BALTIMORE COUNTY MASTER PLAN 1979 - 1990

BALTIMORE COUNTY MARYLAND

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BALTIMORE COUNTY MASTER PLAN

PUBLIC FACILITIES PLAN

PART II. UTILITIES

November 19, 1979

This volume is one of six that were adopted by resolution by the Baltimore County Council November 19, 1979, as the Baltimore County Master Plan . The text of the County Council Resolution adopting the Plan, Resolution No. 71-79, is set out on the following pages.

The six volumes that were adopted as the Baltimore County Master Plan are entitled:

THE PHYSICAL DEVELOPMENT PLAN: PART I LAND USE ELEMENT

THE PHYSICAL DEVELOPMENT PLAN: PART II TRANSPORTATION ELEMENT

THE HOUSING AND COMMUNITY PRESERVATION PLAN

THE PUBLIC FACILITIES PLAN: PART I COMMUNITY SERVICES

THE PUBLIC FACILITIES PLAN: PART II UTILITIES

THE OPEN SPACE AND RECREATION PLAN

COUNTY COUNCIL OF BALTIMORE COUNTY, MARYLAND

Legislative Session 1979, Legislative Day No. 22

RESOLUTION NO. 71-79

Mr. Norman W. Lauenstein, Councilman

By the County Council, November 19, 1979

WHEREAS, by Article XI-A of the Maryland Constitution, the General Assembly is authorized to provide a grant of "express powers" to counties that form a charter government; and

WHEREAS, by Article 25A, Section 5 of the Annotated Code of Maryland, the General Assembly has designated the "express powers" to be granted to charter counties, which powers include the power to enact local laws for the protection and promotion of public health, safety and welfare, relating to planning, zoning and subdivision, and to pass all ordinances, resolutions or bylaws that may be necessary and proper to execute and enforce any of the powers expressly enumerated; and

WHEREAS, the people of Baltimore County in accordance with the Constitution and Laws of the State of Maryland have adopted, ordained and established the Baltimore County Charter; and

WHEREAS, pursuant to provisions of the Charter and of the County Code, the County is responsible for planning for the future growth and development of the County, including the preparation of a Master Plan; and

WHEREAS, pursuant to Section 523 of the Baltimore County Charter, the Master Plan shall be a composite of mapped and written proposals setting forth comprehensive objectives, policies and standards to serve as a guide for the development of the County; and

WHEREAS, the Charter provides that the Office of Planning and Zoning prepare and revise a Master Plan at least every ten years, the previous such revision being accomplished in 1975; and

WHEREAS, pursuant to Section 523 of the Baltimore County Charter, the County Council has the responsibility to accept or modify, and then adopt by resolution, a Master Plan which it receives from the Office of Planning and Zoning; and

WHEREAS, the County Council has caused to be prepared by consultants and staff, at great expense to the taxpayers of Baltimore County, a comprehensive growth management planning study which has been accomplished over the past three years; and

WHEREAS, the elements of said planning study together comprise a Master Plan, containing objectives, policies and standards, and a composite of mapped and written proposals serving as a guide for the physical development of the County; and

WHEREAS, the Planning Board of Baltimore County has held public hearings on the Master Plan and on the elements thereof and has recommended the adoption of certain elements of that Plan; and

WHEREAS, the Office of Planning and Zoning has submitted to the County Council a Master Plan, entitled "Recommended Baltimore County Master Plan 1979-1995", with accompanying map entitled "Baltimore County Master Plan Land Use Plan"; and

WHEREAS, the County Council has held a public hearing on the Master Plan on September 11, 1979.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNTY COUNCIL OF BALTIMORE COUNTY, MARYLAND, that the Master Plan submitted by the Office of Planning and Zoning and adopted by the Baltimore County Planning Board, including mapped and written proposals, are hereby amended and modified, and as so amended and modified, are hereby adopted and declared to incorporate and be comprised of the following written and mapped components, which will serve as a guide for the development of the County, and which may be subject to such further modifications as deemed advisable by the Baltimore County Council:

"Baltimore County Master Plan 1979-1990" Written Components, maps, errata and addendum thereto, as follows:

SECTION I

Baltimore County Growth Management Program Physical Development Plan, Part I, Land Use Element.

SECTION II

Baltimore County Growth Management Program Physical Development Plan, Part II, Transportation Element.

SECTION III

Baltimore County Growth Management Program Housing and Community Preservation Plan.

SECTION IV

Baltimore County Growth Management Program Open Space and Recreation Plan.

SECTION V

Baltimore County Growth Management Program Public Facilities Plan, Part I, Community Services.

SECTION VI

Baltimore County Growth Management Program Public Facilities Plan, Part II, Utilities.

BE IT FURTHER RESOLVED, that, using the Baltimore County Master Plan 1979-1990 herein adopted as a guide, the County Council intends to proceed with development of an overall growth management program for the implementation of the Master Plan, said program to include revised zoning maps, zoning rules and regulations, subdivision rules and regulations, a capital improvements program, community plans, including but not limited to Owings Mills and Whitemarsh, and such other legislation, regulations, policies and programs as may be necessary;

BE IT FURTHER RESOLVED, that until said overall growth management program and implementation measures can be adopted, the Office of Planning and Zoning, the Baltimore County Council and all other departments, agencies and officials of the County, in the exercise of any powers, authority, duties or responsibilities related to actions impacting on land use, growth or development, including planning, zoning and subdivision activities, in the County, shall consider the objectives, policies and standards of the Master Plan.

BE IT FURTHER RESOLVED, that all programs and construction projects initiated by the County be in concert with or further the goals and objectives stated in the Master Plan adopted in this resolution, and further that the Director of the Office of Planning and Zoning make such an evaluation of each and every such project and program and forward said evaluation to the County Executive and the County Council for their consideration.

BE IT FURTHER RESOLVED, that supplementary to and in conformity with the Master Plan, the agencies of Baltimore County engage in an ongoing process which includes water, sewer, and solid waste management planning, management of the coastal zone of Baltimore County, designation of areas of critical state concern, specific area plans, and plans devoted to capital improvements and other facilities. It is intended that such plans, upon enactment by the County Council and as amended from time to time shall be incorporated in the Master Plan by reference.

BE IT FURTHER RESOLVED, that the County Council intends to approve a land use map to be part of the Master Plan concurrently with the adoption of the 1980 Comprehensive Zoning maps.

BE IT FURTHER RESOLVED, that the Planning Board forward to the Council, upon completion of the elements governing growth in each of the Growth Areas, a recommendation on the method of ensuring that all development actions made by the public and private sectors are in conformance with the master plan goals, objectives and elements as adopted by the County Council.

AND BE IT FURTHER RESOLVED, that previous Master Plans adopted by the Planning Board and/or the County Council are rescinded to the extent that they are inconsistent with the Baltimore County Master Plan 1979-1990.

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SECTION I

INTRODUCTION

SCOPE

The purpose of this document is to provide a basis for evaluation of the Consensus Growth Management Plan, in terms of the requirements that the implementation of this plan would place on the water, sewer, stormwater and solid waste management services systems of Baltimore County. The Consensus Plan is described in Technical Memorandum No. 26, and the impact of this plan on land use, transportation systems, community facilities and services, recreation and open space, and housing are detailed in the respective components of the Draft Growth Management Plan. The reader is referred to these documents for detailed information.

The services considered herein are water supply, sewerage service, stormwater management, and solid waste management. The primary focus of this document is directed to the analysis of the impacts of the Consensus Plan on the available and required capacities of these services, and, insofar as possible, on the costs to provide the additional capacities of each service as necessary to support the plan. A comprehensive engineering analysis of each of the utility systems will ultimately be necessary for a complete assessment of the impacts of the Consensus Plan on these utility systems. This comprehensive analysis will take place in the updating of the 10-year Comprehensive Water and Sewer Plan and the Solid Waste Management Plan, a continuous process in each case. Because detailed studies with the Water Analyzer Office and Sewer Analyzer Office models (discussed below) will be required by virtue of the population distribution patterns proposed in the final Growth Management Plan, several years will be required before the comprehensive analysis of total system impacts is complete.

This document represents a very preliminary overview of the impact of the Consensus Plan on water, sewerage, storm drainage and solid waste management services in Baltimore County. For the reader to better understand why this analysis cannot be more definitive, he or she should be aware of the following factors:

(1) Water Supply: The current procedure for in-depth assessment of the impact of growth in the County is for the Water Analyzer Office to utilize the sophisticated digital computer models they have developed and used over the past nine years. The Water Analyzer Model is an operative tool which is built around the delivery capacities of the existing water system, and is designed to support preliminary engineering studies of proposed system modifications. However, the Water Analyzer Model is not structured as a planning tool, i.e. as an interactive tool allowing rapid inquiry and turnaround on proposed modifications. Once the Master Plan has been accepted and implemented as the Comprehensive Plan of the County, the Water Analyzer Office will undertake the "pipeline-by-pipeline" analysis of proposed system modifications, as mentioned above. In comparison, the analysis presented herein is intended to provide an overview of the system modifications that will be needed on the water pressure-zone level.

(2) Sewerage Service: Baltimore County is presently in the process of establishing a Sewer Analyzer Office, analogous to its water supply counterpart. This office has also developed a digital computer model, the Sewer Analyzer Model, which is also an operative tool around the carrying capacity of the system. Like the Water Analyzer Model, it is not an interactive planning model. There are two factors that affect the utility of this model in the present analysis: the model is currently undergoing calibration against water usage records to improve its accuracy; and as noted earlier the Sewer Analyzer Office will also undertake an in-depth engineering evaluation of proposed system modification after acceptance and implementation of the Master Plan. These two factors contributed to the decision that it would be inappropriate to use this model again in the present analysis; instead, an overview of proposed system modifications has been provided on the subsewershed level, using where available the prior data developed with this model from earlier runs by PRC Toups Corporation and by the 208 Study Team.

(3) Stormwater Management: The County is currently engaged in the development of a comprehensive stormwater management policy and the requisite data base to support that policy. Because the technical data base does not yet exist, it was not possible to quantify the effects of the development patterns proposed in the Master Plan on the hydrologic regime. Instead, the focus of the present analysis was on the development of the comprehensive stormwater management policy and the types of analytical tools needed to implement this policy. An estimate of the expected future costs of policy and data base development have been provided, insofar as the available information allows.

(4) Solid Waste Management: Because the time frame for the analysis was the years of 1985 and 1995*, the framework used was that contained in the proposed amendments to the 10-year Solid Waste Management Plan. It was assumed that the essential facilities designated in this plan (i.e.,the transfer stations, reclamation facilities and landfills) would be operational within the time frame specified in these amendments (i.e., by or before 1985), and the analysis was structured to determine the impact of the Master Plan on landfill area requirements.

ACKNOWLEDGEMENTS

The assistance of the following individuals in the conduct of this analysis is gratefully acknowledged: Messrs. Jack Pearson, Don Schuler, Dorwin Grise, Charles Farley, and Steve Lippy (Department of Public Works, Baltimore County).

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

SECTION 2

WATER SUPPLY

INTRODUCTION

The purpose of this analysis is to provide an overview of the expected impact of the Master Plan upon the water supply system. As noted in Section 1, a detailed "pipeline-by-pipeline" analysis of the water system was not attempted, as such an analysis will be the responsibility of the Water Analyzer Office, once the Master Plan is adopted and implemented.

The key issues of water supply service with respect to the Master Plan are: can sufficient raw water supplies be obtained to support the projected increases in population over the planning period, and can the distribution system provide adequate water to those areas in which future populations are projected to be located? The analysis presented herein has focused on this first issue, as a detailed answer to the second question will be provided by the Water Analyzer Office as a result of their in-depth evaluation. However, this report does address this issue, albeit on a macroscopic level.

EXISTING SYSTEM

A detailed explanation of the existing water supply system has been presented in Reference 2-1; however, a brief summary is included herein to provide a framework for the subsequent discussion of the impact of the Master Plan.

Raw Water Supplies

There are three sources of raw water supply to the Baltimore water system, the Gunpowder Falls, the North Branch of the Patapsco River and the Susquehanna River.

There are two dams located on the Gunpowder River, the first at Loch Raven with a capacity of 23.5 billion gallons and a drainage area of 303 square miles; and the second at the mouth of Prettyboy Creek with a storage of 19.6 billion gallons and a drainage area of 80 square miles. Under normal operating conditions water flows by gravity from Loch Raven Reservoir to the Montebello Filtration Plant. When the water level in Loch Raven Reservoir drops about ten feet below the crest of the dam, water is released from Prettyboy Reservoir to maintain a predetermined water level in Loch Raven Reservoir.

The North Branch of the Patapsco River lies west and northwest of Baltimore, with a drainage area of 164 square miles at the concrete gravity Liberty Dam, which is located near Falls Run. It has a storage capacity of 43 billion gallons; water from the Liberty Reservoir flows by gravity to the Ashburton Filtration Plant.

The Susquehanna River system includes the Conowingo Dam intake, the Deer Creek Pumping Station, a 12-foot diameter tunnel and pipeline which connects these two structures, a 9-foot diameter pipeline extending to the proposed Fullerton Reservoir and Filtration Plant, and another 8-foot diameter pipeline connecting this point to the Montbello Filtration Plant. The amount of raw water that can be taken from the river is limited by an agreement between Baltimore and the Philadelphia Electric Company, which limits the withdrawal of water from the Susquehanna River to 100 cfs (64 mgd) when the streamflow is less than 5,000 cfs. The Susquehanna supply is not used unless the water levels of the reservoirs on the Gunpowder and Patapsco Rivers drop below predetermined elevations.

The adequacy of raw water sources to provide sufficient supply is clearly dependent upon the amount of rainfall in the watersheds of the supply sources. For this reason, water supply planning is based upon the concept of source safe yield, which is defined as the maximum quantity of water which can be guaranteed during drought conditions. The safe yields of the three water supply sources serving Baltimore County totals 307 mgd, of which 148 mgd is derived from Loch Raven - Prettyboy system, 95 mgd from the Liberty Reservoir, and 64 mgd from the Susquehanna. However, this calculation of safe yield is subject to the following considerations:

1. Carroll County presently withdraws 3 mgd from Liberty Reservoir, and is seeking State authorization to withdraw up to 15 mgd.

2. The safe yield of the Liberty reservoir is limited to 82 mgd without the use of low-lift pumps at the Ashburton Filtration plant, which ensure supply when the water level of the reservoir falls below the level needed to sustain gravity flow to the Ashburton plant.

3. Harford County has State authority to withdraw up to 10 mgd from the Susquehanna River supply line.

4. Existing agreements would provide 98 mgd for Howard and Anne Arundel Counties.

When these factors are taken into account, the actual safe yields of the raw water sources is 284 mgd, which is only 6 mgd more than the 1978 raw water demand of 278 mgd (Reference 2-2). It should be remembered, however, that safe yield determinations are based on extreme weather conditions (i.e. drought conditions) and not on normal weather conditions. The importance of planning water supply systems on drought conditions is based on the fact that droughts are "non-events", that is, the lack of a rainfall event delays public perception of the existence of a drought until it is well underway.

<u>Filtration</u>

Water drawn from the three rivers is filtered before it reaches the public. Gunpowder and Susquehanna water is treated at the Montebello Filtration plant, while Patapsco water is treated at the Ashburton Filtration Plant. There are two complete filter plants at Montebello. The first plant was built in 1915, has 34 filter units and a capacity of 128 mgd. The second plant was constructed in 1928, has 28 filter units and a capacity of 112 mgd.

The Ashburton Filtration Plant was erected in 1956, has 20 filter units and an average daily capacity of 120 mgd. These capacity figures are average flow capacities; for short periods, a filtration plant can operate at a capacity as much as 50% greater than its average flow capacity, thus the theoretical maximum filtration capacity of the two plants is 540 mgd.

Distribution

The Baltimore water distribution system is divided into service zones. Each zone is designed to meet limiting ground elevations in a particular area of the distribution system. Ground elevations vary from sea level to 700 feet, and in effect, the service zones are stepping stones in an uphill pathway from the City to the County wherein pump stations are used to "walk" the water up the path. In the first and second zones are located the major (central system) elements of the water system essential to the treatment of raw water and transfer of finished water into the storage facilities at each service zone in the system.

Under the present operating system, the Montebello Filtration Plants supply water to the First Zone by gravity, and to the Second and Third Zones by pumping. The Ashburton Filtration Plant supplies water to the Second Zone by gravity, and to the Third, Fourth and Fifth Zones by pumping. The First and Second Zones contain about 45 percent of the land in the distribution system, with consumption in those zones of about 67 percent of the filtered water supply. Most of the heavy industry within the Baltimore Metropolitan region is located in the First Zone.

The Second Zone supplies water to considerable commercial and light industrial development. Both the First and Second Zones, however, supply water to large residential developments within their limits. The Third, Fourth and Fifth Zones contain the remaining 55 percent of the land in the distribution system, with consumption in those zones of about 33 percent of the filtered water supply. The consumers in these zones are predominantly residential in nature with some mercantile interest present.

Pumping and Storage Facilities

There are 15 filtered water pumping stations in active use in the water system. The total safe capacity of the pumping stations is approximately 363 mgd with one large pump on standby at each station. All but three pumping stations (Vernon, Washington Boulevard, and Broening Park) are operated by automatic telemetered control from Ashburton Filtration Plant; it is anticipated that the Washington Boulevard and Broening Park pumping stations will be phased out, and the Vernon Pumping Station will be soon automated.

Areas in the City are supplied with water by six pumping stations; Vernon, Ashburton, and Guilford pumping stations which are located in the City; and Colgate, Towson, and Cromwell pumping stations which are located in Baltimore County. The safe capacity of the pumping stations serving the City is roughly 252 mgd. Also located in the City, but seldom used, is the Washington Boulevard Pumping Station. Its purpose is to pump water from the First Zone to the Second Zone and currently operates on standby.

Approximately 546 mg of water is stored in filtered water reservoirs, open ground reservoirs and elevated storage tanks. More than 491 mg is concentrated in the First and Second Zones where the storage reservoirs are filled by gravity from the filtration plants. During periods when the demand for water exceeds the filtration rate, the storage reservoirs feed into the system to augment the flow from the filtered water reservoirs. When the filtration rate exceeds the demand, the storage reservoirs refill. This system functions only in the First and Second Zones.

Storage facilities located in the City include Montebello filtered water storage reservoirs, Druid Lake, Lake Asbhurton, Guilford Reservoir and the Curtis Bay Tank. The Pikesville and Towson reservoirs and the Colgate tank are located in Baltimore County but serve both the City and the County. The combined capacity of these facilities is 532.0 mg.

FUTURE WATER SUPPLY NEEDS

Population projections for the County Master Plan were converted to projected future water demands and allocated to the various water pressure zones based on area and land use consideration. By 1985, it is estimated that there will be an additional water demand of 23.7 mgd; and by 1995*, an additional demand of 26.5 mgd. Thus, through 1995, an additional water supply demand of 50.2 mgd could occur. A breakdown of expected demands by pressure zone is provided in Table 2-1, from which it can be noted that the greatest increase in demand by 1985 is in the Eastern Third Zone, which corresponds to the Whitemarsh New Development Area.

It is clear that the increase in demand by 1985 exceeds the available system safe yield reserve of 6 mgd. The installation of low-lift pumps at the Ashburton Filtration Plant will enable the system to utilize the entire 92 mgd safe yield from the Liberty Reservoir, assuming that Carroll County is restricted to the present 3 mgd withdrawal. This would increase the reserve safe yield capacity to 16 mgd, however, this still leaves a deficit safe yield situation of 7.7 mgd by 1985, and 34.2 mgd by 1995.*

There are three options available to the County for increasing the total safe yield available to the system. In order of decreasing priority, they are: renegotiate the Susquehanna low-flow agreement, utilize groundwater supplies in the northern and southeastern portions of the County, or construct another surface water reservoir in the County.

*It should be noted that the Plan period extends only through 1990. Projections through 1995 are presented as a reference point for monitoring.

TABLE 2-1

PROJECTED FUTURE ANNUAL AVERAGE WATER DEMANDS

(million gallons per day)

Pressure Zone	1978 Demand[1]	1985 Demand Incremental	1985 Demand Total	1995 Demand* Incremental	1995 Demand* Total
First	123.24	3.64	126.88	2.82	129.7
Second	62.99	3.12	66.11	3.85	66.96
Colgate Second	0.53	0.03	0.56	0.03	0.59
Eastern Third	23.16	4.92	28.08	4.14	32.22
Western Third	39.8	0.88	40.68	1.0	41.68
Catonsville Fourth	4.62	1.35	5.97	2.65	8.62
Towson Fourth	13.10	3.66	16.76	2.65	19.41
Pikesville Fourth[2]	7.67	3.32	11.0	5.50	16.5
Reisterstown Fifth	1.86	1.52	3.38	2.68	6.1
Falls Fifth	-	0.25	0.25	0.30	0.55
Sparks Fifth	-	0.33	0.33	0.33	0.66
Sherwood Fifth	-	0.45	0.45	0.52	0.97
Pot Springs Fifth	1.01	0.23	1.24	0.07	1.31
Total	278.0	23.7	301.7	26.5	328.2

Notes: 1. 1978 demand figures are based on Reference 2-3, adjusted upward proportionately based on the 1978 estimated annual average demand of 278 mgd.

2. Includes the Harrisonville Fifth zone.

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

The most feasible solution would be to renegotiate the Susquehanna River agreement, a process which has been underway since 1976. The present transmission system linking the Susquehanna River supply to the central water system is sized to handle 250 mgd (with improvements to the Deer Creek Pumping Station). A revised agreement, which would allow the City to withdraw 250 mgd at any time, regardless of streamflow, is currently awaiting approval of the Maryland Department of Natural Resources.

Utilization of groundwater reserves can be considered infeasible for several reasons. Groundwater yields in the northern section of the County are limited in both sustainable yield and areal extent. In addition, these supplies will be needed to serve the rural and agricultural growth areas projected in this section of the County. Groundwater yields from the Coastal Plain sediments south of U.S. Route 40 vary from 100 to 2,160 gallons per minute (Reference 2-4). These supplies are currently tapped by several industrial users in this area; in addition, extensive withdrawals of groundwater from these areas could exacerbate saline water intrusion problems and jeopardize the availability of groundwater supplies on the eastern side of the Chesapeake Bay.

Construction of an additional water supply reservoir can also be considered infeasible due to a paucity of candidate sites, increasing public resistance to such impoundments, and the increasing cost of development. A 1969 Hazen and Sawyer study (Reference 2-5) recommended the construction of Darlington Reservoir on Deer Creek. However, at that time, the estimated cost of construction was $35 million. The cost would be considerably higher if the impoundment were to be constructed today.

Water system improvements to support Master Plan growth will be needed in the central system and in several of the water pressure zones, although many of the necessary major facilities needed for the future already exist. The major problem to be overcome in the future is the transfer of good quality water from the sources in the east to the increased demand anticipated in the western portion of the system. The safe capacities of the Gunpowder and Patapsco supplies are presently being utilized to supply the present consumption of the system.

The Susquehanna supply should be utilized for the volume differential between present and future consumption. Past efforts in the use of Susquehanna water caused quality problems in the distribution system during the drought in 1966-67. The problem was caused by the sulphate and hardness levels in the Susquehanna water during low flow periods. The levels were considerably higher than the customers in the present system were accustomed to. The harder water causes more boiler blowdowns and the need for increased use of detergents. The higher sulphates caused red water complaints which occurred from the interaction of the water with unlined distribution mains (Reference 2-5).

Utilization of the Susquehanna supply will necessitate several major improvements to the central system. The largest project will be the construction of the 130 mgd Fullerton Filtration plant to treat the Susquehanna water. The water quality problems associated with the Susquehanna supply will require special design considerations in the filtration plant, which will increase the cost. Table 2-2 is a listing of the proposed central system improvements needed by 1995* to utilize the Susquehanna supply and to optimize the hydraulic efficiency of the central system.

Early in the design period, the Susquehanna water can be blended with Gunpowder water at the Montebello Filtration Plant. The blending, however, would produce a higher sulfate level in the system. However, the level of sulfates can be controlled by the blending ratio. Assuming a 3 to 1 blending ratio at the Montebello facility for the five months a year that Susquehanna water is expected to have a high sulphate content during a drought, the safe supply should not be exceeded until 1991.* Additional pumps at Deer Creek Pumping Station should extend the period that blending should be sufficient. However, by the design year, a blending ratio of approximately 1 to 1 may be necessary at Montebello Filtration Plant. A study to determine the optimum blending ratio and the blending limits will be undertaken in the near future. However, the Fullerton Filtration Plant will still have to be capable of sufficiently removing the sulphates. There is no economical means of blending water at the Fullerton site. If the removal is chemical, the process should also be incorporated at the Montebello site and operated during the high sulphate concentration periods.

If an inhibiting agent cannot effectively remove sulphates, and the State of Pennsylvania has not improved the quality of the Susquehanna River, a raw water reservoir will have to be constructed along the Susquehanna Transmission Main route. If the reservoir is not constructed at Darlington, then it will have to be built along one of the other streambeds, which could conflict with the policies of the State of Maryland Department of Natural Resources.

Possibly a superior method of operating the Baltimore Water System in the future would include the pumping of Susquehanna water to the Ashburton Filtration Plant. The advantages would be the increased blending combinations that may reduce future chemical costs; increased raw water supply to the Ashburton Filtration Plant, particularly if Carroll County is successful in the future through the State Legislature; reduction of average day usage of the facilities at Fullerton during drought periods before design year demands materialize; as a result, sizing of the Fullerton Filtration Plant would be based on a maximum day rather than average day plus firming condition (Maximum Day: 2/3 of 136.1 = 91 mgd, Average Day +Firming =130 mgd), and therefore, could be smaller; and the construction of the Fullerton Filtration Plant could be delayed until slightly later in the design period (estimated at 2002). The disadvantages would be the increased construction of pumping stations and pipelines that would be necessary. However, the savings in the cost of a smaller Fullerton Filtration Plant may offset the added costs. Raw Susquehanna water would have to be pumped from the Montebello Filtration Plants through the existing 84-inch Ashburton-Montebello Tunnel to Ashburton Filtration Plant. The transmission capability of the tunnel would have to be partially replaced in the Second Zone.

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

TABLE 2-2

CENTRAL WATER SYSTEM IMPROVEMENTS

Project Name	Description	Year Needed
1. Deer Creek Pumping Station	Two 50-mgd pumps	1991*
2. 130 MGD Fullerton Filtration Plant	Treatment of Susquehanna River Supply	1994*
3. Fullerton Reservoir	190 MG filtered water reservoir	1988
4. Fullerton Second Zone Pumping Station	Two 8-mgd pumps and one 4-mgd pump	1989
5. Fullerton Third Zone Pumping Station	Two 17-mgd pumps and two 8-mgd pumps	1988
6. Fullerton Transmission Main	11,500' of 102-inch main from Hazelwood Ave. to Fullerton Reservoir	1988
7. Northeast Transmission Main	14,500' of 84" main from Hazelwood Ave. to Herring Run Park	1981
8. Southeast Transmission Main	8,200' of 66" main from Northeast main at Hazelwood Ave. to Pulaski Highway	1981
9. Hillen Pumping Station	Two 39-mgd pumps and two 20-mgd pumps	1994*
10. Gwynns Falls Transmission Main, Section 1	1,500' of 66"; 1,900' of 72"; and 6,440' of 60" main from Hanlon Park to Gwynns Falls Park	1979
11. Gwynns Falls Transmission Main, Section 1A	3,530' of 66" main from existing Ashburton-Montebello tunnel to Section 1 of Gwynns Falls main	1984
12. Leakin Park Pumping Station	Two 41-mgd pumps and two 21-mgd pumps	1983
13. Catonsville Transmission Main Section 1-S	4,400' of 66" main from Hilton Pkwy to Wetheredsville Road	1983
14. Catonsville Transmission Main Section 2	5,240' of 54" main from Cooks Lane to Harlem Lane and U.S. Route 40	1985
15. Catonsville Reservoir	67.2 MG storage reservoir	1986
16. Ashburton Low-Lift Pumps	Four 60-mgd pumps	1981

Source: Reference 2-5

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management

The replacement would require installation of approximately 14,000 feet of 48-inch main from Vernon Pumping Station to the Gwynns Falls Transmission Main. Another 40 mgd pump would be installed at the Vernon Pumping Station, and the size of Hillen Pumping Station would be reduced by 40 mgd to 38 mgd. The future portion of Section 1 of the Gwynns Falls Transmission Main from Ashburton Filtration Plant to Lake Ashburton could be reduced from 66 inches to 60 inches in diameter.

In addition, a raw water pumping station would have to be constructed at the Montebello site. Since raw water quality would be a major factor in the usage of the station, it possibly should be equipped with two variable speed 50 mgd pumps. The pumping facility should pump water from the 96-inch Susquehanna Transmission Main into the 60-inch main at the vault to the 84-inch tunnel.

With raw Susquehanna water being pumped to the Ashburton Filtration Plant, the size of the future Fullerton Filtration Plant can be reduced from 130 mgd to 90 mgd. The reduction in the cost of the Fullerton facility should be nearly the same as the improvements that would be required to pump Susquehanna water to the Ashburton facility. However, a large degree of flexibility would be gained in the actual operation of the Baltimore Water System. Table 2-3 is a listing of the central system improvements that would be needed if this alternate method of central system operation were to be used (Reference 2-5).

Water system improvements needed in the various pressure zones have been identified in the Water and Sewerage Plan (Reference 2-6) based on previous work by the Water Analyzer Office. Because the annual growth in demand projected by the Water Analyzer Office (approximately 2.5 mgd per year) is similar to the demand growth projected by the GMP (approximately 2.2 mgd per year), it was assumed that the projects contained in the Water and Sewerage Plan would still be needed under Master Plan growth. Additional refinement of projected system improvements in the various pressure zones will be possible after an in-depth analysis by the Water Analyzer Office. Table 2-4 is a listing of the projected water system improvements by pressure zones. An estimate of the time at which these various improvements will be needed has been provided; however, only those projects needed prior to 1985 have been pinpointed to a specific year. The specific timing of projects needed after 1985 will have to be determined as a result of future Analyzer Office studies. Consequently, pressure zone improvements scheduled beyond 1985 have been indicated as needed sometime between 1985 and 1990. The Capital Improvement Program (Reference 2-7) has indicated several continuing water system improvement projects, such as: neighborhood extension petitions, water system construction at highway sites, miscellaneous repairs and replacements, and fire hydrant installations. It has been assumed that these projects will be continued through the GMP planning period.

TABLE 2-3

ALTERNATE CENTRAL WATER SYSTEM IMPROVEMENTS

	Project Name	Description	Year Needed
1.	Deer Creek Pumping Station	Two 50-mgd pumps	1991*
2.	90 MGD Fullerton Filtration	Treatment of Susquehanna River Supply	2002*
3.	Fullerton Reservoir	190 MG filtered water reservoir	1988
4.	Fullerton Second Zone Pumping Station	Two 8-mgd pumps and one 4-mgd pump	1989
5.	Fullerton Third Zone Pumping Station	Two 17-mgd pumps and two 8-mgd pumps	1988
6.	Fullerton Transmission Main	11,500' of 102-inch main from Hazelwood Ave. to Fullerton Reservoir	1988
7.	North Transmission Main	14,500' of 84" main from Hazelwood Ave. to Herring Run Park	1981
8.	Southeast Transmission Main	8,200' of 66" main from Northeast main at Hazelwood Ave. to Pulaski Highway	1981
9.	Hillen Pumping Station	Two 19-mgd pumps	1994*
10.	Gwynns Falls Transmission Main, Section 1	1,500' of 66"; 1,900' of 72"; and 6,400' of 60" main from Hanlon Park to Gwynns Falls Park	1979
11.	Gwynns Falls Transmission Main, Section 1A	3,530' of 66" main from existing Ashburton-Montebello tunnel to Section 1 of Gwynns Falls main	1984
12.	Leakin Park Pumping Station	Two 41-mgd pumps and two 21-mgd pumps	1983
13.	Catonsville Transmission Main Section 1-S	4,400' of 66" main from Hilton Pkwy to to Wetheredsville Road	1983
14.	Catonsville Transmission Main Section 2	5,240' of 54" main from Cooks Lane to Harlem Lane and U. S. Route 40	1985
15.	Catonsville Reservoir	67.2 MG storage reservoirs	1986
16.	Ashburton Low-Lift Pumps	Four 60-mgd pumps	1981
17.	Hillen Raw Water Pumping Station	Two variable speed 50-mgd pumps	1994*
18.	Vernon Pumping Station	One 40-mgd pump	2009*
19.	Vernon Discharge Main	Connects Vernon P. S. with Ashburton-Montebello tunnel	1994*

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

TABLE 2-4

WATER SYSTEM IMPROVEMENTS BY PRESSURE ZONE

		Year Needed
	First Zone	
1.	2,600' of 60" and 2,800' of 48" main Southeast Freeway to Orems Rd	1983
2.	7,000' of 36" main, Pulaski Highway from SE transmission main to Martin Blvd	1982
3.	6,600' of 30" main, Pulaski Hwy. from Martin Blvd. to Middle River Rd.	1982
4.	12,700' of 24" main, Pulaski Hwy. from Middle River Rd. to Ebenezer Rd.	1982
5.	5,500' of 24" main, Leland Ave. from Bengies Rd. to Eastern Ave. to Earles Rd.	1981
6.	37,000' of 36" main, Clean and line Pulaski - Orem - Leland Main from City line to Bengies Road	1983
7.	800' of 30" main, North Point Blvd from Charlesmont Road to Dukie Ave.	1985- 1990
	Second Zone	
8.	2,000' of 16" main, Perry Hall Blvd from Silver Spring Rd. to Joppa Rd.	1980
9.	12,200' of 30", 24", and 20" main., Radecke Ave. from Fullerton P.S. to Silver Spring Rd.	1985-1990
	Eastern Third Zone	
10.	4,330' of 36" main, Ridge Rd. from Belair Rd. to Fullerton Pumping Station	1985-1990
11.	11,610' of 24" main, Putty Hill Rd. from Old Harford Rd. to Belair Rd.	1985-1990
12.	5,440' of 24" main, Hillen Rd. - Goucher Blvd. Clean and line main from Loch Raven Blvd. to Towson Reservoir.	1985-1990
13.	6,000' of 24" main in vicinity of Belair Rd. from Pine Hill Dr. to Forge Rd.	1981
14.	5,500' of 12" main from Old Pimlico Rd. and Pheasant Cross Dr. to Indian Head Rd.	1980
	Western Third Zone	
15.	8,900' of 54" main from Patterson Ave. to Slade Ave. and Reisterstown Rd.	1981
16.	6,500' of 16" main. Wilkens Ave. from Kenwood Ave. to Hilltop Rd.	1985-1990
17.	9,500' of 20" main. Melvin Ave. and Rolling Rd. from Frederick Ave. to Wilkens Ave.	1985-1990
18.	20,200' of 36" main. Clean and line transmission main from City line to Pikesville Reservoir	1985-1990
19.	New chlorination facilities at Pikesville Reservoir and Pumping Station	1981
20.	4,500' of 48" water main from Security Blvd. to Baltimore National Pike at St. Agnes	1985-1990

TABLE 2-4 (Cont.)

		Year Needed
	Towson Fourth Zone	
21.	5,000' of 12" main, Charles Street from Greater Baltimore Medical Center to Bellona Avenue and Stevenson Lane	1985-1990
22.	3,200' of 12" main. Joppa Rd. from Bosley Ave. to Chestnut Rd.	1985-1990
23.	17,000' of 48" main. Charles St. and Bellona Ave. to Mays Chapel Reservoir	1980
	Pikesville Fourth Zone	
24.	2.0 - M.G. Lyons Mill Elevated Tank	1980
25.	12,300' of 24" main. Lyons Mill Rd. from Painters Mill Rd. to Deer Park Rd	1985-1990
26.	2,800' of 24" main. Deer Park Rd. and R/W from Liberty Rd. to Deer Park Tank	1983
27.	8,700' of 36" main. Pikesville Pumping Station to McDonogh Rd. at Reisterstown Rd.	1985-1990
28.	27,400' of 16" main. Reisterstown and Pleasant Hill Rds. Clean and cement line from Walker Ave. to Pleasant Hill Tanks	1985-1990
29.	22,000' of 16" main. Naylors Lane, Old Court Rd. and Church Lane. Clean and cement line from Reisterstown Rd. to McDonogh Rd.	1985-1990
30.	7,700' of 20" main in Liberty and Deer Park Rds. from Chapman Rd. to R/W at Deer Park Tank.	1985-1990
	Catonsville Fourth Zone	
31.	1.5 - M.G. elevated tank in vicinity of Rolling Road and Clays Lane	1979
	Falls Fifth Zone	
32.	Pumping station and approximately 2,000' of 24" main in vicinity of Jennifer Rd.	1980
	Pot Spring Fifth Zone	
33.	1 - M.G. elevated tank in Bosley Rd. area	1980
	Miscellaneous Projects	
34.	Neighborhood Water Main Extension Petitions	1979-1995 *
35.	Water System Construction at Highway Sites	1979-1995 *
36.	Miscellaneous Repairs and Replacements	1979-1995 *
37.	Fire Hydrant Installations	1979-1995 *

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

TABLE 2-5

PROJECTED WATER SYSTEM IMPROVEMENT COSTS*

		Estimated County Cost
	Central System	
1.	Deer Creek Pumping Station	$ 83,000
2.	Fullerton Filtration Plant	19,350,000
3.	Fullerton Reservoir	720,000
4.	Fullerton Second Zone Pumping Station	1,016,000
5.	Fullerton Third Zone Pumping Station	3,685,000
6.	Fullerton Transmission Main	5,895,000
7.	Northeast Transmission Main	2,199,000
8.	Southeast Transmission Main	3,960,000
9.	Hillen Pumping Station	2,032,000
10.	Gwynns Falls Transmission Main Section 1	1,947,000
11.	Gwynns Falls Transmission Main Section 1A	275,000
12.	Leakin Park Pumping Station	1,904,000
13.	Catonsville Transmission Main Section 1-S	381,000
14.	Catonsville Transmission Main Section 2	308,000
15.	Catonsville Reservoir	1,164,000
16.	Ashburton Low-Lift Pumps	142,000
	First Zone	
1.	Southeast Freeway to Orems Road	1,665,000
2.	Pulaski Hwy from Southeast Transmission Main to Martin Blvd	1,100,000
3.	Pulaski Hwy from Martin Blvd to Middle River Road	900,000
4.	Pulaski Hwy from Middle River Road to Ebenezer Road	1,290,000
5.	Leland Avenue from Bengies Road to Eastern Ave. to Earles Road	605,000
6.	Clean and line Pulaski-Orem-Leland main	2,960,000
7.	North Point Blvd from Charlesmont Rd to Dukie Ave	110,000
	Second Zone	
8.	Perry Hall Blvd from Silver Spring Road to Joppa Road	140,000
9.	Radecke Avenue from Fullerton Pumping Station to Silver Spring Rd.	1,200,000

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

TABLE 2-5 (Cont.)*

		Estimated County Cost
	Eastern Third Zone	
10.	Ridge Road from Belair Road to Fullerton Pumping Station	$ 700,000
11.	Putty Hill Road from Old Harford Road to Belair Road	1,335,000
12.	Clean and line main from Loch Raven Blvd to Towson Reservoir	310,000
13.	Belair Road from Pine Hill Drive to Forge Road	660,000
14.	Old Pimlico Road and Pheasant Cross Drive to Indian Head Road	238,000
	Western Third Zone	
15.	Patterson Avenue to Slade Ave. and Reisterstown Road	2,937,000
16.	Wilkens Avenue from Kenwood Ave. to Hilltop Road	161,000
17.	Melvin Avenue and Rolling Road from Frederick Avenue to Wilkens Ave.	875,000
18.	Clean and line transmission main from City line to Pikesville Reservoir	1,615,000
19.	New chlorination facilities at Pikesville Reservoir	425,000
20.	Security Blvd. to Baltimore National Pike at St. Agnes Road	1,245,000
	Towson Fourth Zone	
21.	Charles Street from Medical Center to Bellona Avenue and Stevenson Lane	290,000
22.	Joppa Road from Bosley Avenue to Chestnut Road	185,000
23.	Charles Street and Bellona Avenue to Mays Chapel Reservoir	4,488,000
	Pikesville Fourth Zone	
24.	Lyons Mill elevated tank	2,770,000
25.	Lyons Mill Road from Painter's Mill Road to Deer Park Road	1,415,000
26.	Deer Park Road and Right-of-Way from Liberty Road to Deer Park Tank	320,000
27.	Pikesville Pumping Station to McDonough Road at Reisterstown Road	1,395,000
28.	Clean and line main from Walker Avenue to Pleasant Hill tanks	960,000
29.	Clean and line main from Reisterstown Road to McDonough Road	770,000
30.	Liberty and Deer Park Roads from Chapman Road to Right-of-Way at Deer Park tank	710,000

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

TABLE 2-5 (Cont.)*

	Catonsville Fourth Zone	
31.	Elevated tank in vicinity of Rolling Road and Clays Lane	$2,180,000
	Falls Fifth Zone	
32.	Pumping Station and main in vicinity of Jennifer Road	2,200,000
	Pot Springs Fifth Zone	
33.	Elevated tank in Bosley Road area	1,820,000
	Miscellaneous Projects	
34.	Neighborhood extension petitions	16,000,000
35.	Water System Construction at Highway Sites	2,400,000
36.	Repairs and Replacements Fund	4,000,000
37.	Fire hydrant installations	1,600,000
38.	Subdivision extensions	
	a. Whitemarsh new development area	15,645,000
	b. Owings Mills new development area	28,630,000
	Total Water System Development Cost	153,310,000

Note:
Site-Specific conditions may result in special design criteria, and therefore increase costs above those shown.

Source: Reference 2-5

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

COSTS OF WATER SUPPLY IMPROVEMENTS

Estimated costs for water system improvements have been determined and are presented in Table 2-5. These cost estimates reflect Baltimore County's obligation only, whether for jointly-used facilities, or for those projects serving only Baltimore County. A key question is whether the traditional City-County relationship with respect to the initial capital expenditure for water systems costs will continue unchanged through the GMP planning period.

The present water agreement between the City and the County is effective until the parties desire a new agreement. In addition, the financing of any new facilities, including the sharing of engineering and all other preliminary costs, is unlikely to be on the same basis as spelled out in the 1972 agreement due to changes in the benefit distribution. Therefore, it is difficult to project the future financial impact of this agreement on the County, especially when most of the new projects will only benefit the future growth of the County. Historically, the City has financed its estimated share of the construction costs from proceeds of general obligation bonds, with associated annual debt service requirements supported by revenues from the water system. The 1972 agreement specifies that the County's share of all future water projects is to be financed by capital contributions based upon progress billings, unless both parties agree to fund the entire project from City bond proceeds. Increasing reluctance on the part of the city to "front" the capital investment will probably require the County to adopt a lead role.

As indicated in Table 2-5 a total water system development cost of $157,700,000 will have been incurred by 1995.* This cost estimate includes the construction of the Fullerton Filtration Plant to treat the Susquehanna River supply, and the estimated cost of front-ending local subdivision systems in the Whitemarsh and Owings Mills New Development Areas. These front-end costs will be recovered as these areas are developed. Furthermore, it has been assumed that the CIP budgeted annual costs for neighborhood petition extensions ($1,000,000 per year), water system construction at highway sites ($150,000 per year), repairs and replacements fund ($250,000 per year) and fire hydrant installations ($100,000 per year) will continue through the GMP planning period (i.e., to 1995*). The costs for neighborhood petition extensions will also be recovered as those areas are served.

The costs presented so far are capital improvement costs. Equally important are expected annual costs and revenues associated with the water supply system. Annual costs for water supply service include: operations and maintenance,

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

billing and collecting, cost of delivery, cost of handling complaints, and debt service. Each component of annual cost can be expected to increase in the foreseeable future, with the possible exception of debt service. If the City-County agreement is revised to place more of a burden on the County with respect to initial capital expenditures for water supply improvements, the County's proportional share of debt service can be expected to decrease in the future. However, because the issue of "who becomes the banker" is presently unresolved, annual costs have been assumed to increase in direct proportion to the population increase. Total annual costs for water supply in 1976 were $8.04 million and are projected to increase to $8.84 million by 1985 and $9.89 million by 1995.* Annual revenues to the water system are made up of benefit front-foot assessments, metered water billings, fire protection revenue, fees for special services, fire hydrant permits, property connection charges and permit fees, and system connection charges. It was not possible to undertake an analysis of future revenues from front-foot assessments, property connection charges and permit fees, or system connection charges. The revenues accrued from metered water billings, debt service credit to the County, and other miscellaneous revenues totalled $8.08 million in 1976, and was assumed to increase in direct proportion to increases in population. Thus, revenues from these sources are expected to total $8.89 million by 1985, and $9.94 million by 1995.*

CONCLUSIONS AND RECOMMENDATIONS

The two critical issues facing the County with respect to water supply are to renegotiate the Susquehanna Low-Flow Agreement and to resolve the issue as to who pays the initial capital expenditure for water system improvements.

Renegotiation of the Susquehanna agreement to allow withdrawal of 250 mgd, regardless of the amount of streamflow, will allow the County to satisfy expected increases in demand and still maintain an adequate system reserve capacity, even under prolonged drought conditions. If this source of raw water is more frequently used in the future, it will be necessary to construct the Fullerton Filtration Plant, although the timing of the facility can be delayed through blending with Gunpowder water and/or diverting the Susquehanna supply to Ashburton. It should also be noted that, under present conditions, the County could be faced with a major crisis if one of the existing filtration plants were forced to shut down. This is especially true if the alternate method of central system improvements is chosen, which delays the construction of the Fullerton Filtration Plant.

Resolution of the City-County impasse regarding initial capital expenditures for water supply improvements will allow the necessary facilities to be planned, designed, and constructed before they are needed. It is likely that the County will find itself in the position of having to front-end these costs, which will increase the costs of water supply improvements significantly beyond the costs presented in Table 2-5. A reasonable alternative might be the establishment of a regional water authority, empowered to issue revenue bonds for the construction of these major improvements.

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*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

SECTION 3

SEWERAGE SERVICE

The Baltimore County portion of the metropolitan sewer system was analyzed to assess the capability of the system to support the growth projections of the Master Plan. For the reasons noted in Section 1, the Sewer Analyzer Model was not used in this analysis; instead, an overview of proposed system modifications has been provided on the subsewershed level, using where available the prior data developed with this model from earlier runs by PRC Toups Corporation and the 208 Study Team.

The key question to be addressed in this report is: can the sewerage system handle the projected growth forecast in the Master Plan, and, if not, what sewer system improvements and/or extensions are needed to support the projected growth scenario? As noted previously, the Sewer Analyzer Office will be undertaking a detailed "pipeline-by-pipeline" analysis of the existing system to address this issue in the near future. The analysis presented herein focuses on improvements to the existing system on a subsewershed basis, and on extensions to the system needed to support growth in the New Development Areas.

EXISTING SYSTEM

The basic elements of the County's public sewerage system are as follows:

1) To conduct raw wastewater from its source to a treatment plant, the source is connected to a lateral sanitary sewer which leads to subinterceptors and interceptors. The County has nearly 1500 miles of sewer and 200,000 connectors.

2) Pumping stations are used where gravity flow is insufficient to move the wastewater to the treatment plant; approximately 115 pumping stations are used in Baltimore County to transfer wastewater into force mains from which it moves on further through the system.

3) The wastewater is treated at one of five treatment plants. Three are smaller county-owned plants, and two are very large city-owned plants at Back River and Patapsco. Secondary treatment is provided at all of the plants except the Patapsco STP, which is a primary treatment plant. The Patapsco plant is currently undergoing expansion and upgrading to provide secondary treatment.

4) The treated effluents from the City's plants are discharged into the Bay whereas effluents from County plants are discharged to riverine watercourses. Bethlehem Steel Company uses some of the effluent from the Back River plant as cooling water for the industrial processes at their Sparrows Point complex.

The Back River Wastewater Treatment Plant is situated about two miles east of Baltimore City, on the west shore of Back River, and is owned by the City. The existing capacity of the plant is 170 million gallons per day (MGD) in the seven existing primary tanks. With 20 mgd of this total allocated for treating recirculated flow from the plant's process wastewater, 150 mgd of capacity is available for the influent flows.

The service area of the Back River plant extends from Gwynns Falls Valley on the west to Cockeysville on the north, and the Gunpowder Falls on the east. The treatment plant presently serves an area of approximately 140 square miles with a 1975 connected population of 1.2 million (Reference 3-1).

The Patapsco Wastewater Treatment Plant is located on the south shore of Baltimore Harbor at Wagner's Point, and is owned and operated by the City. This plant currently provides service to portions of Anne Arundel, Baltimore and Howard counties, as well as to the southwestern areas of the City. The areas served are all tributary to the Patapsco River Valley, covering 38.5 square miles, with a 1974 connected population of nearly 132,000 (Reference 3-2).

The County owns and operates three small treatment plants which were built in the late 1950's and early 1960's in order to provide sewerage service to those areas outside the central system. It is anticipated that these "package" plants will be discontinued once adequate extensions to the sanitary sewer system are made.

The Coopers Branch Treatment Plant is located in southwestern Baltimore County on a tributary to the Patapsco River. Its design capacity is 0.6 mgd, representing an ultimate flow from 4,700 persons; it presently services an area of 433 acres and a population of 2,356 (Reference 3-3). The plant effluent is discharged to Coopers Branch and the plan is scheduled for abandonment once the Coopers Branch Interceptor is constructed (presently underway).

The Richlyn Manor Treatment Plant is located in the northeast section of Baltimore County, approximately one mile northeast of Perry Hall. Built in 1962, as a temporary facility with a design capacity of 50,000 gallons per day, it serves an area of 275 acres, with an effluent discharge to the Gunpowder Falls. Extensions of existing facilities to relieve the plant appear to be far into the future.

The third County-owned facility is the Forge Heights Treatment Plant, which was also built in 1962, as a temporary facility. Twenty-seven homes in a two-block area of Forge Heights are served by the plant, and the capacity of the plant is 10,800 gallons per day. The effluent from this plant is discharged to a tributary of Gunpowder Falls.

The service areas of the existing City-owned treatment facilities can be subdivided into smaller, more manageable service areas in order to permit cost-effective analyses of treatment disposal alternatives. The establishment of a treatment facility service area starts with the delineation of the natural watershed boundaries. Other factors, however, control the extent of an area. In some cases, an area beyond the natural ridge line can be sewered by gravity into a watershed by laying a deep sewer contrary to the slope of the ground. In addition, a gravity system can be installed outside the watershed boundary to flow to a central location and then be pumped back into the watershed.

The area within Baltimore County that is tributary to the Back River Wastewater Treatment Plant has been subdivided into the following service areas: Western

TABLE 3-1

SUBSEWERSHEDS

Back River Service Area

1. Northeast Creek
2. Lower Stemmers Run
3. Upper Stemmers Run
4. Brien Run
5. Orems
6. Middle River
7. Leland
8. Wilson Point
9. Bengies
10. Bowleys Quarters
11. Chase
12. Harewood Park
13. Whitemarsh South
14. Nottingham
15. Bird River Run
16. Lower Whitemarsh
17. Middle Whitemarsh
18. Upper Whitemarsh
19. Honeygo Run
20. Lorely
21. Forge Heights
22. Hallfield
23. Perry Hall
24. Richlyn
25. Gunpowder
26. Jennifer Run
27. Satyr Hill
28. Mine Bank
29. Long Quarter
30. Hampton
31. Spring Branch
32. Texas South
33. Texas East
34. Cockeysville East
35. Cockeysville West
36. Beaver Dam Run
37. Western Run
38. Essex
39. Back River Neck
40. Eastpoint
41. Northpoint
42. Gray Manor
43. Delmar
44. Sparrows Point
45. Lower Redhouse Run
46. Rosedale
47. Upper Redhouse Run
48. Colgate
49. Dundalk
50. Herring Run East
51. Herring Run West
52. Western Run - Pikesville
53. Lower Jones Falls
54. Woodbrook
55. Towson Run
56. Roland Run South
57. Roland Run North
58. Moores Branch
59. Slaughter House Branch
60. Brooklandville
61. Upper Jones Falls

TABLE 3-1 (cont.)

Patapsco Service Area

62. Powder Mill
63. Lower Gwynns Falls
64. Scotts Level
65. Middle Gwynns Falls
66. Red Run
67. Upper Gwynns Falls
68. Lower Dead Run
69. Dead Run Branch
70. North Branch Dead Run
71. West Low Level
72. Baltimore Highlands
73. Lansdowne
74. Herbert Run
75. Relay/St. Denis
76. Bull Branch
77. Coopers Branch
78. Cedar Branch/Millers Run
79. Bens Run
80. Brices Run

Run (Pikesville), Jones Falls, Herring Run, Texas/Cockeysville, Longquarter, Gunpowder, Whitemarsh, Stemmers Run, Red House Run, Middle River/Chase, Back River Neck, Patapsco Neck, and Dundalk. The Patapsco plant service area has been separated into: Patapsco River Basin, West Low-Level, Dead Run, and Gwynns Falls service areas. A detailed description of each service area and its characteristics can be found in Reference 2-1. Each of these service areas has been further subdivided into subsewersheds on the basis of major interceptor lines. Table 3-1 lists the eighty subsewersheds in Baltimore County.

An analysis of future conditions in a sewerage system is enhanced by the understanding of present system capacities.

Using the same methodology as described in Technical Memorandum 24-D (Reference 3-4), but with different source population data, the "208" Study Group determined the existing reserve capacities (if any) in the present system. The results of this analysis are presented in Table 3-2.

Some of the areas within the Patapsco STP service area are presently constrained for growth, such as: Baltimore Highlands, Herbert Run, West Low Level, and Gwynns Falls, while other areas can support only marginal increases in growth (Lansdowne and Catonsville). The area between Catonsville and Arbutus can support growth. An examination of the Master Plan population projections reveals that little, if any, growth is projected for many of the areas within the Patapsco service area. An exception to this is the Gwynns Falls subsewershed in which considerable growth is projected along the northwest corridor. The Gwynns Falls Relief Interceptor project, which is currently under construction, will handle all projected growth in this subsewershed.

In the Back River STP service area, the Thornleigh, Pot Spring, Parkside Heights, Glenmont and Back River Neck areas are presently constrained for growth, in that the existing system analysis indicates peak flows (based on design criteria) in excess of peak carrying capacity. There is adequate reserve capacity to support marginal growth in the Woodbrook, Valley Crest, Kenwood, Weyburn Park, and Edgemere areas. However, none of these areas is programmed for significant growth during the planning period.

It should be noted that the figures presented in Table 3-2 are based on Sewer Analyzer Model results prior to calibration of the model against water usage records, a process that is currently underway. In addition, the model is based on relatively general design parameter values, such as Manning's pipe roughness coefficient (0.013) and sub-area-wide infiltration quantities.

The Sewer Analyzer Office has initiated a flow metering program to obtain data on existing flows in the sewerage system; this work, combined with the calibration of the model against water usage records may reveal that several of the areas indicated as presently constrained for growth have actual existing flows less than those presented in Table 3-2. In addition, the excess capacities of the various sewer lines shown in Table 3-2 may also turn out to be greater than previously believed. It should also be noted that all peak flows computed by the Model were based on dry weather flow conditions. No attempt has been made, to date, to identify the inflow component which may considerably affect the predicted excess capacities.

TABLE 3-2

SEWER SYSTEM CAPACITIES [1]

NAME OF SYSTEM OR SERVICE AREA	Size	Peak Carrying Capacity (MGD)	1975 Computed Peak Flow (MGD)	Excess (Deficit) Capacity (MGD)
East Branch Herring Run	21"	12.2	11.14	1.06
East Branch - West Fork Herring Run	15"	3.86	4.09	(0.23)
West Branch Herring Run	15"	3.65	2.66	0.99
West Branch - East Fork Herring Run	12"	1.68	3.37	(1.69)
Middle River Diversion	24"	5.68	5.27	0.41
Leland Avenue Int.	48"	32.23	3.03	29.20
Aero Acres O.F.	12"	1.83	0.99	0.84
Eastern Ave Int.	42"	17.29	1.02	16.27
Bowleys Quarters	18"	2.16	0.50	1.66
Lower Red House Run Int.	30"	9.79	8.95	0.84
Chesaco Park F.M. O.F.	18"	2.87	0.44	2.43
Rosedale Hgts. O.F.	12"	1.89	0.55	1.34
Upper Red House Run Int.	24"	6.19	5.45	0.74
Brien Run Int.	33"	23.22	9.72	13.50
Northeast Creek O.F.	24"	4.63	1.32	3.31
Orems Rd. Int.	30"	21.67	6.99	14.68
Lower Stemmers Run Int.	27"	10.91	6.39	4.52
Rossville Sub-Int.	12"	2.40	0.75	1.65
Golden Ring O.F.	12"	1.46	0.51	0.95
Clover Hgts. O.F.	12"	2.53	0.12	2.41
Upper Stemmers Run Int.	18"	5.93	3.79	2.14
Parkville O.F.	15"	3.21	2.10	1.11
Carney Hgts. O.F.	18"	8.16	0.71	7.45
Essex Outfall	18"	3.05	2.37	0.68
Cedar-Taylor Outfall	18"	2.33	1.66	0.67
Cedar Ave. Outfall	27"	6.96	4.90	2.06
Back River Neck Rd.	15"	1.61	1.81	(0.20)
Marlyn Ave. Int.	42"	12.14	3.51	8.63
Middleborough Int.	24"	4.27	1.78	2.49
North Point Blvd. Int.	24"	3.06	1.30	1.76
Bread/Cheese Creek Int.	15"	2.95	2.17	0.78
Lynch Rd. - Wise Ave.	36"	17.32	4.14	13.18

TABLE 3-2, cont.

SEWER SYSTEM CAPACITIES[1]

NAME OF SYSTEM OR SERVICE AREA	Size	Peak Carrying Capacity (MGD)	1975 Computed Peak Flow (MGD)	Excess (Deficit) Capacity (MGD)
Gray Manor F.M. Outfall	36"	18.60	6.89	11.71
Delmar F.M. O.F.	30"	9.93	2.75	7.18
Glen Echo Int.	21"	4.01	3.62	0.39
Sparrows Pt. F.M. Outfall	24"	8.0	4.50	3.50
Baltimore Highlands O.F.	21"	1.70	3.22	(1.52)
Patapsco Interceptor [2]	48"	20.79	24.97	(4.18)
Landsdowne Outfall	12"	1.79	1.54	0.25
Herbert Run Int.	30"	7.92	12.88	(4.96)
Relay St. Denis O.F.	15"	2.67	0.52	2.15
Bull Branch Int.	18"	10.84	4.61	6.23
Millers Run Int.	15"	2.50	1.69	0.81
Cedar Br. Int.	12"	2.12	1.25	0.87
West Low Level	12"	2.56	2.93	(0.37)
Dead Run Interceptor	24"	12.02	7.94	4.08
Dead Run Br.	24"	7.34	4.61	2.73
North Br. Dead Run	21"	6.29	3.25	3.04
Lower Gwynns Falls Int. [2]	33"x30"	22.16	31.27	(9.11)
Powder Mill Br. Int.	27"	14.20	7.97	6.23
Scotts Level Int. [2]	18"	9.86	10.30	(0.44)
Middle Gwynns Falls Int. [2]	27"	8.18	10.50	(2.32)
Roaches Run Int.	15"	3.13	3.55	(0.42)
Upper Gwynns Falls Int. [2]	15"	3.24	3.28	(0.04)
Western Run-Pikesville Int.	12"	2.19	1.21	0.98
Jones Falls Interceptor	42"	29.14	19.55	9.59
Woodbrook O.F.	12"	1.46	1.05	0.41
Towson Run Int.	24"	8.04	5.55	2.49
Roland Run Int. (north)	24"	8.93	9.31	(0.38)
Roland Run Int. (south)	42"	20.52	11.48	9.04
Moores Br. Int.	15"	4.19	2.48	1.71
Slaughterhouse Br. Int.	18"	7.08	0.69	6.39
Texas South Interceptor	18"	5.26	1.22	4.04
Texas East Interceptor	18"	6.32	4.53	1.79

TABLE 3-2, cont.

SEWER SYSTEM CAPACITIES[1]

NAME OF SYSTEM OR SERVICE AREA	Size	Peak Carrying Capacity (MGD)	1975 Computed Peak Flow (MGD)	Excess (Deficit) Capacity (MGD)
Oregon Branch	30"	12.43	1.53	10.90
Western Run Int.	36"	15.64	-	15.64
Greenridge Sub-Int.	18"	6.81	3.52	3.29
Kelly Branch Int.	12"	1.26	1.92	(0.66)
Spring Branch Int.	15"	3.08	2.45	0.63
Perry Hall Interceptor	18"	6.53	0.81	5.72
Gunpowder Interceptor	42"	29.08	8.10	20.98
Jennifer Run Int.	18"	5.09	1.79	3.30
Satyr Hill Int.	12"	3.58	1.89	1.69
Minebank Sub-Int.	15"	4.10	2.33	1.77
Longquarter F.M. Outfall	27"	27.81	2.37	25.44
Whitemarsh South Int.	18"	3.85	0.87	2.98
Whitemarsh Int.	48"	41.07	11.79	29.28
South Branch	24"	8.12	0.89	7.23
West Branch - Middle	27"	16.18	4.43	11.75
West Branch - Lower	24"	10.98	4.32	6.66
Gunpowder F.M. Outfall	36"	34.95	7.51	27.44

TABLE 3-2, cont.

SEWER SYSTEM CAPACITIES[1]

PUMPING STATION		Present Capacity (MGD)	Avg. Daily Pumpage (MGD)	Excess (Deficit) Capacity (MGD)
Patapsco		14.40	12.66	1.74
Texas		9.90	4.10	5.80
Longquarter		15.66	2.03	13.63
Gunpowder		11.50	4.55	6.95
Whitemarsh		24.57	7.54	17.03
Orems Road		6.99	2.42	4.57
Bengies		4.01	1.08	2.93
Redhouse Run		7.20	2.78	4.42
Quad Avenue		1.00	0.02	0.98
Stemmers Run		14.4	10.87	3.53
Essex		4.23	2.90	1.33
Duck Creek		1.94	1.30	0.64
Hyde Park		0.92	0.08	0.84
Bread/Cheese		7.11	1.68	5.43
Gray Manor		25.65	6.54	19.11
Bear Creek		6.22	2.65	3.57
Delmar		3.24	1.44	1.80
Turkey Point		1.40	-	1.40
[1]All data supplied by 208 program [2]Improvement currently under construction [3]Currently undergoing expansion to 48 mgd.				

TABLE 3-3

PROJECTED FUTURE ADDITIONAL WASTEWATER FLOWS*

(million gallons per day)

SUB-SEWER SHED[3]	1985 Peak Flow	Infil-tration	1985 Total Flow	1995 Peak Flow	Infil-tration	1995 Total Flow
1	0.24	0.20	0.44	0.44	0.20	0.64
2	1.1	3.45	4.55	1.50	3.45	4.95
3	1.9	1.82	3.72	2.30	1.82	4.12
4	1.1	1.50	2.60	1.20	1.50	2.70
5	0.4	0.03	0.43	0.04	0.03	0.07 (sic)
6	0.05	0.79	0.84	0.08	0.79	0.87
7	1.60	0.89	2.49	1.80	0.89	2.69
8	0.04	0.66	0.70	0.06	0.66	0.72
9	0	0.54	0.54	0	0.54	0.54
10	1.1	0.26	1.36	2.10	0.26	2.36
11	0.8	3.85	4.65	2.10	3.85	5.95
12	0.23	0.46	0.69	0.84	0.46	1.30
13	0.12	0.42	0.54	0.12	0.42	0.54
14	1.6	1.41	3.01	3.20	1.41	4.61
15	0.74	2.20	2.94	1.70	2.20	3.90
16	1.90	1.50	3.40	3.40	1.50	4.90
17	1.6	2.20	3.80	3.60	2.20	5.80
18	2.0	2.24	4.24	3.4	2.24	5.64
19	2.2	1.20	3.40	2.8	1.20	4.00
20	1.8	2.57	4.37	3.8	2.57	6.37
21[1]	0	0	0	0	0	0
22	1.9	1.35	3.25	4.6	1.35	5.95
23	1.1	0.48	1.58	2.1	0.48	2.58
24[1]	0	0	0	0	0	0
25	2.1	1.37	3.47	3.7	1.37	5.07
26	1.9	1.13	3.03	3.0	1.13	4.13
27	2.2	0.92	3.12	2.80	0.92	3.72
28	1.6	0.73	2.33	3.10	0.73	3.83
29	0.36	0.76	1.12	0.56	0.76	1.32
30	0.56	0.88	1.44	1.60	0.88	2.48

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

TABLE 3-3, cont.

PROJECTED FUTURE ADDITIONAL WASTEWATER FLOWS *
(million gallons per day)

SUB-SEWER SHED [3]	1985 Peak Flow	Infil-tration	1985 Total Flow	1995 Peak Flow	Infil-tration	1995 Total Flow
31	0.40	1.17	1.57	0.63	1.17	1.80
32	2.60	1.28	3.88	3.80	1.28	5.08
33	2.8	0.57	3.37	4.20	0.57	4.77
34	1.10	0.59	1.69	2.00	0.59	2.59
35	0.30	0.30	0.60	0.65	0.30	0.95
36	0.36	2.23[2]	2.59	1.10	2.23[2]	3.33
37	1.39	1.80	3.19	2.30	1.80	4.10
38	1.4	1.03	2.43	2.4	1.03	3.43
39	1.6	3.77	5.37	1.9	3.77	5.67
40	0.4	1.28	1.68	0.77	1.28	2.05
41	0.20	1.13	1.33	0.64	1.13	1.77
42	0.28	1.36	1.64	0.68	1.36	2.04
43	0.4	0.40	0.80	0.65	0.40	1.05
44	0.16	2.60[2]	2.76	0.04	2.60[2]	2.64
45	0.16	0.33	0.49	0.36	0.33	0.69
46	0.40	2.69	3.09	0.72	2.69	3.41
47	0.58	1.08	1.66	1.10	1.08	2.18
48	0.20	0.70	0.90	0.45	0.70	1.15
49	0.24	0.03	0.27	0.39	0.03	0.42
50	1.20	2.58	3.78	2.20	2.58	4.78
51	0.25	2.43	2.68	1.2	2.43	3.63
52	0.65	0.60	1.25	1.4	0.6	2.00
53	1.10	1.50	2.60	2.1	1.5	3.60
54	0.10	0.32	0.42	0.1	0.32	0.42
55	0.36	0.90	1.26	1.10	0.90	2.00
56	0.52	1.07	1.59	0.87	1.07	1.94
57	2.20	4.00	6.20	4.2	4.00	8.20
58	0.87	1.55	2.42	2.7	1.55	4.25
59	1.0	1.31	2.31	2.3	1.31	3.61

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

TABLE 3-3, cont.

PROJECTED FUTURE ADDITIONAL WASTEWATER FLOWS*
(million gallons per day)

SUB-SEWER SHED[3]	1985 Peak Flow	Infil-tration	1985 Total Flow	1995 Peak Flow	Infil-tration	1995 Total Flow
60	0.12	0.5	0.62	0.4	0.5	0.90
61	0.52	9.3	9.82	1.6	9.3	10.9
62	0.8	0.65	1.45	1.1	0.65[2]	1.75
63	2.0	0.92	2.92	4.4	0.92[2]	5.32
64	3.7	1.82	5.52	7.4	1.82[2]	9.22
65	3.1	3.9	7.0	7.0	3.9[2]	10.9
66	1.6	3.0	4.6	5.8	3.0[2]	8.8
67	3.6	4.4	8.0	8.0	4.4[2]	12.4
68	0.21	0.15	0.36	0.68	0.15	0.83
69	0.4	1.03	1.43	1.10	1.03	2.13
70	2.0	2.01	4.01	4.40	2.01	6.41
71	0.56	0.12	0.68	0.61	0.12	0.73
72	0.04	0.57	0.61	0.08	0.57	0.65
73	0.004 (sic)	1.06	1.10	0.02	1.06	1.08
74	0.56	3.95	4.51	1.00	3.95	4.95
75	0.03	0.26	0.29	0.03	0.26	0.29
76	0.20	0.04	0.24	0.98	0.04	1.02
77	0.40	0.73	1.13	0.66	0.73[2]	1.39
78	0.90	0.97	1.87	2.00	0.97	2.97
79	0.70	4.00	4.70	2.3	4.00[2]	6.30
80	1.40	6.04	7.44	3.9	6.04[2]	9.94
TOTAL	-	-	200.17	-	-	274.18

NOTES:

1. Area not studied - no projected growth
2. Infiltration based on 800 gal/acre
3. See Table 3-1 for subsewershed key.

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

TABLE 3-4
EXISTING SEWER LINE PARALLELING

Subsewershed	Sewer Line	Length	Diameter
2	Lower Stemmers Run Interceptor	3,500 ft.	16 in.
3	Upper Stemmers Run Interceptor	9,000	12
6	Middle River Diversion	1,500	12
10	Bowleys Quarters	3,500	12
26	Jennifer Run Interceptor	5,000	12
27	Satyr Hill Interceptor	7,500	16
32	Texas South Interceptor	1,000	12
33	Texas East Interceptor	1,600	12
38	Essex Outfall	6,000	16
38	Cedar-Taylor Outfall	5,400	12
38	Cedar Avenue Outfall	4,800	21
39	Back River Neck Road	1,500	12
41	Bread and Cheese Creek Int.	2,000	15
43	Glen Echo Interceptor	2,000	12
50	East Branch Herring Run	5,000	16
50	East Branch - West Fork Herring Run	7,000	12
51	West Branch Herring Run	3,500	16
51	West Branch - East Fork Herring Run	6,300	18
52	Western Run - Pikesville Int.	3,500	12
57	Roland Run Interceptor (North)	2,000	27
58	Moores Branch Interceptor	10,000	18
67	Roaches Run Interceptor	2,000	24
70	North Branch Dead Run	3,700	18
78	Millers Run Interceptor	2,000	6
78	Cedar Branch Interceptor	4,800	8

FUTURE SYSTEM IMPROVEMENTS

Projected future sewage flows were determined by converting projected populations in each census tract to projected sewage flows in each subsewershed on the basis of area and land use considerations. This calculation resulted in the determination of average flows in each subsewershed. These flows were converted to peak sewage flows (Reference 3-5), to which expected infiltration quantities (Reference 3-4) were added to derive total additional sewage flows by 1985 and 1995.* These total additional sewage flows are given in Table 3-3. It is expected that additional total flow by 1985 (peak plus infiltration) will be slightly more than 200 mgd and additional flow by 1995* will be 274 mgd. These figures are obviously conservative, as they do not consider the effect of infiltration/inflow reduction, which constitutes a significant portion of the total expected flow. Baltimore County has an active program currently underway to reduce I/I quantities in the sewerage system. Actual increases in sewage flow can be assumed to be less than the figures presented in Table 3.3.

Based on the projected increases in flow, as shown in Table 3-3, several existing sewer lines were determined to be inadequate to carry the expected flow. For the purposes of this analysis, it was assumed that these inadequate sewer lines would have to be paralleled along much, if not all, of their entire length. This is also an obviously conservative assumption. Detailed studies by the Sewer Analyzer Office should reveal that several of these lines are adequate to handle the expected flow, and that several others would only have to be paralleled along portions of their existing length. The sewer lines that would need reinforcement, and the diameter and length of the parallel lines are given in Table 3-4.

This analysis revealed that there are several additional lines, not shown in Table 3-4, that would need paralleling by 1995.* These lines, however, are located in areas where the Master Plan projects a population decline and/or where ongoing I/I rehabilitation is being done. These areas include: the Lower and Upper Redhouse Run Interceptors, the Baltimore Highland Outfall, Lansdowne Outfall, Herbert Run Interceptor, West Low Level Interceptor, the Kelly Branch and Spring Branch Interceptors, Beach Drive, and Liberty Parkway collector sewers, and the Chesaco Park Force Main/Outfall. Once flow metering in these areas is complete, and a more accurate determination of existing flows is available, the Sewer Analyzer Office will monitor development activity in these areas on a monthly basis. If the monitoring program indicates that an increase in populations will actually take place, planning will begin for improvement of the sewer lines in these areas.

Extensions to the existing system will be required to serve the Whitemarsh and Owings Mills New Development Areas.

Providing sewerage to the Whitemarsh New Development Area will require an 8,000 foot extension of the 54-inch Whitemarsh Interceptor. A small pumping station will probably be needed to service that portion of Whitemarsh near the Gunpowder

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

TABLE 3-5

BALTIMORE COUNTY SEWERAGE PROJECTS THRU FY 84

EHA Priority Rank	Project Description	Funding Year
23	Facilities plan for Perry Hall-Bengies-Chase area (design)	1980
102	East Branch Herring Run sanitary sewer rehabilitation (design)	1980
103	East Branch Herring Run sanitary sewer rehabilitation (construction)	1980
39	Perry Hall-Bengies-Chase (construction)	1981
48	Glen Echo Interceptor relief sewer (Design)	1980
49	Glen Echo Interceptor relief sewer (construction)	1982
54	Middle River Neck sewerage facilities (including Bowleys Quarters) (design)	1980
55	Middle River Neck sewerage facilities (including Bowleys Quarters) (construction)	1982
67	Sanitary Sewers in Oella area (construction)	1981
90	Duck Creek force main extension (design)	1980
91	Duck Creek force main extension (construction)	1982
92	Cape May Road area sewage collection system (design)	1980
93	Cape May Road area sewage collection system (construction)	1981
101	Brien Run supplementary interceptors, Stemmers Run Pump Station to Middle River Road (design)	1980
102	Brien Run Supplementary Interceptor, Stemmers Run Pump Station to Middle River Road (construction)	1982
151	Lower Jones Falls Diversion, Lake Roland Pumping Station to City Outfall (design)	1981
152	Lower Jones Falls Diversion, Lake Roland Pumping Station and Force Main to vicinity of Towson High School (construction)	1984
153	Lower Jones Falls Diversion, gravity sewer from Towson High School along Herring Run to Cold Spring Lane and pressure sewer to city outfall (construction)	1984

Source: References 3-6, 3-7, 3-8

TABLE 3-6

CITY OF BALTIMORE SEWERAGE PROJECTS THAT WILL BE FUNDED PARTLY BY BALTIMORE COUNTY, THRU FY 84

Project Description	Funding Years
Jones Falls Supplementary Interceptor	1980
Improvement To Eastern Avenue Sewer Extension	1980
Gwynns Falls Relief Sewer	1980
Back River Sewage Treatment Plant Improvements	1980,1981, & 1982
Patapsco Sewage Treatment Plant Improvements	1980,1981, & 1983

Source: References 3-6, 3-7, and 3-8

River, but a lack of detailed information regarding future population distributions within this area precluded sizing of the pumping station. The on-going Facilities Plan will address specific sewerage needs in detail.

Approximately 15,000 feet of 27-inch interceptor and 15,000 feet of 24-inch interceptor will be required to serve the Owings Mills New Development Area. This extension will be located along Red Run, from its confluence with Gwynns Falls to the areas near Berrymans Lane. Because the Soldiers Delight Natural Environmental Area is located in this subsewershed, the sewer extension has been sized to provide a minimum of reserve capacity, to discourage growth beyond the projected levels for this area. Extensions of sewer lines in the Red Run basin will allow the Reisterswood Pumping Station to be taken off-line.

In addition to the projects indicated above, several sewer system improvement projects have been programmed for funding under EPA's Construction Grants Program. Tables 3-5 and 3-6 list these projects, their priority rank on the Environmental Health Administration's statewide priority list, and the expected funding year for the project. Table 3-6 indicates those Baltimore City projects that will be funded in part by the County.

ESTIMATED COSTS OF SEWERAGE SYSTEM IMPROVEMENTS*

Capital costs have been estimated for the various categories of sewerage system improvements noted above. These estimates are shown in Tables 3-7 through 3-13 and include: costs for parallel sewer interceptors within Baltimore County by 1995, costs for required sewer extensions by 1985, costs for required sewer extensions by 1995, costs for Baltimore County's share of Baltimore City projects (FY 1980 through FY 1984), the costs of Baltimore County sewerage projects through FY 1984, County costs for "front-ending" local systems development in the new development areas, and a summary of expected sewer system capital cost by year.

Examination of Tables 3-7 through 3-13 reveals that the County can expect to spend $5.78 million in sewer paralleling projects by 1995; $2.37 million for sewer system extensions in Whitemarsh and Bowleys Quarters by 1985; $2.656 million in sewer extensions for Owings Mills between 1985 and 1995; $73.3 million for the County's share of Baltimore City projects between fiscal years 1980 and 1984; $9.625 million for County sewerage projects (EPA fundable) between fiscal years 1980 and 1984; and $26.7 million in local systems development by 1995. The obligation to the County is approximately $149.75 million by 1995.

A detailed evaluation of projected annual costs and revenues associated with sewerage service is beyond the scope of this report, however, it is possible to formulate a few general observations. As noted previously, provision of sewerage service in the new development areas will allow the decommissioning of several pumping stations. Table 3-14 lists the expected annual savings associated with the elimination of these pumping stations.

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

TABLE 3-7

ESTIMATED COST FOR PARALLEL SEWER INTERCEPTORS WITHIN BALTIMORE COUNTY BY 1995

Sewershed	Required Length(ft)	Required Diameter(in)	In Place Cost
Cedar Branch/Millers Run	4800	8	$216,000
Cedar Branch/Millers Run	2000	12	96,000
North Branch Dead Run	3700	18	237,000
Western Run-Pikesville	3500	12	168,000
Roland Run North	2000	27	200,000
Moores Branch	10000	18	640,000
Texas South	1000	12	48,000
Texas East	1600	12	77,000
Jennifer Run	5000	12	240,000
Satyr Hill	7500	16	442,000
Herring Run East	5000	16	295,000
Herring Run East	7000	12	336,000
Herring Run West	6300	18	403,000
Herring Run West	3500	16	206,000
Middle River	1500	12	72,000
Bowleys Quarters	3500	12	168,000
Upper Gwynns Falls	2000	24	166,000
Lower Stemmers Run	3500	16	206,000
Upper Stemmers Run	9000	12	432,000
Essex	4800	20	326,000
Essex	6000	16	354,000
Essex	5400	12	259,000
Back River Neck	1500	12	72,000
North Point	2000	16	118,000
Delmar	2000	12	96,000
TOTAL			$5,779,000

TABLE 3-8

Required Sewer Interceptor Extensions by 1985			
Sewershed	Required Length (ft)	Required Diameter (in)	In Place Cost
Lorely	9,000	27	$846,000
Honeygo Run	15,000	21	1,080,000
Total			$ 1,926,000

TABLE 3-9

Required Sewer Interceptor Extensions by 1995 *			
Sewershed	Required Length (ft)	Required Diameter (in)	In Place Cost
Red Run	15,000	27	$1,410,000
Red Run	15,000	24	1,245,000
Total			$2,655,000

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

TABLE 3-10

Baltimore County Share of Baltimore City Sewerage Projects

Capital Costs for FY 1980 thru FY 1984

(Units in $1000)

	FY 1980	FY 1981	FY 1982	FY 1983	FY 1984
Total Capital Cost of Projected Projects	$90,754.4	$41,482.5	$355,000.0	$188,730.0	N.D.[2]
Estimated EPA Share of Project Capital Cost	$66,706.2	$31,112.0	$266,250.0	$141,547.8	N.D.[2]
Estimated City and County Share of Project Capital Cost	$24,048.2	$10,370.6	$ 88,750.0	$ 47,182.2	N.D.[2]
Estimated County Share of Project Capital Cost[1]	$ 8,977.2	$ 4,825.7	$ 31,763.6	$ 27,747.9	N.D.[2]

Notes:

[1]County share based on 1979 county utilization of city sewerage facilities.

[2]No data available

Table 3-11

Capital Cost of Baltimore County Sewerage Projects thru FY1984

($1000 Units)

	FY 1980	FY 1981	FY 1982	FY 1983	FY 1984
Total Capital Cost of Projected Projects	$1,693.0	$9,475.0	$9,425.0	0	$18,100.0
Estimated EPA Share of Project Capital Cost	$1,270.0	$7,129.0	$7,069.0	0	$13,575.0
Estimated Baltimore County Share of Project Capital Cost	$ 423.0	$2,346.0	$2,356.0	0	$ 4,525.0

TABLE 3-12

DEVELOPMENT AREA SUBSIDIES THRU 1995* (UNITS OF MILLION DOLLARS)

Area	1980	1981	1982	1983	1984	1985 - 1990	1991 - 1995
Whitemarsh	0.94	0.94	0.94	0.94	0.94	4.72	6.95
Owings Mills						2.66	7.63
Total	0.94	0.94	0.94	0.94	0.94	7.38	14.58

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

TABLE 3-13

SUMMARY OF SEWER SYSTEM CAPITAL COST BY YEAR ($1000)

	1980	1981	1982	1983	1984	1985 - 1990	1991 - 1995*
Identified Baltimore County projects	423	2,346	2,356	-	4,525	-	-
County share of identified Baltimore City projects	8,977	4,826	31,764	27,748	-	-	-
Required parallel sewer interceptors	-	-	-	-	-	-	5,779
Required sewer interceptor extensions	-	-	-	-	-	1,926	2,655
Required I/I rehabilitation	500	500	500	500	-	9,500	9,500
Development area subsidies	940	940	940	940	940	7,380	1,458
Total	10,840	8,612	35,560	29,188	5,465	18,806	19,392

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

TABLE 3-14

Annual Savings from Elimination of Sewage Pumping Stations		
Pump Station Name	Service Capacity (MGD)	Annual Savings[1]
Registerswood	0.36	$1,980
Chapel Hills	0.18	990
Total		$2,970

Note:
[1]Assume average O & M cost of $5,500/MGD of Service Capacity

Source: Reference 3-9

Labor cost increases and increases in the cost of materials and supplies will spur increases in total annual costs for sewerage service. It is conceivable that the increase in annual costs will more than offset the savings realized from the elimination of pumping stations. For the purposes of this report, it has been assumed that O&M costs will increase in direct proportion to the increase in population. The 1976 cost for sewerage service O&M was approximately $2,788,500; therefore 1985 O&M costs are estimated to be $3,080,000, and by 1995*, annual costs will rise to $3,446,000. The same assumption has been applied to future County obligation for debt service on jointly-used facilities. The County spent $217,500 for debt service in 1976, therefore, it is estimated that 1985 expenditures for debt service would be approximately $240,200, and for 1995*, $268,700.

Revenues realized from the sale of treated effluent and sludge totaled $23,000 in 1976. Using the same linear increase assumption, 1985 revenues are projected to be $25,300, and 1995* revenues are projected to be $28,300.

CONCLUSIONS AND RECOMMENDATIONS

The conservative analysis presented herein may lead the reader to believe that there are serious deficiencies in the sewerage system. It should be noted that the planned detailed study by the Sewer Analyzer Office will, in all likelihood, indicate that many "deficient" areas are actually adequate to handle projected growth. That is not to say that the sewerage system is completely problem-free; on the contrary, one of the largest problems facing the County is the elimination of infiltration and inflow to the sewerage system. The County's current program of flow metering, development monitoring, model calibration, and system rehabilitation should allow them to eliminate the majority of I/I problems.

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

SECTION 4

STORMWATER MANAGEMENT*

The analysis presented herein is not intended to be an evaluation of the adequacy of each storm drainage or stormwater management facility in Baltimore County, as that level of detail is beyond the scope of this study. Nor would such an analysis be meaningful, as the County is well-aware of existing inadequacies and will proceed towards a solution as funding becomes available. The County is presently making the transition from responding to localized flooding problems to a comprehensive stormwater management policy and action plan, based on sound hydrologic and hydraulic data, that will enable the County to predict the effect of development on the hydrologic regime, and to respond in a preventative, rather than curative manner. Therefore, the purpose of this section is to identify the pathways the County should consider in order to achieve this goal.

EXISTING CONDITIONS

Baltimore County lies in six major watersheds: Patapsco River, Gwynns Falls, Gunpowder River, Jones Falls, Back River, and Bird River. Major tributaries to these watercourses include: Beaver Dam Run, Dead Run, Herbert Run (including the East and West Branches), Honeygo Run, Redhouse Run, Roland Run, Stemmers Run, Whitemarsh Run, and numerous other smaller-order tributaries.

Several of these streams have been studied in the past (References 4-1 to 4-11); the reader is referred to these documents for detailed information on those areas.

Problem Areas

Several areas have been identified by the County as having runoff problems which could become more serious without proper planning and/or stormwater management. These areas are described below:

Gwynns Falls Watershed

Along Gwynns Falls, there are numerous properties within the 100-year floodplain that will not be removed in the near future, and there are several commercial properties within the floodplain that are not scheduled for removal. It is anticipated that the stormwater detention facilities proposed in Reference 4-2 will provide adequate protection to these properties. In addition, there are several inadequately-sized bridges and culverts along the stream.

Within the Dead Run basin, there is commercial property located within the 100-year floodplain near the City line; removal of these buildings is not anticipated. In addition, delineation of the 100-year floodplain is needed.

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management

On Maiden Choice Run, culverts at Ingleside Avenue and Stoney Lane are inadequate, the culvert under the Beltway is believed to be inadequate, and downstream of the Beltway, the culvert that carries the stream is also inadequate.

Patapsco River Watershed

The bridges across the Patapsco River at Patapsco Avenue and Hanover Avenue within the City are inadequate, there is a commercial establishment in Anne Arundel County at Hammonds Ferry Road and the Beltway that lies within the 100-year floodplain, and there are numerous residential and commercial properties situated within the 100-year floodplain, both in the City and in the County. There are numerous other bridges across the Patapsco River between Baltimore and Anne Arundel County that are known to be inadequate. A study is presently underway to define the limits of flooding on the Patapsco River.

There are residential properties along both the East and West Branches of Herbert Run that are located in the floodplain. In addition, several of the drainage structures are inadequate and there are erosion and flooding problems in several areas. There are also residential and commercial properties in the floodplain along the tributary to Lansdowne.

Gunpowder Falls Watershed

The bridges over the Gunpowder at Route 40, Route 7, Route 1, Sparks Road and Glencoe Road are inadequate; however, there are no plans to improve these structures at the present time. There are also several other structures on the Gunpowder known to be inadequate. Several areas have also been flooded; in Gunpowder State Park, these include a historical building and a maintenance building. Along Beaverdam Run, numerous properties are located within the 100-year floodplain.

On Western Run, the drainage structures at Mantua Mill Road, Cuba Road, York Road, and Ashland Road are inadequate. Western Run Road is within the 100-year floodplain, as are commercial and residential properties at York Road, Ashland Avenue, and opposite Thornton Mill Road.

Existing problems on Oregon Branch have not been precisely defined, but it is known that York Road is flooded during a 100-year storm, numerous buildings along York Road are within the 100-year floodplain, commercial buildings from York Road to Route I-83 are within the floodplain, and homes at Baisman Run and Beaverdam Run are in the floodplain.

There are several inadequate culverts in the watershed, including: Piney Grove Road and Belmont Road over Delaware Run, Longnecker Road at both Slade Run and Longnecker Run, Butler Road over McGill Run (where farm buildings may be in the 100-year floodplain), Mantua Mill Road at Piney Run, Western Run Road and Stringtown Road over Black Rock Run, and on Indian Run at the intersection of Falls Road and Stringtown Road. In addition, portions of Falls Road along Black Rock Run and Indian Run are located within the 100-year floodplain, a building at Falls Road and Black Rock Road is in the floodplain, and eight homes on Bean Run are located in the floodplain.

Bird River Watershed

The culvert at Ebenezer Road and Whitemarsh Run is inadequate. Numerous properties along Honeygo Run at Cowenton Avenue, Route 40, and Route 7 have been flooded, and two homes along a tributary to Honeygo Run at Red Lion Road and Route 40 have been flooded due to an inadequately-sized culvert.

Back River Watershed

Homes and commercial property at Golden Ring Road, Orems Road, Route 40 and Trumps Mill Road are located in the floodplain and have experienced flooding problems in the past. The northernmost ramp of the I-695 and Route 702 interchange is located within the floodplain. The Martin Boulevard culvert at Brien Run is inadequate, causing occasional flooding of nearby homes.

On Redhouse Run, approximately 111 homes and 19 commercial buildings are located in the floodplain, and the Route 40 and Route 7 culverts are inadequate. Based on a recently completed floodplain study, proposed acquisition and channel improvements would alleviate the flooding to all homes and all but eight commercial buildings. There are 23 homes in the floodplain of Moores Run at Biddle Street and 62nd Street.

Jones Falls Watershed

The Bellona Avenue Bridge over Towson Run is inadequate. There are approximately 45 homes in the 100-year floodplain of Roland Run, and three in the Deep Run floodplain at Brooklandville. Several other hydraulic structures in this watershed are also known to be inadequate.

The preceding list is not intended to be a comprehensive list of runoff problems in Baltimore County. It should be realized that many other bridges and culverts over the streams in rural and urban areas are inadequate and cause problems similar to those found in the urban areas.

Alternatives

There are several mechanisms at the County's disposal to deal with these problem areas: enlarge the drainage structures at critical locations, provide on-site or regional runoff management impoundments, and remove the flood-prone properties from the floodplain. Baltimore County has traditionally resorted to the first alternative, i.e., enlarging culverts; but in recent years, has developed a stormwater management facility policy and a floodplain acquisition program.

The goal of Baltimore County's stormwater management program is to control the rate of stormwater runoff from developing areas. As stated in Reference 4-12, the policy is that the hydrologic design criteria shall be that all new subdivisions, commercial, industrial or institutional sites will provide on-site control of the increase in runoff due to development. The release rate for the 2-, 10-, and 100-year frequency design storms shall equal the predevelopment runoff rates for these frequencies.

The methods of achieving this goal shall be at the discretion of the developer's engineer and may include sub-surface storage, rooftop storage, parking lot storage, seepage pits, storage in swales or open channels, dry ponds, permanent pool ponds, or other approved methods; however, the method of determining the peak discharge and required volume of storage shall be consistent with U.S. Soil Conservation Service criteria.

Baltimore County initiated a floodplain acquisition program in 1975 to obtain and remove properties located in the 100-year floodplain of the major streams in the County. The initial objectives of this program were: public property protection; a decrease in annual demands for public funds for emergency relief; to develop new legislation, regulations, policies, and codes to more adequately manage stormwater flows; preserve natural storage; increase storage volume; and to remove structures that could contribute debris and cause the clogging of drainage structures. The floodplain acquisition program has been focused on seven watersheds: Herbert Run, Herring Run, Dead Run, Gwynns Falls, Stemmers Run, Redhouse Run, and Jones Falls. Between September, 1976 and April, 1978, the County has purchased 103 homes, some of which were resold at substantial discount for subsequent relocation to higher elevations (Reference 4-13). When the program began, it was anticipated that it would cost approximately $27 million between 1976 and 1981. Approximately $6 million has been spent to date (Reference 4-14).

FUTURE STORMWATER MANAGEMENT NEEDS

The implementation of a comprehensive stormwater management policy requires that the County be able to assess the impact of Master Plan development on the hydrologic and hydraulic regimes of the streams in the County. This can be done through the development of an existing conditions data base against which future impacts can be assessed, and through the development of an interactive analysis tool with which the assessment can be accomplished. This is of greater importance in the higher frequency, landscaping storm events (i.e., 2-, 5-, and 10-year recurrence interval) than in the relatively rarer, flood-producing events (i.e, the 100-year storm), because the data base for the latter category already exists (for the most part) as a result of the numerous previous studies, and through the work of the Flood Control Task Force. In any case, once the flood-prone properties have been removed from the hazard areas, future development in the 100-year floodplain will be in violation of both County and State regulations.

The emphasis in the next few years must be on the development of a county-wide data base and implementation of the appropriate analytical tools that will enable an assessment of future Master Plan development impacts, a process currently underway. The County is currently using the Soil Conservation Service TR-20 hydrograph model to determine expected stormwater flows and the Corps of Engineers HEC-2 hydraulic model to determine runoff elevations. They are now actively developing basin-wide data bases with the TR-20 model and are using the model to analyze stormwater management facilities and changes in watersheds from development (Reference 4-15).

The problem is that use of these tools is still somewhat piecemeal; the real need is to establish a coherent framework for data base development and utilization.

Data Base Requirements

A problem of data base collection lies in the level of detail required or desirable for any given size of watershed. The relative level of detail required for a given degree of accuracy is approximately constant in relation to the total area under consideration; i.e. a study for a large watershed will have about as many data points as one for a small watershed, but the data for the large watershed will cover larger subareas than those for the smaller. While some sensitivity studies have been made of both of the computer programs the County has selected for its use (TR-20 and HEC-2), sufficient data are not available to permit a precise formulation of data requirements.

The implications of the above considerations are that, in order to assure the availability of a data base sufficiently detailed to be useful for small watersheds, the data must be based on a small data cell, preferably about two acres or less, and that studies of larger areas must either process a massive quantity of data, or have some means of aggregating and generalizing the detailed data so as to permit the execution of the computer programs in an economical timespan. A further problem in data-base compilation lies in the input requirements idiosyncratic to each program. TR-20, for example, requires data regarding areas, rainfall, soils, channel velocities, and hydraulic characteristics of structures; HEC-2 requires data relating to runoff rates, channel morphology and structural hydraulic characteristics. These two programs have only one data set in common, and should other modeling methods be used, they in turn will present their own requirements. The ideal data base would have the following characteristics:

(1) Completeness: It should cover the entire county, in fine grain.

(2) Transferability: It should be directly usable by a variety of data processing methods, ranging from high-level electronic computer programs down to manual calculations.

(3) Accessibility: Any data item for any data cell should be available on a random or semi-random basis.

(4) Flexibility: The data should be stored in such a fashion that the information can be accessed in various ways - for example, by a program which uses a triangular cell rather than a rectangular cell.

Such a data base would be extremely expensive to obtain on a County-wide basis; however, the data base should be arranged to have a variable cell size. At first, the data on most cells will be very coarse-grained, but such cells can be subdivided as required for each individual study and the finer-grained detail stored instead. In this way, only the detailed data required up to a given time will have been entered into the system and unnecessary expense will not have been incurred for unrequired data acquisitions.

The level of output detail required for stormwater management will vary greatly, depending on the purpose of any particular requirement. In some cases, the data will be used for analysis to pin point the cause of some particular problem, or to analyze the effect of some proposed change in existing or future conditions; in other cases, the output will be used for the design of an actual structure. This implies that different approaches should be used in the data processing phase, depending on the intended application of the output from the system.

The purpose of any data processing (DP) operation falls into one of three types: statistical; analytical; or design. At present, there is an abundance of statistical DP programs available. Numerous analytical programs exist for use at a variety of levels of both computer and user sophistication. Unfortunately, there are very few design-oriented programs available at any level, and the few that exist are modifications of existing analytical approaches.

A prime consideration in design is turnaround time. The designer requires rapid feedback from any data processing operation, so that he may make a decision; the longer the turnaround time, the less acceptance the operation will have, and the less economical it becomes. For this reason, most existing design programs share a number of features: they tend to be relatively short, which permits faster execution, or execution on a smaller (and hence less expensive) machine; they use relatively little data, and permit easy change of any given parameter; and their output is not highly detailed unless such detail is specifically requested.

The present County approach of using only TR-20 and HEC-2, for hydrology and hydraulics respectively, is valid for the analysis of large watersheds, but is of questionable value in the case of smaller areas.

PROJECTED FUTURE COSTS

Costs for stormwater management during the GCMP planning period will fall into three general categories: structural improvements in various areas to alleviate existing floodplain conditions, continued expenditures for the floodplain acquisition program, and future watershed studies necessary to support the development of the comprehensive stormwater management program. The estimated future costs for these various components are shown in Table 4-1. It is estimated that total County obligations over the GMP planning period will be on the order of $140 million.

Approximately $58,921,000 will be needed to finance storm drainage improvements to correct existing deficiencies, to provide funds for planning and acquisition of sites for proposed major storm drains, to provide funds for extending storm drainage systems downstream of new developments (the developer finances storm drainage facilities within new developments), and to provide short extensions to facilities where increased development has rendered those facilities inadequate.

As noted previously, the floodplain acquisition program was initially programmed for completion by 1981. Because only $6 million of the allotted $27 million has been expended to date (Reference 4-14), it was assumed that the remainder would be expended in the next two fiscal years. This is a conservative assumption, as it appears probable that the time frame for completing this program would be extended beyond FY 1981, however, data regarding future years' funding was not available. In addition, it has been estimated that the County could spend approximately $1,000,000 per year, over the GMP planning period, for continued watershed studies and data base development and implementation. Stormwater management activites in Baltimore County are not concentrated in any one particular department, therefore an analysis of expected future annual costs was not possible within the scope of this study.

TABLE 4-1

PROJECTED COSTS FOR FLOOD CONTROL, STORM DRAINAGE AND RELATED AREAS

($1000)

CATEGORY	FY 1980	FY 1981	FY 1982	FY 1983	FY 1984	1985-1990	1990-1995
Correction of Existing Flooding Problems							
1. Patapsco R. Watershed	376	695	1,484	1,680	996	300	N.D.[1]
2. Gwynns Falls Watershed	1,056	1,000	2,867	4,150	1,216	395	N.D.[1]
3. Gunpowder R. Watershed	100	100	530	380	-	-	N.D.[1]
4. Jones Falls Watershed	500	500	1,000	1,513	470	1,130	N.D.[1]
5. Back River Watershed	1,190	993	2,632	2,000	2,145	2,873	N.D.[1]
6. Bird River Watershed	150	100	50	475	655	620	N.D.[1]
Major Projects Planning and Site Acquisition	50	50	-	-	-	-	-
Subdivision Storm Drains[2]	3,500	3,500	3,500	3,500	3,500	17,500	17,500
Short Extensions	1,000	1,000	1,000	1,000	1,000	5,000	5,000
Floodplain Acquisition Program[3]	10,000	11,000	-	-	-	-	-
Watershed Studies	1,000	1,000	1,000	1,000	1,000	5,000	5,000
TOTAL	18,922	19,938	14,063	15,698	10,982	32,818	27,500

NOTES: 1. No data available
2. Costs are for non-developer funded storm drainage projects
3. Source is Reference 4-14

SOURCE: Reference 4-16.

RECOMMENDATIONS

Data Base

The County should continue to collect data as it is now doing. However, consideration should be given to providing a means of changing the structure of the data base when desired, preferably by way of an electronic data processing manipulation of the data base.

Output

A clear distinction should be made between analytical and design output. This will encourage the use and development of appropriate tools for the processing of data to achieve the desired output at minimal cost.

Data Processing

Consideration should be given to the use of "cut-down" versions of TR-20 and HEC-2, to improve speed and economy. Iterative, goal-seeking subroutines should be incorporated in design-oriented versions of these programs, and unnecessary output suppressed or eliminated. A comparison of some of the more commonly used programs is presented in Table 4-2.

TABLE 4-2

COMPARISON OF ALTERNATIVE SWM METHODOLOGIES

	Data Base Requirement			Level of Output Detail for SWM			Computational Power Required					Applicability To SWM			Economy Of Operation			
Method	Min.	Avg.	High	Min.	Avg.	High	Manual	Calc.[2]	Mini.[3]	T/S[4]	Batch[5]	Unac.	Acc.	Exc.	Cheap	Avg.	Exp.	Remarks
Rational	x			x			x					x			x			Does not yield data usable for SWM (peaks only).
TR-55	x				x			x	x[1]				x			x		Short-cut adaptation of TR-20; in common use.
TR-20		x	x			x			x	x	x			x			x	Developed specifically for watershed management & design; can be relatively easily modified for T/S & minicomputer use.
HEC-1		x	x		x					x	x		x				x	Analogous to TR-20. Difficult to modify for T/S.
HEC-2			x		x					x	x		x				x	Uses data generated by HEC-1 to compute water profiles in channels; Does not generate reservoir levels.
WSP-2		x			x				x[1]	x	x		x				x	Analogous to HEC-2; can be modified for T/S.
HYDROCOMP			x			x					x			x			x	Proprietary; requires extensions calibration.
SWMM			x			x					x			x			x	Rarely used in this area.
STANFORD			x			x					x			x			x	Rarely used in this area.

Notes: [1]Program can be adapted to run on microcomputer
[2]Hand-held calculator
[3]Mini-computer (128Kx16 bit RAM) or Micro-computer (64K x 8 bit RAM)
[4]Time-sharing on mainframe computer (CDC 6600 or equivalent)
[5]Batch processing on mainframe computer

SECTION 5

SOLID WASTE MANAGEMENT*

The essential issue of solid waste management services in Baltimore County is not whether the Master Plan has more or less impact than some other pattern for growth, or whether the collection services can be provided (they can), but rather, will the facilities proposed in the 10-year Solid Waste Management Plan be available in time to receive, handle and dispose of the refuse? The facilities proposed in this plan, (Reference 5-1) are shown in Figure 5-1 and include two new landfills in the northern and eastern sectors of the county, to provide capacity for disposal of residuals from the (existing) Texas Reclamation Facility and the proposed Eastern Reclamation Facility, respectively, and the Northwestern Transfer Station, to accept wastes now disposed of at the Hernwood Landfill, for transfer to the Texas or Eastern Reclamation Facilities. The new transfer station in the northwest, coupled with the two reclamation facilities and their adjacent residual disposal landfills represent a logical and cost-effective framework for solid waste management over the 20-year period ahead.

The problem ahead lies in whether the framework facilities will be available on time, inasmuch as:

(1) The presently available landfill capacity in the County at Hernwood and Parkton will likely be exhausted by the end of 1982.

(2) Sites have not been selected for any of the key facilities (viz., the transfer station, the new reclamation facility and the two landfills), despite (in the case of the transfer station) a very prolonged effort to this end.

(3) Even with near-term resolution of the siting issue - hopeful at best - it is unlikely that the new reclamation facility can be operational much earlier than 1985, given the developmental status of much of the technology involved.

(4) The capital investment involved (as discussed at the end of this section) is of sufficient magnitude that it is unlikely that the County can finance these improvements through General Obligation Bonds before 1981.

In this latter regard the performance schedule in the plan may be maintainable by financing the bulk of the improvements (i.e., the Eastern Reclamation Facility) through State revenue bonds coupled with a Federal grant; however, the State revenue bonds involve greater long-term costs to the County.

Perhaps the single greatest issue on the pathway to the necessary facilities for the future is the siting issue. The public unwillingness to accept the location of the needed facilities in their midst is a much greater determinant of where the facilities will ultimately be placed than is the issue of meeting the

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

TABLE 5-1

SOLID WASTE GENERATION COEFFICIENTS

TYPE	YEAR	NET COEFFICIENT[1]
DOMESTIC	1985	3.12 lb/cap/day
	1995*	3.12 lb/cap/day
COMMERCIAL	1985	0.545 tons/acre/day
	1995*	0.450 tons/acre/day

NOTES: [1] Assumes increasing levels of reclamation from 1985 to 1995*, before collection

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

plethora of siting criteria offered by all levels of government. Experience in Baltimore County and elsewhere has shown that there is neither a perfect site nor a perfect set of criteria. There is no other option but to proceed on the premise that any site ultimately selected will be the least undesirable - rather than the most desirable.

ANALYSIS

The primary objective of the analysis herein was to estimate, on a preliminary basis, the capacity requirements imposed on the key facilities by the residential development and commercial activity associated with the Master Plan. The basic elements used in structuring the analysis were: (1) the projected population distributions and central area commercial acreage by RPD (Regional Planning Districts) for the years 1985 and 1995*, and (2) the assumption that all proposed facilities in the 10-year plan would be on-line by 1985. The analysis focused on solid waste generation from residential (domestic) and commercial sources, the latter including some "light" industry. Special wastes and other industrial wastes have created a need for a hazardous waste landfill, which is not included in the 10-year plan. This facility would have to be designated by the State Departments of Health and Natural Resources. It is unknown if the County will pursue this course, as the policy to date has been to treat industrial wastes as a private sector problem.

METHODOLOGY

Sources and Characteristics

Background information presented in the 1973 Weston report (Reference 5-2) and the assumptions below were used to establish the residential and commercial solid waste generation coefficients presented in Table 5-1.

(1) The coefficients are expressed as "net", i.e., adjusted to reflect the assumption that increasing levels of reclamation would take place over time, before collection. This "internal" impact is assumed to be far greater for commercial refuse (over 60 percent of which is paper) than for residential refuse.

(2) The net residential coefficient of 3.12 lb/capita/day includes a base residential coefficient of 2.4 lbs/capita/day, increased by 30% to account for "other residuals" (Reference 5-2). Also, the net residential coefficient is assumed to remain constant from 1985 to 1995*, i.e., the projected increase in the gross per capita coefficient (1 to 2 percent annually, per Reference 5-2) is assumed to be offset by increased reclamation prior to collection.

(3) It was additionally assumed as a simplification for the analysis that both residential and commercial solid wastes are fully (100%) processable at a county

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

reclamation facility; current estimates are that residential and commercial wastes are approximately 95 and 90% processable, respectively.

Facilities

A map showing the solid waste management facilities presently operational and programmed to be operational in the 1985 to 1995* time frame is presented in Figure 5-1, as excerpted from Reference 5-1. In terms of residential and commercial solid wastes, the facilities of concern are:

(1) Existing: Texas Reclamation Facility and Southwestern Transfer Station.

(2) Programmed or Planned: Northwestern Transfer Station; Eastern Reclamation Facility; Eastern Landfill; and Northern Landfill.

The approximate maximal capacity of the site upon which the Texas Reclamation Facility is located is 1,000 tons per day, a limitation taken into account in structuring alternative routings as discussed below.

Service Sectors

The entire county was segmented into service (collection) sectors as the basis for defining the collection routes from RPD's to points of primary aggregation. The assignment of waste generation by RPD's was done by sectors of the county, with a primary aggregation point designated for each sector as indicated in Table 5-2 and illustrated in Figure 5-2. In this assignment scheme for domestic and commercial refuse (developed with the counsel of the Bureau of Sanitation, Department of Public Works):

(1) Sector 1 refuse would be transported directly to the Texas Reclamation Facility and Sector 3 refuse directly to the (future) Eastern Reclamation Facility.

(2) Refuse from Sectors 2 and 4 would be directed to the (future) Northwestern and (existing) Southwestern Transfer Stations, respectively, as primary aggregation points.

Alternative Routings

Three alternative routings were evaluated for the transfer of refuse from the Northwestern and Southwestern Transfer Stations to the Texas and Eastern Reclamation Facilities. The alternative routings were selected in anticipation that projected tonnages to the Texas Reclamation Facility would possibly exceed the assumed site-limited 1,000 ton per day capacity at Texas, and in response to the continued problems with handling certain wastes in the commercial refuse stream at Texas. The alternate routings are shown in Figures 5-3, 4 and 5. Briefly, in Alternative Routing 1, the commercial streams from the transfer stations are directed with the residential streams to the reclamation facilities; in Alternative Routing 2, the commercial streams from the Northwestern and Southwestern

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management

TABLE 5-2

ASSIGNMENT OF WASTE GENERATION

FROM RPD'S BY PRIMARY AGGREGATION POINT

SECTOR NO.	RPD'S	AGGREGATION POINT	CATEGORIZE BY
1.	301 302 304 305 307(half) 308 309 310 313(half) 314 315	Texas Reclamation Facility	ADP, 1985, 1995, Domestic, Commercial
2.	303 306 307(half) 311 312 313(half) 319	Northwest Transfer Station	ADP, 1985, 1995, Domestic, Commercial
3.	316 317 318 320 321 322 326 327 328 329 330 331	Eastern Reclamation Facility	ADP, 1985, 1995, Domestic, Commercial
4.	323 324 325	Southwest Transfer Station	

Note: ADP = alternative development plan (second generation test plan)

Transfer Stations are directed to the Eastern Reclamation Facility, and in Alternative Routing 3, the commercial streams from all sectors are directed to the Eastern Reclamation Facility. The Alternative Routing 3 reflects the anticipated future operational pattern in the County, whereas the other routings reflect various combinations of routing.

Residual Factors

The term "residual factor" is used herein to connote the fraction of the refuse stream tonnage entering a reclamation facility that must be disposed to landfills as residuals, after reclaimable materials have been removed from the stream for disposition in the marketplace. Based on experience accrued from operations at the Texas Reclamation Facility, and the inherent ultimate design capabilities of this facility, it is understood that (1) facilities of this type are inherently capable of reducing tonnages requiring landfill disposal by as much as 80% (equivalent to a residual factor of 0.20), but (2) operating experience to date has indicated that about five percent of the reclaimed tonnage can be marketed, meaning that 95% must be disposed to landfill after on-site stockpiles are saturated (equivalent to a residual factor of 0.95). Because of the uncertainty of the marketplace, and the impact of having to dispose reclaimed but unmarketable materials to landfills, it was deemed appropriate to evaluate the landfill area requirements for a range of residual factors reflecting the extremes of current experience and resource recovery potential. Three values of residual factors were selected as representative: 0.95 (current experience); 0.20 (ultimate potential); and 0.60 (mid-point situation).

RESULTS

Waste Generation

Waste generation rates (tons per day) are presented by primary aggregation point for the Alternative 1,2 and 3 routings in Tables 5-3 and 5-4 respectively. Several observations can be made from the analysis:

(1) The total domestic tonnages generated will increase from 1,183 tons/day in 1985 to 1,320 tons/day by 1995*.

(2) The total commercial tonnages generated will increase from 1,094 tons/day in 1985 to 1,363 tons/day.

(3) Accordingly, the total tonnages considered herein will increase from 2,277 tons/day in 1985 to 2,683 tons/day by 1995* approximately half of which are of domestic origin and half of commercial origin.

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

TABLE 5-3

ESTIMATED DOMESTIC AND COMMERCIAL SOLID WASTE GENERATION BY SECTOR

ALTERNATIVE ROUTING 1 (TONS/DAY)

ROUTING	YEAR	SOURCE	SECTOR 1 TO TEXAS R.F.	SECTOR 2 TO TEXAS R.F. VIA N.W.T.S.	SECTOR 4 TO TEXAS R.F. VIA S.W.T.S.	TOTAL TO TEXAS R.F.	SECTOR 3 TO EASTERN R.F.
1	1985	Domestic	287	254	150	691	492
		Comm'l.	289	177	180	646	448
		Total	576	431	330	1,337	940
	1995	Domestic	311	334	146	791	529
		Comm'l.	356	362	163	881	482
		Total	667	696	309	1,672	1,011

TABLE 5-4

ESTIMATED DOMESTIC AND COMMERCIAL SOLID WASTE GENERATION

ALTERNATIVE ROUTINGS 2 AND 3 (TONS/DAY)

			TO TEXAS RECL. FACILITY			TO EASTERN RECL. FACILITY			
ALTERNATE ROUTING	YEAR	SOURCE	FROM SECTORS 1,2 & 4	FROM SECTOR 1	TOTAL	FROM SECTOR 3	FROM SECTORS 2,3 & 4	FROM SECTORS 1,2,3, & 4	TOTAL
2	1985	Domestic	691	-	691	492	-	-	492
		Comm'l.	-	289	289	-	805	-	805
		Total			980				1,297
	1995	Domestic	791	-	791	529	-	-	529
		Comm'l.	-	356	356	-	1,007	-	1,007
		Total			1,147				1,536
3	1985	Domestic	691	-	691	492	-	-	492
		Comm'l.	-	-	0	-	-	1,094	1,094
		Total			691				1,586
	1995	Domestic	791	-	791	529	-	-	529
		Comm'l.	-	-	0	-	-	1,363	1,363
		Total			791				1,892

TABLE 5-5

SOLID WASTE DELIVERIES BY ALTERNATIVE ROUTING

(TONS/DAY)

ALTERNATIVE ROUTING	YEAR	RESIDUAL FACTOR	TO NORTHERN L.F. FROM TEXAS R.F.	TO EASTERN L.F. FROM TEXAS R.F.
1	1985	0.95	1,270	893
		0.60	802	564
		0.20	267	188
	1995	0.95	1,588	960
		0.60	1,003	607
		0.20	334	202
2	1985	0.95	931	1,232
		0.60	588	778
		0.20	196	259
	1995	0.95	1,090	1,459
		0.60	688	922
		0.20	229	307
3	1985	0.95	656	1,507
		0.60	415	952
		0.20	138	317
	1995	0.95	751	1,797
		0.60	475	1,135
		0.20	158	378

TABLE 5-6

IMPACT OF MARKETABILITY ON HAUL COSTS

FROM RECLAMATION FACILITIES TO LAND FILLS

YEAR	TOTAL DAILY TONNAGES TO RECLAMATION FACILITIES	ANNUAL HAUL COST, ($1000 UNITS/YEAR) @ 0.95 RESIDUAL FACTOR	@ 0.20 RESIDUAL FACTOR	HAUL COST SAVINGS
1985	2,277	$868.5	$183.2	$685.3
1995	2,683	$1,023.0	$215.2	$807.8

Note: Haul costs from reclamation facilities to landfills computed for assumed 5-mile haul distances at $0.22 per ton-mile (1979 cost basis)

TABLE 5-7

IMPACT OF LANDFILL LOCATIONS ON HAUL COSTS

FROM RECLAMATION FACILITIES TO LANDFILLS

ALTERNATIVE ROUTING	YEAR	ANNUAL HAUL COSTS, $1000 UNITS/MILE/YEAR NORTHERN LANDFILL	EASTERN LANDFILL	TOTAL
1	1985	102.0	71.7	173.7
	1995	127.5	77.1	204.6
2	1985	74.8	98.9	173.7
	1995	87.4	117.2	204.6
3	1985	52.7	121.0	173.7
	1995	60.3	144.3	204.6

Note: Assumes current residual factor @ 0.95, and haul cost at $0.22 per ton mile (1979 cost basis)

(4) With Alternative Routing 1, the daily tonnage deliveries to the Texas Reclamation Facility exceed the site-limited capacity of 1,000 tons/day by 34 percent (1985 case) and by 67 percent (1995* case).

(5) Even with Alternative Routing 2 (intended to relieve some of the commercial loadings to the Texas Facility), the site-limited capacity of this facility is exceeded by as much as 15 percent in the 1995* case.

(6) With Alternative Routing 3, the tonnages to Texas are well within the 1,000 tons/day limit.

Landfill Deliveries

The deliveries of residual solid wastes to the landfills from the reclamation facilities will vary with the alternative routing and residual factor, as illustrated by the results presented in Table 5-5. Of the two variables, the residual factor is the most important, inasmuch as the quantity of residuals delivered is directly proportional to the assumed residual factor. A nearly 80% reduction in delivery quantity would be possible in each test case if the marketplaces were available for all of the reclaimable materials. The marketplaces are evolving slowly with time, but are insignificant at present. The direct result of this in the County is that the expected life of the Parkton Landfill - originally planned in anticipation of the rapid development of the required marketplace - is being foreshortened several-fold.

Haul Costs

In addition to the impact on landfill life expectancy, the absence of marketplaces for reclaimable materials causes increased haul costs from the reclamation facilities to their respective satellite landfills.

An exemplification of the resultant savings in haul costs when reclaimable materials do not have to be hauled to landfills is presented in Table 5-6, for which:

(1) Haul costs (inclusive of the "empty" return trip) were estimated at $0.22 per ton per mile of one-way haul distance, based upon current (1979) cost experience in Baltimore County.

(2) The haul cost savings associated with not having to deliver reclaimables to the landfills were estimated for the case wherein maximum marketability is assumed to be attainable (reflecting a residual factor reduction of 0.95 to 0.20), and for an assumed five-mile haul distance.

As reported in Table 5-6, annual haul cost savings of nearly $700,000 could be realized by 1985, and $800,000 by 1995*, for the example of 5-mile haul distance,

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

TABLE 5-8

ESTIMATED GROSS LANDFILL AREA REQUIREMENTS

(ACREAGE OVER 20-YEAR PERIOD)

ALTERNATIVE ROUTING	RESIDUAL FACTOR	NORTHERN LANDFILL	EASTERN LANDFILL
1	0.95	1,595	965
	0.60	1,008	610
	0.20	336	203
2	0.95	1,095	1,470
	0.60	692	928
	0.20	231	309
3	0.95	758	1,808
	0.60	479	1,141
	0.20	160	381

Notes: Landfill area requirements are based on:

1. 7,250 tons/gross acre
2. 1995 delivery rates from reclamation facilities

simply if the marketplaces were available for the reclaimables such that the extra haulage to the landfills would not be required.

Yet another determinant of haul cost is the distance between the reclamation facility and its satellite landfill. To illustrate the importance of distance, haul cost savings were computed for the 1985 and 1995* tonnages to each reclamation facility by the three alternative routings. A residual factor of 0.95 was used for the analysis, and the results are presented on a per-mile basis in Table 5-7. The savings in haul cost achievable by simply locating the landfills one mile closer to their respective reclamation facilities would amount to about $174,000 annually by 1985 and $205,000 annually by 1995* (in 1979 dollars for a residual factor of 0.95). When it is considered that each $73,000 to $80,000 increment of annual savings can be used to amortize $1,000,000 worth of 30-year bonds, it is evident that the tradeoff between haul cost savings and higher per-acre purchase costs for "closer-in" landfills must be given serious consideration in the site acquisition process.

Gross Landfill Area Requirements

The tonnages delivered to landfills from the reclamation facilities were used to estimate the approximate acreages required at the Northern and Eastern Landfills. The estimates were made based upon the delivered tonnages presented in Tables 5-3 and 5-4, and the assumptions below:

(1) Design for a 20-year life, computed using the 1995* tonnage rates as representative of the average for the 1985 to 2005 time period.

(2) Assume five lifts of eight feet each can be emplaced per net acre, at an emplaced density of 0.45 ton per cu. yd.

(3) Assume four acres of land area (gross) are required to yield one acre (net) of fillable land to provide adequate area for buffering and natural screening in non-developable portions to satisfy environmental concerns.

Based upon the preceding assumption about volume emplacement, approximately 7,250 tons of compacted refuse can be emplaced per gross acre.

The gross area requirements at the Northern and Eastern Landfills were estimated for the preceding conditions, and the results are presented in Table 5-8 as a function of alternative routing and assumed residual factor. As is expected, the total acreage required is directly proportional to the residual factor assumed. The total acreage requirements at both landfills would be approximately 2,560 acres at a residual factor of 0.95 decreasing to about 1,620 acres at a residual factor of 0.60 and 540 acres at a a factor of 0.20.

The County should be aware that it could become heir-apparent to the problem of providing landfill disposal capacity for residual solids from regional wastewater treatment plants. While this is an issue for Facilities Planning, consideration was also given to the landfill acreage requirements for sludge acceptance should it be required. The estimated acreage requirements would vary from as little as 100 acres if incineration of the sludge at the plants is found cost-effective to as much as 1,100 acres if not, over the 20-year period.

*It should be noted that the plan period extends only through 1990; improvements required in subsequent years are presented for reference in growth management monitoring.

TABLE 5-9

SOLID WASTE MANAGEMENT CAPITAL EXPENDITURES

PROJECT	FY 1980	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985	TOTAL
1. SW Transfer Station and Texas Reclamation Facility	$460,000						$460,000
2. Refuse Disposal Facilities at Hernwood Sanitary Land-fill	$736,000	$300,000	$150,000	$150,000	$100,000	$100,000	$1,536,000
3. Refuse Disposal Facilities at Parkton Sanitary Land-fill	$666,000	$350,000	$250,000	$250,000	$100,000	$100,000	$1,716,000
4. Northern and Eastern Area Refuse Disposal Facili-ties and Eastern Reclama-tion Facility	$3,000,000[1]	$1,500,000	$1,500,000	$600,000	$600,000	$600,000	$7,800,000
TOTAL COUNTY COST	$4,862,000	$2,150,000	$1,900,000	$1,000,000	$800,000	$800,000	$11,512,000
State Funds for Project No. 4 Above	-	$10,000,000	$25,000,000	$25,000,000	$10,000,000	-	$70,000,000

[1]These funds are in reserve from a previous bond issue for landfill development.

PROJECTED SOLID WASTE MANAGEMENT COSTS

Estimates of expected capital expenditures for solid waste management facilities are shown in Table 5-9. These projects include: additional work needed at the Texas Reclamation Facility, additional work at the Parkton and Hernwood sanitary landfills, and the development of new sanitary landfills in the northern and eastern sectors of the County, and a new Eastern Reclamation Facility. It has been estimated that the County may have to spend $11,512,000 between 1980 and 1985 for the requisite facilities, assuming that $70,000,000 in State funds can be obtained for the Eastern and Northern landfills, and for the Eastern Reclamation Facility.

Funds totalling $460,000 are allocated for improvements at the Southwestern Transfer Station and at the Texas Reclamation Facility. At the Southwestern Transfer Station, a portion of the roadway will be repaved to prolong the life of the roadway. At Texas, the homeowner's pit will be expanded to improve service provided to the citizens by decreasing waiting time during the numerous busy periods, and a scale house and scale system will be installed to enable the County to resume collection of accurate data on tonnages generated in the Southwestern sector of the county.

Additional expenditures are needed to continue the expansion of the Hernwood Sanitary Landfill by finishing the excavation of Cell #5 and the Demolition Cell, and starting the excavation of Cell #6. Part of these funds will be used for the construction of a spray irrigation system to dispose of collected leachate. This work is scheduled to be completed during FY 1980. Estimated project costs are $1,536,000 between FY 1980 and FY 1985.

It has been estimated that $1,716,000 will be needed for continuing expansion work at the Parkton Sanitary Landfill from FY 1980 to FY 1985. This work consists of finishing the excavation and preparation of Cell #2, beginning the excavation of Cell #3, and finishing the covering of Cell #1. It is anticipated that this work will be completed in FY 1980.

Approximately $7,800,000 will be needed to conduct preliminary engineering on sanitary landfill sites in the Northern and Eastern Sectors of the County, acquire the sites, engineer them, and construct them in order to accept residuals from the Texas Reclamation Facility and Eastern Reclamation Facility, to accept non-processable wastes and to serve as back-up disposal sites for the Reclamation Facilities. In addition, these funds will be used for preliminary planning associated with the Eastern Reclamation Facility, which will be located in the Eastern Sector of the County, and will accept processable residential and commercial wastes.

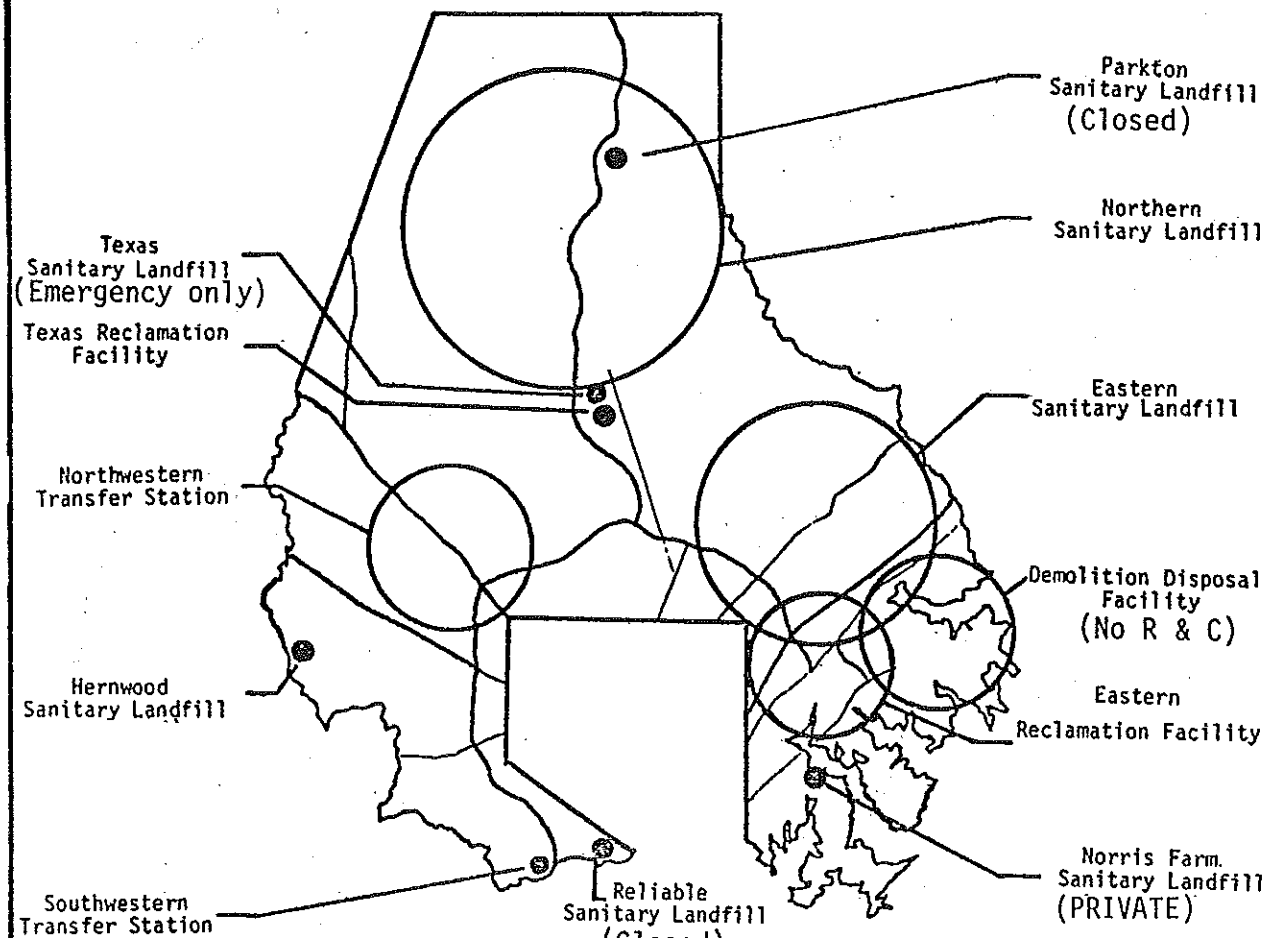
RECOMMENDATIONS

The County should proceed with the plans for improvement at the Texas facility, the expansion work for the Parkton and Hernwood Sanitary Landfills, and most importantly, with the needed site selection studies, and engineering to bring the new facilities (i.e. Northern and Eastern Landfills, Eastern Reclamation Facility and the Northwest Transfer Station) on-line at the earliest possible date. Planning for these facilities should include consideration of the quantities landfilled at Norris Farm and expected sludge residuals from the treatment plants, in the possibility that the County will incur the responsibility for disposal of these materials. It should be noted that the County has initiated a detailed planning effort to meet these concerns.

BALTIMORE COUNTY

SOLID WASTE MANAGEMENT PLAN

(1985 to 1995 Time Frame)



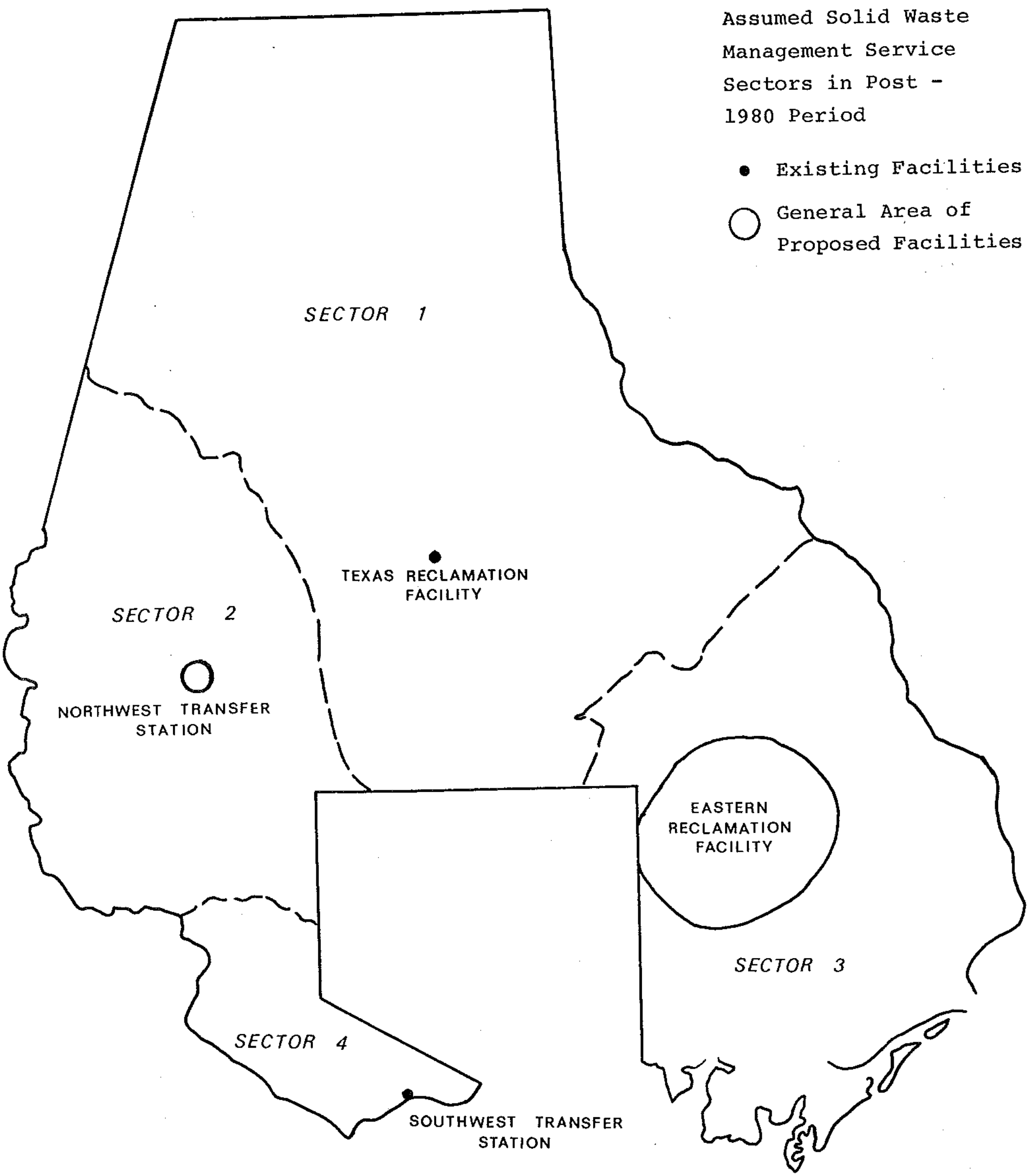
SOLID WASTE FACILITIES

PER JANUARY, 1978 AMENDMENTS AND UPDATE

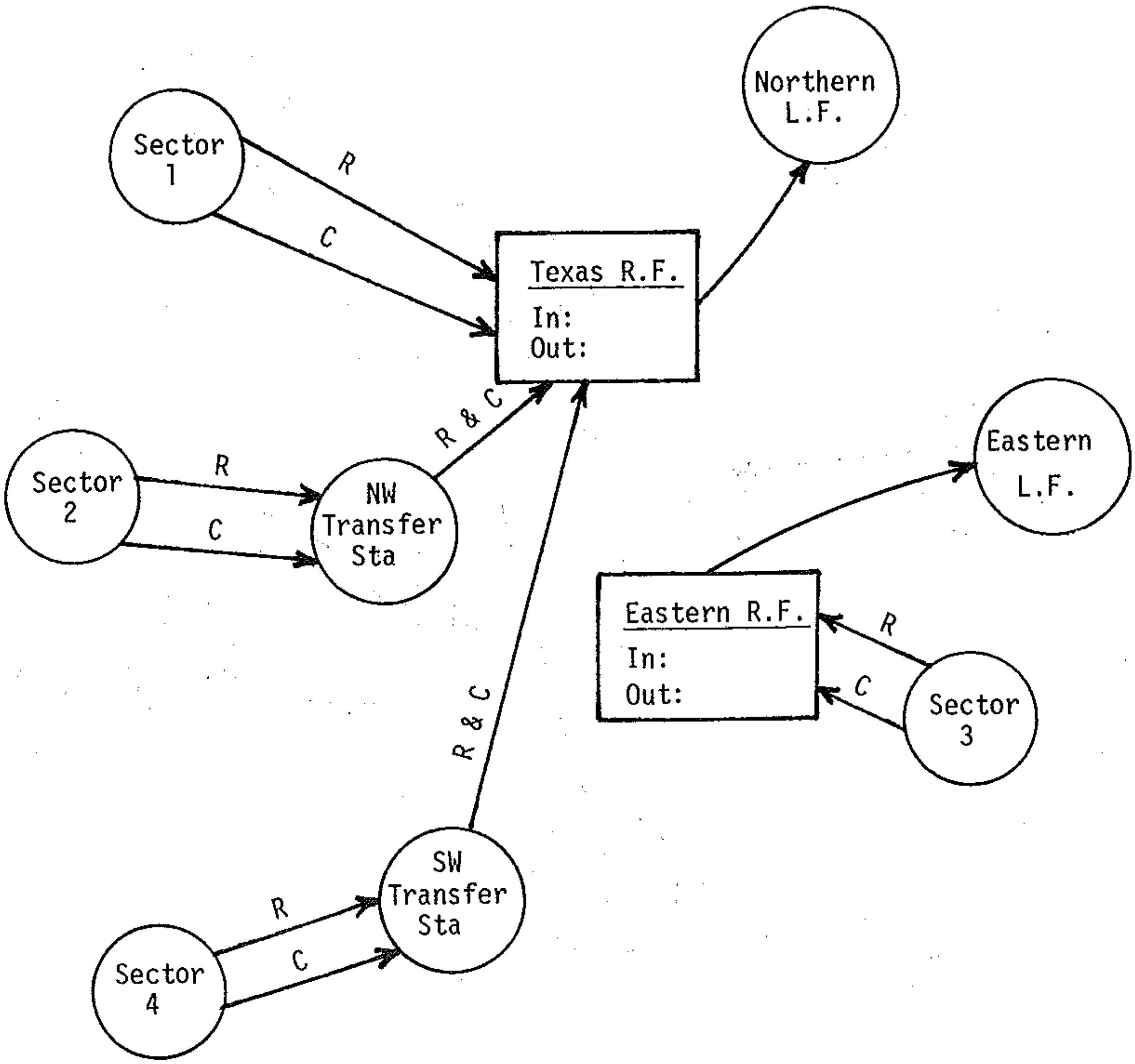
Note: R = Residential and
C = Commercial solid wastes

Figure 5-2

Assumed Solid Waste Management Service Sectors in Post - 1980 Period



ALTERNATIVE ROUTING 1

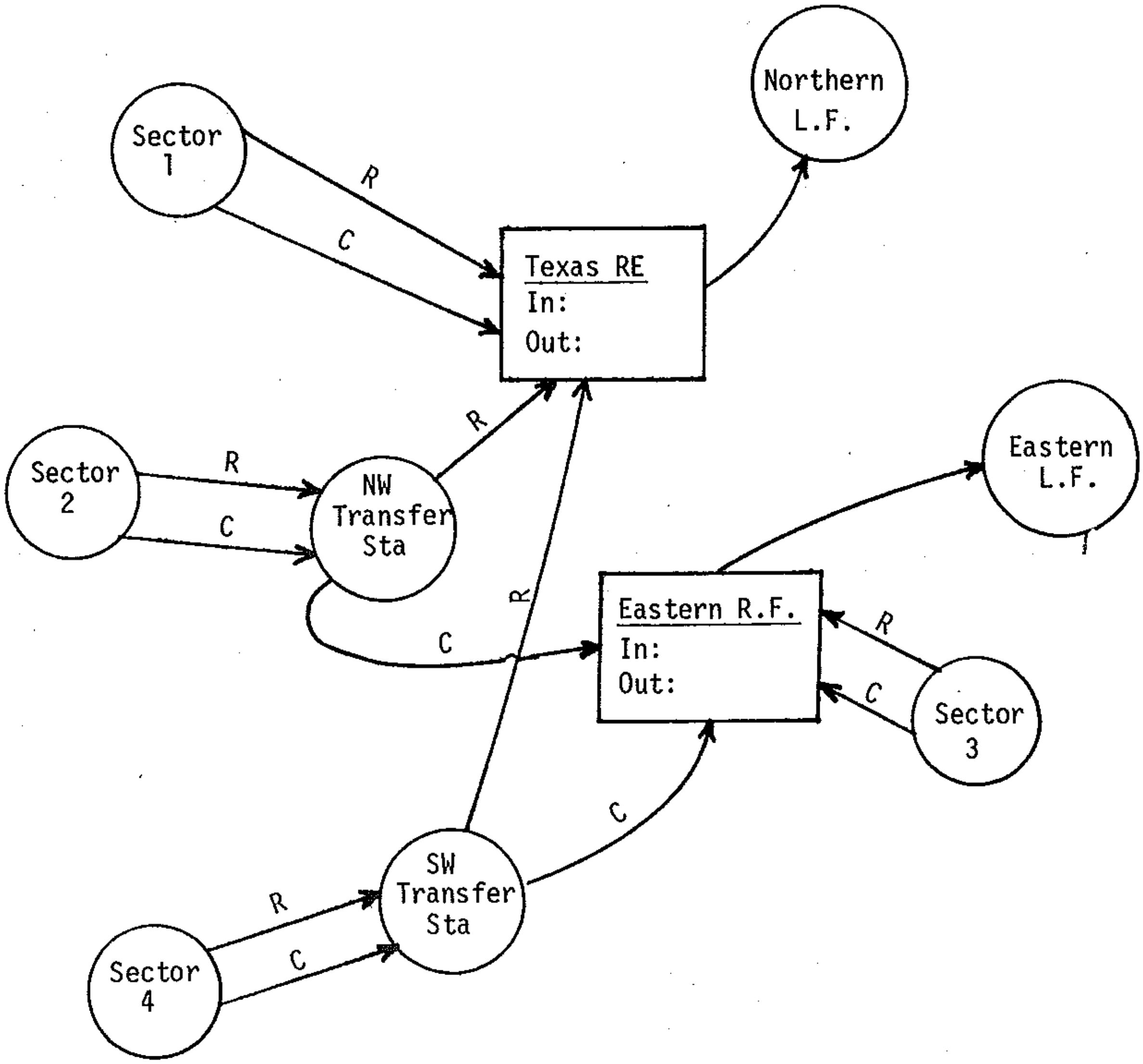


Notes: "R" connotes residential

"C" connotes commercial

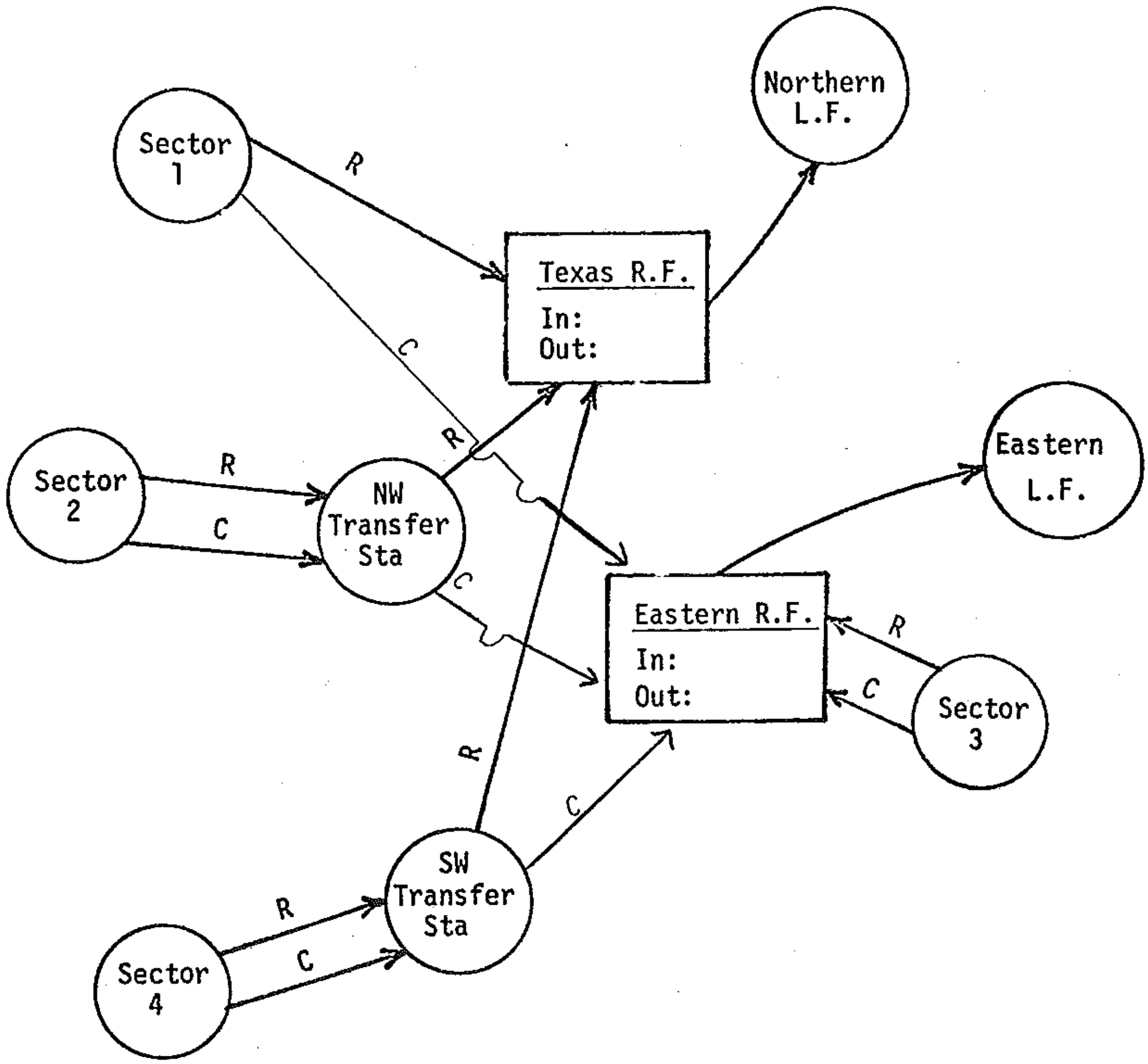
FIGURE 5-4

ALTERNATIVE ROUTING 2



Notes: "R" connotes residential
"C" connotes commercial

ALTERNATIVE ROUTING 3



Notes: "R" connotes residential

"C" connotes commercial

SECTION 6

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