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Cost of Rural Community Water and Sewer Systems Compared to Private Systems

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Cost of Rural Community Water and Sewer Systems Compared to Private Systems

Cooperative Extension Service of South Dakota State University and U. S. Department of Agriculture
Purpose of This Publication

Almost all South Dakota counties are preparing or have completed comprehensive sewer and water studies under the direction of County Planning Commissions. Many of these studies are being made under a Farmers Home Administration program.

These studies give generalized information and project probable future needs for water supplies in various areas of the county. They also outline areas in the county where community systems appear feasible. They do not go into sufficient engineering and feasibility detail for construction purposes.

County Planning Commissions need to know whether they should contract for these more detailed studies. To determine this they must know the degree of interest among prospective users of the water. Before making their decision, prospective users need to know how much, if any, economic and convenience advantage they would get by obtaining water from the community system rather than developing their own source.

This publication provides a simple cost analysis sheet so that prospective users can compute their present costs using their present system. This cost can then be balanced against the estimated cost of water service from the community system. So called “hidden costs” that are mostly a result of poor quality water are included.

Sewer System May Be Separate Consideration

The sewer system and the water system for a community may be considered separately even though the county comprehensive study includes both.

Normally sewer systems are adaptable only in more densely populated areas. They are important in these areas for sanitation reasons. A sewer system is always an important consideration in lake front developments for reasons of sanitation.

Since sewer systems are important more from the sanitation standpoint than from a dollar saving standpoint, they are not included in the cost sheet analysis.

Basic Differences in Designs

Community Water Systems may be designed to accomplish various purposes. They may be designed to provide water for household use only, for livestock use only or for both. The livestock water may be delivered to corral areas only or to both corrals and range or pasture. Normally livestock water is metered separately from household supplies.

“Pressurized flow” delivery and “constant flow” delivery are terms often heard.

Pressurized flow delivery (sometimes called “demand” delivery) means that the system will deliver the water to points of use in an adequate supply and under sufficient pressure so that no auxiliary equipment is needed to increase pressure. When this method is used, large pressure...
regulating tanks are frequently needed at several of the higher elevations throughout the community to be served. Where this type of system is to be used, a water supply large enough to meet peak demand flows is essential.

The constant flow method delivers water into a cistern or storage tank on each user’s property. The user then picks up the water with his own pumping and pressurizing system and delivers it to his various points of use.

Water is delivered to the cisterns at relatively low pressure and at a relatively slow rate since the cistern serves as a place to “stock pile” the water for periods of high use rates. Automatic shut-off devices are installed in the cistern to prevent overflow.

This method adapts itself well when the water supply available at a given time is limited, as would be the case with low yield wells as the water source.

Table 1. First cost of plumbing and water service items INSTALLED. (Based on medium quality items)

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>(a) Cost as quoted by one contractor</th>
<th>(b) Cost in your area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bath Tub w/faucets</td>
<td>Each</td>
<td>$115.00</td>
<td></td>
</tr>
<tr>
<td>Lavatory w/faucets</td>
<td>Each</td>
<td>$52.00</td>
<td></td>
</tr>
<tr>
<td>Toilet</td>
<td>Each</td>
<td>$40.00</td>
<td></td>
</tr>
<tr>
<td>Drain for Toilet, Tub,</td>
<td>Job</td>
<td>173.00</td>
<td></td>
</tr>
<tr>
<td>Kitchen Sink and</td>
<td>Job</td>
<td>173.00</td>
<td></td>
</tr>
<tr>
<td>Kitchen Sink w/faucets</td>
<td>Each</td>
<td>86.00</td>
<td></td>
</tr>
<tr>
<td>Distribution Pipe</td>
<td>Average job</td>
<td>173.00</td>
<td></td>
</tr>
<tr>
<td>Distribution Pipe</td>
<td>Foot</td>
<td>.90</td>
<td></td>
</tr>
<tr>
<td>Well and Casing</td>
<td>Foot of depth</td>
<td>6.75</td>
<td></td>
</tr>
<tr>
<td>Pump, Submersible</td>
<td>Each</td>
<td>370.00</td>
<td></td>
</tr>
<tr>
<td>Pump, jet package w/pipe</td>
<td>Each</td>
<td>230.00</td>
<td></td>
</tr>
<tr>
<td>Pump, cylinder</td>
<td>Each</td>
<td>140.00</td>
<td></td>
</tr>
<tr>
<td>Stock Watersers (combination)</td>
<td>Each</td>
<td>180.00</td>
<td></td>
</tr>
<tr>
<td>Water Softener</td>
<td>Each</td>
<td>345.00</td>
<td></td>
</tr>
<tr>
<td>Pressure Tank</td>
<td>Each</td>
<td>60.00</td>
<td></td>
</tr>
<tr>
<td>Water Heater</td>
<td>Each</td>
<td>115.00</td>
<td></td>
</tr>
<tr>
<td>Chlorinator</td>
<td>Each</td>
<td>400.00</td>
<td></td>
</tr>
<tr>
<td>In-line Filter</td>
<td>Each</td>
<td>30.00</td>
<td></td>
</tr>
<tr>
<td>Motor for cylinder pump and pump jack</td>
<td>Each</td>
<td>173.00</td>
<td></td>
</tr>
<tr>
<td>Pressure Pump w/drop pipe</td>
<td>Each</td>
<td>145.00</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: No estimated costs are given for cisterns, ponds, dugouts, water hauling tanks, trucks or water delivery service charges because costs vary widely due to many conditions.

Explanation of Tables

Tables 1, 2, 2a, 3, 3a, and 4 provide forms on which persons can compute the economic advantage or disadvantage resulting from their joining a community water system project.

The left side of each table gives an example of such a computation. The right side of each table is provided for use by anyone wishing to make his own analysis using local costs. In every case local costs should be used because of considerable variation in many costs from one area to another.

In the example given, the farmer or rancher would enjoy an economic advantage if the community project could deliver water under pressure for less than $24.85 per month or by constant flow for less than $23.36.

Table 1 Column (a) is a compilation of costs of various plumbing and water service items as supplied by one contractor. The figures represent about average quality goods. They are neither “economy lines,” nor elaborate fixtures. Size of some items such as pipe will vary from situation to situation. Prices in the table are based on sizes that fit the needs of most situations.

Greatest variation will be in per-foot cost of drilling and casing a well because of varying soil conditions, rocks and methods of drilling used in different areas.

Fill in column (b) with your local costs. They will likely be different than shown in the example.

Tables 2 and 2a show an actual situation as our “example” on the left side of the form. Using the same procedure as shown in the example, fill in the right side of the table with costs of your own system. If your community system will deliver water under pressure use table 2. If delivery is by constant flow use table 2a.

Your answer will likely be much different than the example since many costs vary between areas and every situation requires the use of different cost items.

These tables consider only those items that will not be needed if a community system is used.

Tables 3 and 3a evaluate your saving on items that are still needed but whose life expectancy increases because the community system delivers good quality water that does not incrust or corrode pipes and fixtures. Use table 3 if water is delivered under pressure and table 3a if the community system uses the constant flow principle.

Much South Dakota water is highly mineralized and incrustation and/or corrosion often greatly reduces the normal life of pipes and fixtures.

The left side of these tables show “our example” as a means of demonstrating how to use the table.

Fill in table 4 with the results you obtained in tables 2 and 3 or 2a and 3a.

In the examples shown it would be an economic disadvantage to join the community system if the estimated monthly charge for pressurized delivery would be more than $24.85 or the constant flow delivery more than $23.36. The analysis of your own system may result in a figure higher or lower than the examples.
importance of water quality

many water sources on individual farms and ranches contain water of inferior quality for domestic uses. this does not necessarily mean that the water is a health hazard. usually it is inferior because of a high mineral content that either-corrodes, incrusts, stains or otherwise shortens the normal life of pipes, cooking utensils and plumbing fixtures. also undesirable tastes and odors are sometimes present.

in some cases locating and delivering good quality water may be as important an objective of the community system as the delivery of adequate quantities.

when a rural community system is needed

need for a community water system is normally evident under the following conditions or a combination of them:
1. when quantity of water available on many farms and ranches is inadequate.
2. when quality of water available is inferior.
3. when quantity and quality are satisfactory but cost of developing the water source is prohibitive unless the cost can be spread over a larger number of users.
4. when users consider the convenience and sanitation features of a community system highly desirable.

convenience, sanitation may be factors

it should be kept in mind that the analysis made here considers only the dollar advantage or disadvantage offered by the community system. the convenience offered by water service from a community system may be considered of sufficient value by some persons to justify its use even if an economic disadvantage results from such use.

possible contamination of privately developed sources is always a worry. a well designed, operated and maintained community system will remove this worry.

no attempt is made here to compute the hidden cost of excess amounts of detergents needed when water quality is simply classified as "hard." it is believed, however, that when water is in excess of 17 grains of hardness per gallon of water it becomes economically feasible to install a water softener. using this criteria, the delivery of soft water by the community system has an evident economic advantage when water from the private system is very "hard."

this method usually results in lower initial costs to the district administering the water service but it may not be cheaper to the individual user in the long run since he must maintain and operate his own cistern and water pressure system.

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Table 3 -- Average annual installed cost of items STILL NEEDED if good quality water is delivered UNDER PRESSURE but whose life expectancy would increase

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
<th>Actual Life (years)</th>
<th>Normal Life* (years)</th>
<th>Actual Cost per year (in buildings)</th>
<th>Normal Cost per year (in buildings)</th>
<th>Cost Actual normal life (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Heater</td>
<td>$15</td>
<td>6</td>
<td>10</td>
<td>19.15</td>
<td>11.50</td>
<td>7.65</td>
</tr>
<tr>
<td>Plumbing Fixtures</td>
<td>408</td>
<td>12</td>
<td>16</td>
<td>34.00</td>
<td>25.50</td>
<td>8.50</td>
</tr>
<tr>
<td>Distribution System</td>
<td>720</td>
<td>12</td>
<td>20</td>
<td>60.00</td>
<td>36.00</td>
<td>24.00</td>
</tr>
<tr>
<td>Distribution System (Farmhouse)</td>
<td>173</td>
<td>12</td>
<td>20</td>
<td>14.35</td>
<td>8.65</td>
<td>5.76</td>
</tr>
<tr>
<td>Automatic Metering</td>
<td>180</td>
<td>8</td>
<td>12</td>
<td>22.60</td>
<td>15.00</td>
<td>7.50</td>
</tr>
<tr>
<td>Chlorination System</td>
<td>400</td>
<td>12</td>
<td>15</td>
<td>33.33</td>
<td>26.66</td>
<td>6.67</td>
</tr>
<tr>
<td>Pressure Pump</td>
<td>145</td>
<td>7</td>
<td>12</td>
<td>20.71</td>
<td>12.08</td>
<td>8.63</td>
</tr>
<tr>
<td>Pressure Tank</td>
<td>60</td>
<td>15</td>
<td>20</td>
<td>4.00</td>
<td>3.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Storage Tank or Cistern</td>
<td>370</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$15.85</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest on Total, at 7%</td>
<td><strong>3.73</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>