hackensack meadowlands comprehensive land use plan



609



hackensack meadowlands comprehensive land use plan



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OCTOBER, 1970

hackensack meadowlands development commission

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preface

This report, entitled the Comprehensive Land Use Plan for the Hackensack Meadowlands, is a synthesis of highly detailed studies ordered by the New Jersey Hackensack Meadowlands Development Commission.

The report is presented in four sections, beginning with an introduction.

The second part of the report traces the natural and developmental history of the Hackensack Meadowlands and also offers a summary of the existing conditions which are the starting point for the Land Use Plan.

The third section bears the title of the full report, Land Use Plan, and outlines the specific uses and allocations of the 20,000 acre Hackensack Meadowlands tract. From a popular viewpoint, it is this section that will be the most examined and commented upon.

Finally, the fourth part summarizes some of the major steps to be taken in the implementation of the plan.



David N. Van Pelt

September 4, 1970

contents

Page

Part I — Introduction V

Part II — Natural and Development History 9

Part III — Land Use Plan 33

Part IV — Implementation 45

Major Illustrations

Meadows Size Relative to Manhattan and Central Park 1

Official Zoning Map — Stage I
Hackensack Meadowlands District 3

Location of Hackensack Meadowlands vi

Geology and Soils
Hackensack Meadowlands District 11

Illustration of Food Chains in a Productive
Marsh/Estuary 12

Typical Marsh Vegetation Sequence 12

Regional Transportation 16

Developed Areas
Hackensack Meadowlands District 20

Solid Waste Disposal Areas
Hackensack Meadowlands District 23

Hackensack Meadowlands in Relation to the Region's
Major Waterways 24

Schematic — The Ecology of an Unpolluted
Marsh/Estuary 26

Schematic — The Ecology of the Hackensack
Marsh/Estuary 26

Illustrated Schematic — The Hackensack
Marsh/Estuary 26

Existing Vegetation
Hackensack Meadowlands District 27

The Two Eco-Systems in the Hackensack
Marsh/Estuary — The Marsh Based Community;
The Garbage Cycle 29

Developed Land — North Atlantic Seaboard 32

Land Use Plan
Hackensack Meadowlands District 34

Rendering of Land Use Plan
Hackensack Meadowlands District 36

Profile of the Hackensack Meadowlands 39

Rendering — A Residential Island Cluster 41

Rendering — Berrys Creek Center 43

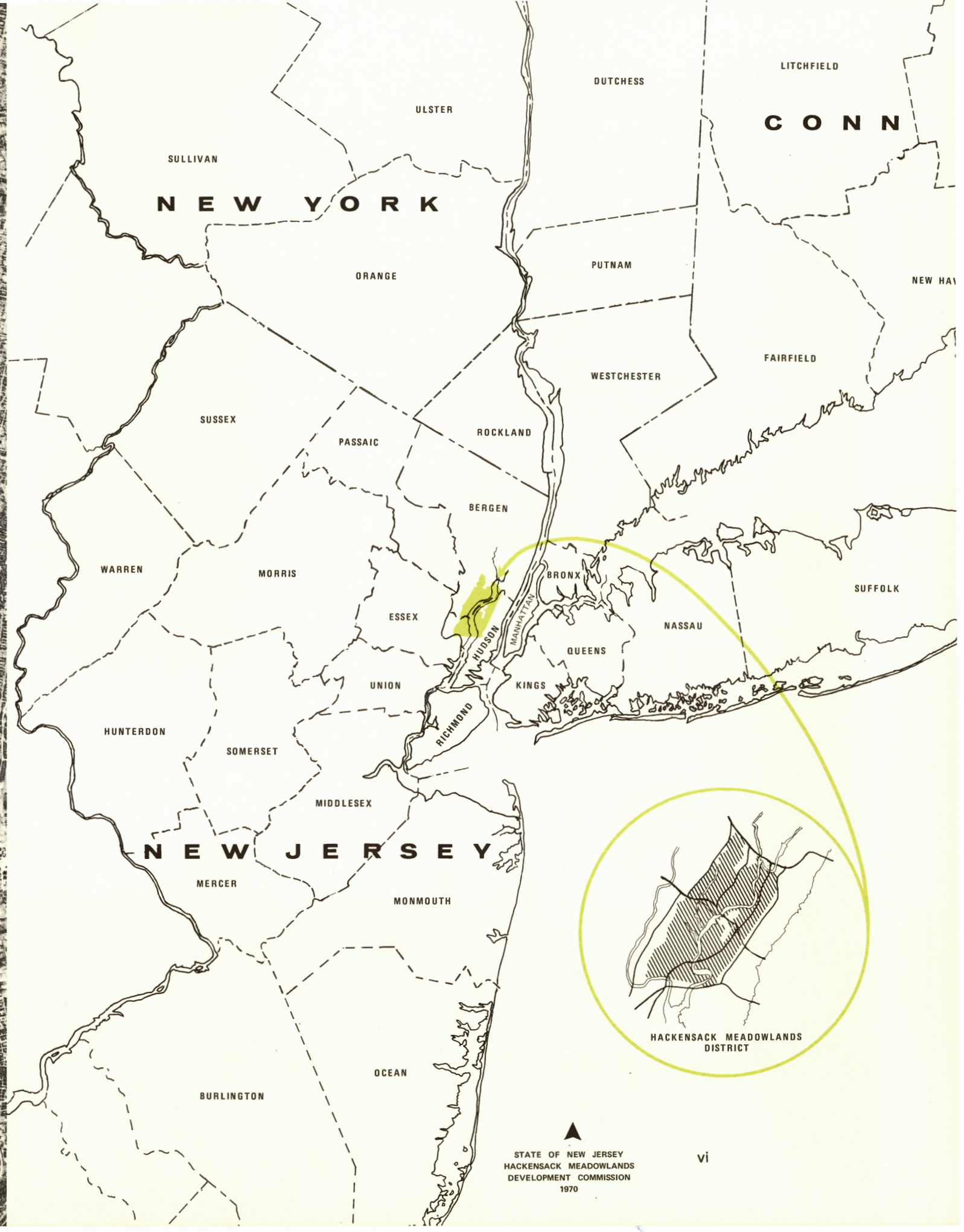
Air Quality Control Region 51

Water Quality
Hackensack Meadowlands and Environs 55



part 1
introduction





STATE OF NEW JERSEY
HACKENSACK MEADOWLANDS
DEVELOPMENT COMMISSION
1970

THE HACKENSACK MEADOWLANDS DISTRICT

The Hackensack Meadowlands District is at the hub of the New York-New Jersey Metropolitan Area.

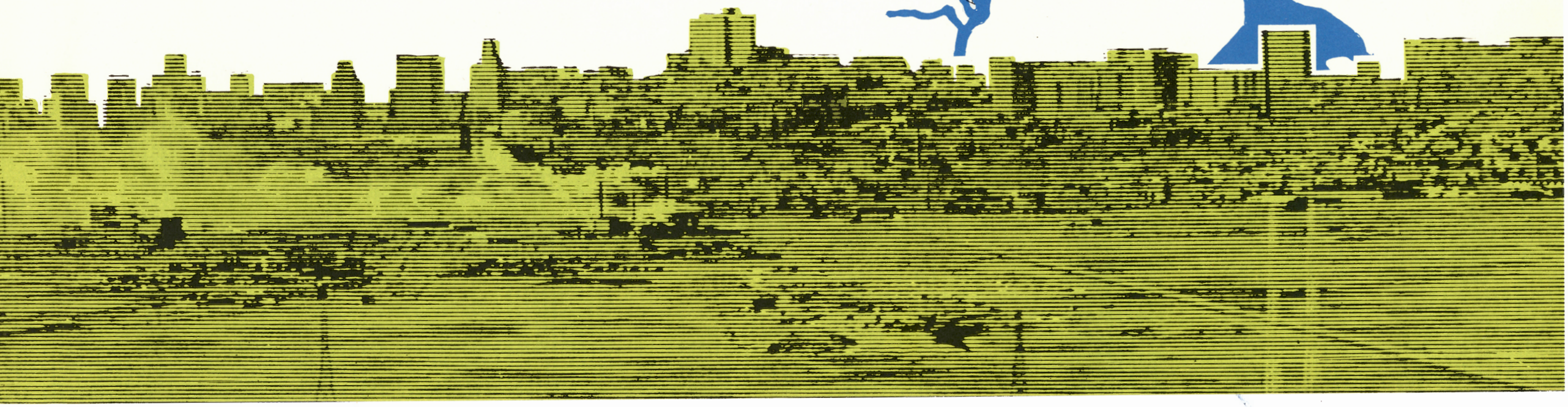
It is larger than Manhattan and more than 20 times as large as Central Park, the region's most renowned open space.

The urban development that rings the Meadowlands — in New York, Newark, Jersey City, Paterson, Passaic, Hackensack and the smaller, densely built-up towns of Hudson and Bergen Counties — is among the most concentrated and richest in the world.

A large part of the District has been developed, mostly for transportation and industry. The existing development limits the usefulness of the remaining open lands, but these limitations notwithstanding, the District is a land resource of vast potential.

No other American urban area has within its inner ring so large a tract of open land which can be used to complement previous development and to correct existing imbalances in regional land use.





The Hackensack Meadowlands Development Commission

The New Jersey Legislature, fearing that the incalculable opportunity of the Meadowlands was being lost to the State through piecemeal development and declaring that the planned use of the Meadowlands could no longer be deferred, passed Chapter 404 of the Laws of 1968. The Act charged the Hackensack Meadowlands Development Commission with the responsibility for planning and developing the Meadowlands to achieve the greatest public good.

The Hackensack Meadowlands Development Commission began its work in April of 1969.

The Master Plan — Stage I

In November, 1969, the Commission published Stage I of the Master Plan for the Hackensack Meadowlands District. Stage I described the problems that have thwarted past attempts to realize the great and varied potentials of the Meadowlands: the difficult physical features, the complexity of devising a plan, the absence in the past of a sound governmental vehicle for carrying out the plan, the uncertainty of title and the environmental degradation of the area.

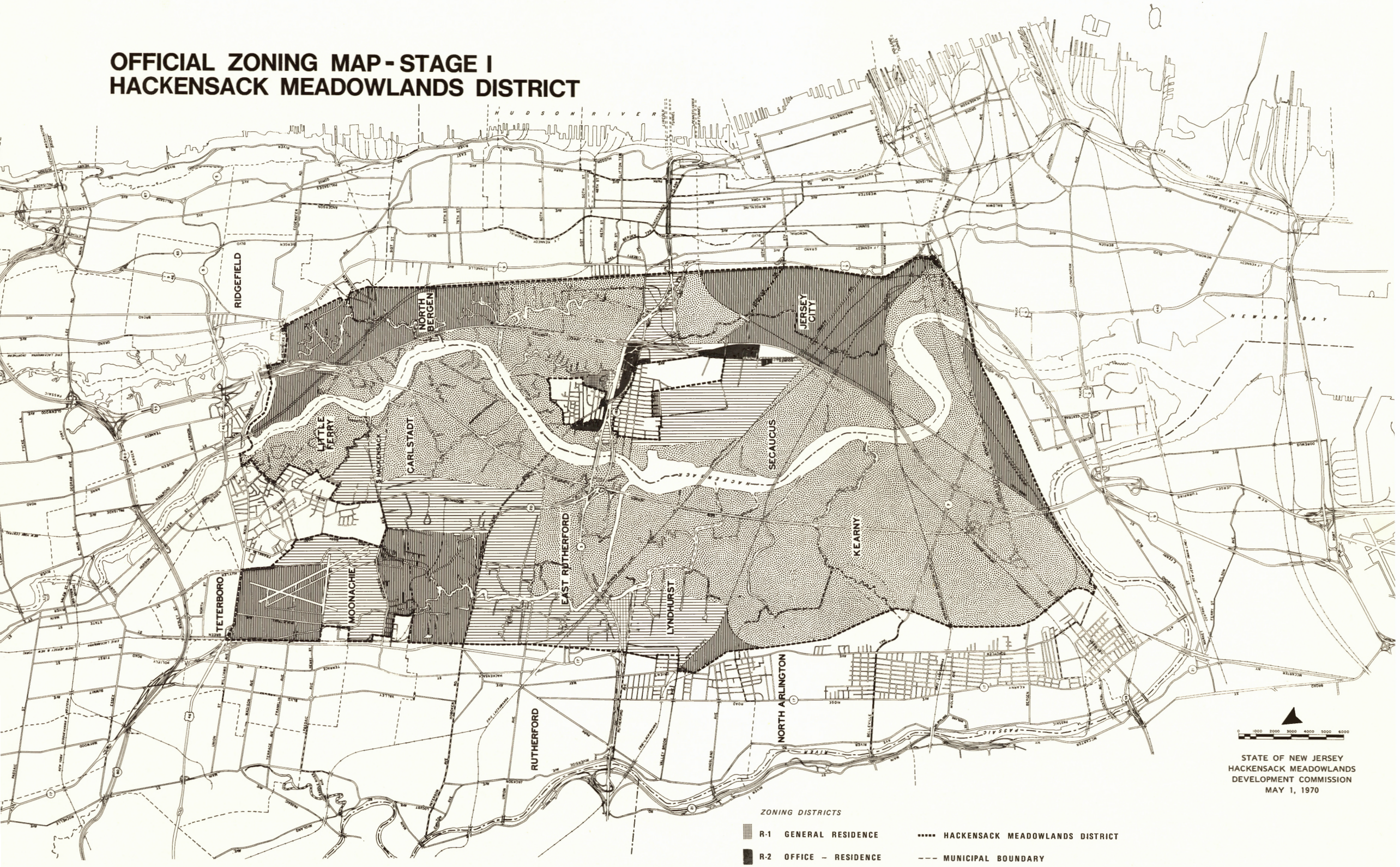
Stage I defers the development of about 10,000 acres of still open Meadowlands, but for no more than two years. It permits development within some 2,500 acres of peripheral, open land where the influence of nearby developments leaves little or no choice as to future use. This development area is large enough to hold more than ten times the annual development rate in the District. Stage I also imposes environmental controls and uniform engineering, zoning, subdivision and building standards in this development area. The purpose of Stage I is to protect the integrity of the Meadowlands while the full plan is being prepared without unreasonably restricting short-term development. In this way, the Commission sought both to comply with legislative direction to commence regulation of the Meadowlands development as soon as possible and to avoid the dangers inherent in an attempt to complete the entire plan too hurriedly.







OFFICIAL ZONING MAP - STAGE I
HACKENSACK MEADOWLANDS DISTRICT



STATE OF NEW JERSEY
HACKENSACK MEADOWLANDS
DEVELOPMENT COMMISSION
MAY 1, 1970

ZONING DISTRICTS

- R-1 GENERAL RESIDENCE
- R-2 OFFICE – RESIDENCE
- B-C BUSINESS–COMMERCIAL
- M-1 LIGHT INDUSTRIAL
- M-2 HEAVY INDUSTRIAL
- P-A PLANNING AREA

- ••••• HACKENSACK MEADOWLANDS DISTRICT
- – – – MUNICIPAL BOUNDARY

Stage I took effect on May 1, 1970 after public hearings and the formal review required by law by the 14 mayors whose communities share the District. Thus having protected the area, the Commission now moves forward with the present report, proposing a Land Use Plan which involves solid waste disposal, transportation, conservation, recreation, flood control, reclamation, pollution abatement and other interlocking elements.

Acknowledgements

This plan builds upon years of work by municipal groups, county agencies, various State departments, legislative commissions, federal agencies and private associations and individuals. Those who have worked on the Meadowlands will see many of their ideas within this plan. Their work makes it possible for the Commission to offer soon after its first anniversary a plan which otherwise would have taken years to draft. Indeed, this accumulated legacy of ideas, facts and aspirations is the foundation on which this plan rests. Like a coral reef it takes its shape and support from the generations that preceded it.

Special mention is due the Division of State and Regional Planning. The Division worked on the Meadowlands program for over a decade, reviving interest in it, countering the frustrations that surrounded the project, doing work that showed the ways and means of going forward, helping to draft the necessary legislation and endowing the Commission with many invaluable studies and reports.

Paul N. Ylvisaker was the first Chairman of the Meadowlands Commission. To a great extent, he built the ship and set its course.

The Land Use Plan was framed chiefly by the team of Dan Coleman Associates, planners; Harding, Miller and Lawson, geologists and Ryan Development Associates, development consultants. Zurn Environmental Engineers helped prepare those portions of the plan dealing with solid waste management. John J. Kassner and Company was the chief consultant on water pollution and its abatement. Dr. E.E. MacNamara of Lehigh University, the New Jersey Marine Sciences Consortium and the New Jersey Department of Conservation and Economic Development were the principal advisors on marsh ecology, conservation and open space. The New Jersey Department of Transportation, the New Jersey Turnpike Authority, the Tri-State Transportation Commission, The Port of New York Authority, the Regional Plan Association, the New Jersey State Council on the Arts and many officials of Bergen and Hudson Counties and the Meadowlands constituent municipal governments were extremely helpful in a variety of subjects. Considerable assistance was provided by the federal government, especially by the United States Army Corps of Engineers, the Department of Housing and Urban Development and the Department of Health, Education and Welfare.

The work of the Commission's consultants on Stage I — Development and Resource Corporation on engineering; Ross, Hardies, O'Keefe, Babcock, McDugald and Parsons on land use regulations, and Real Estate Research Corporation on real estate economics — provided a sound basis for this report.

The Setting for the Land Use Plan

Any worthwhile plan for the Meadowlands depends first upon restoration of the environment.

The Meadowlands is more the victim than the cause of pollution. The abatement of water pollution in the Hackensack River, for example, will require action by authorities far removed from the District and even outside New Jersey. The control of the air pollution which affects the District will require national action. Solid waste, it is hoped, will be converted from a problem to an asset by the recycling, in part at least, of reusable wastes. But the recycling of waste is a policy that affects homes and factories far outside the District that manufacture, use and discard millions of tons of waste material that each year enter the District. The Commission alone is not able to bring about such a far-reaching policy. It would be easier to plan for the Meadowlands without having to accept 30,000 tons of waste per week. However, we cannot solve the garbage problem by moving it to somebody else's doorstep.

Much can be expected of the Meadowlands in serving the needs of the region for open space and physical development of various types. But it should be pointed out that too much can be expected of the Meadowlands. While the District must be protected and while the Land Use Plan must do all it can to help meet the region's needs, the Meadowlands alone cannot solve all the problems of northern New Jersey.

The plan, depending as it does on the larger forces in society, is presently feasible; it might have seemed visionary before the recent awakening of popular concern for the environment. It is possible now to see these larger improvements on the horizon just as it is possible to make the customary numerical projections of population, employment, and the rest. Attitudes have changed. Less than a decade ago, the environmental potential of the Meadowlands was held in low regard by most authorities. Today, we believe that a half dead river should be given life, not given up. The Meadowlands plan rests on such beliefs. Restoration will be very difficult and costly, but it is possible, perhaps for the first time, to look forward to its accomplishment. This plan is forward-looking in that respect.

Today's environmental concern must be directed at the broad question of how society is to build and to restore a habitable environment for man. By the year 2000, it has been predicted, the United States will have to duplicate all of its past development in order to accommodate population growth and to replace substandard and obsolete facilities. And while some may ask: Can we not stop development altogether?, the real issue, in the case of the Meadowlands as in all the urban areas of the country, is whether man can respect his environment yet live pleasantly in close proximity to the industrial sinews of his civilization.



No recommended land use plan for the Meadowlands is worthy of presentation unless it can be carried out. Various plans for the Meadowlands have been proposed for over seven decades and have invariably fallen by the wayside. This plan will work economically as well as from an engineering and physical point of view. The costs of developing the Meadowlands, although high, will be less than the values to be created. The creation of values that are greater than costs is the key to any successful development. These values must include the worth of preserving open space, restoring natural areas and other merits not easily measured in dollars.

Anyone seriously interested in the future of the Meadowlands must consider the Meadowlands as it now exists. Some 7,000 acres of the District are already committed to a more or less permanent use. This acreage influences the possible uses of nearby, unused land.

The Land Use Plan begins with the existing conditions of the Meadowlands and the history that created them. Nothing that exists is assumed away because it will not fit a preconceived notion. This is not a hypothetical tract of land, a hypothetically classic salt marsh or an industrial park with a hypothetical ability to absorb development without limit.



There is no wishful assumption that without positive action degradation will *somehow* be stopped, much less reversed, or that this low-lying, water-logged tract will *somehow* be protected from flooding. The changes foreseen in the Meadowlands stem from a positive, feasible plan of action.

The real challenge of the Meadowlands is to identify the limitations of the land, to determine the leeway for beneficial action and to stretch the leeway and the benefits as much as possible.

Benefits are difficult to weigh. There are three separate scales to read. First, long term benefits must be balanced against the benefits that can be had immediately. A plan of this scope will not be realized until well into the future. It is difficult to judge today what will be considered beneficial by tomorrow's citizens. The Commission has made a special effort to confer with the youth of the area. And the plan tries to be flexible enough to accommodate changing conditions and new judgments about goals for 1980 that can be better made in 1979 than in 1970.

Second, there are constituencies of successively large size — the fourteen Meadowlands towns, the two counties, the whole of northern New Jersey — whose values are not always the same. For example, municipalities having land within the Hackensack Meadowlands are understandably vitally concerned with the matter of new tax ratables. Their concern is caused by the pressures of a revenue system which they did not create but which forces them to rely heavily upon revenues from the local real property tax. These are the revenues which maintain schools, police and fire departments, health services and other local services that citizens need, expect and demand. So long as the present tax structure exists, the need for ratables is real and the drive for ratables should not be scorned by those not directly affected. A goal of the Meadowlands plan must be to see that real estate values grow. However, should this dependence upon the real property tax be relieved by new State and federal revenue systems, also foreseeable on the horizon, the resulting change can be accommodated within the Land Use Plan.

Finally, there are the opposing views of advocates of conflicting uses; in the extreme example between those who seek economic growth at all costs and those for whom economic growth is the whole cost and preservation the only goal.

In the plan, this scale has been balanced judiciously in light of the realities of the land. The solution is genuine. It has been tested economically by the same rigorous analyses on which businessmen have made multi-million dollar investment decisions. It has been looked over carefully by eyes that know a killifish in the murky waters of the tidal creek. And while it may be provocative to postulate all sorts of ultimate designs for the Meadowlands — to talk of desired effects with no thought about causes, to advocate ends with no worry for means — in reality, the range of choice is narrower than either side would wish.

A Plan for Public Discussion

The Land Use Plan is offered to the public as a discussion draft for appraisal and suggested modifications.

In preparing this plan, the Commission has evaluated the air overhead and the speck of pollen buried years ago beneath layers of silt and peat. It has considered ages of geologic history and yesterday's oil slick, the complicated interactions of a bustling urban region and the simple pleasures of local muskrat trappers. But no agency, even with the solid base of documentation the Commission has inherited and the broad technical support it has gathered, can expect to have all the answers to so complex a problem as the Meadowlands. The Commission expects that this plan will be improved by public commentary. Indeed, even now, the Commission is making further studies which will no doubt suggest changes. This plan, then, may not be the last word, but we expect that it will be the last plan to be made for the Meadowlands, because, in some form, it will be the first to be carried out. Time and development pressures would not permit another try in any event.

Meanwhile, Stage I secures the area and allows time for a thorough public review and appraisal. After this review





period, the Land Use Plan and its supporting legal instruments and financial programs will be adopted by the Commission as Stage II of the Master Plan and will be submitted to formal public hearings and mayoral review.

In public discussion, there will be differences of opinion about particular pieces of land, about the emphasis given to one or another use. There is room for change, but the discussion will be more useful if it is limited by the same realities that limited the Commission in preparing this plan. To encourage this useful discussion, existing conditions and the history that preceded them are covered as much as the plan itself. This coverage, found in Part II, sets the stage for presentation of the Land Use Plan in Part III. Finally, Part IV sums up the important engineering, environmental and economic programs needed to implement the plan.

Since this report is meant for public review, it contains the main conclusions of the many technical studies on which it is based, sparing the reader the technicalities and, insofar as possible, the technical language used by the profession to give crisp expression to complicated ideas.

This plan is more than a simple numbers game, so many acres of this and so many miles of that, thousands of these and millions of those, although it does contain this sort of figuring. These numbers can change and will.

What is more important is the challenge to perceive in the future of the Meadowlands a totality that is both inspiring and possible.

The plan should raise the sights and hopes of everyone concerned with urban and environmental issues. Where else are the great problems and challenges of our day combined so visibly and on such a scale? What place has been more widely condemned and ridiculed as a bad example of man's work? What success could better prove to the whole country that the sundry programs of the various levels of government can be made to produce results on a grand scale?

Planned use of Hackensack Meadowlands can bring nationwide distinction to New Jersey. It will be a proving ground where New Jersey can attain the goals of a healthful environment, protection of wildlife and open space, sensible use of land, creation of balanced communities, economic growth, efficient disposal of waste materials, control over dangerous pollutants, rapid mobility of people and goods and imaginative use of modern design and technology.



part 2

natural and development history of the meadowlands

Hypothetically, the Meadowlands can be devoted to a wide range of alternative and varied uses. Practically, this oft repeated statement is suspect. The real challenge of the Meadowlands is to understand the limitations of the land, to find the leeway for beneficial action, and to stretch the leeway as much as possible. The history of the Meadowlands, to a great extent, determines what its future might be.

Geologic History

The past of the Hackensack Meadowlands — signaled to the aerial observer by the slowly flowing river, by the valley etched between the Palisades and the Watchung Mountains, by the rock outcropping of Laurel Hill and by the large flats of mud and plumegrass weed — lies deep in geologic history.



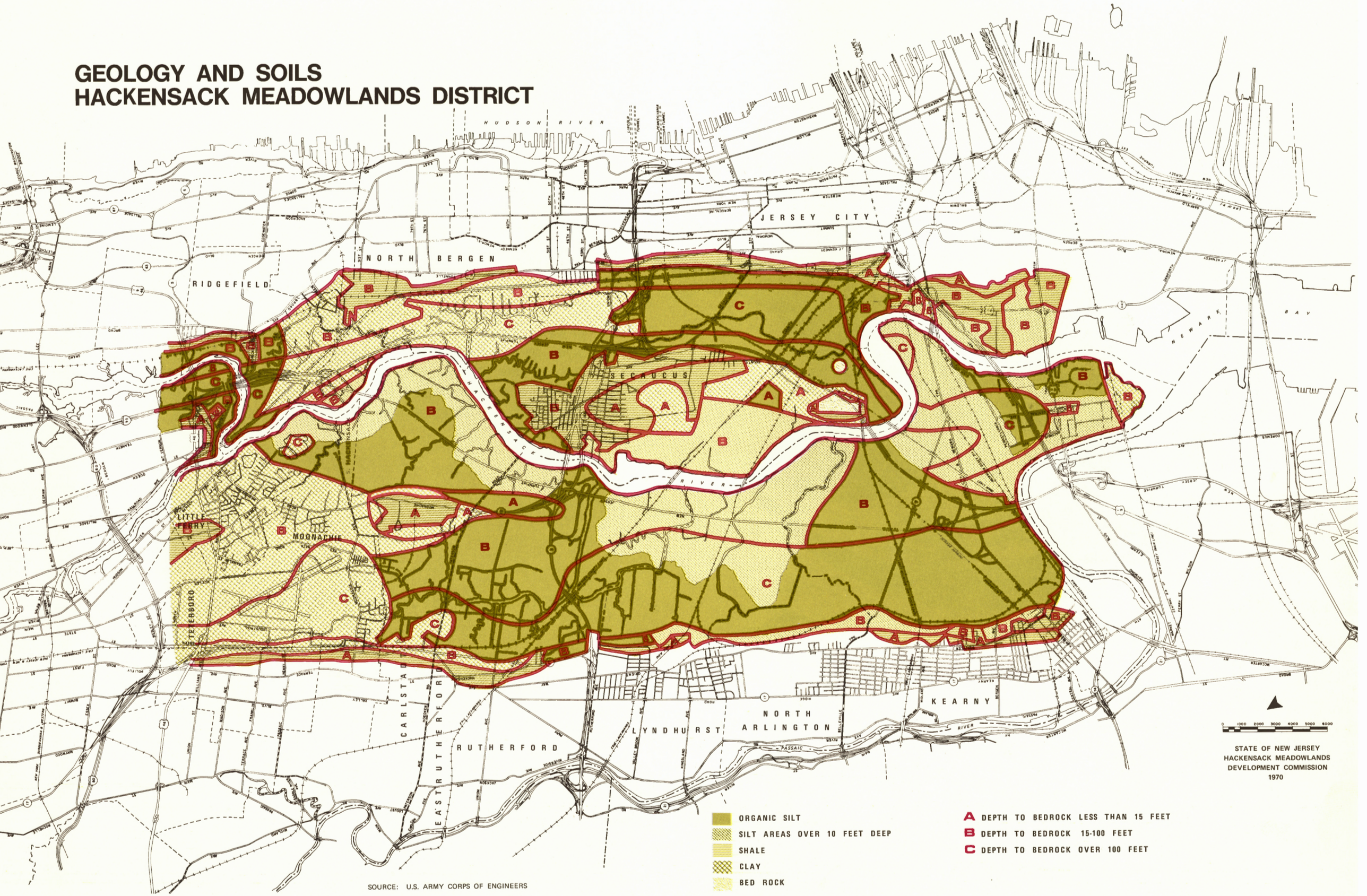
The Hackensack Meadowlands District is a tidal swamp underlain by a succession of marine, fresh water and glacial deposits recording the rise and fall of sea level since the last period of glaciation.

Geologists believe that during the Pleistocene Period the basin was scoured by advancing ice sheets, sometimes a mile thick. The last advance, the Wisconsin Glaciation, reached its furthest point some 20,000 years ago. A world-wide warming trend later caused the retreat of the ice sheet. Glacial drift, the gravel, boulders, sand and silt carried by the glacier filled the basin as the ice melted. A terminal moraine extending from Long Island across Staten Island to Perth Amboy trapped melt water, creating Glacial Lake Hackensack. Fresh water clays and organic silts were deposited in layers on the lake's bottom.

The melting ice gradually raised the levels of the water. The rising water breached the terminal moraine, draining Glacial Lake Hackensack. Vegetation took hold on the damp ground that was thereby exposed. And the ocean, rising from the meltwater, entered the lower reaches of the former lake bed, now coursed by a winding river whose entire watershed had been etched by the receding glacier. River and sea met. Fresh water mixed with salt. Grasses sprouted at the tenuous and changing meeting places of land and water. Thousands of years ago, the Hackensack marsh/estuary was born — the one that Dutch settlers were to find in the seventeenth century.

The historical records of that day are too fragmentary to give us a complete picture of the marsh they found, but, to the extent that it then resembled one of the natural salt marshes still found along the mid-Atlantic Coast, we can reconstruct by analogy and by the glimpses of evidence the history of this now disrupted natural system whose value to man has only too recently become known.

GEOLOGY AND SOILS
HACKENSACK MEADOWLANDS DISTRICT



SOURCE: U.S. ARMY CORPS OF ENGINEERS

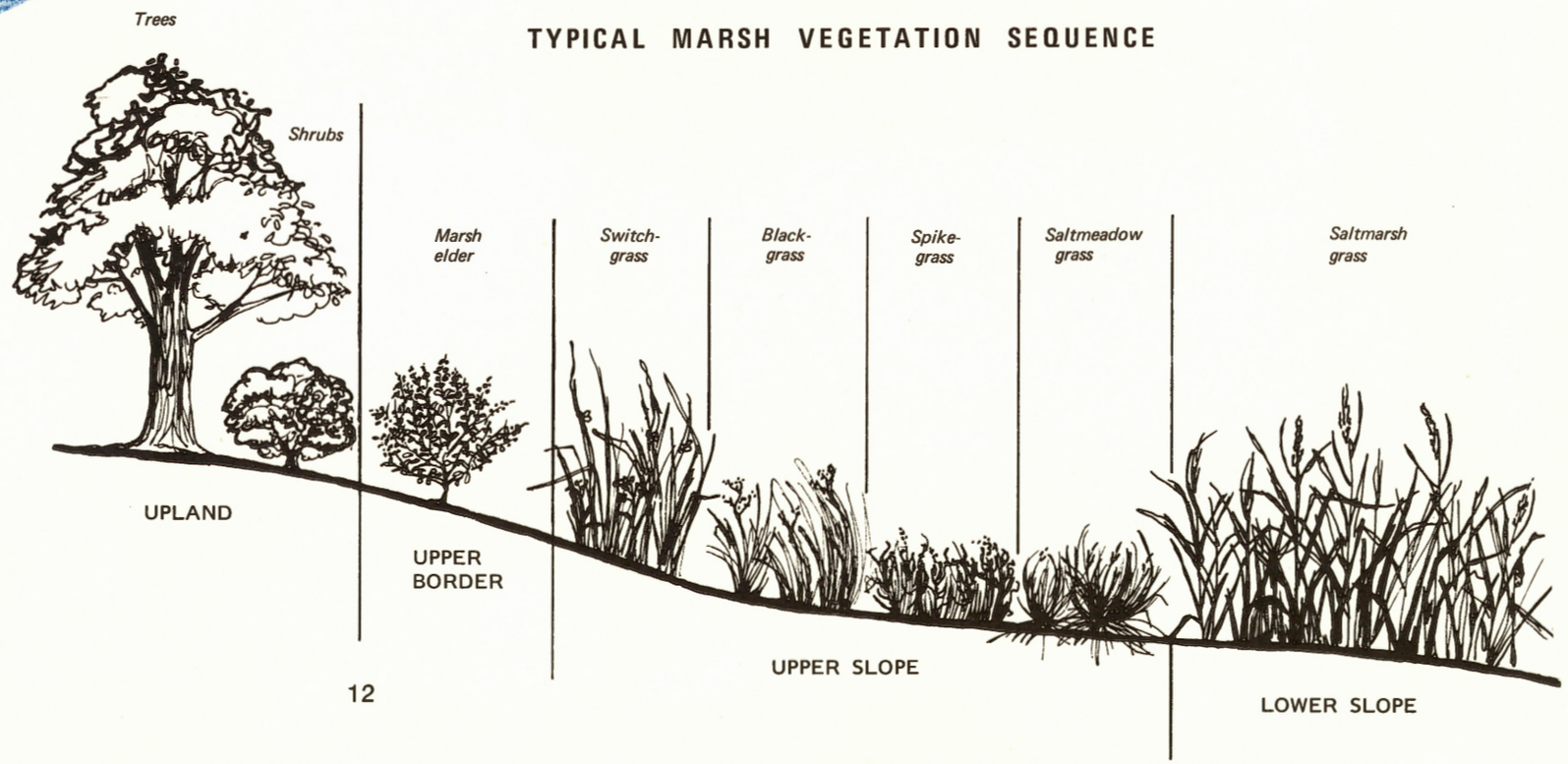
STATE OF NEW JERSEY
HACKENSACK MEADOWLANDS
DEVELOPMENT COMMISSION
1970



The Marsh/Estuary

In the classic salt marsh, salt and fresh water mix to produce a complex solution which supports a great variety of life. The motion of the waters induces sedimentation patterns, sand bars, tidal flats and mud deposits. Bottom dwelling life is distributed according to the constantly changing temperature and salinity of the intermixing fresh and salt water, according to the amount of bottom that becomes exposed at low tide and according to the seasons.

Other forms of life cruise and float in the various layers of water. Some of these organisms travel daily from layer to layer, partly because the penetration of light varies with the time of day. Others, like the killifish, cruise the creeks, ditches and water courses in search of mosquito larvae and other foods. Bluefish and striped bass are often close behind.

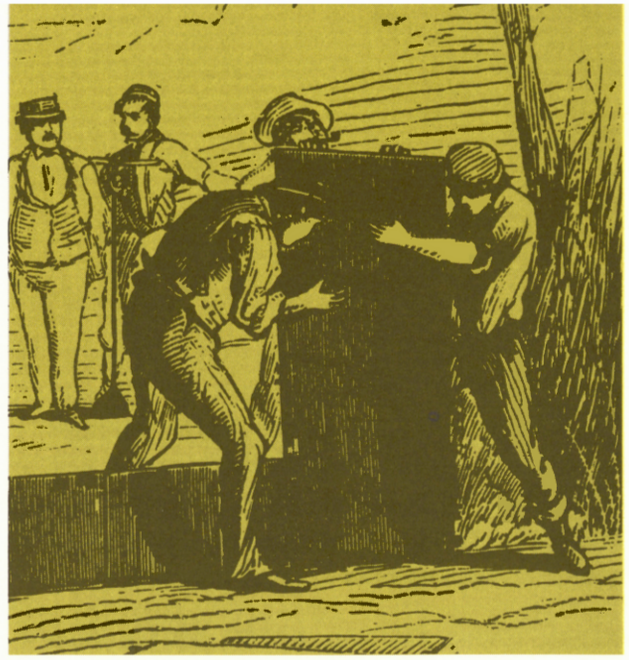


In the classic salt marsh, where tide meets shoreline, grasses sprout in the mud. Here is the core of the estuary's life support system. Marsh birds nest and feed in the protective cover of this vegetation; algae grow in the ooze and in the shallow pools which evaporate slowly after the tide recedes. Fiddler crabs peer from burrows in the mud held in place by the grasses. Mussels lie there thriving on the algae and the decomposed matter washed off the decaying grass roots by the tide. Insects scamper up the stalks of plants as the tide rises. Birds hover above, waiting patiently for the insects to bunch together. Muskrats, strict vegetarians, live off the underground and exposed stems of the marsh grass. Farther from the water's edge, plant types change, their zones demarked by each type's tolerance for moisture, salt, temperature change, soil depth and soil composition. The complex and shifting chemistry of the water and soil beneath are signaled by the marsh plants waving above.

In the estuary, biological events are always occurring. They change in rate as the seasons vary, as the tides fluctuate, as the river rises and falls, as the marsh changes — in short, as the environment is altered. Each event is in some way related to each other event. Each form of life is tied to every other form of life. No organism lives in its environment without in some way having an effect on it.

The Hackensack River, draining a 200 square mile watershed, carried a rich assortment of nutrients to the estuary. The salt water surged more than 20 miles upstream from Newark Bay. On the ebb tide, the water carried nutrients from the estuary to the bay and to the Atlantic Ocean beyond. The Hackensack marsh was undoubtedly the spawning, feeding and food producing segment of a richly productive estuary, its productivity visible in the harvest of coastal fishermen.

From time to time, the flows and the tides were extraordinary, but the marsh absorbed the shock of the flood waters. The changes caused by the periodic floods were barely perceptible in the long, slow course of natural history.



Reclamation

The early settlers did not understand the elaborate, fragile network of biochemical connections between the marsh, the sea beyond and themselves. They did see the abundance of the marsh and its forbidding nature as well. They laid the first plans to overcome nature's defenses and to turn that abundance more directly to man's benefit.

Thus, the human history of these marshes began as a history of various attempts at "reclamation." The Dutch settlers built dikes in the Meadowlands to reclaim small patches of marsh for agriculture. British settlers of Newark fought a constant battle with the tides that flooded their crops and washed away the soil. In 1816, the Swartwout Brothers invested almost a half-million dollars in land, dikes and ditches, primarily for agricultural purposes, but the tides and burrowing mammals destroyed their dream and their purse.

In the great Iron Diking enterprise of 1868, Spencer Driggs and Samuel Pike bought 5,000 acres of Meadowlands in Kearny and North Arlington and proceeded to construct massive dikes with sheet iron cores designed to frustrate both the tide and the ubiquitous, burrowing muskrats.



Courtesy of the *Scientific American*



From the collection of the *Newark Museum*

In this attempt, as in many others like it, there resided a characteristic American optimism about a land made to yield its resources to resourceful men. In 1868, the *Scientific American* wrote of the Driggs-Pike scheme:

> The draining of the swamp lands is not a new idea. Such lands are not only unproductive of anything which can subserve any important purpose, but they are productive of numerous evils. Teeming with miasma, the home of mischievous and annoying insects they are blotches upon the otherwise fair face of nature. To render them fruitful, and productive of good rather than evil, is a problem for which a solution has been anxiously sought, but heretofore only partially obtained . . . .
>
> The iron dike invented by Mr. S. B. Driggs of New York, seems to put an effectual barrier in the way of these destructive agencies.

The *Scientific American* projected this apparent triumph of technology over environment to the "large tracts of waste swamp lands to be found in Mississippi, Louisiana, Arkansas, Missouri, Tennessee, and other parts of the United States". For better or worse, the Hackensack Meadowlands had already become a demonstration area for the rest of the country.

Ironically, corn stalks grew lushly on the reclaimed land, but through an unexplained whim of Nature, did not produce a single ear of corn. The dried land cracked, and the massive iron dikes later sank out of sight. This was the last major attempt at reclaiming the Meadowlands for agriculture. Salt hay, a natural product of the marsh, remained its chief crop, useful in those days for packing ice, bedding animals and for other forms of packaging and insulation.

Crossing the Meadowlands

Entrepreneurs had long been following another path in which the Meadowlands was not so much land to be reclaimed as an obstacle to be crossed over or by-passed. Perhaps it began in 1759 when John Schuyler built a cedar plank roadbed, now the Belleville Turnpike, to his copper mine at the edge of the Meadowlands in North Arlington. After this prodigious feat, the Meadowlands became incidental to the industrial revolution and urban development in the greater region around it.

By 1868, when Driggs and Pike began their diking, the road network of the Meadowlands was well established. Only four primary roads have been added since — the Pulaski Skyway, New Jersey Route 3, the New Jersey Turnpike and its western spur. Major railroads had already cut across the Meadowlands to provide rapidly growing New York City with rail outlets to the West. The basic rail pattern established then was filled out in later decades. Extensive freight yards were built in the Meadowlands to handle traffic volumes that were too great for the existing tunnels or the crowded Hudson River shores.

Somewhere along the line, the perception of the Meadowlands had changed. Instead of a marsh intersected here and there by roads and rails, it had become a transportation network interspersed with marsh.





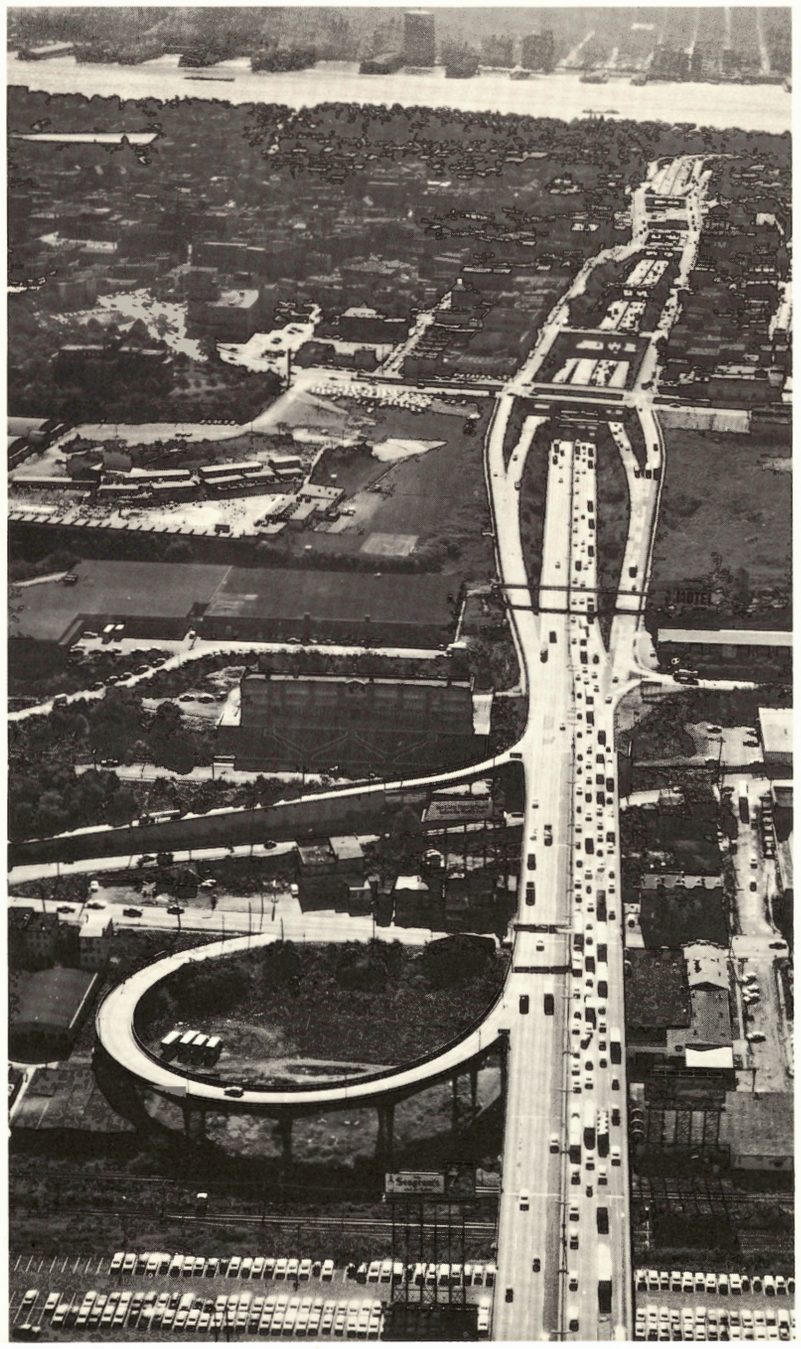


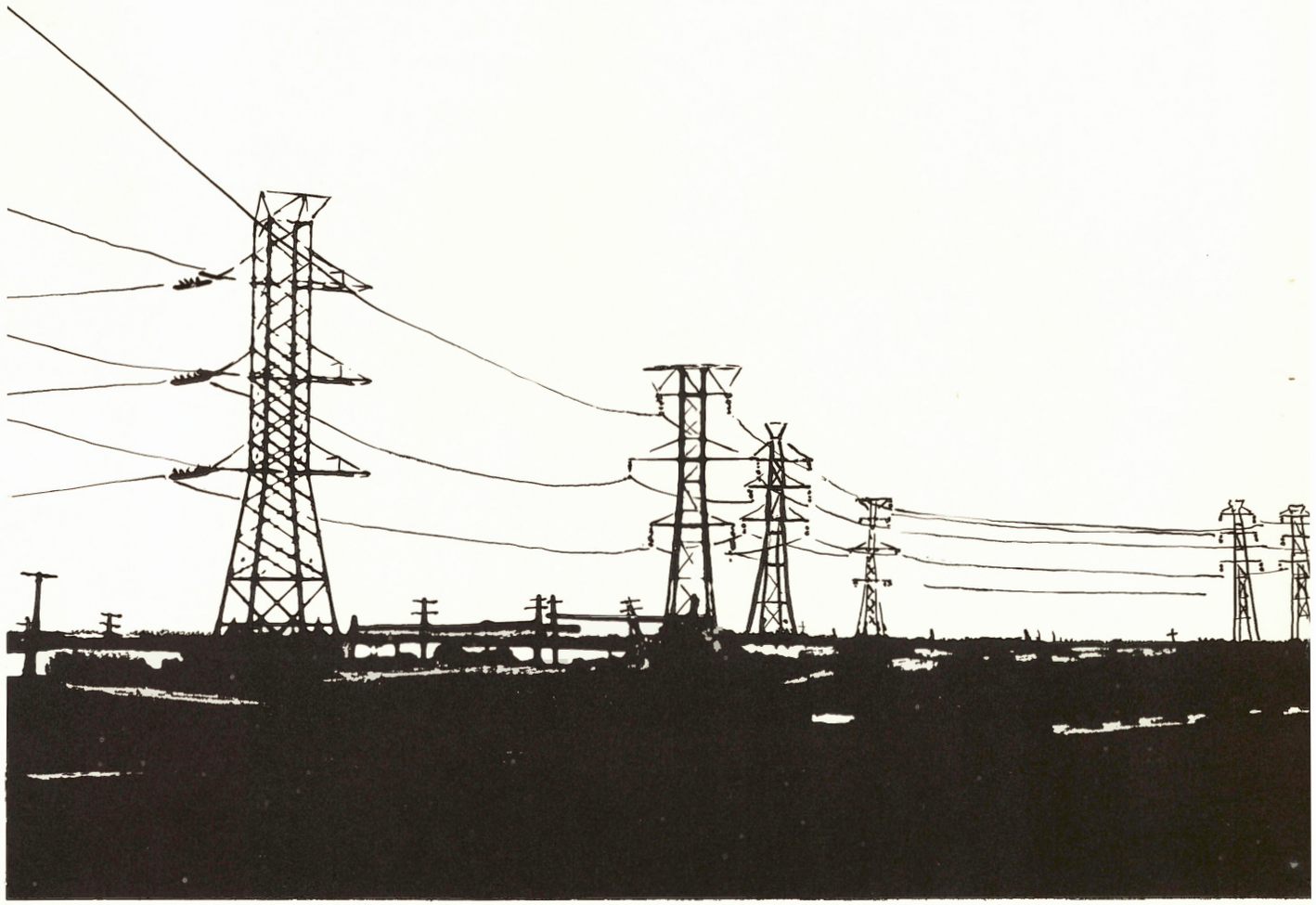
From the collection of the *Newark Museum*

Snake Hill, now known as Laurel Hill, jutting 200 feet above the marsh, has stood as a reminder of the geologic past. In the 1870's, a piece of the hill became the rock bed of the Erie Railroad's Greenwood Lake Division line. More of the hill was cut in 1909 for the Pennsylvania line to New York. Today, the big rock is being cut for traprock. Its disappearance typifies man's intervention in the natural history of the area.



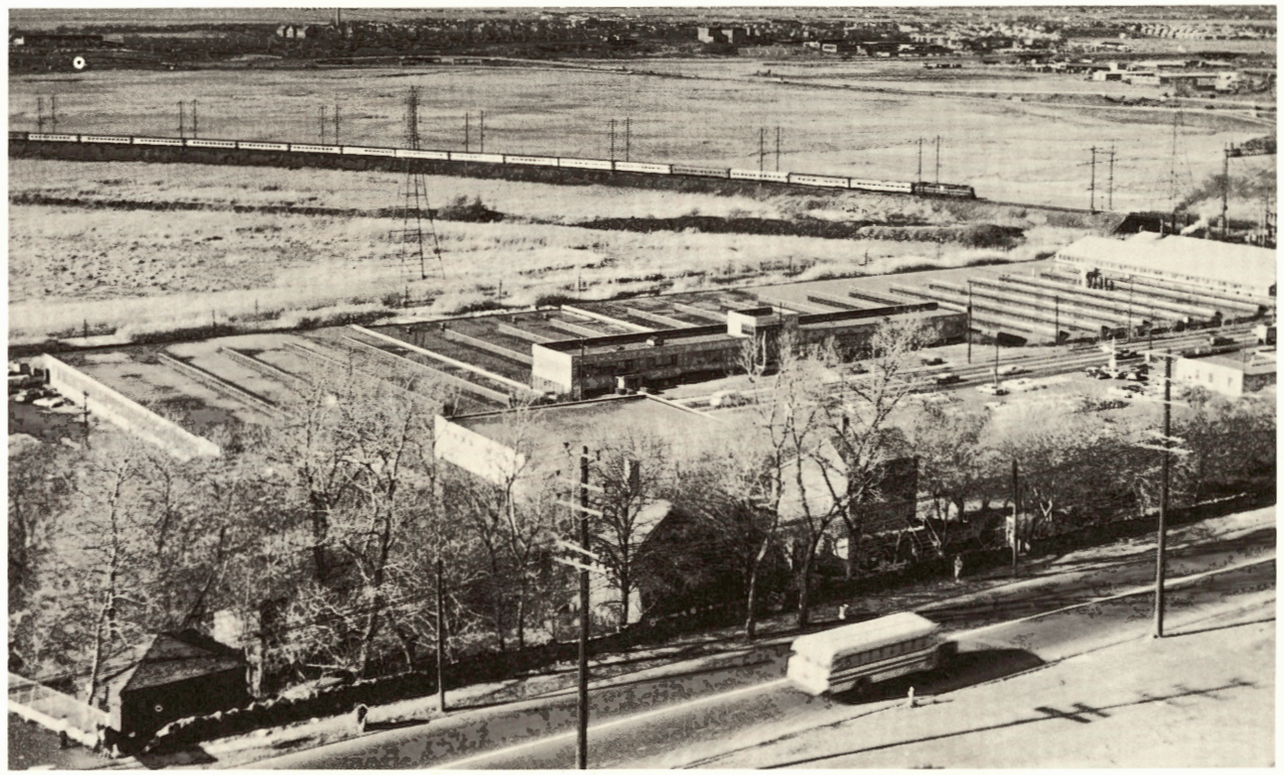
The increasingly dense development around the Meadowlands brought further attendant development to it and new ways of moving people and goods across it. The Hudson River was crossed by tunnel and bridge, inviting automobiles and trucks and leading to the expansion of the road network to its present form. The Meadowlands was crossed by towers and lines for transmission of power, fuel and radio signals.



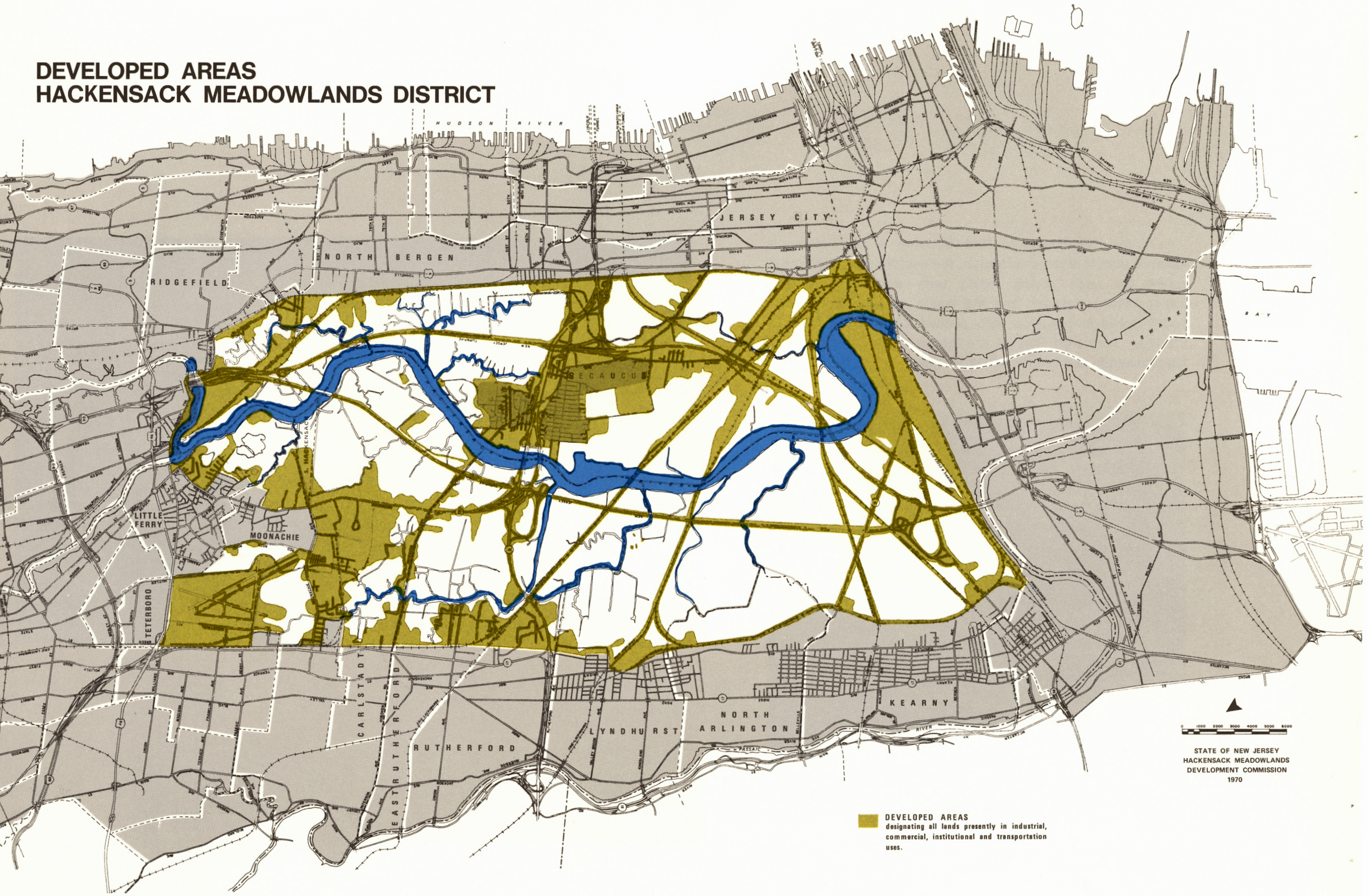


If the Meadowlands had become a transportation network interspersed with marsh, the development logic next called for uses which would take advantage of the transportation network and the ready access to markets. Today, for example, over forty percent of the truck bays in the New York Port District are located in the Hackensack Meadowlands and its immediate fringes.





DEVELOPED AREAS
HACKENSACK MEADOWLANDS DISTRICT



STATE OF NEW JERSEY
HACKENSACK MEADOWLANDS
DEVELOPMENT COMMISSION
1970

DEVELOPED AREAS
designating all lands presently in industrial, commercial, institutional and transportation uses.

HACKENSACK MEADOWLANDS DISTRICT

Summary of Development History

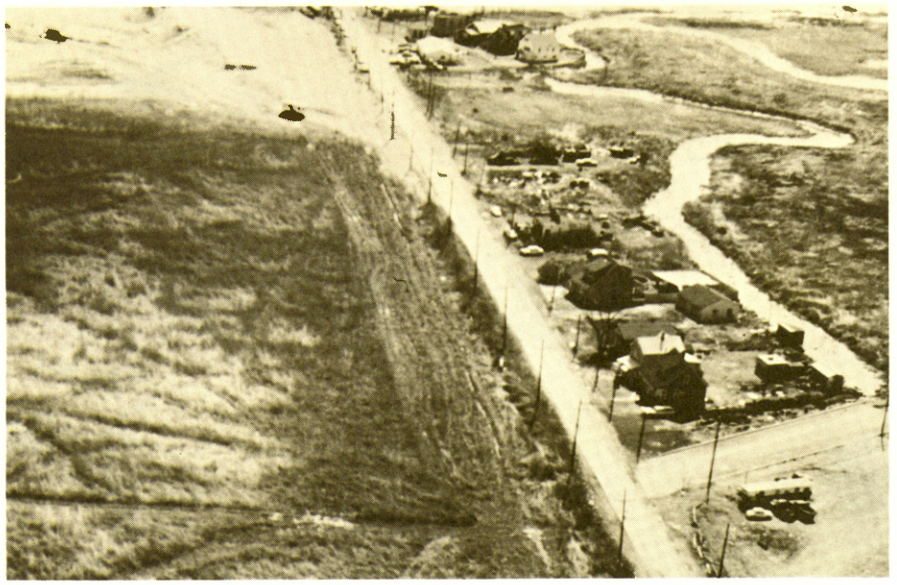
The map of developed land sums up part of the history just told. About 7,000 acres of Meadowlands are committed to more or less permanent uses. Most of the developed land — roads, rails and airports, freight yards and terminals, warehouses, transmission lines for power and gas, storage tanks and roadside services — serves in some way to expedite the movement of persons, goods or services across the Meadowlands or to store them in transit.

Table
Summary of Existing Land Use
1970

Use	Acreage
Distribution and Manufacturing	2,860
Roads, Rails and Airport	2,645
Residential	235
TOTAL	5,740

Very few people live in the Meadowlands. The residential sections of Secaucus, Little Ferry, and Moonachie extend slightly into the District and there are some homes scattered here and there among the industries and along the roads. Being highly accessible to the dense population centers of the region and at the same time somewhat removed from them, the Meadowlands became the site for necessary but unaesthetic functions in the urban scheme of things.





Solid Waste

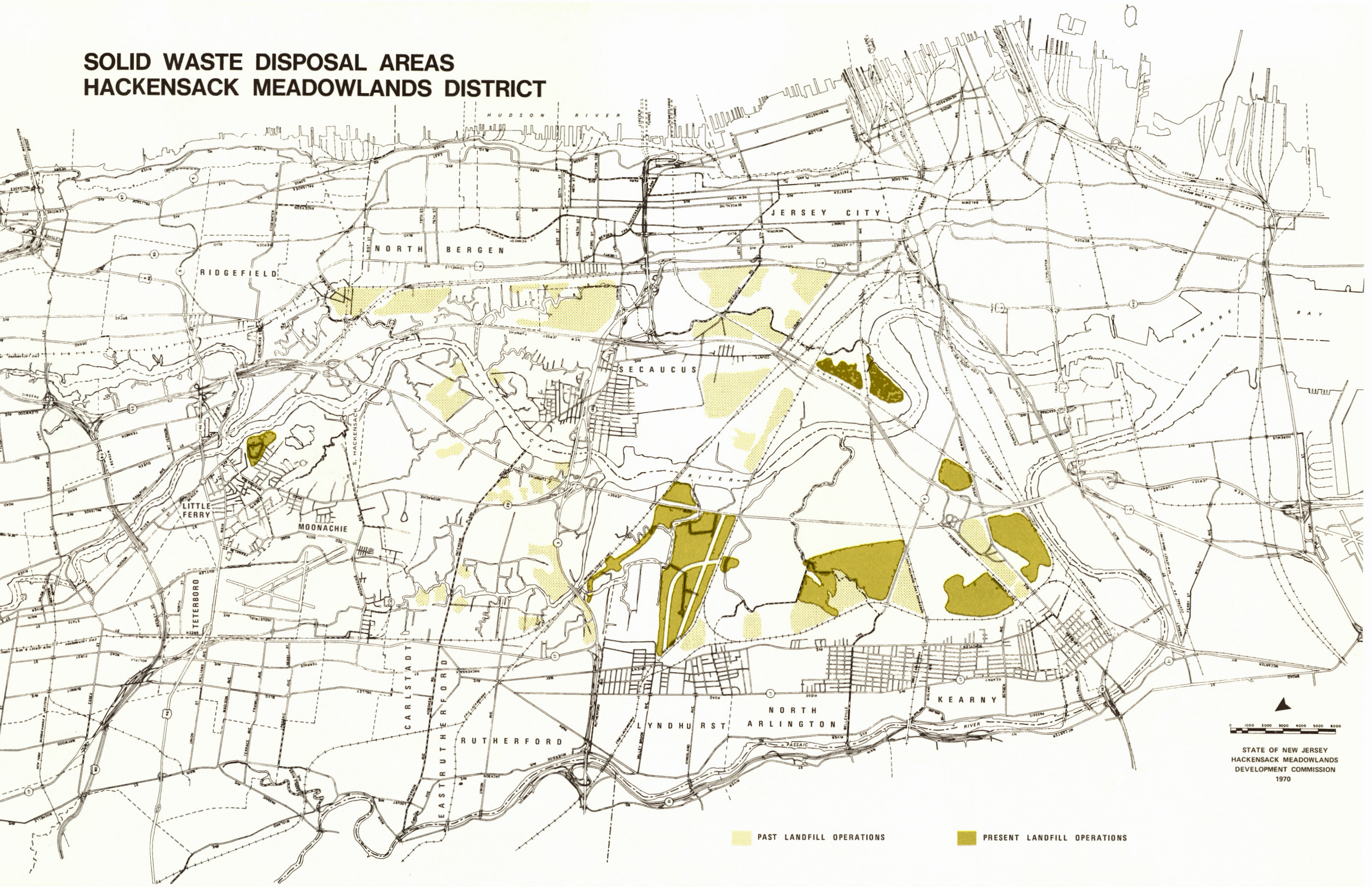
The most important of these functions is the disposal of solid waste — household garbage, industrial waste, demolition rubble, automobile bodies and other discardings of an urban society.



The infamous pig farms of the Meadowlands were closed by the State Health Department in the nineteen fifties. The open burning of rubbish has also been prohibited. Landfilling is the present method by which some 30,000 tons of waste from more than 100 municipalities are disposed of in the Meadowlands each week. Solid waste has significantly



SOLID WASTE DISPOSAL AREAS
HACKENSACK MEADOWLANDS DISTRICT



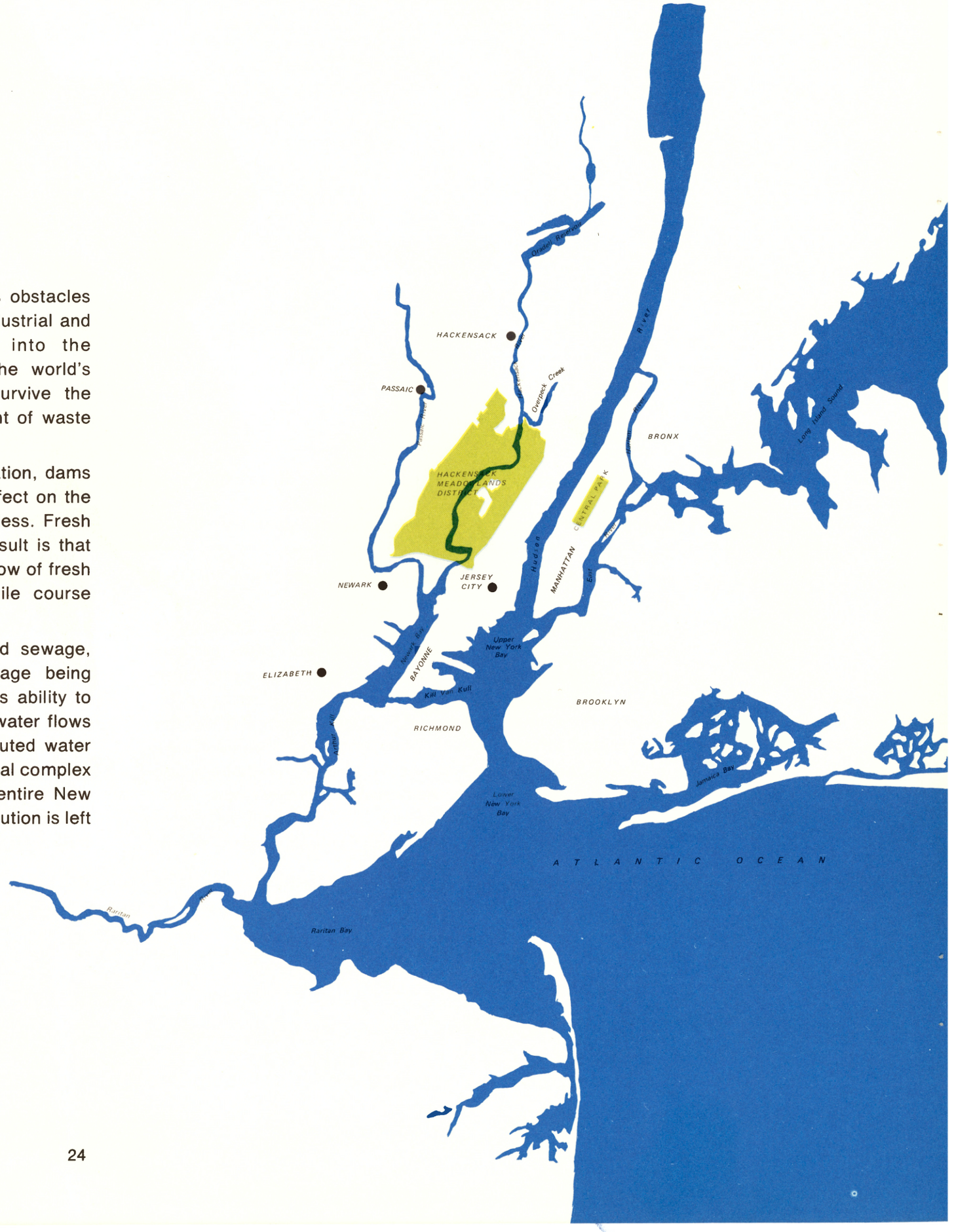
changed the lay of the land, complicating the possible use of the land it occupies and the land it is near. The map which summarizes a century of waste disposal is as much a determinant of future land use in the Meadowlands as the map of its geology which summarizes ages of momentous natural history.

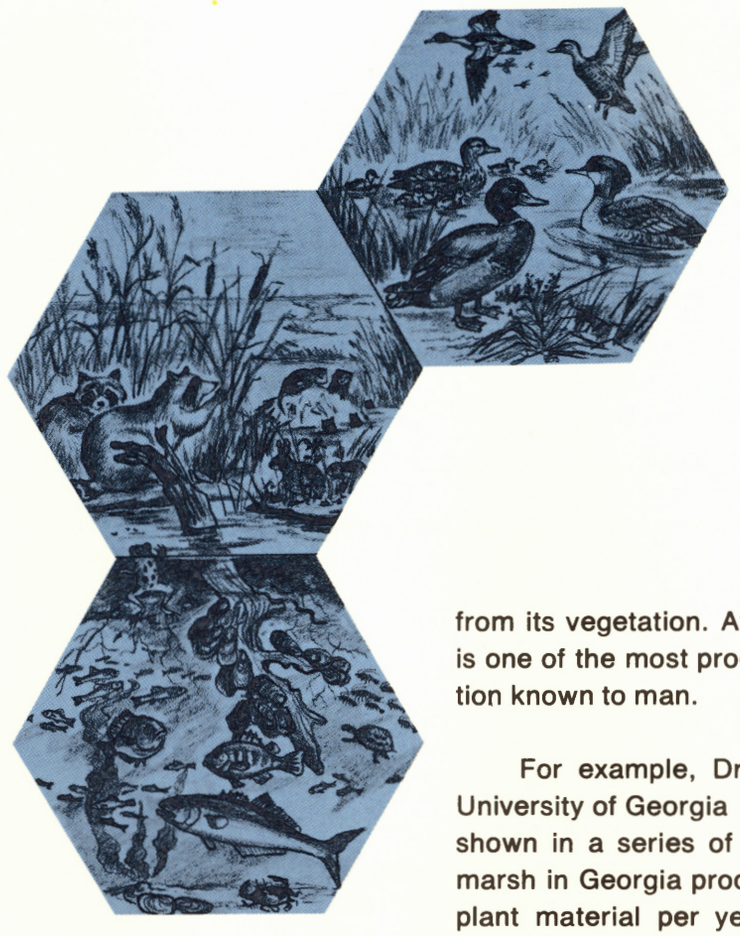
Summary of Natural History

A set of remarkable triumphs over nature's obstacles took place in the Hackensack Meadowlands. Industrial and urban America transformed this estuary into the transportation corridor and the backyard to the world's greatest city. Nature was hard pressed to survive the disruptions and to assimilate the growing amount of waste matter.

To provide the water for the growing population, dams were built upstream on the Hackensack. The effect on the estuary was inadvertent, but substantial nonetheless. Fresh water was diverted into these reservoirs. The result is that today, for much of the year, there is little or no flow of fresh water into the Hackensack River in its 22-mile course between the Oradell Dam and Newark Bay.

Increased use of water leads to increased sewage, domestic and industrial. The amount of sewage being discharged into the river increased as the river's ability to dilute and assimilate it decreased. The polluted water flows slowly into Newark Bay along with similarly polluted water from the Passaic River and from the heavy industrial complex around the Bay and the Kills, indeed from the entire New York Harbor system. The flushing of upstream pollution is left to the polluted tides.



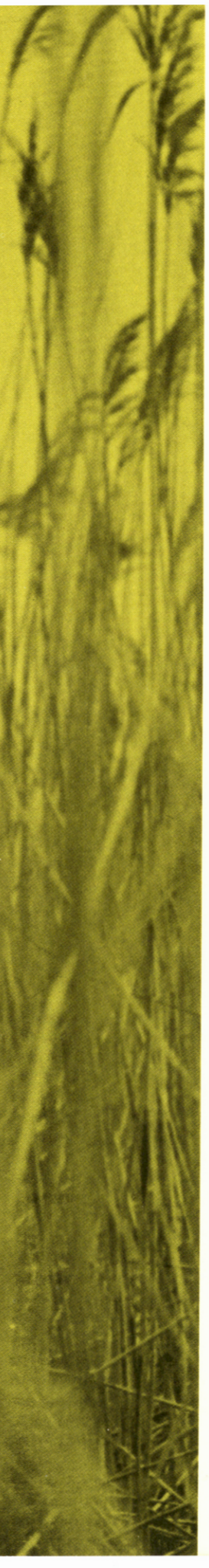


An inventory of the present biological components of the Hackensack marsh/estuary further tells of the cumulative effects of countless decisions.

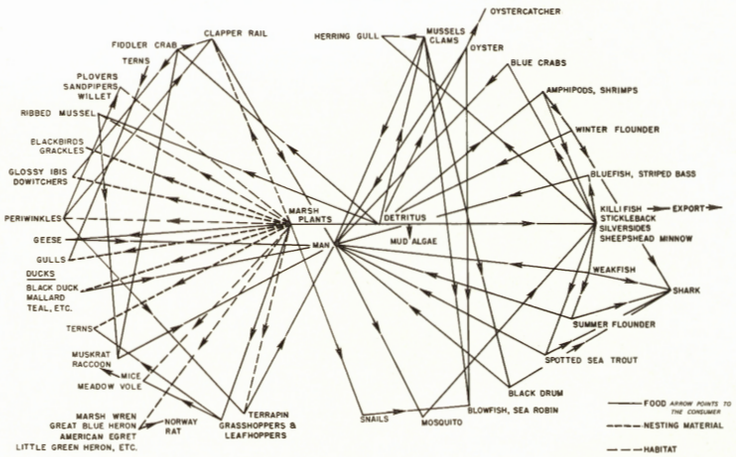
This story arises from a number of sources. Only a few partial studies of the flora and fauna of the Meadowlands were made before the Commission was formed. But much ecological data about the Hackensack Meadowlands had lain unnoticed in engineering reports, foundation studies, flood protection analyses, water supply data, mosquito commission reports, newspaper accounts, state geology records and even in paintings found in local museums. Other information has come from the riparian title issue which generated the need and the technology to find out about the flow of water over the land. Other bodies of information are lodged in the memories of people whose grandfathers had salt hay cutting rights and who hunt and trap there now.

A diagnosis of the condition of a marsh is easily drawn from its vegetation. At its healthiest, a marsh is one of the most productive forms of vegetation known to man.

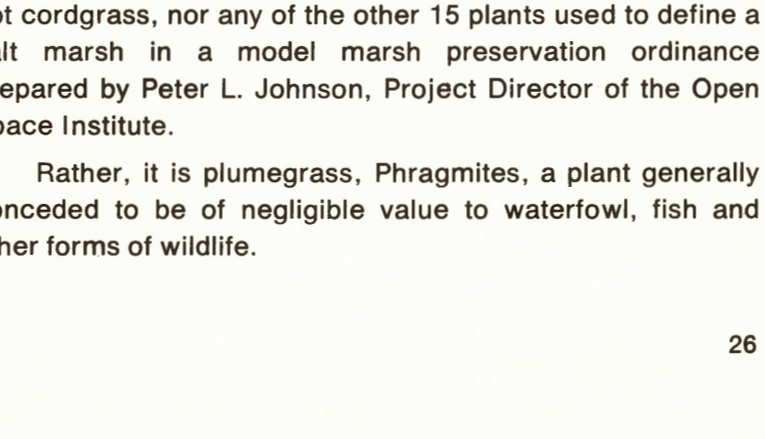
For example, Dr. Eugene Odum of the University of Georgia and his associates have shown in a series of reports that an acre of marsh in Georgia produces about nine tons of plant material per year. In comparison, the average yield of an acre of wheat is one and a half tons, including stems and leaves. These productive marshes are characterized by tall cord grass scientifically called *Spartina alterniflora.* They are among the most valuable salt marsh plants for waterfowl, fishes, shellfishes, crustaceans and other forms of wildlife. Almost half of the plant material produced by a healthy marsh is exported on the tide to sustain the life of the coastal zone, the source of some 90 percent of the total seafood harvest of the United States. About two thirds of the coastal fish species depend directly on estuaries, for spawning, for the harboring of young or for their food source.



THE ECOLOGY OF AN UNPOLLUTED MARSH/ESTUARY



THE ECOLOGY OF THE HACKENSACK MARSH/ESTUARY



The top diagram shows some of the species that inhabit a healthy marsh and contribute to the estuarine food web. In comparison, and in many ways summarizing the environmental effects of 200 years of human intervention, the lower diagram shows much of the damage that has been done to that web.

As well, recent vegetation studies of the Hackensack Meadowlands conducted for the Commission by the New Jersey Marine Sciences Consortium reveal a support system for nowhere near as elaborate a biological network as that of the classic marsh. This map depicts the major vegetation zones now present in the Hackensack Meadowlands District.

The dominant plant of the Hackensack Meadowlands is not cordgrass, nor any of the other 15 plants used to define a salt marsh in a model marsh preservation ordinance prepared by Peter L. Johnson, Project Director of the Open Space Institute.

Rather, it is plumegrass, Phragmites, a plant generally conceded to be of negligible value to waterfowl, fish and other forms of wildlife.

For example, those concerned with waterfowl production consider the plumegrass a weed. Ecologists see it as a symptom of disruption. The productivity of plumegrass in New Jersey is far less than that of Dr. Odum's *Spartina* marsh in Georgia.

From as early as 1954, the Hackensack Meadowlands has been rated by the United States Fish and Wildlife Service as having little natural value.

The present condition of the marsh is not surprising in view of the massive intervention in natural processes that we have briefly summarized here — the ditching, damming, diking, spraying to control mosquitos, polluting, road and rail building, dumping, filling, dredging and developing. The extent of this interference may be seen in the expanses of the plumegrass, in the extent of the land removed entirely from vegetation and in the crazy-quilt pattern of vegetation supported by old garbage dumps. What is surprising is that vestiges of the natural marsh and the life it sustains are still present.

This schematic, in diagram and in illustration, shows some of the species that remain.



ILLUSTRATED SCHEMATIC
THE HACKENSACK
MARSH/ESTUARY



EXISTING VEGETATION
HACKENSACK MEADOWLANDS DISTRICT



TRANSPORTATION
ROADBED
QUARRY
LANDFILL
CAT-TAIL
PHRAGMITES
MARSH
OPEN WATER
FIELD
FOREST

STATE OF NEW JERSEY
HACKENSACK MEADOWLANDS
DEVELOPMENT COMMISSION
1970

2400 0 2400 4800 FEET

APRIL 7, 1969







The vegetation study and the other data analyzed by the Commission reveal this inventory of survival:

a) a single large expanse of wetland with vestiges of Spartina marsh in the Saw Mill and Kingsland Creek area, east of the new Turnpike spur;

b) a discontinuous, narrow strip of Spartina grasses along the length of the river and on occasional creek beds;

c) an abundance of muskrats and an occasional mink, raccoon, rabbit or vole;

d) some highly tolerant killifish swimming the waterways;

e) an abundance of waterfowl and shore and field birds, found for the most part, but not entirely, in the Saw Mill Creek area. Irving Black of the Newark Museum reports some 205 species of birds sighted in this general area between 1961 and 1967;

f) grass shrimp, an occasional crab, some snails and perhaps an eel and turtle.

This is not a complete inventory. However, it highlights this marsh, showing great gaps in the normal estuarine food webs. Missing, for example, is the usual rich assortment of razor clams, mussels, oysters, periwinkles, barnacles, blue and green crabs and mud snails, whose niche in the food web is to turn particles of algae and the organic matter into food for fish, birds and other occupants of higher levels in the chain, including man.

Studies show that a lesser percentage of what is produced is exported and total production is less than in the classic marsh. Some of it must slip far enough into the sea to reach the fish who rely on this food chain. But the pollution in Newark Bay plugs the estuary and breaks the connection between the producers of the marsh and the consumers in the sea. With the exception of a single large expanse, much of the plant life has been cut off from the daily tidal contact. Dikes, embankments and fill have cut down the protection against flood damage that the marsh once gave to its neighbors. The four forms of marsh life that persist in any abundance — waterfowl, muskrat, killifish, plumegrass — have adapted better than other classic marsh forms to the special rigors of a fouled environment. In addition, a wholly new ecology, that of the urban estuary, has been formed. It is based on seeds carried by dump trucks, garbage, the Norway rat, the sea gull and the owl. By any standards available, the marsh is disrupted, dislocated, crippled. It lies in an urban estuary.







MARSH BASED COMMUNITY GARBAGE CYCLE

Two Interacting Eco-Systems in the Hackensack Marsh/Estuary

Implications for the Future

The history of natural and human activity tells us what the Meadowlands is and how it got that way. It tells us where it is tending and where it might be made to go. The Meadowlands was once a place of life, beauty, and pleasure. It has become the site for the inner workings and the tailings



From the collection of the *New York Historical Society*

of the urban life that envelops it. Two years ago, its future was plain. Acre after acre would be used until the entire expanse was covered with industrial buildings and waste material.

The logic that led to that conclusion seemed inexorable. If garbage was heaped in one place, why not put more garbage next to it? If the water was badly polluted, what harm would there be in further pollution? And, why spend millions to have clean water flowing through an industrial and waste area into a polluted bay? If the road led to a garbage dump, why not toss rubbish alongside the road? Why put



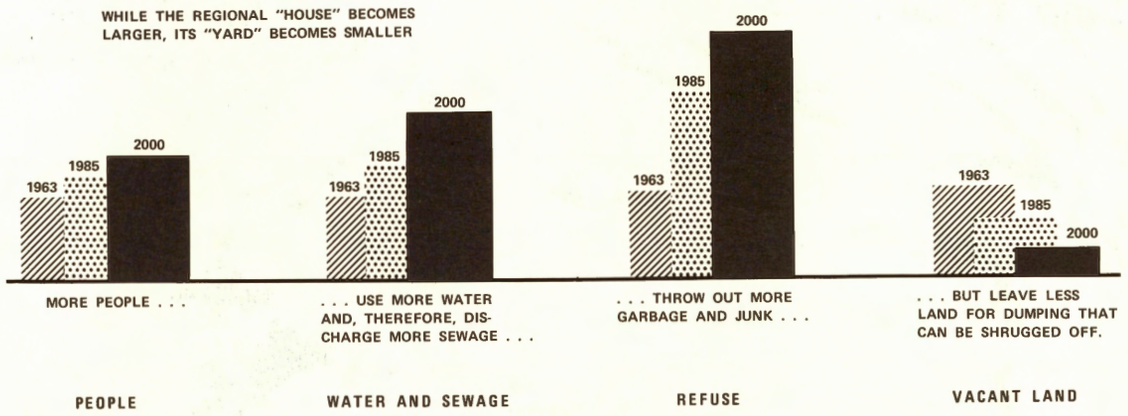
parks there; who would use them? If most of the wildlife had already left the area, and with it most of the hunters, trappers, fisherman, students and naturalists, what little value would be lost if the rest perished? In short, the logic concluded that this was not to be a place for people or for other living things.



The logic shows the power of past events and perceptions over the possibilities for shaping the future of this place. It also shows some of the consequences of a simple view of nature, uncomplicated by the newer wisdom about the fragile links between men and their biological lifelines.

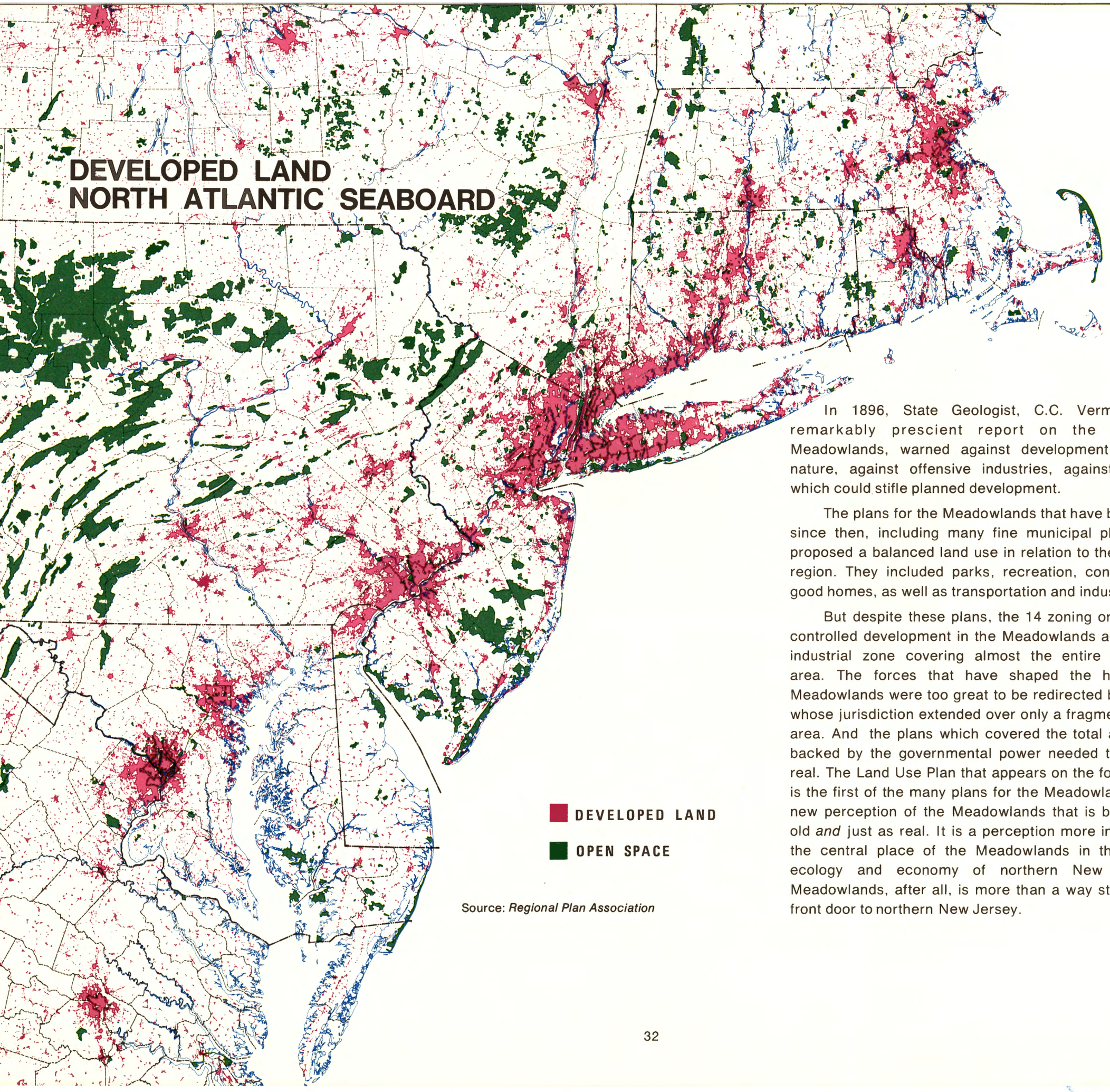
This conclusion for the Meadowlands is not the only one possible. Nor is it consistent with the needs of the region. The urban region surrounding the Meadowlands has been analyzed year after year by the many agencies responsible in one way or another for its health and well-being. The analyses vary, but the conclusions are generally the same — a terrible shortage of housing, an environmental crisis, a lack of useful open space, a disappearance of nature, overburdened transportation systems, an archaic tax structure forcing upon the attention of government officials and civic leaders an overriding concern for new tax ratables, a growing distance between work force and jobs and a need for new centers of activity to relieve the unmanageable congestion of the center cities.

All of these concerns are heightened when one turns from the inventory of existing conditions to the projections for the future that complete the regional analyses–a growing population with smaller families but a greater number of households. This will mean even more housing needed, even more open space, more jobs, more municipal services and more industries. Each person will need more water, use more power and consume more things, so there will be more sewage and more waste per person.



Source: Tri-State Transportation Commission, in *"Managing The Natural Environment."* March, 1970

One common denominator of these present and projected regional needs is land. Land is a fixed resource and it is imperative that it be used prudently. Of the available lands near the center of the region, the Hackensack Meadowlands is the largest tract. Even so, the available land in the Meadowlands is not sufficient to meet all of the region's needs. Each piece of land must be evaluated as to its particular characteristics and used in a way that makes the greatest contribution to the region.



Source: *Regional Plan Association*

In 1896, State Geologist, C.C. Vermeule, in his remarkably prescient report on the Hackensack Meadowlands, warned against development of a trifling nature, against offensive industries, against fringe uses which could stifle planned development.

The plans for the Meadowlands that have been prepared since then, including many fine municipal plans, have all proposed a balanced land use in relation to the needs of the region. They included parks, recreation, conservation and good homes, as well as transportation and industry.

But despite these plans, the 14 zoning ordinances that controlled development in the Meadowlands added up to an industrial zone covering almost the entire Meadowlands area. The forces that have shaped the history of the Meadowlands were too great to be redirected by any agency whose jurisdiction extended over only a fragment of the total area. And the plans which covered the total area were not backed by the governmental power needed to make them real. The Land Use Plan that appears on the following pages is the first of the many plans for the Meadowlands to offer a new perception of the Meadowlands that is better than the old *and* just as real. It is a perception more in keeping with the central place of the Meadowlands in the geography, ecology and economy of northern New Jersey. The Meadowlands, after all, is more than a way station; it is the front door to northern New Jersey.

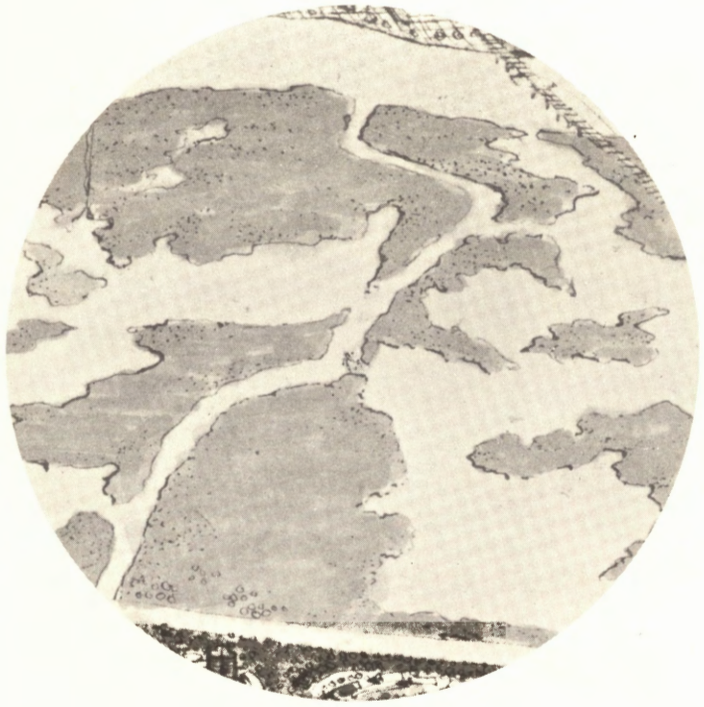






part 3

land use plan



MARSH CONSERVATION



INDUSTRY



PUBLIC AREAS :

- CONSERVATION & WILDLIFE RESERVE
- PARK & RECREATION AREAS
- WATER AREAS

BOUNDARIES :

- HACKENSACK MEADOWLANDS
- COUNTY
- MUNICIPAL

CIRCULATION SYSTEM :

- NEW JERSEY TURNPIKE
- LIMITED ACCESS HWY
- LAND SERVICE ROAD
- FREIGHT & TRANSIT
- FREIGHT
- FREIGHT & TRANSIT RESERVE

COMPREHENSIVE LAND USE PLAN

HACKENSACK MEADOWLANDS

STATE OF NEW JERSEY

HACKENSACK MEADOWLANDS DEVELOPMENT COMMISSION

DAN COLEMAN ASSOCIATES

PLANNING CONSULTANTS

1970

0 1000 2000 3000 4000 5000 6000

SCALE IN FEET



EMPLOYMENT AREAS :
- MANUFACTURING, RAIL & TRUCK TERMINALS
- DISTRIBUTION & WAREHOUSING AREAS
- RESEARCH PARK

BUSINESS DISTRICTS :
- BERRYS CREEK CENTER
- HOTEL-OFFICE-HIGHWAY COMMERCIAL DISTRICT
- COMMUNITY SHOPPING DISTRICT
- NEIGHBORHOOD SHOPPING DISTRICT

QUASI PUBLIC USES :
- CULTURAL CENTER
- TRANSPORTATION CENTER
- COMMERCIAL RECREATION AREAS
- SPECIAL USE AREAS

RESIDENTIAL AREAS :
- ISLAND RESIDENTIAL 25 UNITS/AC. Gross Density
- PARKSIDE RESIDENTIAL 40 UNITS/AC. Gross Density
- EXISTING RESIDENTIAL

EDUCATIONAL FACILITIES :
- HIGH SCHOOL SITE
- ELEMENTARY SCHOOL SITE

PUBLIC AREAS :
- CONSERVATION & WILDLIFE RESERVE
- PARK & RECREATION AREAS
- WATER AREAS

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COMPREHENSIVE LAND USE PLAN
HACKENSACK MEADOWLANDS
STATE OF NEW JERSEY
HACKENSACK MEADOWLANDS DEVELOPMENT COMMISSION

DAN COLEMAN ASSOCIATES
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1970

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SCALE IN FEET

A map and a rendering of the Land Use Plan for the Meadowlands are presented on the facing fold-out pages.

The pivotal part of the plan is a central, six square mile regional breathing space, recreational water park and marsh conservation-wildlife preserve running the length of the District.

Main Features of the Plan

- a water-oriented business, shopping, civic and cultural complex, built along parks and plazas, pedestrianways and the restored Berrys Creek Canal. The complex is planned to include educational and medical institutions, museums, art galleries, facilities for the performing arts, office buildings and a regional shopping area.

- new and improved commuter and rail transit facilities.

- Transportation Centers, where commuters can transfer to rail and bus facilities leading into New York, Newark and other destinations. The Transportation Centers also will include office buildings, making them destination points for a significant number of future New Jersey commuters.

- 1,000 acres of public park and 500 acres of commercial recreation space, such as marinas and golf courses, buffering existing uses and extending in fingers from the water areas to residential zones in the plan and to upland communities.

- complete residential communities directly related to major parks and recreation areas, with internal linear parks and pedestrianways connecting all school, recreation and commercial facilities within these planned neighborhoods.

- island residential clusters, built along the water and over looking the preserved marshlands with neighborhood shopping, elementary schools and parking facilities planned as part of each island development.

- the logical filling out and extension of existing development meeting the local needs of job opportunities and tax ratables.

- upgraded employment zones with increased office, business, hotel, entertainment and research uses.

- transformation of abandoned landfill sites into appropriate uses, mainly park and recreation, to remove blight and enhance the attractiveness of adjacent lands.







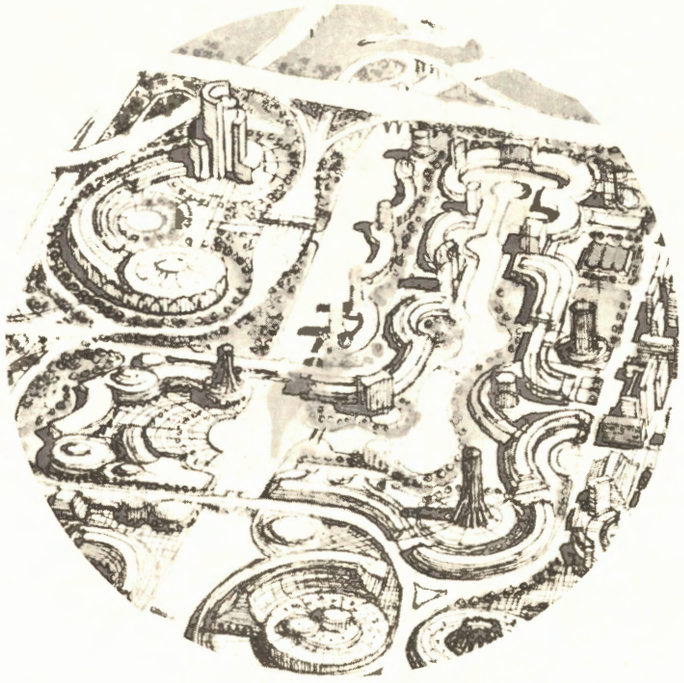
RESIDENTIAL ISLAND CLUSTERS



PARKSIDE RESIDENTIAL



TRANSPORTATION CENTER



BERRYS CREEK CENTER

Conservation — Parks and Recreation

A purpose of this plan is to restore life to the Meadowlands and the prerequisite is that the water be cleaned. With clean water and with a program of marsh management, the Kingsland-Sawmill Creek area stands a chance of becoming a valuable marsh. Urbanization has made this remnant of salt marsh all the more valuable in its scarcity. It will be a sizable area of marsh and wildlife, especially waterfowl, in highly developed northeastern New Jersey. This proposal of the plan is a true form of "marsh reclamation."

The preserve will be a valuable testing area for scientists, for learning and experimentation by students, a permanently preserved marsh for trappers and outdoorsmen and a haven and habitat for waterfowl and the myriad forms of marsh life.

The conservation portion of the plan also covers selected smaller areas and the ecologically vital buffers between land and water along the still natural river and creek edges. The conservation areas comprise the substantial part of the land that have not already been cut off from tidal action or otherwise disrupted as indicated on the vegetation map. It is contemplated that a nature observation, education and research center will be established in conjunction with this restoration effort.

The marsh retention will continue to provide some degree of flood protection now and even after a flood control system is installed. Since the planned installations will cut off tidal action only in exceptional storm conditions, the flood protection program is not incompatible with this conservation and restoration program.

In addition to the six square mile water park-conservation area, the plan proposes 1,000 acres of public park lands. The proposed parks are shown throughout the District extending as a series of green fingers from the central conservation and water park area to the residential areas of the surrounding communities.

The plan proposes still another 500 acres in commercial recreation uses. These areas could include golf courses, archery ranges and similar uses as well as marinas and other water-oriented activities.

The park and recreation lands were located in part to provide a compatible re-use for extensive garbage fill areas and for waterfront areas which have been built upon or filled. These areas have no possibilities for marsh conservation or restoration, but as park and recreation land they are suitable counterparts to the marsh and will enhance the enjoyment of it by providing vantage points.

A summary of the eventual acreages in marshland conservation, open water, park,commercial recreation and school-related park uses is as follows:

Marshland Conservation	1,500 acres
Open Water Areas	2,200 acres
Public Parks	1,000 acres
Commercial Recreation	500 acres
School-Related Parks	250 acres
	TOTAL 5,450 acres

Employment Areas

The Land Use Plan proposes these increases in employment or industrial use.

Manufacturing, Rail and Truck	800 acres
Distribution and Light Industrial	2,200 acres
Research-Office Parks	1,300 acres
	TOTAL 4,300 acres

The proposed employment uses, added to the existing employment in the District, will produce a range of job opportunities for some 200,000 persons.

The areas designated for manufacturing are planned only for the southern, southeastern, and northeastern limits of the District, on land which contains or lies directly adjacent to existing uses of similar character.

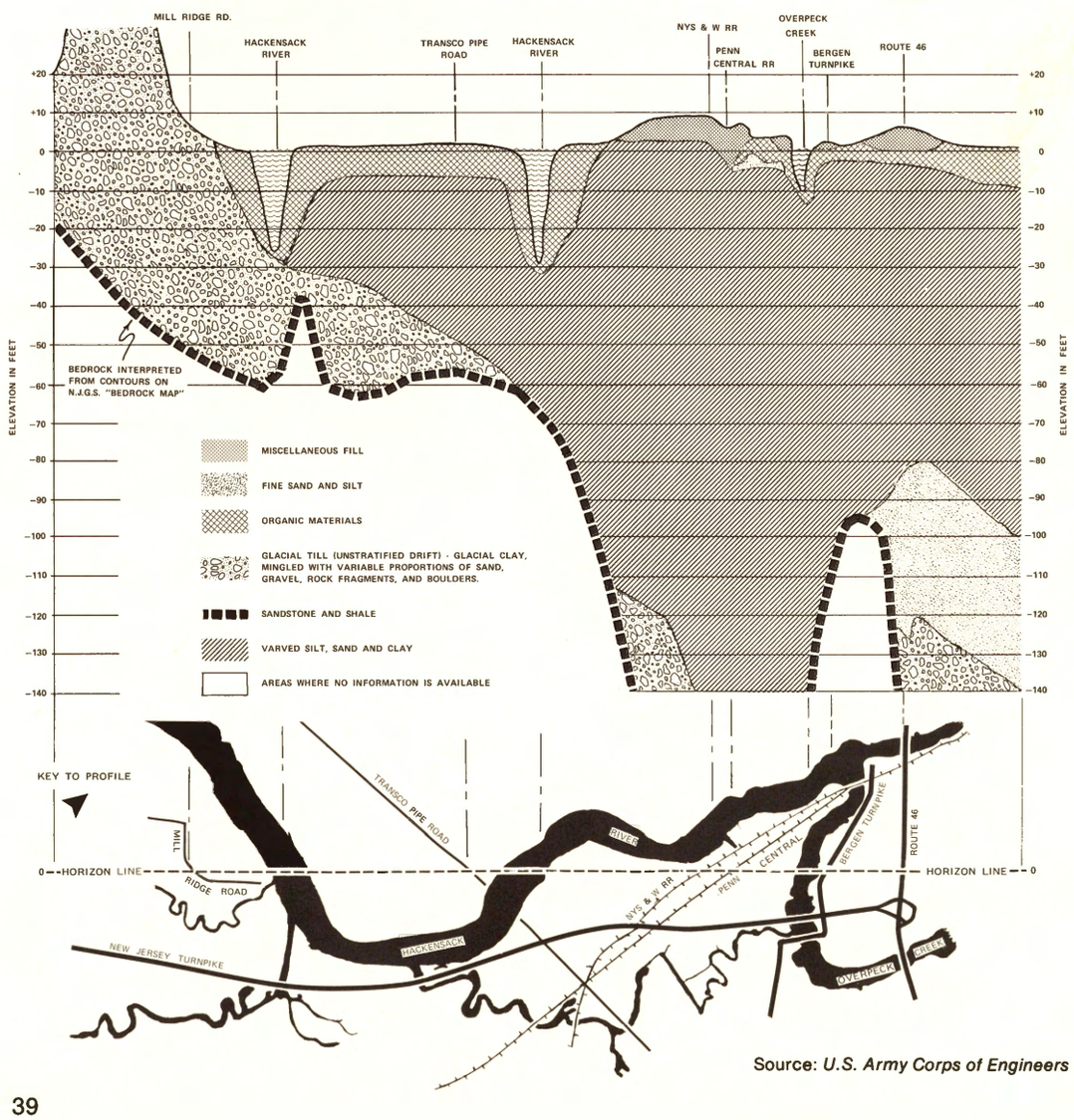
The plan proposes that rail and truck terminal facilities, open building material storage and heavier manufacturing uses will be permitted only in these areas.

The planned manufacturing operations, however, will not be permitted to pollute the air or the waters of the District. Under the performance controls of the Commission, they should not create other forms of nuisance.

The areas designated for distribution and light industry lie generally around the perimeter portion of the District, much of which is already fixed in this use. Most of these sections lie in those areas of the District which are underlain with deep deposits of compressible material and where heavy buildings would be at an economic disadvantage because of the high costs of piling. In general, however, relatively light buildings can be developed in these areas within the limits of reasonable economics. There is a ready market for this land use. Since these areas, when filled to the elevations proposed in Stage I, will generally be the least difficult to protect against flooding prior to the flood control program and will be compatible with the ultimate elevations of that program, their early development to meet the market demand is acceptable from a flood control point of view. All areas designated for distribution uses have excellent access to the Meadowlands' extensive highway and rail system.

These areas will be placed under appropriate development standards. For example, consideration will be given to roof designs to enhance views from surrounding hillsides. Landscaping will be required. Open storage areas will be discouraged and, in certain areas, prohibited.

PROFILE OF THE HACKENSACK MEADOWS



Source: *U.S. Army Corps of Engineers*

The areas designed for Research-Office Parks lie adjacent to the proposed special use areas and along the southwestern edge of the District.

Development within this land use category is foreseen as being of the low density, extensively landscaped, campus-type similar in character to the research parks near Princeton. Well designed and landscaped, they will complement the residential, educational and recreational complexes.

Much of the land area shown in this use on the plan has been totally or partially filled with solid waste. In a low density, campus-type development, landscaping and parking areas can be safely developed on the solid waste. Solid waste in the limited areas designated for buildings could be removed or buildings could be supported on piles driven through the solid waste, with appropriate protection against fire, gas build-up and differential settlement.

Residential

On the facing page is an architectural rendering of a residential island cluster.

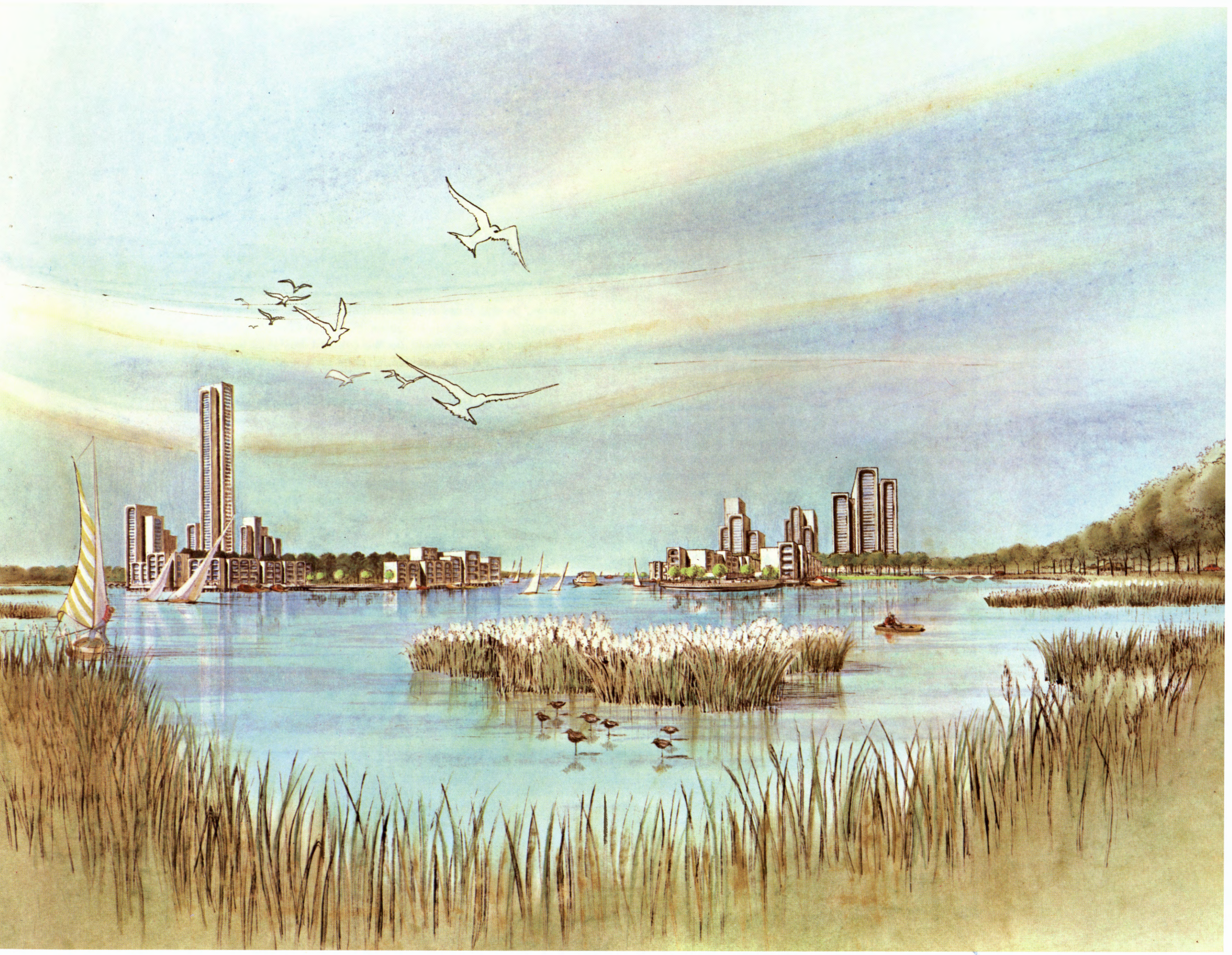
Such areas were chosen for residential use because of their potentially attractive water setting and their relative remoteness from the incompatible uses in other sections of the District. Moreover, bedrock is relatively close to the surface, an important consideration in the economics of construction.

All residential areas are either adjacent to the open water conservation area or to the major park and recreational elements in keeping with the basic premise of the plan that man and nature can and should exist in harmony.

In order to conserve land, reduce development costs, provide housing for all income levels and produce a community in keeping with the urban setting, all residential units will be in cluster groupings in forms of townhouse, or low rise, medium and high rise multi-family units. The proposed mix includes about one-third townhouses, one-third garden or medium rise apartments and one-third high rise apartments. The overall densities will average some 25 units per acre in the waterfront residential areas and 40 to 50 units per acre in the parkside residential areas. But the units will be clustered on a proportion of the total acreage, leaving the remainder in permanant open space.

Each island cluster is proposed to be designed and built as a whole, containing approximately 2,500 residential units, a population of from 5,000 to 7,000 persons, and neighborhood shopping, recreation, parking and service centers. The major structures can be constructed on piles over water; fill will be required only for schools, roadways, parks, shops and certain parking facilities.

The residential areas shown on the Land Use Plan would result in the ultimate development of 70,000 residential units and a new population of approximately 185,000.



Business Districts

Berrys Creek Center

The main business area is planned on 50 acres within the Berrys Creek Center, which would also contain 100 acres of high density residential use and 50 acres in offices.

The Berrys Creek Center would be developed along Berrys Creek Canal. As shown on the facing page, it should be modern and attractive, embodying the most farsighted architectural concepts. The area will contain a series of plazas of varying size, around and through which the life of the community would flow. Built along the water and next to a Transportation Center, it will be accessible by all forms of transportation, including water transit. This center should have all the charm of Venice's San Marco Plaza. With its distinctive design, it will be a focal point in the changed perception of the Meadowlands.

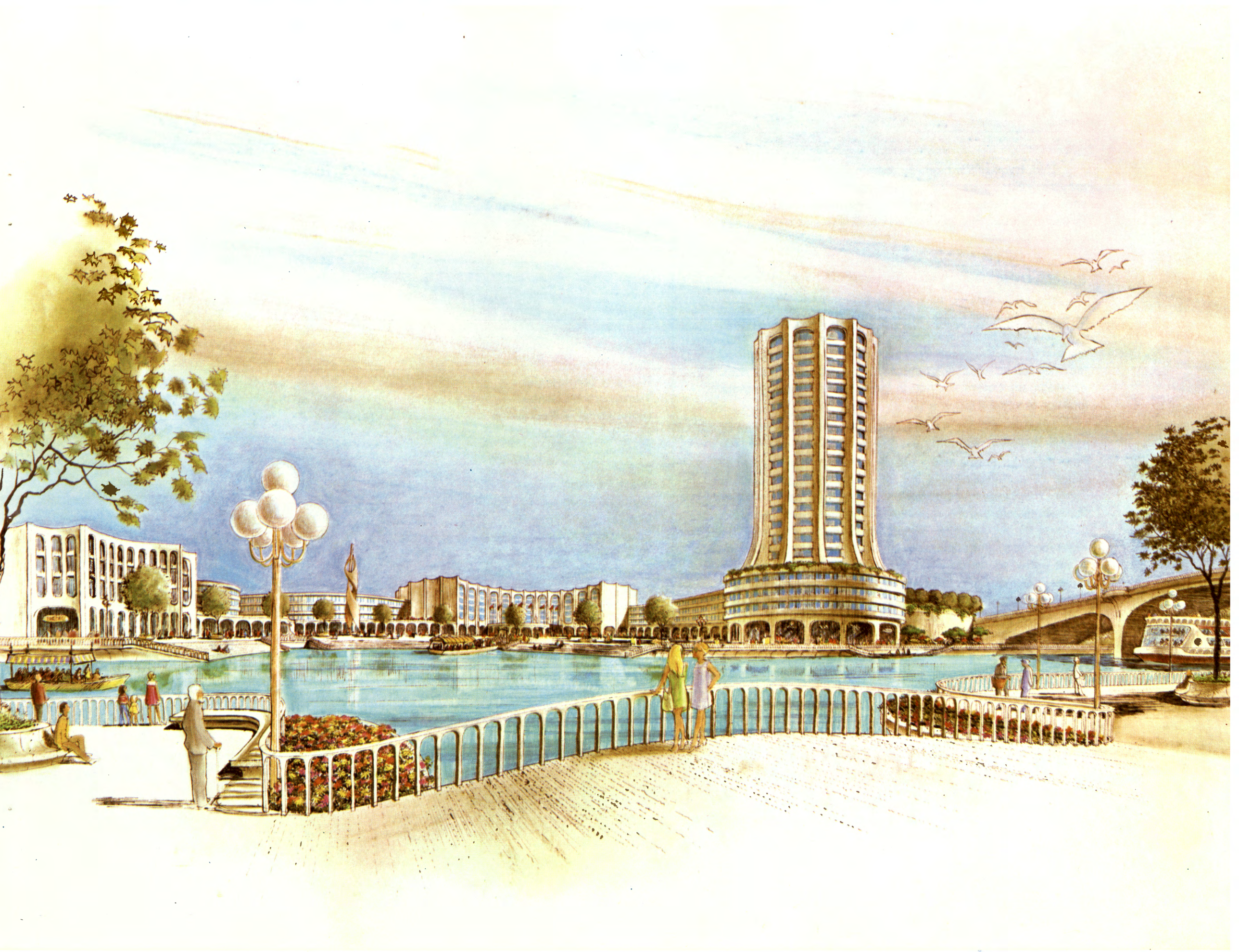
Other Business Districts

The population proposed for the Meadowlands also will be served by 24 five-acre neighborhood shopping centers and three 15-acre community centers. Each neighborhood center will be located adjacent to its supporting population of 5,000 to 10,000 persons. Groupings of neighborhoods will be served by the three new community centers, each with a supporting population of about 50,000 persons. A fourth community center would be the present business area of Secaucus. The new residential units proposed in the plan should significantly strenghten the Secaucus business area.

The Land Use Plan also proposes 500 acres in hotel-office-highway commerical use, including:

- 200 acres of hotel, motel, and convention space with a total of 10,000 rooms;
- 200 acres of office use with a total of ten million square feet of office space. Five million square feet of additional office space is proposed in the Transportation Centers and five million square feet more in the Berrys Creek Center. The addition of these offices would result in twenty million square feet of office space in the Meadowlands;
- 100 acres of commercial uses such as display areas, showrooms and automobile dealerships.

The offices would serve local and nearby industrial development and provide headquarters facilities for those who want to be located in a smaller center of activity near the heart of the metropolitan area.



This hotel-office-highway commercial element would provide restaurants, recreation facilities, theaters and showrooms, lighted at night, to create interest and activity throughout the entire day in these business and visitor areas of the Meadowlands.

Special Uses

The Meadowlands District is suited to special land uses of a regional importance, such as sports stadiums, major education and health institutions, cultural facilities and other large-scale development of that nature. Some of these facilities will be needed eventually to serve the Meadowlands development. Others will find in the Meadowlands a suitable location to serve a larger area.

Although it is not possible to anticipate the exact type of special use that will come along in the future, the Land Use Plan reserves areas which are most suitable for a general range of activities. For example, a site near the Lincoln Tunnel has been reserved as a special use area. A tract in the southwestern portion of the District has been set aside because its accessibility to major highways and to existing and proposed rail transit makes it suited to a range of large-scale activities which generate large numbers of visitors. Similarly, the special use area near Route 3 will accommodate a range of major uses that are compatible with the neighboring land uses in that central part of the District.

By designating these areas for special uses, the Land Use Plan can accommodate desirable regional activities that cannot be specifically foreseen.

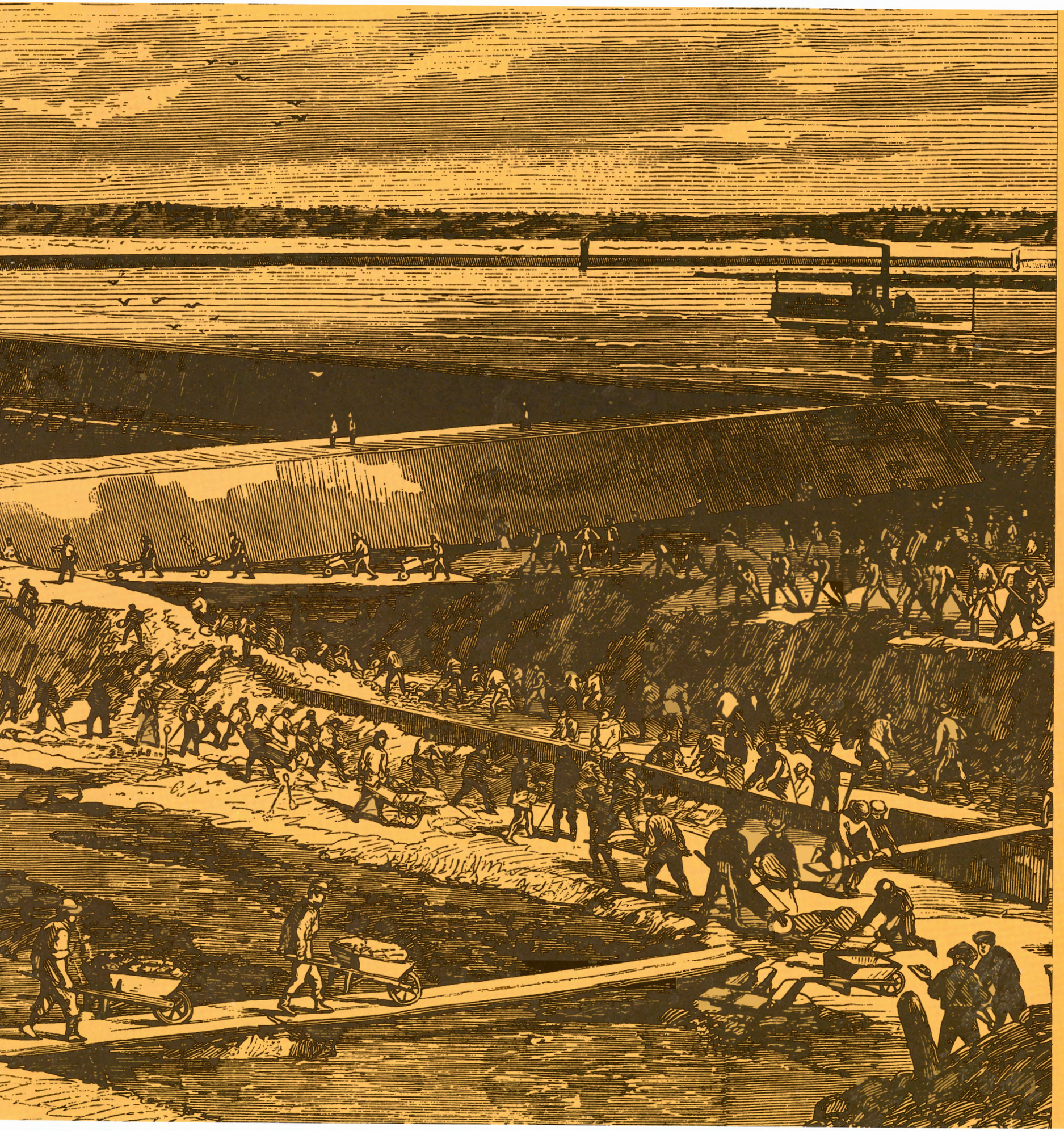
LAND USE ALLOCATION

Hackensack Meadowlands Comprehensive Land Use Plan

	Existing Uses	Proposed Future Uses	Total Acres
Distribution	1,800	2,200	4,000
Manufacturing	700	800	1,500
Research	100 **	1,300	1,400
Hotel-Office-Highway Commercial	190 **	310	500
Transportation Center	20 **	130	150
Commercial — Recreation	50 **	450	500
Business Districts	—	265	265
Cultural Center	—	50	50
Special Use	—	700	700
Island Residential	—	650 *	650 *
Parkside Residential	—	750 *	750 *
Low Density Residential	235	—	235
Educational Facilities or Schools	—	250	250
Airport (Teterboro)	650	100	750
Conservation	—	1,500	1,500
Park	—	1,000	1,000
Water	1,400	800	2,200
Rail	975	25	1,000
Local Roads	70	130	200
Turnpike & Limited Access Roads	950	1,050	2,000
Totals	7,140	12,460	19,600

*Net developable area

**Area to be redeveloped in higher use



part 4

implementation

Reclamation and Flood Control

The U.S. Army Corps of Engineers is considering several schemes for reclamation and flood control in the lower reaches of the Hackensack River basin. The Land Use Plan for the Hackensack Meadowlands is based on a modified version of the scheme that features a tidal barrier across the Hackensack River with a sector gate and a series of spillway bays. The sector gate would be open to permit normal tidal action and water traffic on the Hackensack River except during periods of exceptional tidal surges in Newark Bay. During such periods the sector gate would be closed and any storm waters draining from the lower portion of the watershed into the Hackensack River would be pumped downstream over the closed barrier.

A pumping plant with a capacity of several thousand cubic feet per second would be installed upstream of the sector gate to handle the anticipated storm water flow. The upstream channel of the Hackensack River and the permanent low-lying marsh conservation lands will act as a ponding area. The combination of this ponding area and the proposed pumps would keep the upstream water level below elevation five feet above mean sea level.

Since the elevation of the Meadowlands at the ends of the proposed barrier is well below the height of anticipated tidal surges, levees will be necessary to connect the barrier to the high ground along the western and eastern sides of the District.

The construction of these levees will necessitate three local pumping stations to drain the areas that will be cut off from the Hackensack River by the levees.

This scheme would result in the most desirable and the least disruptive development of the Meadowlands while, at the same time, would assure positive protection to low-lying areas in the river basin.

Under this scheme, all land areas proposed for development would be filled to a final elevation after settlement of six feet above mean sea level. This proposed minimum elevation of six feet is based on the fact that the nominal ground water elevation is approximately three feet above mean sea level. Filled surface elevations would rise in an easterly and westerly direction from the river for drainage purposes. Elevations at the perimeters will be approximately ten feet above mean sea level after settlement.

The timing of the flood control installations is an important factor in the staging of the plan. Under reasonably conservative assumptions regarding tidal surges and river floods, the high water anticipated in the Meadowlands under present conditions is approximately nine feet. Therefore, lands developed close to the perimeter of the District in anticipation of the flood control scheme would be reasonably safe from flooding until the tidal barrier is installed.

The plan proposes that development can proceed in the Meadowlands before the tidal barrier is installed, provided that the land is filled to a height, which, after settlement, is in accord with the ultimate surface drainage recommendations of the flood control scheme.

Where the surface drainage recommendations call for final elevations below nine feet, interim development should be enclosed with temporary protecting levees with top elevations of at least ten feet above mean sea level.

In constructing the temporary protecting levees, upstream drainage must not be blocked. Within the temporary levee system, local pumps or ponding areas should be provided. After the sector gate is installed, the temporary levees, pumps and ponding areas protecting the individual parcels can be removed.

As more land areas in the Meadowlands are filled and the storage potential is diminished, water will rise to higher elevations under similar storm conditions. Therefore, specifications must be prepared for the sector gate, main pumping installation, downstream levees and local pumps and these facilities should be installed at the earliest possible time. Only with such a positive plan of action can the development of the Meadowlands proceed in an orderly manner.

All flood control works should be designed and installed in cooperation with the U.S. Army Corps of Engineers and in a manner which will allow for orderly expansion of flood control works both upstream and downstream from the District.

Soil and Foundation Conditions

Poor soil conditions have historically been regarded as a deterrent to the development of the Meadowlands. But similarly difficult soil conditions have been overcome successfully in other areas of the country. The soil problems of the Meadowlands are neither unique nor especially difficult to solve, but the solutions may be time consuming and expensive. Consideration of the geological problems connected with development have been taken into account in the preparation of the Land Use Plan.

Soil types and thickness vary throughout the Meadowlands, but they may be grouped into three principal horizons. The upper level is a layer of meadow mat, peat and organic silt. Beneath this layer, extending to depths of 15 to 100 feet or more, is the old lake bed deposit of varved clay. The upper portion of this layer is drier, more compact and relatively strong compared to the lower part that was never drained. Beneath the varved clay is bedrock or glacial till, the third principal horizon.

The surface layer of organic silt is nearly worthless as foundation material and it will consolidate substantially under fill loads. The varved clay has moderate strength.

Almost all structures developed under the Land Use Plan would be sited on filled ground. The plan assumes three types of foundations: shallow, moderately deep and deep. The selection depends upon three principal variables: project economics, the settlement pattern at the specific site and building characteristics in terms of weight, shape, stiffness, function and useful life.

The eastern and western borders of the Meadowlands are generally underlain with the deepest deposits of compressible material. For the most part, employment uses are proposed for these areas. Light buildings are the most suitable and buildings requiring piles to bedrock would be at an economic disadvantage.

The central section of the Meadowlands is generally underlain with shallower deposits of compressible material with bedrock at varying depths from 15 to 100 feet.

High rise buildings are planned in the central portion of the District for land uses which would generate high density. Buildings in excess of five stories are seen as being built upon pile foundations driven to bedrock. Buildings of less than five stories may be built on shorter piles.

Transportation

The proximity of the Meadowlands to New York City and to Newark makes it a primary transportation corridor, both for inter-city and local travel. In addition, the Meadowlands area serves an important warehousing function for many types of goods destined to and from east coast locations. The plan for the development of the Meadowlands gives consideration to the present and future transportation needs, to provide for the demands of the surrounding developed areas as well as to enhance the proposals made for the Meadowlands itself.

Many forms of transportation exist within the Meadowlands, shipping on the Hackensack River, air transport at Teterboro Airport, numerous railroad lines for both freight and passengers and many highways of national, regional and local importance.



Water Transport

Below the proposed tidal barrier, the Hackensack River contains a 30-foot deep navigation channel and a 25-foot turning basin. Above the proposed barriers, traffic consists primarily of barges to serve local industrial uses. Neither type of shipping would be disrupted by the proposals in the plan. In addition, marinas and water-oriented commercial recreation areas are proposed along the river in anticipation of extensive use by pleasure craft.

The housing elements of the plan are, for the most part, water oriented. The plan provides that one mode of local transit among these areas, the main shopping and commercial complex and the Transportation Centers will be by small boats which would be equivalent to transit buses. These "water boats" would be somewhat similar to the "vaporetto" used in Venice and the small sight-seeing boats used around New York and other waterfront cities. Each residential complex would have a "bus stop" at the water, from which residents could ride to the other residential and shopping areas. Service would be frequent to encourage patronage and to reduce the dependence on automobile transportation.

Air Transport

Teterboro Airport is the primary New York metropolitan area field for general aviation. This facility is now being expanded and will become more important with the growth of general aviation. In recognition of the value of this facility to the entire area, the plan proposes an adjacent Transportation Center and improved highway access.

Highways

The Meadowlands contains a major highway network serving traffic to and from New York City. Major highways within and adjacent to the Meadowlands are the New Jersey Turnpike (Interstate Route 95), State Routes 3 and 20,

serving the Lincoln Tunnel from the west, U.S. Route 46 along the northern boundary, the Pulaski Skyway and proposed Interstate Route 280 near the southern boundary, Tonnelle Avenue (U.S. Route 1 and 9) along the eastern boundary and State Route 17 on the western boundary.

Other roads of importance include Moonachie Avenue, Washington Avenue-Moonachie Road and Paterson Plank Road in the north, and Belleville Turnpike and Harrison Avenue-Newark Turnpike in the south.

The latest traffic volume studies prepared by the New Jersey Department of Transportation show all of these routes to be at or above practical capacity and congested during peak periods.

Provision has been made in the Meadowlands Land Use Plan for expanding the existing highways serving the surrounding areas and for additional highways to serve the increased traffic to be generated by the Meadowlands development itself.

An important provision is the upgrading of the Route 20 – Paterson Plank Road loop to expressway standards, and, as soon as practical, to full, limited access status. This loop road would allow New York bound traffic coming from the northwest to bypass the main business area near the Route 3 – Route 17 interchange.

The plan also calls for the upgrading of the Newark and Belleville Turnpikes to expressway standards with a minimum number of access points, the extension of the Paterson Plank Road across the Hackensack River and the extension of Hudson Street from Little Ferry into the District as a major land service road.

Many smaller, land service roads are shown to provide proper circulation within the proposed development.

The plan calls for the staged development of the proposed limited access routes. Certain of these will be reserved initially as park area. Then, as the development of the Meadowlands proceeds and traffic requires, these facilities would be upgraded to full limited access status. The plan has been correlated with previous State studies and proposed routes, including Interstate Route 280, the extension of Route 17 south of its existing Route 3 junction. the upgrading of Route 7 and the limited access route between Routes 3 and 7 parallel to U.S. Route 1 and 9. In final engineering, the precise alignments and interchanges would no doubt vary to some extent from the more general pattern shown in the plan.

Freight and Passenger Railroads

The Hackensack Meadowlands District is crossed by three major railroads, Penn-Central, Erie-Lackawanna and New York, Susquehanna and Western. Extensive freight yards, serving the entire New York metropolitan area, are maintained in the Meadowlands area. There is potential for rail-oriented industry within the District. The plan proposes both the retention of existing facilities and the expansion of rail-oriented industries in appropriate locations.

The Erie-Lackawanna and Penn-Central Railroads operate daily commuter service to New York City. In addition, the Port Authority Trans-Hudson (PATH) passenger rail line across the south end of the Meadowlands is connected to lower and midtown Manhattan by tunnels.

The plan proposes the establishment of a rail transit system, using existing rail lines where necessary. To the extent that the terminal and tunnel facilities permit, the plan proposes the interconnection of the Penn-Central main line with the Erie-Lackawanna Railroad to allow direct service

into Manhattan's Penn Station. With the same qualifications, connections should be made to the Port Authority Trans Hudson (PATH) in the southwestern corner of the District. This long range proposal would be dependent upon tunnel reconstruction to accommodate a standard transit vehicle. The possibility of connecting these facilities to a newly proposed tunnel under the Hudson River has been considered. This tunnel crossing is not yet a firm proposal; however, it would beneficially affect the plan and the reserved rail corridors in the plan would provide the connections to the Meadowlands transit system and Transportation Centers and to other parts of New Jersey.

In order to intercept eastbound automobile traffic and reduce congestion on traffic arteries leading into New York City, three Transportation Centers have been shown on the western side of the Meadowlands, at Teterboro Airport, at Route 3 and at the Penn- Central — PATH lines on the southern border of the District. One additional center is proposed on the eastern boundary. This feature of the plan would allow thousands of commuters to park their automobiles at these centers and switch to rail or bus transit for travel to New York City or other locations in New Jersey. The Transportation Centers also will contain some 5,000,000 square feet of office space and become destinations, as well as transfer points, for commuters.

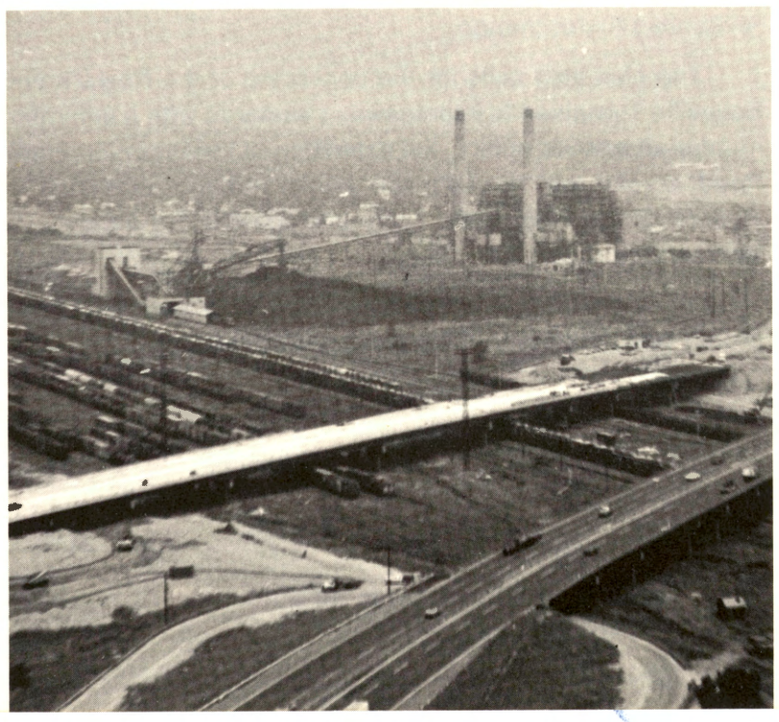
The Meadowlands water oriented residential areas would be accessible by water bus to the central Route 3 Transportation Center, so commuters could get to rail or bus transit without the use of automobiles. Of course, road and parking facilities will be available for the island residential clusters in the plan.

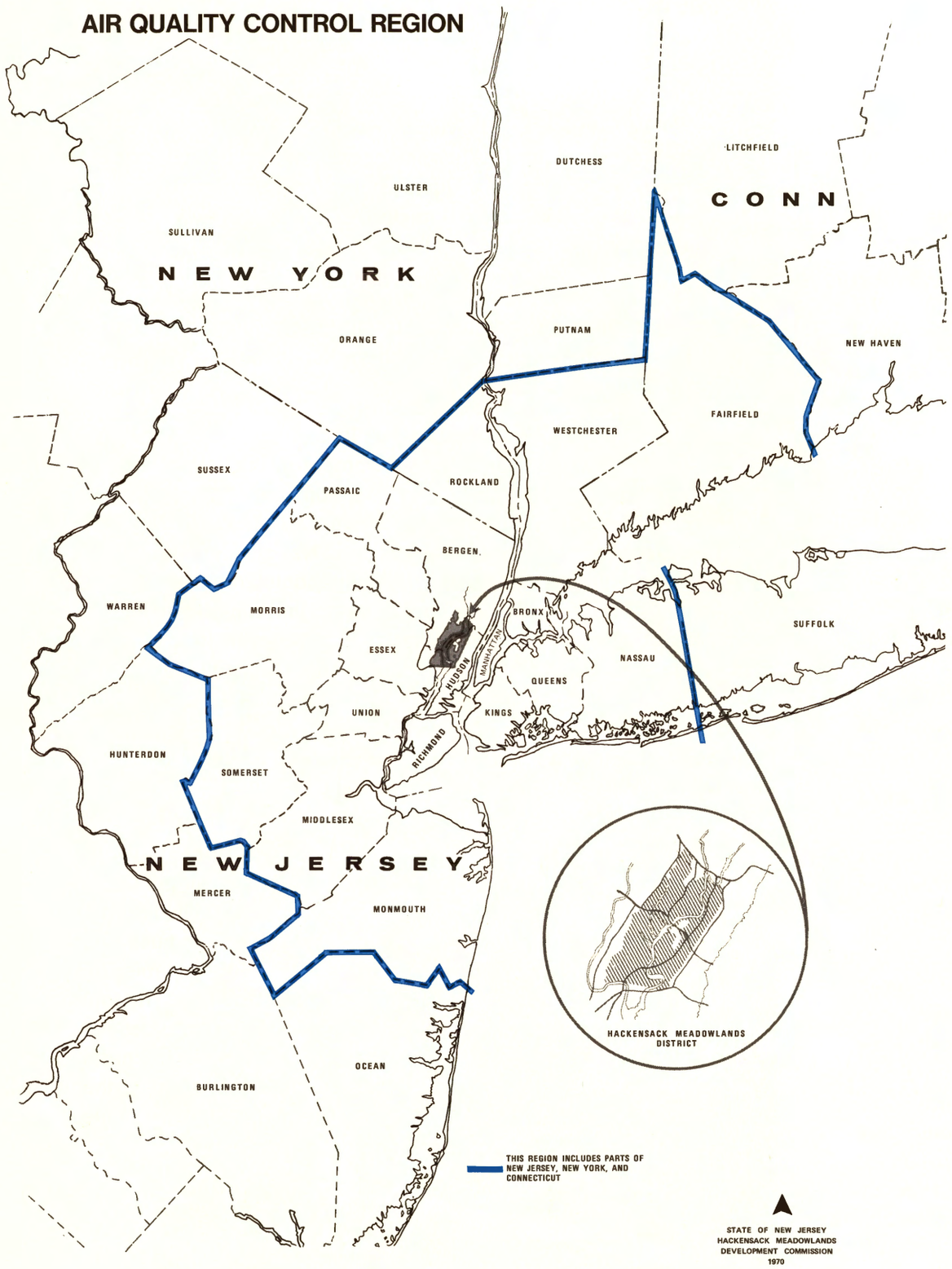
To provide full flexibility for the system and to permit future development of a north-south transit system into Newark, the plan proposes extending the Erie Railroad's New Jersey and New York Branch south to connect with Erie's Newark Industrial Line and then the PATH system. This connection may initially have to operate as a bus route until traffic becomes heavy enough to justify rail operation. It could also be used to provide service to the proposed special use area in the southwest by means of a station in that locale.



Air Quality

The Hackensack Meadowlands District is near the center of the New Jersey-New York-Connecticut Interstate Air Quality Control Region. The boundaries of the region and geographical placement of the District can be seen in the figure opposite. Because of its location, the Meadowlands District has relatively high air pollution levels despite its large proportion of open space. Also because of its location, the improvement of its air quality depends largely on general improvements in air quality of the entire region.





Specific data about all air pollution sources within the District are not yet available. But approximations can be made from available data for Bergen and Hudson Counties. By extrapolation, it may be estimated that the Hackensack Meadowlands District and its immediate environs now add to the air approximately 163 tons of sulfur dioxide, 300 tons of carbon monoxide and 8 tons of particulate matter per day. As seen in Table A, *"Mean Day Emissions,"* this amounts to about 2.2% by weight of the pollution in the New Jersey-New York-Connecticut Interstate Air Quality Control Region, and about 25% of the sulfur dioxide, 15% of the carbon monoxide and 11% of the particulate matter produced within Bergen and Hudson Counties.

TABLE A
MEAN DAY EMISSIONS

Area	Approximate Daily Emissions (Tons/Day)			
	Sulfur Dioxide	Particulate Matter	Carbon Monoxide	Total 3-Pollutants
New Jersey-New York-Connecticut Interstate Air Quality Control Region	4,892	515	15,577	20,984
New Jersey Total (within region)	2,063	202	6,955	9,220
Bergen County Total	246	30	1,366	1,642
Hudson County Total	404	43	645	1,092
Meadowlands District Area	163	8	300	471
% Contribution-Meadowlands Region	3.3	1.6	1.9	2.2

Source: Consultant Report, 1968, Department of Health, Education and Welfare New Jersey-New York-Connecticut Air Quality Control Region

TABLE B
AIR POLLUTION SOURCES
IN BERGEN AND HUDSON COUNTIES

Source	Approximate Contribution (By Weight — %)		
	Sulfur Dioxide	Particulate Matter	Carbon Monoxide
Commercial and Government	18	7	—
Industry and Industrial Processes	22	40	—
Refuse Disposal	—	5	—
Residential	10	15	—
Power Plants	50	20	—
Transportation (Mainly Automobiles)	—	13	99

— = Negligible

Source: Consultant Report, 1968, Department of Health, Education and Welfare New Jersey-New York-Connecticut Air Quality Control Region

Table B, *"Air Pollution Sources in Bergen and Hudson Counties,"* shows that automobiles produce almost all of the carbon monoxide and that industry and power plants produce about 60% of the particulate matter and 70% of the sulfur dioxide.

The *sulfur dioxide* condition is being improved by the strict standards of the State Department of Environmental Protection, limiting the sulfur content of fuels. For example, the transition to low sulfur fuel by the Public Service Generating Station in Ridgefield will substantially improve the ambient air quality in the Meadowlands.

Regarding *particulate matter,* the State enforces a strict set of standards over this type of emission as well.

The introduction of automobile pollution control devices and anticipated improvements in automobile fuels and combustion processes are the necessary first steps in reducing *carbon monoxide* pollution.

Three basic weather conditions, wind speed, wind direction and turbulence,affect air quality. The wind diffuses pollutants, higher wind speeds reduce local air pollution. The Meadowlands District lies within a triangle formed by three weather stations: the U. S. Weather Station at Newark Airport, The U. S. Weather Station in Central Park in New York City and the Weather Station at Teterboro Airport.

The average of the annual mean hourly wind speeds at these three stations is about ten miles per hour. This value, which is a reasonable approximation of average wind speed in the District, exceeds the median of U.S. Weather Bureau Stations in the continental United States. The local effects which might be produced by the small valley within which the District lies have not yet been quantified.

The concentration of air pollutants varies with wind direction. Within the Meadowlands, the prevailing wind direction is from the southwest.

Turbulence of the vertical movement of air also helps disperse pollution. When temperature inversions occur, usually accompanied by light winds and high pressure areas, the air is stable; vertical mixing is limited and consequent diffusion of pollutants is restricted.

The frequency of ground-based inversions in the region is relatively low compared to other areas of the United States. High level inversions, on the other hand, are frequent over the metropolitan area.

Because air pollution figures importantly in plans for the District and because any development in the Meadowlands will affect the air quality of the region, the Commission, in cooperation with the New Jersey Department of Environmental Protection and the National Air Pollution Control Administration, is working on a computer model of air quality in the region directly related to the Land Use Plan for the Meadowlands.

This project will provide the detailed data, now lacking, about emissions, current and projected, climatology, meteorology and micrometeorology. More importantly, the model will provide for the first time a thorough methodology for relating land use to pollution.

In this way, the Meadowlands project will be contributing to the nationwide campaign against air pollution. At present, there is no practical method of establishing the relationship among the many factors that affect land use and the many factors that affect air quality. The Commission believes that land use is a key to air pollution control. The tool it is helping to develop here can be used to guide the development of the Meadowlands and in plans for other parts of the country. This is yet another example of the use of the Meadowlands as a national testing ground for improvements in environment and urban policy.

This comprehensive study will make it possible for the Commission to find the best location for installations which are particularly air quality sensitive, to set emission standards, to direct the patterns of land use and to stage development according to projected changes in air quality stemming from stricter controls and technological improvements. The Land Use Plan for the Meadowlands is flexible enough to respond to recommendations that may be forthcoming from this analysis and the Commission intends to implement the recommendations it deems appropriate.

The Land Use Plan takes several important steps towards the control of air pollution. Listed below are some of these:

- the largest single land use in the Meadowlands is open space, including golf courses, other commercial recreation, open water, conservation areas, parks and the like. The open spaces have been designed as buffers separating residential areas from other uses;

- all development, even that permitted under the Stage I Plan, must meet State air pollution emission standards, among the strictest in the country. The zoning regulations which will implement the present Land Use Plan will contain further controls;

- the great majority of industrial uses proposed in the Meadowlands are of the light industrial type in which, generally speaking, combustion is limited to heating the building. The record of development over the last five years shows no new heavy manufacturing industry in the Meadowlands;

- the use of automobiles, which today cause about 95% of the carbon monoxide concentrations in the District, is minimized by several features of the plan. First, the development has been clustered so that schools, shops, and neighborhood services are within walking distance, eliminating several daily auto trips for the typical family. Second, the plan proposes a mass transportation system that extends beyond the Meadowlands to serve many commuters and travelers who now are forced to rely on automobiles. An illustration of the positive effects of this sort of program is the Skokie-Swift mass transit line in suburban Chicago which led to a 15% reduction in hydrocarbons. Third, the plan proposes to use waterways for public transportation, thereby lowering reliance on the automobile still further. In addition, the plans call for four Transportation Centers which include provisions for rapid transit and which will enable people to leave their cars before they cross the Meadowlands and to use public transportation. Again, the purpose is to improve transportation and to reduce reliance on the automobile.



Water Quality

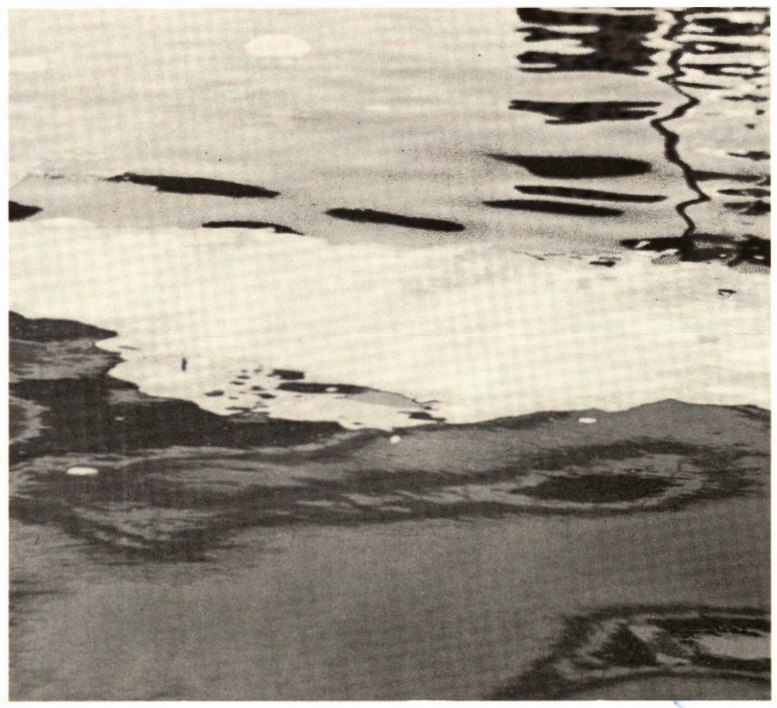
The terms "water pollution" and "water quality" mean vastly different things to different people. To the conservationists, the introduction of anything which negatively affects the proprogation of wildlife or fish is gross pollution. To the manufacturer whose processes require water use, any material in the water which increases production costs, which causes scaling or corrosion or which decreases the efficiency of cooling or quenching is gross pollution. To the layman, the water is polluted if he cannot use it for his purposes. By anyone's definition, the waters of the Hackensack River estuary are polluted.



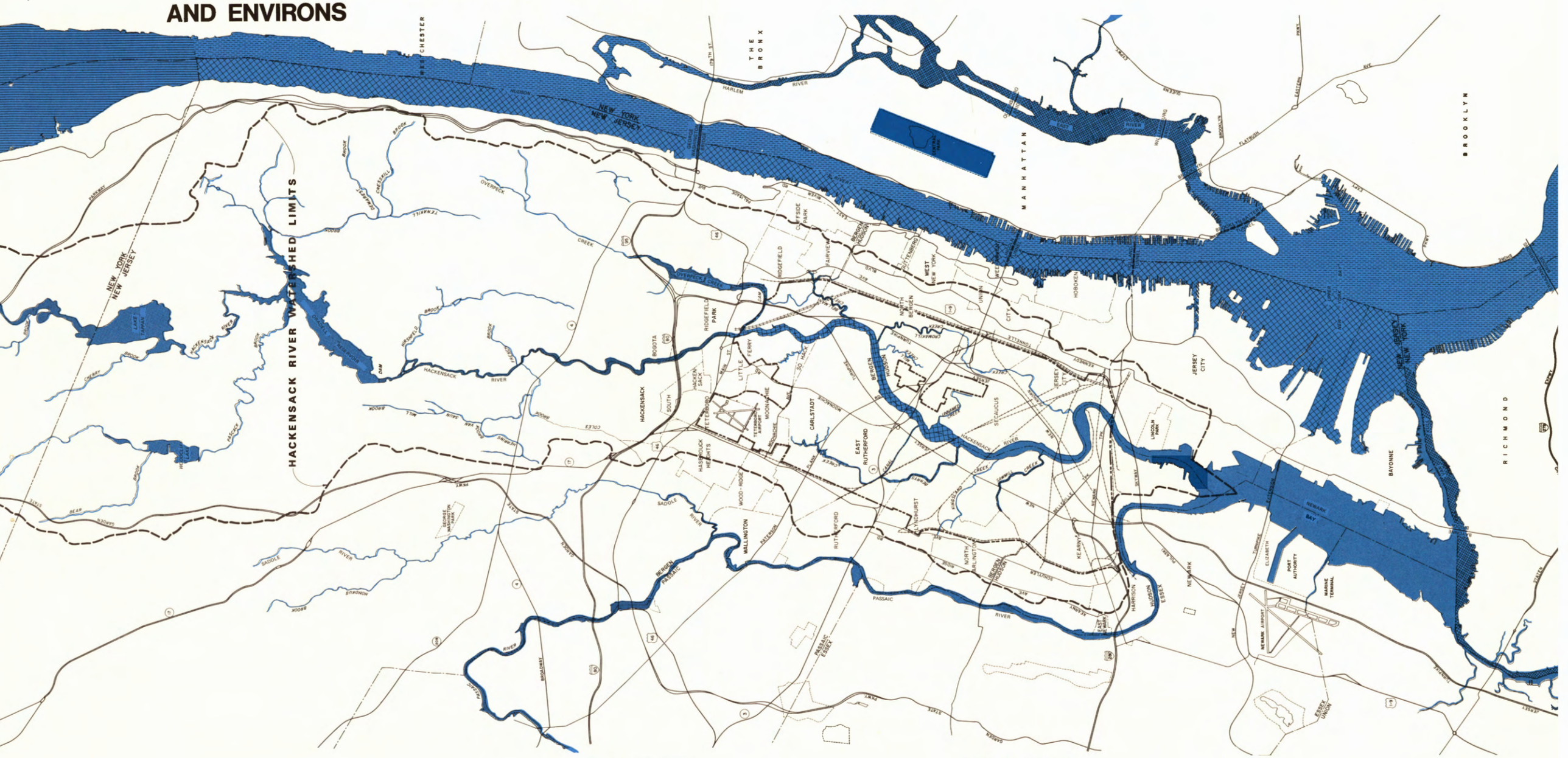
The building of the Oradell Reservoir to produce potable water divided the Hackensack River into two parts. The upper part is a controlled watershed fed by fresh water runoff. The lower part is a disturbed estuary subject to the tidal fluctuations and to the effects of salt water carried upstream from the New York harbor system through Newark Bay.



In normal streams, the fresh water flow moves impurities in the stream toward the sea. However, the headwaters of the Hackensack River are dammed and for large portions of the year, particularly during the critical summer months, there is little or no flow into the tidal part of the river, except from the sewage and effluent outfalls. The



WATER QUALITY
HACKENSACK MEADOWLANDS
AND ENVIRONS



HACKENSACK MEADOWLANDS DISTRICT

STATE OF NEW JERSEY FRESH WATERS

FW-2 Existing water conditions will be upgraded (or maintained) for public potable water supply; for recreation; for propagation, migration and harvest of aquatic life.

FW-3 Existing water conditions will be upgraded (or maintained) for recreation; for the propagation, migration and harvest of aquatic life.

TIDAL WATERS

TW-1 Existing water conditions will be upgraded (or maintained) for contact recreation; for boating; for the propagation, migration and harvest of aquatic life.

TW-2 Existing water conditions will be upgraded (or maintained) for limited recreation; for the survival and migration of aquatic life.

TW-3 Existing water conditions will be upgraded (or maintained) for navigation; for pleasure craft; for fish survival.

STATE OF NEW YORK FRESH WATERS

A Source of water supply for drinking, culinary or food processing, and any other usages.

TIDAL WATERS

SB Bathing and any other usages except shellfishing for market purposes.

SC Fishing and any other usages except bathing or shellfishing for market purposes.

SPECIAL CLASSES

I Fishing and any other usages except bathing or shellfishing for market purposes.

II All waters not primarily for recreational purposes, shellfish culture or the development of fish life.

SCALE
0 2000 4000 8000

STATE OF NEW JERSEY
HACKENSACK MEADOWLANDS
DEVELOPMENT COMMISSION
1970

tide water surges and retreats rhythmically in what is, in effect, a dead-end tube. There is little flushing of accumulated pollutants or contaminants.

Pollutants and contaminants enter the river from inadequate municipal and industrial treatment plants and, in some cases, without any treatment at all. During storms in communities with combined storm and sanitary sewers, raw sewage mixes with storm runoff in quantities that exceed the capacity of the treatment plants. The excess, including the raw sewage, is then diverted to overflows and deposited directly in the streams. The solid waste fills in the Meadowlands have not been protected against tidal waters. Leacheate from these sites is another source of pollution. Finally, the tidal water itself is badly polluted, a far-reaching problem originating in the entire New York Harbor-Newark Bay system.

In the long range, the abatement of pollution in the Hackensack River requires action throughout the length and breadth of this complex and extensive system of waterways. The factors and forces involved are many and variable. Only a computerized model of the system can begin to make them understandable. The New Jersey Department of Environmental Protection is creating such a model as the first step toward an eventual program of action aimed at improving water quality in the Hackensack River and related waterways.

Some of the pollution of the Hackensack, especially the particularly acute localized conditions, can be controlled within the short term. A regional system of modern wastewater treatment is needed to replace the outmoded and inadequate plants in the District and at the head of Newark Bay. All of the sewage draining into the District must be collected and returned to the waterways as a high quality effluent. The Commission is working with the Department of Environmental Protection on specific plans in this regard.

The objectives now set for the river are given the designation TW-2 from Berrys Creek to the Oradell Dam and TW-3 below Berrys Creek. The designations are references to standards set by the State Department of Environmental Protection. Having meaning in terms of odor, clarity, floating solids and capability for survival of marine life, TW-2 is a higher and more desirable objective than TW-3. The cleansing of the waters is another important factor in the staging of various types of development indicated by the Land Use Plan. Within a decade, the river should be cleaned up to support aquatic life and be pleasant to be near and boat on. It should be free of floating matter and oil slicks.

It is the long range goal of the Commission that the Hackensack will be suitable for swimming and will see a resurgence of many forms of desirable aquatic life.

There are now more than 200 pleasure boats on the river, showing the demand for this form of recreation. This also shows that, even in its present state, the river is not totally objectionable for this particular use.



Solid Waste Disposal

The Commission is required by statute to provide in perpetuity for the disposal of at least the amount of solid waste emanating from New Jersey municipalities and disposed of in the District in 1969. This guarantee covers some 26,000 tons of waste per week.

There are now nine active disposal sites in the District, five in Kearny, two in North Arlington, one in Secaucus and one in Lyndhurst. The plan foresees that these sites, already covered with waste to some extent, will continue to provide the necessary capacity for a period of three to five years. Solid waste disposal sites will be limited to those now in existence. As they are completed and phased out of operation, the Commission will provide for disposal through waste reduction processes which meet the air and water quality standards of the State. Incineration, for example, is not a disposal method but rather a waste reduction method which itself produces waste products. However, the waste product is inert and can be used as fill under proper controls. The waste reduction process should be located in industrial areas that are easily accessible. It is hoped that the air pollution model will be developed to the point that it will assist in final site selection.

The operating disposal sites and the more than 20 landfill sites which now lie abandoned in the District have serious limitations for subsequent use. The plan takes account of these limitations and designates these areas for permanent park areas, open space, commercial recreation areas, parking and for limited industrial uses such as storage of building materials.

With careful engineering, certain of the areas can be used for high rise or high density structures supported on piles free of the solid waste surface and surrounded by lawns and landscaping.

The existing landfill operations are subject to a strict set of standards as of July 1, 1970, the effective date of the new code of the Department of Environmental Protection. The code eliminates some of the worst practices prevalent in the area, including the disposal of wastes directly into tidal areas and the failure to provide adequate cover material.



Economic Feasibility

Throughout the process of structuring the plan, attention has been paid to its economic feasibility, considering development costs, values which can be created and the time frame of anticipated development.

To a very large extent, the Land Use Plan relates to the physical conditions of the site and the engineering considerations which must be taken into account. The surface and subsoil conditions of the Meadowlands dictate much of the recommended land use if the plan is to be implemented within the limitations of economic feasibility and still include the extensive conservation and public purpose uses proposed. Land uses are further located in relation to the apparent market demand so that logical, staged development may occur. It is estimated that the plan will take some 30 years to be implemented.

A key test of an investment, whether it be private or public, should be the test of economic feasibility. In this connection, an economic model has been developed as an adjunct to the Land Use Plan. The model has produced computer runs indicating the economic feasibility of various proposed uses of land in the Meadowlands. These computer runs which have been made in connection with the planned development of the Meadowlands indicate that the project recommended in the Land Use Plan is economically feasible and justifies the investments called for. This model was developed by using such inputs as the present value of land in the Meadowlands in various uses, construction and development costs with a cost-escalating factor to compensate for inflation and a conservative assumption as to the rate at which the market would digest various types of land over a period of 30 years. Using these conservative estimates and varying rates of interest as applied to the cost of money, the results of the several computer runs indicate that the development can create investment opportunities which will more than justify the necessary investments.

Accordingly, in considering the question of financing the development of the Meadowlands and the implementation of the Land Use Plan, it has been assumed that a major portion of the investment required for the full implementation of the plan will come from private investment sources. In addition, public investment must also take place and, for the full implementation of the plan, some of the public investment must come at the early stages. This is especially true in connection with protecting the area from exceptionally high tides and in connection with certain improvements in the transportation network necessary to serve the Meadowlands and in the provision of water and sewer facilities and services.

In part, this public investment may be anticipated from State and federal sources under already existing grant-in-aid programs and other public works project formulae. For example, a formula, based upon costs benefits, already exists in connection with the U.S. Army Corps of Engineers flood control projects. Furthermore, a federal loan and grant program already exists for financial assistance to local transit agencies and authorities. In addition, a wide variety of programs which include federal and State participation exists for such facilities as water, sewer, and highways; existing federal and State aid can be anticipated for housing and renewal projects included in the Meadowlands plan.

Alternative and supporting financial approaches are being considered in the developing of the strategy and mechanics of financing. The fundamental test of the financing rests with the economic feasibility of the total development plan. If that plan were not to be economically feasible, any financial arrangement proposed would rest on an unsound foundation.

Conclusion

To reconstitute an urbanized area, to respond to needs that can be met only in such a reconstituted environment, to perceive nature not as obstacle but as intrinsically valuable resource, to give expression to the connections between the human and natural forces that meet in this marsh, to provide jobs, homes, recreation space and public revenue from the economic potential of this land: these are, in sum, the purposes of this plan.

To achieve these purposes, activity must be *staged,* within and among the plan's components, so that the final product is connected to the present scene by a progression of realistic steps.

Activity Proceeding from the Periphery

The logic of past development in the Meadowlands proceeded from early attempts at "reclamation" for agricultural purposes and has culminated in markedly more successful attempts to interlace the marsh with rail, road, power and fuel transmission networks. As has been noted, industrial development honors those connections; most of the developed land is on the periphery and serves in some way to expedite the movement of persons, goods or services across the Meadowlands or to store them in transit.

In an important sense, then, the periphery of the District is the most susceptible to the power of the past and of the immediate present. In producing the plan, the smallest redirections are possible here. Indeed, the smallest redirections are *appropriate* here. The land surrounding such sites already commits them to this use. Most of these sections lie in those parts of the District underlain with deep deposits of compressible material which can support light buildings. There is a ready market for such a land use. These areas are easiest to protect against flooding in the short term aspects of the plan.

Activity Proceeding from the Center

The river, at the center of the Hackensack Meadowlands District, becomes the center of the Hackensack Meadowlands Plan.

In the District, it is crossed ten times by rail and highway. But, much of its course is comparatively remote from the dense population and development at the District's periphery. Thus the river and the land contiguous to it, for at least a while, are the least susceptible to the developmental logic of the past. In producing the plan, the greatest redirections are possible here.

The greatest redirections are not only possible at the center of the District; they are most needed there. The waters must be cleansed, the abnormal tides must be controlled, the degeneration of the marsh must be reversed and the few existing developments which impair the new perception of the District's core must be phased out. The Land Use Plan does not count heavily on redevelopment other than by natural economic forces which will upgrade the use of the land. But a small amount of redevelopment may be necessary, especially along the waterfront, to establish the new perception of the river and the land uses that depend on the new perception. For example, the islands of residential development in the general area of the gas storage tank in Carlstadt depend on the site of the gas tank being compatible with this desired ultimate use. As stated, the pivotal part of the plan is a central six square mile regional breathing space, recreational water park, and marsh-conservation-wildlife preserve, running the length of the District.

Other components of the plan depend upon a newly perceived river. Residential island clusters make use of the river and the restored marsh as environmental assets. Schools and shops serve these population centers. Parks and golf courses are placed next to marsh conservation areas. Other residential areas are placed next to the parks and golf courses. A civic and cultural center, at the physical center of the District, becomes the focal center of the plan for the District. Office buildings and a commercial complex contiguous to the civic and cultural center generate jobs and revenue from the economic potential of this land.

Under this plan, the Hackensack Meadowlands will be transformed. There will be industry and waste disposal but it will no longer be viewed simply as an industrial park or as a garbage dump. It will still have roads and rails but it will no longer be simply a transportation hub interpersed with fouled marsh. It will have marsh, but marsh destined to remain permanently in an improving state rather than to await the inevitable drag line and garbage truck. It becomes a place to go to, not just a place to go through. The plan challenges the surrounding area to stop the degradation of the Meadowlands and offers, in reward, the prospect of a far greater contribution to be made by a vitally creative Meadowlands area than the contribution it now makes as a repository.

The plan imposes a set of difficult tasks on the Commission and other governmental agencies. There will be roads and rails to be built, waste disposal facilities and wastewater treatment lines and plants to construct. There will be parks and housing to finance, flood control systems to install. The implementation of this plan is no simple job and will not be accomplished in a day. But, it can be done over time. This plan is believed to contain the balanced elements of a realistic and far reaching program which will benefically affect the region for decades.

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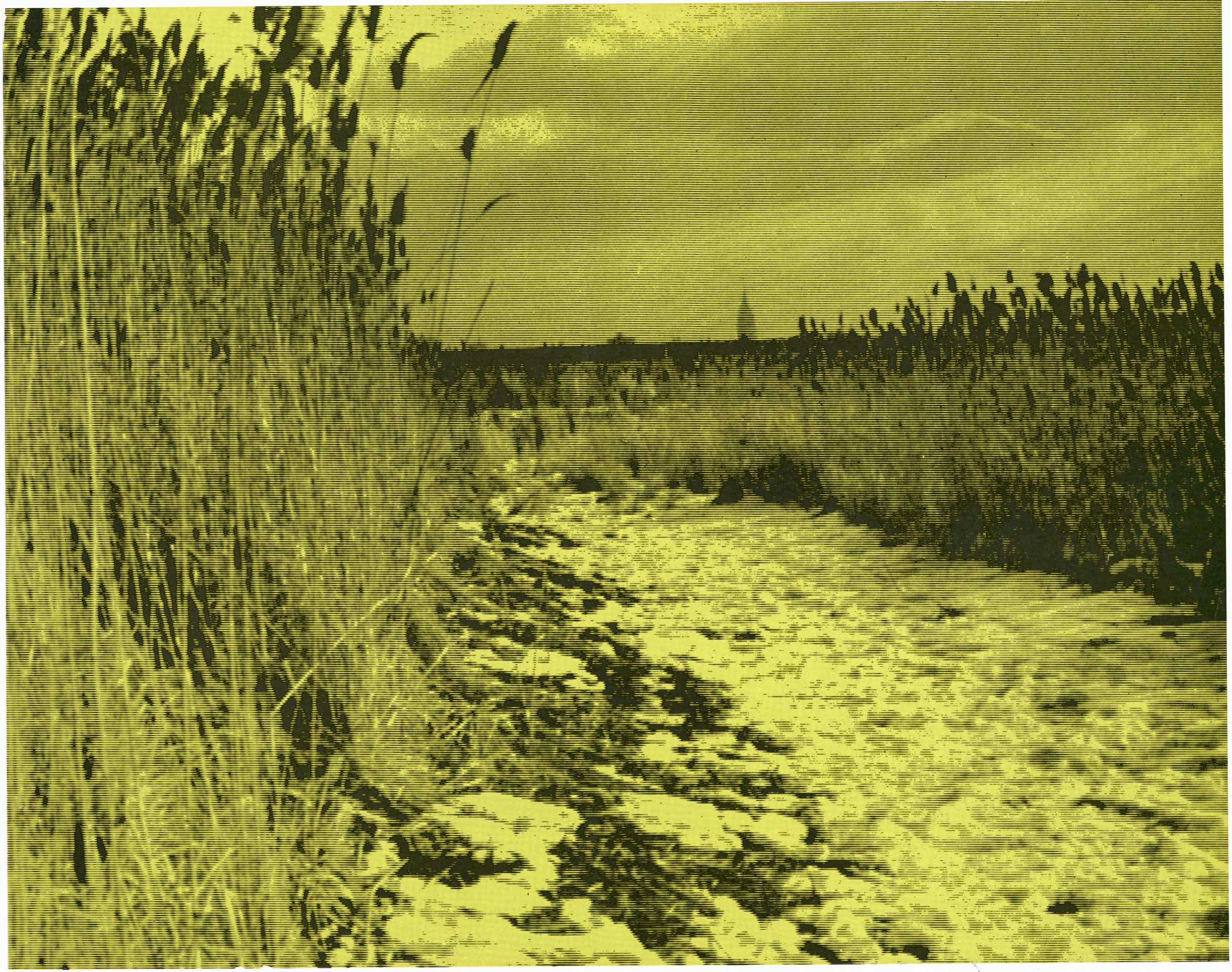
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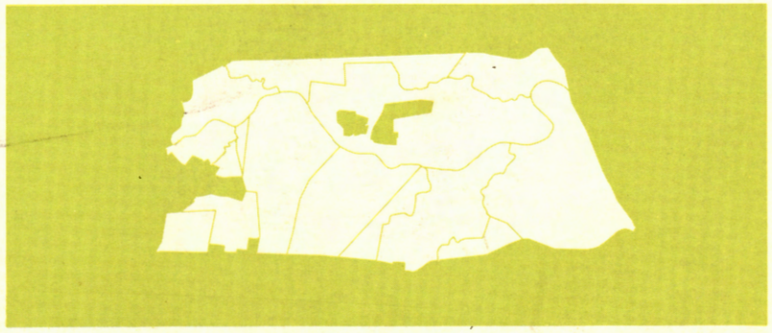
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