

CHAPTER 1

WATER SUPPLY SOURCES

1-1. Purpose and scope. This manual prescribes the standards to be used for developing or investigating water sources at Army mobilization facilities.

1-2. Definitions. Definitions for water supply sources will be as presented in EM 1110-3-160.

1-3. General. Water supplies may be obtained from surface or ground sources by expansion of existing systems or by purchase from other systems. The selection of a source of supply will be based on water availability, adequacy, quality, cost of development and operation, and the expected life of the project to be served. In general, all alternative sources of supply should be evaluated to the extent necessary to provide a valid assessment of their value for a specific installation. Alternative sources of supply include purchase of water from U. S. Government owned or other public or private systems, as well as consideration of development or expansion of independent ground and surface sources. A combination of surface and ground water, while not generally employed, may be advantageous under some circumstances and should receive consideration.

1-4. Use of existing systems. If the installation is located near a municipality or other public or private agency operating a water supply system, this system should be investigated to determine its ability to provide reliable water service to the installation at reasonable cost and to determine the possible arrangements that might be made for its use. The investigation must consider near future as well as current needs of the existing system and, in addition, the impact of the Army project on the water supply requirements in the existing water service area. The feasibility of utilizing the existing supply should be compared with the feasibility of reasonable alternatives. Among the important matters that must be considered are: quality of the supply; adequacy of the supply during periods of peak demand; reliability and adequacy of raw water pumping and transmission facilities; treatment plant and equipment; high service pumping; storage and distribution facilities; facilities for transmission from the existing supply system to the Army project; and costs.

1-5. Environmental considerations. For guidance on environmental considerations, EM 1110-3-160 will be consulted.

1-6. Water quality considerations. Guidelines for determining the adequacy of a potential raw water supply for producing an acceptable finished water supply with conventional treatment practices are given in EM 1110-3-162.

9 Apr 84

a. Hardness. Water hardness classifications are shown in table 1-1.

Table 1-1. Water Hardness Classifications

<u>Total Hardness</u> mg/l as CaCO ₃	<u>Classification</u>
0 - 100	Very Soft to Soft
100 - 200	Soft to Moderately Hard
200 - 300	Hard to Very Hard
over 300	Extremely Hard

For mobilization work, softening will not be considered unless the hardness exceeds about 400 mg/l as CaCO₃ or equipment and processes need low hardness water. In this case the water should be softened at the supply point to the particular equipment or process.

b. Total dissolved solids (TDS). In addition to hardness, the quality of ground water may be judged on the basis of dissolved mineral solids. In general, dissolved solids should not exceed 800 mg/l.

c. Chloride and sulfate. Chloride and sulfate cannot be removed by conventional treatment processes, and their presence in concentrations greater than about 250 mg/l reduces the value of the supply for domestic and industrial use and may justify its rejection if development of an alternative source of better quality is feasible. Saline water conversion systems, such as electro dialysis or reverse osmosis, are required for removal of excessive chloride or sulfate and also certain other dissolved substances, including sodium and nitrate.

d. Other constituents. The presence of certain toxic heavy metals, fluoride, pesticides, and radioactivity in concentrations exceeding U.S. Environmental Protection Agency standards, as determined by the Surgeon General of the Army, will make rejection of the supply mandatory unless unusually sophisticated treatment is provided. For detailed discussion of U.S. Environmental Protection Agency water standards, see 40 CFR - Part 141, AR 420-46, and TB MED 576.

e. Water quality data. Base water quality investigations or analysis of available data at or near the proposed point of diversion should include biological, bacteriological, physical, chemical, and radiological parameters covering several years and reflecting seasonal variations. Sources of water quality data are installation records, U.S. Geological Survey District or Regional offices and Water Quality Laboratories, U.S. Environmental Protection Agency regional offices, state geological surveys, state water resources agencies, state and local health departments, and nearby water utilities, including those

9 Apr 84

serving power and industrial plants, which utilize the proposed source. Careful study of historical water quality data is usually more productive than attempting to assess quality from analysis of a few samples, especially on streams. Only if a thorough search fails to locate existing, reliable water quality data should a sampling program be initiated. If such a program is required, the advice and assistance of an appropriate agency will be obtained. Special precautions are required to obtain representative samples and reliable analytical results. Great caution must be exercised in interpreting any results obtained from analysis of relatively few samples.

1-7. Checklist for existing sources of supply. The following items, as well as others, if circumstances warrant, will be covered in the investigation of existing sources of supply from Government owned or other sources.

- Quality history of the supply; estimates of future quality.
- Description of source.
- Water rights.
- Reliability of supply.
- Quantity now developed.
- Ultimate quantity available.
- Excess supply not already allocated.
- Raw water pumping and transmission facilities.
- Treatment works.
- Treated water storage.
- High service pumping and transmission facilities.
- Rates in gpm at which supply is available.
- Current and estimated future cost per 1,000 gallons.
- Current and estimated future cost per 1,000 gallons of water from alternative sources.
- Distance from Army installation site to existing supply.
- Pressure variations at point of diversion from existing system.
- Ground elevations at points of diversion and use.

EM 1110-3-161
9 Apr 84

- Energy requirements for proposed system.
- Sources of pollution, existing and potential.
- Assessment of adequacy of management, operation, and maintenance.
- Modifications required to meet additional water demands resulting from supplying water to Army installation.