Water for the World

Choosing Between Community Distribution Systems and Household Water Connections

Technical Note No. RWS. 4.P.2

A communal distribution system provides water to public watering points in or near the community. Household water connections can be simply an outside faucet at each home or a connection to indoor plumbing. A communal distribution system is Level 2 service while household connections are Level 3 service as described in "Methods of Delivering Water," RWS.4.M.

To determine which type of system is best for a given community, the following considerations should be addressed:

- Project feasibility from a technical standpoint,
- Project feasibility from an economic standpoint,
- Community desire, willingness and ability to operate and maintain a system.

Technical Feasibility

The first step which should be taken is to determine the technical feasibility of the project. This requires estimating the quantities of water needed for each type of system. Potential sources of water can then be identified. This may require drilling or digging a test well if information is not available. Potential sources should be shown on a map. If the potential source produces insufficient water for household water connections, the only option is communal distribution. Once a source or sources is identified, estimates of the cost of delivering water to the community can be developed. A major factor in estimating costs is whether the water is delivered by gravity flow or with a pump. See "Choosing Between Gravity Flow and Pumps," RWS.4.P.1. Worksheet A can be used to estimate water needs for communal distribution points and for household connections.

Economic Feasibility

Once the project has been determined to be technically feasible, an economic analysis should be done comparing the costs of Level 2 and Level 3 service. Worksheet B can be used for cost estimates. The cost of operation and maintenance should also be estimated for each type of system as shown in Worksheet C. These costs play an important role in the final decision on the type of system. The costs of the more economical systems should then be compared using Worksheet D.

Once costs have been determined, available resources must be assessed. there are several methods of obtaining the necessary resources ranging from the community fully paying for, contracting for, and operating and maintaining the system to the government assuming this responsibility. Most projects fall between these extremes with the community providing some funding or in-kind contributions of labor and material and the government providing technical help and funding for materials and equipment that the community cannot contribute. Level 3 systems require additional resources from the homeowner to install plumbing in the house and provide for wastewater disposal.

Community Involvement

The community should be involved in deciding on the type of distribution system. This can be accomplished through community meetings and discussions. Problems concerning crossing privately owned land and providing operation and maintenance can be discussed at these meetings. Responsibilities for providing resources must be clearly understood along with the cost of and responsibility for operation and maintenance.

Worksheet A. Estimating Water Needs for Communal Distribution Systems and Household Water Connections

1. Estimated present water needs in liters:

	Number of	Unit use	Total
Population	Persons _____	x _____	= _____
School	Students _____	x _____	= _____
Church	Attendees_____	x _____	= _____
Large Animals (cows)	_____	x _____	= _____
Small Animals (sheep)	_____	x _____	= _____
Public Watering Fountains	_____	x _____	= _____

Total present water needs = _____

2. Estimated future water use:

Use a 20 year design life. If no better information is available, use a population growth of 2 times the present population and an increase in animals of 1.25 times the present number. In addition, assume an increase in the rate of water use of 2 times current use.

Population	Present use _____	x 4 = _____liters
Institutions & Public Fountains	Present use _____	x 2 = _____liters
Animals	Present use _____	x 1.25 = _____liters

Total future water use = _____l/day

3. Sources to be considered (each letter is a different source):

Quantity available (liters per day Gravity-G or Pumped-P)

A. _____ B. _____ C. _____ D. _____ E. _____ F. _____ G. _____ H. _____

Types of source (Spring-Sp, Surface-S, Well-W)

A. _____ B. _____ C. _____ D. _____ E. _____ F. _____ G. _____ H. _____

Height above (+), below (-) point of use

A. _____ B. _____ C. _____ D. _____ E. _____ F. _____ G. _____ H. _____

Distance from source to point of use

A. _____ B. _____ C. _____ D. _____ E. _____ F. _____ G. _____ H. _____

Distance to existing power (Electricity-E, None-N)

A. _____ B. _____ C. _____ D. _____ E. _____ F. _____ G. _____ H. _____

Quality (Taste, odor, clarity -Good-G, Fair-F, Poor-P; Chemical test Yes/No, Y/N; enter for each source)

A. T._____ O._____ C._____ Chem._____ B. T._____ O._____ C._____ Chem._____

C. T._____ O._____ C._____ Chem._____ D. T._____ O._____ C._____ Chem._____

E. T._____ O._____ C._____ Chem._____ F. T._____ O._____ C._____ Chem._____

G. T._____ O._____ C._____ Chem._____ H. T._____ O._____ C._____ Chem._____

Obstacles between source and point of use

A. Rock _____m
Wash/stream _____
Paved road (y/n) _____
Other _____
Right of Way _____

B. Rock _____m
Wash/stream _____
Paved road (y/n) _____
Other _____
Right of Way _____

C. Rock _____m
Wash/stream _____
Paved road (y/n) _____
Right of Way _____

D. Rock _____m
Wash/stream _____
Paved road (y/n) _____
Right of Way _____

E. Rock _____m
Wash/stream _____
Paved road (y/n) _____
Other _____
Right of Way _____

F. Rock _____m
Wash/stream _____
Paved road (y/n) _____
Other _____
Right of Way _____

G. Rock _____m
Wash/stream _____
Paved road (y/n) _____
Other _____
Right of Way _____

H. Rock _____m
Wash/stream _____
Paved road (y/n) _____
Other _____
Right of Way _____

Water rights available?

A. _____ B. _____ C. _____ D. _____ E. _____ F. _____ G. _____ H. _____

Worksheet B. Estimated Cost of Facilities Communal/Household Delivery System

Item	Quantity	Cost	Total
Water System Materials			
4-inch PVC pipe	_____	_____	_____
2-inch PVC pipe	_____	_____	_____
3/4 inch PVC pipe	_____	_____	_____
4-inch gate valve and box	_____	_____	_____
2-inch gate valve and box	_____	_____	_____
4-inch flush valve	_____	_____	_____
2-inch flush valve	_____	_____	_____
House service line	_____	_____	_____
Miscellaneous fittings & valves	_____	_____	_____
Water source (well)	_____	_____	_____
(spring)	_____	_____	_____
(surface)	_____	_____	_____
Power source (electricity)	_____	_____	_____
(fuel engine)	_____	_____	_____
Pump and Controls	_____		_____
Pumphouse	_____	_____	_____
Water treatment	_____	_____	_____
Storage tank (_____m^3)	_____	_____	_____
Communal watering point	_____	_____	_____
	Water System Materials		_____
Labor			
Lay water line	_____	_____	_____
Construct pumphouse	_____	_____	_____
Construct storage tank	_____	_____	_____
Construct water source	_____	_____	_____
(dug well)	_____	_____	_____
(spring)	_____	_____	_____
(surface)	_____	_____	_____
Install pump	_____	_____	_____
Install motor	_____	_____	_____
Construct communal watering points	_____	_____	_____
		Labor	_____
Equipment			
Pickup truck	_____	_____	_____
Dump truck	_____	_____	_____
Other _____	_____	_____	_____
_____	_____	_____	_____
		Equipment	_____
Cost Summary			
Sub-total Material		_____	
Sub-total Labor		_____	
Sub-total Equipment		_____	
Sub-total project cost		_____	
Add contingency 20%		_____	
Total project cost		_____	

Worksheet C. Operation and Maintenance Costs

Labor

Monthly: _____hrs/mo. x _____/hr. x 12 mo/yr. _____
Annual: _____hrs/yr. x _____/hr. _____
Overhead 1.25 _____ = _____/yr. _____
Total Labor _____

Vehicle

Monthly: _____miles/mo. x _____/mi. x 12 mo/yr. _____
Annual: _____miles/yr. x _____/mi. _____
Total Vehicle _____

Special

1 major repair every two (2) years (time - 12 Hr)
_____men @ _____/hr. x _____hr. _____
_____trucks @ _____/day _____
Total Special _____

Pumps and Controls

Cost of pump and control replacement
_____hrs. of crane @ _____/hr. _____
Labor _____ men for _____ hr. @ _____/hr. _____
Total Pumps and Controls _____

Tank

At ten (10) years needs flushing and cleaning
_____ men x _____ days x _____ hr./day x _____/hr. _____
Equipment and Paint _____
Total Tank _____

Chemical

Fluoride: 3gm/1000 liters x _____ liters/day x 365 days/yr. _____
.657 gm/yr. x $0.58/Kg _____
Chlorine: 0.5mg/l/day x 365 day/yr x _____l/day 1000000mg/Kg
_____Kg pure chlorine/year
329 Kg/yr. x $0.90/Kg Chlorine _____
Total Chemical _____

Chemical feeders

Chlorinator: replace every 15 years _____ x 15 _____
Fluoridator: replace every 15 years _____ x 15 _____
Total Chemical Feeders _____

Electrical

_____ hp pump @ 21 hr/day
_____ hp x 0.746 kw/hp x 12 hr/day x $\frac{365 \text{ days}}{12 \text{ months}}$ = kwh/mo _____
_____ Kwh @ $_____/Kwh $_____
_____ Kwh @ $_____/Kwh $_____
_____ Kwh @ $_____/Kwh $_____
_____/mo.
_____/mo. x 12 mo/yr. _____
Total Electrical _____

Motor

Replace every 10 years: _____ x 10
Cost of fuel _____liters/hr x _____ hrs/day x 365 days x _____
$_____liter = $_____yr.
Total Motor _____

Summary

Labor $_____
Vehicle _____
Special _____
Pump and Controls _____
Tank _____
Chemical _____
Chemical Feeders _____
Electrical _____
Motor _____
Total Operation and Maintenance Cost _____/yr.

Worksheet D. Comparison of Costs for All Systems

	Type system	System number	Cost
A.			
B.			
C.			
D.			
E.			
F.			
G.			

System selected _____