EMERGENCY GROUND-WATER SUPPLIES IN THE SEATTLE-TACOMA URBAN COMPLEX AND ADJACENT AREAS, WASHINGTON

BY
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INTRODUCTION

Urban areas that are supplied from surface-water sources are especially vulnerable to major disruption of their water supplies. Such disruption could result from natural disasters such as earthquakes, floods, or landslides, or from such other causes as dam failures, fallout of radioactive material or other toxic substances from the atmosphere, or direct introduction (either accidental or deliberate) of any substance that would render the water unfit for use. Prolonged disruption of public water supplies not only causes personal hardships, but also endangers health and safety unless suitable alternative emergency supplies can be provided. The degree of hardship and danger generally increases in direct relation to the population density.

Ground water, because it occurs beneath protective soil and rock materials, is less subject to sudden, major contamination than are surface-water bodies. For this reason, and also because of its widespread availability in the Puget Sound region, ground water is especially desirable as a source of emergency supplies for drinking or other uses requiring water of good quality. In much of the area, existing wells would be suitable as safe sources of emergency supplies.

DISTRIBUTION OF WELLS IN AREA

The accompanying map shows the locations of wells in the area that have produced moderate to large yields of water (100 gallons per minute or more), and parts of the area (shown by pattern) in which wells yielding appreciable amounts of water are generally no more than 1 mile apart. The well data were obtained mostly during several detailed studies of geology and ground-water resources, conducted by the U.S. Geological Survey in cooperation with the State of Washington Department of Water Resources (now in the Department of Ecology).

The wells represented here range widely in their value as sources of emergency supplies. The representation of an individual well does not necessarily assure that the water it yields is of good quality, although few cases of contaminated well waters are known. Some existing wells that seemed to be especially vulnerable to contamination (such as shallow dug wells) were not included in this compilation.

Furthermore, the availability and distribution of wells suitable as emergency water sources are constantly changing. New wells are being constructed every day and some are in areas where no wells existed previously. Similarly, older wells are being abandoned and destroyed, especially in areas where community water-supply systems become established, and where urbanization displaces farms that were irrigated with well water.

ELECTRICAL-POWER CONSIDERATIONS

The nature of the emergency conditions, especially the availability or lack of electrical power for existing well pumps, also would determine the usefulness of the wells as emergency sources. Nearly all the regular well pumps are powered by electricity, and these, of course, would be unavailable for use during a failure of electrical power unless mobile generators could be moved in. In a dire emergency, many of the smaller pumps could be removed and water sufficient to sustain life could be bailed from the wells. The wells that would be especially useful as emergency sources where power is unavailable are the flowing artesian wells. The locations of flowing wells in this region, derived from a statewide compilation of such wells (Molenaar, 1961), are shown on the accompanying map.

The most reliable sources of emergency water supplies, of course, would be the existing ground-water-supply systems that already have auxiliary power supplies for the well pumps. Some of the water-supply districts that are thus equipped, especially those that also have their storage reservoirs placed underground, could supply water under many emergency conditions even for prolonged periods. The advantage of an all-ground-water system in urban environments under emergency conditions was forcefully illustrated in New York State during the drought of the 1960's. While major metropolitan areas that depended upon water in the dwindling streams were under severe water-use restrictions, the areas of Long Island that were supplied with well water avoided practically all such restrictions.

The information presented here is designed to provide broad guidance to the availability of ground water for future emergency supplies. For example, the array of wells shown here, when compared with present or expected distributions of population and (or) water-supply pipelines, might suggest a network of existing wells that could be designated and prepared to yield emergency water supplies for the urban areas. Similarly, the locations of the large-yield wells indicate, indirectly, areas where productive aquifers are present. Of course, the large-yield wells would be the most desirable to protect and keep available for emergency use as intensive urbanization proceeds.

NEED FOR ADDITIONAL STUDIES

More detailed and updated information will be needed for actual design of emergency-supply systems. Much of the detailed data on well locations, ownerships, and construction features can be found in reports of ground-water studies in this region. (See selected references.) However, because the records of some wells date back to the 1940's and may pertain to wells that no longer exist, a recanvass of the wells would be needed to provide adequate design information in virtually any part of the area for which an emergency-well network was planned. Included in such field examination should be: (1) the plotting of precise well locations on modern, large-scale maps; (2) evaluation of the sanitary condition, accessibility, pumping equipment, and permanence of each well; and (3) collection and analyses of water samples from the selected wells.

In the case of existing water-supply systems that utilize wells, the entire system, including fire hydrants and outside faucets, should be evaluated as a possible emergency source. For the ground-water-supply systems that have high rates of yield, emergency intertie systems between adjacent water systems would be desirable.

A network of carefully chosen private wells, adequately equipped for emergency use, might be a much more satisfactory method for providing safe supplies of drinking water in this region than the alternative method of storing canned emergency water in a few central repositories.

SELECTED REFERENCES

Liesch, B. A., Price, C. E., and Walters, K. L., 1963, Geology and ground-water resources of northwestern King County, Washington: Washington Dept. Conserv. Water Supply Bull. 20, 241 p.

Luzier, J. E., 1969, Geology and ground-water resources of southwestern King County, Washington: Washington Dept. Water Resources Water-Supply Bull. 28, 260 p.

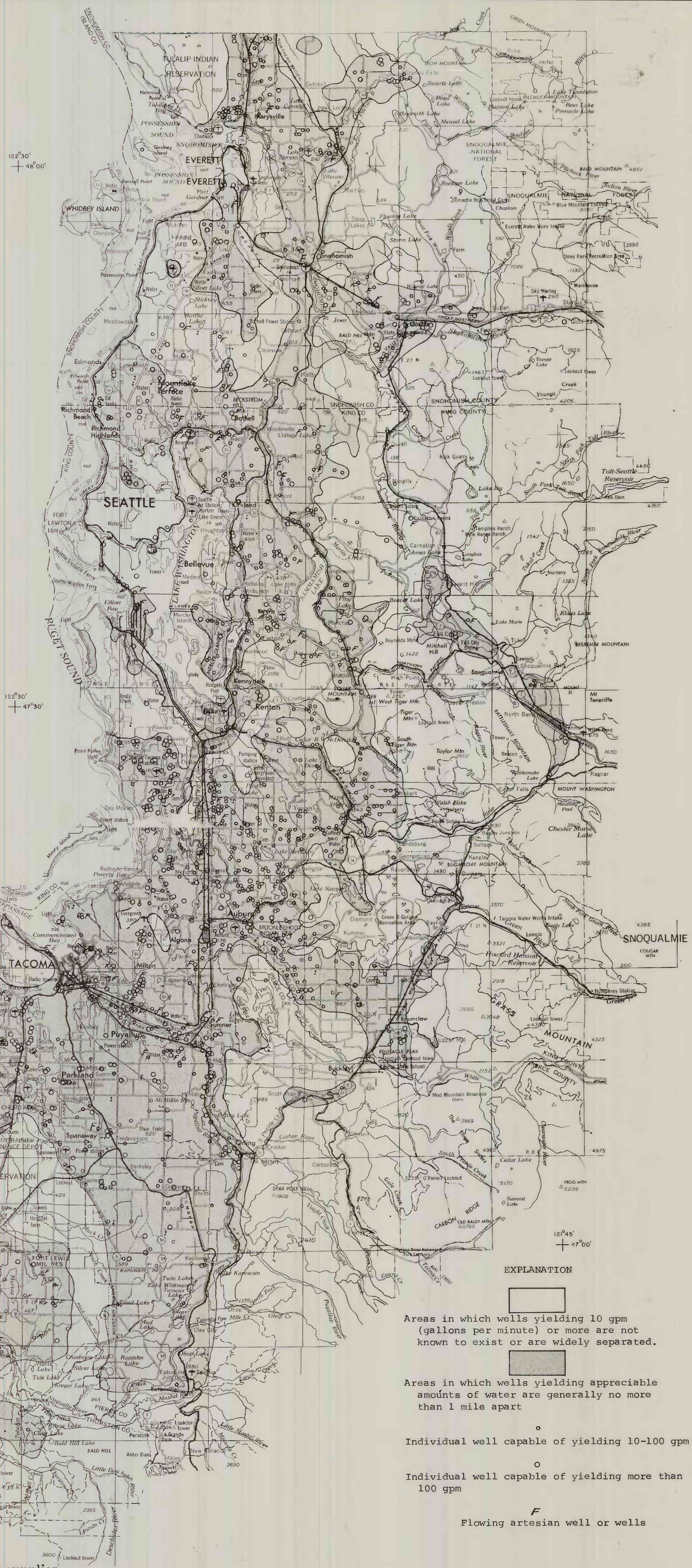
Molenaar, Dee, 1961, Flowing artesian wells in Washington State: Washington Dept. Conserv. Water Supply Bull. 16, 115 p.

Mundorff, M. J., Weigle, J. M., and Holmberg, G. D., 1955, Ground water in the Yelm area, Thurston and Pierce Counties, Washington: U.S. Geol. Survey Circ. 356, 58 p.

Newcomb, R. C., 1952, Ground-water resources of Snohomish County, Washington: U.S. Geol. Survey Water-Supply Paper 1135, 133 p.

Wallace, E. F., and Molenaar, Dee, 1961, Geology and ground-water resources of Thurston County, Washington: Washington Dept. Conserv. Water Supply Bull. 10, v. 1, 542 p.

Walters, K. L., and Kimmel, G. E., 1968, Ground-water occurrence and stratigraphy of unconsolidated deposits, central Pierce County, Washington: Washington Dept. Water Resources Water Supply Bull. 22, 428 p.



Distribution of wells that may be usable for emergency supplies.

Base map from parts of Victoria-66, Concrete-62, Seattle-65, Wenatchee-63, Hoquiam-58, Yakima-63, at 1:250,000

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