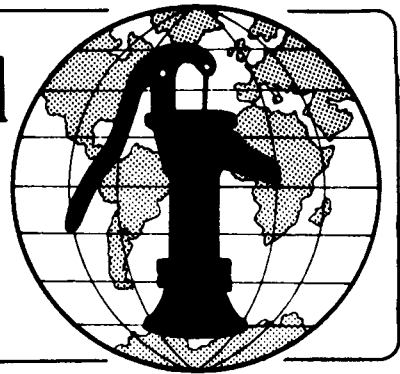


Water for the World

Methods of Delivering Water
Technical Note No. RWS. 4.M



Once a water source has been identified and developed, some means of delivering the water to the users must be found. This is usually called a distribution system or a delivery system. Several factors must be taken into account in deciding on a method of delivering water. These include the desired use of the water, such as drinking, cooking, washing, livestock, gardens and religious and commercial needs, and resources in the community to construct, operate and maintain a distribution or water delivery system.

Individual water systems, communal watering points, or community water distribution systems may be used. The closer to individual homes that water is supplied, the less the chance of contamination and the more water will be used for such purposes as hand-washing and bathing. Water should be provided as close to individual homes as possible.

The type of delivery system chosen depends on the concentration of homes, water availability, resources such as construction materials, labor and funds, and the desire and ability of the users to operate and maintain the system. In any case, a distribution system, whether a communal watering point or one which provides water to each home, will be a wasted investment if it becomes inoperative because of lack of maintenance or of funds to operate it. The distribution system should be designed and constructed with simplicity and cost of operation in mind. Systems should be designed to allow future expansion and upgrading to a higher level of service.

Types of Delivery Systems

In this technical note, the delivery systems normally considered for rural villages are described in terms of three levels of service. As a general

rule, the higher the level of service, the more expensive the system will be to construct, operate and maintain. However, the higher level systems provide greater potential for improved health, and reduce or eliminate the need for water hauling so that people have more time for other activities, such as raising vegetables. The levels of service from least to most desirable are as follows:

Level 1. Water source development or improvement with a distribution point at or near the source. At this level, water must be hauled from the source to each house. The distance water must be carried will vary with the location of the source. The primary advantage of Level 1 service is a protected water source.

Level 2. Water source development or improvement with distribution point(s) near population centers. This level of service provides water at one or more points serving several homes. The method of distribution may be by a water pipeline or by a tank truck or trailer. Individuals haul water from the distribution point to their homes.

Level 3. Water source development or improvement with distribution of water to each house by a pipeline.

Whichever system is initially decided on, the eventual goal should be to at least provide water to a sink in each house.

Useful Definitions

COMMUNAL DISTRIBUTION POINT - A place where water is delivered for community use; usually consists of one or more taps.

TRANSMISSION LINE - The pipeline from the water source to the point of storage and/or use.

Level 1 Service

Water source development or improvement with a distribution point at or near the source is normally provided when resources are not available to pipe or haul the water nearer to the point of use and/or it is beyond the capability of the village to operate and maintain a more complicated system. It should also be considered when water sources are scarce and have very low yields. The location of the distribution point should be slightly away from the source to reduce the chance of contamination. Storage at or near the source will often be required if the source has a low yield. Storage for dug wells can be incorporated into the well design. The system should provide at least 15 liters per day for each person using it.

Typical Level 1 service developments include a windmill pumping to an adjacent storage tank with a public distribution point, shown in Figure 1, a hand pump used to pump water away from the source to a distribution point, shown in Figure 2a, a hand pump at the source with the distribution point at the pump, shown in Figure 2b, and a spring development with water piped to a nearby distribution point, shown in Figure 3.

Level 2 Service

At this service level, the water source is developed or improved with distribution of water to population centers. If the source is near the population center, Level 1 service can be the same as Level 2. See Figures 1, 2 and 3. If the source is remote from the users, a tank, truck or trailer may be used to haul water as shown in Figure 4c or a transmission line can be installed to the distribution point(s). A source of pressure will be required to move the water from the source to the point of use. This can be accomplished by gravity if the source is at a higher elevation than the point of use or by pumping. See Figure 4a.

Level 2 service is more costly and complicated than Level 1 because valves are required so that repairs can be made, so that air trapped in the main line can be released, and so that the main transmission line can be flushed clean. A transmission line may be required and a more sophisticated distribution point may be needed. More

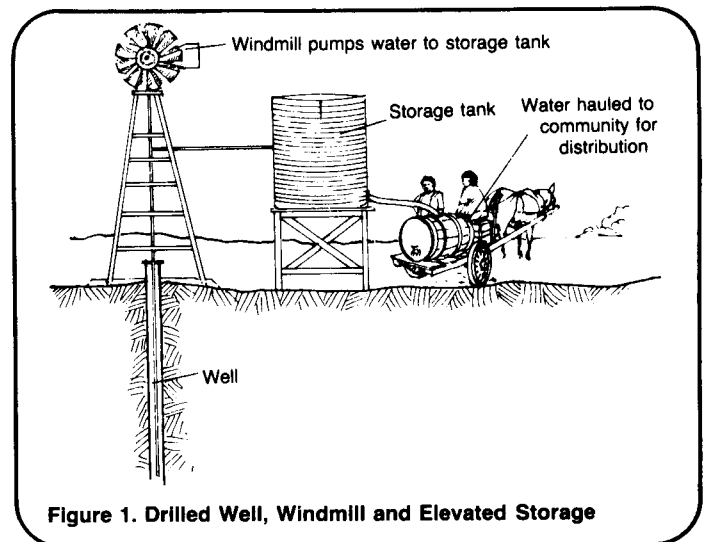


Figure 1. Drilled Well, Windmill and Elevated Storage

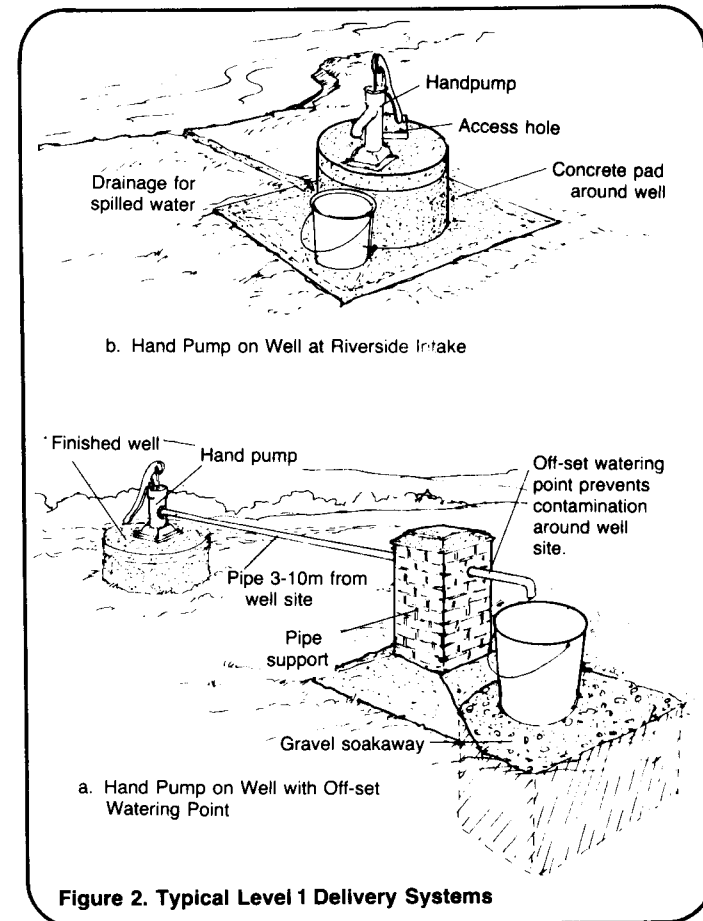
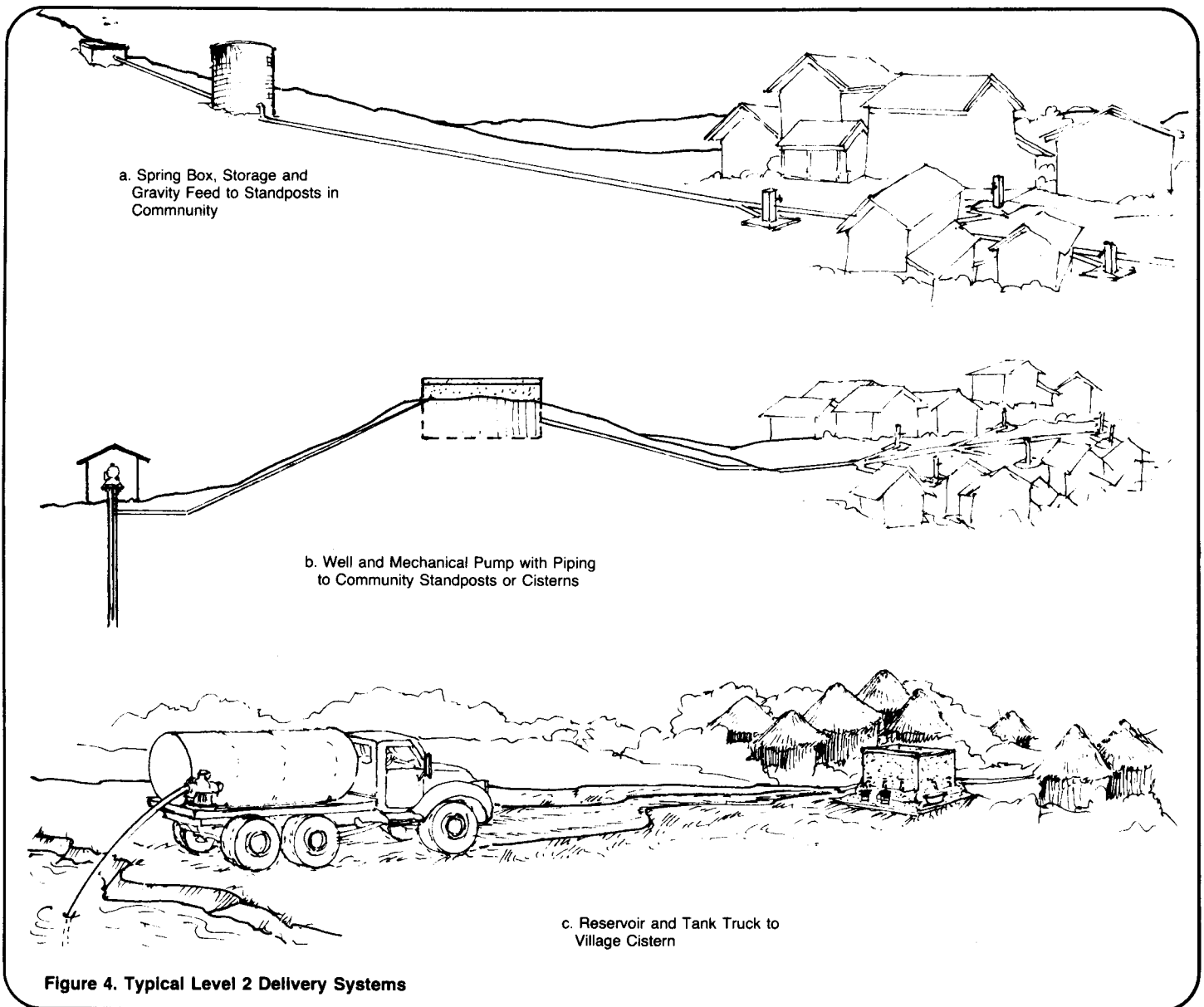
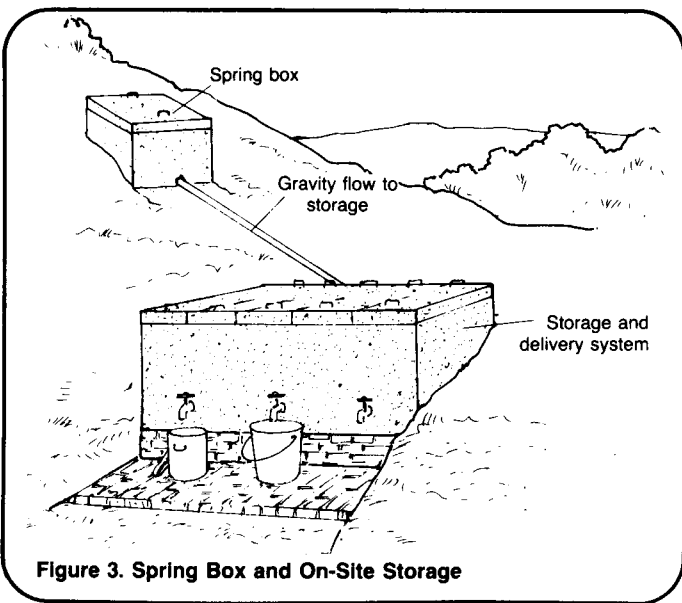


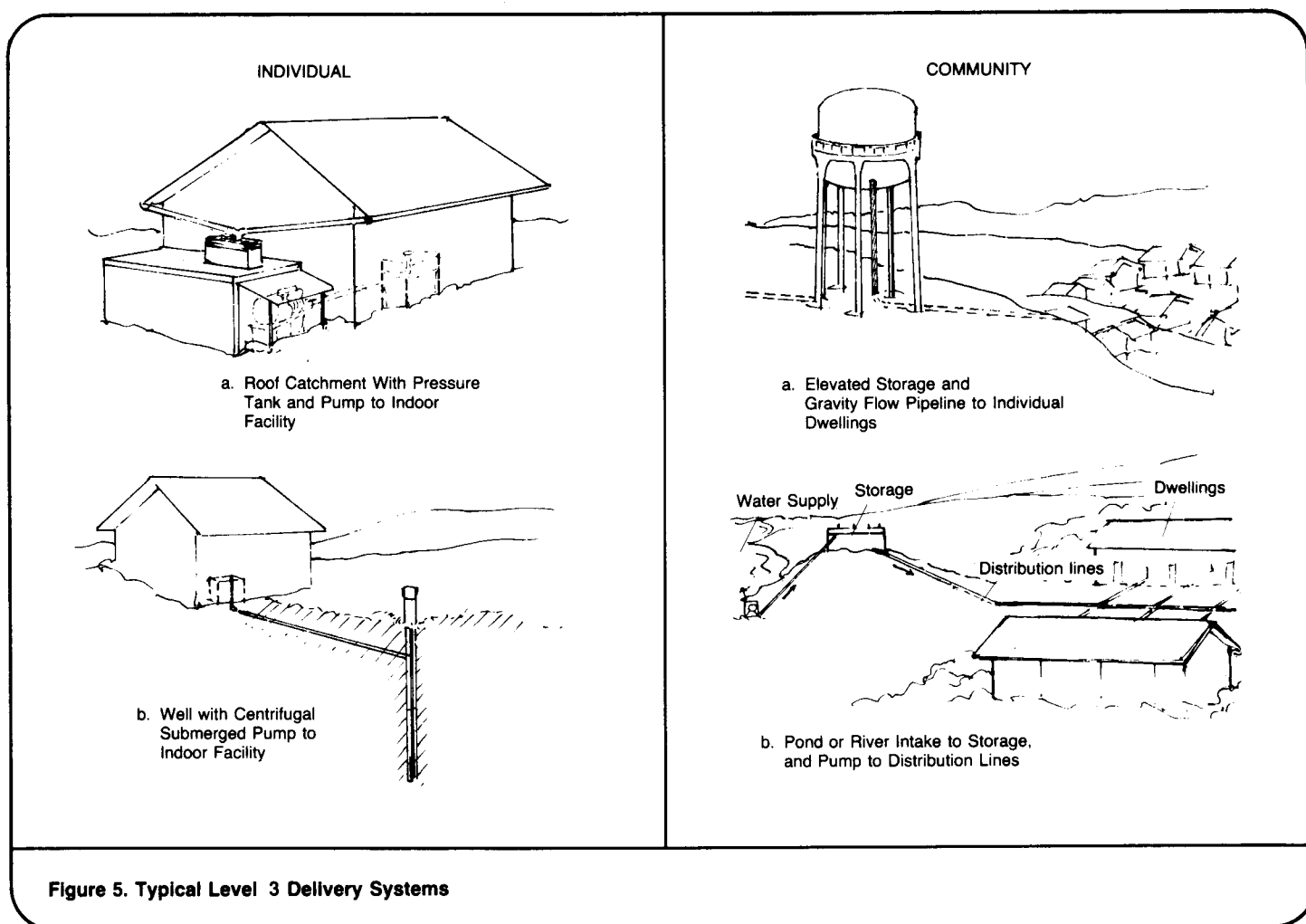
Figure 2. Typical Level 1 Delivery Systems

storage is also needed since water use will increase when the distribution point is nearer the household. Pump controls may also be required. Storage may be provided at or near the source, the distribution point, or both. Level 2 systems should be designed to provide at least 40 liters of water per day to each person being served. Figure 4b shows a system with several distribution points in a rural community with one storage tank.

Level 3 Service

Level 3 systems have a water source, usually have mechanical pumps, a transmission pipeline, water storage reservoirs and a water distribution system. They are similar to Level 2 systems except that water is delivered to each house rather than to one or more communal distribution points. Water may be supplied to a tap outside the house or to a sink inside the house. In some systems, a water meter may be installed at each home to measure the amount of water used so that each household can be charged for the water it uses. Figure 5a and b





show Level 3 systems using a water source near the house. This would be most likely to occur where water is easy to obtain. Figures 5c and d show water supplied by gravity or by mechanical means to each home through a water distribution system.

Table 1 summarizes the most important considerations in choosing a method of water delivery.

Table 1. Delivery Method Selection Considerations

Level of Service	Suitability for Population Size			Construction Costs			Relative Costs of O&M		
	Small (to 100)	Medium (100-500)	Large (500+)	Low	Moderate	High	Low	Moderate	High
Level 1									
Gravity	x	x	x	x	to	x	x	to	x
Handpump	x	x		x			x		
Windmill	x	x			x		x	to	x
Level 2									
Gravity	x	x	x	x	to	x	x		
Handpump	x	x		x			x		
Windmill	x	x			x	to	x	to	x
Electric	x	x	x		x	to	x	to	x
Fuel		x	x			x			x
Level 3									
Gravity	x	x	x	x	to	x	x		
Handpump	x	x	x	x			x		
Windmills	x	x		x	to	x	x	to	x
Electric	x	x	x	x	to	x	x	to	x
Fuel		x	x			x			x

Technical Notes are part of a set of "Water for the World" materials produced under contract to the U.S. Agency for International Development by National Demonstration Water Project, Institute for Rural Water, and National Environmental Health Association. Artwork was done by Redwing Art Service. Technical Notes are intended to provide assistance to a broad range of people with field responsibility for village water supply and sanitation projects in the developing nations. For more detail on the purpose, organization and suggestions for use of Technical Notes, see the introductory Note in the series, titled "Using 'Water for the World' Technical Notes." Other parts of the "Water for the World" series include a comprehensive Program Manual and several Policy Perspectives. Further information on these materials may be obtained from the Development Information Center, Agency for International Development, Washington, D.C., 20523, U.S.A.