodland Acres</td>
<td>20</td>
<td>$15.00</td>
<td>$300,000.00</td>
</tr>
<tr>
<td>Woodland First Lot.</td>
<td>5</td>
<td>$15.00</td>
<td>$75,000.00</td>
</tr>
<tr>
<td>Shattock Hills</td>
<td>7</td>
<td>$15.00</td>
<td>$105,000.00</td>
</tr>
<tr>
<td><strong>Sub-Total</strong></td>
<td>457</td>
<td><strong>$2,180.35</strong></td>
<td><strong>$1,583,300.00</strong></td>
</tr>
</tbody>
</table>

**Notes:**
- $15.00 (first 5000 gal) + $0.70 per 1000 gal after
- Resident Survey Questionnaire
- Cost for ALL Projects "Per Lot" Basis

---

**Per Lot Connection Option**

<table>
<thead>
<tr>
<th>Subdivision</th>
<th>Per Lot Rate</th>
<th>Per Lot ACCEPTABLE RATE</th>
<th>Acceptable Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brimmer Subd.</td>
<td>$29.47</td>
<td>$26.89</td>
<td>$0.00</td>
</tr>
<tr>
<td>Buck's Subd.</td>
<td>$38.45</td>
<td>$44.22</td>
<td>$45.00</td>
</tr>
<tr>
<td>Cedar Hills Subd.</td>
<td>$38.45</td>
<td>$23.26</td>
<td>$23.00</td>
</tr>
<tr>
<td>Glenn Vista Estates</td>
<td>$36.45</td>
<td>$44.22</td>
<td>$30.00</td>
</tr>
<tr>
<td>Hanwood Subd.</td>
<td>$36.45</td>
<td>$27.40</td>
<td>$32.00</td>
</tr>
<tr>
<td>Hills Subd.</td>
<td>$36.45</td>
<td>$23.26</td>
<td>$25.00</td>
</tr>
<tr>
<td>Hilltop Acres</td>
<td>$36.45</td>
<td>$24.00</td>
<td>$20.00</td>
</tr>
<tr>
<td>Janes Acres</td>
<td>$36.45</td>
<td>$23.26</td>
<td>$20.00</td>
</tr>
<tr>
<td>Knapp Subd.</td>
<td>$36.45</td>
<td>$23.26</td>
<td>$30.00</td>
</tr>
<tr>
<td>Lakeview Subd.</td>
<td>$36.45</td>
<td>$23.26</td>
<td>$26.67</td>
</tr>
<tr>
<td>Lakeview Estates</td>
<td>$29.47</td>
<td>$26.89</td>
<td>$38.06</td>
</tr>
<tr>
<td>Mitchell No. 1</td>
<td>$36.45</td>
<td>$23.26</td>
<td>$0.00</td>
</tr>
<tr>
<td>Pine Crest</td>
<td>$36.45</td>
<td>$23.26</td>
<td>$34.29</td>
</tr>
<tr>
<td>Pine Haven</td>
<td>$36.45</td>
<td>$27.40</td>
<td>$34.29</td>
</tr>
<tr>
<td>Pine Hollow</td>
<td>$36.45</td>
<td>$23.26</td>
<td>$0.00</td>
</tr>
<tr>
<td>T-J Subd.</td>
<td>$36.45</td>
<td>$27.40</td>
<td>$26.67</td>
</tr>
<tr>
<td>Whispering Pines</td>
<td>$28.47</td>
<td>$26.89</td>
<td>$44.22</td>
</tr>
<tr>
<td>Winslow Addition</td>
<td>$28.47</td>
<td>$26.89</td>
<td>$44.22</td>
</tr>
<tr>
<td>Woodland Acres</td>
<td>$38.45</td>
<td>$29.81</td>
<td>$42.00</td>
</tr>
<tr>
<td>Woodland First Lot.</td>
<td>$38.45</td>
<td>$29.81</td>
<td>$45.00</td>
</tr>
</tbody>
</table>

**Summary:**

- Total Estimated Monthly Cost: $2,180.35
- Total Projected Costs: $1,583,300.00

**Inclusions:**
- Well Included in "Per Lot" Basis
- Transmission Loop Included in "Per Lot" Basis
- Water Connection Included in "Per Lot" Basis
- Current Well Included in "Possible" Basis
- Well Connection Included in "Possible" Basis
- Transmission Loop Included in "Possible" Basis
- Water Connection Included in "Possible" Basis

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**Notes:**
- "Per Lot" Basis
- Resident Survey Questionnaire
- Cost for ALL Projects "Per Lot" Basis

---

**X** - Denotes ProjectBenefits Subdivision

(1) $15.00 (first 5000 gal) + $0.70 per 1000 gal after

(2) Resident Survey Questionnaire

(3) Cost for ALL Projects "Per Lot" Basis
well for a back-up water source for the community. This well would benefit the entire community as a whole and allow development in the future. The approximate project costs are summarized as follows:

<table>
<thead>
<tr>
<th>Project</th>
<th>Cost</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well Const.</td>
<td>$356,500</td>
<td></td>
</tr>
<tr>
<td>Testing &amp; Engineering</td>
<td>$99,820</td>
<td>$456,500</td>
</tr>
</tbody>
</table>

**WWDC Level III – Design**

It is recommended that improvements that are critical to the Pine Haven water system’s operation and reliability be moved directly to Level III funding and design. These improvements include a dedicated transmission pipeline from the existing well to the .25 MG tank, abandonment of the leaking storage reservoir, abandonment of the booster pump station, removal of piping restriction within the pump station, relocation of the chlorination facility, looping pipeline from the .25 MG tank to the distribution system, and a looping transmission pipeline to the north end of town. A summary of the approximate project costs are presented as follows:

<table>
<thead>
<tr>
<th>Project</th>
<th>Loan *</th>
<th>Estimated Project Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backup Well Development</td>
<td>$48,000</td>
<td>$ 96,000</td>
</tr>
<tr>
<td>Existing Well Trans.</td>
<td>$85,000</td>
<td>$170,000</td>
</tr>
<tr>
<td>Tank Tie-in North</td>
<td>$30,000</td>
<td>$ 60,000</td>
</tr>
<tr>
<td>North Loop Line</td>
<td>$90,000</td>
<td>$180,000</td>
</tr>
<tr>
<td><strong>Total =</strong></td>
<td><strong>$253,000</strong></td>
<td><strong>$506,000</strong></td>
</tr>
</tbody>
</table>

* Assumes 50% grant – 50% Loan

**Pine Haven Improvements Project Program**

It is recommended that the remainder of the system improvements around the Pine Haven community be constructed as funding and community interest allows. It may not be realistic to pursue all the projects at one time due to the magnitude of total project costs and available funding. It would however, be realistic to start a program over a period of time using the “Master Plan” as a guideline of necessary improvements, and completing projects as funding comes available. Although not WWDC eligible projects, funding sources are available for distribution system upgrades and should be pursued to complete each alternative. This approach will also give the Town Council sufficient time to obtain either firm resident financial commitments or form local improvement districts,
whichever procedure is desired. A summary of the approximate project costs are presented as follows:

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Loan *</th>
<th>Estimated Project Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pine Haven South Loop</td>
<td>$85,000</td>
<td>$170,000</td>
</tr>
<tr>
<td>Water Street</td>
<td>$80,000</td>
<td>$160,000</td>
</tr>
<tr>
<td>Misc. Pipe Upgrades</td>
<td>$86,000</td>
<td>$172,000</td>
</tr>
<tr>
<td>Hays Blvd.</td>
<td>$75,000</td>
<td>$150,000</td>
</tr>
<tr>
<td>Glenn Vista Drive.</td>
<td>$65,000</td>
<td>$130,000</td>
</tr>
<tr>
<td>Antler-Elm-Maple</td>
<td>$90,000</td>
<td>$180,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$481,000</strong></td>
<td><strong>$962,000</strong></td>
</tr>
</tbody>
</table>

* Assumes 50% grant – 50% Loan