

many cities to construct elaborate and costly plants for the treatment and purification of domestic and industrial sewage wastes. Where untreated wastes are an integral part of storm water, as in the case of wastes carried through systems of combined sewers, it becomes economically prohibitive to expend the large sums of capital required for the construction of treatment plants of the capacities needed to satisfactorily treat the total flows. In such cases, operating costs would also be extremely high. As a consequence, treatment plants serving areas with combined sewers have almost invariably been constructed of a capacity adequate to treat the sanitary waste and a fraction of the runoff only. During periods when main sewers are carrying flows greater than treatment capacity, combined sewers divert the excess flow into drainage canals, lakes, or natural bodies of water. This flow carries untreated domestic and industrial wastes into our lakes and streams, and often pollutes one of our most precious resources.

Although a few areas continue to construct combined sewers, many urban areas, and most suburban areas, have ceased constructing such sewers, and some areas have begun a program of converting combined sewers into separate systems. Complete conversion is very costly. The District of Columbia began its program of separation in 1954, with plans for completion by the year 2000. The cost for complete separation is estimated to be \$300 million. A major research program to determine the feasibility of a rational method of separation of combined sewer systems or at least to minimize pollution from such systems, was commenced in the year 1966. It is hoped that methods will be developed, through research efforts, which will make separation feasible from an economic standpoint. The city of Chicago does not have plans at present for a sewer separation program. It has been estimated that the total cost of such a program in Chicago alone would total \$2.3 billion. A remedial plan being studied for Chicago, which appears less costly and which should surpass separation insofar as pollution abatement is concerned, involves the construction of huge tunnels carved in the limestone strata more than 700 feet below ground surface. During periods of overflow, the wastes from the combined sewers would be dropped through vertical spillways into these tunnels which constitute a large temporary detention reservoir. The wastes would later be pumped to the surface, treated at treatment plants, and/or chlorinated and upgraded in temporary retention ponds, and then released to the natural watercourses at controlled rates. Such a system would prevent pollution of water bodies and would eliminate the excessive damages and inconveniences being suffered by citizens during periods of heavy precipitation.

One of the economies being effected in suburban residential areas and parkways results from the construction of open, paved channels, in lieu of underground conduits. Such open channels result in the loss of otherwise usable ground surface, are sometimes hazardous, and are sometimes aesthetically undesirable; they do, however, perform adequately when properly incorporated into a separate storm sewer system. Open channels are frequently improved or constructed through urban areas to serve as major collectors of runoff, and also waters containing a portion of the area's untreated wastes during periods of rainfall. The contamination of receiving waters, from the latter case, is objectionable. In other areas, such major channels carry only runoff, and are usually acceptable.