WATER SUPPLIES FOR INDUSTRY IN OKLAHOMA

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Water supplies for certain industries are as important as other raw materials, and the availability of an adequate supply of water of satisfactory quality may be the limiting factor in locating an industrial plant. Water supplies are obtained from two sources, underground and surface, and the quality of both is subject to local variations resulting from the presence of soluble minerals in the rocks through which the water moves, or over which it flows. In a similar way, local climatic conditions—rainfall, temperature, and evaporation—will affect the quantity of both surface and ground water available in a given area. However, the availability of ground water in any area is determined to a much greater degree by the lithologic character of the aquifer. Gravel and coarse sand, or cavernous limestones are the most efficient aquifers, for the openings are large, allowing free movement of water. They have high permeability, and readily give up water to wells. Shale, on the other hand, though having equal porosity, and containing as much water, has low permeability and gives up water very slowly, so that wells tapping it are of small capacity.

Ground-water supplies. Four distinct ground-water provinces exist in Oklahoma: (1) alluvium of major streams, (2) terrace deposits, (3) sands and gravels of the High Plains, and (4) certain consolidated rock formations in which water occurs under artesian conditions.

Alluvium or valley fill consists of unconsolidated sand, gravel, and silt, and generally is of high permeability. Recharge is from precipitation on the valley floor, runoff from adjacent uplands, and underflow from the stream itself. Owing to lower rainfall and smaller stream flow, and to the presence of soluble salt and gypsum in the bed rock in western Oklahoma, satisfactory industrial supplies from alluvium can not be expected west of the 98th meridian.

Terrace deposits are alluvium deposited at older and higher stages of rivers that have since cut their channels deeper, and developed new flood plains. Generally, they are of relatively high permeability, absorb direct rainfall and runoff from adjacent uplands, and produce ample supplies of good quality for such cities as Enid, Alva, Woodward, Mangum, and Frederick.

The High Plains of the Panhandle overlie sand and gravel containing large quantities of water. The abundant supply of ground water for domestic and stock use has made possible the settlement and continued occupancy of this area.

Certain consolidated rock formations contain water under artesian conditions and water will rise in a well which taps the formation. There are five principal artesian ground-water provinces: (a) limestones of the Wichita, Arbuckle, and Ozark Mountains areas, (b) Nelagoney-Vamoosa formation, extending from Osage County to southern Seminole County, (c) Garber sandstone of Oklahoma and Cleveland Counties, and slightly higher sandstones of the Clear Fork-Wichita formation in western Carter and Stephens Counties, (d) Rush Springs (upper Whitehorse) sandstone of west-central Oklahoma, and (e) Trinity formation of southeastern Oklahoma.

Surface-water supplies. Many cities and industries in Oklahoma depend on streams and reservoirs for their supplies. In western Oklahoma, surface supplies are inadequate for industry, except where steps have been taken to impound flood flow. Streams that perennially have sufficient flow at low stage to furnish large supplies are few, and located mainly in the eastern fourth of the state.

The Ouachita-Mountains region of southeastern Oklahoma has the highest rainfall, is largely forest-covered, and therefore the streams are least subject to wide fluctuations. In addition, the region is underlain almost entirely with sandstone and shale, hence the waters are very low in dissolved solids, and notably soft.

The over-all picture of Oklahoma's surface-water resources for industry is not a brilliant one. However, it is by no means hopeless, for adequate supplies can be provided in many areas by the construction of dams for impounding runoff, and the flow of smaller, spring-fed streams.