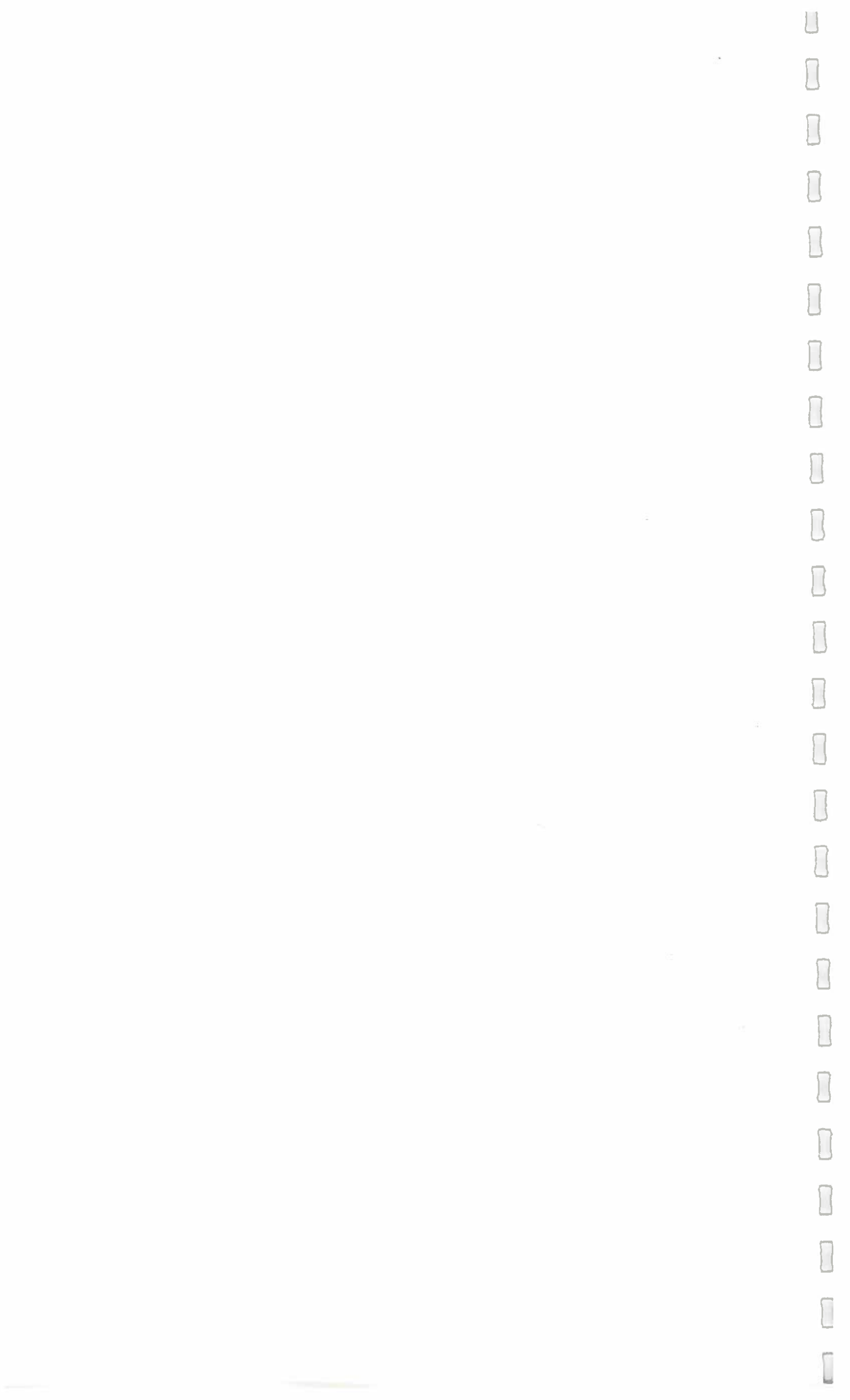
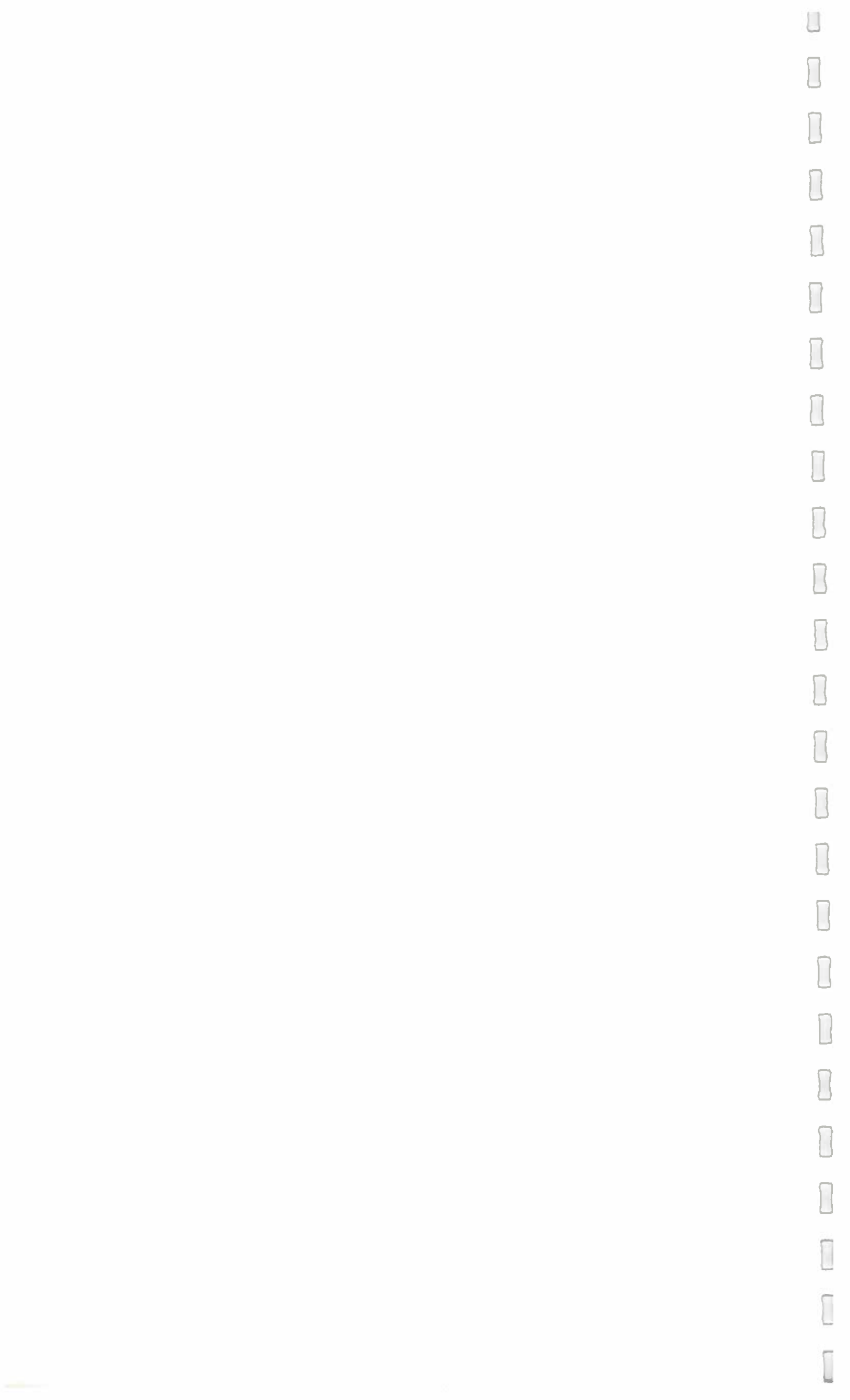


**BALTIMORE CITY  
FLOODPLAIN MANAGEMENT  
PLAN  
GWYNNNS FALLS  
WATERSHED**



# **GWYNNNS FALLS WATERSHED PLAN**



## SUMMARY OF FINDINGS AND RECOMMENDATIONS

The Gwynns Falls is the first of the drainage systems in Baltimore City for which a watershed plan has been completed. This plan addresses the flooding problems in the Gwynns Falls, and recommends cost-effective solutions to mitigate damages and enhance environmental quality.

### FINDINGS

The Gwynns Falls is one of three stream systems in Baltimore. Flooding damages occur at several locations within the Gwynns Falls watershed. The most severe damages occur in the lower Gwynns Falls (Westport/Morrell Park area), along Maiden's Choice Run, and in the upper City portion of the Gwynns Falls (Dickeyville area).

The Gwynns Falls Watershed Plan describes the natural features of the drainage area, as well as historic flood damages suffered in the area. All previous reports and studies done on the Gwynns Falls watershed relating to flood control are reviewed. On the basis of the findings and recommendations set forth in the Analysis volume of the Baltimore City Floodplain Management Plan, alternatives have been chosen to alleviate flooding damages and to develop a comprehensive plan for the Gwynns Falls watershed. Interjurisdictional coordination is an element of this plan.

### RECOMMENDATIONS

The following floodplain management strategies are recommended in the Gwynns Falls Watershed Plan:

- Two areas in the Gwynns Falls watershed have been identified as high hazard residential areas. These areas are the lower Gwynns Falls (Westport/Morrell Park area) and Maiden's Choice Run in the vicinity of Frederick Avenue and Beechfield Avenue. The Plan recommends that these properties be eligible for public acquisition on a voluntary basis. There are 66 properties in the lower Gwynns Falls and seven on Maiden's Choice Run which are considered eligible in the first phase of the residential acquisition program. The cost of purchasing these homes will be approximately 1.1 million dollars. Owners of residential structures not located in the highest hazard areas but still subject to flooding will be eligible for low-interest loans to floodproof the structure. Information on floodproofing will be sent to these owners to promote this technique. Areas where residential floodproofing may be useful include the Dickeyville area, homes near Maiden's Choice Run, and homes in areas where further studies are to be done.
- There are approximately twenty non-residential structures located in flood-prone areas in the Gwynns Falls. The Plan recommends that, in cooperation with the Army Corps of Engineers these structures be eligible for no-cost floodproofing surveys. These surveys will begin following completion of surveys in the Jones Falls Valley.
- Several flood-prone areas in the Gwynns Falls watershed have not received adequate detailed hydrologic/hydraulic study needed to formulate final plans. The Plan recommends that detailed studies be performed under the State Water Resources Administration's floodplain management program. The two areas needing study are Maiden's Choice Run and Gwynns Run.

- Although many properties in flood-prone areas of the Gwynns Falls watershed are covered by flood insurance, there remain structures uninsured under this Federal program to promote the benefits of flood insurance in the Gwynns Falls watershed. This effort will consist of mailings to property owners and renters as well as workshops and publications.
- Baltimore City has in place an existing early warning system for snow, wind, ice, flood and tornado (SWIFT). The Plan recommends that SWIFT be fully implemented in the Gwynns Falls watershed, utilizing all available data generated during this planning effort.
- Debris located in stream beds in the Gwynns Falls continues to aggravate flooding. The Plan recommends that the City's erosion control and stream stabilization program be targeted to areas where debris accumulation is a problem. In the Gwynns Falls, areas needing attention are the lower Maiden's Choice Run, the vicinity of Forest Park Avenue, and near the confluence with the Middle Branch, about two miles of stream length in total.

These recommendations are discussed in detail in the Recommended Plan section of this report.

## IMPLEMENTATION SCHEDULE

- Upgraded City building code and zoning ordinance: 1982 introduction to City Council.
- Acquisition of high hazard residential structures: Grant application for the acquisition of 66 properties in the Gwynns Falls watershed will be submitted to the State in January 1982.
- Floodproofing: Surveys by the Army Corps of Engineers will begin after completion of the program in the Jones Falls watershed (1984).  
  
Promoting residential floodproofing will begin in 1982 with informational mailings to homeowners.
- Studies of the two areas in the Gwynns Falls watershed with insufficient data should begin in 1982 under the State Water Resources Administration Program.
- Flood insurance promotion will begin in 1982 with informational mailings to property owners and occupants.
- Targeting of the erosion control/streambank stabilization program will begin with the 1983-1988 Capital Improvement Program.

# ENVIRONMENTAL DESCRIPTION

## INTRODUCTION

The Gwynns Falls is one of three stream systems in Baltimore City. Situated in the western portion of the City, it flows from Baltimore County, through the City, to its confluence with the Middle Branch of the Patapsco River. Major considerations in the development of a watershed plan are the problems of urbanization and the interjurisdictional nature of the drainage area. These considerations require the application of several distinct floodplain management strategies, whose cumulative effect will be to reduce or eliminate flood damages in a cost-effective, environmentally sound manner. These strategies will be chosen from among those selected in the Baltimore City Floodplain Management Plan Analysis.

To develop a watershed plan for the Gwynns Falls, those areas prone to flooding were first identified and characterized. Considerations included the type and severity of flooding damages existing land uses, and the nature of the stream in the given area. Recommendations were then developed, often utilizing several management strategies in order to achieve a plan which addresses short and long-term problems, financial constraints, environmental impacts, and social concerns. These recommendations are presented graphically, by strategy and by location, and are accompanied by a discussion of each recommendation.

The goal of the Gwynns Falls Watershed Plan is to provide alternatives for dealing with existing problems, and a framework for preventing future flood damages. Implementation of the plan will require adequate support and participation by all levels of government, including interjurisdictional efforts, as well as the understanding and cooperation of the citizens of Baltimore.

## GWYNNS FALLS WATERSHED DESCRIPTION

The Gwynns Falls watershed covers approximately 66 square miles in west-central Baltimore County and Baltimore City. The headwaters lie near Reisterstown, from which the Falls flows in a generally southeasterly direction to the Middle Branch of the Patapsco River. (See Map 1). The watershed is composed of nine sub-drainage areas:

1. Main stem of Gwynns Falls - 27.7 square miles
2. Maiden's Choice Run - 4.8 square miles
3. Dead Run - 8.0 square miles
4. Powder Mill Branch - 4.0 square miles
5. Scotts Level Branch - 4.0 square miles
6. Horsehead Branch - 2.1 square miles
7. Red Run - 7.6 square miles
8. Gwynns Run - 5.4 square miles
9. Unnamed tributary northwest of Red Run - 2.4 square miles

The tributaries located wholly or partially within the City boundaries are the lower portions of the main stem, Maiden's Choice Run, Dead Run, Gwynns Run and Powder Mill Branch.

The watershed area within the City of Baltimore (See Map 2) is totally developed with the exception of parkland in Carroll Park (16.3 acres) and the Gwynns Falls - Leakin Park system (1200 acres). The County portion of the watershed is nearly fully developed, between the City line and the Beltway, with medium density residential housing and scattered commercial developments. Upstream of the Beltway, the development consists of scattered residential development of low to medium density, strip commercial, institutional development and industrial sites. Approximately 70% of the watershed area is urbanized.



The Gwynns Falls watershed lies within the Piedmont and Coastal Plain Physiographic Provinces. The Piedmont Province consists of a complex series of metamorphic and igneous rock. In the Gwynns Falls and tributary valleys the major formations include the Baltimore gneiss, Cockeysville Marble, Setters Formation, members of the Wissachickon Formation, Baltimore gabbro and the Jones Falls and James Run Formation in the Laurel Belt. The drainages pattern is irregularly branching with many angular reaches and steep-sided valleys (see Map 3).

The major soils in the Piedmont Province of the Gwynns Falls drainage area are the Chester, Glenelg and Manor series. These are generally characterized as moderately fertile, with moderate infiltration rates and moisture retention, while being well-drained. These soils are well suited for agriculture but have a potential for erosion problems.

The Coastal Plain Province consists of sedimentary rocks of the Potomac Group as well as unconsolidated Lowland Deposits (gravel, sand, silt and clay). In this Province, aquifers (Patuxent and Patapsco) are present between layers of impervious clay formations. The Coastal Plain dips gently in a southeasterly direction beneath the Chesapeake Bay, on the Eastern Shore and out to the Continental Shelf. The stream valleys of the Coastal Plain are broader and flatter than those in the Piedmont Province, and the materials are of a more erodable nature.

The major Coastal Plain soils in the Gwynns Falls watershed are the Chillum, Sassafras, and Beltsville series. These soils are not naturally fertile but respond well to good agricultural management. These soils have been extensively developed for non-agricultural uses. In addition, areas in the lower portion of the Gwynns Falls, near the mouth of the stream, have undergone extensive excavation and fill, so that the natural soil profile is severely disturbed.

The Gwynns Falls watershed is traversed by the Fall Line, the transition zone between the Piedmont and the Coastal Plain. This was historically, an ideal location mills and factories which depended on water for power generation. Today, while no factories use water for power, factories as well as residential and other commercial structures are located in the vicinity of the Fall Line. Here the Falls is characterized by a rocky streambed, rapids, and relatively steep stream gradient. Although siltation has lessened the dramatic gradient changes, the Dickeyville area and mill are evidence of the former industrial value of the Falls. Today, homes and factories are situated on the banks of the Gwynns Falls and its tributaries, where flooding can be a severe problem.

Flooding damages occur at several locations within the Gwynns Falls watershed. In Baltimore County, there is a residential acquisition program to remove persons and structures from these flood hazard areas. In Baltimore City flooding damages are most severe in the Westport/Morrell Park area (89 structures flooded during Hurricane Agnes in 1972), Maiden's Choice Run (114 structures flooded in Agnes) and the Upper City portion of Gwynns Falls in the historic Dickeyville area. During Tropical Storm David, structures on the Gwynns Run, which is almost entirely in closed conveyance, received heavy damages. Maiden's Choice Run, which is also in closed conveyance in several areas, causes flooding of a major City street and residential structures during severe storms.

In the next section, those portions of the Gwynns Falls watershed which lie within the City limits will be examined to determine the kind and severity of flooding damages. Using the matrix developed in the analysis section of the plan, alternatives will be chosen to alleviate these damages and to produce a comprehensive floodplain management plan for the Gwynns Falls. The last portion of the Gwynns Falls Watershed Plan will address the interjurisdictional problems and opportunities for the Gwynns Falls. A County-City strategy will also be presented on the basis of this analysis.

## HISTORIC FLOOD DAMAGES IN THE GWYNNS FALLS

Flooding in the Gwynns Falls watershed has affected homes, businesses, factories and public lands. The recent history of flooding in the Gwynns Falls is available from several sources. These include the Baltimore Metropolitan Streams Report (U.S. Army Corps of Engineers), the Patapsco River Basin Study (Soil Conservation Service and Regional Planning Council), the Baker-Wibberley report done for the Interstate Division of Baltimore City, and various newspaper accounts.

The following account summarizes the kinds and severity of flood damages incurred, by area, during Hurricane Agnes in 1972 as well as other recent storms for which historical information is available.

1. Wilkens Avenue to the Middle Branch of the Patapsco River-

This area is predominantly industrial, although there is a small residential community in the Maisel Street area. During Agnes, an estimated 5.3 million dollars in damages was reported. 21 industries, 16 commercial structures, and 73 homes were flooded. The average annual damages computed for this area by the Corps was 137,000 dollars in 1977. Today, this figure has risen to roughly 200,000 dollars in average annual damages.

2. The Gwynns Falls from the Baltimore City Line to the confluence of Gwynns Falls and Dead Run-

During Agnes, 17 out of 19 residences, 2 commercial and 3 industrial structures were flooded, with over 300,000 dollars in damages. The residential structures are located in the Dickeyville Historic District, a preserved nineteenth-century mill town. (See Appendix for inventory of areas of historical and archeological value.) Average annual damages in 1977 were estimated at 152,726 dollars. Today this figure is approximately 223,000 dollars.

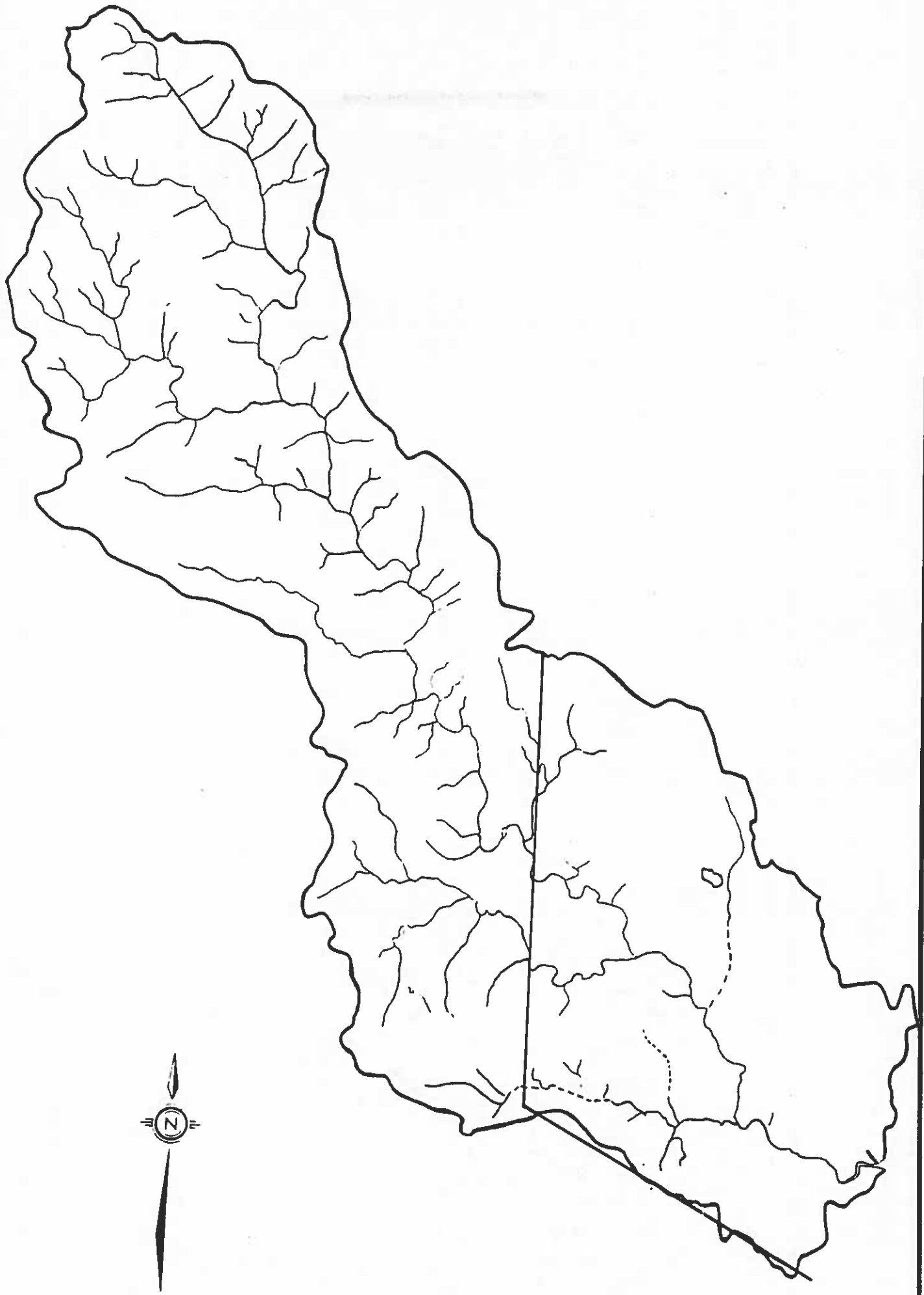
3. Maiden's Choice Run in Baltimore City-

A total of 91 residential and one commercial structures were damaged during Agnes, incurring about 400,000 dollars worth of damage. The stream flows in a closed conveyance system under the residentially developed Frederick Avenue. This conveyance system is inadequate for severe storm events. Although most of the homes on Frederick Avenue have received only basement flooding during flood events, some of the homes have sustained damages to the first floor. In addition, repeated severe flooding in basement apartments of the 4900 block has posed serious threats to life. Since the occurrence of a flash flood in June, 1981, these apartments have been vacant. Average annual damages were estimated in 1977 at 14,763 dollars. In 1981 dollars this figure is 21,614 dollars.

4. Gwynns Run-

During Tropical Storm David, in 1979, this tributary to the Gwynns Falls caused severe damage in the vicinity of Ashburton and Walbrook. The stream has been placed almost entirely in closed conveyance (see Map 9). David, which struck the northwestern portion of the City most severely, caused Gwynns Run to surcharge its conduits and flow over-head down streets and through yards, undermining several house foundations and causing damage to streets and public utilities.

A total of 13.5 million dollars in damages occurred in the entire Gwynns Falls watershed from Hurricane Agnes.



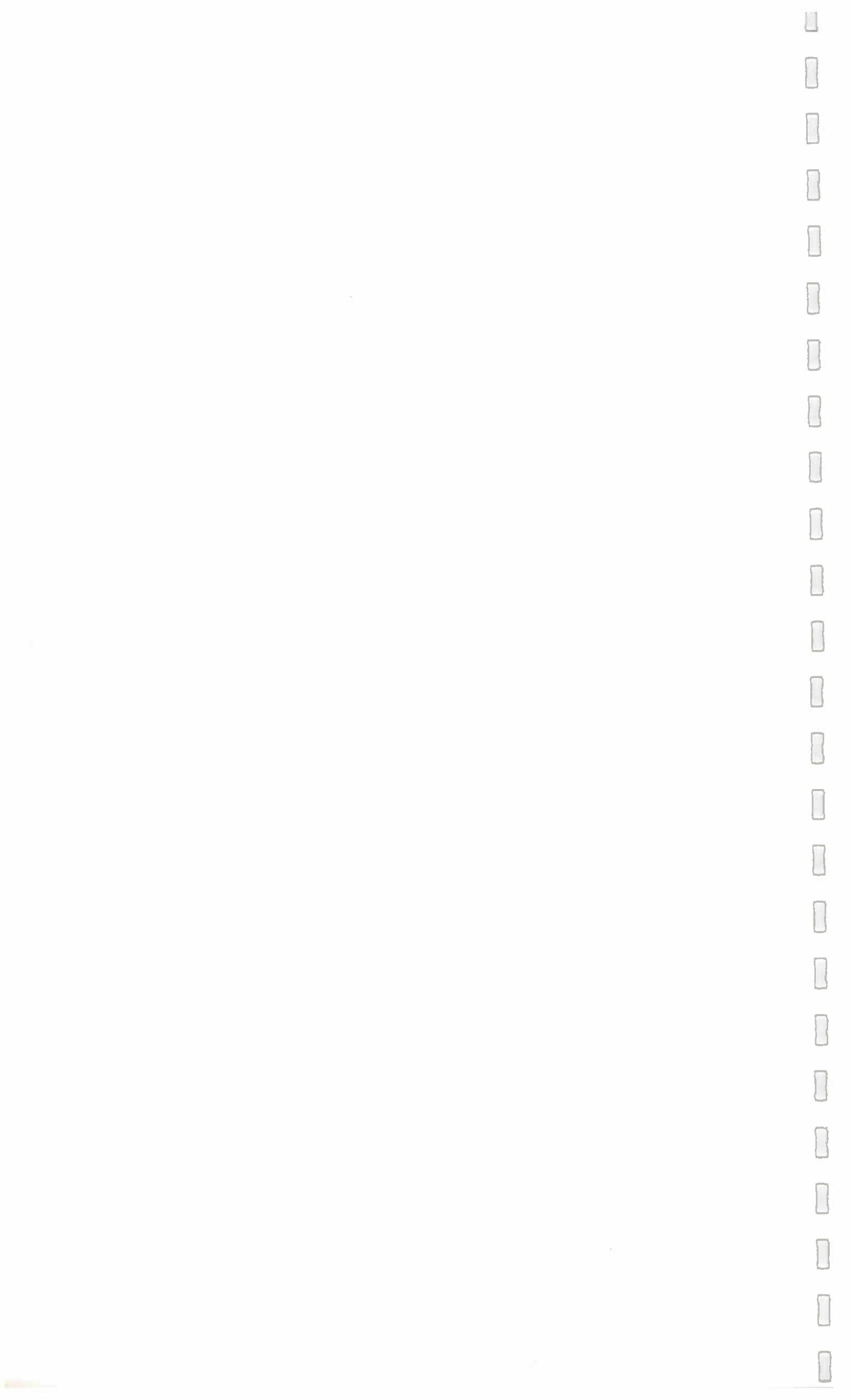
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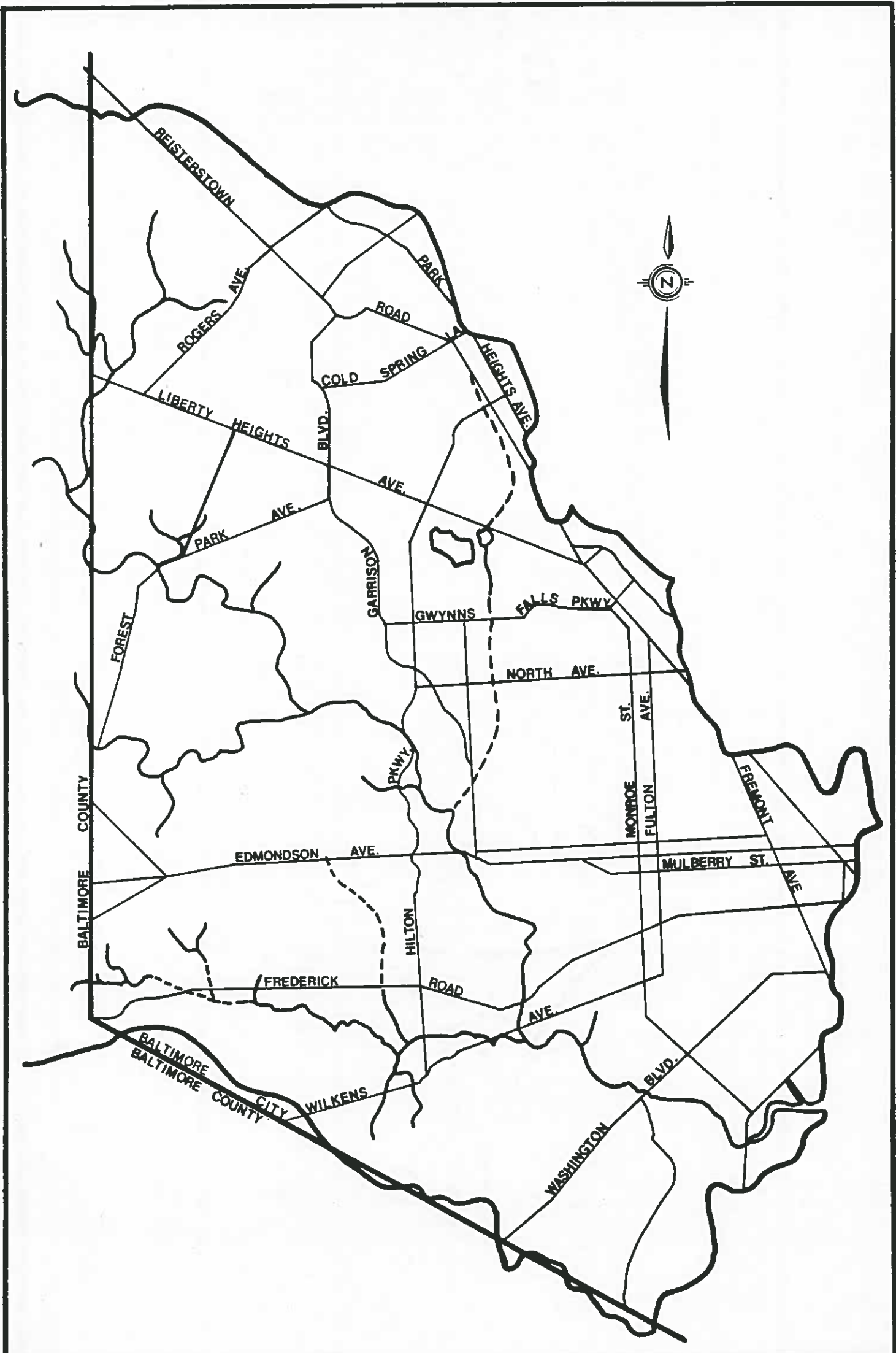
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**GWYNNS FALLS WATERSHED**

Map 1







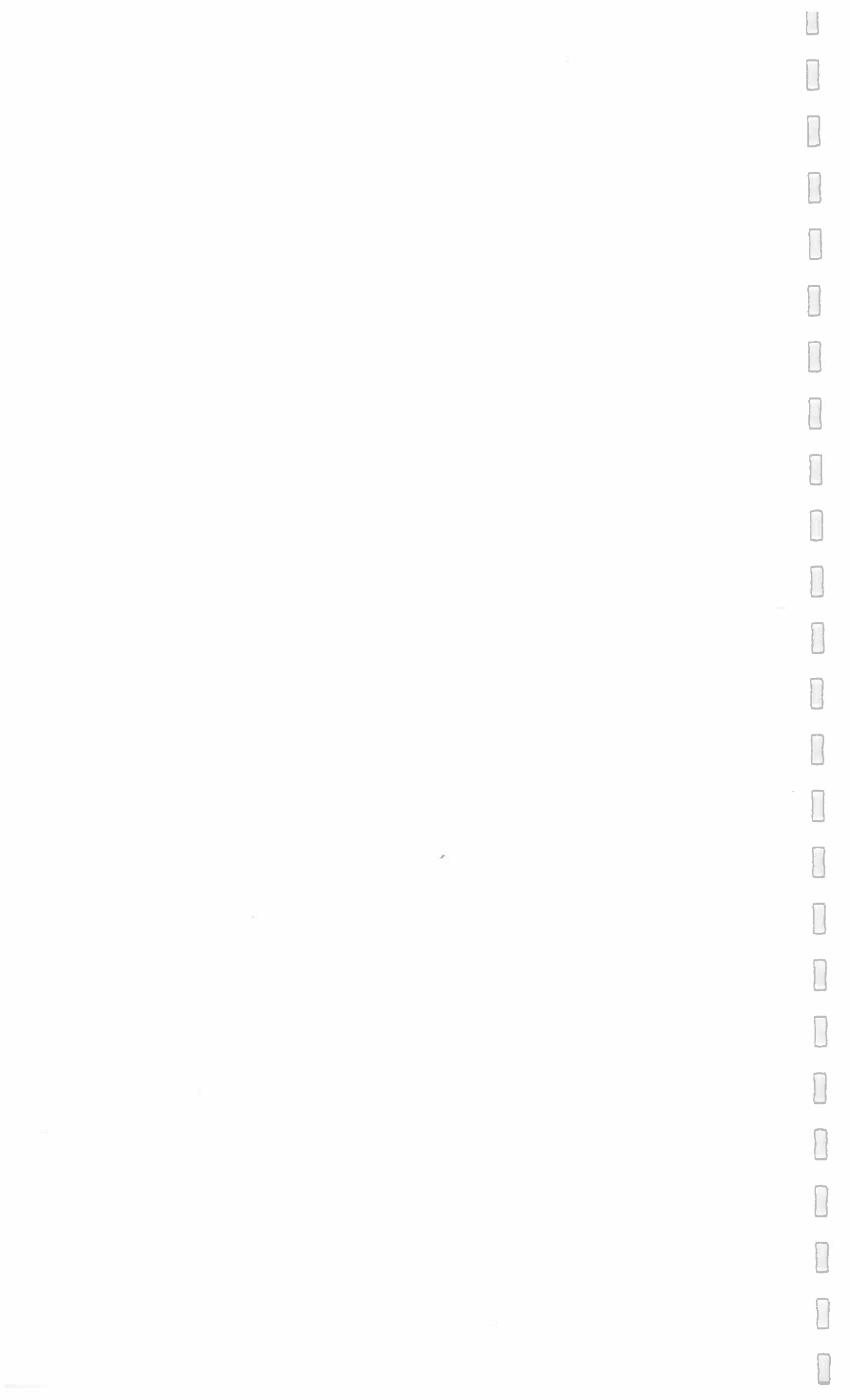
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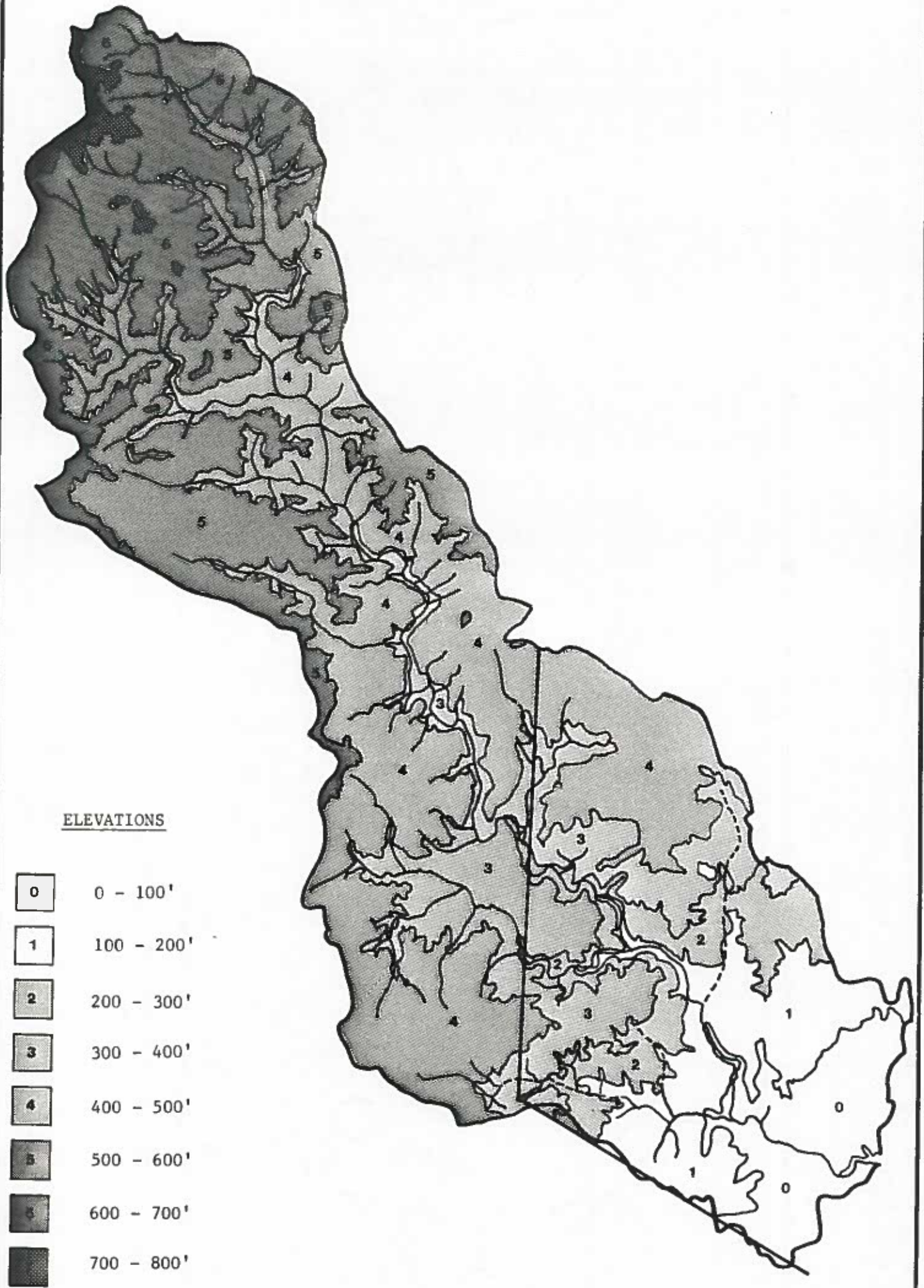
**GWYNNS FALLS WATERSHED**

Map 2









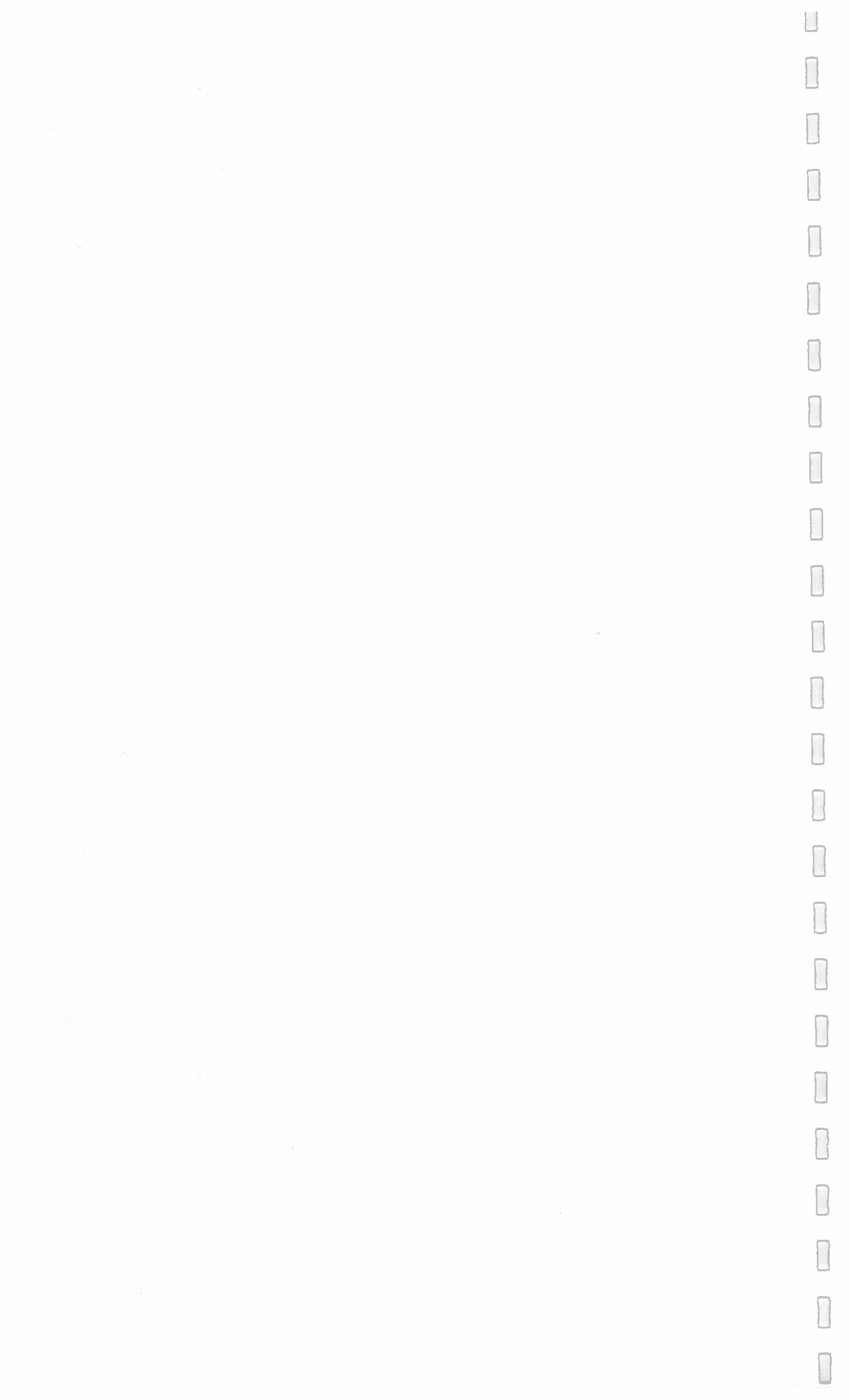
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GWYNNS FALLS WATERSHED  
TOPOGRAPHIC ELEVATIONS

Map 3







## PREVIOUS STUDIES

There have been several studies done, in the recent past, investigating the flooding problems and potential solutions in the Gwynns Falls watershed. This section summarizes these studies, noting the purpose, findings and recommendations of the researchers.

### 1. Report on the Maiden's Choice Run Storm Water System (Whitman, Requardt and Associates, 1973)

This study was done by the consultants at the request of the Baltimore City Department of Public Works. The scope of work was to "develop a system within the City limits that will alleviate the causes of flooding, to avoid further damage and danger to life..., to make the main drainage course within the City limits adequate for the runoff from a 100-year storm."

The work separated Maiden's Choice Run in the City into two segments: the natural open channel from Gwynns Falls to Beechfield Avenue, and a conduit section from Beechfield Avenue to the City line near Overbrook Road. Their computations of stream flow were based on the development of a time zone hydrograph. The Rational Formula was used to compute runoff for each time zone.

One finding of the study was that some storage of stormwater is available in the Loudon Park cemetery area and the Mt. St. Joseph area upstream from the Yale Avenue culvert. A second finding was that allowing some overland flow on Frederick Road to accommodate flood waters would not be cost-effective, in part due to the cost of floodproofing homes which would be affected by allowing this overland flow. The consultants concluded that the most cost-effective solution was the construction of inlets and collection drains large enough to handle a 100-year storm event.

The recommended improvements were to:

1. Make approximately eight channel improvements, install larger culverts at bridge crossings, improve inlet conditions, stabilize utility lines and other minor improvements on the open channel portion.
2. Replace existing main drains with new maximally sized double drains, install new culverts, change channel course, and install new laterals and inlets, on the portion in closed conveyance.

The consultants included a cost estimate with this study, which totalled \$10.5 million in 1973.

In 1976, at the request of the Department of Public Works, Whitman Requardt and Associates performed a "Supplemental Study on the Maiden's Choice Run Storm Drain System". The Supplemental Study investigated the possibility of an open channel floodway from Beechfield Avenue to the City Line as an alternative to the earlier proposed box conduit drains. This alternative would include the acquisition of homes and land, removal of the homes, regrading streets, utility relocations and construction of an open channel floodway to parallel Frederick Road. Their economic analysis showed this alternative to cost approximately \$14,870,000, about two million dollars less than the first alternative (inflated to 1976 dollars). However, due to the effects of displacement of persons, the alternative was considered less desirable than the first set of recommendations. No other alternatives were examined, such as detention systems or a mix of conveyance, detention, and acquisition.

2. Report on Gwynns Falls Hydrologic Study  
(Baker-Wibberley & Associates, Inc. 1974)

This study was done for the Interstate Division of Baltimore City to determine the effect of the construction of that part of I-70 and I-95 adjacent to Gwynns Falls, and to ascertain the water surface elevations of peak storms for the design of bridges and channel improvements, the effect of encroachment on the floodplain and necessary erosion control of such encroachment.

The major finding of the study was that flooding damages were being caused by "bridges which restrict the flow, inadequate channel cross-sectional area in some reaches, and debris and vegetation which increased the roughness in some areas."

Recommendations to alleviate these flooding problems included:

1. Replacing the Washington Boulevard bridge with a new structure in conjunction with an eight foot grade change and widened stream channel at the bridge.
2. Lining the channel with gabions from Washington Boulevard to the Middle Branch.
3. Creating a new meander pattern for the Gwynns Falls from Washington Boulevard to the Middle Branch, and constructing levees along the stream in the reach between Washington Boulevard and the B&O Railroad bridge.

This study used the U.S. Soil Conservation Service method for determining stream flows. The storm of record (Agnes, 1972) and the 100-year storm event were investigated. Both existing and future land use were considered. No capital improvements have been scheduled as a result of this study.

3. Review Report, Baltimore Metropolitan Streams, Maryland  
(draft)  
(Baltimore District Corps of Engineers, Department of the Army, 1979)

In this report, the Corps of Engineers determined the feasibility of providing flood protection along streams in the Baltimore area. Various structural and non-structural alternatives were investigated as solutions to flooding problems, and analyzed according to the Corps' cost/benefit methodology. The flooding caused by Agnes in 1972 provided the impetus for the study. Structural alternatives considered included bridge modifications and replacements, diversion, channel improvement, upstream reservoirs, and levees and floodwalls. Non-structural measures included floodproofing, evacuations, legislative controls, flood forecast and warning, and flood insurance. Specific technical, economic, environmental and social well-being criteria were used to evaluate the cost-effectiveness of these techniques. The findings of the study were that none of the plans of improvement investigated warranted further detailed study because they either lacked economic justification or did not meet Federal implementation criteria.

Based on these findings the report recommended that no further action be taken toward providing improvements for flood control along streams in the Baltimore Metropolitan Area. However, the report itself contains a useful discussion of the flooding problems, management alternatives and the analysis used to determine the feasibility of these alternatives.

4. Patapsco River Basin Study  
(Regional Planning Council and U.S. Soil Conservation Service, 1980)

This final report for the Patapsco River Basin study compiled information on the types and severity (average annual damages) of damages for several frequency storms, including Agnes and the 100-year flood, examined the feasibility of structural projects, and where appropriate, presented alternative solutions to flooding problems in the Patapsco River Basin. The basin includes the watersheds of both the Patapsco River and the Gwynns Falls.

The study determined, as had the Army Corps of Engineers' Baltimore Metropolitan Streams Review Report (1979) that no structural projects were eligible for federal assistance under the Watershed Protection and Flood Prevention Act, because of unfavorable cost/benefit analyses. However, for the Gwynns Falls, the study recommended a combination of flood management techniques all of which stressed the mutual involvement of and benefits to Baltimore County and the City.

The recommendations included:

1. Installation of several small impoundments in the County on the main stem, to benefit both City and County.
2. Joint development by the City and County of a flood warning system and flood disaster preparedness plan.
3. Construction of dikes and floodwalls in both jurisdictions at the sites of most concentrated flood damage, such as Owings Mills and the Brittany Apartments. (Although not mentioned in this report, the Corps of Engineers specified areas in the Lower Gwynns Falls where dikes and floodwalls would afford some protection to homes and industries).
4. An exploration of opportunities for retrofitted stormwater management in already urbanized portions of the Gwynns Falls watershed. Underground storage in culverts is one such technique.

The study used the TR-20 computer program, developed by the U.S. Soil Conservation Service, to create a hydrologic model for the entire Patapsco River watershed. A Storm Water Management Task Force was formed as an off-shoot from the study, with representatives from state and local governments, the Soil Conservation Service and the Corps of Engineers. In addition to the TR-20 model, certain portions of the watershed have been hydraulically modelled as well. At the present time, this remains to be done for the rest of the Gwynns Falls drainage area. This would certainly assist Baltimore City & Baltimore County in the development of a comprehensive watershed plan.

While these studies have provided some information on the flooding problems of the Gwynns Falls, and offer several alternatives, the development of a comprehensive watershed plan requires the following:

- (1) Adequate hydrologic (TR-20) and hydraulic (HEC-2) models for the Maiden's Choice Run, and Gwynns Run streams upon which management strategies can be based.
- (2) Interjurisdictional cooperation on stormwater management projects, development plans and flood control or mitigation strategies to insure watershed integrity and effective floodplain management.

# INTERJURISDICTIONAL COORDINATION

## INTERJURISDICTIONAL COORDINATION

Baltimore County has undertaken a flood-prone property acquisition program for the Gwynns Falls area. Homes which have been subjected to more than one foot of water were considered eligible for purchase. An acquisition program along the County portions of the Gwynns Falls is in keeping with the City's plans for the watershed within its jurisdiction. The restrictions on development imposed by County policy will also complement the City's efforts to prohibit all residential development and restrict the construction of non-residential structures in the Gwynns Falls floodplain.

Baltimore County is presently considering a culvert and channel improvement project in the vicinity of Stoney Lane. This area suffered over 93,000 dollars in damages during Agnes, to eight residential structures and three commercial structures. A watershed study of the Maiden's Choice Run, from its headwaters to the City line, is required by the State Water Resources Administration for the issuance of a construction permit. The study must show that the proposed improvements will not affect flooding downstream. Baltimore City and Baltimore County representatives have discussed cooperation on the watershed study to extend its limits down to the confluence of Maiden's Choice Run and the Gwynns Falls. However, due to the lack of available City funds, this portion of the study must await the State's involvement. The development of a hydrologic/hydraulic model for the watershed will serve as a planning tool for assessing the impacts of any proposed improvements or new construction in the floodplain.

A letter of understanding has been written and signed by both the County and the City to insure a mutual review of plans and studies in interjurisdictional watersheds and that each jurisdiction conducts activities in the floodplain to prevent any increase in downstream flooding as well as incompatible uses in the floodplain.



# RECOMMENDED PLAN

## INTRODUCTION

In keeping with the goals and objectives of the Baltimore City Floodplain Management Plan the recommended program for reducing flood damages in the Gwynns Falls will be a combination of non-structural strategies and techniques. The report is therefore organized by technique or strategy. The areas of application of each related technique are then discussed and shown on accompanying maps.

The strategies chosen for use in the Gwynns Falls include acquisition, floodproofing, flood insurance, regulations, operation SWIFT and minor stream channel improvements. Based on the results of earlier studies, structural projects are considered non-cost-effective for these areas. It is recognized that one non-structural technique used alone cannot achieve the desired reduction in flood damages. Therefore, two or more are used together. The result is a combination of approaches that collectively address short- and long-term floodplain problems and issues, such as land use, disaster recovery, and protection of natural resources.

The highly urbanized nature of the Gwynns Falls mandates an innovative, responsive and multi-faceted approach to achieve a significant reduction in flood damages and enhance the natural features of the floodplain. The following strategies, selected for their complementary functions and adaptability to the urban environment, constitute such an approach.

# ACQUISITION

Two areas in the Gwynns Fallswatershed have been identified for residential property acquisition. These areas are in the lower Gwynns Falls, just south of Washington Boulevard, and in Maiden's Choice Run, along Frederick Avenue in the vicinity of Beechfield Avenue (see Map 4). The following is a brief description of each area, the number of properties eligible for acquisition, and the expected benefits from the acquisition of properties in these areas.

## Lower Gwynns Falls

Homes in the Maisel Street - Hollins Ferry Road area have experienced repeated and severe flooding. Many of these homes are located in the floodway or in the 25-year floodplain. Recognition of the flooding problems here is well documented in flood damage survey reports and City memorandam. The removal of these residential structures and relocation of the residents outside the floodplain is considered a high priority.

Forty-three residential structures have been identified as eligible (See Maps 4-0 through 4-4). The tax assessment value on these properties ranges from \$1,940 to \$8,700. Market value, however, will be higher.

In addition to these improved properties, there are sixteen unimproved lots in the immediate area (See Maps 4-1 and 4-2). The acquisition of these vacant lots would prevent future development and contribute to the open space that will be created by the acquisition of homes in the area. The total assessment for these twelve lots is \$19,280. Fair market value is expected to be higher.

The acquisition of homes which experience flooding in the lower Gwynns Falls will have several benefits. The first and most important is the removal of citizens from a serious flood hazard area. This act benefits the citizens by reducing physical risk and by purchasing property which is difficult to sell on the market because of the flooding risks. The City benefits by decreasing the number of citizens who will require emergency warning and evacuation, as well as the number of post-flood emergency repairs that must be made to damaged utilities, roads and streams which directly service or threaten adjacent private properties.

A second benefit is the increased open space that will result from the acquisition and removal of residential structures. The acquisition of eligible properties and the removal of existing structures will open up an area along the Gwynns Falls of approximately 6.7 acres. This will enhance the view from the bike path which follows the Gwynns Falls on the opposite bank, and will form an attractive open space for both local residents and travellers on Washington Boulevard. It will offer increased opportunities for passive recreation in a highly urbanized area.

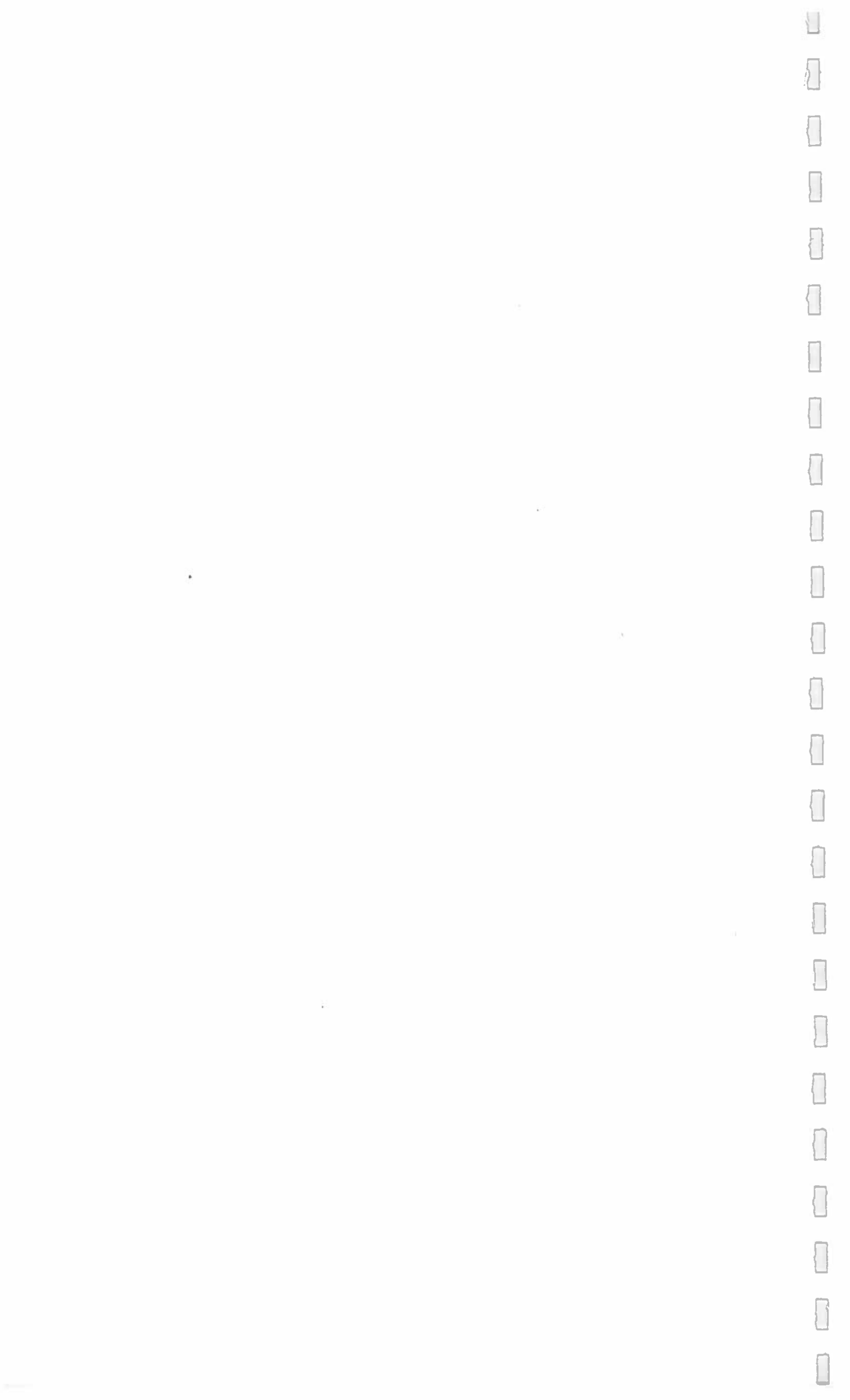
## Maidens Choice Run

Although a detailed hydrologic study has not been performed on Maiden's Choice Run, the repeated flooding problems in some portions of the subdrainage area are well documented. The urbanized nature of the stream valley, in conjunction with alterations done to the natural stream over the years, renders the Frederick Avenue area in the vicinity of Beechfield Avenue particularly susceptible to flash flooding and serious flood damages. Because the area is nearly entirely residential, and Frederick Avenue is a major corridor into the City, the threat to life and personal property is potentially high. A death in 1981, during a flash flood in which tenants were forced from their basement apartments, has recently prompted the formation of concerned citizens' groups and legislative action from local elected officials urging State and local efforts to prevent future incidents and tragedies.

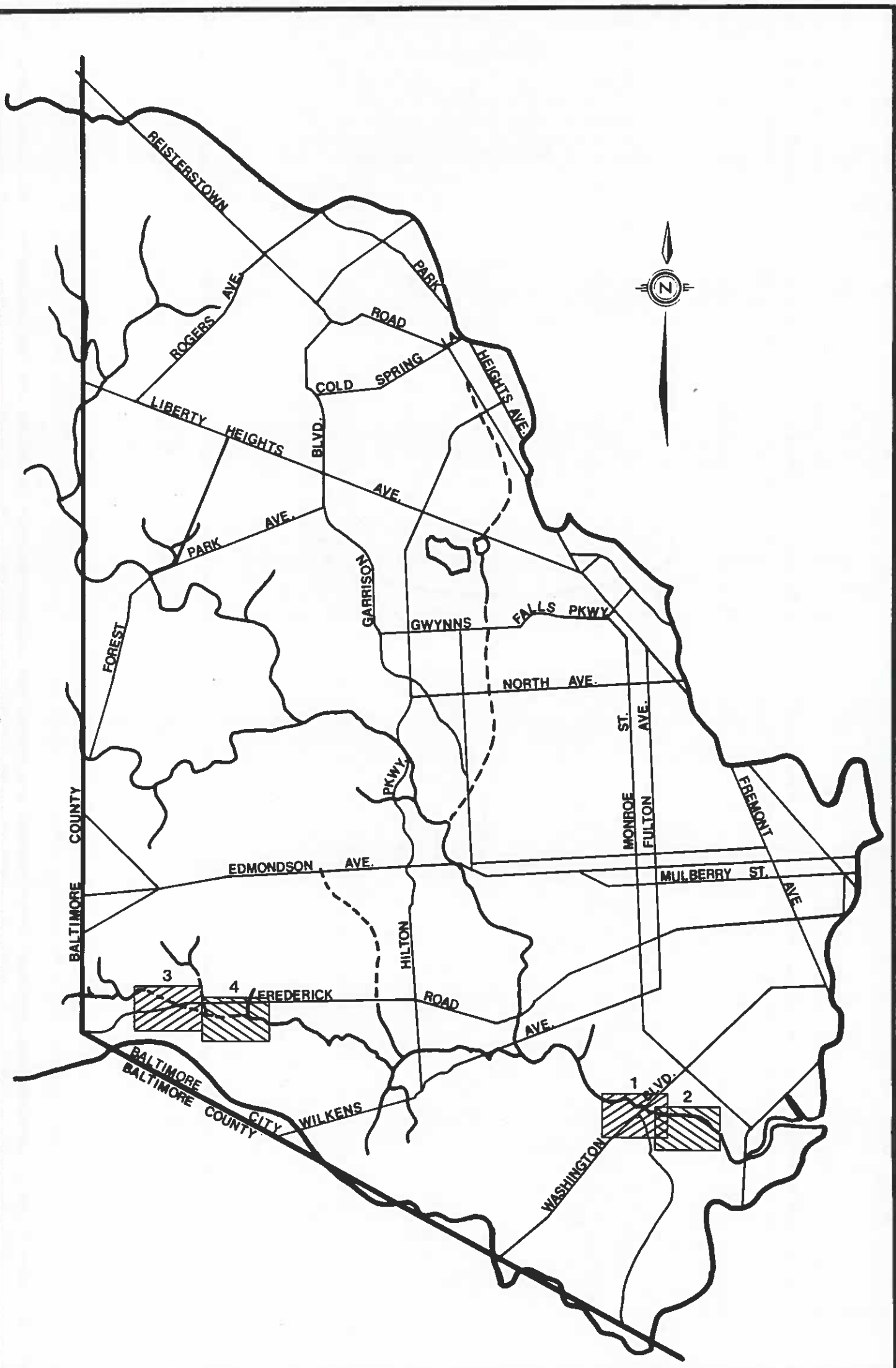
Acquisition will be part of a comprehensive approach to managing flooding problems on Maiden's Choice Run. The first properties identified for acquisition are detached homes located in the direct path of high velocity, destructive flood waters, as evidenced by post-flood surveys (see Maps 4-3 and 4-4). In addition, the above-mentioned flooded apartments are identified for acquisition. Acquisition of these rental units will take the form of a partial acquisition or condemnation, if necessary, to prevent future occupation.

The type of housing on Frederick Avenue presents a problem in acquisition. In order to be an effective floodplain management tool, the acquisition and removal of contiguous housing units is desired. However, the nature of flooding is such that not all rowhouse units flood uniformly to a depth serious enough to consider acquisition. Since the acquisition program is, by policy, voluntary, it may be difficult to attain the acquisition of an entire row of homes. In addition, without a detailed flood study, the potential threat to these homes is not clearly defined. It will, therefore, be the policy of the City to await detailed flooding information prior to acquiring rowhouses along Frederick Avenue and on adjacent streets. Exceptions to this may be made based on extenuating circumstances. For example, if the owner of an end rowhouse approaches the City with documentation of serious flooding in the home to request acquisition, this case may be considered as an eligible property for acquisition.

The next sections will describe additional floodplain management techniques to be used in the Gwynns Falls watershed, to reduce or prevent future flood damages.





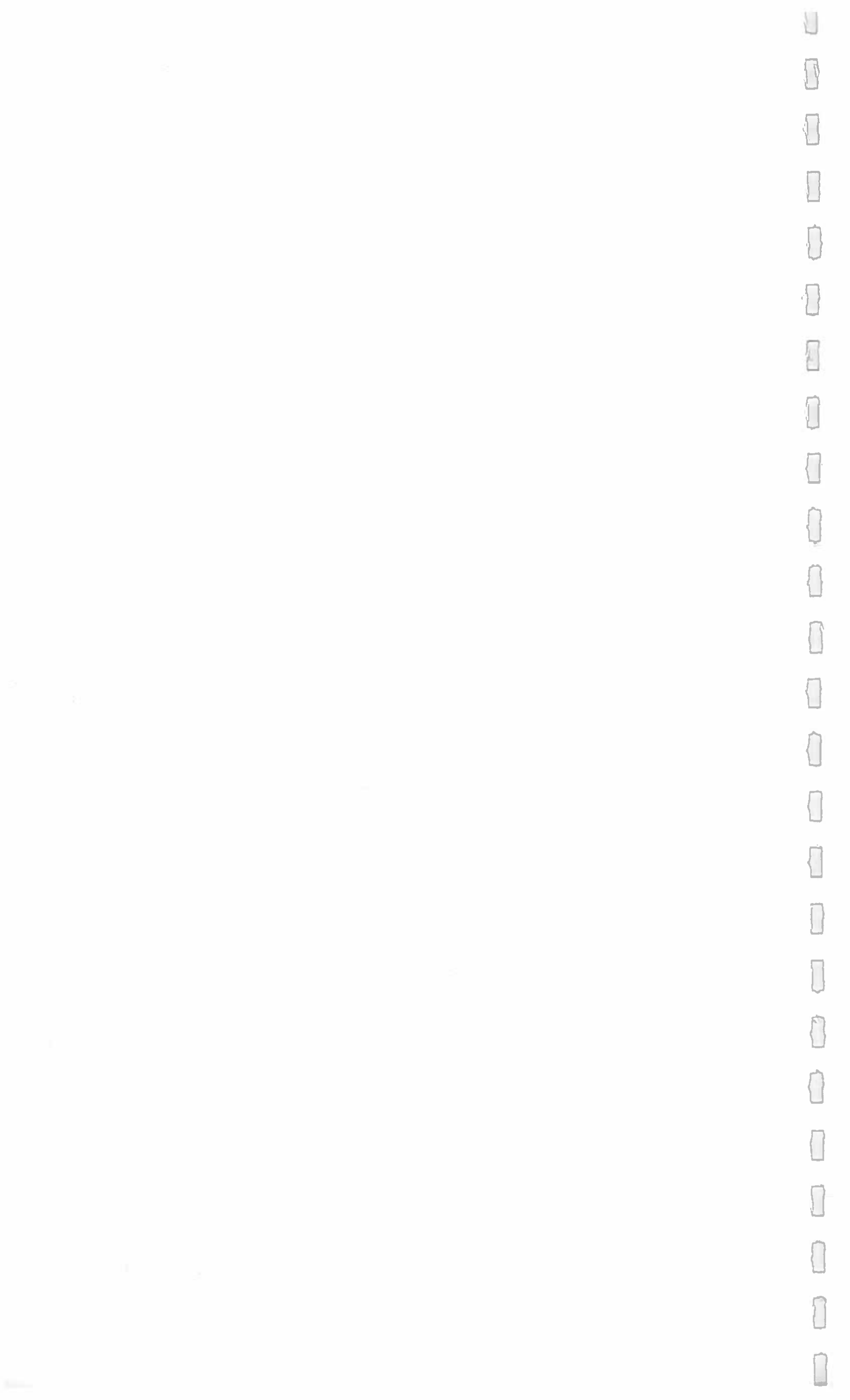


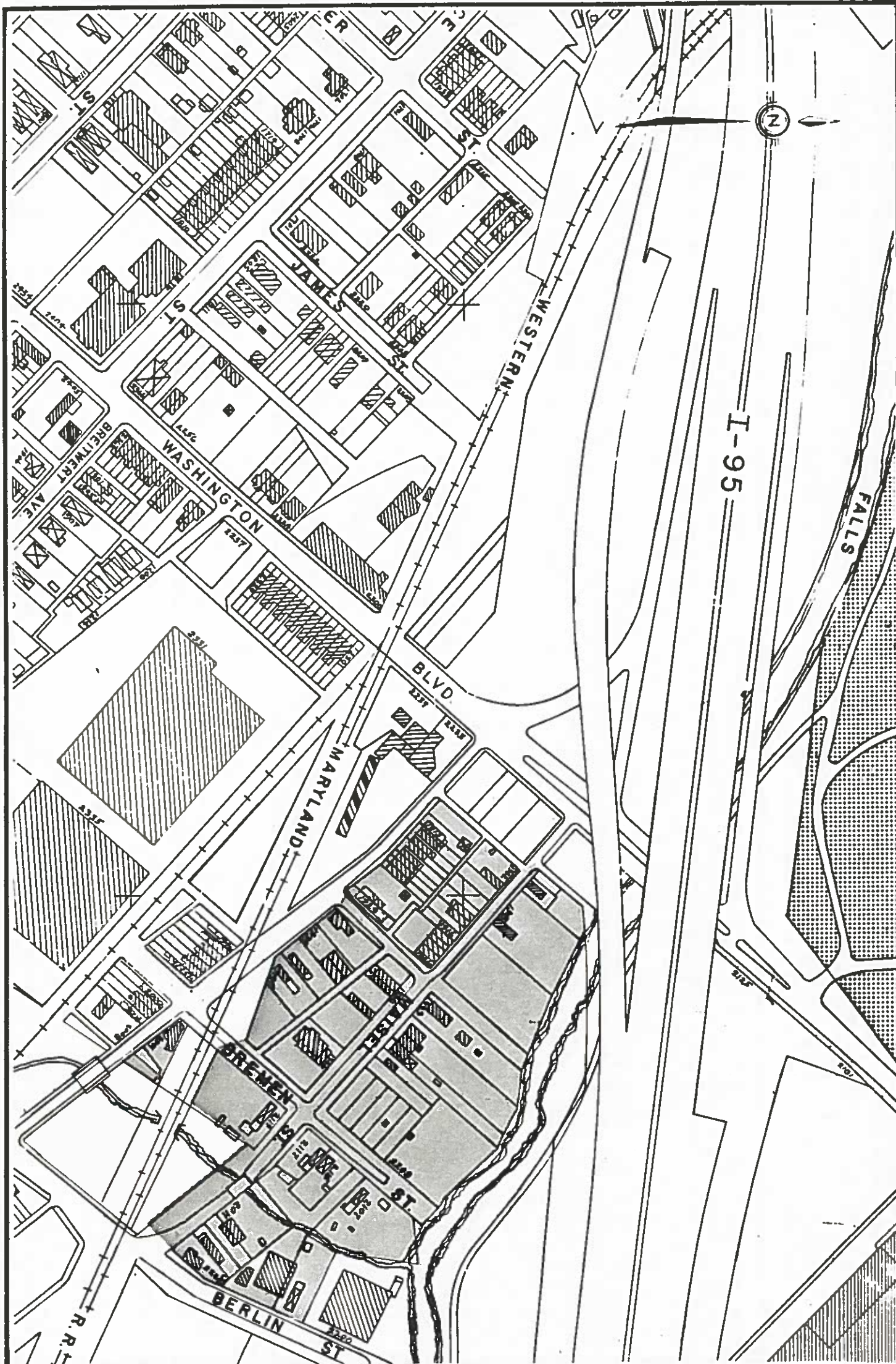
# BALTIMORE CITY FLOODPLAIN MANAGEMENT PLAN

DECEMBER 1981

GWYNNS FALLS WATERSHED  
 RESIDENTIAL ACQUISITION - KEY TO DETAILED MAPS

Map 4-0  
 0 4000  
 scale feet





**BALTIMORE CITY  
FLOODPLAIN MANAGEMENT PLAN**

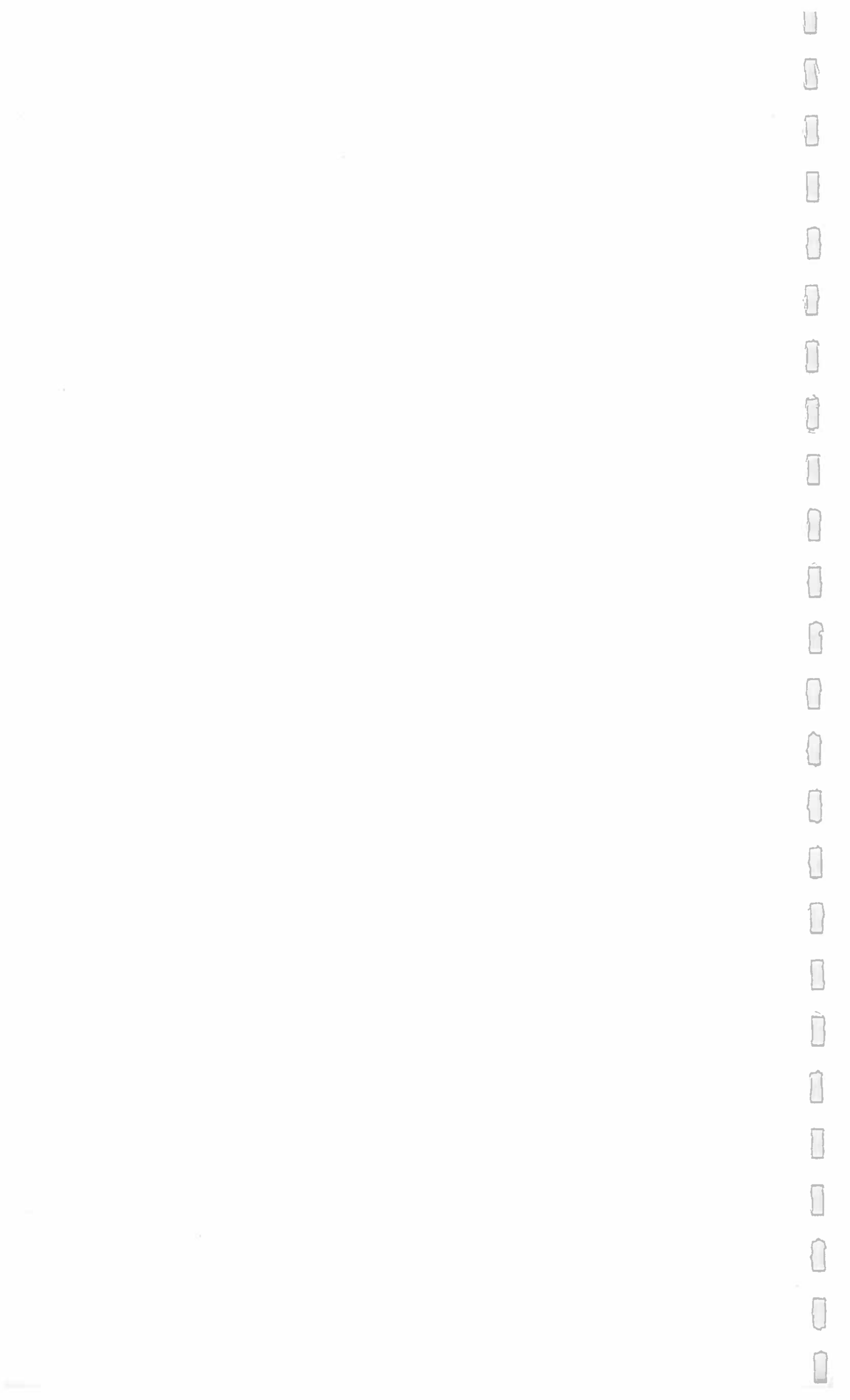
**DECEMBER  
1981**

LOWER GWYNNS FALLS

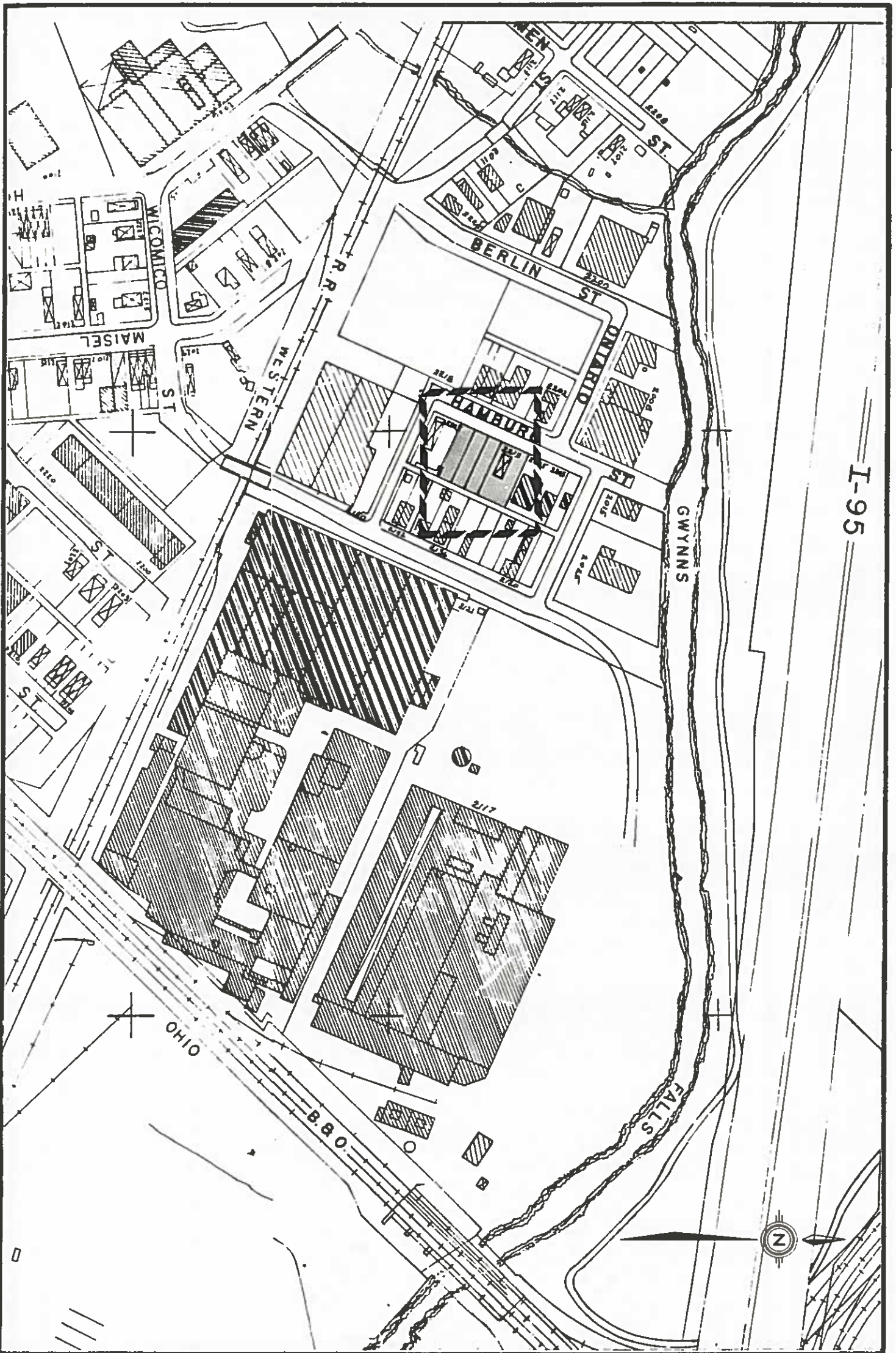
RESIDENTIAL AREAS ELIGIBLE FOR ACQUISITION

Map 4-1









**BALTIMORE CITY  
FLOODPLAIN MANAGEMENT PLAN**

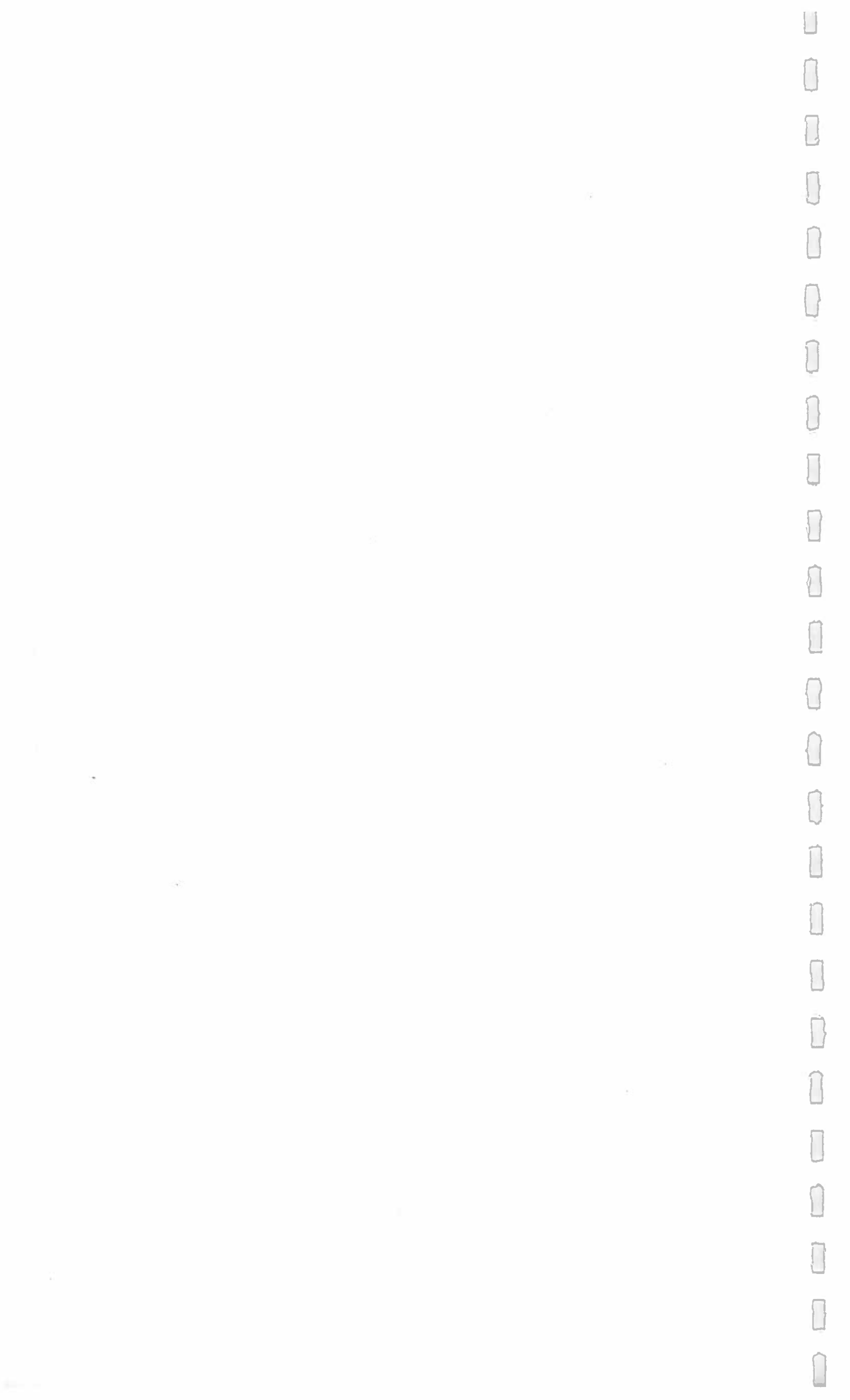
**DECEMBER  
1981**

LOWER GWYNNS FALLS

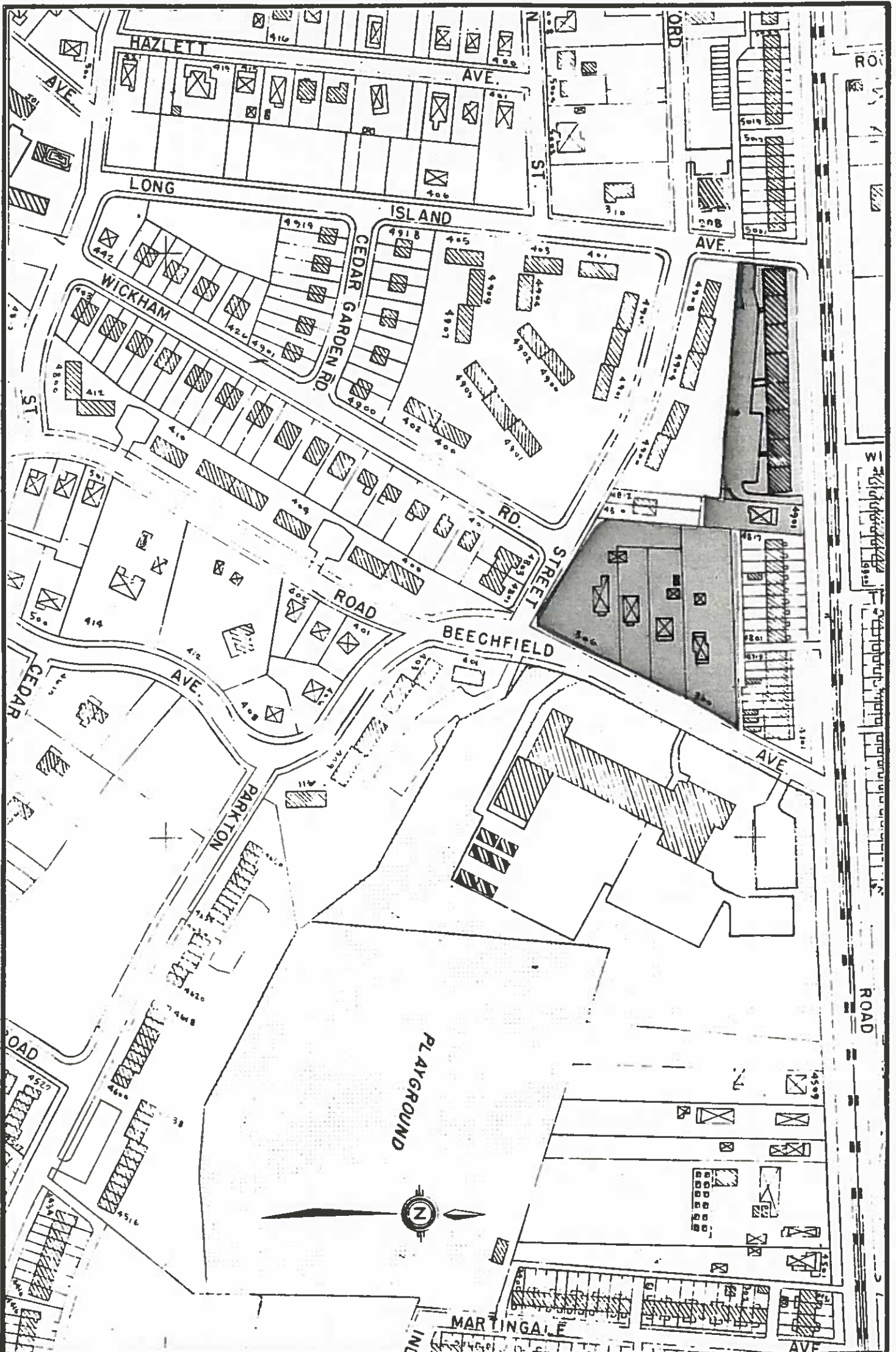
Map 4-2

RESIDENTIAL AREAS ELIGIBLE FOR ACQUISITION









**BALTIMORE CITY  
FLOODPLAIN MANAGEMENT PLAN**

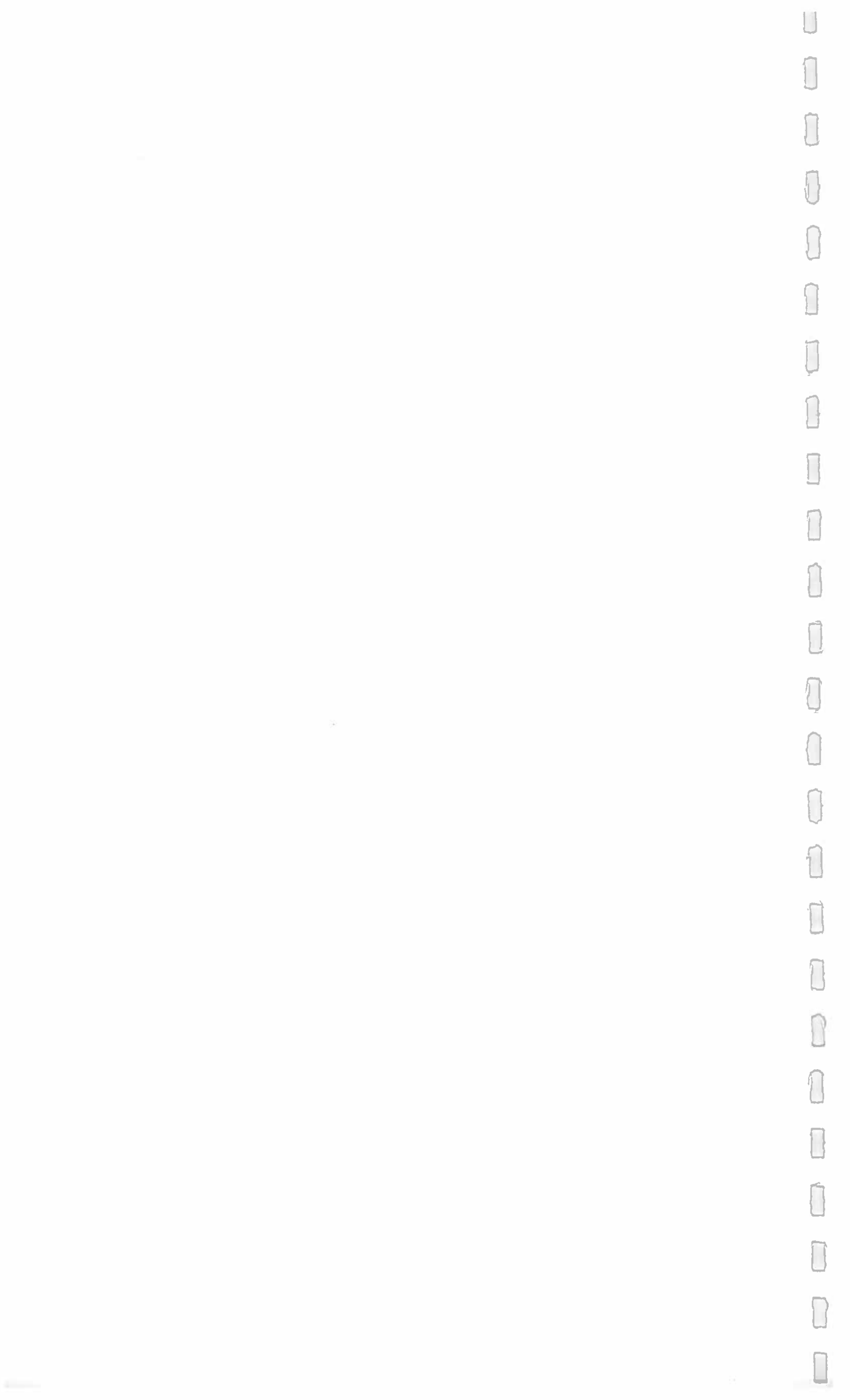
**DECEMBER  
1981**

MAIDEN'S CHOICE RUN

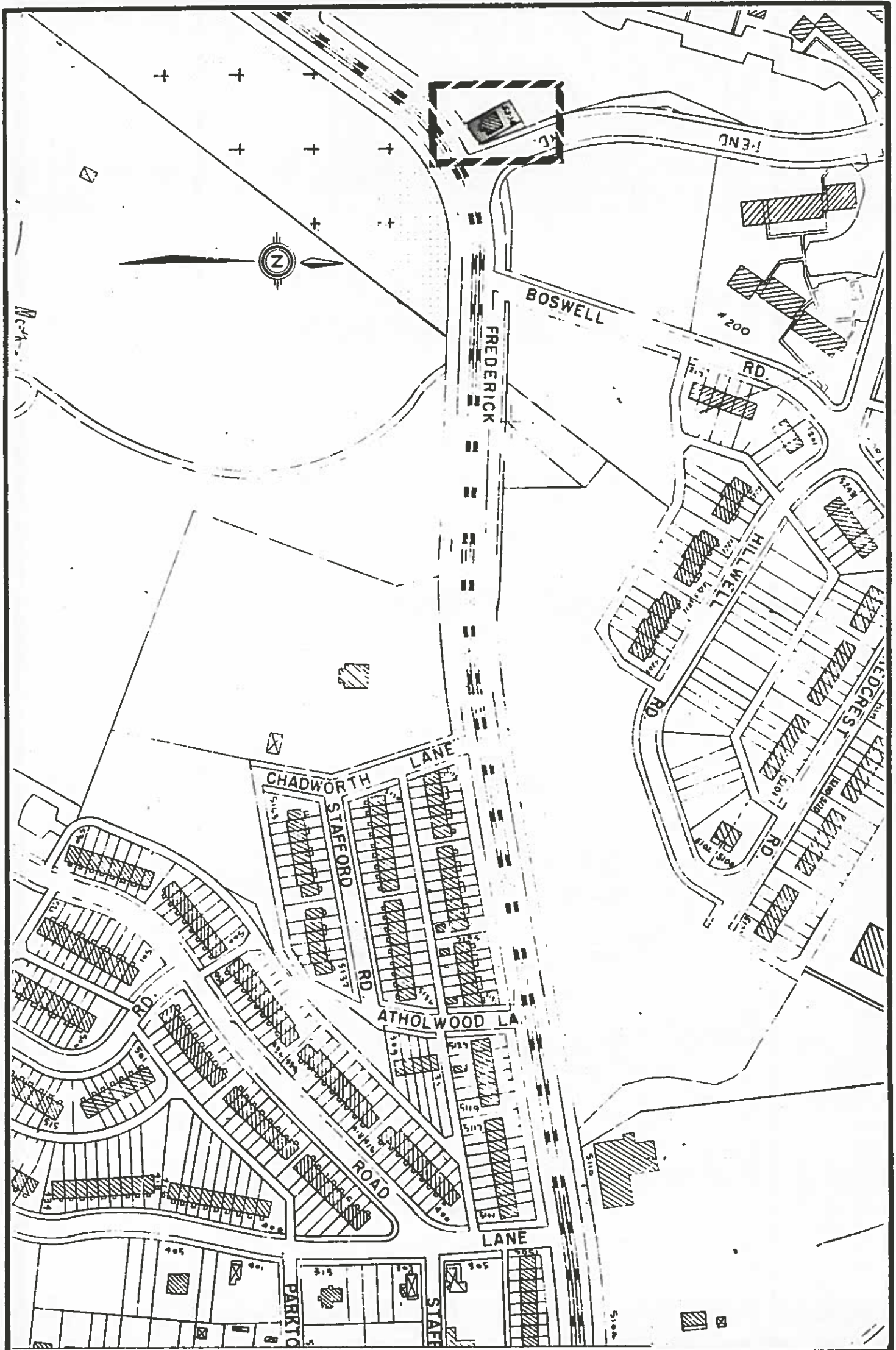
RESIDENTIAL AREAS ELIGIBLE FOR ACQUISITION

Map 4-3









**BALTIMORE CITY  
FLOODPLAIN MANAGEMENT PLAN**

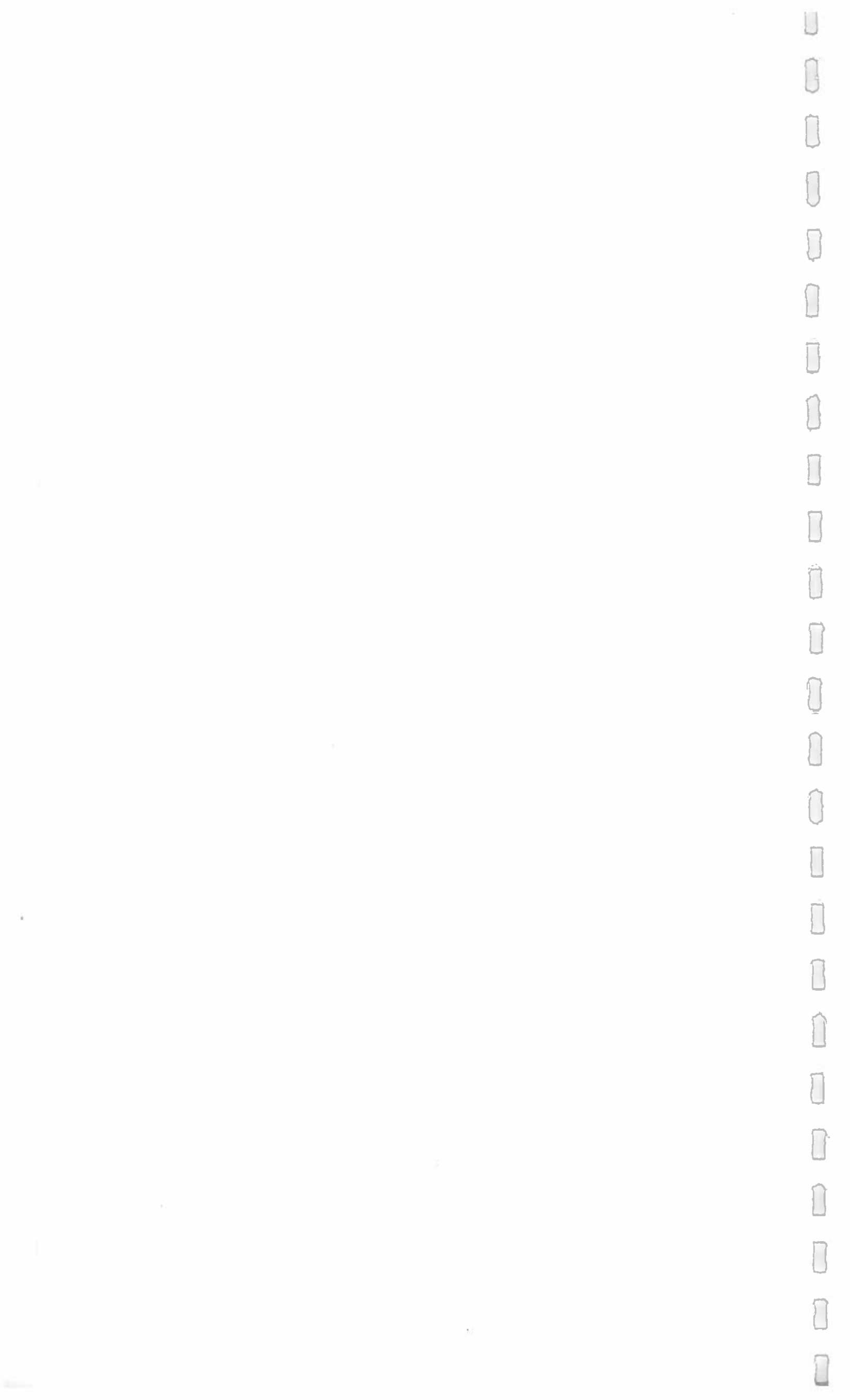
**DECEMBER  
1981**

MAIDEN'S CHOICE RUN

Map 4-4



RESIDENTIAL AREAS ELIGIBLE FOR ACQUISITION



# FLOODPROOFING

Floodproofing in the Gwynns Falls watershed will have a residential and a non-residential component. The need for both kinds of program reflects the variety of land uses, the degree and kind of flooding damages and the economic framework within which the City Floodplain Management Plan must be implemented. The presence of commercial and industrial properties as well as historic homes in the Gwynns Falls which cannot be purchased requires that some degree of protection of existing structures be considered. The residential nature of the Maiden's Choice Run drainage area similarly demands that some program be instituted to help property owners protect their homes and possessions. The floodproofing program is an element of the Baltimore City Floodplain Management Plan intended to be applied where acquisition is infeasible, and where structural solutions are not cost-effective. To be fully effective, it will be implemented in conjunction with an emergency warning and evacuation system, and an effort by the City to encourage home owners and renters to participate in the National Flood Insurance Program.

## Lower Gwynns Falls

There are numerous commercial and industrial structures in the lower Gwynns Falls (from the confluence of Maiden's Choice Run and the Gwynns Falls to the Middle Branch), which receive flooding damages during severe storms. Damages may range from a small amount of water and silt in a building to major damages to the structure and contained equipment, as well as loss of raw materials. These damages are costly to the industry, in terms of both recovery and replacement of damaged equipment, and losses accrued from the time out of production.

The City cannot afford to purchase these properties. Therefore, a program similar to that presently being implemented in the Jones Falls Valley will be instituted for industries along the Gwynns Falls (See maps 5-1 and 5-2). Following initial contact of eligible industries (approximately 20 located in the 100-year floodplain) by the Planning Department, a priority list of interested industries will be developed, based on relative flood hazard and flood history. The U.S. Army Corps of Engineers will, at the request of Baltimore City and the industry, perform a floodproofing survey for each industry. This survey will provide the property owner with a set of recommendations on reducing flood damage. The industry must hire an engineering firm to work out the details of implementing the recommendations. The development of an emergency preparedness and evacuation plan is considered a part of any floodproofing plan.

In addition to these commercial and industrial properties, there may be residential property owners who do not wish to relocate through the acquisition program. These homeowners will be encouraged, through such methods as a low-interest loan program, to floodproof their homes where feasible.

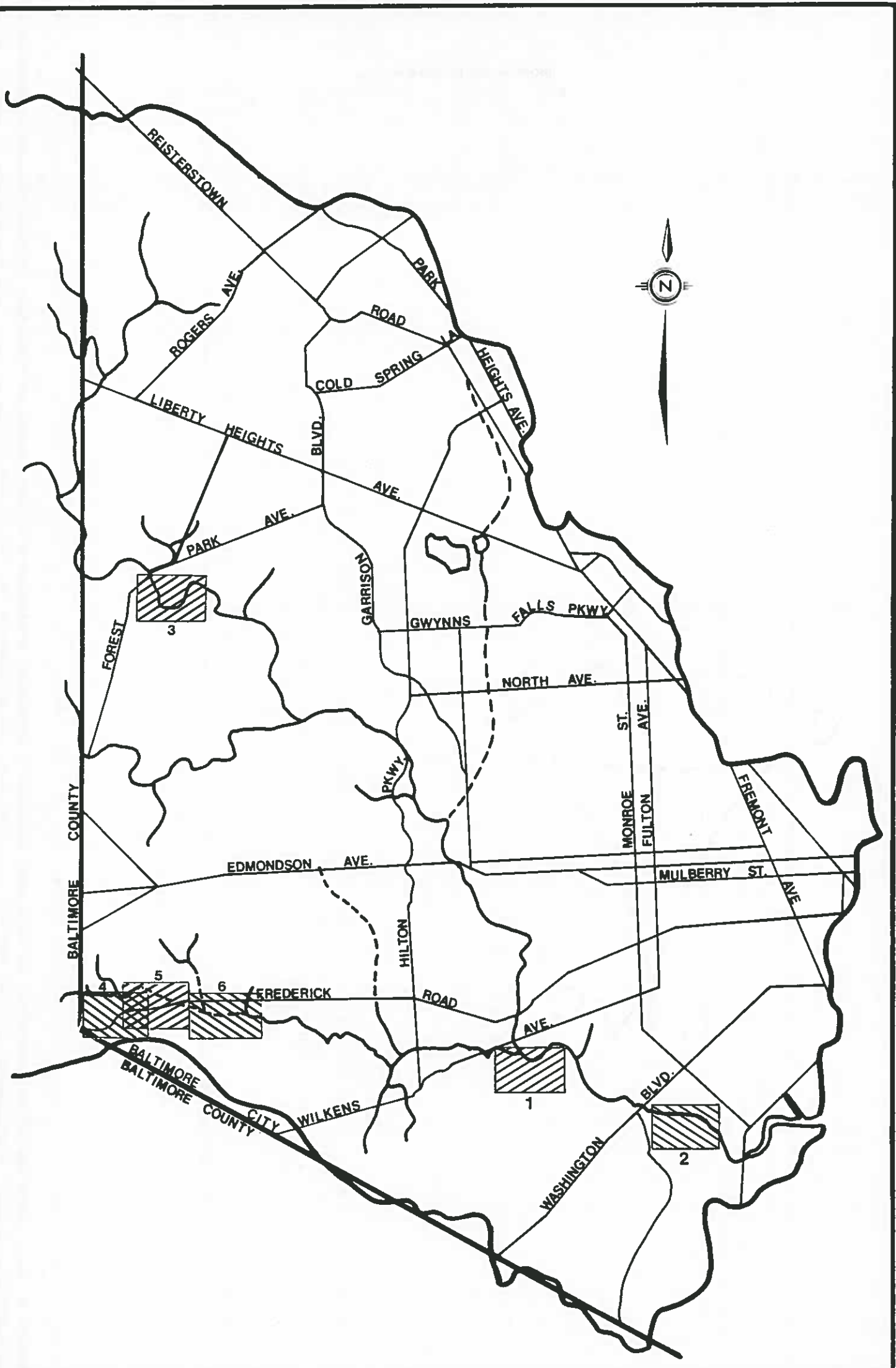
## Upper Gwynns Falls

There are a few homes along the Gwynns Falls in the Dickeyville area which are prone to flooding from severe storms. These homes, located on or near Wetheredsville Road, North Franklinton Road and Pickwick Road, may experience flooding of only yards or basements. However, homeowners should be aware of a potential flood threat, and be encouraged to floodproof (see map 5-3). Unfortunately, since many of these homes are quite old, and historically significant, floodproofing may be difficult to accomplish from a practical as well as aesthetic standpoint.

## Maidens Choice Run

The areas along Maidens Choice Run susceptible to flooding are predominantly residentially developed. Rowhouses form the most common type of housing, although there are some detached units and apartment buildings as well. Floodproofing will be a major management technique applied along Maiden's Choice Run for two reasons. First, rowhouses are difficult to approach for acquisition. The purchase of an entire row is most desirable, in that complete removal of structures is a major objective in acquisition. However, under a voluntary program, purchase of all units will be difficult. Second, without detailed flood studies, it is in many cases difficult or impossible to predict the severity of flooding. Adjacent rowhouses receive differing amounts of damage during a given flood.

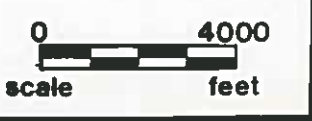
Therefore, floodproofing offers an alternative to reduce flood damages along Maidens Choice Run. In general, the path of flooding is such that the waters flow down along Frederick Avenue, spreading out somewhat to flow into the alleys and streets south of Frederick Avenue. Increasing curb height, and berming front yards to a higher elevation may prevent the entry of water from minor floods. Bricking up basement windows or constructing walls around exterior window and stair wells can also effectively keep water out. In some blocks it may be found effective to construct low floodwalls at the uphill corners to deflect water away from the homes. A combination of floodproofing techniques both inside and outside of individual homes is recommended for this area, as shown in maps 5-4 through 5-6.

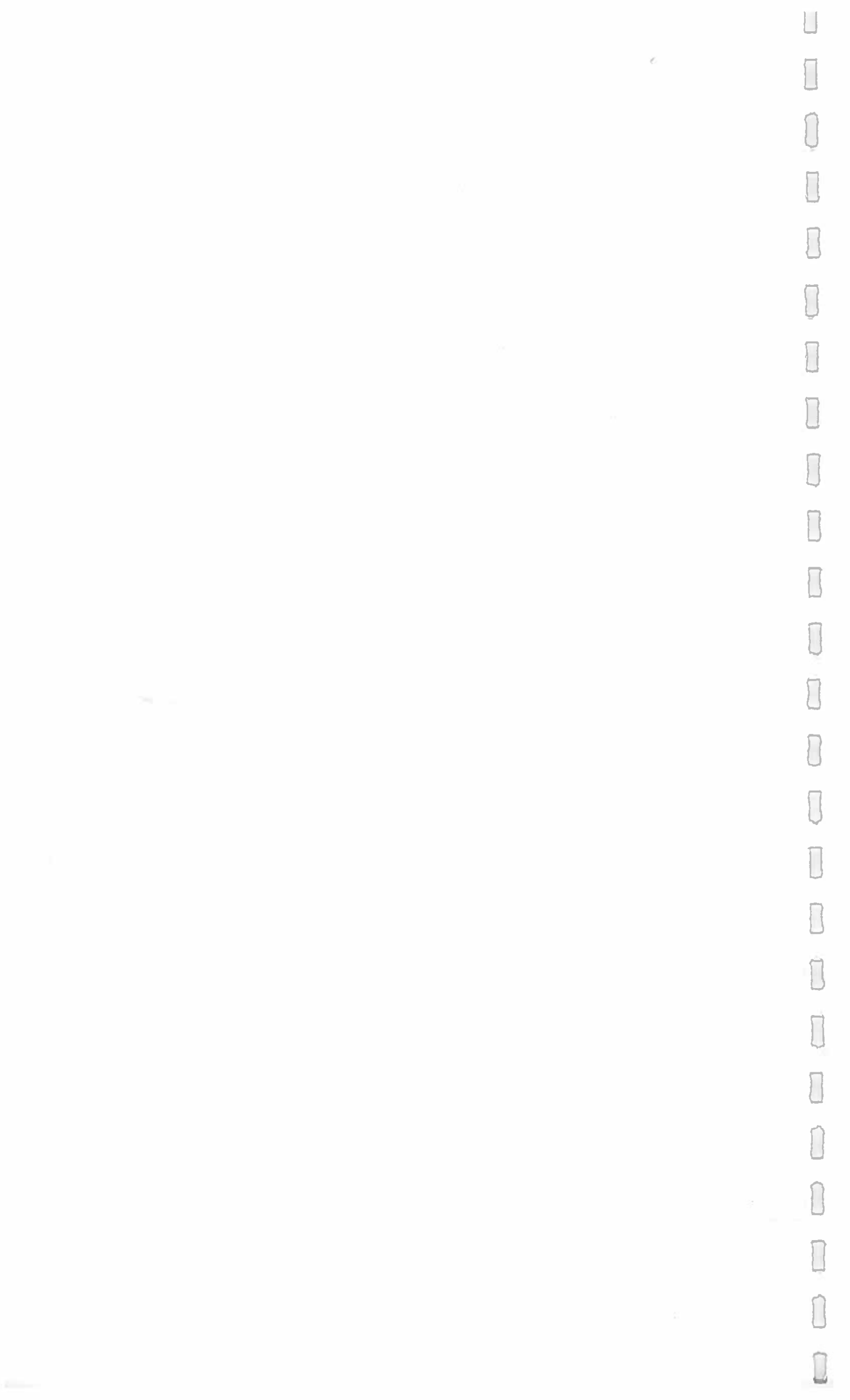


# BALTIMORE CITY FLOODPLAIN MANAGEMENT PLAN

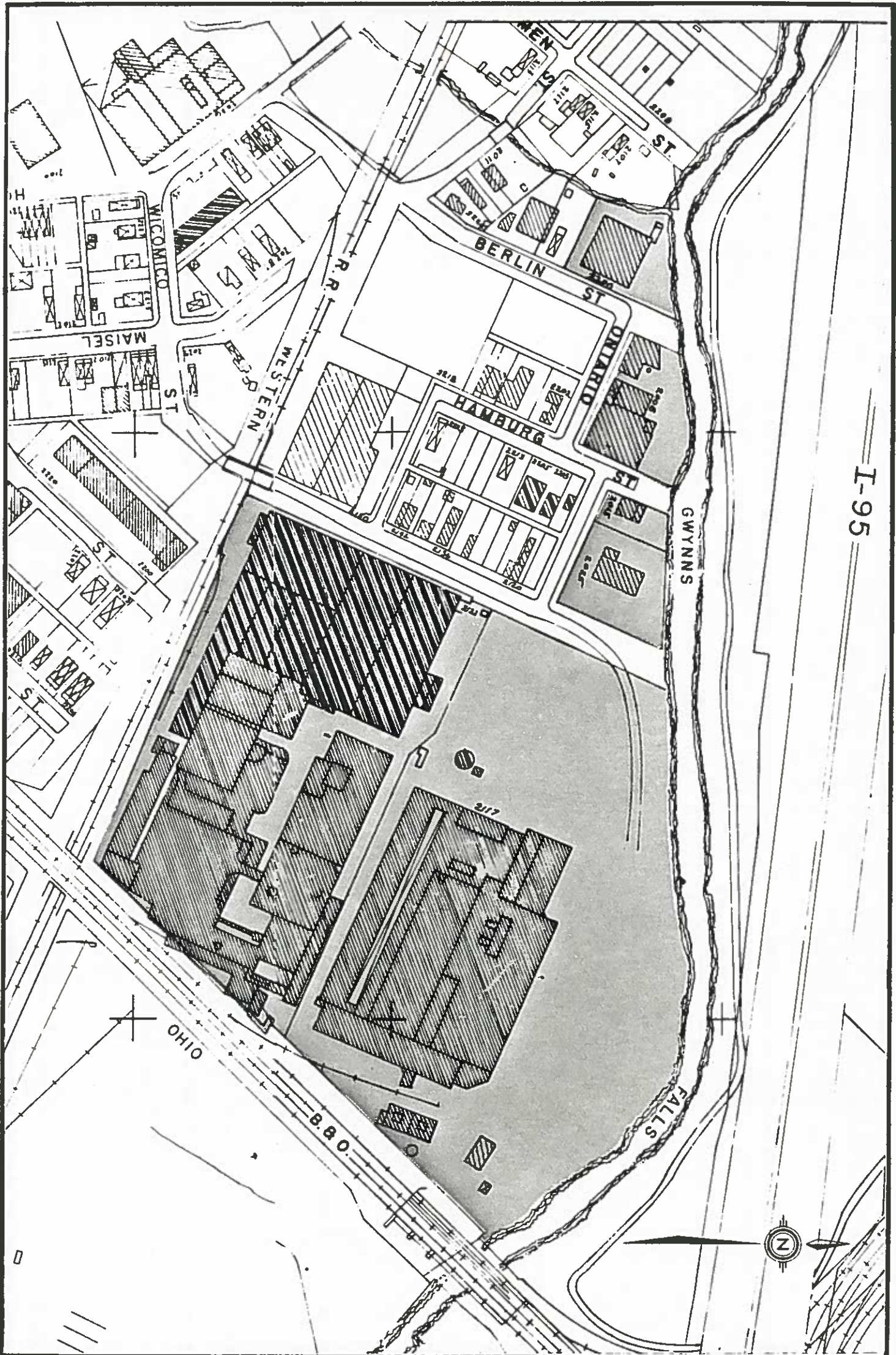
DECEMBER 1981

GWYNNS FALLS WATERSHED  
 FLOODPROOFING - KEY TO DETAILED MAPS









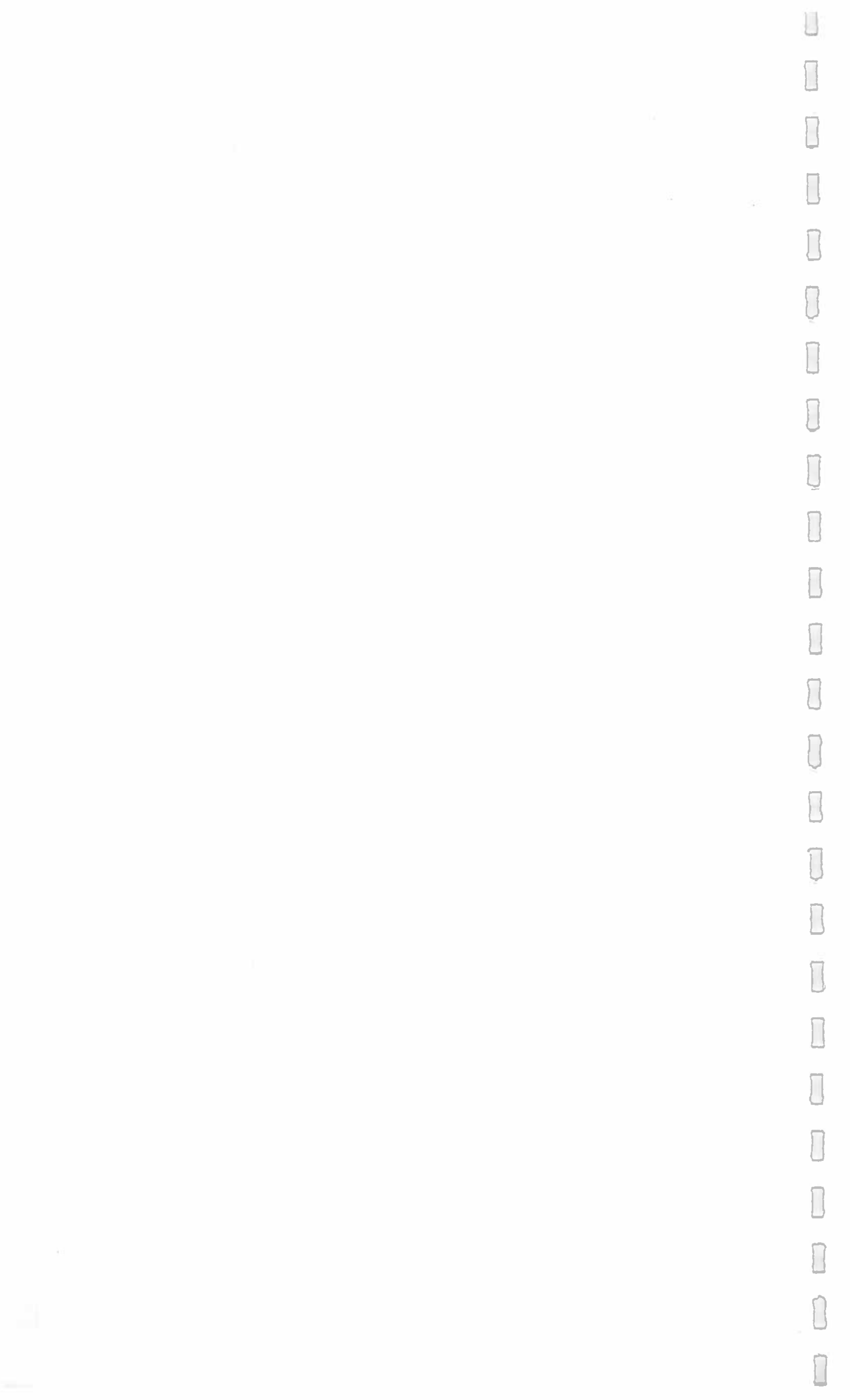
# BALTIMORE CITY FLOODPLAIN MANAGEMENT PLAN

DECEMBER  
1981

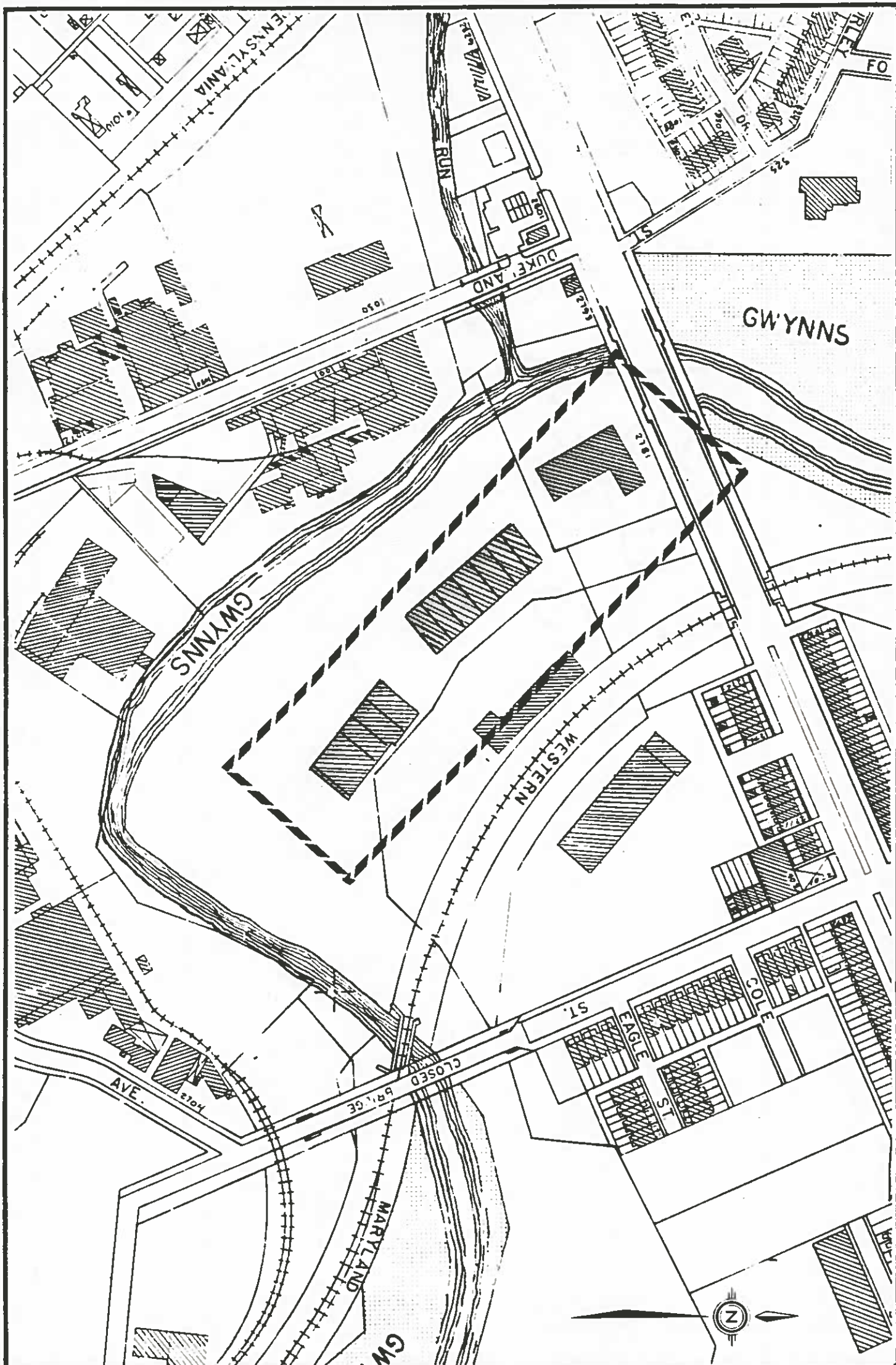
LOWER GWYNN'S FALLS  
AREAS ELIGIBLE FOR FLOODPROOFING

Map 5-1







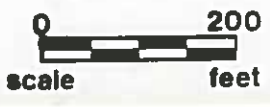


# BALTIMORE CITY FLOODPLAIN MANAGEMENT PLAN

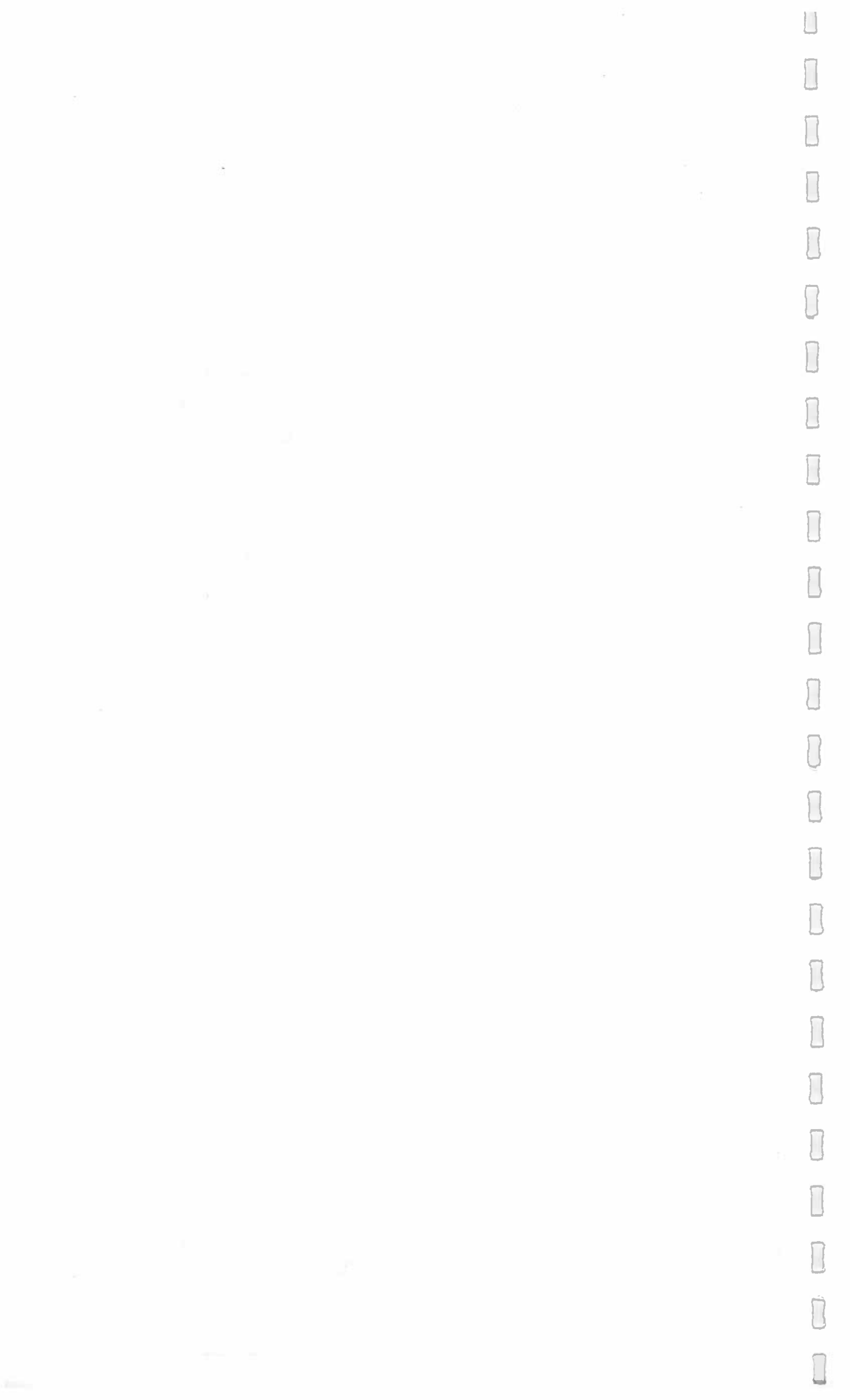
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LOWER GWYNNS FALLS  
AREAS ELIGIBLE FOR FLOODPROOFING

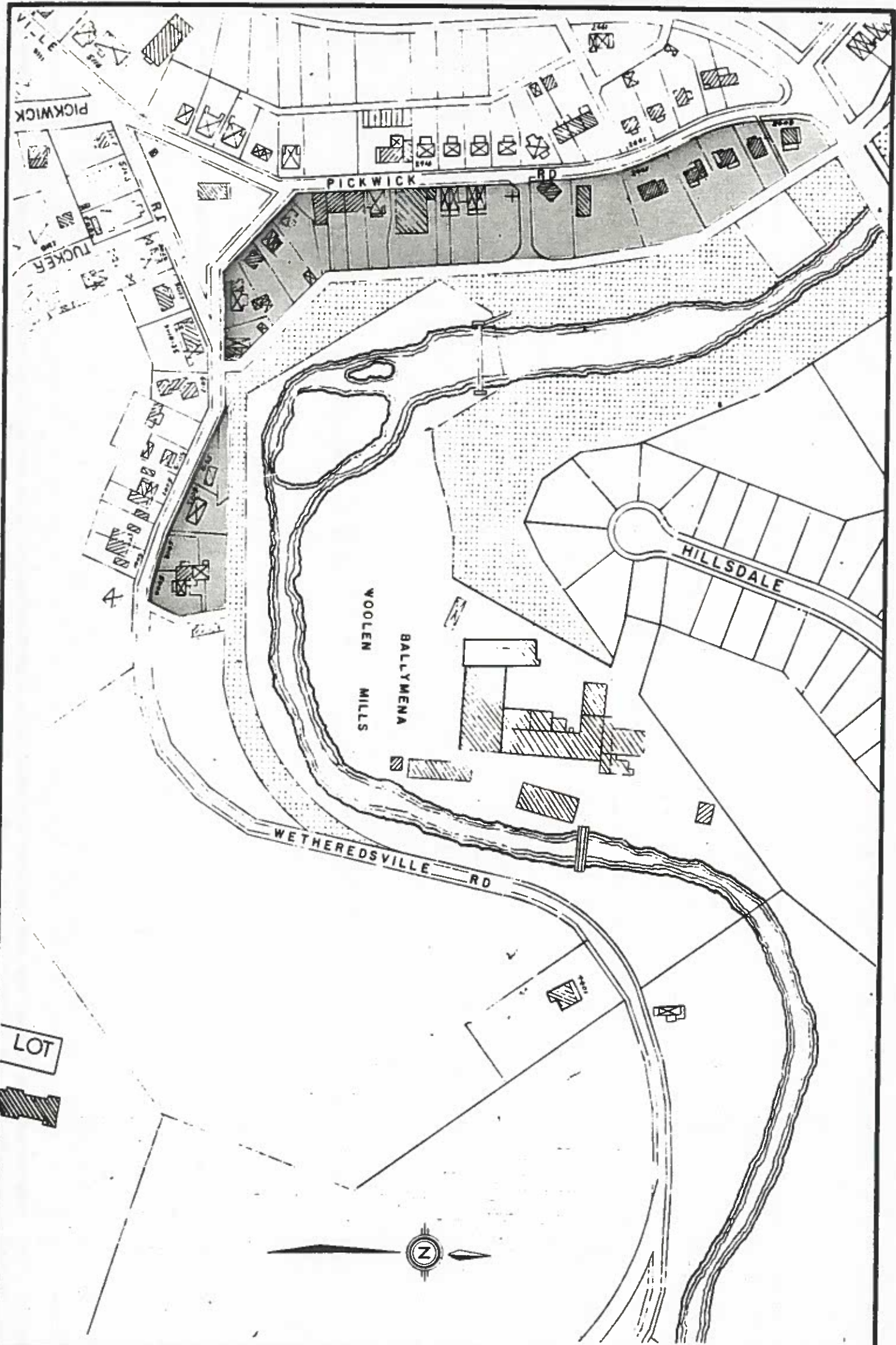
Map 5-2



GF-26







**BALTIMORE CITY  
FLOODPLAIN MANAGEMENT PLAN**

**DECEMBER  
1981**

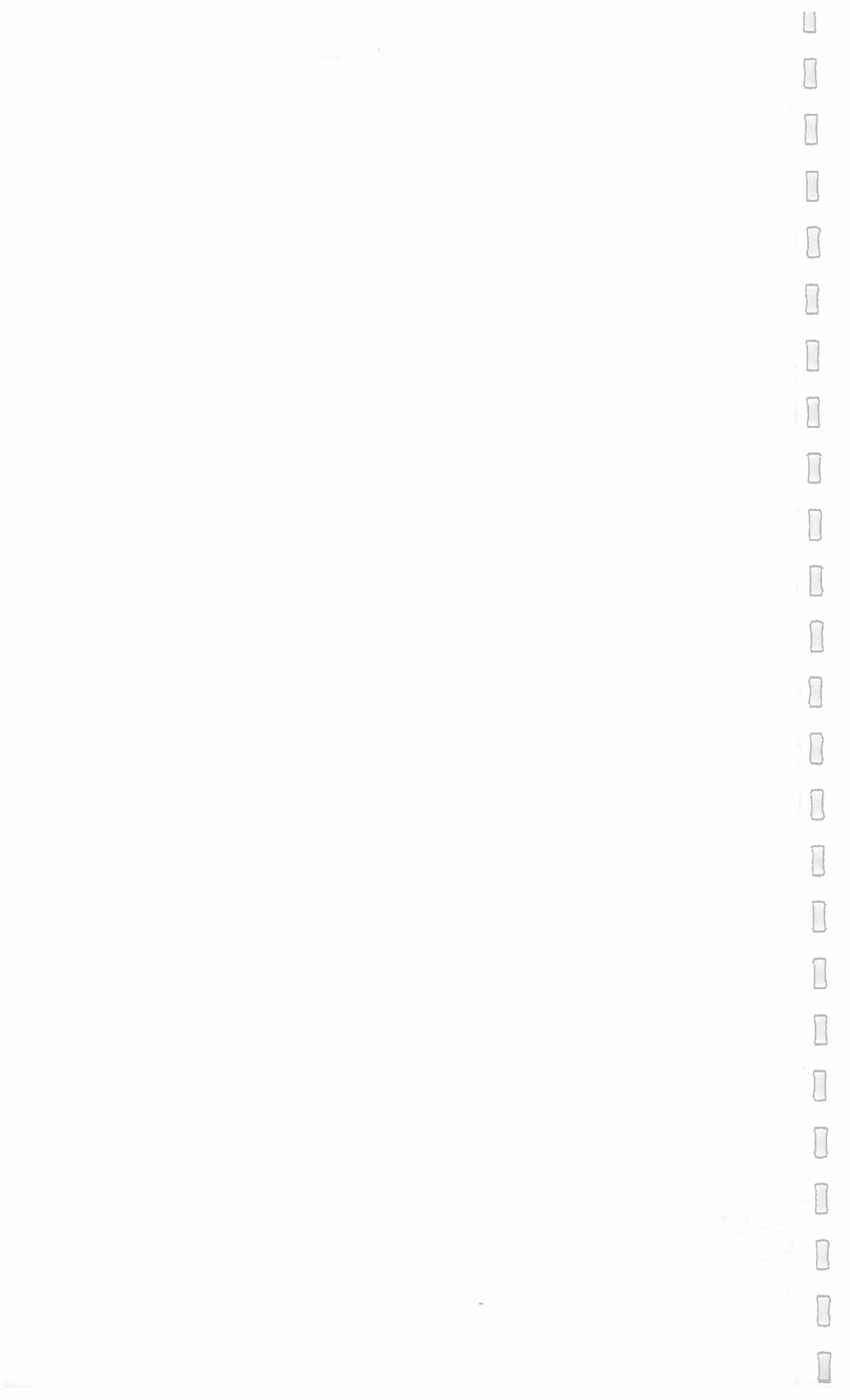
UPPER GWYNNS FALLS

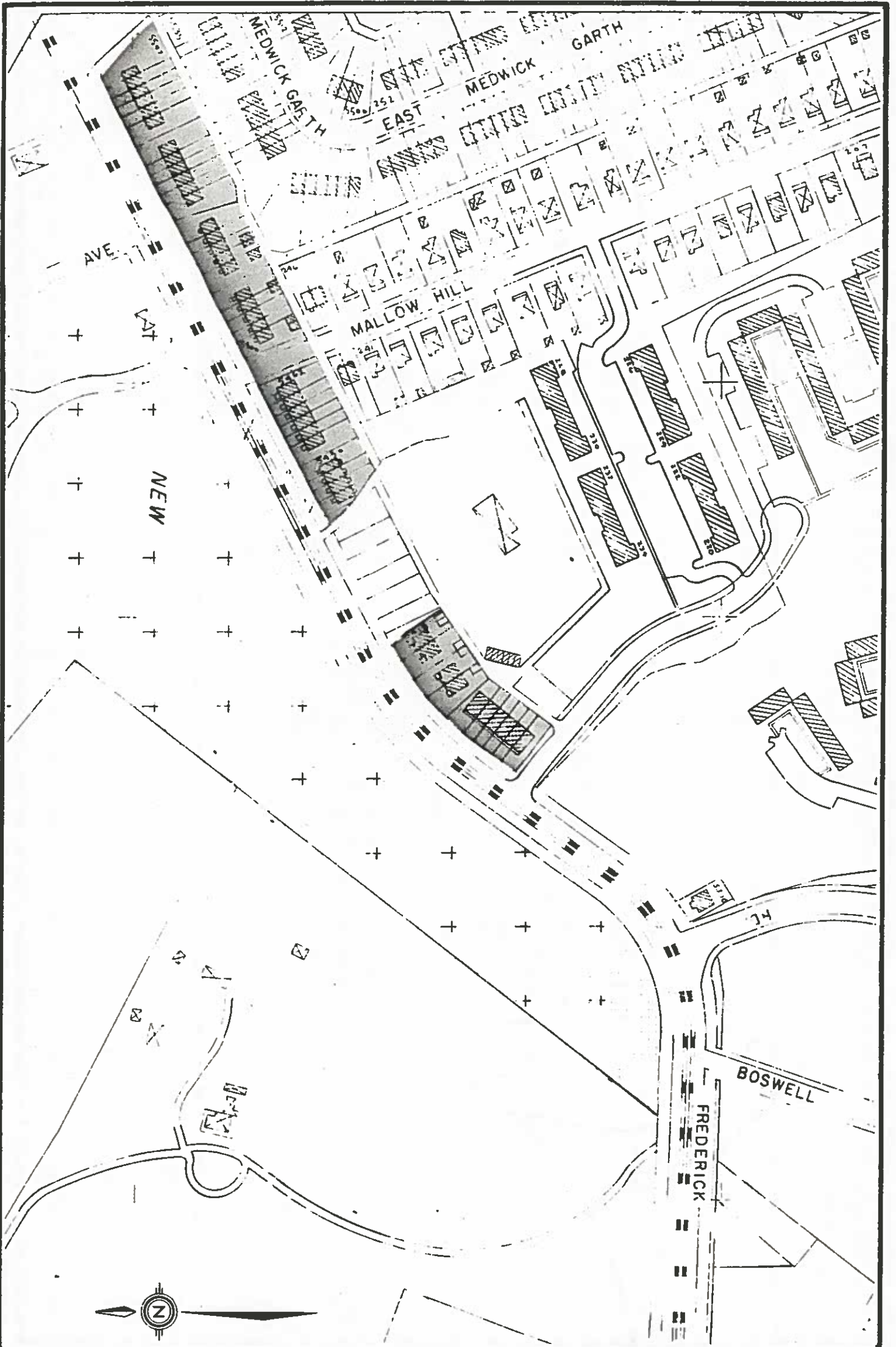
AREAS ELIGIBLE FOR FLOODPROOFING

Map 5-3



GF-27





**BALTIMORE CITY  
FLOODPLAIN MANAGEMENT PLAN**

**DECEMBER  
1981**

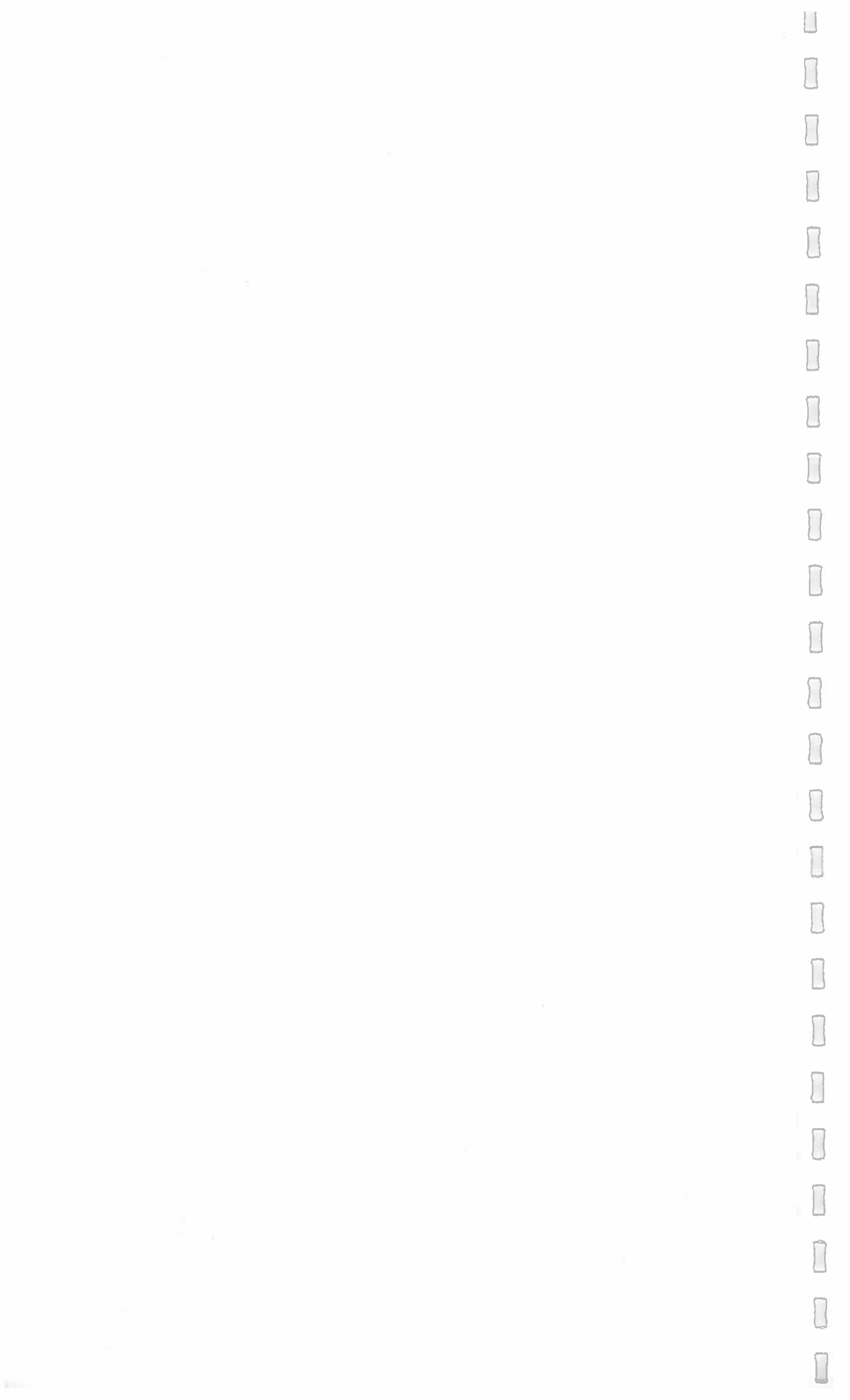
MAIDEN'S CHOICE RUN

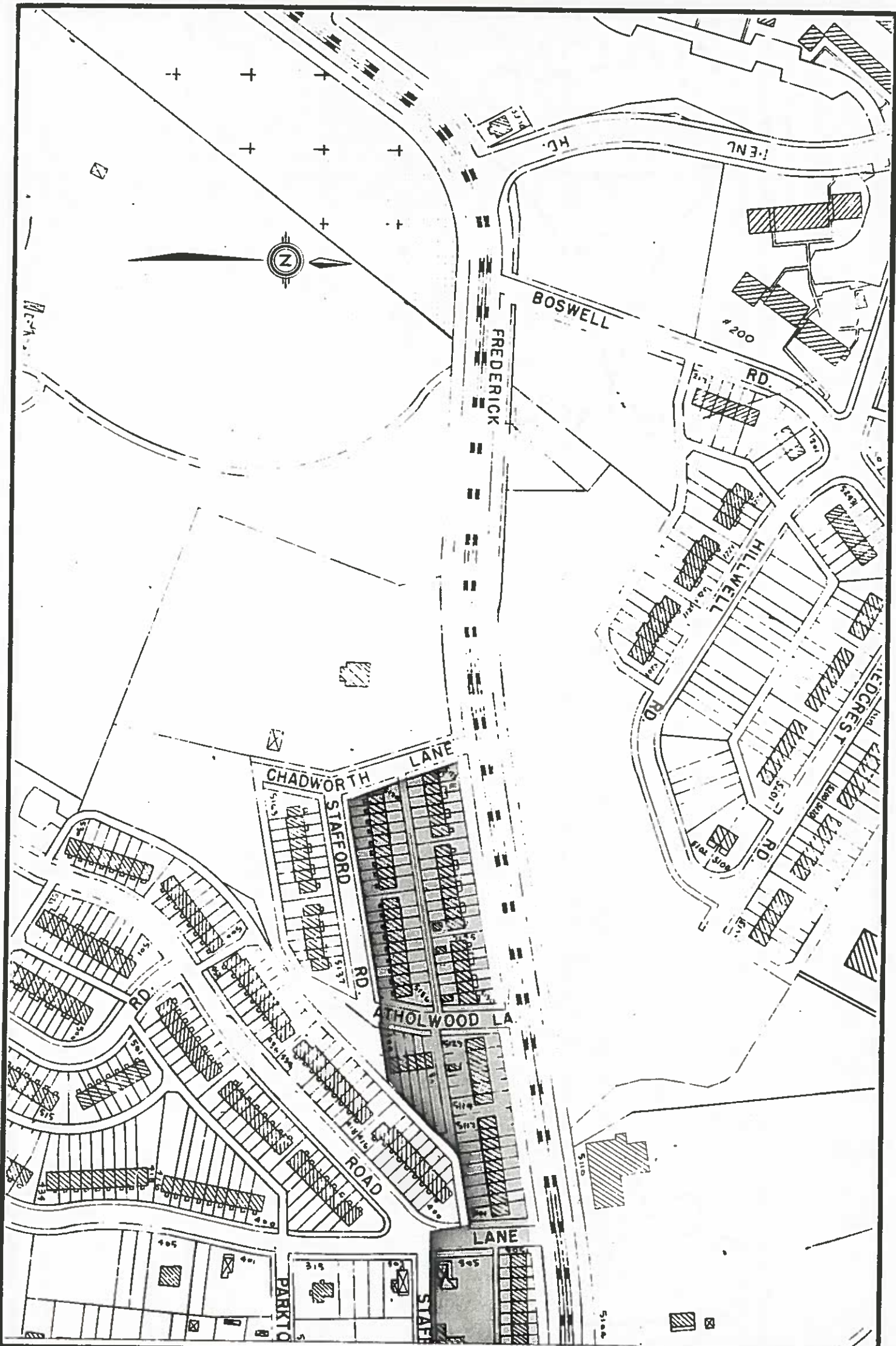
Map 5-4



AREAS ELIGIBLE FOR FLOODPROOFING







# BALTIMORE CITY FLOODPLAIN MANAGEMENT PLAN

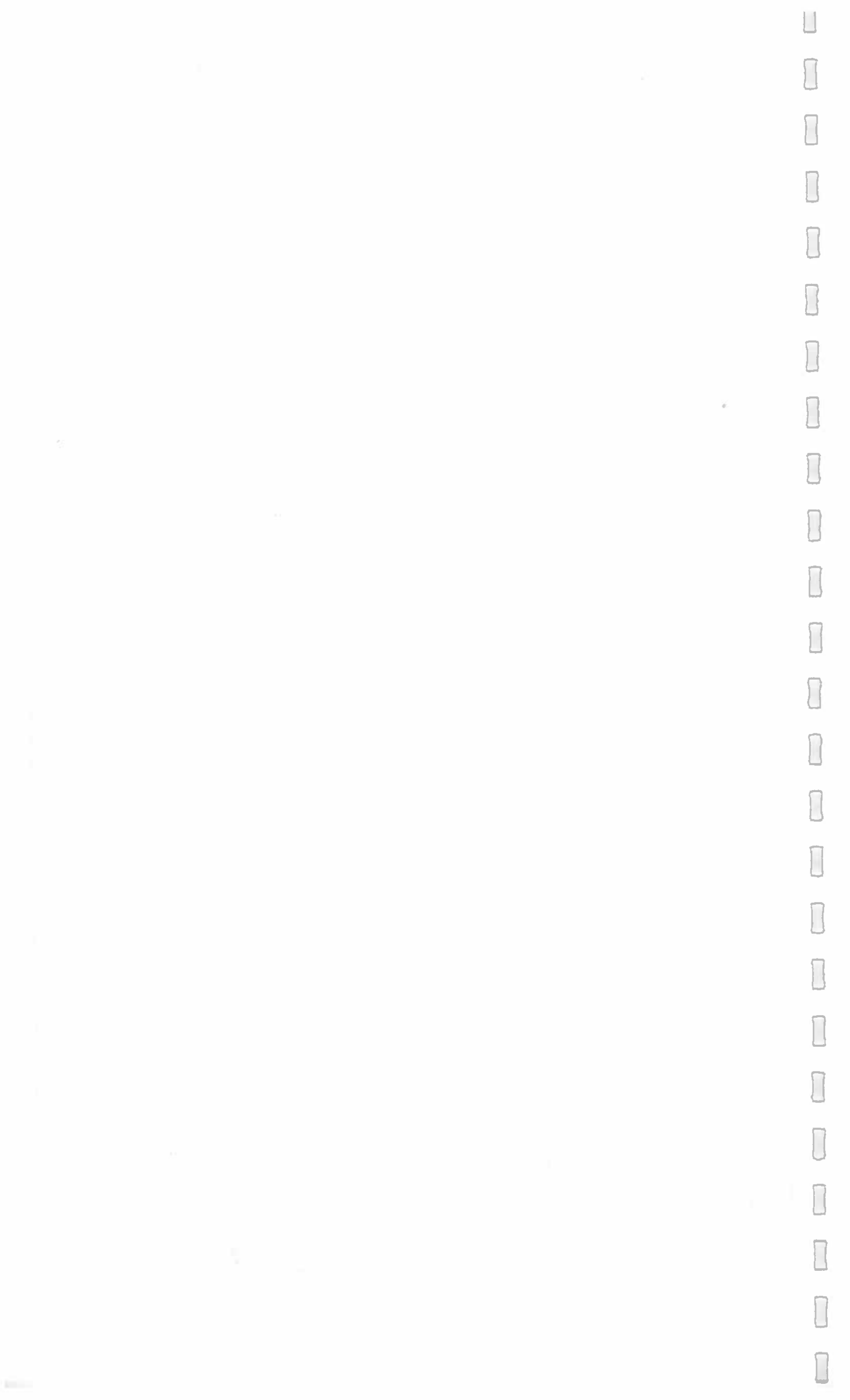
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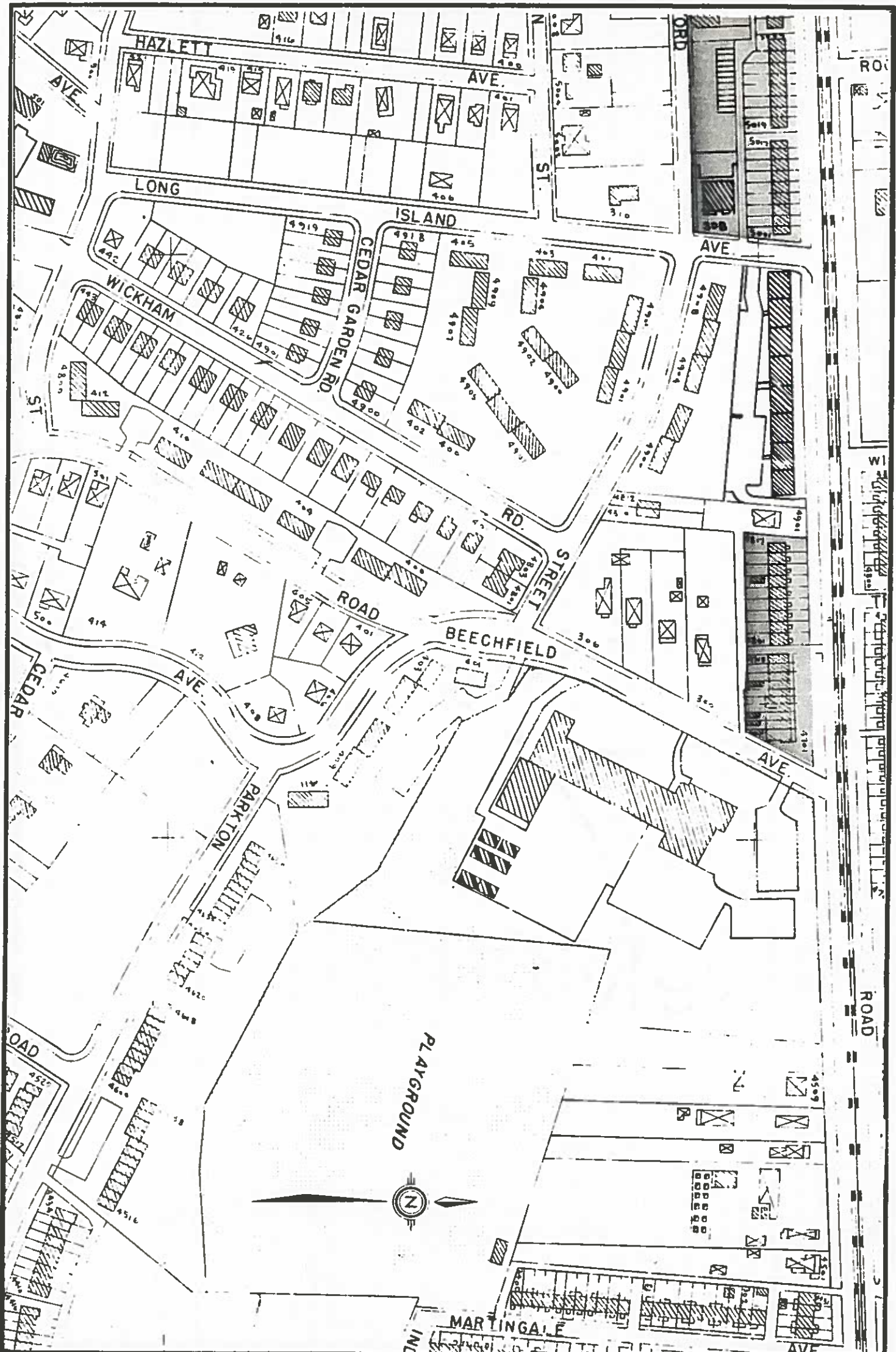
MAIDEN'S CHOICE RUN

Map 5-5

AREAS ELIGIBLE FOR FLOODPROOFING







**BALTIMORE CITY  
FLOODPLAIN MANAGEMENT PLAN**

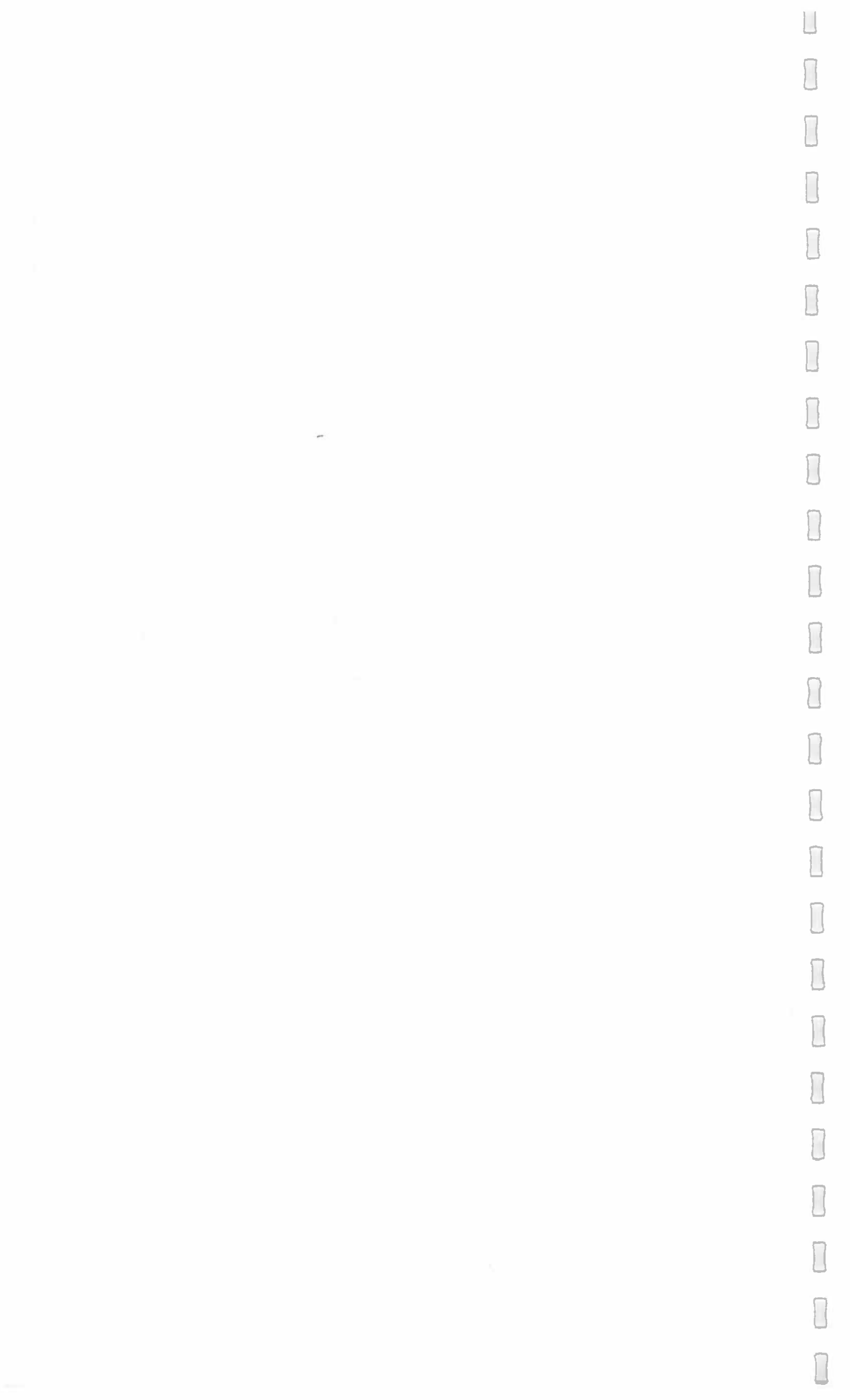
**DECEMBER  
1981**

MAIDEN'S CHOICE RUN

Map 5-6

AREAS ELIGIBLE FOR FLOODPROOFING







## LEGISLATION

Several areas in the Gwynns Falls watershed will be affected by the recommended building code revisions. The intent of these changes in the Gwynns Falls is to insure that existing and future uses do not conflict with other program elements of the comprehensive floodplain management plan. For example, after acquiring homes on the Gwynns Falls, it then becomes necessary to insure that nearby undeveloped parcels in the 100-year floodplain are not converted to residential use. The prohibition of new residential development is, therefore, a long-term provision which enhances the acquisition element of the plan.

Similarly, the elevation of new non-residential structures reduces the flood threat where the prohibition of non-residential use is not feasible. This is the case in the industrialized lower portion of the Gwynns Falls, where available land for factories and warehouses is limited. Elevating new structures above the level of the 100-year flood will significantly reduce physical damages. It must be remembered, however, that the safety of employees will still be an important consideration.

The prohibition of new residential development will affect the upper Gwynns Falls, in the areas adjacent to Leakin Park, to the City/County line, and along the lower Gwynns Falls, in the vicinity of Washington Boulevard. Maiden's Choice Run will not be affected by these legislative amendments until a detailed flood study is done. The requirement to elevate new non-residential structures in the 100-year floodplain will predominantly affect the area from the confluence of Maiden's Choice with the Gwynns Falls, downstream to where the Gwynns Falls floodplain meets the Harbor Flood Zone.

# FLOOD INSURANCE

The National Flood Insurance Program (NFIP) has City-wide application. As part of a comprehensive floodplain management plan for the Gwynns Falls, the City will continue to encourage insurance coverage for residential and non-residential properties. The City provides information to the public concerning the location of properties in designated floodplains. New structures and substantial improvements to existing structures in the Gwynns Falls watershed must meet the construction standards specified in the City's floodplain building codes, which were adopted to allow the City to enter the regular NFIP. Flood insurance for non-residential properties represents the protection of several large investments in the lower Gwynns Falls area, which is heavily industrialized. It is recommended that the City arrange, with representatives of the Federal Emergency Management Agency, to hold flood insurance program workshops to bring policy holders and interested firms or individuals in the Gwynns Falls up to date on changes in the program. As part of a City-wide effort to increase participation in the NFIP, a letter will be sent to all identified flood-prone properties, advising the recipients of the availability, benefits, and costs of flood insurance. This form of publicity for Flood Insurance has proven successful in the past.

Flood insurance is a very important element in the City's comprehensive floodplain management plan. The highly urbanized nature of portions of the Gwynns Falls floodplain makes many other management alternatives impractical. For example, the City cannot afford to acquire the large industrial properties on the lower Gwynns Falls. Similarly, the construction of a dike or levee is undesirable because of environmental as well as economic impacts. Since the Corps of Engineers' Metropolitan Streams Report found such an alternative to be non-cost-effective, there would be no federal participation in such a project.

Alone, however, flood insurance cannot lead to long-term wise management of the Gwynns Falls watershed. Insurance must be part of a broader program of floodproofing, acquisition, stream maintenance, enforcement of City ordinance, and an effective early warning system for flood events.

# EARLY WARNING AND EVACUATION SYSTEM

Operation SWIFT will help to reduce risks to life and property damage in the Gwynns Falls floodplain. Flood-prone homes have been identified in the Frederick Avenue, Dickeyville and Maisel Street areas for early warning and evacuation procedures in the event of a flood. The Baltimore City Police Department will be provided with the list of susceptible homes, as well as a list of non-residential buildings prone to flooding. The Police are responsible for notifying residents and property owners that a flood warning has been issued. Contingency plans for flood-proofing, such as placing floodshields, and sand bags or moving valuable objects to upper floors, can then begin. In addition, evacuation of threatened structures can proceed under the direction of the Police Department in a more orderly fashion.

SWIFT will also utilize a series of maps, developed by the Baltimore City Department of Public Works, to monitor and close, if necessary, roads which are prone to flooding. Several recent deaths during floods have occurred because motorists were trapped by rapidly rising water on City streets. The Bureau of Highways will perform street closings, with assistance from the Department of Transit and Traffic. In the Gwynns Falls area, the major streets prone to flooding are listed in the Appendix.

The Appendix contains the Standard Operations Procedure for Operation SWIFT. The included map the location of the Police and Fire stations in the Gwynns Falls watershed, as well as the areas considered high priority in SWIFT.

There are several stream and one rain gauge located in the Gwynns Falls watershed, which, combined with Weather Service predictions and updates, will form the data base for decision-making in SWIFT. The stream gauges are located on Maiden's Choice Run at Overbrook Road and Beechfield Avenue, and on the Gwynns Falls at Forest Park Avenue and Washington Boulevard. The rain gauge is located at Fire Company #30 on Frederick Avenue. These gauges form a network with other gauges located throughout the City and in the Counties, and are monitored during Operation SWIFT (See Appendix).

# MINOR STREAM CHANNEL IMPROVEMENTS

There are many segments of stream in the Gwynns Falls watershed where minor stream channel improvements would be beneficial in floodplain management. Although shoal and debris removal, as well as bank stabilization, will not prevent flooding during the relatively infrequent yet severe storm events, these measures would help to safely pass the peak discharge from more frequent and less severe storms, which often cause localized flooding problems.

A considerable amount of repair work has recently been done on the Gwynns Falls, Dead Run and Maiden's Choice Run under the Tropical Storm David Disaster Recovery program. In the Gwynns Falls watershed, approximately 3.3 million dollars has been spent on shoal removal, streambank and utility protection and other minor channel improvements. Gabion installation has been the predominant method used for streambank and utility protection. In some areas, the channel has been deepened and widened to restore or improve channel capacity where excess sedimentation and deposition have occurred. Repairs to culverts and associated structures were also necessitated by the damages done during the 1979 storm.

The areas repaired in the Tropical Storm David Recovery program are shown generally on Map 6. This Federally funded program has enabled the City to repair those portions of streams where damages from Tropical Storm David posed a threat to life or affected public property and utilities. There remain, however, segments of stream in the Gwynns Falls watershed in need of repair, but ineligible for funding under the Federal program. These segments are shown generally on Map 7. Most of the repair needs consist of erosion control to protect streambanks and public utilities, and shoal and debris removal. Clearing culverts of debris is needed on an ongoing basis.

The performance of needed repairs, clean-up and minor improvements will require a considerable capital expenditure, estimates at about 1 million dollars to clean and restore the Gwynns Falls. This should be programmed into the City's Capital Improvement Program over several years, utilizing, if available, City and State matching funds. In addition, stream maintenance should be reinstated as an operating budget item in the Department of Public Works.

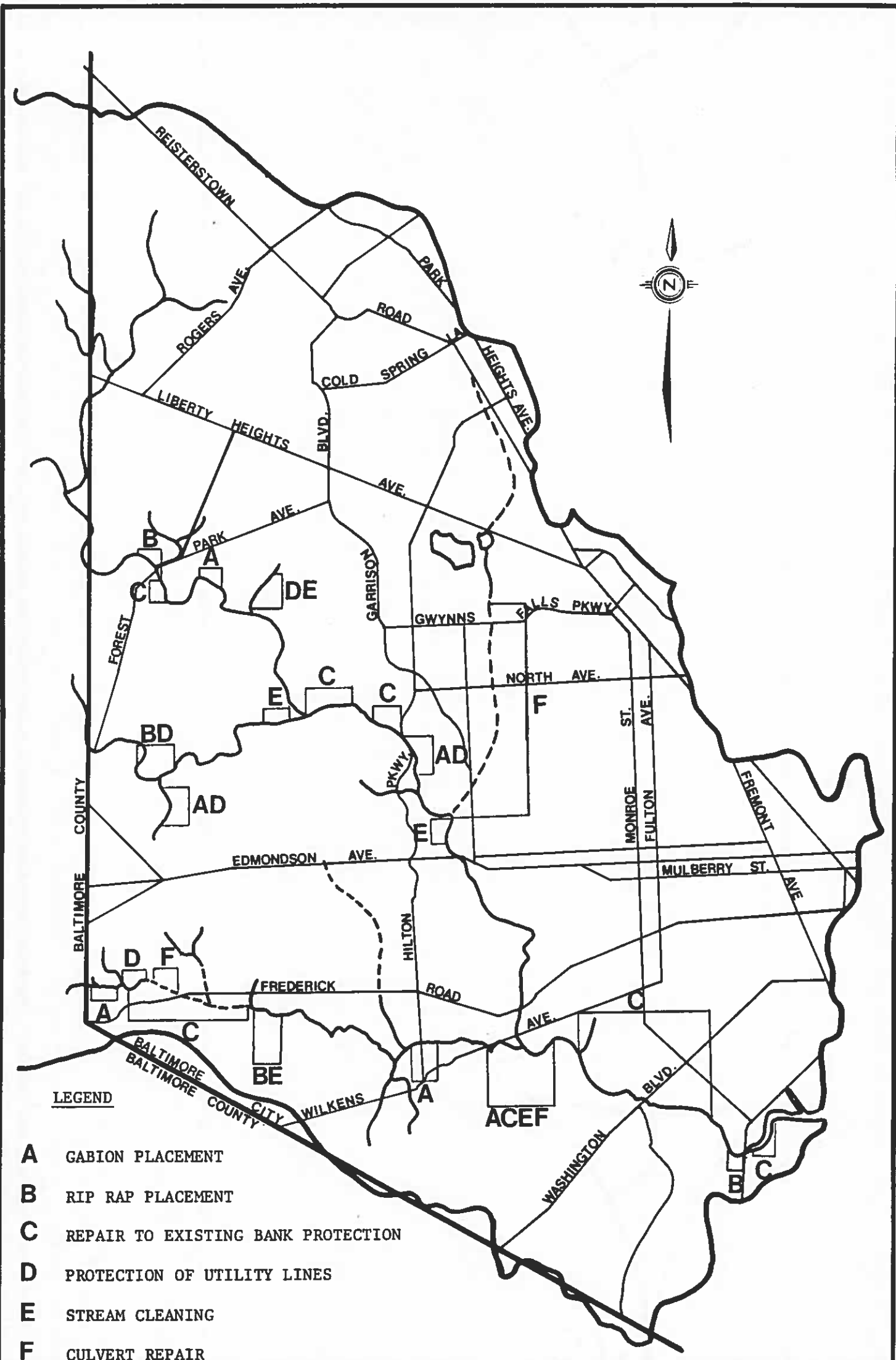
Several benefits will be derived from a program of minor stream improvements. First localized flooding from minor storms may be alleviated, particularly in developed areas adjacent to open stream channels where flow is constrained by bridges, or where culverts have been placed and are prone to blockage. On the Maiden's Choice Run, for example, much of this work was needed after Tropical Storm David, and Federal funds were appropriated for the task. Second, a systematic and thorough program of shoal removal, channel restoration and streambank stabilization may contribute to a reduction in the cumulative flooding problems along the length of the stream, by enhancing the passage of flood flows. This will be particularly beneficial when combined with the removal of structures in the floodplain. Enhancing the passage of the peak discharge is especially important in the lower portions of a watershed. The lower Gwynns Falls, where flooding causes extensive damages, would benefit from such a stream improvement program.

A third benefit of minor stream improvements in the Gwynns Falls will be improved water quality and appearance of the stream valleys. The control of erosion will decrease turbidity and sedimentation. The proper installation of gabions and wire mats will allow revegetation of a stabilized streambank with grasses and wildflowers, so that aesthetic objectives can be achieved as well. This removal of debris also has obvious water quality and aesthetic benefits.

Finally, a program of minor stream improvements in the Gwynns Falls watershed will complement and complete the work begun under the Tropical Storm David recovery program. In areas where Federal funding requirements precluded work from the program, it is necessary to use alternative funds to do the stream repairs. In addition to a capital program to do this necessary work, an operating budget for an ongoing stream maintenance program should be initiated, to insure that streams remain clear and in good condition. In this way, the Gwynns Falls and its tributaries will be cleaned, restored and maintained in a comprehensive and ongoing manner, to help reduce flooding damages and enhance water quality.







# BALTIMORE CITY FLOODPLAIN MANAGEMENT PLAN

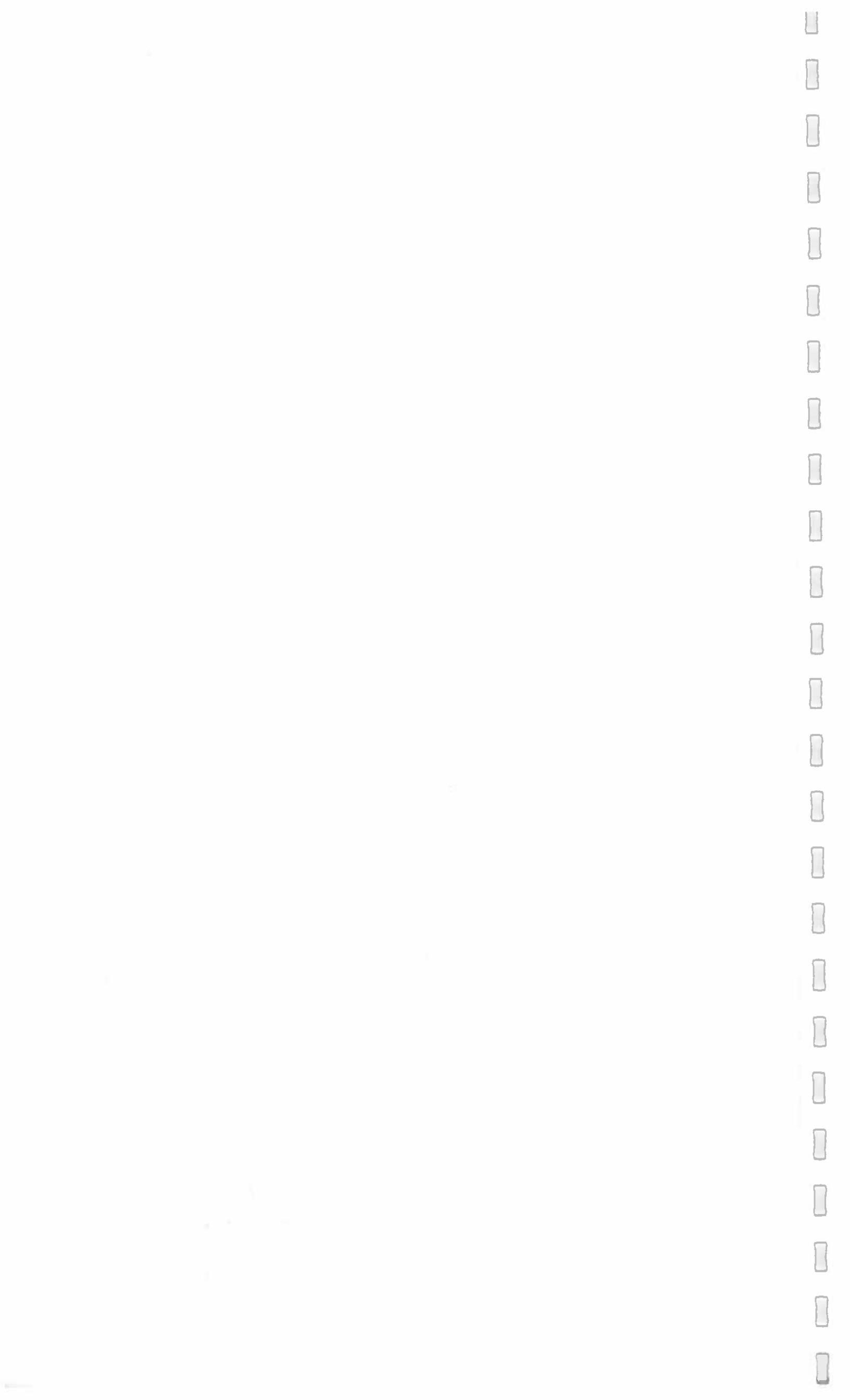
DECEMBER 1981

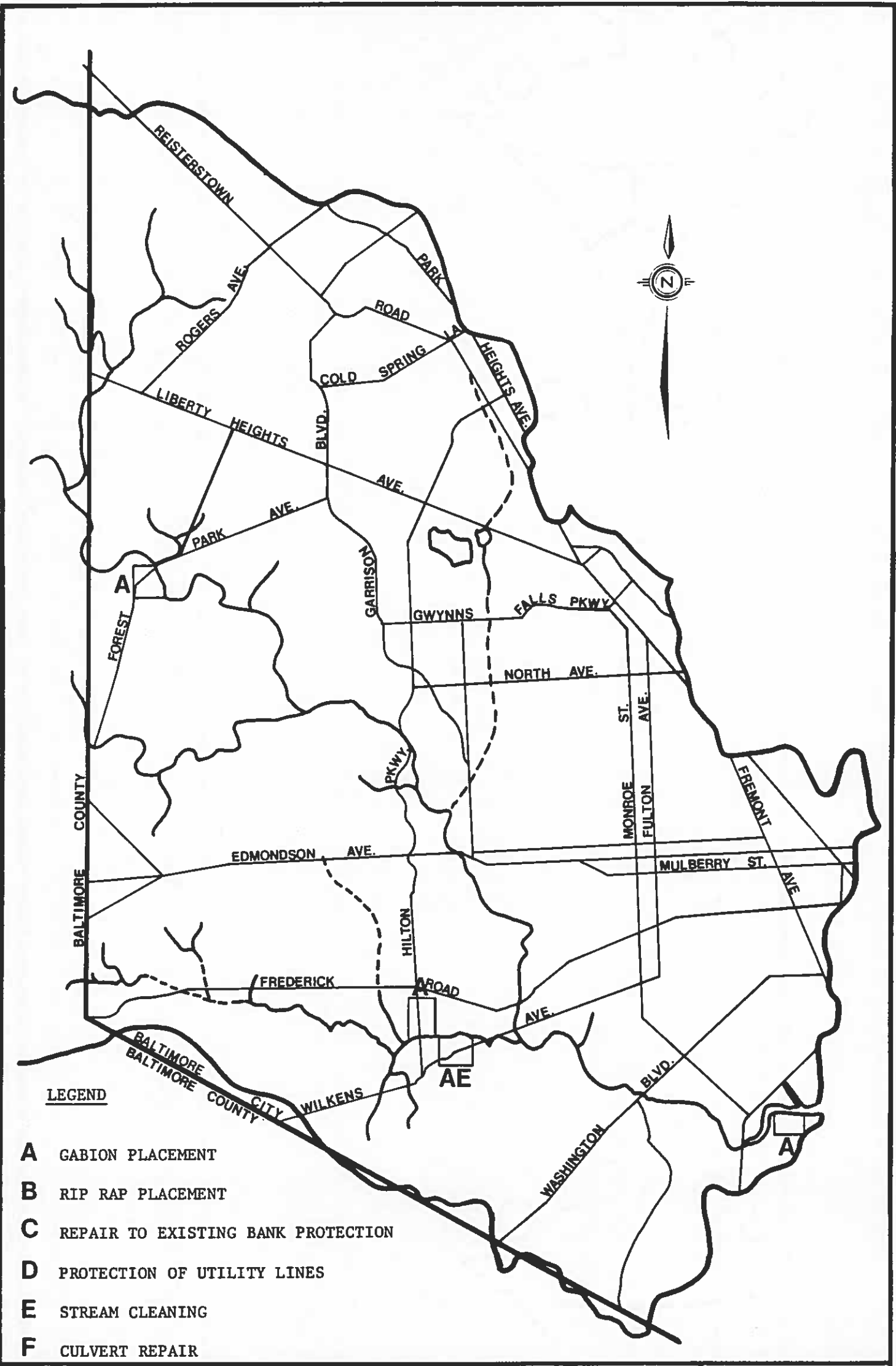
GWYNNS FALLS WATERSHED

Map 6



COMPLETED AND PROGRAMMED STREAM IMPROVEMENTS





**LEGEND**

- A** GABION PLACEMENT
- B** RIP RAP PLACEMENT
- C** REPAIR TO EXISTING BANK PROTECTION
- D** PROTECTION OF UTILITY LINES
- E** STREAM CLEANING
- F** CULVERT REPAIR

**BALTIMORE CITY FLOODPLAIN MANAGEMENT PLAN**

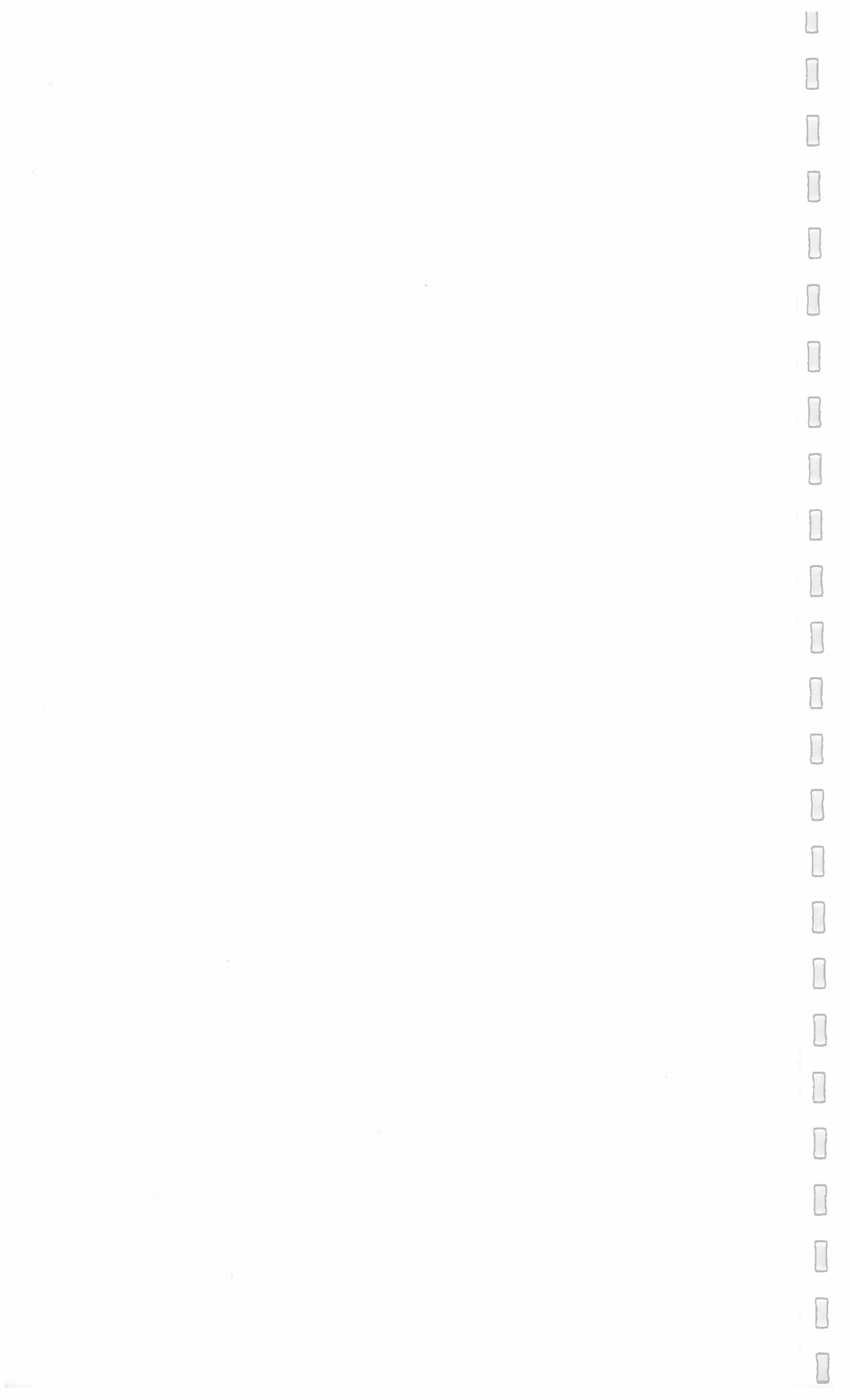
**DECEMBER 1981**

Gwynns Falls Watershed

Map 7



AREAS NEEDING STREAM IMPROVEMENTS





## AREAS NEEDING FURTHER STUDY

Fourth, a detailed flood study, including hydrologic and hydraulic characterizations for the drainage area should be performed. Delineation of the floodplain and generation of predicted water surface profiles for the 10-, 25-, and 100-year frequency floods should be products of the study. A model capable of predicting water behavior due to increased development or changes in stream configuration (e.g. channelization, restoration of open stream channel, or additional closed conveyance with changes in culvert diameter) should be developed.

With these data and predictive tools, it should be possible to better manage the Maiden's Choice Run watershed, to predict the effects of development, to identify those homes which should be considered for acquisition and floodproofing, and to implement floodplain regulations.

Because of the interjurisdictional nature of Maiden's Choice Run the City and Baltimore County should cooperate on early warning and evacuation plans, jointly review development plans in the drainage area, and coordinate flood studies to insure continuity and compatible predictive capabilities.

### Gwynns Run

Gwynns Run, a tributary of the Gwynns Falls, is nearly entirely enclosed in storm drains (See Map 9). Its drainage area is approximately 5.4 square miles. It flows through predominantly residential neighborhoods, where localized flooding has caused impassable streets, flooded basements, and in some cases, undermined homes.

The stream was gradually enclosed as development proceeded in that portion of the City during the 1940's and 1950's. Today, the only open channel portion is visible in Hanlon Park, between Park Heights Avenue and Gwynns Falls Parkway.

Flooding occurs in sump areas, where depressions in the topography, either natural or created by home and street construction, cause water from overland runoff to accumulate. As is the case with Maiden's Choice Run, the storm drain culverts become surcharged when rainfall exceeds the capacity of the pipes. The excess water then flows downhill on the streets, following the topography to reach the lowest points.

Tropical Storm David caused substantial damages in the Gwynns Run drainage area. It is an area prone to flooding when the capacity of the underground conveyance system is exceeded. Rapidly occurring street flooding may inundate passing cars or become dangerous to pedestrians and water may enter homes in the low-lying areas.

### RECOMMENDATIONS

Although it has been shown that the Gwynns Run drainage area is susceptible to flooding, there have been no detailed flood studies done to delineate the floodplain and determine water surface elevations. It is recommended that such a study be done to predict the floodplain and water surface elevations for the 10-, 25-, and 100-year frequency floods. The study should have predictive capabilities as well. Appropriate long-term solutions to the flooding problems could be determined with the help of this study.

In addition to recommending a flood study for Gwynns Run, other actions should be made to reduce flood damages. First, sumps along streets and at intersections should be marked by flood warning signs to alert motorists and pedestrians to the potential danger. Second, the residential floodproofing program should be publicized to homeowners in the area. Third, homeowners should be encouraged to purchase adequate flood insurance. Fourth, Action Plan S.W.I.F.T. should be prepared to close flood-prone streets, and to alert, and evacuate if necessary, affected residents.

Two tributaries of the Gwynns Falls have not received adequate study on which to base the full implementation of floodplain management strategies. These tributaries are Maiden's Choice Run and Gwynns Run. Loss of life, as well as costly property damages, has occurred in these drainage areas during severe storms. However, the City lacks the hydrologic and hydraulic information needed to accurately delineate the floodplain and predict water surface elevations.

#### Maiden's Choice Run

The Maiden's Choice Run drainage area encompasses approximately 4.8 square miles. Approximately two-thirds of this area lies within Baltimore City (See Map 8). The stream flows through an urbanized residential and commercial area. It has been channeled and placed in underground conveyance for portions of its length. Thus, the stream hydrology and hydraulics have been extensively altered by human activities.

Flooding occurs along the Maidens Choice Run in both the City and the County, where the stream originates. During heavy rainfall, the culverts along the stream are surcharged, causing the waters to back up, overflow the streambanks, and flow down the nearby streets. Frederick Avenue, under which the stream flows in culvert, often acts as the stream channel during these periods of overflow. The flood waters travel with substantial velocity and may reach several feet in depth.

The situation in the vicinity of Frederick Avenue where the stream is in closed conveyance, becomes extremely hazardous. Because of the relatively small yet steep drainage area, the degree of development and the engineering alterations to the stream, it responds very quickly to heavy rainfall. Flash flooding, therefore, is common in this area. It presents a serious hazard to pedestrians, motorists, and to occupants in buildings located in the topographically low area on Frederick Avenue and adjoining streets. In addition, extensive basement and yard flooding causes damages and losses.

Despite the lack of engineering data, there is enough historic information of flooding along Maidens Choice Run to recommend some floodplain management. It is necessary to implement a strategy to reduce the threat to life while awaiting detailed studies to prevent future accidents.

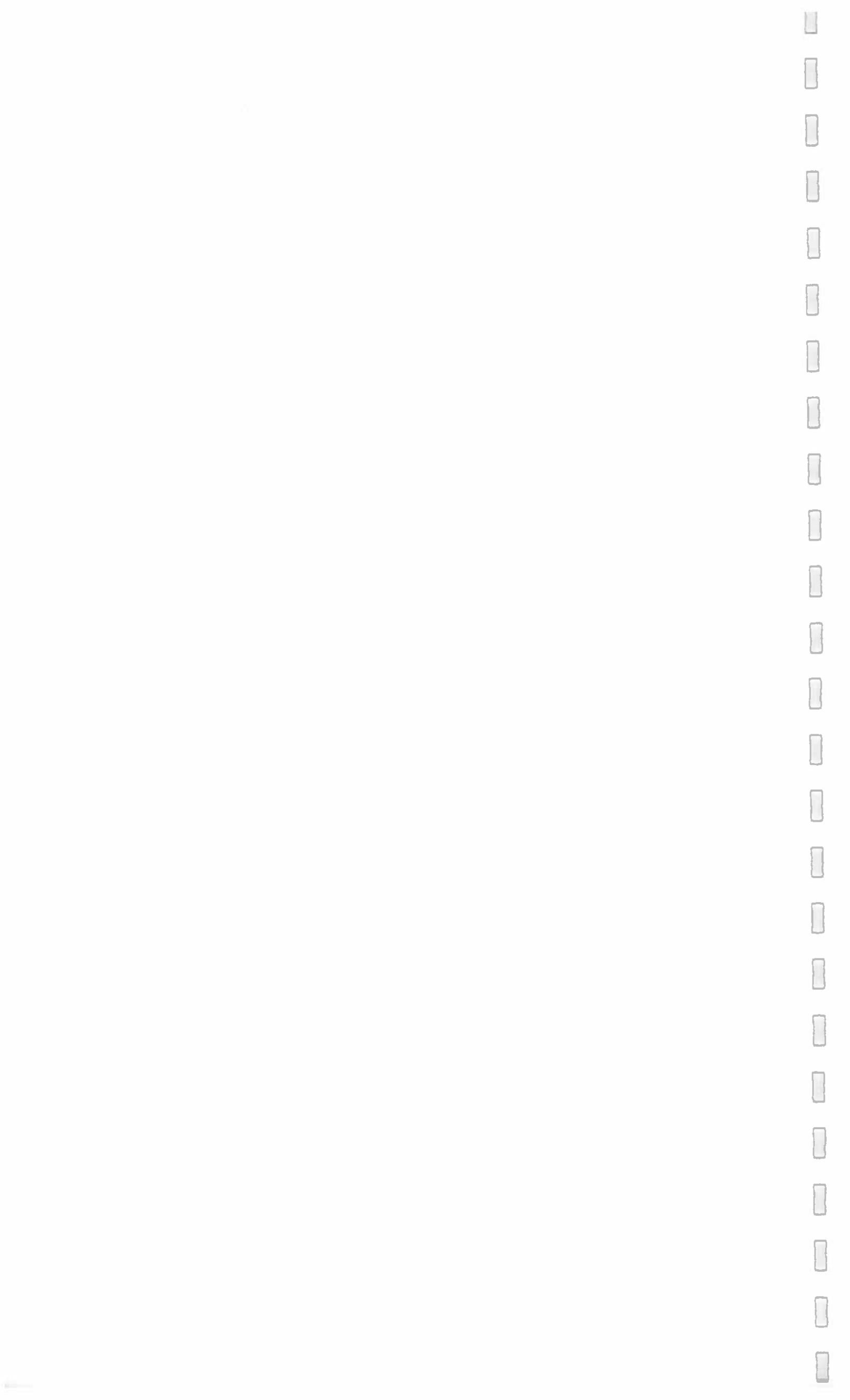
#### RECOMMENDATIONS

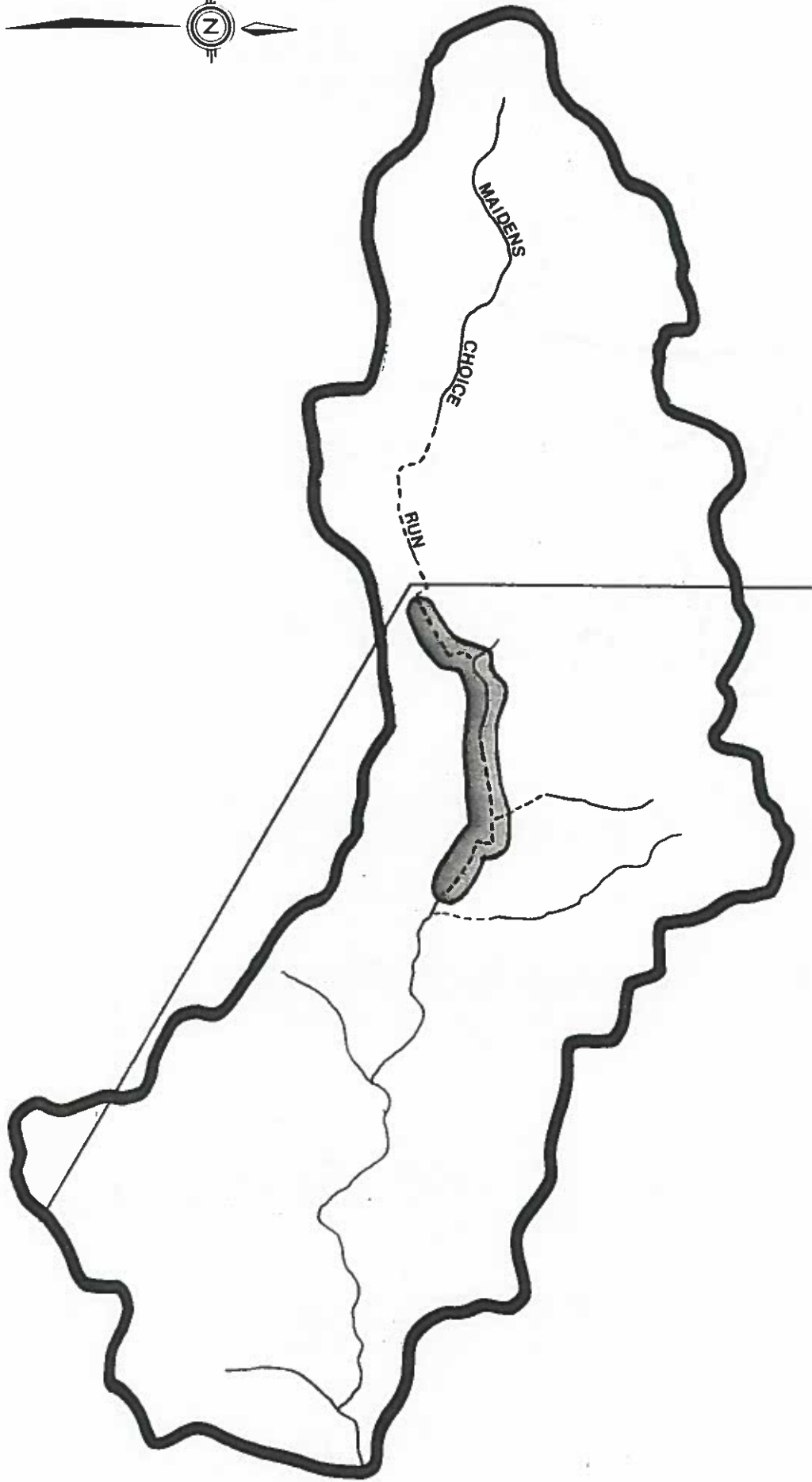
First, on the basis of past flooding damages, the acquisition homes has been recommended. These homes lie in the direct path of floodwaters and sustain first floor flooding. These were flooded during Agnes, David and the recent flash flood in June, 1981. These homes also experienced flooding during storms in 1947 and 1954. In addition, it has been recommended that the apartments on Frederick Avenue, which have been repeatedly and seriously flooded since their construction, not be rented in the future. This may require partial acquisition, an easement, or partial condemnation by the City.

Second, it has been recommended that homeowners and occupants of homes which experience any flooding be encouraged to purchase adequate flood insurance and to floodproof their homes to the extent possible. The City should provide technical and financial assistance for residential floodproofing.

Third, Action Plan S.W.I.F.T. could reduce risks to motorists, pedestrians and persons in flood-prone structures by issuing warnings, closing streets, monitoring weather and stream conditions, and initiating evacuation if this become necessary. This early warning and evacuation system should be prepared to respond to flash flood alerts issued by the National Weather Service, as well as to warnings of hurricanes and tropical storms, for which there is more preparation time. Flood warning signs should be posted along Frederick Avenue to deter motorists from continuing during heavy rainfalls.

This combination of non-structural techniques will contribute to a lessening of flood damages should the Gwynns Run area experience a storm like Tropical Storm David again. With a detailed flood study, more permanent solutions to the problems may become apparent.





RESIDENTIAL FLOODING

# BALTIMORE CITY FLOODPLAIN MANAGEMENT PLAN

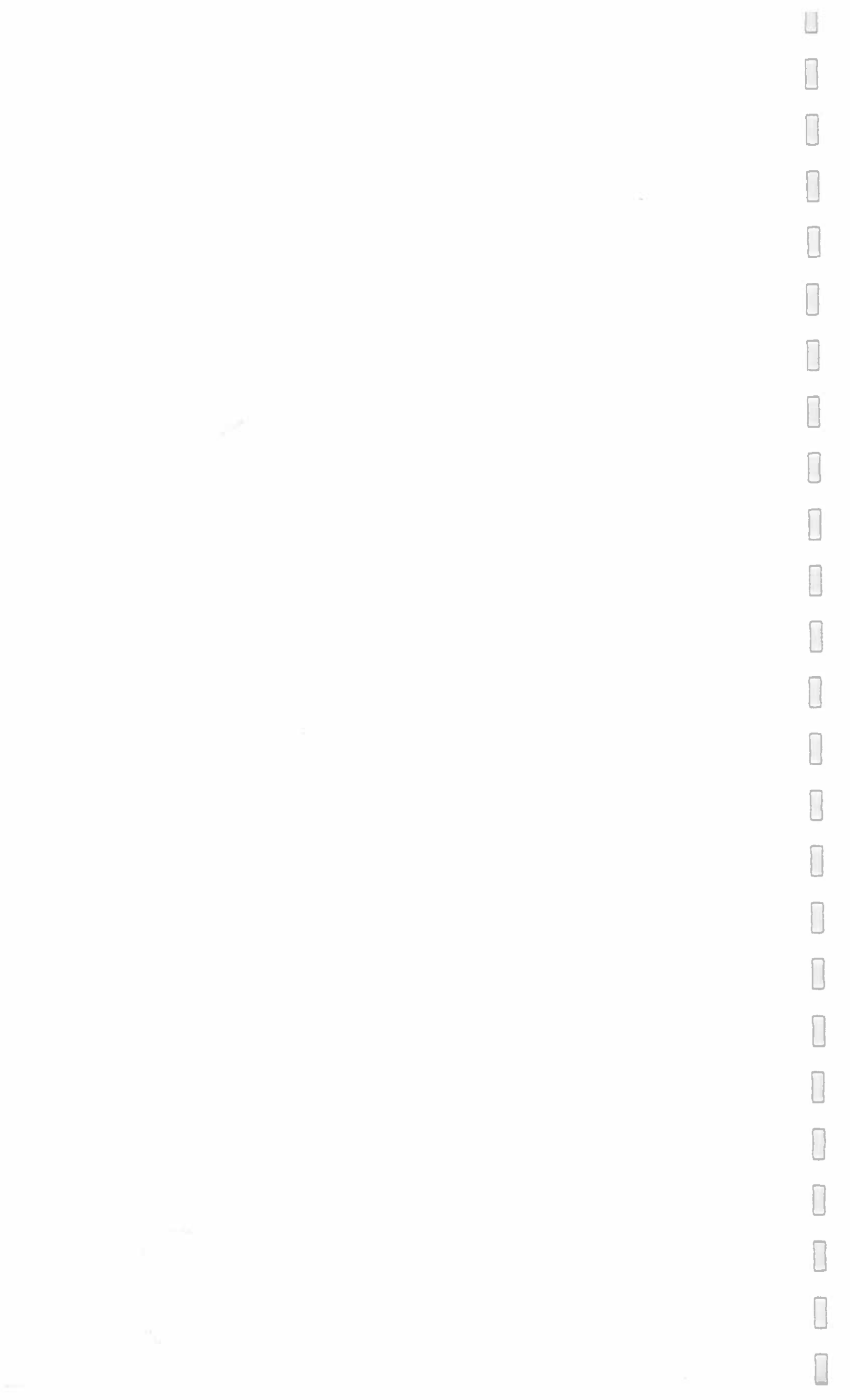
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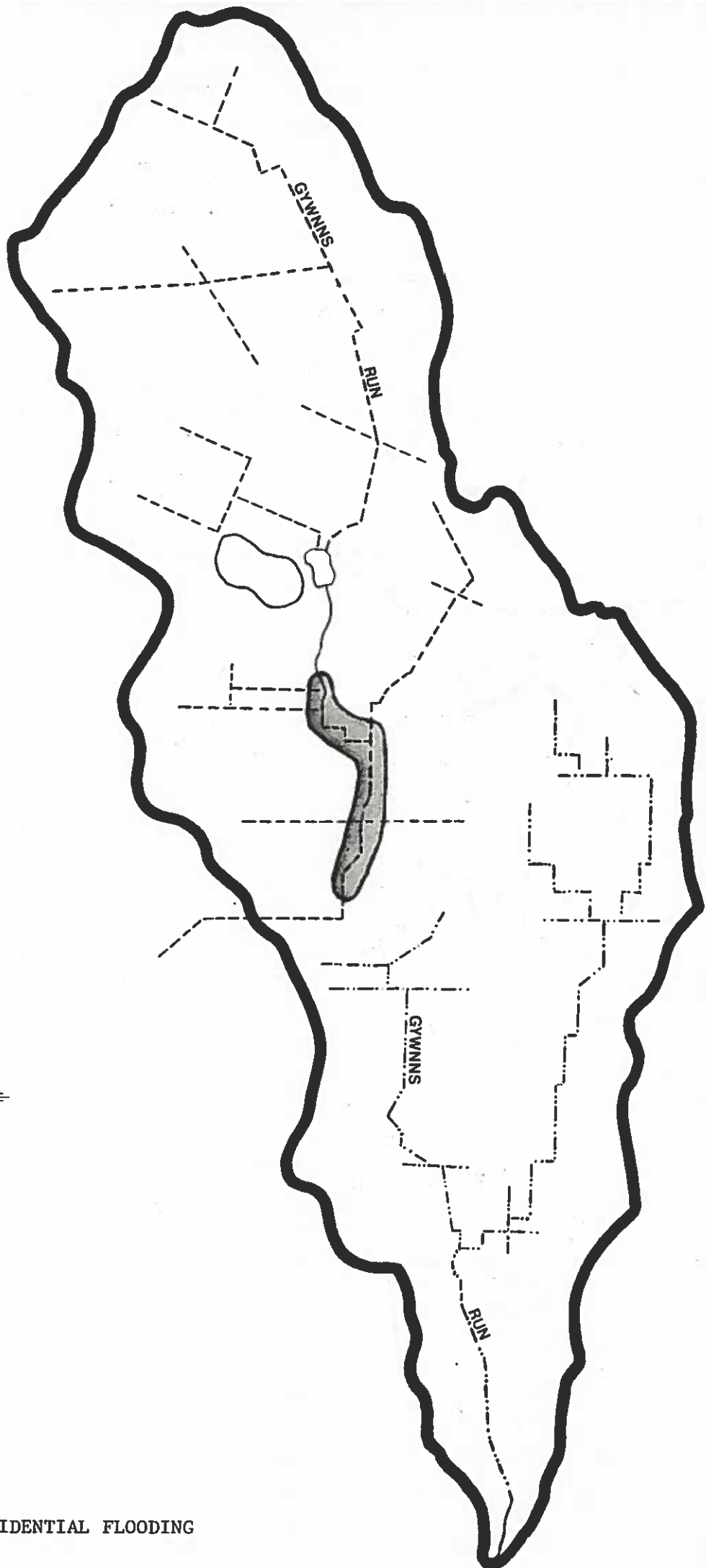
MAIDENS CHOICE RUN DRAINAGE AREA  
AREA NEEDING FURTHER STUDY

Map 8

0 2400  
scale feet







RESIDENTIAL FLOODING

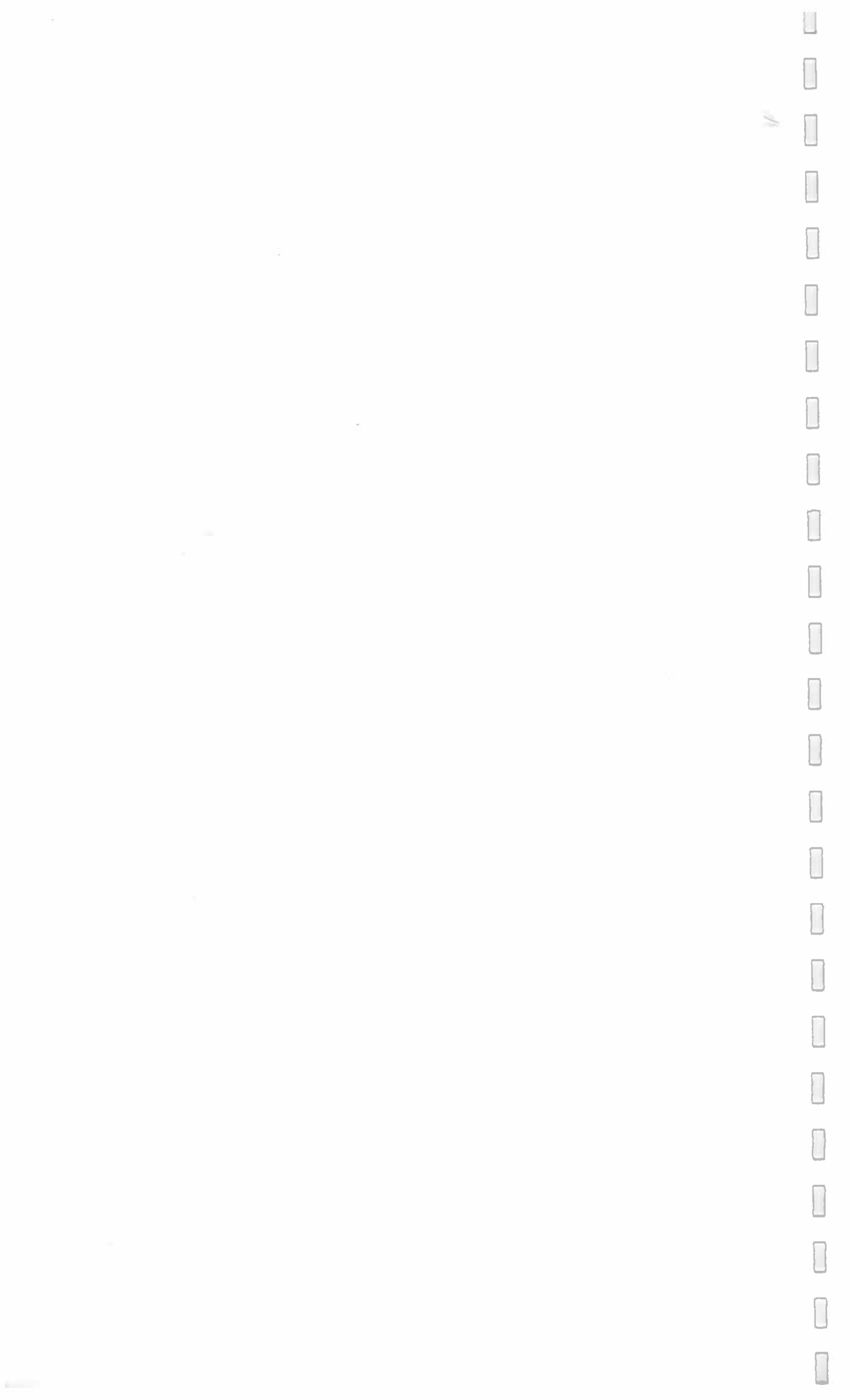
# BALTIMORE CITY FLOODPLAIN MANAGEMENT PLAN

DECEMBER 1981

GWYNNS RUN DRAINAGE AREA  
 AREA NEEDING FURTHER STUDY

Map 9





BALTIMORE CITY

FLOODPLAIN MANAGEMENT  
PLAN

JONES FALLS  
WATERSHED

