PROCEEDINGS OF THE

NINTH ANNUAL MEETING

of the

NEW YORK-NEW JERSEY DIVISION

ASSOCIATION OF AMERICAN GEOGRAPHERS.

NEW YORK-NEW JERSEY DIVISION.

Held at the
State University of New York at Albany
Albany, New York
October 11-12, 1968

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FOREWORD

These Proceedings . . . include the program of the Ninth Annual Meeting of the New York-New Jersey Division of the AAG, held 11-12 October 1968 on the campus of the State University of New York at Albany. Included are the full text of all the papers presented at the meeting except that of Mr. Gordon Reckord whose presentation was not in a form which he deemed suitable for publication.

As in Volume I of the Proceedings . . . , papers appearing in this volume underwent relatively little editorial alteration. All papers were retyped to ensure a uniform format and the Editor stands responsible for any errors introduced as a result of the retyping.

The Division still operates under certain budgeting restraints in producing this document which limit the reproduction of illustrations to line drawing with definite sharp contrasts. Some of the illustrations used in support of a few articles in this publication were lacking in this sharp contrast and thus their reproduction is not of the quality desired by the Author or the Editor. Only part of the responsibility for this poor quality lies with the Author; a major degree of it rests with the method of reproduction used this year which lacked the capability required to make sharp enough distinctions between areas of weak contrast.

Statements or opinions expressed in the Proceedings . . . are the responsibility of the authors and do not necessarily reflect the views of the Division.

The Editor wishes to express his appreciation to Mrs. Sylvia Sands who was most faithful in retyping all of the papers, to Mr. William Van Zetta for help in many logistical problems, to Mr. Glen Heberling for the design of the cover, to Mrs. Gloria Waddell and her staff for cutting the stencils, to Mr. Sigmond Davis for the printing, to the U.S. Army Signal Photo Lab for making the many photo reductions required, and to the officers of the Environment Faculty at West Point for doing the collating of the finished publication.

LTC Wesley C. Smith
Editor

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of the
NEW YORK-NEW JERSEY DIVISION

ASSOCIATION OF AMERICAN GEOGRAPHERS

Held October 11-12, 1968 at
State University of New York at Albany
Albany, New York

Friday, October 11, 1968

Registration Booth, Information Booth, and Exhibits, Campus Center Gallery, 1:00-11:30 p.m.

Guided tours of State University of New York at Albany Campus, 1:30-4:00 p.m.

Session A - Campus Center Ballroom, 8:00-9:45 p.m.

GEOGRAPHY IN GOVERNMENT
Presiding: Stanley Mackum, State University College at Brockport

"The Role of the Geographer in the Federal Government"
Gordon E. Reckord, National Academy of Sciences

"Comprehensive Multi-scaled Mapping Program for New York State"
L. A. Maercklein, New York State Department of Transportation

"The Role of the Geographer in Special Commissions"
John Volkert, Hudson River Valley Commission

Coffee Break - Campus Center Ballroom East, 9:45-10:00 p.m.

Session B - Campus Center Ballroom, 10:00-11:30 p.m.

IMPLICATIONS OF URBANIZATION
Presiding: George Carey, Rutgers University

"The Albany South Mall Project"
GEN C. V. R. Schuyler, New York State Office of General Services

"Implications of Urbanization on Public Water Supply Systems in the New York Metropolitan Region"
Michael Greenberg, Columbia University

"Recreation and Conservation"
Charles C. Morrison, Jr., New York State Natural Beauty Commission

"Man and Water Pollution"
Ronald T. Stewart, State University of New York at Albany

Saturday, October 12, 1968

Registration Booth, Information Booth, and Exhibits - Campus Center Gallery, 8:00 a.m. - 5:00 p.m.

Welcome - 8:30-9:00 a.m.

For the Division -
LTC Wesley C. Smith, Chairman, Acting Deputy Head, Department of Earth, Space, and Graphic Sciences, United States Military Academy

For the University -
O. W. Perlmutter, Dean of the College of Arts and Sciences, State University of New York at Albany

Session C - Campus Center Ballroom, 9:00-10:00 a.m.

CONTRIBUTED PAPERS
Presiding: Peter Wacker, Rutgers University

"The Role of Maps in Early American Geographies"
Michael Antonelli, Syracuse University

"Technology and Location in the Early American Iron Industry - An Example from Ringwood Manor, New Jersey"
Theodore W. Kury, State University College at Buffalo

Session D - Campus Center Assembly Hall

CONTRIBUTED PAPERS
Presiding: George McDermott, State University College at Cortland

"Geonomy - A Name Proposed for the Field of Geography"
LTC John Fox, United States Military Academy

"The Use of Computer Graphics in the Hudson River Valley"
Hal Schneider, Hudson River Valley Commission

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Session C (continued) - Campus Center Ballroom, 10:15-11:15 a.m.

CONTRIBUTED PAPERS

"A Historical-Geographic Study of a Mid Hudson Valley City - Newburgh, New York"
LTC Kenneth Ebner, United States Military Academy

"The Geography of Religious Groups in New York, Pennsylvania and Ohio - Persistence and Change, 1890-1965"
Stephen Tweedie, Syracuse University

Session D (continued) - Campus Center Assembly Hall

CONTRIBUTED PAPERS

"Locational Characteristics of the Plastic Industry in the United States"
Richard Mitchell and Norman Gomlak
State University of New York at Buffalo

"The Geography of Poverty in New York State: A Selective Analysis"
LTC John Garver, United States Military Academy

Business Meeting - Campus Center Ballroom, 11:30 a.m.-12:00 p.m.

Luncheon - Campus Center Patroon Room, 12:00-1:30 p.m.

Field Trips - Buses for the field trips leave from the south side of the Campus Center and return to the same location at the conclusion of the trip, 1:45-4:45 p.m.

A Urban Geography Trip - William Tyson, Assistant Director of Special Programs, New York State Office of Planning Coordination

B Geology Trip - James Davis, New York State Geologist

Cocktail Hour - Campus Center Assembly Hall, 5:00-6:00 p.m.

Banquet - Campus Center Patroon Room, 6:00-8:00 p.m.

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THE DEVELOPMENT OF A STATEWIDE MAPPING PROGRAM AND PROJECTION-GRID SYSTEM FOR USE WITH A COMPUTER-BASED INFORMATION SYSTEM

Leslie A. Maercklein
Program Analysis Bureau, Planning Division
New York State Department of Transportation

Introduction

The great need for accurate and up-to-date information for analysis and decision making is just recently being recognized in State government. This awareness has developed largely from the need to direct and control activities; this is especially true in the Department of Transportation whose responsibilities have been greatly expanded by the Legislature. An example of the size of the management responsibilities of the Department of Transportation is the planning, direction, and control of its statewide highway construction program. Today that single program alone has more than 400 projects under contract, amounting to a total contract value of $1.3 billion.

Obviously, computers can help in the tasks of planning and managing these sizable programs. And we do use them. As in much of industry, our use of computers has evolved from routine accounting and high-speed computational problem-solving into what can now be called information centers. That is, centers where vast quantities of information can be stored, processed, manipulated, and retrieved expecially for use in planning and management decision making. As an example of our data processing and manipulation abilities, we can now simulate the travel in a whole metropolitan area and do it simultaneously for automobile travel and for transit, a process used for planning metropolitan transportation systems that could not be done without computers.

For us this evening, the relevant thing about these new computer information systems is that most of the data requires geographic identification. That is, the location of the data is equally as important as the nature of the data. For example, land use, accident, and travel

data are almost useless for transportation analysis without knowledge of their geographic location.

The next chapter of this paper discusses the demands for a coordinate system to meet the need for geographic control of data when computer equipment is used. The unique problems of New York State in establishing a statewide coordinate system and a description of the new mapping program which utilizes this coordinate system are discussed in the two chapters which follow.

The Need for a Coordinate System

The geographic location identification system must obviously be a system which can be used by the computer. For example, street addresses, although a form of geographic identification, cannot be used for many types of computer analysis work since addresses, by themselves, do not provide a means of automatically relating a feature to a specific point on the earth's surface. The use of this type of geographic identification in operations such as measuring distance or plotting data wastes valuable manpower. If proper geographic controls are utilized, these operations can be done automatically by a computer or auxiliary equipment such as digitizers or plotters. The design constraints of this type of equipment, however, require that a cartesian grid coordinate system be used to describe geographic location of data. Therefore, a cartesian grid must be superimposed on a set of maps which can be used to assign location to the data.

Two separate approaches can be used in gridding maps. The maps can be arbitrarily gridded, with no relationship between the map projection and the grid, or a mathematical relationship can be established between the grid and the projection. There are great disadvantages in establishing an arbitrary grid. If the grid and projection are not mathematically related, the resulting information system developed in correlation with the maps and grid system will be a closed system.

That is, coordinate data from other sources cannot be accepted by the data system, nor will coordinate output from the system be accepted by other data systems. There has, in the past, been a tendency for local governments and regional agencies involved in the development of information systems within their own area of concern to establish these local grid systems. Even different New York State agencies have tended to develop their own arbitrary local grid systems for their various regional and small-area studies. Given these individual grids, automatic comparing and updating data from different sources can never be accomplished.

If, however, in the development of a computer-based information system a coordinate grid is selected to the map projection which is mathematically related, it is possible to automatically convert data to or from any other mathematically related grid-projection system. This, of course, provides a means of entering data available in latitude-longitude form as well as from any standard grid system. The benefits to be derived from the exchange of data based on compatible coordinate systems among all levels of government are obviously considerable.

It was the need for an accurate up-to-date statewide map series which could be married to a computer-based information system which led the New York State Department of Transportation to develop a comprehensive mapping program based on a mathematically related projection-grid system.

Selection of a Statewide Coordinate System for New York

There are only two well-known projection-grid systems covering New York State which needed to be evaluated for suitability as a base for the mapping program. They are the State Coordinate System and the Universal Transverse Mercator grid and projection system, commonly known as the UTM.

A. State Coordinate System

The State Coordinate System, although designed for each state by the U. S. Coast and Geodetic Survey primarily to simplify surveying techniques and to relate individual surveys to the national triangulation network, is well suited for use as a coordinate system for computer use. It employs a mathematical relationship between a plane coordinate grid and geodetic values on the earth's surface, using a two-dimension map projection interface.

Two projections, the transverse Mercator or the Lambert conformal are used in this system, depending upon the shape and size of the state. Since it is important to keep scale error in the projection small, in large states the projection must be re-centered several times, thus establishing several grid zones in the states.

Because of its unusual shape, New York State employs both projections and four grid zones in its State Coordinate System. The Lambert is used for the Long Island zone, and the transverse Mercator is re-centered three times over the remainder of the State forming the East Zone, the Central Zone, and the West Zone.

The adoption of an existing projection-grid system as a means of geographically coding data has obvious advantages. Because the grid coordinates are mathematically relatable to geodetic coordinates, data in various forms, for example latitude-longitude or other established projection-grid systems, can be inputs to the system. Also, because it is an existing system, there are benefits to be gained from familiarity with the system, acceptance by a larger group of people, and direct use of data identified by the established system.

The great disadvantage of using the State Coordinate System for geographic coding in New York State is that it is impossible to assemble a single state-wide projection for the four separate grid zones, each with its own re-centered projection. In fact, only single-zone states enjoy this advantage. Therefore, data would still have to be converted to a single statewide projection-grid system for the production of all statewide displays of data or displays which included two or more zones. For this reason, although the State Coordinate System is a highly accurate, widely accepted system, it was rejected as not suitable for the Department's new map series.

B. Universal Transverse Mercator Grid and Projection System

In examining the geographic realities of New York State for the selection of a suitable statewide projection, it became obvious that the transverse Mercator of zone 18 of the UTM was quite well suited. The UTM consists of a series of identical transverse Mercator projections with corresponding grids encircling the world at low and intermediate latitudes, each covering 6° of longitude. Although New York State is nearly 8° wide, the central meridian of zone 18 (75°W) and the center of the longitudinal span of New York State (75°45' W) are only 45 minutes apart. As a result, the projection and grid can easily be extended in both longitudinal directions to provide a projection-grid system which covers all of New York State and which is reasonably centered within the State.

Extending the UTM to provide a single projection-grid system to cover New York State meets the requirement imposed for production of statewide maps or data displays on these maps. Upon careful evaluation of this alternative, it was decided that the extended version of the UTM best served the needs of the Department of Transportation and was adopted as the base for its mapping program.

The Department of Transportation Mapping Program

New York State has never had a statewide series of base maps which were both highly accurate and up-to-date. When the Department of Transportation outlined its new mapping program in 1965, the best existing mapping in the State was the U. S. Geological Survey's 1:24,000 topographic series. Although this series is highly accurate, it covered only about 80 per cent of the State, and even those maps were, to varying degrees, badly in need of updating. However, because of the accuracy of the base data of this series, it was selected as the base for the production of the first of five separate map series planned by the Department.

The USGS 1:24,000 sheets were, up to about 1956, based on the polyconic projection which, for the area covered by a single 7½ minute quadrangle, were basically "error free" in terms of scale error. Since that time, however, they have been based on the State Coordinate System using either the Lambert conformal or the transverse Mercator projection. There are obviously theoretical differences between these three projections and the transverse Mercator projection of the UTM system which affect size and shape of areas represented. However, from a practical standpoint, the shape differences are so small that the UTM grid can be superimposed on a 7½ minute quadrangle in its true rectangular shape with only systematic variations in size of the grid from quad to quad. This results in maps which can be used individually for automatic data extraction, or plotting, using the UTM grid system. For the smaller scale series planned by the Department, a single statewide projection-grid will be constructed for each scale and those maps will fit together perfectly over the entire State.

A. Scale

In addition to the 1:24,000 series, the scales selected as being most valuable for planning and programming purposes within the Department were: 1:9,600, 1:62,500, 1:250,000, and 1:500,000. All scales but the 1:9,600 series are presently scheduled for statewide production; the 1:9,600 scale is being produced only for cities, villages, and other built-up areas.

B. Content

The content of each series will vary from scale to scale according to the general uses of the map and the method of production. For

example, since the 1:24,000 series is essentially an updated planimetric version of the standard USGS quadrangle at that scale, it will be similar to it in content with only slight modifications. The 1:9,600 series will be produced photographically from the 1:24,000 series with the addition of all street names at the larger scale as the only significant difference in content. Contour versions of both of these series may be produced using existing USGS contour plates. The other smaller scale series will vary in symbolization and content appropriate to base maps at each respective scale. Production to date is exclusively in the 1:24,000 series, of which about 400 of 967 maps are completed and published.

The Benefits of the Department of Transportation Mapping Program

What are the benefits of the Department's mapping program based on this common projection-grid system?

The maps and the grid system are already being used by the Department, and other agencies as well, for computer-related activities.

For several years it has been of great concern to several groups within New York State government to develop a system of information exchange among various departments within the State and also other levels of government. As a result, a steering committee comprised of members of several state departments was established to guide the development of a Statewide Information System (SWIS). Although development of the Statewide Information System is still in its infancy, it appears likely that the extended UTM developed by the Department of Transportation will be adopted as the coordinate system for statewide data applications. This new system will simplify the exchange of data among agencies and should greatly expand the availability and use of data.

For each of its urban transportation studies, the Department of Transportation is presently in the process of converting its data files which are based on local grids, to the extended UTM. This will provide a common coordinate file for the entire State, and existing data can be used, along with the new maps, for such purposes as the Department's ongoing Statewide Transportation Study.

The Department of Commerce, using the UTM, has begun the digitizing of the more than 50,000 industrial facilities in New York State. Since a great deal of data about these facilities, such as name,

address, Standard Industrial Classification (SIC), physical size, and number of employees, is already stored on magnetic tape, the adding of coordinates of each facility will allow the automatic production of graphic displays of great value to analysts, planners, and decision makers.

The State Office of Planning Coordination has adopted the extended UTM system for use in its statewide Land Use and Natural Resource Inventory. This inventory identifies 135 separate land uses, and the data are summarized for graphic display on the basis of one kilometer-square grid cells. The data, whether summarized on a grid cell basis or not summarized at all, are directly compatible with the Department of Transportation's mapping products.

The Hudson River Valley Commission, which is conducting a land use inventory for its area of responsibility more detailed than the OPC inventory, is also using the UTM.

Conclusion

It has not been the purpose of this paper to discuss in detail the variety of applications of a unified statewide grid system and mapping program. However, the examples cited here reflect the potential value of such a system to geographers and others in search of data -- whether physical, economic, or social -- keyed to a compatible up-to-date base map series.

If others are to share in the benefits to be derived from the use of data collected for the specialized needs of various agencies at all levels of government, it is essential that efforts be made by all involved in data collection, evaluation, and dissemination of information to consider the alternatives and consequences when selecting reference systems and base maps. This applies to the choice of projections of maps used or produced, as well as the coordinate systems associated with these base maps. Such considerations also apply to the inputs and the development of complete data information systems.

Geographers can and ought to be involved, along with mathematicians and others, in the development of information systems. Up-to-date, accurate maps keyed to a mathematically relatable projection-grid system are vital to an effective and useful information system, and it is up to those who are most knowledgeable of these requirements to assure their consideration in information systems development.

PROCEEDINGS
of the 8th Annual Meeting

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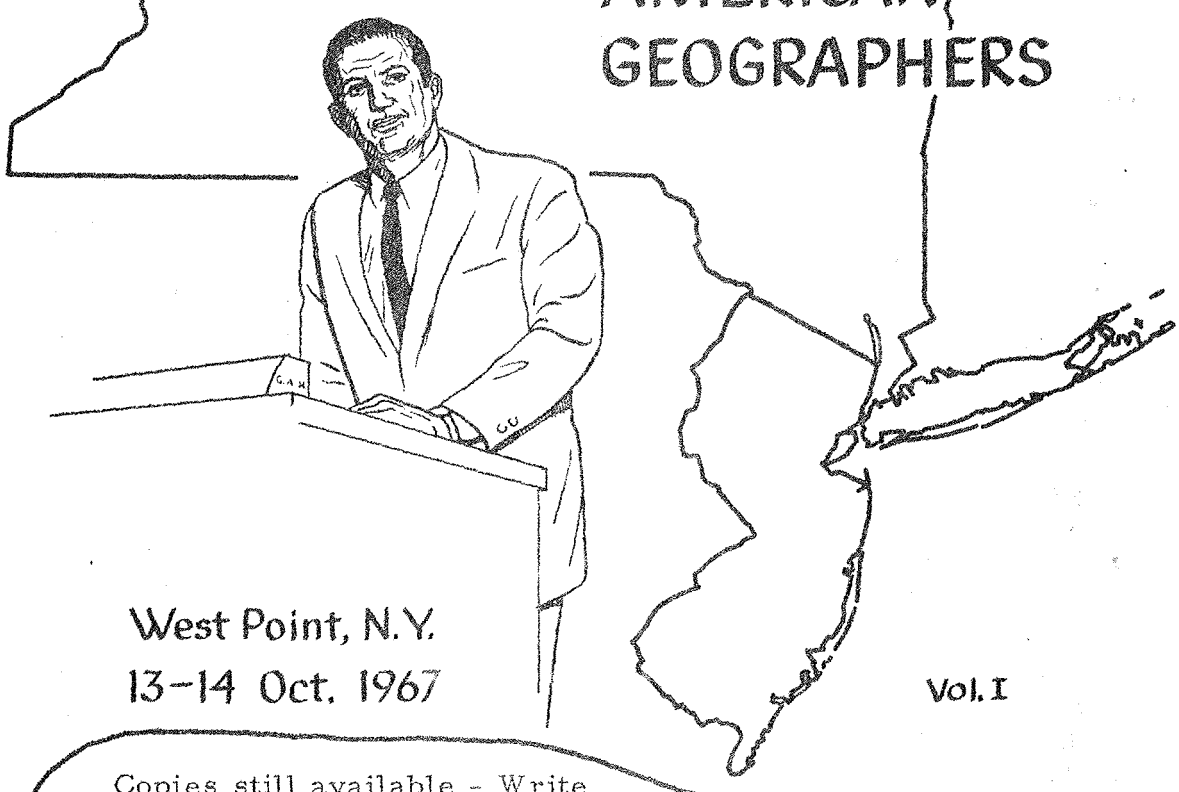

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Vol. I

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THE ROLE OF THE GEOGRAPHER IN A COMMISSION

John Volkert
Hudson River Valley Commission

The role of the geographer in a Commission is the same as the role of the geographer in any other government agency. He must interpret in the terms of his discipline the function or purpose of his Commission's reason for being.

Although I have no intention of undertaking an extensive discussion of the nature of geography, I do believe that I have an obligation to convey to you my own definition of geography even though it must of necessity be brief and therefore not altogether satisfying. Geography, then, is the science which studies the spatial attributes of phenomena so as to explain and predict the spatial relation and association of these phenomena. By science, I mean a body of knowledge based on human observation and experience subject to change and error.

Unfortunately, there are few, if any, geographers who are generalists to the extent of being able to interpret an agency's reason for being in any and all of its various geographic aspects. Due to the immense body of geographic knowledge which has been generated, geographers have tended to specialize in certain kinds of spatial differences. As a result there are several branches of geography. Yet, in spite of this specialization and regardless of the level of government one can usually identify the geographer by simply observing his manner of study.

His treatment of phenomena whether it be economic or climatic is such that he seeks to relate them to other elements -- linking them into a spatial system. Thus, the primary role of the geographer in Government is to give to his colleagues an understanding of spatial systems as they pertain to the specific function of the agency he works for, particularly in terms of his own special field of interest.

By way of illustration, I would like to discuss my role as Staff Geographer of the Hudson River Valley Commission. Though it presently is a special New York State Agency, it may eventually become a corporate and political body serving the States of New York and New Jersey and the United States of America.

The present Commission was established in 1966, after a 1965 study pointed out the need for a regional coordinating body ". . . . to encourage the preservation, enhancement, and development of the scenic, historic, recreational, and natural resources of the Hudson River Valley, and to encourage the full development of the commercial, industrial, agricultural, residential and other resources which are vital to the continued progress of the Hudson River Valley." (Article 1, Hudson River Valley Commission Act). This need was based upon the widespread public concern over the social and economic stagnation of many riverfront communities.

To carry out its purpose the Commission was charged to ". . . provide the leadership in developing a coordinative, comprehensive plan. . ." and ". . . to encourage public and private agencies and persons to undertake projects which are in accord with the coordinative comprehensive plan . . ." (Articles 5 and 6 Hudson River Valley Commission Act.)

To carry out its functions the Commission has an authorized staff of 66 people, half of whom are professional or technical personnel. They include urban and regional planners, engineers, landscape architects, geographers, economists, cartographers, an architect, an ecologist, a historian and others.

The Commission's functions are multidimensional and its staff is multidisciplinary. It is within the context of such a situation that a geographer can make his best contribution. By seeing the valley as a spatial system the geographer provides an underlying unity to the Commission's functions of planning and review. Because he is concerned with linking different elements together in a spatial system his view provides a means for the multidisciplinary staff to evolve into an interdisciplinary team.

A spatial system real or abstract, may be thought of as consisting of parts which are interdependent. A river valley is a real spatial system. In fact it is an open real spatial system since it exchanges matter and energy with its environment, that is, it imports goods, people, water, and a host of other tangible and nontangible inputs and in turn it exports solid waste, air pollutants, manufactured goods, and a variety of ideas and services.

A river valley such as that of the Hudson is highly complex because it contains life forms that are involved in a pluralistic decision making process. For example, its population can interact with its technology and institutions to change its environment with a resulting change in its inputs or outputs or both.

Viewing the Valley as a spatial system within which exist a great number of subsystems, its town and cities for example, is analogous to seeing an animal as a system composed of a number of sybsystems such as the brain, the heart, the lungs, the liver, the nervous system and so forth. A systems approach affirms the autonomy of the individual subsystems while confirming their interrelationship and importance to the entire system. No one would confuse the individual organs of an animal nor would anyone deny their interdependence and importance to the total being of the animal. In a like manner, no one would confuse the City of Albany with any other subsystem within the Valley nor would anyone deny its importance, for its failure as a subsystem would have serious consequences for the Valley and beyond.

Part of the Commission's jurisdiction is highly urbanized but the major portion is undeveloped land which varies greatly in terrain, resource quality and economic value. In formulating a comprehensive planning procedure, the Commission must determine the land-use options that are available within the parameters established by the natural environment. This involves gathering detailed information on such factors as geology, physiography, soils, vegetation, and animal ecology. As the various environmental studies are completed, they will combine with data from concurrent studies on urban development, transportation, utilities, population, employment trends, industrial location and other planning elements to determine the optimum land uses for each area.

The diagram in Figure 1 is an illustration of the process which might be used by the Commission to undertake a planning study of one of the Valley's subsystems such as the Albany area. When planning is conceived of in these terms no one person nor one discipline would be capable of providing the necessary expertise to carry out such a study. It takes an interdisciplinary effort - one in which the geographer's role is to provide not only the specific inputs called for in the data and interpretation phases but also to clarify in the analysis and synthesis phases the spatial relation of the subsystem to the larger and more complex system of the Valley.

I would now like to turn to the discussion of a recently completed microgeographic study as a working example of the role of the geographer in a Commission.

In 1967 the town of Philipstown in Putnam County lost a potential tax revenue from an eight million dollar gypsum product plant due to the State's encouragement that the plant should locate elsewhere in the Hudson River Valley so as not to endanger the scenic and natural beauty of the Highlands gorge. The not-to-be site of

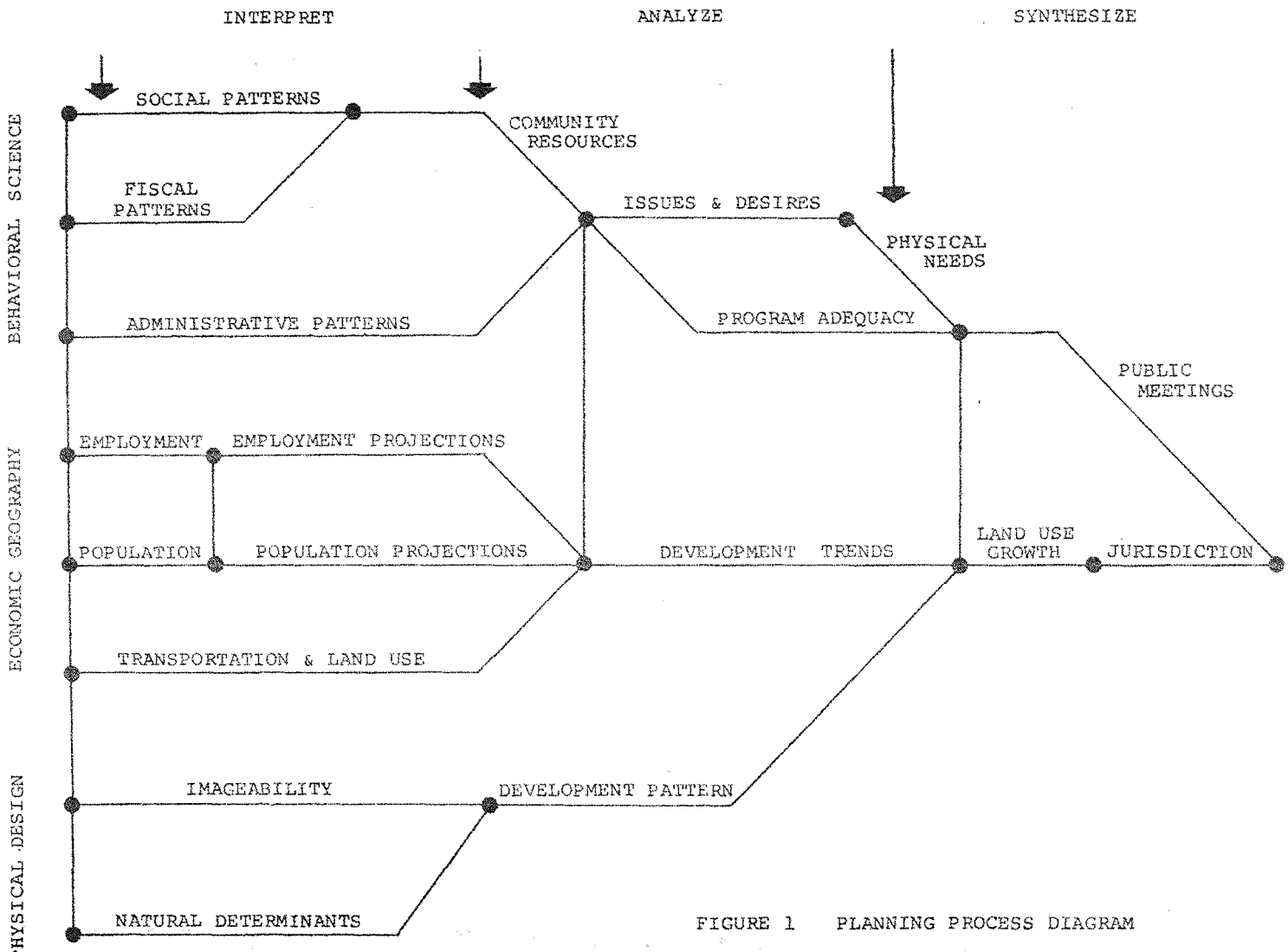


FIGURE 1 PLANNING PROCESS DIAGRAM

this plant has since been incorporated into a Hudson Highlands State Park and has thereby been removed from the industrial real estate market. As a result of some understandable local upset over the matter the Commission was directed by the Governor to undertake a study of Philipstown. The study was to take a hard look at the economic structure and industrial development problems and potentials of the town.

As a geographer, my first concern was to relate the town to its surrounding area, specifically other towns and cities. This concern was predicated on the assumption that a political unit the size of a town is too small and too dependent socio-economically to be considered in isolation. Figure 2 shows the study area which was decided upon in order to provide meaningful comparisons.

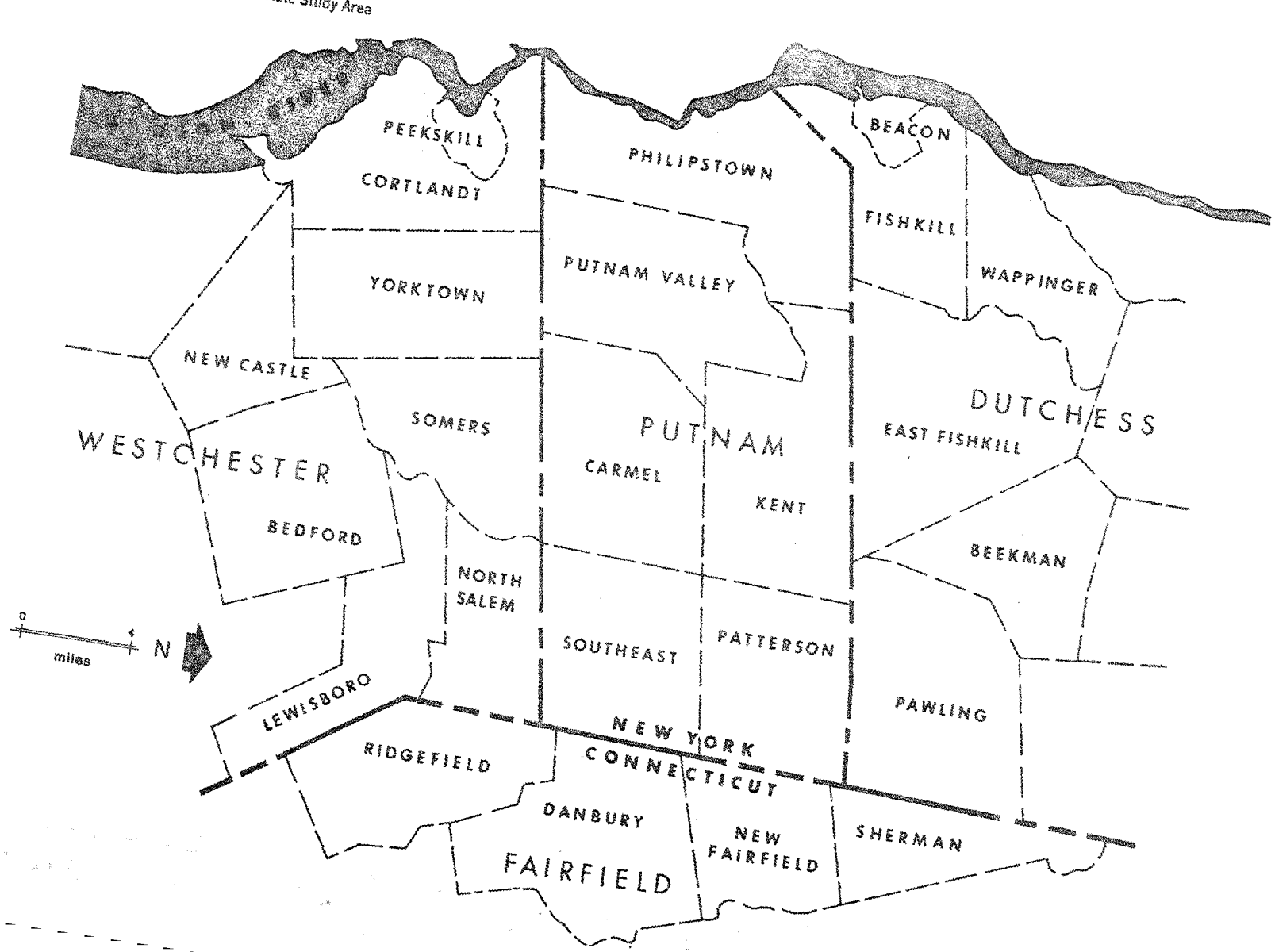
The magnitude and direction of Philipstown's interdependence with the surrounding towns and cities becomes apparent once it is realized that its development, as the development of the study area in general, has been conditioned by its landforms and surface hydrology. These features have influenced the location of railroad and highway networks, which, in turn, have been a major factor in the area's pattern of settlement.

In the western part of the study area, the Hudson River has encouraged development, while the rugged terrain of the Hudson Highlands has constrained it. As a result, the cities of Beacon and Peekskill have developed just north and south of the mountains. Philipstown, in the intervening area, has remained relatively undeveloped. In the central and southeastern portions of Putnam County, the lakes and reservoirs have been dominant influences on the settlement pattern.

Historically the primary flow of goods and people through the study area has been north-south. River transportation initiated this flow, and road and railroad developments have reinforced it. East-west flow has been secondary, acting as a collector for the primary flow.

Within Putnam County, the development of east-west roads has been limited by topography. Those that have been built have skirted either north or south to avoid the Highlands. Although an intracounty east-west road was undertaken as early as 1815, it was partly abandoned by 1879. It was not until 1930 that Route 301, the first year-round cross-county road, was completed.

Because of this limitation on cross-county transportation, the towns of Putnam County have been oriented externally rather than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internally. For example, the western part of the County has ties with Beacon and Peekskill. However, most of the people in Philipstown live in the Cold Spring-Nelsonville area, which lies closer to Beacon than Peekskill and accounts for the town's primary orientation toward Dutchess County.

It was mainly because of natural features, and the resulting evolution of its transportation system, that the towns of Putnam County have failed to develop a large urban center. They still rely for most of their higher-order goods and services on urban areas beyond their borders: Beacon, Poughkeepsie, Danbury, Peekskill, Mount Kisco, and White Plains.

This external orientation is reflected in newspaper circulation figures, shown in Figure 3. A similar pattern of external orientation can be seen in telephone traffic data. (Data for this analysis were obtained from the New York Telephone Company.) For example, an analysis of customer calls-per-month indicates that Philipstown residents have strong ties with Beacon and Poughkeepsie to the north and with Peekskill and New York City to the south. In fact, toll calls made from Philipstown to these areas far exceed toll calls made to other areas within Putnam County.

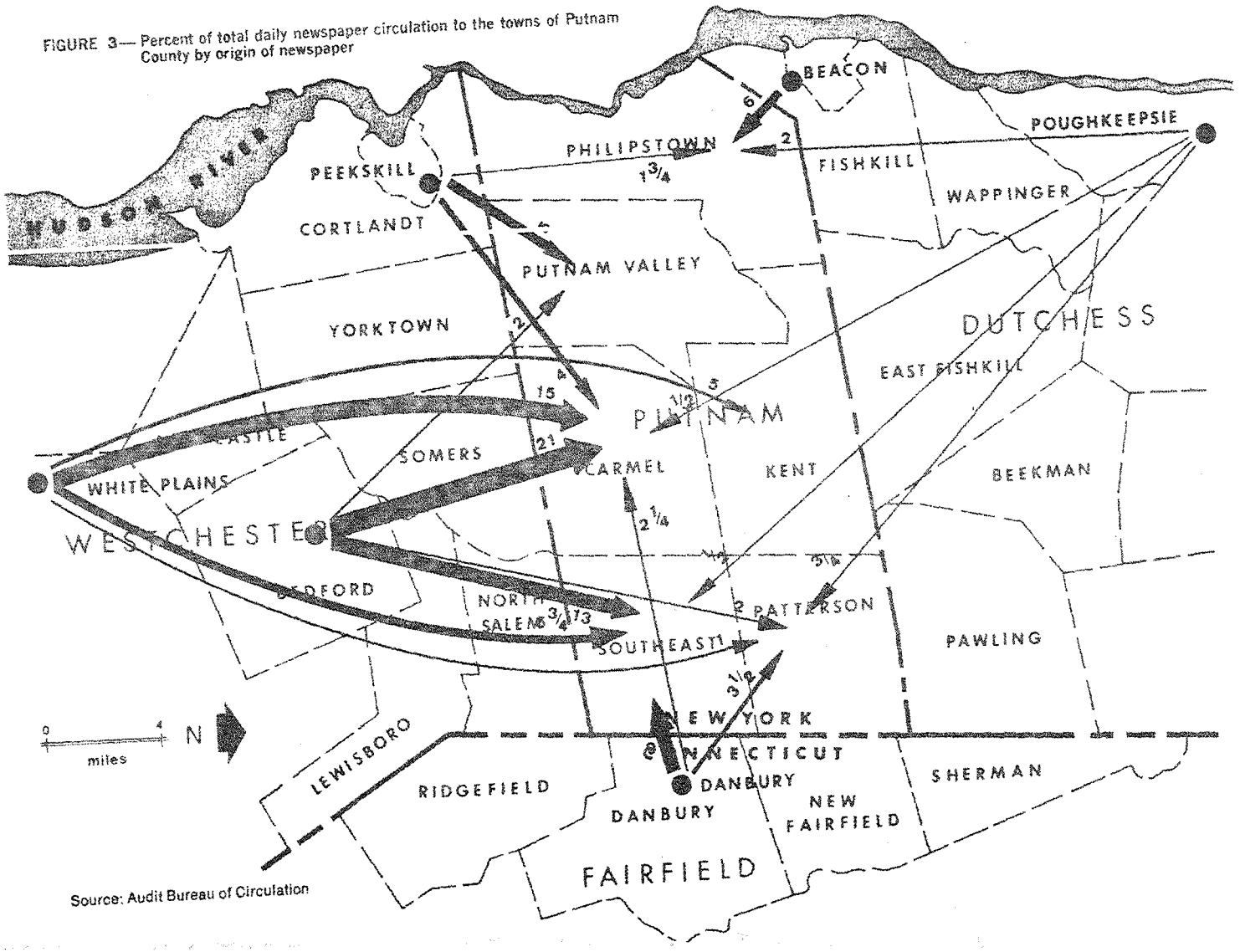
Even in earning their livings, the residents of Philipstown and the other towns in Putnam County are oriented to areas outside the County itself. The 1960 Census found that Putnam County had 11,447 employed residents, of whom, 5,096 - approximately 45% - worked outside the County's borders.

All the foregoing is evidence of the strong and unique economic orientation of the residents of Philipstown and Putnam County to areas outside, rather than within the town and the county.

The study area's top three growth industries - electrical machinery, non-electrical machinery, and printing and publishing - accounted for nearly 79% of the total net floor space added in manufacturing industries in the study area during 1961 through 1966. Philipstown experienced some expansion in electrical machinery but none in any other industry group. In Philipstown the Sonotone Corporation, manufacturers of nickel cadmium batteries, is the town's principal employer and accounted for all the growth in manufacturing floor space which was just under 3% of the study area's total.

To better understand the recent past and probable future evolution of study area's industrial structure, 29 manufacturing plants were examined in detail. The information derived from this analysis is given in Figure 4.

FIGURE 3— Percent of total daily newspaper circulation to the towns of Putnam County by origin of newspaper



Source: Audit Bureau of Circulation

FIGURE 4—Characteristics of expansions of selected individual firms within the New York State portion of the Study Area

Minor Political Unit	*Name of Firm & SIC*[1]	*Size*[2] *and Nature of Expansion*	*% of Total Gross Floor Space added in Political Unit: 1961-1966*	*Site: Slope more than 10%*	*Access from Major Roads: within ½ mile*	*Access from Major Roads: within 1 mile*	*Site Compatible with surrounding land use*	*Facilities: Water*	*Facilities: Sewage*	*Area of Site in Acres*
East Fishkill	IBM (36)	878 n	100	No	ILO		Yes	Pvt—We	Pvt—Tr	498
Yorktown	IBM (35)	459 n	90	Yes	PO		Yes	Pub	Pvt—Tr	215
	IBM (36)	51 a	6	No	PO		Yes	Pub	Pub	24
New Castle	Reader's Digest (27)	185 a	60	No	PO		Yes	Pvt—We	Pub	155
	Kraus Periodicals (27)	50 n	15	No	O	P	Yes	Pub	Pvt—Sp	15
	Zierick Mfg. (36)	47 n	15	No	O	P	Yes	Pub	Pub	15
Beacon	Technical Tape (26)	214 e	46	No	O		Urban	Pub+Pvt—Su	Pvt—Sp	14
	Baldwin-Lima (35)	40 a[3]	9	No	O		Urban	Pub	Pub	8
	Brunetto Cheese (20)	30 n	6	No	O		Urban	Pub	Pub	1
	Richardson Co. (30)	26 e	5	No		O	Urban	Pub+Pvt—Su	Pub+Pvt—Sp	16
Fishkill	IBM (36)	170 na[4]	84	No	IO		Yes	Pub	Pvt—Sp	9
	Texaco (29)	18 n	9	Yes	O		Yes	Pvt—We—Su	Pvt—Tr—Sp	151
Cortlandt	Guenther Mfg. (34)	35 n	23	Yes	L		No	Pub	Pvt—Sp	11
	Geringer Mfg. (34)	33 n	22	Yes		O	Yes	Pub	Pvt—Sp	12
	Arlo Industries (35)	31 e	20	No	PO		Yes	Pub	Pvt—Sp	6
Philipstown	Sonotone (36)	82 na[5]	100	No		O	No	Pvt—We	Pub+Pvt—Tr	12
Peekskill	Carlisle Corp. (33)	20 e	28	No	L		Urban	Pub	Pub	6
	Jeta Power (36)	15 e	20	No	L		Urban	Pub	Pub	1
	Mearl Corp. (28)	12 n	17	No	L		Urban	Pub	Pub	5
Pawling	Pawling Rubber (32)	20 n	57	No	O		Yes	Pub	Pub+Pvt—Tr	32
	Lumilite (39)	15 a	43	No	O		No	Pub	Pub+Pvt—Tr	15
Wappinger	Three Star Anodizing (34)	83 e	93	No	O		No	Pub	Pvt—Sp	2
North Salem	Controlex (35)	26 n	100	Yes	I		Yes	Pvt—We—Su	Pvt—Sp	18
Patterson	U. S. Plywood (24)	26 a	100	Yes	O		Yes	Pvt—We	Pvt—Sp	19
Carmel	General Castings (33)	14 n	60	No	O		Yes	Pvt—We	Pvt—Sp	10
	Brady-Palmer (27)	10 a	40	No	O		Yes	Pub	Pub	2
Lewisboro	Standard Instrument (38)	20 n	100	No	O		Yes	Pub	Pvt—Sp	2
Kent	Technical Machine (35)	15 n	100	No	O		Yes	Pvt—We	Pvt—Sp	4
Southeast	Hipotronics (36)	12 n	100	Yes	O		Yes	Pvt—We	Pvt—Sp	16

[1]SIC = Standard industrial classification
[2]Size = Thousands of square feet
[3]Estimated size of addition
[4]20,000 sq. ft. as an addition
[5]46,000 sq. ft. as an addition

[6]The largest expansions within the minor political unit accounting for a minimum of 65% of all floor space added.

n = new building
a = addition
e = existing building
f = site leased and of unknown size

I = interstate
L = limited access
O = other primary
P = parkway

Pub = Public facility
We = Well water
Su = Surface water
Tr = Treatment facility
Sp = Septic tank or field
Pvt = Private facility

Of the several characteristics recorded, that of site accessibility is the most significant. Figure 5 shows the relationship between the location of all manufacturing expansions and the transportation network of the study area. Virtually all of the expansions occurred along the major roads - that is, within a half-mile of an interstate road, a parkway or a state primary route.

The size of the site area on which an expansion takes place also is important in describing the characteristics of manufacturing growth. A large single-level plant or a complex of buildings generally requires a correspondingly large site, as indicated in Figure 4.

Except for expansions within urban areas, even those firms experiencing small expansions tended to locate on relatively large sites. Most of the companies wanted a large site, relative to plant size, to insure space for future expansion. In a few instances a large site also was chosen to screen or buffer the plant from the surrounding environment.

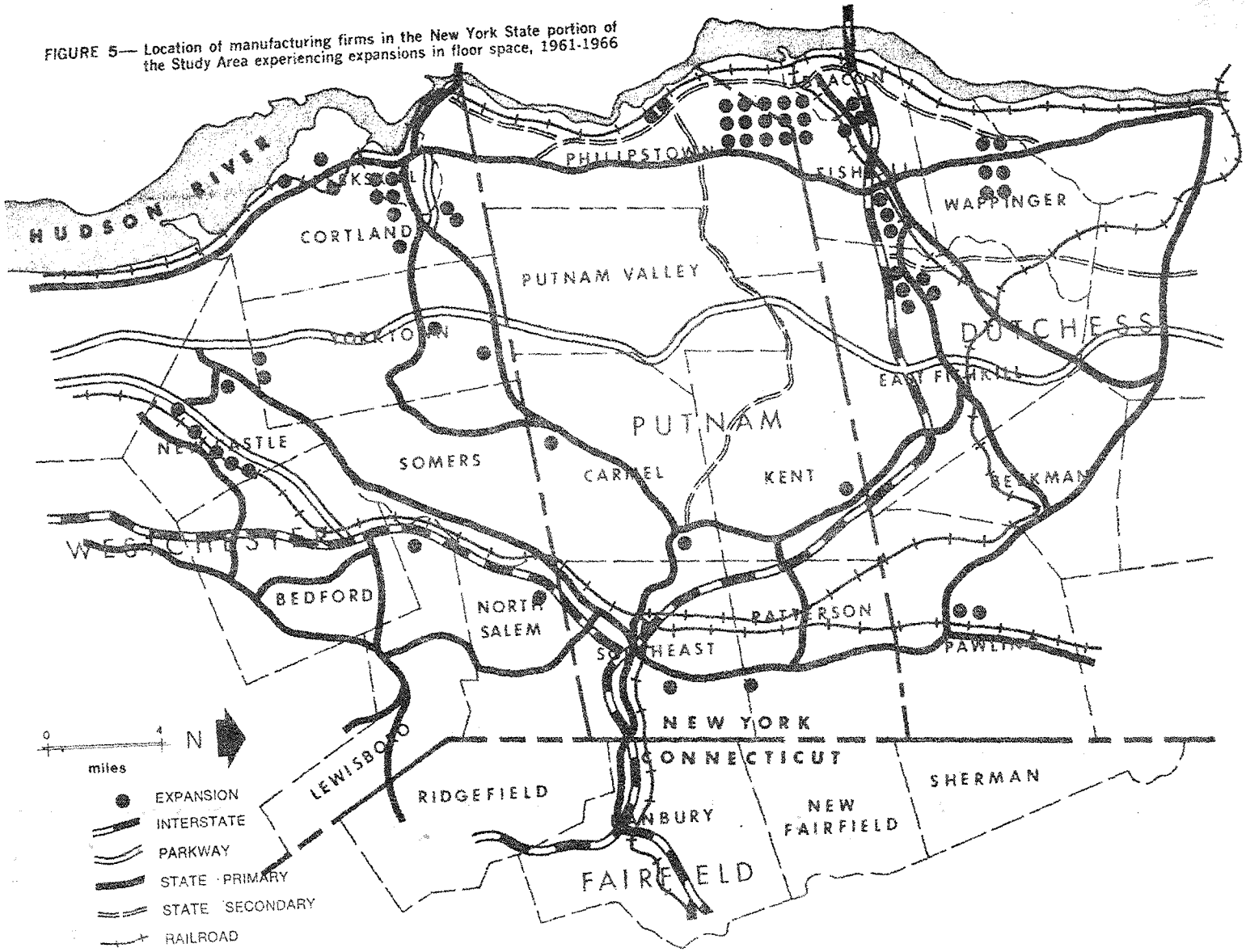
Another important site characteristic is slope. Most of the plants studied were on sites of less than 10% slope. Seven sites are described as being more than 10% slope, but in three instances, the firms involved built on the more level portion of hilltops for essentially aesthetic reasons.

The question of aesthetics focuses attention on another characteristic recorded in Figure 4, that of the compatibility of the plant location with surrounding land use. (The expansions in Beacon and Peekskill were not included in this evaluation since they took place in older existing buildings located in areas that have been industrial for decades.) In general, the expansions taking place outside of the urban areas appear compatible with surrounding land uses.

Another characteristic noted was the amount of floor space added in existing structures as opposed to expansions into new buildings. Existing buildings were used most often in the two urban areas, Beacon and Peekskill. The firms using existing structures appeared to be new enterprises or those that need low-cost manufacturing space in order to be competitive.

A final characteristic recorded on Figure 4 is that of water and sewage facilities. The pattern that emerges is the obvious one: where public water and sewage facilities exist and the capacity is adequate, manufacturing firms will use them. Other arrangements are made only where plant wastes need special processing or where public facilities cannot be extended adequately.

FIGURE 5— Location of manufacturing firms in the New York State portion of the Study Area experiencing expansions in floor space, 1961-1966



When the analysis of manufacturing changes is combined with the analyses of employment structure and population growth and density changes, it suggests that the comparatively slow economic development of Philipstown and the other towns in Putnam County, especially in the manufacturing sector, is a function of the relatively low competitive quality of the potential industrial sites in the town and county. Figure 6 is a schematic diagram that expresses the interrelationship of these elements. To change the process depicted the town of Philipstown would need to initiate trial sites to a competitive level. But first these sites must be identified.

Based on the analysis of industrial development in and around Philipstown during the period 1961 through 1966 the following criteria were established for the purpose of identifying potential sites:

1. The site must be within a half mile of a primary road or interstate highway, or within a half mile of a parkway interchange.

2. The site should be level or slope no more than 10%. (Thus, the level portion of a hilltop may be a potential site.)

3. The site must be visible from the primary road, parkway or interstate highway.

4. The site must be 10 acres or more in size and suitable in shape.

5. The site must have soil conditions providing good bearing qualities and drainage. (A site with a correctable surface hydrology problem also is acceptable.

6. Expected use of the site must be compatible with existing and surrounding land use.

The method used in identifying potential industrial sites in the towns of Putnam County can best be described as a process of elimination, substantiated by field verification. Site criteria were successively applied to maps at a scale of 1:24,000. The potential sites identified were then further evaluated by analysis of aerial photographs and field inspection. Figures 7 through 12 provide an illustrated example of the method used.

Given the application of the foregoing criteria, the best potential industrial sites in Philipstown are in the McKeel Corners area,

FIGURE 6 —Growth constraint diagram

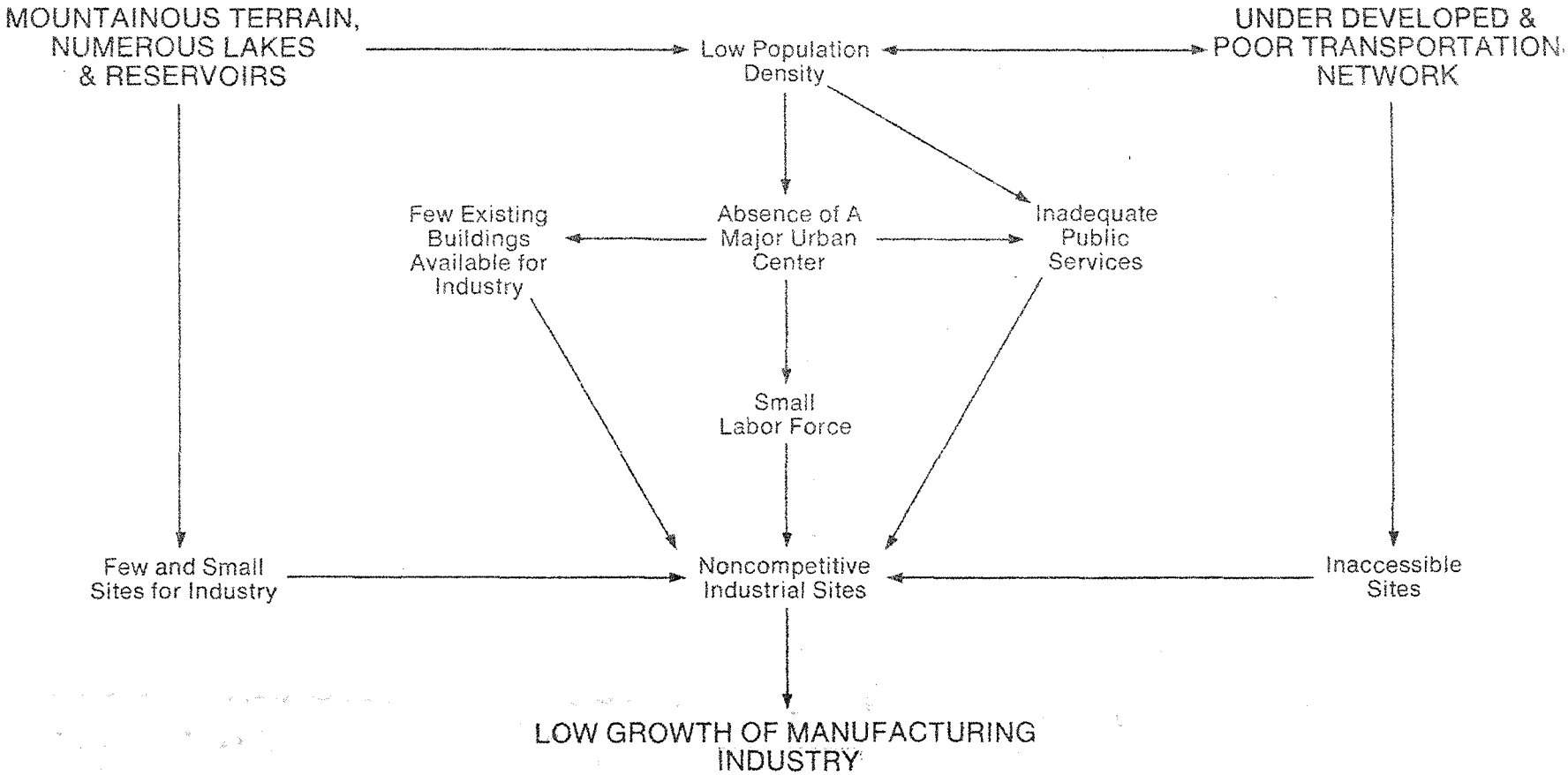


FIGURE 7 —Area of one-mile corridor

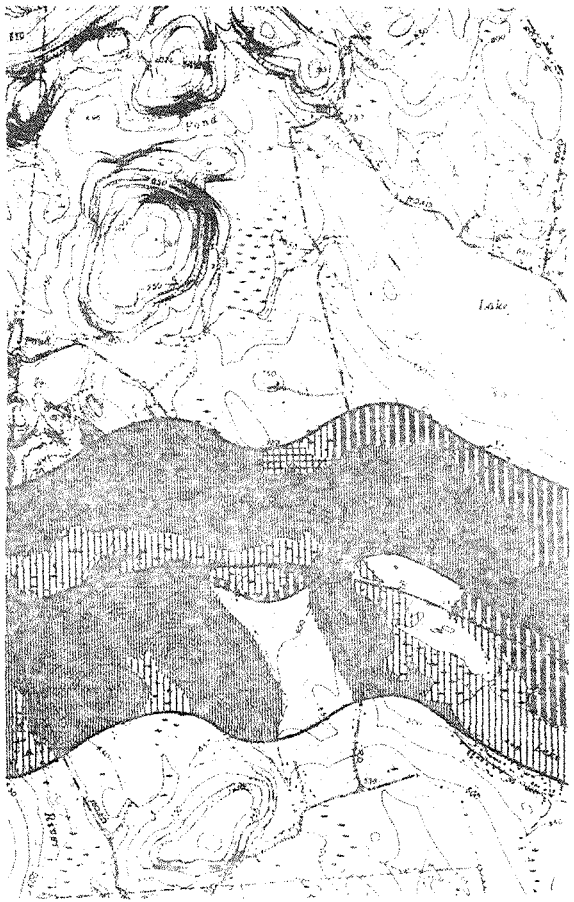
FIGURE 8 —Areas of excessive slope

FIGURE 9 —Areas with poor soil or surface hydrology

FIGURE 10—Areas of unsuitable size or shape

FIGURE 11—Areas with inadequate visual or local road access

FIGURE 12—Areas in conflict with existing land uses



which consists of two parts (Nos. 1 and 2, Figure 13). One part, of approximately 150 acres, lies north of Route 301 with about 100 acres east of Route 9. The other part, of approximately 150 acres, lies south of Route 301 with about 125 acres on the east side of Route 9.

Present planning indicates the possibility of a limited access highway traversing the length of Philipstown. Such a facility would connect with Interstate 84, and would provide an excellent north-south linkage with the Beacon and Peekskill labor markets. Should this road become a reality, good planning dictates that an interchange between the new limited access highway and Route 301 be constructed in the vicinity of McKeel Corners to serve the Cold Spring-Nelsonville area.

Whether these two sites could be described as sites suitable for use by an industry would depend upon two further qualifications: that adequate water and sewage facilities were available and that the sites were industrially zoned.

Apart from the future interchange possibility, the McKeel Corners area already has some substantial advantages:

1. It has good access to Route 9, linking it with the Beacon and Peekskill labor markets.

2. It is on Route 301, the only east-west road in the county.

3. Its terrain is generally level or slightly sloping.

4. The soil conditions appear to be good.

5. The site area affords good visual accessibility.

6. The existing land use would not conflict with industrial development. For example, the Hi-Health dairy recently built a plant on a 20-acre site south of Route 301.

7. The site area consists of a few large landholdings rather than many small ones, facilitating possible acquisition.

At present these sites lack the basic water and sewage facilities that industry requires. Whether the town of Philipstown chooses to acquire or to bring these sites under land-use control in order to limit or prevent their use by conflicting uses, as recommended by the

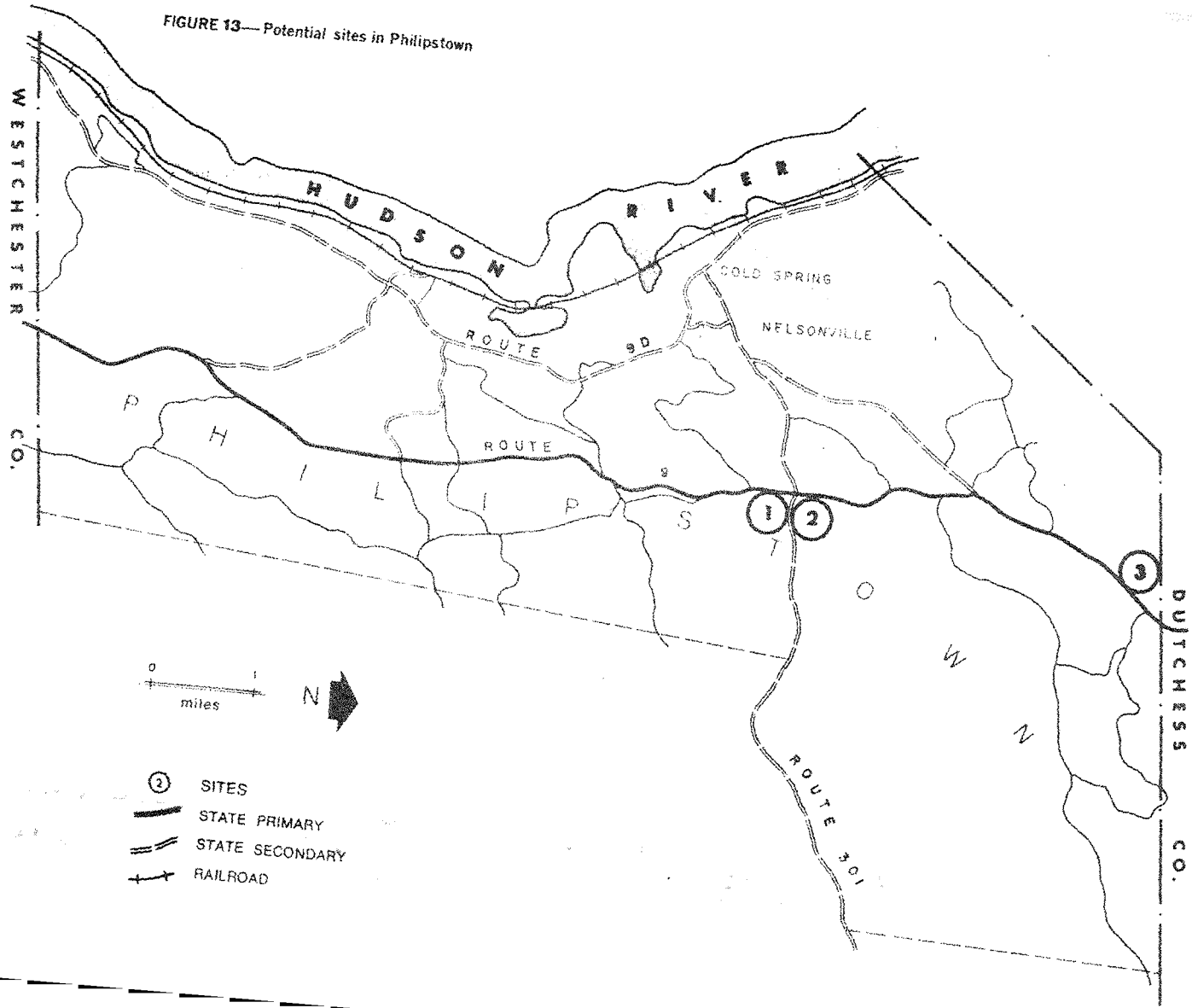


FIGURE 13—Potential sites in Philipstown

Commission, remains to be seen. That does not, however, imply that the role of the geographer ends with the publication of the report and its findings. It is, perhaps, better described as only the beginning. For with its publication comes the time when the study must be discussed with the communities involved -- and that is also a part of the role of a geographer in a Commission.

THE ALBANY SOUTH MALL PROJECT

General C. V. R. Schuyler
NYS Office of General Services

Albany's South Mall project is unique in the annals of American Government. It is not essentially an urban renewal effort. Nor is it simply a project for the construction of new State Government facilities. Actually it is something of both, and a great deal more besides.

The South Mall can best be described as a grand design for the transformation, at one fell swoop, of a great 98½ acre tract of largely deteriorating structures in the heart of the city, into a beautiful new State Government complex of landscaped parks, reflecting pools, roadways, office buildings, libraries and museums, all integrated with the existing group of older State buildings centered around the Capitol. This new complex, with its facilities for public meetings, its large underground parking accommodations, its outdoor and indoor concert areas and lecture halls, its large cultural center, and its numerous other attractions has been conceived as an active and vibrant contribution to the life of the new Albany community. At the same time, it will constitute a highly functional center for the conduct of State business.

The project had its inception in a recommendation by Governor Rockefeller, with swift approval by the State Legislature, for the appointment of a Temporary Commission on the Capitol City, headed by Lieutenant Governor Malcolm Wilson. Its other members were selected, some by the Governor, some by the Legislature, and some by the Mayor of Albany. The Commission's primary task was to prepare a long-range plan for the rehabilitation of Albany. After considerable study, the Commission proposed, as a first but vital step in its ten-year program, prompt action to concentrate as many as possible of the State's agencies downtown, near the Capitol, in an attractive setting. Such a step, it was felt, would contribute to improved efficiency in government operations and at the same time give a much-needed lift to the economy of the downtown business district. The area south and east of the Capitol was suggested as a suitable site for this new development.

In furtherance of the Commission's proposal, the Governor caused studies and surveys to be made of the area suggested and appointed Wallace K. Harrison of the firm of Harrison & Abramovitz as site architect. Working closely with members of the Commission, with the State's own planners, and indeed, with the Governor himself, Mr. Harrison proceeded step-by-step with the development of the architectural plan. It is that plan, finally approved by all parties concerned, which is now well along toward realization. The first buildings will be ready for occupancy in a little over a year. The entire project will not be completed until about 1974.

Unique also is the method of funding developed for the South Mall. It involves an arrangement, sanctioned by special legislation passed in 1963, whereby the County takes title to the land and floats bonds in amounts needed to cover all construction costs, and the State pays to the County as annual rental the sums required for interest and amortization of the bonds, together with reimbursement for revenues lost through removal of the land from county tax rolls. The total construction cost is expected to be slightly in excess of $500 million.

There are no federal funds involved. Moreover, although the county itself issues the bonds, it is reimbursed each year for all costs involved. And the State, having full use of all facilities from the moment they are completed, regains full title to all land and structures when the last bonds are retired.

The Master Plan

Opening southward from the State Capitol will be a great landscaped mall with reflecting pools and fountains, lawns and formal trees. As the top level of a vast structure bridging the valley which lies between State Street and Madison Avenue, the platform is the base for five large office buildings and a meeting center, designed as widely spaced vertical structures to accommodate numerous State agencies and several thousand employees. The open landscape between will provide beauty and a place for relaxation for the people who work here and the people who live here -- both in the new housing and in the older neighborhoods nearby. A fine restaurant on the platform will afford a magnificent view in all directions, and a skating rink and children's play areas offer year-round recreation for young people.

Beyond the south end of the main platform a wide stairway crosses Madison Avenue to another massive structure comprising the Cultural Center. Still in preliminary planning, this facility will house a new and enlarged State Museum and Science Service, History

and Archives Center and Library. An outdoor amphitheater for cultural and public events will face the mall.

The main concourse -- the level directly below the platform -- will include a meeting center, shops, cafeterias, public exhibition space, a bus terminal, a post office and other facilities for use both of State employees and of the general public. From this level, pedestrians will have direct access to all of the Mall buildings, the Capitol, and the Governor Alfred E. Smith State Office Building.

Two additional parking levels lie immediately below the main concourse, and a third level will provide both parking and a service loop for truck delivery to all the buildings of the Mall. In addition, many centralized services for the Mall as a whole such as mailroom, duplicating, and maintenance facilities will be located here.

Into these lower levels traffic feeds from east or west via the central Mall highways connecting the riverfront arterial expressway with a future north-south arterial. Traveling westward from the circular interchange at the Hudson River (which is linked to the Thruway and the Interstate Highway system) visitors will be able to drive up the approach highway, pass beneath the platform, and circle up by ramp to the main platform of the Mall. For many visitors to Albany, this may be their first breathtaking view of their monumental new Capital City.

The Main Buildings

The location of each building is shown on the accompanying plan. A brief description follows:

The Office Tower

The dominant structure of the Mall skyline, this 44-story skyscraper will be the tallest building in the State outside New York City. With 572,000 square feet of office space, its angled walls reflect a new design for elevator and corridor use for great efficiency. Connecting with it at the Concourse level are laboratory and research facilities of the State Health Department.

The Agency Buildings

Four identical 23-story office buildings of 90,000 square feet each will be built along the western rim of

the platform. Designed with large column-free floor spaces, they will adapt themselves to changes in agency size and needs.

The Swan Street Building

The major part of this long structure, running nearly the length of the main mall, will be occupied by the Motor Vehicles Department. Mechanized handling of large quantities of records and data required this horizontal plan.

The Meeting Center

Its bowl form reveals the function of this structure, which encloses a 900-seat auditorium, a second smaller auditorium and various conference and exhibit spaces. On the Concourse level below, a spacious hall will accommodate up to 2800 people for meetings and 1500 people for banquets. Associated smaller meeting rooms and service facilities will enable the Meeting Center to serve a wide range of needs.

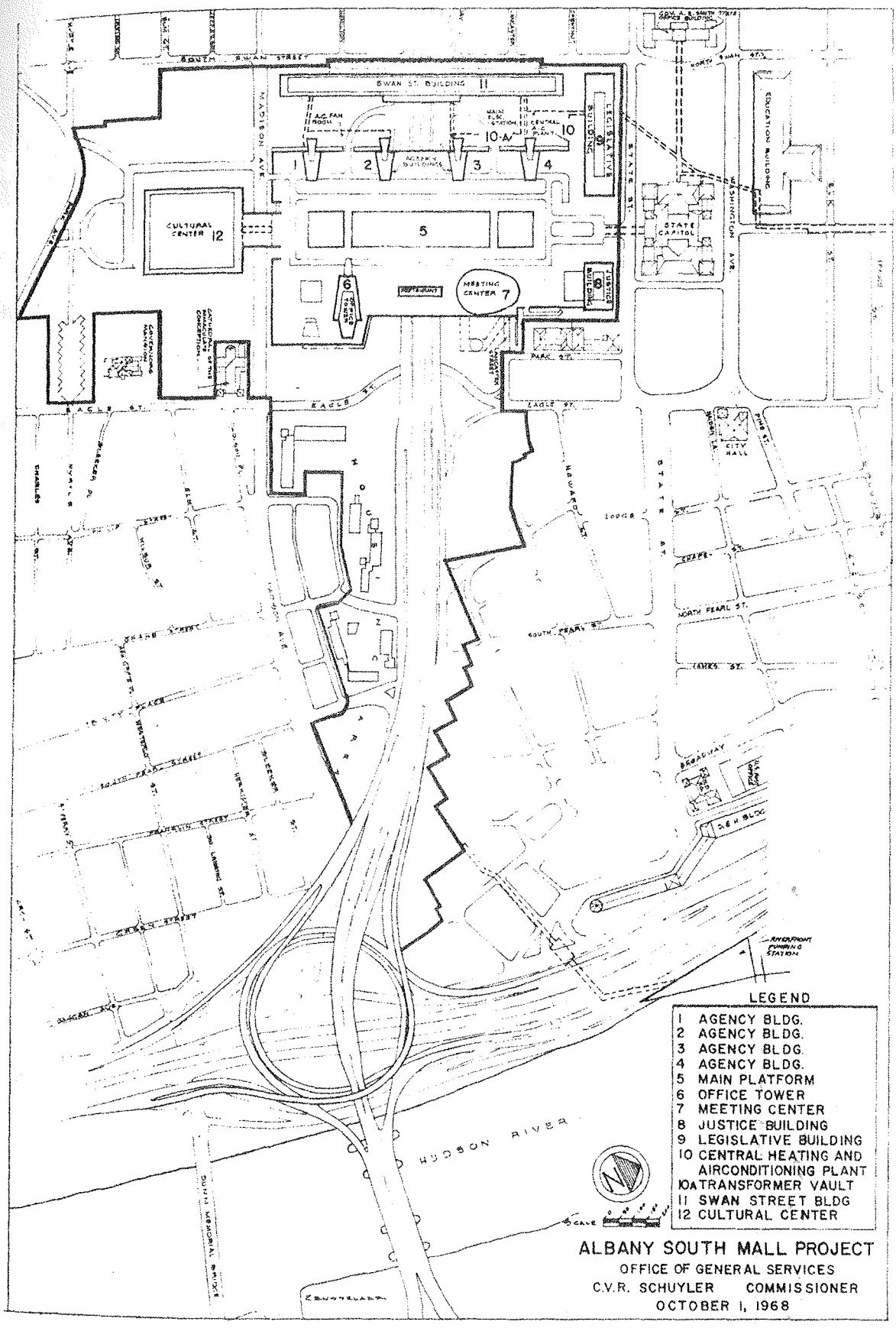
The Legislative and Justice Buildings

The larger of these two structures, which face the Capitol along State Street, provides offices and other essential facilities for the Legislature, augmenting the historic but outgrown Capitol.

The smaller building houses the Court of Claims and the Department of Law. Both buildings will have direct access, at the Concourse level, to all other Mall buildings and to the Capitol.

The Cultural Center

This building, the only one in the entire complex still to be placed under contract, will contain upwards of one million square feet of floor space. Operated by the Department of Education, it is expected to become a very special point of interest for groups of visiting school children and, indeed, for tourists in general. Its library and museum facilities will be among the finest in the Nation.


SOUTH SWAN STREET
NORTH SWAN ST.
SWAN ST. BUILDING 11
A.C. FAN ROOM
MAIN TELE. STATION
CENTRAL A.C. PLANT
10-A
10
AGENCY BUILDING
1
2
3
4
LEGISLATIVE BUILDING
9
MADISON AVE.
STATE ST.
WASHINGTON AVE.
EDUCATION BUILDING
STATE CAPITOL
CULTURAL CENTER 12
5
6
OFFICE TOWER
MEETING CENTER 7
JUSTICE BUILDING
8
PARK ST.
EAGLE ST.
CITY HALL
PINE ST.
NEWARK ST.
LODGE
CLARE ST.
NORTH PEARL ST.
SOUTH PEARL ST.
BROADWAY
DEW BLDG.
RIVERFRONT PUMPING STATION
HUDSON RIVER
SOUTH MEMORIAL BRIDGE
LEGEND
1 AGENCY BLDG.
2 AGENCY BLDG.
3 AGENCY BLDG.
4 AGENCY BLDG.
5 MAIN PLATFORM
6 OFFICE TOWER
7 MEETING CENTER
8 JUSTICE BUILDING
9 LEGISLATIVE BUILDING
10 CENTRAL HEATING AND AIRCONDITIONING PLANT
10A TRANSFORMER VAULT
11 SWAN STREET BLDG
12 CULTURAL CENTER
SCALE
ALBANY SOUTH MALL PROJECT
OFFICE OF GENERAL SERVICES
C.V.R. SCHUYLER COMMISSIONER
OCTOBER 1, 1968

New Low and Middle Income Housing for some 400 families will be built on the long open slope between the Mall and the river.

The South Mall, like all great projects before it, is not without its critics. Some regard it as "too costly," others term it "too vast" and still others criticize its architecture as "too lavish." But to the great majority of those who have examined the project carefully, the cost is not at all out of line considering the magnitude and variety of the facilities it provides, facilities which will fully meet the needs of many decades to come. The project is "vast" only by comparison with the almost minuscule efforts made heretofore to beautify and modernize the Capital City of this great State. And as for architectural criticisms, there are as many different tastes among architects as there are among the creators of women's fashions. Our South Mall architect has endeavored to impart to his buildings and their immediate surroundings a sense of modernism, of dignity, and of spaciousness, while still harmonizing them with the older, more massive and stolid State structures immediately adjacent. It seems to be the opinion of most observers that he has succeeded to a marked degree.

Even though the project is still less than half finished, signs of optimism and new hope for the future are already apparent within the business community of the Capital City. Almost a dozen new high-rise commercial office buildings are either on the drawing boards or under construction. New businesses and industries are searching out store and plant sites. Three or four separate urban redevelopment projects are under way. And the local press continues to point with pride to numerous other efforts, -- some small, some large, -- all directed toward improving the drab, somewhat down-at-heel appearance of the venerable city.

In the words of Governor Rockefeller: "There is nothing in the laws of nature or in the nature of man to require that a State which is big and vital and productive must also be mundane and dirty and ugly."

THE IMPLICATIONS OF URBANIZATION ON PUBLIC WATER SUPPLY AGENCIES IN THE NEW YORK METROPOLITAN REGION[1]

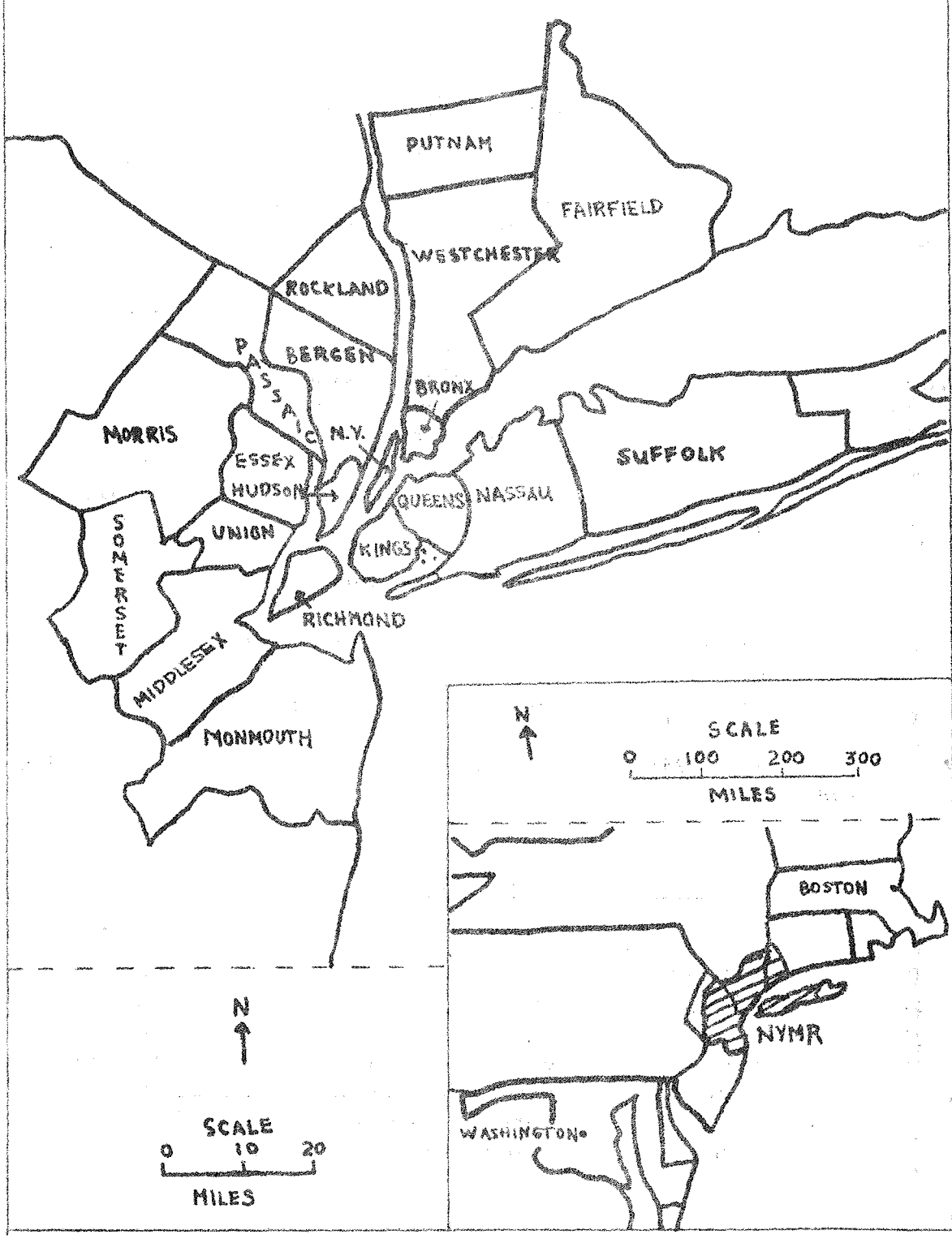
Michael R. Greenberg
Columbia University

The population of the twenty county New York Metropolitan Region (NYMR, Figure 1) is expected to increase from almost 16 million in 1960 to 21 million in 1985. Simultaneously the number of jobs is estimated to increase from more than six million to nine million. Moreover, as a consequence of added real income and leisure time, the average family may be expected to spend more money and time on homes, goods, transportation, recreation, and education. In response, the Region's political units and private utilities will be required to provide more services: generating plants and pipelines, airports and highways, playgrounds and parks, schools and hospitals, and water distribution and treatment facilities. The purpose of this paper is to examine the implications of the expected growth on one of these services: public water supply agencies. The paper is divided into three sections: (1) a summary of basic data and terminology used in water works engineering; (2) an examination of present distribution in the NYMR; and (3) an estimation of requirements in the year 1985.

A Summary of Basic Data and Terminology

Public water agencies sell water for use in homes, stores, offices, and industries. They also distribute free of charge or sell water for public services such as, fire fighting and recreation. Ownership may be either public or private. Public systems are to be distinguished from privately owned systems supplying individual industries or private individuals. The key distinguishing characteristic is the lack of individual prerogative in the distribution of the supply. This paper considers only water distributed by public agencies.

FIGURE 1--THE NEW YORK METROPOLITAN REGION



On an average day in 1963, public water systems in the United States distributed about 25 billion gallons (bgd). For purposes of analysis, the 25 bgd distribution may be separated into two components: population served and per capita distribution (gpcd). As the national population has urbanized, the percentage served by public systems has increased: from two-fifths (30 million) in 1900 to two-thirds (130 million) in 1960.[2] Per capita distribution is a surrogate for per unit distribution to homes, offices, stores, industries, and public services. Table 1 indicates the major distribution sectors and their average daily demands in the United States.

TABLE 1 -- Components of Daily Per Capita Distribution[3]

Sector	Per Capita	Per cent
Domestic	65	43
Industrial	38	25
Commercial	28	19
Public and other	20	13
Total	151	100

Domestic. -- Factors influencing domestic requirements at the intraregional scale include the type and age of the dwelling unit, the real income of the residents, the extent of metering, and the presence of sewer systems.

Industrial. -- Industrial demands vary considerably with the type of industry and the availability of alternative private sources.

Commercial. -- Along with variation by type of establishment, the presence of water cooled air conditioning systems has been a major discriminating factor.

Public and Other. -- The presence of air conditioning systems is the major distinguishing factor in public buildings. However, water lost through leakage and unmetered water accounts for the major portion of this sector.

Present Water Use in the NYMR

In 1963, average daily distribution by the 387 agencies in the NYMR was almost 2.2 bgd, or ten percent of the National distribution. Between 1961 and 1966 water distribution declined from 2100 mgd to 2084 mgd. The one percent decline is a direct result of drought restrictions imposed in portions of the Region from mid-1965 to mid

1966. Between 1964 and 1965 demand from public systems dropped from 2.20 bgd to 2.00 bgd, or almost a ten percent decrease. Daily per capita service was 135, ten percent below the National average. The lower per capita distribution in the NYMR may be traced to two sources: (1) on Long Island the presence of ample groundwater sources has made it unnecessary for industry to turn to more expensive public water supplies; and (2) in New York City the specialization in the low water using apparel and printing and publishing industries has reduced relative demands.

Intraregional Variation

Within the NYMR areal and temporal variation in the distribution of water has been traced and linked to the Region's development. Specifically, present water distribution is largely a function of the concentration of people and industrial, commercial, and public activity in and around core centers. Conversely, changes in water disbution reflect the movement of population and some enterprise from heavily industrialized and densely settled areas to formerly sparsely developed portions of the Region.

At the County scale these observations are easily illustrated. Figure 2 reflects the present pattern: the concentration of nonresidential water using activities in and around the core areas of the Region. Conversely, Figure 3 illustrates the changing pattern: substantial growth in peripheral areas, relative stability in core areas. Indeed, in the last decade four core counties experienced both a population loss and a reduction in water distribution: Kings, New York, Hudson, and the Bronx.

Measurement of the Present Pattern of Water Distribution

At the finer scale of the water agency, the present and changing patterns reflect the general pattern and local differences. Intraregional differences may be quantified and used as the basis for estimating future requirements. Table 2 lists the factors which were quantified or dichotomized, then correlated with the per capita distribution of water.

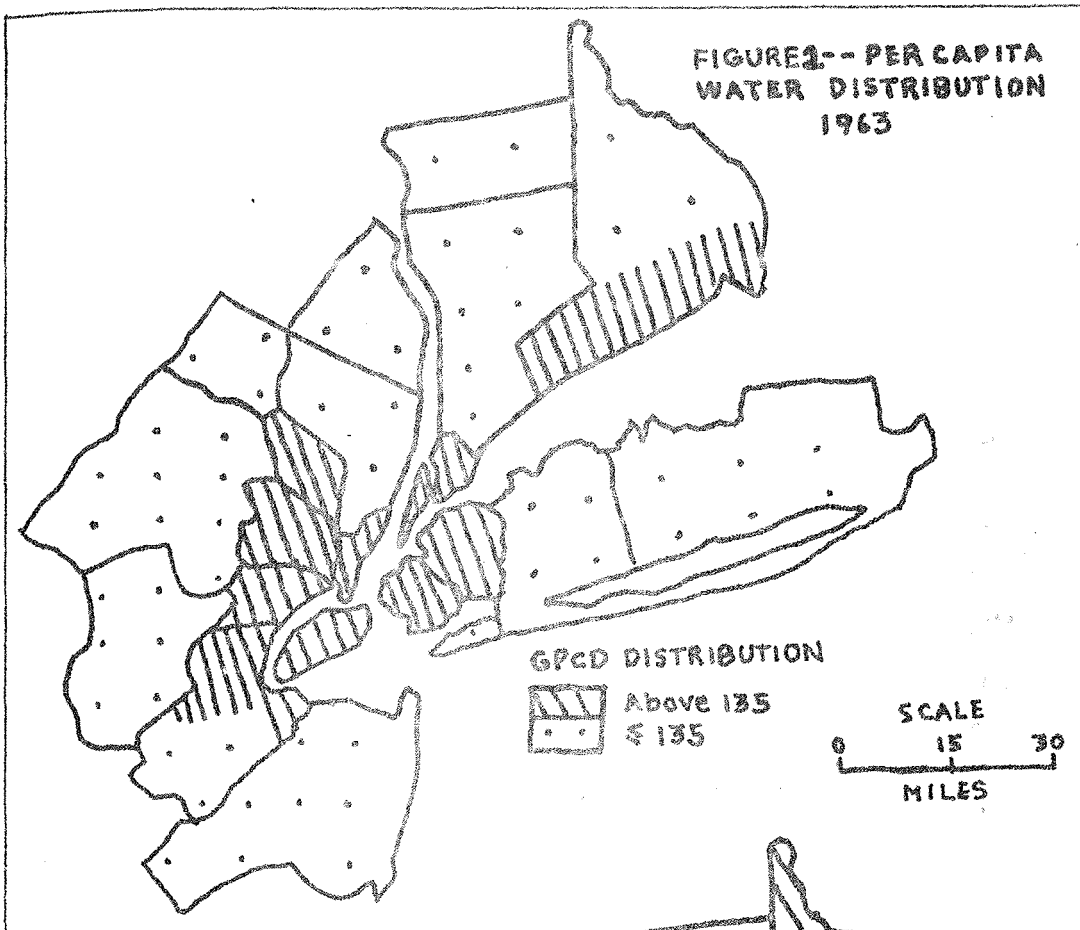


FIGURE 1--PER CAPITA WATER DISTRIBUTION 1963

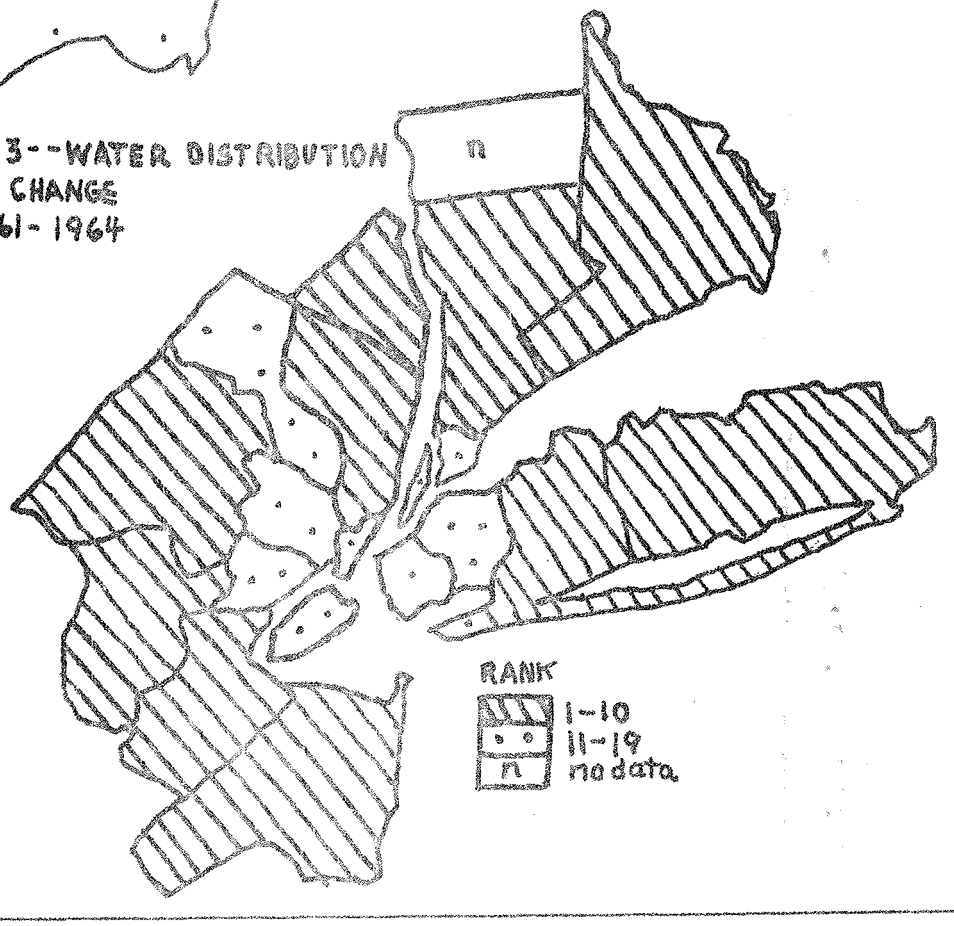


FIGURE 3--WATER DISTRIBUTION CHANGE 1961-1964

TABLE 2 -- Variables for Classification of Consuming Types in the NYMR

Variable	Scale of use
1. per capita water distribution, 1963	ratio
2. per capita manufacturing floor space, 1963	ratio
3. per capita commercial floor space, 1963	ratio
4. per capita public floor space, 1963	ratio
5. per capita nonresidential floor space, 1963 (sum of variables 2, 3, and 4)	ratio
6. median family income, 1960	ratio
7. percent of services metered, 1962	nominal
8. percent of population served by sewers, 1962	nominal

Each variable should have been compared with per capita data disaggregated into domestic, industrial, commercial, and public sectors. However in 1963, such data existed for only a small percentage of the 387 agencies in the Region. With only a single measure of per capita use, it was necessary to subject all the variables to multivariate analysis to determine which one or combinations were the most important in given areas.

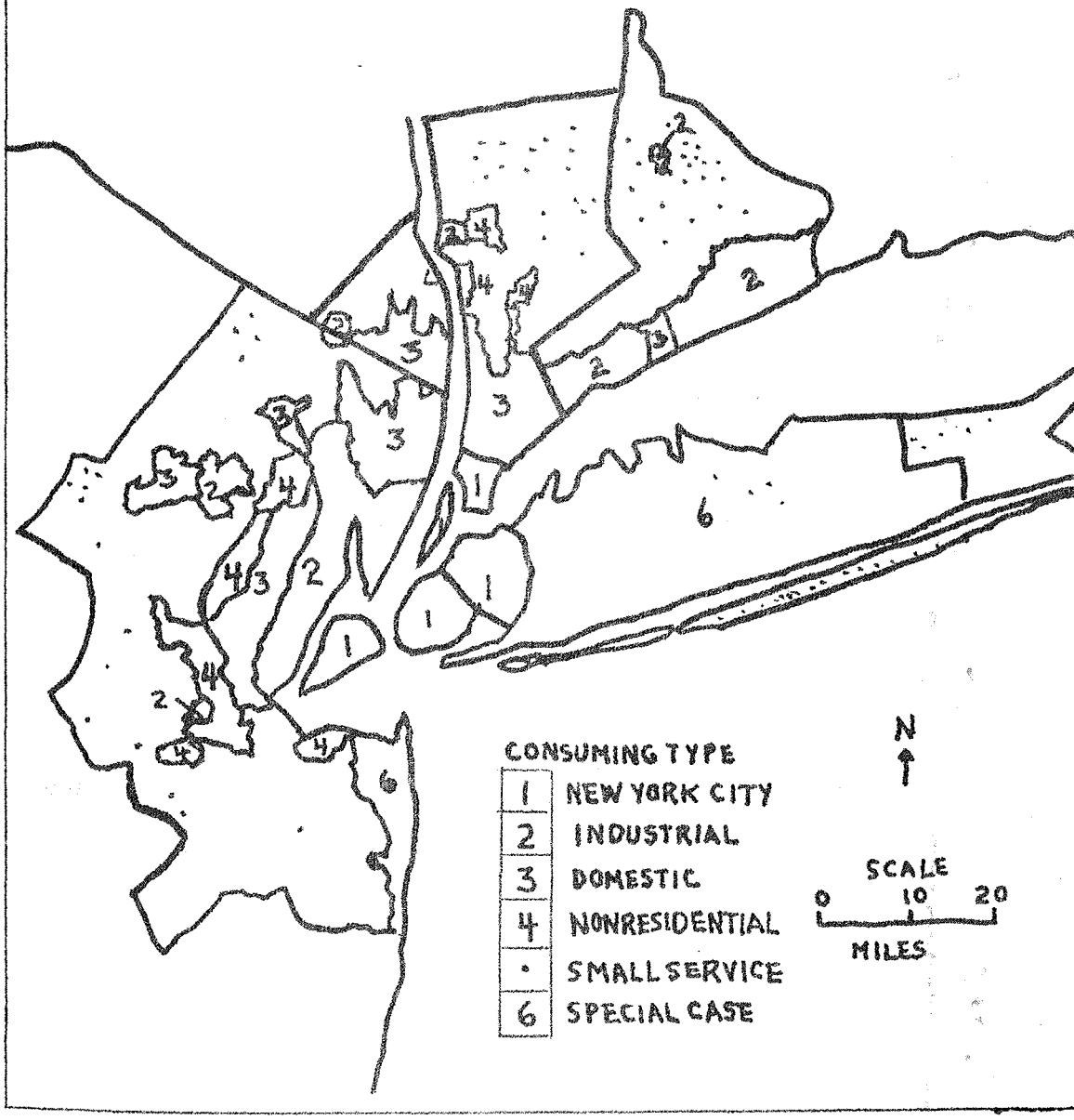
The analysis reduced the 387 agencies to six major water consuming types (Figure 4).[4] The groups form an hierarchy: from few agencies in the core areas serving large populations at high per capita rates to many agencies on the periphery of the Region serving small populations at low per capita rates. Consideration of the groups will proceed out from the core.

1. New York City.

The five New York City boroughs consume more than half of the Region's water at a rate above 150 gpcd. The size of the New York City agency demands that it be given special attention. The fact that New York's industrial demand sector is relatively low and its domestic services are not metered further distinguishes it from most agencies serving large, central cities.

In a recently published study focusing on New York City and Westchester County, three engineering firms suggest that "universal metering and a vigorous conservation program of services could cut back use 20 gpcd by 1975."[5] In 1963 a 20 gpcd cutback in the distribution within New York City was equivalent to more than seven percent of the water distributed in the Region. Although the idea of reducing waste is attractive, the author questions the

FIGURE 4--GENERAL LOCATION OF CONSUMING TYPES



recommendations of the study. As proposed, each structure, not individual apartments, would be metered. It seems unlikely that a tenant in a multiunit structure would be willing to reduce his demands without assurance that his savings were not being squandered by his neighbors.

Moreover the solutions ignore other, more serious implications which are related to the economic status and the "mood" of New York City residents. As suburbanization has proceeded in the NYMR, the economic status of the population in New York City has tended to polarize: many low and upper income residents, relatively few middle income residents. The effect of metering and a conservation program on the first two groups is unlikely to achieve the desired results, or would achieve them at a social cost. Upper income tenants paying high rents are unlikely to lower water demands due to a small increment in rent. Conversely, low income tenants may be hard pressed to cover higher water rates. Moreover, their fees are likely to be considerably more than for the upper income tenant because older and unserviced buildings have more leaks. Thus, the ghetto dweller is likely to regard the conservation and metering programs as another action directed at him by the City. Accepting the premise that water is a service, not a luxury, further sharpens the possible political implications. Should another forced cutback be implemented the low income resident would be the first to feel the economic pressure. This, in turn, would open the City to the charge that it was practicing discrimination in the distribution of a public service. In short, the city should balance the possible savings in water against the possible cost of adverse public opinion.

2. Agencies with an important industrial component. -

Thirty-seven agencies were distinguished by high correlations with the manufacturing floor space variable. In 1963, they distributed one-fourth of the Region's water at the rate of 148 gpcd. Thirty-one of the thirty-seven are located in four counties that distributed above 150 gpcd in 1963: Hudson, Essex, Passaic, and Fairfield.

The initial group was subdivided into groups of twenty-seven and ten. Each agency in the first group served more than 20,000 persons, while everyone in the second group served less than 20,000. Other distinguishing characteristics were noted. All but two of the twenty-seven agency group border on a 30 foot channel or have direct access to one via a major New Jersey river. The location tendency relates to the need for direct access for industrial bulk products and water for cooling. The ten agency group is distinguished by its high mean per capita distribution: 210. Every one of the ten serves a

relatively small population and one or two heavy water using industries such as General Motors in North Tarrytown and Ford in Mahwah.

3. Areas distinguished by the economic status of their population.

Twenty-three agencies serving much of southern Westchester and a sizeable portion of western Essex, Morris, and northern Passaic counties distributed six percent of the Region's water at the rate of 111 gpcd. Once again the group was dichotomized: a group of nine agencies in Westchester County serving upper income communities with little nonresidential water use; and a group of agencies in Westchester and New Jersey serving communities with a nonresidential component.

4. Agencies distinguished by high correlations with the floor space surrogate.

Eighty-three agencies, nearly all on the periphery of the present area served by public water systems, distributed 95 gpcd to less than three percent of the Region's population. The group was split based on the presence of sewer systems. The forty-two agencies served by sewer systems distributed 99 gpcd, the forty-one without sewer service 88 gpcd. Thus, the threshold cost of installing public sewer systems, a function of population density, is reflected by lower per capita distribution on the fringe of the Region's service areas.

5. Agencies serving less than 1,000 people.

The hierarchy of water using types is completed by the 161 agencies located close to the Region's perimeter. With few exceptions they are privately owned, use ground water or small lakes as sources, and have no sewer service. Within the group a clear distinction exists between the forty percent operating only in the summer months and the remainder operating throughout the year. Those functioning all year round rarely distributed more than 80 gpcd or less than 70 gpcd. Consequently, it may be assumed that demands by commercial and public interests are negligible and industrial demands are absent.