achieve this by conventional electrodialysis would be prohibitively costly. The answer appears to be in operating secondary biological treatment under nitrifying conditions so that NH_4^+ is almost completely converted to NO_3^-. For simple discharge to stream when nutrients are a pollution problem, the nitrate levels present may be undesirable, but for reuse as a municipal, industrial, or agricultural supply, the NO_3^- concentration is not of concern in most cases.

Capital costs for electrodialysis equipment should be less than $.15/daily gallon capacity at 10-20 mgd and under $.11/daily gallon capacity at 100 mgd. Unless serious unforeseen difficulties are encountered in pilot-scale tests, total operating costs should not exceed $.15/1,000 gallons at 10-20 mgd and should be about $.10/1,000 gallons at 100 mgd.

The type of water renovation sequence described above, while not yet in any full-scale application, is undergoing pilot study and, with proper safeguards and conservatism in design, represents an existing technology within our present capability. On September 8, 1965, Dr. Donald F. Hornig, the President's Special Assistant for Science and Technology, testified before the Senate Interior and Insular Affairs Committee and stated that:

> At my request, the Department of Health, Education, and Welfare has just completed a feasibility analysis of a 100-mgd waste water purification plant which could be added to a secondary sewage treatment plant of the kind now used in New York City and northern New Jersey. Their report indicates that such a plant could be built for $33 million and would produce potable water at a cost of about 16¢ per 1,000 gallons. The Department of Health, Education, and Welfare has had a modest research program in waste water purification underway and the plant they considered would use the best proven, presently available technology. Almost certainly these costs could be reduced still further through a R & D program. The suggested plant employs aeration, chemical coagulation and sedimentation, carbon adsorption and chlorination to purify the effluent from a secondary sewage treatment plant. If the product water is mixed with water from other sources in a large system no further treatment is necessary. For a completely closed system in which all water is recycled a buildup of salinity would occur and a desalting unit would be needed. Because of the very low salt content, electrodialysis could be used and the additional cost would be only a few cents per 1,000 gallons depending on the amount of salts to be removed. The costs quoted above include cost of land, treatment, and pumping costs to return the water to the distribution system.

Direct delivery of purified waste water to a city distribution system is possible and can be completely safe. If it is too unattractive aesthetically, the purified waste water can be used for recreational and decorative lakes, watering parks and golf courses, industrial processes, or can be recharged to the groundwater. It must be noted, however, that there is very little practical difference between purification and direct reuse of waste water and the present widespread practice of discharging of wastes to a river from which a downstream city takes its water supply.

Water Renovation—Tomorrow's Promise

Only a year or so ago, the plan Dr. Hornig referred to could not have been offered. Today it can be proposed with confidence. Even with its realization,