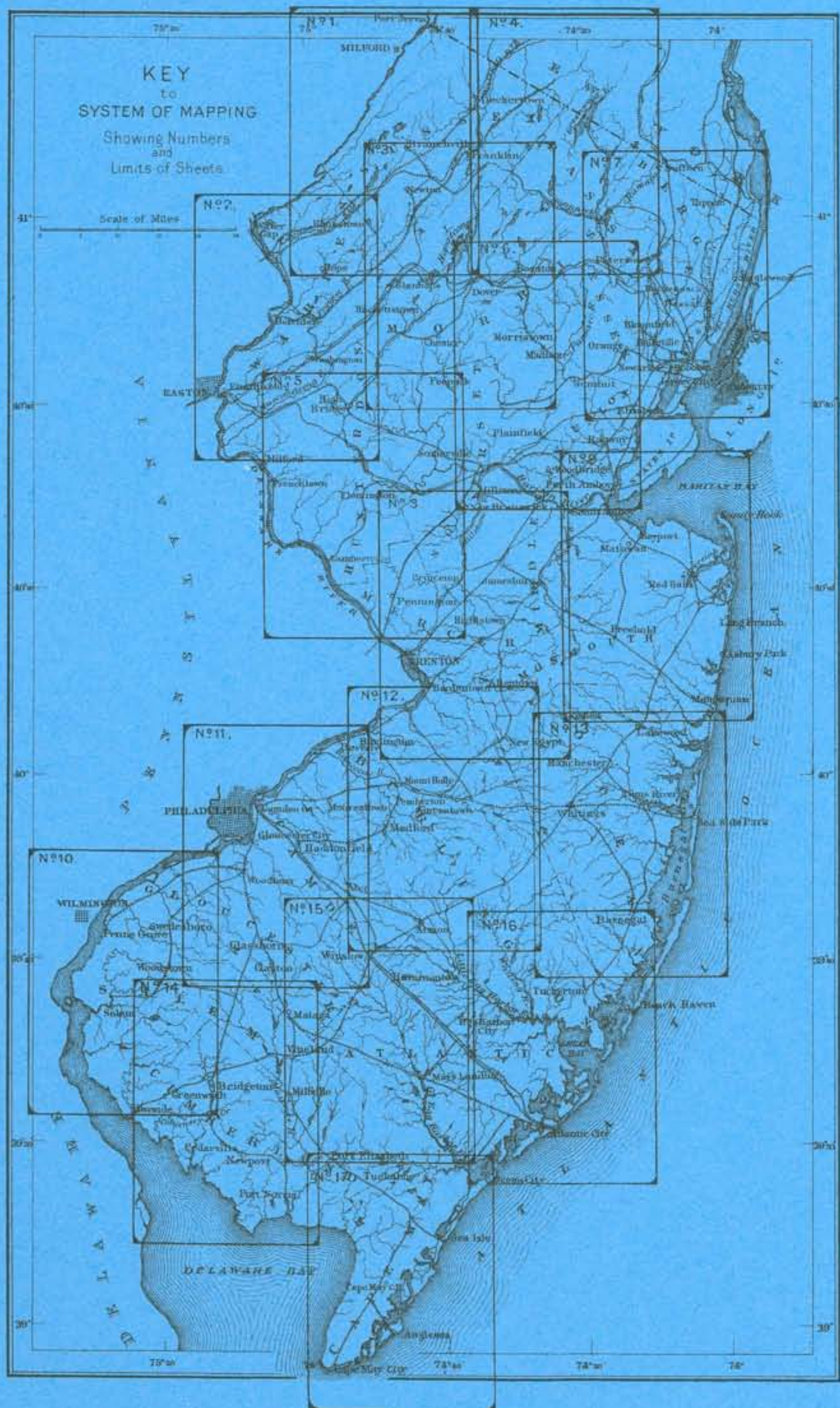
New Jersey Geological Survey
Geological Survey Report GSR 23

MAPPING DIGEST FOR NEW JERSEY



N.J. Department of Environmental Protection - Division of Water Resources

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Cover illustration: 1889 index map for New Jesey State Atlas topographic sheets. New Jersey was the first state in the nation to undertake statewide topographic mapping. The program was begun in 1877 and completed in 1887. The map series consists of 17 sheets at a scale of one mile to an inch.

New Jersey Geological Survey
Geological Survey Report GSR 23

MAPPING DIGEST FOR NEW JERSEY

by
Harold J. Barker, Jr.

New Jersey Department of Environmental Protection
Division of Water Resources
Geological Survey
CN-029
Trenton, NJ 08625

1990

DEDICATION

In memory of Harold J. Barker, Jr., (1927-1988), whose untimely death after 27 years of service with the Department of Environmental Protection occurred shortly after he completed the final draft of this publication.

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Table 1. Chart scales and equivalents (modified from U. S. Air Force, 1960).

Fractional Scale	Miles per Inch Nautical	Miles per Inch Statute	Inches per Mile Nautical	Inches per Mile Statute	Feet per Inch
1:500	0.007	0.008	145.83	126.72	41.67
1:600	0.008	0.009	121.52	105.60	50.00
1:1,000	0.014	0.016	72.91	53.36	83.33
1:1,200	0.016	0.019	60.76	52.80	100.00
1:1,500	0.021	0.024	48.61	42.24	125.00
1:2,000	0.027	0.032	46.46	31.78	166.67
1:2,400	0.033	0.038	30.38	26.40	200.00
1:2,500	0.034	0.039	29.17	25.34	208.33
1:3,000	0.041	0.047	24.30	21.12	250.00
1:3,600	0.049	0.057	20.25	17.60	300.00
1:4,000	0.055	0.063	18.23	15.84	333.33
1:4,800	0.066	0.076	15.19	13.20	400.00
1:5,000	0.069	0.079	14.58	12.67	416.67
1:9,600	0.132	0.152	7.60	6.60	800.00
1:10,000	0.137	0.159	7.29	6.34	833.33
1:12,000	0.165	0.189	6.08	5.28	1,000.00
1:15,000	0.206	0.237	4.86	4.22	1,250.00
1:20,000	0.274	0.316	3.65	3.17	1,666.67
1:21,120	0.290	0.333	3.45	3.00	1,760.00
1:22,800	0.313	0.360	3.20	2.78	1,900.00
1:24,000	0.329	0.379	3.04	2.64	2,000.00
1:25,000	0.343	0.395	2.92	2.53	2,083.33
1:31,680	0.434	0.500	2.30	2.00	2,640.00
1:48,000	0.658	0.758	1.52	1.32	4,000.00
1:50,000	0.686	0.789	1.46	1.27	4,166.67
1:62,500	0.857	0.987	1.17	1.01	5,208.33
1:63,360	0.869	1.000	1.15	1.00	5,280.00
1:75,000	1.029	1.184	0.97	0.85	6,250.00
1:100,000	1.371	1.578	0.73	0.63	8,333.33
1:125,000	1.714	1.973	0.58	0.51	10,416.67
1:200,000	2.743	3.157	0.35	0.32	16,666.67
1:250,000	3.429	3.946	0.29	0.25	20,833.33
1:400,000	5.486	6.313	0.18	0.16	33,333.33
1:500,000	6.857	7.891	0.15	0.13	41,666.67
1:750,000	10.286	10.837	0.10	0.08	62,500.00
1:1,000,000	13.715	15.783	0.07	0.06	83,333.33
1:1,500,000	20.572	23.674	0.05	0.04	125,000.00
1:2,000,000	27.430	31.565	0.04	0.03	166,666.67
1:2,500,000	34.287	39.457	0.03	0.03	208,333.33
1:5,000,000	68.575	78.914	0.01	0.01	416,666.67
1:10,000,000	137.149	157.828	0.01	0.01	833,333.33
1:20,000,000	274.299	315.656			1,666,666.67
1:25,000,000	342.873	394.570			2,083,333.33

MAPPING DIGEST FOR NEW JERSEY

INTRODUCTION

This publication is a summary of basic information on maps, map availability and geodetic control for New Jersey. The original edition was "Sources of information for New Jersey engineers and land surveyors" (Blanchard, ca. 1955). It was updated and expanded by Barker (1965). In this third version, sections on topographic mapping, geodetic datums, tidal datums, sea level, and plane coordinates have been updated. The section listing sources of maps has been expanded.

Acknowledgments

Ronald Kuzma prepared materials on the Earth Science Information Center. William Chapman, A. P. Colvocoresses, Phillip Guss, Louis Marchuk, and John P. Snyder reviewed the manuscript. Lillian Allar, Jennie M. Starkey, and Josephine Valencia typed the manuscript in its various revisions. I. G. Grossman greatly improved the final product through his thorough and careful editing.

NEW JERSEY MAPS AND TOPOGRAPHIC SURVEYS

1656-1877

One of the earliest maps to show considerable detail for New Jersey was compiled and published by Nicholas Joan ("Claes") Visscher in 1656. Its coverage extended from Virginia to southern Canada. This map was used by the Duke of York in 1664 to describe the boundaries of the Province of New Jersey. Inaccuracies in Visscher's map and vagueness in the boundary description resulted in a boundary controversy between New York and New Jersey which lasted more than a century (Cook, 1888, p. 40-73).

Adriaen vander Donck included in his "Description of New Netherland As It Is Now" (1656) a map largely based on that drawn by Visscher. Donck's map (and Visscher's as well) had errors of as much as 21 miles.

One of the earliest maps printed in this country was "A map of PENSILVANIA, NEW-JERSEY, NEW-YORK, and the THREE DELAWARE COUNTIES," by Lewis Evans (1749). It was published on a scale of approximately 1:1,000,000 and was a considerable improvement over earlier maps.

Bernard Ratzer, a lieutenant in the 60th Regiment, British Royal Artillery, drew a map of New Jersey in 1769 to assist the Boundary Commission of the same year in settling the dispute between New Jersey and New York. The Ratzer map was more accurate than that of Evans, but it lacked many details.

In December 1777 a map was published by William Faden, Charing Cross, London, "THE PROVINCE OF NEW JERSEY, Divided into East and West, commonly called THE JERSEYS." It was compiled from the Ratzer map of 1769, a map of the northern regions drawn by Gerard Bancker on a scale of 1:500,000, and other military and property maps covering smaller areas. Errors of location were as much as 12 miles, but the map nevertheless was an advance.

Still more detailed was William Watson's (1812) "A Map of the State of New Jersey" at a scale of 1:250,000. It delineated townships throughout the State for the first time, but substantial errors remained (Snyder, 1973, p. 94).

The State Legislature, recognizing the need for more accurate maps, authorized a loan of $1000 to Thomas Gordon in 1822 "to enable him to obtain additional surveys, for the purpose of making a state map" (Cook, 1885, p. 187). It was compiled on a scale of 1:192,000 from existing surveys supplemented by some field work. Titled "A Map of NEW JERSEY, with part of the Adjoining States, compiled under the patronage of the Legislature of said State, by Thomas Gordon, 1828," this map, with revisions in 1833, 1850, and 1854, was authoritative until 1860. Errors of position were reduced to only three-quarters of a mile in latitude and five-eighths of a mile in longitude, greatly less than in older maps.

In 1860, a map of New Jersey on a scale of 1:158,400 was published privately by William Kitchell, superintendent of the inactive New Jersey Geological Survey, and G. M. Hopkins. The map was based on United States Coast Survey publications and work of the State Geological Survey of 1854-56.

In 1864 a new map (apparently unpublished) was prepared by the New Jersey Geological Survey on a scale of 1:31,680 (0.50 inch per mile) from triangulation and plane-table sheets of the United States Coast Survey, plane-table sheets of the State

Geological Survey of 1854-56, and county, city, and local surveys.

1877-1934

In 1877 it was found that accurate delineation of geologic features was impossible without better maps, and work was begun on a New Jersey State Atlas. The atlas was to cover the entire State on 17 overlapping topographic "Atlas Sheets" on a scale of 1:63,360 (1 inch per mile) in three colors. Information was compiled from United States Coast and Geodetic Survey triangulation and plane-table sheets for coastal and Delaware River areas, city and town surveys, the more reliable railroad surveys and an entirely new survey covering all areas not already covered adequately. The manuscript maps were based upon Clarke's Spheroid of 1866 and prepared on a scale of 1:21,120 using a polyconic section (Cook, 1885). Tolerances were held to one-fiftieth of a map inch (approximately twenty feet on the ground).

New Jersey was the first state to undertake and, in 1887, complete such a comprehensive mapping program. Two Federal organizations contributed significantly to the project: the United States Coast and Geodetic Survey provided funds and personnel to broaden the triangulation net; the United States Geological Survey, in 1884, assumed the topographic work after mapping had been completed for approximately 45 percent of the State.

The State Atlas series has successfully stood the test of time. The maps were kept current for approximately a century through periodic revision by the Topographic Engineer of the New Jersey Geological Survey, and cultural changes can be readily seen by comparison of older with newer editions. Through the history of the series, only two major changes were made in format. In 1903 the overlapping system was changed to an edge-matched system (Atlas Sheets 21 through 37). Beginning in 1956, two additional colors were added to enhance readability. More than 100,000 maps have been distributed since 1900.

Although demand for the maps continued even a century after the first series was completed in 1887, the New Jersey Geological Survey discontinued revision of the Topographic Series in the late 1970's. Further revision would have required conversion of Clarke's spheroid of 1866 grid values to a new horizontal datum (NAD 83) and preparation of entirely new printing plates. In view of a USGS program for publication of topographic maps at a scale of 1:100,000, revision would not have been cost effective.

In addition to the State Atlas, 15- and 30-minute USGS topographic maps were based on the 1877-1887 survey. 15-minute topographic maps were published for the entire state on a scale of 1:62,500. Most of the sheets were kept up-to-date until about 1910. Some were revised into the 1940's, and one in 1954. Eight 30-minute quadrangles covering widely separated areas of New Jersey were published on a scale of 1:125,000 between 1899 and 1907, when this series was discontinued in favor of more detailed, larger-scale maps.

After completion of the State Topographic Series in 1887, a base map of the State was produced by the New Jersey Geological Survey on a scale of 1:316,800 (0.20 inch per mile). This was a commonly used base for many years and appeared with culture (State Atlas sheets 18 and 38), relief (sheet 19), geology (sheet 20), forests, watersheds and other information.

By 1898, rapid development of several large population centers necessitated a larger-scale map series, and field revision of the State Atlas manuscripts was begun. In 1899 the first maps of the "Name Sheet" series were published by the New Jersey Geological Survey. Each sheet covers 7 minutes latitude by 13 minutes longitude on a scale of 1:24,000. Only 24 of the 102 edge-matching sheets required to cover the State were published before work was discontinued. The last new sheet was published in 1905, and the last revised sheet of the series was published in 1944.

In 1915 "County and Municipality Map of New Jersey" (State Atlas sheet 39, scale 1:250,000), a base map at a larger scale than the 1881 base, was published. This map was revised on several occasions and was still available as of 1990. The base has appeared with railroads, highway networks, areas covered by atlas sheets and USGS quadrangle maps (sheet 39A), geology (sheet 40), and with emphasized county, municipal and state boundaries.

1934-1968

Large-scale resurveying was begun by the USGS in 1934, primarily in the northern metropolitan area. Maps were published as 7.5-minute quadrangles on a scale of 1:31,680 (2 inches per mile).

During World War II, most of northern New Jersey was mapped by the Army Map Service (AMS). Forty one 7.5-minute quadrangle maps were published at the 1:31,680 scale. In 1943 the AMS converted to the 1:25,000 scale for 7.5-minute maps; 48 maps were published on this scale. In addition to the 7.5-minute series, the AMS produced a 15-minute quadrangle series on a scale of 1:50,000. Several 15-minute quadrangles were produced for southern New Jersey and one (Milford) for the northern portion of the State.

Between World War II and the early 1950s, 7.5-minute quadrangle map coverage was completed by the USGS at a scale of 1:24,000 for the entire State. Quadrangle maps were based predominantly on new mapping (including coastal and Delaware River area mapping by the U.S. Coast and Geodetic Survey), but also incorporated revision of older AMS and USGS 7.5-minute quadrangle maps, and for the Fort Dix area, civil conversion of revised AMS maps.

1968-1987

The postwar 7.5-minute series has been extensively revised since 1968. Review and revision of a quadrangle is begun by photoinspection (a review of aerial photography to determine whether changes in drainage and cultural features necessitate revision). If revision is necessary, it consists of either photorevision (an update using aerial photography to revise physical and cultural features, but without a field check) or new mapping (based on field checking as well as aerial photography).

Between 1968 and 1987, 157 of the 172 New Jersey quadrangles were photoinspected or photorevised. 136 quadrangles were updated by photorevision between 1968 and 1972. New mapping for 2 quadrangles was completed. Photoinspection of 59 quadrangles, most in southern New Jersey, was completed in 1977. No major changes were observed so these quadrangles were not revised. In 1981 and 1982, photorevision was completed for 55 quadrangles in the Boston-Washington Northeast Corridor. Five quadrangles were revised in 1983 and 1984.

Additional revision of the 7.5-minute series is under way. As of 1987, new mapping was in progress for 15 quadrangles in Atlantic, Monmouth and Ocean Counties and photorevision had been authorized for 10 southern New Jersey quadrangles.

Larger-scale USGS topographic maps prepared for New Jersey include a 1:500,000-scale "New Jersey Relief Map," the "United States Series," consisting of sheets covering 2° longitude by 1° latitude at a scale of 1:250,000, and the "30 x 60 Minute Series," consisting of topographic sheets at a scale of 1:100,000.

Topographic maps and mapping programs are further discussed in Snyder (1973) and Carlucci (1980; 1986).

UNITED STATES NATIONAL MAP ACCURACY STANDARDS*

With a view to the utmost economy and expedition in producing maps which fulfill not only the broad needs for standard or principal maps, but also the reasonable particular needs of individual agencies, standards of accuracy for published maps are defined as follows:

1. Horizontal accuracy. For maps on publication scales larger than 1:20,000, not more than 10 percent of the points tested shall be in error by more than 1/30 inch, measured on the publication scale; for maps on publication scales of 1:20,000 or smaller, 1/50 inch. These limits of accuracy shall apply in all cases to positions of well-defined points only. Well-defined points are those that are easily visible or recoverable on the ground, such as the following: monuments or markers, such as bench marks, property boundary monuments; intersections of roads, railroads, etc.; corners of large buildings or structures (or center points of small buildings); etc. In general what is well defined will also be determined by what is plottable on the scale of the map within 1/100 inch. Thus while the intersection of two road or property lines meeting at right angles would come within a sensible interpretation, identification of the intersection of such lines meeting at an acute angle would obviously not be practicable within 1/100 inch. Similarly, features not identifiable upon the ground within close limits are not to be considered as test points within the limits quoted, even though their position may be scaled closely upon the map. In this class would come timber lines, soil boundaries, etc.
2. Vertical accuracy, as applied to contour maps on all publication scales, shall be such that not more than 10 percent of the elevations tested shall be in error more than one-half the contour interval. In checking elevations taken from the map, the apparent vertical error may be decreased by assuming a horizontal displacement within the permissible horizontal error for a map of that scale.
3. The accuracy of any map may be tested by comparing the positions of points whose locations or elevations are shown upon it with corresponding

*from Thompson, 1982, p. 104

positions as determined by surveys of a higher accuracy. Tests shall be made by the producing agency, which shall also determine which of its maps are to be tested, and the extent of such testing.

4. Published maps meeting these accuracy requirements shall note this fact on their legends, as follows: "This map complies with National Map Accuracy Standards."
5. Published maps whose errors exceed those aforestated shall omit from their legends all mention of standard accuracy.
6. When a published map is a considerable enlargement of a map drawing (manuscript) or of a published map, that fact shall be stated in the legend. For example, "This map is an enlargement of a 1:20,000-scale map drawing," or "This map is an enlargement of a 1:24,000-scale published map."
7. To facilitate ready interchange and use of basic information for map construction among all Federal mapmaking agencies, manuscript maps and published maps, wherever economically feasible and consistent with the uses to which the map is to be put, shall conform to latitude and longitude boundaries, being 15 minutes of latitude and longitude, or 7.5 minutes, or 3.75 minutes in size.

SURVEY DATUMS AND COORDINATE SYSTEMS

Horizontal Geodetic Control Datums

The nationwide net of triangulation arcs was established by the U.S. Coast and Geodetic Survey to determine precise locations by spherical coordinates. The work began early in the nineteenth century, and for many years individual arcs remained unconnected. About 1900, extensions and connections of the arcs made it possible to treat the entire net as a single unit. Instead of embarking upon a major adjustment, which would have involved recomputing the position of every control station, it was decided to adopt the 1879 New England datum that had been used throughout New England and along the Atlantic Coast. Much recomputation was avoided, yet the datum proved nearly ideal for the entire country. Designated the United States Standard Datum, it was based upon the Clarke spheroid of 1866 and originated at station Meades Ranch in Kansas (latitude 39^{o} 13′ 26".686, longitude 98^{o} 32′ 0".506). Inherent errors in the positions of stations throughout the triangulation net balanced out when Meades Ranch was used as a starting point for computations.

In 1913, after Canada and Mexico adopted this datum, the name was changed to North American Datum. By 1927 the national triangulation network was complete enough to allow a major adjustment. Many of the arcs established between 1900 and 1927 had been made to fit the existing network, and error distribution was not ideal. To correct this situation, first the western half of the national net, and then the eastern half, were readjusted. Because station positions were altered as much as 1 second in latitude and 1.4 seconds in longitude, it was necessary to change the name of the datum to prevent confusion. The name North American Datum of 1927 (NAD 27) was adopted. The geographic position of base station Meades Ranch remained unchanged and Clarke's 1866 spheroid was retained. Thus, fundamental properties of the net were not altered (U.S. Dept. of Commerce, 1941, p. 12-15).

Although the positions were considered final and the Atlantic Coast Arc adjustments completed by 1933, minor readjustments proved necessary. During the course of the New Jersey Geodetic Control Survey, discrepancies were discovered between two parallel triangulation arcs. In 1937 a first-order baseline from Elizabeth to Port Reading was measured, and first-order triangulation checks were made between Princeton and Netcong by the United States Coast and Geodetic Survey. The results of this work slightly changed geographic positions north of a line from Seaside Park to Mount Holly to Newton to Phillipsburg. Local traverses in the area were then recomputed and in every case closure ratios were improved (N.J. Division of Geology and Topography, 1938, p. 10).

In the 1970's, due to improved capabilities, the surveying community became increasingly aware of deficiencies in the North American Datum of 1927. As a result, in 1974, the National Geodetic Survey began a readjustment. The readjustment was completed in 1986. The new system is referred to as the North American Datum of 1983 (NAD 83) and is conformable with satellite systems utilized for position determination to closer than one part in 10^7 (Morgan, 1987, p. 31).

Describing NAD 83, Bossler (1975, p. 15) states "The adjustment will probably place every country considered a part of North America (Denmark (Greenland) to Panama) on the same datum. That datum will be, to the best of our knowledge, earth centered and on a newly adopted reference system. Simply stated we imply that the latitude and longitude for station Meades Ranch in Kansas will no longer be the origin of the North American Datum and the Clarke Ellipsoid of 1866 will be replaced by an ellipsoid more representative of the earth on the whole."

Discussion continues over adoption of the International Foot or retention of the U.S. Survey Foot for NAD 83. NGS has proposed adoption of the International Foot (Stem, 1985 p. 20), which is used by the National Bureau of Standards and in many computer systems. At one time the difference between the two values (1 part in 500,000) was inconsequential. With increasing accuracy in surveying, however, the difference has become significant for surveys of large parcels and for extension of the primary control system.

Vertical Geodetic Control Datums

First-order control leveling by the U.S. Coast and Geodetic Survey was begun in 1878 to provide elevation control for trigonometric leveling for the Transcontinental Arc of Triangulation. As additional level lines became available and connections to tidal stations increased in number, adjustments of the level net were required. The weight assigned to each line was based on the instruments, methods, and corrections used in the leveling operation.

The first level-net adjustment was done in 1899. Partial adjustments were made in 1903, 1907 and 1912. In 1929 the entire level net was completely readjusted. Special adjustments were made in 1927 and 1929 to test the difference between mean sea level and a level surface. The 1927 Special Adjustment was based upon the first-order level net of the United States. The 1929 Special Adjustment extended this study by combining the level nets of the United States and Canada. Both special adjustments based elevations upon sea level at Galveston, Texas, and derived sea level planes for tide stations on the Gulf, Atlantic and Pacific Coasts with respect to the Galveston datum.

These adjustments demonstrated that mean sea level slopes downward to the east on the Gulf Coast and upward to the north along both the Atlantic and Pacific Coasts. Also, mean sea level on the Pacific Coast is measurably higher than on the Atlantic Coast.

In 1929, a general adjustment was computed by holding sea level (zero elevation) fixed as observed at 21 tide stations in the United States and 5 in Canada (U.S. Department of Commerce, 1961, p. 7-10). For the station at Sandy Hook, New Jersey this datum was based upon tidal observations of 1876-1881 because much of the leveling in New York and northeastern New Jersey was based on data from this period (J.O. Phillips, U.S. Coast and Geodetic Survey, written communication, 1964).

The resulting datum, upon which all elevations in the adjustment are based, was referred to for many years as the Sea Level Datum of 1929. In 1973 the name was changed to "National Geodetic Vertical Datum of 1929" (NGVD 29). The change was made to recognize that while elevations at primary tide gages had been based upon local mean sea level, the remainder of the level net had been adjusted using equipotential surfaces. The name change did not affect the datum; the same reference surface was in use from the General Adjustment of 1929 until 1988.

With computerization and new geodetic techniques, it has become possible to recompute the entire North American vertical geodetic control network. A new North American reference surface, the North American Vertical Datum of 1988 (NAVD 88) (Zilkoski, 1986, p. 1) is the result of an extensive readjustment. It is based upon the most recent elevations of mean sea level at more than 100 primary tidal stations located throughout North America, releveling of 110,000 kilometers of the national network, densification of gravity observations, and a general least-squares adjustment of 480,000 bench marks.

Mean Sea Level and Sea Level Change

Oceanic water levels are influenced by wind, atmospheric pressure, precipitation, evaporation, river discharge, currents, salinity and water temperature (Hicks and others, 1983, p. 2). In estuaries, natural and artificial changes such as dredging and water diversion can change tide range and local tidal datums (Marmer, 1951, p. 132). As conditions vary from day to day and year to year, determination of a mean sea level datum must take into account nonperiodic as well as periodic variations.

An accurate determination of mean sea level requires a series of tidal observations spanning a complete cycle of the phase relationships of the earth, moon, and sun. This progression, known as a Metonic cycle, occurs through a period of 19 years (Hicks and others, 1983, p. 11). The accompanying 19-year cycle of tidal activity is known as a tidal epoch.

Tidal fluctuations for a full epoch are analyzed mathematically to identify the amplitudes and phases of each constituent of the tide-generating forces. The variable effects remain as a nontidal, nonperiodic residual, and a mean-sea-level datum can be established based only on predictable, cyclic changes.

In New Jersey, the non-periodic change includes a component of relative sea level rise. Tidal observations at New York (1893-1930) and Baltimore (1903-1930) indicate an apparent rise of slightly less than 0.01 foot per year (Marmer, 1951, p. 58). After 1930, the apparent rate of rise increased, reaching, in 1980, 0.014 foot per year at Sandy Hook and 0.013 foot per year at Atlantic City (fig. 1). The rate of rise is not uniform and the New Jersey value of 1.0 foot between 1881 and 1987 cannot be applied elsewhere. The values at Sandy Hook are high because localized subsidence adds to the worldwide effect of glacial melting (Hicks and others, 1983, p. 14).

Since 1928 the U.S. Coast and Geodetic Survey (USC&GS) and its successor, the National Ocean Service (NOS), have published local tidal datums for New Jersey tidal bench marks. In 1943, the USC&GS adopted the first official 19-year National Tidal Datum Epoch (NTDE), spanning the years 1924-1942. Following the NTDE 1941-1959, and after most of the surviving tide stations had been brought into the geodetic vertical network, the USC&GS began issuing tables listing the relationship of the Sea-Level Datum of 1929 (NGVD 29) to local mean low water.

During the mid-1960's the NGVD 29 MLW values were changed for most New Jersey tidal stations. This reflected apparent sea-level rise from the period 1876-1881 through the 1941-1959 NTDE and the releveling of some geodetic vertical network lines. Publication of these newer values continued until 1975.

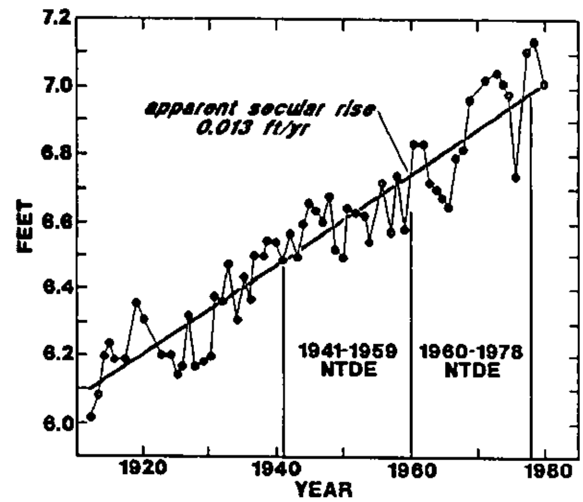

Figure 1. Mean sea level at Atlantic City, 1914-1981 (modified from Hicks and others, 1983).

As mean sea level rose, the 1941-1959 NTDE values became outdated and the surveyed location of a mean high water line was left progressively farther seaward of the actual line. To bring the surveyed and actual sea level values into agrement, tidal datum elevations in New Jersey are based upon a special epoch (1966-1984) established through a cooperative agreement between the NJ Department of Environmental Protection and NOS. The NOS 19-year epoch for this period is 1960-1978 (U.S. Department of Commerce, 1986, p. 2).

THE NEW JERSEY GEODETIC CONTROL NETWORK

Accurate control systems are essential for topographic and planimetric mapping, determination of boundaries, and management of utilities and resources. The use of geodetic control has been gradually adopted by private surveyors so that now land surveys based upon geodetic positions are commonplace except in the most remote settings. In addition, control survey networks are essential in aerial photography for aerotriangulation, rectification, and production of accurate aerial photograph mosaics.

Under legislation passed in 1807, Ferdinand Hassler established the first Federal control network in 1816. New Jersey was chosen as the location of the first base line for coastal triangulation arcs because of its central position along the coast.

In 1864, when the need for accurate maps of New Jersey became apparent, Edward Bowser, Assistant in the U.S. Coast Survey, began triangulation which eventually formed the basis for the New Jersey State Atlas. The cost of this work was borne entirely by the Federal Government. When it was completed in 1887, a total of 458 geographic positions had been established. All triangulation points determined before 1880 had been computed on the Bessel spheroid. The adoption of the 1866 Clarke spheroid in 1880 made it necessary to recompute the positions of many stations.

The need for a uniform survey base led, in the 1930's, to the formation of control surveys under the auspices of the US Coast and Geodetic Survey in many states. In New Jersey a program was sponsored by the Civil Works Administration from 1933 to 1934, the Emergency Relief Administration until 1935, then reorganized under the Works Progress Administration in 1935 and sponsored by the New Jersey Department of Conservation and Development until 1938. Maintenance of the geodetic survey was the responsibility of the Topographic Engineer of the New Jersey Geological Survey until 1987, when it was transferred to the New Jersey Department of Transportation.

Both national and local control networks were designed to a level of error indiscernible in traditional transit-and-tape surveys. As use of modern equipment increassed however, surveyors began to criticize the control systems as inaccurate, especially for surveys connecting separate control traverses. Accurate positioning on triangulation stations using earth satellites also indicated discrepancies. Limitations of the original surveys have been compounded by distortion induced by manipulations for best fit (Dracup, 1977, p. 5).

The original specifications for second-order traversing called for closure ratios no larger than 1:10,000. Many New Jersey Geodetic Control Survey traverses reached ratios of 1:40,000 or more, although they were still classified as second-order because the precision necessary for first-order work had not been obtained. As a result of upgrading of specifications in 1974 (Federal Geodetic Control Committee, 1975, revised 1980), New Jersey traverses with errors of closure larger than 1:20,000 must now be considered third-order. Readjustment of the primary national network to the North American Datum of 1983 (NAD 83) will improve the system. A complete upgrading of the Statewide control survey network may, however, be necessary in the future.

Geodetic Station Markings and Abbreviations

MON. - Monument, DK. - DISK: A standard U.S. Coast and Geodetic Survey and State Survey disk or New Jersey Geodetic Control Survey disk of bronze or aluminum set in a concrete post, pavement, curb, bedrock or similar firm base, stamped with a reference number, and used for both horizontal and vertical control.
A number of New Jersey Geodetic Control Survey monuments were moved and reset with the old disk utilized in a new position. Letters were stamped after the serial numbers to indicate the direction of position change. The letter "A" after a number indicates that the elevation was changed, but the monument was reset on the horizontal ties, saving the original coordinates. The letter "X" indicates that the horizontal position (and, of course, the elevation) were changed. This practice has been discontinued.

PT. - Point: A State highway, riparian, city, etc., survey marker represented by a chiseled cross, punch hole, brass plug, etc., used for horizontal and vertical control. These stations are not marked, but if there is an enclosing box, the rim may be stamped with a number.

RV. - Rivet: A standard monel-metal rivet set by the New Jersey Geodetic Control Survey, used for vertical control.

MK. - Mark: Same as "point," but used only for vertical control. These stations have designations preceded by "MK." On some marks, the digits following "MK." represent a serial number. On older marks, the digits are an elevation which may be superseded. In order to determine if the elevation is currently accepted, it is necessary to refer to the description.

(C&S) D.C.D. - Department of Conservation and Development (New Jersey Geodetic Control Survey)

H.C.E. - Hudson County Engineering Department

MAP CONTROL STA. - United States Army Engineers mapping control station

N.G.S. - United States National Geodetic Survey

N.J. - New Jersey State Highway Department

N.J.D.C.D.-G.C.S. - New Jersey Dept. of Conservation and Development, Geodetic Control Survey

N.J.D.W.S.C. - North Jersey District Water Supply Commission

N.J.G.C.S. - New Jersey Geodetic Control Survey

N.O.S. - United States National Ocean Survey

RIPARIAN - Riparian Streams and Waterways Survey

RV#(D.L.R.R.) - United States National Geodetic Survey (Delaware, Lackawanna and Western Railroad)

RV#(E.R.R.) - United States National Geodetic Survey (Erie Railroad)

RV#(N.Y.S.R.R.) - United States National Geodetic Survey (New York Susquehanna and Western Railroad)

U.S.C.E. - United States (Army) Corps of Engineers

U.S.C.S. & S.S. - United States Coast and Geodetic Survey and State Survey

U.S.E. - United States Engineering Department

U.S.G.S. - United States Geological Survey

W.B. - United States Weather Bureau

Geodetic Station Preservation *

Over the past 150 years, State and Federal geodetic surveys have determined with great accuracy the positions of survey points throughout New Jersey. At each point a bronze or aluminum disk is embedded in concrete, bedrock, or in a substantial structure or crimped to the top of a metal rod driven into the ground. More than thirteen thousand of these markers have been placed.

The disks, about 3-1/2 inches in diameter, mark survey points for latitude and longitude, State plane coordinates, elevation, gravity, and azimuth. They are used by engineers, surveyors and mapping agencies as the basis for maps, charts, local survey controls, boundary surveys, and for various public and private engineering projects. The cost of surveying and placing a single disk may be as much as several thousand dollars depending on the type of survey, its accuracy, and proximity to other survey monuments.

Resurveying operations throughout the state show destruction of thousands of Federal and State permanent survey marks. To improve this situation, the National Oceanic and Atmospheric Administration (NOAA) and the New Jersey Geodetic Control Survey ask the cooperation of the public.

Preservation of these marks can be accomplished by following these suggestions:

1. Never remove or disturb a survey marker unless authorization is obtained from the National Geodetic Survey, or in the case of a State mark, the New Jersey Geodetic Control Survey. If a mark is removed or displaced, its value as a survey point is lost and expensive resurveying is usually required.
2. If a mark appears in danger of destruction or damage by erosion, construction, or other causes, please take appropriate steps to preserve it. For example, if danger is from construction, call it to the attention of the foreman or flag the mark by stakes. A valuable public service is performed by those who help preserve survey markers.
3. In all cases, please report actions or findings by letter or telephone to:

   National Geodetic Survey
   National Oceanic and Atmospheric Administration
   Rockville, MD 20852
   (301) 443-8319 (collect calls accepted)

or N.J. Department of Transportation
   Engineering and Operations
   Roadway Geodetic Survey Section
   1035 Parkway Avenue, CN 600
   Trenton, NJ 08625
   (609) 530-5641

PLANE COORDINATE SYSTEMS

Complex computational procedures prevent the use in most cadastral and topographic surveys of geographic coordinates which account for the curvature of the earth. Instead plane coordinate systems covering limited areas are used. Prior to 1933, projections were based upon a plane tangent to the earth, and accuracy diminished rapidly with distance from central meridians. Individual states had as many as 21 different origins. Surveys in regions where projections overlapped required cumbersome transformation equations and expenses were burdensome.

In 1933 the North Carolina Highway Commission asked the U.S. Coast and Geodetic Survey to investigate plane coordinate projection systems that would cover large areas without great sacrifice of accuracy. O. S. Adams, Senior Mathematician in the Division of Geodesy, developed a Lambert conformal conic projection which covered the entire State of North Carolina with a single central meridian and scale departure of slightly more than 1:10,000. North Carolina, with its east-west orientation, was especially suited for the Lambert projection. Using New Jersey, Adams then developed a system based on the transverse Mercator projection for States oriented north-south.

Shortly after the development of these projection systems, the Civil Works Administration came into being. Work on computations was expedited, and by early 1934 plane coordinate projection information was available for the entire country (Adams, 1937, p. 10-16).

Philip Kissam of Princeton University, technical advisor to the New Jersey Geodetic Control Survey from 1933 to 1935, actively promoted the use of plane coordinate systems and wrote the first legislative act on plane coordinates in this country. Opposition came from representatives of title companies who feared that property descriptions would become unnecessarily and dangerously abbreviated if they were based solely upon the coordinates of land corners. To meet these objections, the final draft contained a provision excluding real-estate transactions from any

*modified from National Geodetic Survey Information Flyer 85-7 requirement to accept descriptions based wholly upon coordinate values.

The New Jersey Plane Coordinate System was originally based on NAD 27 (below). A revision of this system, with changes in the transverse Mercator projection to conform with NAD 83, was legally adopted in 1989.

NEW JERSEY PLANE COORDINATE SYSTEM (NAD 27)

51:3-7. Official survey base established; plane coordinates

The official survey base for New Jersey shall be a system of plane coordinates to be known as the New Jersey system of plane coordinates, said system being defined as a transverse Mercator projection of Clarke's spheroid of 1866, having a central meridian 74° 40′ west from Greenwich on which meridian the scale is set at one part in 40,000 too small. All coordinates of the system are expressed in feet, the x coordinate being measured easterly along the grid and the y coordinate being measured northerly along the grid, the origin of the coordinates being on the meridian 74° 40′ west from Greenwich at the intersection of the parallel 38° 50′ north latitude, such origin being given the coordinates x = 2,000,000 feet; y = 0 feet. The precise position of said system shall be as marked on the ground by triangulation or traverse stations established in conformity with the standards adopted by the United States Coast and Geodetic Survey for first- and second-order work, whose geodetic positions have been rigidly adjusted on the North American datum of 1927, and whose plane coordinates have been computed on the system defined.

51:3-8. Connecting property surveys with system of coordinates

Any triangulation or traverse station established as described in section 51:3-7 of this title may be used in establishing a connection between a property survey and the above-mentioned system of rectangular coordinates.

51:3-9. Endorsement of surveys

No survey of lands hereinafter made shall have endorsed thereon any legend or other statement indicating that it is based upon the New Jersey system of plane coordinates unless the coordinates have been established on that system as herein defined.

51:3-10. Reliance wholly on system not required

Nothing in this article contained shall be interpreted as requiring any purchaser or mortgagee to rely on a description based wholly upon the aforesaid system.

NEW JERSEY PLANE COORDINATE SYSTEM (NAD 83)

1. R.S. 51:3-7 is amended to read as follows:

51:3-7. The official survey base for New Jersey shall be a system of plane coordinates to be known as the New Jersey system of plane coordinates, said system being defined as a transverse Mercator projection of the Geodetic Reference System of 1980, having a central meridian 74° 30′ west from Greenwich on which meridian the scale is set at one part in 10,000 too small.

All coordinates of the system are expressed in meters, the x coordinate being measured easterly along the grid and the y coordinate being measured northerly along the grid, the origin of the coordinates being on the meridian 74° 30′ west from Greenwich at the intersection of the parallel 38° 50′ north latitude, such origin being given the coordinates x = 150,000 meters; y = 0 meters. The precise position of said system shall be as marked on the ground by triangulation or traverse stations established in conformity with the standards adopted by the National Geodetic Survey formerly the United States Coast and Geodetic Survey for first- and second-order work, whose geodetic positions have been rigidly adjusted on the North American Datum of 1983, and whose plane co-ordinates have been computed on the system defined.

2. R.S. 51:3-8 is amended to read as follows:

51:3-8. Any triangulation or traverse station established as described in section 51:3-7 of this title shall be used in establishing a connection between a property survey and the above mentioned system of rectangular coordinates.

3. This act shall take effect immediately.

As part of a 1903-1908 survey of New York City by the U.S. Coast and Geodetic Survey, systems of local plane coordinates were established for the various boroughs. The following materials enable the user to convert coordinates on the Bogart, Memorial Church (Spire) and Prospect Water Tower tangent plane coordinate systems to approximate New Jersey Plane Coordinates (NAD 27).

Bogart Grid*

The Bogart grid origin is Triangulation Station BOGART 1885 on Staten Island, NY. It covers the northeast shore of Staten Island, Ellis Island, Bergen Point and Constable Hook, parts of the Hackensack and Passaic Rivers, and Raritan Bay. It may also have been used on some northern Atlantic Coast rivers in New Jersey.

Coordinates were expressed in meters and feet N and S, and E and W of this point (N being positive, S negative, E negative, and W positive). These values are published in "A Report on the Triangulation of Greater New York" (U.S. Coast and Geodetic Survey, ca. 1909).

At some later date, the x = 0 and y = 0 local coordinates assigned to BOGART were changed to x = 20,250 ft N and y = 20,350 ft E. The resulting coordinates (x and y) for all stations are thus placed in the SW quadrant and are expressed as W and S.

Conversion of Bogart system coordinates to approximate New York Long Island zone and New Jersey zone plane coordinates on NAD 27 is reproduced below.

Where the coordinates are given in the original format (x and y), the new values are computed as follows:

$$x_{[original]} = 20{,}250.00 + x_{[new]} = W$$

$$y_{[original]} = 20{,}350.00 - y_{[new]} = S$$

To determine the scale and rotation elements of the conversion formulas, geodetic inverses resulting in geodetic lengths and azimuths were computed from BOGART to all stations of the 1903-1908 triangulation which were considered part of the Borough of Richmond (BOGART) system. The geographic positions were the original values computed on the U.S. Standard Datum, which became the North American Datum in 1913 without any changes to the positions computed previously. Similar computations were carried out, using the positions for the same stations computed on the North American 1927 Datum. Only one station (ASBURY CHURCH) of the original Borough of Richmond survey was not recomputed on the North American 1927 Datum.

Based on 40 computations, the average change to the North American Datum orientation or azimuth to obtain North American 1927 Datum values was +5".0 (with a range of +2".34 to +9".14). Similarly, the average change in scale amounted to minus one part in 33,337, which expressed as a scale factor is 0.999970033. Two length comparisons were rejected; thus the average change in scale is based on 38 computations, which range from minus one part in 12,328 to minus one part in 77,982.

For the conversion to New York Long Island zone plane coordinates, the formulas also included the '0' (or mapping angle) on the NYLI system for BOGART and a scale factor of 1.0000043. This scale factor is that for station BOGART on the NYLI system; and since the station is about at the mid-latitude for the network, it is entirely satisfactory.

The formulas to convert BOGART coordinates to approximate values on the NYLI zone system are:

$$x = 1{,}988{,}023.75 - 0.99997339\,W - 0.00135012\,S$$
$$y = 157{,}512.14 + 0.00135012\,W - 0.99997339\,S$$

NYLI zone plane coordinates derived through these formulas show that where calculations could be made, agreements were obtained within ±0.5 ft in x and y, and in most instances considerably better. However, there may be occasions where the coordinates at some distance from the origin (BOGART) could differ by one foot or more.

The general formulas to convert BOGART coordinates to approximate New Jersey State plane coordinates follow. These formulas were developed from the data described previously. In these formulas a scale factor of 0.9999919, based on a mean x' of 121,400 feet on the New Jersey State system and the "$\Delta\alpha$" (or mapping angle) for BOGART on the New Jersey State system, were included.

$$x = 2{,}172{,}995.41 - 0.99994982\,W + 0.00622879\,S$$
$$y = 665{,}202.79 - 0.00622879\,W - 0.99994982\,S$$

From the available evidence, it would appear for points at the limits to which BOGART coordinates have been extended in New Jersey (70,000 W and 50,000 S or N of the origin) that the computed values should agree with New Jersey State coordinates

* modified from J. F. Dracup (National Geodetic Survey, written communication, 1976)

within +1 foot in x and y. Formulas for particular quadrants, which give somewhat better agreements with New Jersey State coordinates, have been provided by the National Geodetic Survey to users in the past and are available to others on request. However, in order to keep the entire problem in a simple perspective, it is recommended the general formulas given here for converting BOGART coordinates to both the NYLI and New Jersey State plane systems be employed.

Memorial Church and Prospect Water Tower Grids*

The Memorial Church grid origin is Triangulation Station Memorial Church Spire in Manhattan, New York City; it covers parts of the Hudson River south of Palisades Park. The Prospect Water Tower grid origin is Triangulation Station Prospect Water Tower, adjacent to the Brooklyn Botanical Gardens. It covers parts of Upper New York Bay and the Hudson River.

The tables here are for plotting information furnished by the U.S. Engineers on U.S. Coast and Geodetic Survey charts [NAD 27]. U.S. Engineer survey prints are referred to a local origin on a tangent plane system. It is necessary to determine a relationship between these local coordinates and the various state plane coordinates in order to make use of the information on U.S. Coast and Geodetic Survey charts. The relationship shown in these tables is not the result of a rigid transfer but is based upon relatively simple formulas which give results which are adequate for plotting purposes.

In the body of the tables, X and Y represent the state plane coordinates on the designated grid; x and y represent the coordinates on the local system referred to the designated origin.

Example of the use of the tables

For a typical example of the use of tables 2, 3, 4 and 5, refer to U.S. Engineer survey print dated January 7, 14, 17 and 27, 1949, covering the Red Hook Channel in the Upper New York Harbor, numbered 2. The area covered by these prints will fall upon U.S. Coast and Geodetic Survey Chart no. 12334 and the given coordinates on the print are referred to the origin Memorial Church. The tables for the Origin: Memorial Church, Grid: Long Island table 5 therefore, are to be used.

Orienting the print with north at the top, the local coordinates of the lower left or southwest intersection are, x = 18,500 W, y = 43,000 S, or x = -18,500, y = -43,000. Going into the body of the table, the tabulated value for the local coordinates nearest to this intersection is

x = -21,887.01
y = -42,928.22

These local coordinates correspond to

X = 1,990,000
Y = 160,000

which lies outside of the area of the print, considerably to the west of the border. The even thousand intersection, which can be plotted, must lie within four inches or, at the scale of one inch to 100 feet, within 400 feet west of the southwest local intersection. As the Xs and Ys differ by approximately the same amount of state and local grids this intersection is found to be

X = 1,993,000
Y = 160,000

That is, by adding a round 3,000 to the tabulated x, a coordinate of -18,887 is obtained, which is within the desired limit. Then by inspecting the area of the sheet it is easily determined that the four State coordinate intersections to control the sheet will be

(1) X = 1,993,000, Y = 160,000
(2) X = 1,993,000, Y = 162,000
(3) X = 1,995,000, Y = 162,000
(4) X = 1,995,000, Y = 160,000

Using the table of Proportional Parts, the local coordinates of these four intersections are found by a double linear interpolation as follows:

(1)		x	y
	(X=3,000)	+ 3,000.00	-1.47
	(Y= 0)	0.00	0.00
		+ 3,000.00	-1.47
Tabular		-21,887.01	-42,928.22
		-18,887	-42,930
		18,887 W	42,930 S

(2)		x	y
	(X=3,000)	+ 3,000.00	-1.47
	(Y=2,000)	+0.98	+2,000.00
		+ 3,000.98	+1,998.53
Tabular		-21,887.01	-42,928.22
		-18,886	-40,930
		-18,886 W	-40,930 S

*modified from Belote (1947)

Table 2. Values for origins of Prospect Water Tower and Memorial Church tangent plane grids (from Belote, 1947).

Origin Grid	Longitude and Latitude (N.A. 1927 Datum)	$\bar{X}$ $\bar{Y}$	G	Sin G Cos G	x-$\bar{X}$Cos G-$\bar{Y}$Sin G y-$\bar{X}$Sin G-$\bar{Y}$Cos G	$\bar{x}$ $\bar{y}$
Prospect Water Tower	40°40'20''.334	2,193,873.94	+0 27 19.837	+0.00795 00704	-2,199,136.154	0.00
New Jersey	73°58'03''.950	670,628.72		+0.99996 83977	-653,166.074	0.00
Memorial Church	40°46'57''.150	2,196,492.67	+0 27 48.4568	+0.00808 88186	-2,202,170.427	0.00
New Jersey	73°57'25''.754	710,810.21		+0.99996 72850	-693,019.925	0.00

Table 3. Memorial Church grid transformation tables, New Jersey (from Belote, 1947).

ORIGIN: Memorial Church GRID: New Jersey

X	2,160,000		2,170,000		2,180,000	
Y	x	y	x	y	x	y
620,000	-37,226.02	-90,512.06	-27,226.35	-90,592.94	-17,226.68	-90,673.83
630,000	145.14	80,512.38	145.46	80,593.27	145.79	80,674.16
640,000	-37,064.25	70,512.71	-27,064.57	70,593.60	-17,064.90	70,674.49
650,000	-36,983.36	60,513.04	-26,983.69	60,593.93	-16,984.01	60,674.81
660,000	902.47	60,513.37	902.80	50,594.25	903.12	50,675.14
670,000	821.58	40,513.69	821.91	40,594.58	822.24	40,675.47
680,000	740.69	30,514.02	741.02	30,594.91	741.35	30,675.80
690,000	659.81	20,514.35	660.133	20,595.23	660.46	20,676.12
700,000	578.92	10,514.67	579.24	10,595.56	579.57	10,676.45
710,000	498.03	-515.00	498.36	-595.89	498.68	-676.78
720,000	417.14	+9,484.67	417.47	+9,403.79	417.80	+9,322.90
730,000	336.25	19,484.34	336.58	19,403.46	336.91	19,322.57
740,000	255.36	29,484.02	255.69	29,403.13	256.02	29,322.24
750,000	-36,174.48	39,483.69	-26,174.80	39,402.20	-16,175.13	39,321.91

PROPORTIONAL PARTS

ΔX/ΔY	Δx/Δy	−Δx/Δy
1,000	999.97	8.09
2,000	1,999.93	16.18
3,000	2,999.90	24.27
4,000	3,999.87	32.36
5,000	4,999.84	40.44
6,000	5,999.80	48.53
7,000	6,999.77	56.62
8,000	7,999.74	64.71
9,000	8,999.71	72.80
10,000	9,999.67	80.89

Table 4. Prospect Water Tower grid transformation tables, New Jersey (from Belote, 1947).

ORIGIN: Prospect Water Tower GRID: New Jersey

X	2,100,000		2,110,000		2,120,000		2,130,000	
Y	x	y	x	y	x	y	x	y
630,000	-94,193.97	-39,881.13	-84,194.29	-39,960.63	-74,194.61	-40,040.13	-64,194.92	-40,119.63
640,000	114.47	29,881.45	114.79	29,960.95	115.11	30,040.45	115.42	30,119.95
650,000	-94,034.97	19,881.76	-84,035.29	19,961.26	-74,035.61	20,040.76	-64,035.92	20,120.27
660,000	-93,955.47	-9,882.08	-83,955.79	-9,961.58	-73,956.10	10,041.08	-63,956.42	10,120.58
670,000	875.97	117.60	876.29	+38.10	876.60	-41.40	876.92	-120.90
680,000	-93,796.47	-10,117.29	-83,796.79	+10,037.79	-73,797.10	+9,958.29	-63,797.42	+9,879.79

X	2,140,000		2,150,000		2,160,000		2,170,000	
Y	x	y	x	y	x	y	x	y
630,000	-54,195.24	-40,199.13	-44,195.55	-40,278.63	-34,195.87	-40,358.14	-24,196.19	-40,437.64
640,000	115.74	30,199.45	116.05	30,278.95	116.37	30,358.45	116.69	30,437.95
650,000	-54,036.24	20,199.77	-44,036.55	20,279.27	-34,036.87	20,358.77	-24,037.19	20,438.27
660,000	-53,956.74	10,200.08	-43,957.05	10,279.58	-33,957.37	10,359.08	-23,957.68	10,438.58
670,000	877.24	-200.40	877.55	-279.90	877.87	-359.40	878.18	438.90
680,000	-53,797.74	+9,799.29	-43,798.05	+9,219.79	-33,798.37	+9,640.28	-23,798.68	+9,560.78

PROPORTIONAL PARTS

ΔX/ΔY	Δx/Δy	-Δx/Δy
1,000	999.97	7.95
2,000	1,999.94	15.90
3,000	2,999.91	23.85
4,000	3,999.87	31.80
5,000	4,999.84	39.75
6,000	5,999.81	47.70
7,000	6,999.78	55.65
8,000	7,999.75	63.60
9,000	8,999.72	71.55
10,000	9,999.68	79.50

Table 5. Memorial Church grid transformation tables, Long Island, New York (from Belote, 1947).

ORIGIN: Memorial Church GRID: Long Island

X	1,970,000		1,980,000		1,990,000		2,000,000		2,010,000	
Y	x	y	x	y	x	y	x	y	x	y
120,000	-41,906.57	-82,918.43	-31,906.57	-82,923.32	-21,906.57	-82,928.21-	-11,906.58	-82,933.11	-1,906.58	-82,938.00
130,000	901.68	-72,918.43	901.68	-72,923.32	901.68	-72,928.22	901.68	-72,933.11	901.68	-72,938.00
140,000	896.79	-62,918.43	896.79	-62,923.33	896.79	-62,928.22	896.79	-62,933.11	896.79	-62,938.00
150,000	891.90	-52,918.44	891.90	-52,923.33	891.90	-52,928.22	891.90	-52,933.11	891.90	-52,938.00
160,000	887.01	-42,918.44	887.01	-42,923.33	887.01	-42,928.22	887.01	-42,933.11	887.01	-42,938.00
170,000	882.12	-32,918.44	882.12	-32,923.33	882.12	-32,928.22	882.12	-32,933.11	882.12	-32,938.00
180,000	877.22	-22,918.44	877.23	-22,923.33	877.23	-22,928.22	877.23	-22,933.11	877.23	-22,938.00
190,000	872.33	-12,918.44	872.33	-12,923.33	872.34	-12,928.22	872.34	-12,933.11	872.34	-12,938.01
200,000	867.44	-2,918.44	867.44	-2,923.33	867.44	-2,928.22	867.45	-2,933.12	867.45	-2,938.01
210,000	862.55	+7,081.56	862.55	+7,076.67	862.55	+7,071.77	862.55	+7,066.88	862.56	+7,061.99
220,000	857.66	17,081.56	857.66	17,076.66	857.66	17,071.77	857.66	17,066.88	857.66	17,061.00
230,000	852.77	27,081.55	852.77	27,076.66	852.77	27,071.77	852.77	27,066.88	852.77	27,061.99
240,000	847.88	37,081.55	847.88	37,076.66	847.88	37,071.77	847.88	37,066.88	847.08	37,061.99
250,000	-41,842.99	+47,081.55	-31,842.99	+47,076.66	-21,842.99	+47,071.77	-11,842.99	+47,066.88	-1,842.99	+47,061.99

X	2.020,000		2,030,000		2,040,000		2,050,000		2,060,000	
Y	x	y	x	y	x	y	x	y	x	y
120,000	+8,093.42	-82,942.89	+18,093.42	-82,947.78	+28,093.42	-82,952.67	+38,093.42	-82,957.56	+48,093.42	-82,962.45
130,000	098.31	-72,942.89	098.31	-72,947.78	098.31	-72,952.67	098.31	-72,957.56	098.31	-72,962.45
140,000	103.20	-62,942.89	103.20	-62,947.78	103.20	-62,952.67	103.20	-62,957.56	103.20	-62,962.46
150,000	108.10	-52,942.89	108.09	-52,947.78	108.09	-52,952.67	108.09	-52,957.57	108.09	-52,962.46
160,000	112.99	-42,942.89	112.99	-42,947.78	112.98	-42,952.68	112.98	-42,957.57	112.98	-42,962.46
170,000	117.88	-32,942.89	117.88	-32,947.79	117.88	-32,952.68	117.87	-32,957.57	117.87	-32,962.46
180,000	122.77	-22,942.90	122.77	-22,947.79	122.77	-22,952.68	122.77	-22,957.57	122.76	-22,962.46
190,000	127.66	-12,942.90	127.66	-12,947.79	127.66	-12,952.68	127.66	-12,957.57	127.66	-12,962.46
200,000	132.55	-2,942.90	132.55	-2,947.79	132.55	-2,952.68	132.55	-2,957.57	132.55	-2,962.46
210,000	137.44	7,057.10	137.44	7,052.21	137.44	7,047.32	137.44	7,042.43	137.44	7,037.53
220,000	142.33	17,057.10	142.33	17,052.21	142.33	17,047.32	142.333	17,042.43	142.33	17,037.53
230,000	147.23	27,057.10	147.22	27,052.21	147.22	27,047.32	147.22	27,042.42	147.22	27,037.53
240,000	152.12	37,057.10	152.12	37,052.21	152.11	37,047.31	152.11	37,042.42	152.11	37,037.53
250,000	+8,157.01	47,057.10	+18,157.01	47,052.20	+28,157.01	47,047.31	+38,157.00	47,042.42	+48,157.00	47,037.53

PROPORTIONAL PARTS

ΔX/ΔY	Δx/Δy	−Δx/Δy
1,000	1,000.00	0.49
2,000	2,000.00	0.98
3,000	3,000.00	1.47
4,000	4,000.00	1.96
5,000	5,000.00	2.45
6,000	6,000.00	2.93
7,000	7,000.00	3.42
8,000	8,000.00	3.91
9,000	9,000.00	4.40
10,000	10,000.00	4.89

(3)	x	y
(X=5,000)	+5,000.00	-2.45
(Y=2,00)	+0.98	+2,000.00
	+5,000.98	+1,997.55
Tabular	-21,887.01	-42,928.22
	-16,886	-40,931
	16,886 W	40,931 S

(4)	x	y
(X=5,000)	+5,000.00	-2.45
(Y= 0)	0.00	0.00
	+5,000.00	-2.45
Tabular	-21,887.01	-42,928.22
	-16,887	-42,931
	16,887 W	42,931 S

From these values the intersections may be plotted and the sheets used in conjunction with the chart.

Theory of the tables and formulas

The relationships shown in these tables are found by superimposing the small local system on the State coordinate grid. Disregarding all difference in datums, the origin of the local tangent plane is given the coordinates corresponding to its geographic position on the North American 1927 datum. The axes of the local plane are then rotated until they coincide at the point with the line on the state projection which represents the meridian through the local origin.

(X, Y) = state coordinates of the local origin
(X, Y) = state coordinates of the point P (x, y)
= local coordinates of the local origin (x, y)
= local coordinates of the point P
G = the angle of rotation, usually the mapping angle at the origin on the state grid

(X -Y) = (x - x) cos G - (y - y) sin G (Y -Y)
= (x - x) sin G + (y - y) cos G (x -x)
= (X - X) cos G + (Y - Y) sin G (y -y)
= (X - X) sin G + (Y - Y) cos G

or

$$x = (x - X\cos G - Y\sin G) + X\cos G + Y\sin G$$

$$y = (y + X\sin G - Y\cos G) - X\sin G + Y\cos G$$

Delaware River 1939 Grid

For information on the Delaware River 1939 grid contact:

U.S. Corps of Engineers
Philadelphia District
U.S. Custom House Building
2nd and Chestnut Streets
Philadelphia, PA, 19106
Attention: Survey Branch

MAGNETIC DATA

The first magnetic survey of New Jersey was a declination survey by the New Jersey Geological Survey in 1887. This work clearly showed the widespread irregularities in the northern part of the State. In his report on this survey, Cook (1888, p. 324) states "While the compass must still be used in retracing old lines, the teaching of the irregularities of magnetic declination shown by the isogonic chart and list of declinations, of the notes on magnetic disturbances, and those on instrumental defects, is clearly that no new surveys should be recorded by reference to the magnetic needle alone. The time has come when its use for this purpose should be discontinued throughout the greater part of the State." This statement could appropriately be included in any contemporary surveying journal.

In other surveys of magnetic field orientation, the U.S. Coast and Geodetic Survey made complete observations at eighty stations throughout the State, mostly between 1904 and 1914, and the New Jersey Geodetic Control Survey measured declination at several stations between 1934 and 1938.

Because magnetic declination does not vary consistently, it is impossible to cite the precise value at a specific point unless it is measured there. Lacking actual observations, the best estimate may be obtained from the latest isogonic chart of the United States. The values shown on these charts are intended to represent the average of diurnal and irregular fluctuations over several days. In a region free from magnetite the 'probable error' of a value scaled from an isogonic chart is one-half degree or less.

Daily variation of declination in New Jersey is characterized by an easterly motion of the north end of the needle in the morning, with an easterly extreme about 8 or 9 am, local time; then a westerly motion, with a westerly extreme about 1 or 2 pm; and then an easterly motion for several hours. From dusk to the

Table 6. Values of magnetic declination (modified from National Geophysical Data Center, 1982).

LATITUDE	38	39	39	40	40	40	40	41	41	41	41	42	42	42	42
LONGITUDE	76	75	76	73	74	75	76	73	74	75	76	73	74	75	76
YEAR	Deg. Min.	Deg. Min.	Deg. Min.	Deg. Min.	Deg. Min.	Deg. Min.	Deg. Min.	Deg. Min.	Deg. Min.	Deg. Min.	Deg. Min.	Deg. Min.	Deg. Min.	Deg. Min.	Deg. Min.
1750	2 17W	3 22W	2 58W	4 57W	4 31W	4 06W	3 42W	5 43W	5 19W	4 54W	4 29W	6 32W	6 10W	5 45W	5 20W
1760	1 40	2 45	2 19	4 23	3 54	3 27	3 02	5 09	4 41	4 14	3 48	5 57	5 30	5 04	4 38
1770	1 08	2 15	1 46	3 58	3 25	2 56	2 28	4 43	4 11	3 41	3 12	5 32	5 00	4 30	4 00
1780	0 44	1 52	1 20	3 42	3 04	2 31	1 59	4 26	3 49	3 15	2 42	5 14	4 37	4 02	3 28
1790	0 28	1 39	1 03	3 35	2 54	2 17	1 41	4 19	3 39	3 00	2 23	5 07	4 26	3 47	3 08
1800	0 22	1 36	0 55	3 39	2 54	2 12	1 32	4 23	3 38	2 55	2 13	5 10	4 24	3 41	2 58
1810	0 25	1 42	0 58	3 51	3 02	2 17	1 34	4 35	3 46	3 00	2 15	5 22	4 32	3 45	2 59
1820	0 37	1 57	1 10	4 11	3 20	2 32	1 46	4 56	4 04	3 15	2 27	5 44	4 51	4 01	3 11
1830	0 58	2 21	1 31	4 41	3 48	2 57	2 08	5 26	4 32	3 41	2 49	6 15	5 19	4 26	3 34
1840	1 27	2 53	2 01	5 18	4 23	3 30	2 38	6 04	5 08	4 14	3 20	6 54	5 56	5 01	4 06
1850	2 03	3 31	2 37	5 59	5 03	4 08	3 14	6 46	5 49	4 53	3 57	7 36	6 37	5 40	4 43
1860	2 40	4 09	3 14	6 39	5 42	4 46	3 52	7 26	6 28	5 31	4 35	8 17	7 17	6 19	5 21
1870	3 20	4 49	3 54	7 16	6 21	5 26	4 32	8 03	7 07	6 11	5 15	8 54	7 56	6 58	6 01
1880	3 58	5 27	4 34	7 51	6 59	6 05	5 13	8 40	7 47	6 52	5 58	9 32	8 37	7 41	6 46
1890	4 31	5 58	5 07	8 20	7 29	6 37	5 46	9 08	8 16	7 23	6 31	10 00	9 06	8 12	7 19
1900	5 08	6 34	5 44	8 54	8 04	7 13	6 23	9 43	8 51	7 59	7 08	10 34	9 41	8 48	7 56
1905	5 28	6 57	6 04	9 20	8 28	7 35	6 44	10 08	9 15	8 22	7 29	10 59	10 05	9 11	8 18
1910	5 52	7 22	6 28	9 48	8 54	8 01	7 08	10 36	9 41	8 48	7 54	11 27	10 31	9 37	8 42
1915	6 14	7 46	6 51	10 14	9 20	8 25	7 32	11 03	10 07	9 13	8 18	11 54	10 57	10 02	9 07
1920	6 29	8 02	7 07	10 33	9 38	8 42	7 48	11 22	10 26	9 30	8 35	12 13	11 16	10 20	9 24
1925	6 50	8 25	7 29	10 58	10 02	9 06	8 11	11 47	10 50	9 54	8 58	12 38	11 41	10 45	9 48
1930	7 08	8 44	7 48	11 19	10 22	9 26	8 30	12 07	11 10	10 14	9 17	12 57	12 00	11 04	10 07
1935	7 21	8 57	8 00	11 33	10 36	9 39	8 42	12 20	11 23	10 27	9 29	13 10	12 13	11 16	10 19
1940	7 20	8 57	7 59	11 34	10 37	9 39	8 41	12 22	11 24	10 26	9 28	13 12	12 14	11 16	10 18
1945	7 22	9 00	8 01	11 38	10 40	9 40	8 42	12 25	11 26	10 28	9 28	13 15	12 15	11 17	10 16
1950	7 21	8 58	7 59	11 36	10 37	9 38	8 38	12 21	11 22	10 23	9 23	13 09	12 09	11 10	10 09
1955	7 28	9 03	8 04	11 40	10 41	9 41	8 42	12 24	11 25	10 25	9 25	13 10	12 10	11 11	10 10
1960	7 38	9 12	8 13	11 46	10 48	9 49	8 50	12 29	11 31	10 32	9 32	13 14	12 15	11 16	10 16
1965	7 55	9 25	8 28	11 54	10 58	10 01	9 03	12 35	11 38	10 41	9 42	13 18	12 21	11 23	10 24
1970	8 15	9 42	8 45	12 05	11 10	10 14	9 18	12 43	11 48	10 52	9 55	13 23	12 28	11 31	10 33
1975	8 43	10 05	9 11	12 21	11 29	10 35	9 42	12 57	12 04	11 10	10 16	13 34	12 41	11 47	10 52
1980	9 18	10 36	9 45	12 45	11 55	11 04	10 14	13 17	12 28	11 37	10 45	13 52	13 02	12 11	11 19
1985	9 53W	11 06W	10 18W	13 08W	12 21W	11 33W	10 45W	13 38W	12 51W	12 03W	11 14W	14 10W	13 23W	12 35W	11 45W

early morning there is little change. The average amplitude of the swing from morning to afternoon is usually between five and ten minutes of arc, being greater in summer than winter, and greater at the eleven-year peak of sunspot activity than at its nadir. Amplitude and timing of the extremes fluctuate daily..

Aside from this systematic daily variation, magnetic declination occasionally undergoes erratic fluctuations which, if sufficiently severe, constitute a magnetic storm. Surveys made during a magnetic storm may be as much as half a degree in error in the latitude of New Jersey. During a magnetic storm of September 18 and 19, 1941, fluctuations in this region were more than four degrees. A magnetic storm may last many hours (sometimes several days) and the more severe ones extend from pole to pole over the entire globe. They are usually associated with auroras and ionospheric phenomena; they have no apparent relation with the weather (U.S. Department of Commerce, 1948, p. 38-40).

Long-term changes in magnetic declination*

Long-term changes in magnetic declination cannot be predicted, nor can they be reduced to any simple mathematical law or formula. Values in the New Jersey magnetic tables presented here are derived from measurements in New Jersey and adjacent states. The U.S. National Geophysica Data Center periodically updates declination tables.

These tables give the estimated values of magnetic declination at each degree of latitude and longitude. Where available, the values are given from 1750 to 1900 at ten-year intervals, and from 1900 to the present at five-year intervals, in degrees and minutes of arc. Values for intervening years may be found by interpolation. Also, values for a few years beyond 1980 may be derived by extrapolation.

Values of declination from 1972.5 have been obtained using the data models used to prepare U.S.G.S. Map I-1283, Magnetic Declination in the United States, 1980.0 (Fabiano and Peddie, 1980). Values from 1967.5 through 1972.5 were obtained from models used to prepare U.S.G.S. Map I-911, Magnetic Declination in the United States, 1975.0 (Fabiano, E.B., 1975). Values from 1955 through 1967.5 were derived using unpublished data. Values prior to 1955 were derived using the source data of table 4 of Coast and Geodetic Survey Publication 40-2, United States Magnetic Tables for 1960 (Svendsen, 1962).

The accuracy of the 1980 values is generally within 20 minutes, but natural or artificial disturbance could cause differences of several degrees. The values of declination have been given to the nearest minute so that secular change may be properly illustrated.

The accuracy of the secular change for the most recent decades is probably within two minutes for a ten-year period. For the earlier part of the table, the secular change is less reliable.

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* modified from "State Tables of Magnetic Declination" (National Geophysical Data Center, 1982)

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SOURCES OF NEW JERSEY MAPS AND GEODETIC INFORMATION

The following listing is intended as a guide to sources for the many kinds of maps available for New Jersey. It does not, in most instances, include specific information on particular maps. The use of brand, commercial and trade names is for identification purposes only and does not constitute endorsement by the New Jersey Geological Survey.

AERIAL PHOTOGRAPHY AND SATELLITE IMAGERY

See also Map dealers

N.J. Department of Environmental Protection
Division of Coastal Resources
Planning Group
CN 401
Trenton, NJ 08625 (609) 984-0245

The Planning Group maintains an extensive, statewide archive of historic and recent aerial photography. This is a non-circulating collection, but arrangements can be made for copying.

N.J. Department of Transportation
Bureau of Cartography and Graphics
CN 600
Trenton, NJ 08625 (609) 530-2845

DOT has available diazo prints of numerous aerial photo sets taken for transportation projects or regional planning. For further information, request **New Jersey maps, materials and services available to the public.**

Earth Science Information Center (ESIC)
Mid-Continent Mapping Center
U.S. Geological Survey
1400 Independence Road.
Rolla, MO 65401 (703) 860-6045

Aerial Photography Summary Record System (APSRS): the standard reference base for users of aerial photography. It is an index to federal, state, municipal, and commercial aerial photography. All photographs listed in APSRS are available for purchase from the contributing agencies. For further information contact ESIC or the New Jersey Geological Survey (the New Jersey ESIC State Affiliate).

EOSAT (Earth Observation Satellite Company)
4300 Forbes Boulevard
Lanham, MD 20706 (301) 552-0500

A full range of Landsat photographic and digital products is listed in the EOSAT Landsat Products and Services catalog

In addition, aerial photography companies (in phone book), planning boards, county engineers' offices, and tax offices may have local photography.

AGRICULTURE

See also Soil surveys, Land use/land cover (State development and redevelopment plan)

N. J. Department of Agriculture
State Farmland Preservation Office
State Agricultural Development Committee
CN 330
Trenton, NJ 08625

Agricultural Development Areas: Periodically updated county maps based in information supplied by counties.

Farmland Preservation Tracts: Showing 8-year committments and lands committed in perpetuity.

U.S. Department of Agriculture
Soil Conservation Service
1370 Hamilton St.
Somerset, NJ 08873 (201) 246-1205

Important farmlands. Prepared in the 1970s for several counties on U.S. Geological Survey county planimetric base. Some at scale 1:100,000, others at 1:50,000.

AVIATION

See Transportation

BIBLIOGRAPHIES

See Indexes and general listings

BICYCLING, BOATING, CANOEING

See Recreation

CENSUS

Information on maps and other materials produced by the U.S. Bureau of the Census is in the **Census catalog and guide**, issued annually, for sale by the U.S. Government Printing Office, Washington DC 20402; (202) 783-3238. Collections of census materials are maintained at federal depository libraries. Alexander Library, Rutgers University, New Brunswick, has materials from the first U.S. census (1790) through the 1980 census.

COASTAL

See Fisheries, Nautical charts, Riparian lands and coastal wetlands, Floods and coastal storms

CUSTOM CARTOGRAPHIC SERVICES

Custom Cartographic Services, a nationwide list of companies which will make custom maps, charts, guides, or cartographic software, is available on request from the Earth Science Information Center (ESIC), U.S. Geological Survey, 507 National Center, Reston, VA 22092, or from the New Jersey Geological Survey (the ESIC state affiliate), CN 029, Trenton, NJ 08625; (609) 292-2576.

A wide variety of special-use Federal maps and map products (digital map data, color separates, photoquads, etc.) is available from the U.S. Geological Survey Mid-Continent Mapping Center (see "Topographic and Planimetric Maps").

Many aerial photography companies (in phone book) will make planimetric or topographic maps for special purposes.

DRAINAGE BASINS

See Lakes and streams

ELECTION DISTRICTS

N.J. Department of State
Election Division
CN 304
Trenton, NJ 08625

Legislative Districts 1982-1992: Political subdivision map of New Jersey showing legislative districts. Approximate scale 1:654,000. Lists municipalities by district.

N.J. Department of Law and Public Safety
Division of Legislative Information and Research
Office of Legislative Services
CN 042
Trenton, NJ 08625

Congressional Districts: Political subdivision map of New Jersey with congressional districts. Approximate scale 1:654,000. Lists municipalities by district.

Further information on legislative districts is in **New Jersey legislative district data book**, Rutgers University Bureau of Government Research, 1986. Includes maps of districts and county maps showing districts. Scale 1:500,000.

FISHERIES

See also Lakes and streams

N.J. Department of Environmental Protection
Division of Fish, Game and Wildlife
Freshwater Fisheries Laboratory
P.O. Box 394
Lebanon, NJ 08833

New Jersey Anadromous Fish Inventory, Spawning Run Confirmation Locations: 8.5x11-inch, black-and-white maps showing tributaries where shad and river herring spawn. Three sheets, updated periodically.

N.J. Department of Environmental Protection
Division of Fish, Game and Wildlife
Bureau of Marine Fisheries
Nacote Creek Research Station
Star Route
Absecon, NJ 08201

New Jersey Recreational and Commercial Ocean Fishing Grounds: Black-and-white map. Scale 1:500,000. Indicates fishing grounds for 32 species of fin fish and shellfish.

N.J. Department of Environmental Protection
Division of Water Resources
Bureau of Shellfish Control
Star Route
Absecon, NJ 08201

Shellfish Growing-Water Classification Charts: Restricted, seasonal, condemned and approved areas for the harvest of shellfish. Summary of yearly changes, explanatory text. Photoreduced from Intracoastal Waterway Charts, updated yearly. May be obtained from any shellfish agency, shellfisheries office or Marine Police station.

FLOODS AND COASTAL STORMS

N.J. Department of Environmental Protection
Division of Coastal Resources
Bureau of Floodplain Management
CN 401
Trenton, NJ 08625

Floodway and Flood Hazard Areas Maps: From various sources. Scale 1:2,400 (1 inch equals 200 feet). Separate black-and-white prints show stream profiles for New Jersey Flood Hazard Area design flood and 100-year flood. Coverage is statewide but irregular and incomplete. Some areas remain unmapped owing to lack of significant potential for flooding.

Coastal Storm Vulnerability Analysis Maps: Coastal hazard area zone boundaries, wave runup zones, overwash zones, flotation zones, areas with special evacuation problems, and safe zones. Coverage in 1987 included Ocean City, Cape May County and barrier islands along the coast of Atlantic County. Black-and-white prints of screened photomosaics. Scale 1:4,800 (1 inch equals 400 feet).

Federal Emergency Management Agency
Flood Map Distribution Center
6930 San Tomas Road
Baltimore, MD 21227-6227 (800) 638-6620

Flood Insurance Rate Maps: 50- and 100-year flood hazard areas. Scales from 1:4,800 (1 inch equals 400 feet) to 1:12,000 (1 inch equals 1,000 feet). Hazard zones and projected elevation of floodwater for upland and coastal storm flooding included. Index available.

Flood Boundary and Floodway Maps - Flood Insurance Study Texts: floodway boundaries, 50- and 100-year flood-hazard areas and surveyed cross-section locations. Annotated black-and-white prints. Scales from 1:4,800 (1 inch equals 400 feet) to 1:12,000 (1 inch equals 1,000 feet). Index available.

FORESTS

See also Land use and land cover, Pinelands.

Information on forests and forestry in New Jersey is available through New Jersey Department of Environmental Protection, Bureau of Forestry, CN 404, Trenton, NJ 08625.

GARDENS

New Jersey Garden Directory, includes locations and detailed descriptions of public gardens and private gardens open to the public. Available for purchase from: Horticulture Department, Somerset County Parks Commission, RD 2, Layton Rd., Far Hills, NJ, 07931; (201) 234-2677. Maps may be available from the individual gardens.

GEODETIC CONTROL AND RELATED DATA

N.J. Department of Transportation
Engineering and Operations Building
Bureau of Engineering Services
Roadway Geodetic Survey Section
1035 Parkway Avenue
Trenton, NJ 08625 (609) 530-5641

Descriptions, elevations, coordinates and geographic positions for geodetic control in New Jersey. Locations and descriptions of seven calibration base lines for Electronic Distance Measurement (EDM) instruments.

U.S. National Geodetic Information Center (N/CG17X2)
National Geodetic Survey
Charting and Geodetic Services
National Ocean Service
Rockville, MD 20852 (301) 443-8631

Publications of the National Geodetic Survey: A periodically updated sales catalog of geodetic control data and publications of NOAA, the U.S. Coast and Geodetic Survey, the Federal Geodetic Control Committee and other organizations.

U.S. National Geodetic Information Center (N/CG 174)
National Oceanic and Atmospheric Administration
6001 Executive Blvd.
Rockville, MD 20852

Descriptions of horizontal and vertical datums, 1° x 2° quadrangle maps showing federal horizontal and vertical geodetic control data; flyers on the Global Positioning System, research publications, listings of calculator and computer programs for geodetic work, etc. A complete index to flyers is available on request.

U.S. National Ocean Service
6001 Executive Blvd.
Rockville, MD 20852

Summary of National Ocean Service Technical Publications and Charts (National Ocean Service Educational Pamphlet no. 7): includes publications on geodesy, geodetic survey data, plane coordinate systems, map projections, nautical and aeronautical charts, sea level, tides, coastal currents, gravity, satellites, photogrammetry.

National Ocean Service Products and Services Handbook (1983): lists products and services of the Tides and Water Levels Branch of NOS. Subjects include tide observation station lists by state, tides at observation stations, descriptions and elevations of tidal bench marks, tidal zoning, tidal current data and tide tables.

GEOGRAPHIC INFORMATION SYSTEMS

Geographic Information Systems (GIS) are computer-based packages for recording, coding, analyzing and displaying map data. Natural and cultural data reside on many geographic information systems, often for assessment and protection of nautral resources. Planning and implementation for public utilities, distribution networks, emergency response operations, industrial operations and waste disposal siting are also among the potential uses of a GIS. Application of GIS is developing rapidly and numerous systems are being established. Current information about New Jersey data on GIS systems can be obtained from the Earth Science Information Center (ESIC), Mid-Continent Mapping Center, U.S. Geological Survey, 507 National Center, Reston, VA 22092, and many state agencies.

GEOLOGY AND GROUND WATER

N.J. Department of Environmental Protection
Bureau of Revenue
Maps and Publications Sales Office
CN 402
Trenton, NJ 08625 (609) 530-5789

New Jersey Geological Survey Price List: Includes state, federal and non-governmental maps and publications concerning ground water, geology, wetlands, and related environmental issues.

U.S. Geological Survey
Geologic Inquiries Group
907 National Center
Reston, VA 22092 (703) 648-4383

The Geologic Inquiries Group has personnel available to answer questions about geology, geologic maps and other earth science topics. Information packets on maps and geology are available for teachers.

U.S. Geological Survey - WRD
Hydrologic Inquiries Group
419 National Center
Reston, VA 22092 (703) 648-6815

The Hydrologic Inquiries Group has personnel available to answer questions about ground and surface water, the hydrologic cycle, and related topics.

Further information on geology and ground water of New Jersey is in **Bibliography and Index of New Jersey Geology, 1753-1983**, available through the N.J. Department of Environmental Protection Maps and Publications Sales Office. Specific questions on New Jersey geology and ground water may be addressed to New Jersey Department of Environmental Protection, Division of Water Resources, Geological Survey, CN 029, Trenton, NJ 08625; (609) 292-1185.

GREEN ACRES

See Public lands

HIKING

See Recreation

HISTORIC AND ANTIQUE MAPS

See also Topographic and planimetric maps (Earth Science Information Center), Aerial photography and satellite imagery (DEP Planning Group), and Nautical charts (early date nautical charts)

Institutions holding extensive collections of historic maps of New Jersey include:

Council of Proprietors
Western Division of New Jersey
230 High Street
Burlington, NJ 08016

General Board of Proprietors
Eastern Division of New Jersey
550 East Bay Avenue
Barnegat, NJ 08005

Library of Congress
Geography and Map Division
Washington, DC 20540

Morristown National Historical Park
P.O. Box 759
Morristown, NJ 07960

National Archives and Records Service
Cartographic Branch
General Services Administration
Washington, DC 20408

New Jersey Historical Society
230 Broadway
Newark, NJ 07104

New Jersey State Archives
CN-307
Trenton, NJ 08625

New Jersey State Library
185 West State St.
CN 520
Trenton, NJ 08625

New York Historical Society
170 Central Park West
New York, NY 10024

Princeton University Library
Maps Division
Princeton, NJ 08540

Rutgers University Libraries
Special Collections and Archives
New Brunswick, NJ 08903

Local historical societies may hold historic maps. Most of the historical societies in New Jersey are listed in **Directory, historical societies and agencies in the United States and Canada**. Copies may be purchased from: American Association for State and Local History, 1400 8th Avenue South, Nashville, TN 37203

Books on the history of mapping and boundaries in New Jersey include:

The story of New Jersey's civil boundaries, 1606-1968, by John P. Snyder, N.J. Bureau of Geology and Topography Bulletin 67, 294 p.

The mapping of New Jersey, the men and the art, by John P. Snyder, Rutgers University Press, 234 p.

Many out-of-print topographic and planimetric maps (maps in discontinued series and superseded editions of maps in current series) are available from microfilm through the Earth Science Information Center. See Topographic and planimetric maps (Earth Science Information Center).

Dealers specializing in antique maps or map restoration include:

Geo Graphics, Inc.
208 Glenridge Avenue, Box 183
Montclair, NJ 07042 **(201) 744-7873**

Nelson and Associates
P.O. Box 293
Cherry Hill, NJ 08003 **(609) 429-6029**

Historic and antique maps, a nationwide list of companies which sell original antique maps or high quality reproductions, is available on request from U.S. Earth Science Information Center (ESIC), U.S. Geological Survey, 507 National Center, Reston, VA 22092, or from the New Jersey Geological Survey (the ESIC state affiliate), CN 029, Trenton, NJ 08625; (609) 292-2576.

HISTORIC SITES

See Parks, forests, historic sites; Public lands; Travel and tourism

HUNTING

See Recreation

INDEXES AND GENERAL LISTINGS

Index to maps in books and periodicals, Map Department, American Geographical Society, 1968, 10 volumes, 3 supplements, last supplement issued 1980.

A directory of map collections in New Jersey, by April Carlucci, 1980, 21 p.

Guide to New Jersey maps in special collections and archives, Rutgers University Libraries, by April Carlucci, 1986, 632 p. A bibliography of almost 1700 maps depicting New Jersey and surrounding areas from 1677 to 1986.

Guide to U.S. map resources, compiled by David A. Cobb, American Library Association, 1986. Includes descriptions of 17 map collections housed in New Jersey.

Map collections in the United States and Canada, 4th edition, D.K. Carrington and R.W. Stephenson, editors, 1985, Special Libraries Association, 235 Park Ave. South, New York, NY 10003, 192 p.

Bibliographic guide to maps and atlases, the Research Libraries of the New York Public Library and the Library of Congress: annual listing of maps added to the collections of the New York Public Library and the Library of Congress, G.K. Hall & Company, 70 Lincoln Street, Boston, MA 02111.

The mapping of New Jersey, the men and the art, by John P. Snyder, Rutgers University Press, 234 p.

LAKES AND STREAMS

See also Travel and tourism, Recreation

N.J. Department of Environmental Protection
Bureau of Revenue
Maps and Publications Sales Office
CN 402
Trenton, NJ 08625 **(609) 530-5789**

New Jersey lakes maps: page-size maps showing depth, bottom conditions and aquatic vegetation. Most are from the New Jersey Fisheries Survey reports (ca. 1955). A few are more recent and were published in New Jersey Outdoors. Available for handling charge. Index available on request.

Drainage Basin Maps: available for purchase from the N.J. Department of Environmental Protection. A price list is available on request from New Jersey Department of Environmental Protection, Bureau of Revenue, Maps and Publications Sales Office, CN 402, Trenton, NJ 08625)

N. J. Division of Parks and Forests
Public Information
CN 404
Trenton, NJ **(609) 292-2797**

Depth maps of Round Valley and Spruce Run Reservoirs are available on request.

Delaware River Basin Commission
P.O. Box 7360
West Trenton, NJ 08628 **(609) 883-9500**

The Delaware and outdoor recreation: A packet of 10 maps showing public access areas, channels and rapids, American Whitewater Affiliation scale of difficulty, and recreational opportunities along the river from Hancock, NY to Trenton, NJ. Available for purchase.

LAND USE/LAND COVER

N.J. Office of State Planning
150 W. State St., CN 204
Trenton, NJ 08625

State development and redevelopment plan, tier boundaries: A series of maps showing areas within 8 level-of-development categories proposed on the basis of such environmental factors as sewer service, water availability, and presence of endangered species. On USGS 7.5-minute quadrangle base. Scale 1:24,000.

U.S. Geological Survey
Earth Science Information Center
507 National Center
Reston, VA 22092 **(703) 860-6045**

The U.S. Geological Survey is compiling land use and land cover maps for the entire United States at scales of 1:250,000 or 1:100,000. Those available are listed in **Index of land use and land cover maps and associated maps**, available on request.

MAP DEALERS

See also Topographic and planimetric maps, Nautical charts, Aerial photographs, etc.

This list is modified from "Dealers for topographic maps" in **New Jersey catalog of topographic and other published maps**, U.S. Geological Survey, National Mapping Program. Because of space limitations, it is restricted to dealers located within New Jersey. Map dealers located in other states can be found using phone directories.

Advanced Broadcast Consultants
204B Cross Keys Road
Berlin, NJ 08009 (609) 767-7070

Around the World in Maps
548 Cookman Avenue
Asbury Park, NJ 07712 (201) 774-2020

Blueridge Mountain Sports (The Nickel)
Princeton Forrestal Village
Princeton, NJ 08540 (609) 520-9899

Campmor, Inc.
810 Route 17 North
Paramus, NJ 07652 (201) 445-5000

Cape May-Atlantic Soil Conservation Div.
1200 West Harding Highway
Mays Landing, NJ 08330 (609) 625-3144

Communications Technologies
65 Country Club
Box 1130
Marlton, NJ 08053 (609) 985-0077

Comp Comm, Inc.
900 Haddon Avenue
Station House, Suite 412
Collingswood, NJ 08108 (609) 854-1000

Dover Sport Center
Route 46
Dover, NJ 07801 (201) 366-3133

D.W. Sargent Broadcast Service
804 Richard Road
Cherry Hill, NJ 08034 (609) 667-8573

Edwin's Sport Shop
217 Market Street
Paterson, NJ 07505 (201) 684-2941

Effinger Sporting Goods
513 West Union Avenue
Bound Brook, NJ 08805 (201) 356-0604

Explorer & Historian
21 Somerset Place
North Plainfield, NJ 07060 (201) 769-8790

Fireside Book Shop, Inc.
1212 Third Avenue
Spring Lake, NJ 07762 (201) 449-1991

Fish & Fur Sports, Inc.
1000 N. Black Horse Pike
Blackwood, NJ 08012 (609) 228-4340

Geo Graphics, Inc.
208 Glenridge Avenue, Box 183
Montclair, NJ 07042 (201) 744-7873

Geostat Map & Travel Centers

Montgomery Center
Routes 206 & 518
Skillman, NJ 08558 (609) 924-2121

Routes 10 & 202
Morris Plains, NJ 07950 (201) 538-7707

Wick Plaza
Route 1 and Plainfield Avenue
Edison, NJ 08817 (201) 985-1555

Greentree Square
910 North Route 73
Marlton, NJ 08053 (609) 983-3600

I. Goldberg
Route 70 and King Highway
Cherry Hill, NJ 08034 (609) 795-2244

Hammond Map Company
515 Valley Street
Maplewood, NJ 07040 (201) 763-6000

Harry's Army & Navy Store
691 Route 130
Robbinsville, NJ 08691 (609) 585-5450

Jubon Engineering
Kettle Run Road, Box 117
Atco, NJ 08004 (609) 767-7555

McCarthy Map Co., Inc.
1003 Main Street
Boonton, NJ 07005 (201) 316-5494

N.J. Dept. of Environmental Protection
Maps & Publications Sales Office
436 E. State St.., CN-402
Trenton, NJ 08625 (609) 777-1038

Packmasters
12 Hardwick Street
Belvidere, NJ 07823 (201) 475-3588

Pleasant Valley Shoppe
228 Main Street
Chatham, NJ 07928 (201) 635-1920

Radio Techniques
402 Tenth Avenue, Box 367
Haddon Heights, NJ 08035 (609) 546-0472

Ram Broadcasting Co.
1152 St. George Avenue
Avenel, NJ 07001 (201) 636-6970

Red Lion Gun Shop
1820 North Delsea Drive
Vineland, NJ 08360 (609) 692-7471

Robinson Aerial Surveys, Inc.
43 Sparta Avenue
Newton, NJ 07860 (201) 383-2511

Sea & Ski Sports
314 Rt 46
Denville, NJ 07834 (201) 627-3030

Stokes Forest Sports Shop
Rt 206 at Lake Kittatinny
Box 1878
Branchville, NJ 07826 (201) 948-5448

The Bookshop
83 South Street
Morristown, NJ 07960 (201) 539-2165

The Map Store
Route 31 and Anderson Road
Box 366
Hampton, NJ 08827 (201) 537-4081

The Map Store
International Map Company
547 Shaler Boulevard
Ridgefield, NJ 07657 (201) 943-6566

W.A.G. Sport Shop
Route 46 and Walnut Road
Columbia, NJ 07832 (201) 496-4641

NAUTICAL CHARTS

A complete list of authorized National Ocean Service nautical chart sales agents is printed on **United States Atlantic and Gulf Coasts, Including Puerto Rico and the Virgin Islands** (Nautical Chart Catalog 1). Over 50 New Jersey agents are listed.

U.S. National Ocean Service
Distribution Division OA/C44
Riverdale, MD 20840 (301) 436-6990

United States Atlantic and Gulf Coasts, Including Puerto Rico and the Virgin Islands (Nautical Chart Catalog 1): Index map to nautical charts. Also includes information on Notices to mariners, the American nautical almanac, U.S. Coast Guard light list, Rules of the road, U.S. coast pilots, tide tables, tidal current tables, tidal current diagrams, special issue charts, outline maps, special maps, map projections and miscellaneous maps and publications.

United States Bathymetric Maps and Special Purpose Charts (Map and Chart Catalog 5): Bathymetric maps, ocean bottom geophysical maps, marine boundary charts showing 3-mile, 12-mile and 200-mile boundaries, marine weather service charts, offshore mineral leasing area maps, storm evacuation maps, other maps and publications.

U.S. National Ocean Service CG 243
6001 Executive Blvd.
Rockville, MD 20852

Early date nautical charts: Sizes and scales vary. Indexes are available.

Large-scale maps (T-Sheets): For coastal and inland waterway areas, U.S. Geological Survey 7.5-minute quadrangle maps are prepared by NOS. T-sheets are the manuscript maps used in this preparation. Scales: 1:20,000, 1:10,000, and, in the vicinity of New York, 1:5,000. Available as planimetric maps, shoreline surveys (planimetric maps covering only the shoreline and adjacent land), and topographic maps.

Large-scale hydrographic surveys (H-Sheets): Maps showing waterway soundings and features of the adjacent land. Scales range from 1:4,800 to 1:20,000.

Index maps showing T-Sheets and H-Sheets in New Jersey are available. Specify whether T- or H-Sheets are needed and the areas and dates of interest.

PARKS, FORESTS, HISTORIC SITES

See also Forestry, Lakes and streams, Pinelands, Public lands, Recreation, Travel and tourism

Public-information brochures with maps are available for most State and Federal parks in New Jersey. For **New Jersey State Parks, Forests, Recreation Areas, and Wildlife Management Areas** contact: N.J. Division of Parks and Forestry, Public Information, CN 404, Trenton, NJ 08625; (609) 292-2797. For information on Federal and Interstate facilities, contact the local headquarters listed below:

Brigantine National Wildlife Refuge
P.O. Box 72
Oceanville, NJ 08231 (609) 652-1665

Delaware Water Gap National Recreation Area
Bushkill, PA 18324 (717) 588-2435

Finns Point National Cemetery
RD 3, Box 542
Fort Mott Road
Salem, NJ 07079 (609) 935-3628

Gateway National Recreation Area
Sandy Hook Unit
Box 530
Ft. Hancock, NJ 07732 (201) 872-0115

Great Swamp National Wildlife Refuge
P.O. Box 152
Basking Ridge, NJ 08231 (201) 647-1222

Morristown National Historic Park
Washington Place
Morristown, NJ 07960 (201) 539-2016

Palisades Interstate Park Commission
P.O. Box 155
Alpine, NJ 07620 (201) 768-1360

Sepawno Meadows National Wildlife Refuge
Finns Point Rear Range Light
RD 3, Box 540
Salem, NJ 07079 (609) 935-1487

PINELANDS

See also Parks, forests, historic sites; Public lands; Recreation

New Jersey Pinelands Commission
P.O. Box 7
New Lisbon, NJ 08064 (609) 894-9344

The Pinelands Commission has the following maps available:

Black-and-white maps on USGS 7.5-minute quadrangle base, scale 1:24,000, showing:
- **Pinelands Jurisdiction Boundaries**
- **Comprehensive Management Plan Land Capability Boundaries**
- **Vegetation** (overlay)
- **Soils** (as mapped by the U.S. Soil Conservation Service)

Black-and-white maps. Scale 1:125,000:
- **Index to USGS 7.5-minute quadrangles covering area under regulation by the Pinelands Commission**
- **Pinelands Jurisdiction Boundaries**
- **Revised Land Capability Boundaries**
- **Public Land Boundaries**

Color maps. Scale 1:125,000:
- **Revised Land Capability Map**

PLANIMETRIC MAPS

See Topographic and planimetric maps

PLANNING

See Land use/land cover

POLITICAL SUBDIVISIONS

See also Election districts

N.J. Department of Community Affairs
Office of Program Analysis
CN 800
Trenton, NJ 08625

Political Subdivision Map of New Jersey, 1982: Black-and-white maps available at scales of 1:250,000 and 1:500,000.

Information on historic municipal boundaries can be found in:

The Story of New Jersey's Civil Boundaries, 1606-1968, by John P. Snyder (N.J. Bureau of Geology and Topography Bulletin 67, 294 p., available for purchase from the N.J. Department of Environmental Protection. A price list is available on request from New Jersey Department of Environmental Protection, Bureau of Revenue, Maps and Publications Sales Office, CN 402, Trenton, NJ 08625.)

PUBLIC LANDS

See also Parks, forests, historic sites; Travel and tourism

N.J. Office of State Planning
150 W. State St.
CN 204
Trenton, NJ 08625

Government-owned real property in New Jersey: Separate booklets with tabulations describing federal, state, and county property in New Jersey. Properties shown on black-and-white map, scale 1:500,000, included with booklet. Prepared by N.J. Department of Community Affairs, 1973-76.

N.J. Department of Environmental Protection
Green Acres Program
CN 404
Trenton, NJ 08625

DEP-owned lands overlays: Overlays for 131 U.S. Geological Survey 7.5-minute quadrangle maps showing wildlife management areas, parks, forests and other DEP-administered open space and recreation lands. Updated every six months. Index available. Black-and-white prints or transparencies. Scale 1:24,000.

New Jersey's public open space and recreation areas: Scale 1:250,000. Available for purchase from the N.J. Department of Environmental Protection. A price list is available on request from New Jersey Department of Environmental Protection, Bureau of Revenue, Maps and Publications Sales Office, CN 402, Trenton, N.J., 08625.

RAISED RELIEF

Plastic raised-relief maps are available for the Scranton and Newark sheets of the U.S. Geological Survey United States Series (covering northern parts of the State). The sheets covering southern New Jersey have not been produced because of their low relief. Horizontal scale 1:250,000, vertical scale 1:83,333 (vertical exaggeration 3X). *See* Map dealers.

RECREATION

See also Lakes and streams; Nautical charts; Parks, forests, historic sites; Public lands; Travel and tourism

Appalachian Trail Conference
P.O. Box 236
Harpers Ferry, WV 25425 (304) 535-6331

Maps of the Appalachian Trail: New York-New Jersey: A packet of six maps, scale 1:36,000 (1.75 in. = 1 mile).

Delaware River Basin Commission
P.O. Box 7360
West Trenton, NJ 08628 (609) 883-9500

The Delaware and outdoor recreation: A packet of 10 maps showing public access areas, channels and rapids, American Whitewater Affiliation scale of difficulty, and recreational opportunities along the river from Hancock, NY to Trenton, NJ. Available for purchase.

N.J. Division of Parks and Forestry
Public Information
CN 404
Trenton, NJ 08625

Special use guides showing opportunities for canoeing, fishing, hiking, hunting and the like are available on request for most New Jersey parks and trails. **New Jersey Trails Plan Executive Summary** includes a map at a scale of about 1:500,000 showing trails, proposed trails, and canoeable waterways.

N.J. Department of Transportation
Bicycle Program
CN 600
1035 Parkway Avenue
Trenton, NJ 08625 (609) 530-2000

Bicycle tour guides are available on request for several routes in rural areas of New Jersey.

N.Y.-N.J. Trails Conference
232 Madison Ave.
New York, NY 10016 (212) 696-6800

The Trails Conference has information on hiking trails throughout New Jersey.

Boating and Hiking and Biking Maps, are nationwide lists of companies which sell recreation maps. These lists are available on request from U.S. Earth Science Information Center (ESIC), U.S. Geological Survey, 507 National Center, Reston, VA 22092, or from the New Jersey Geological Survey (the ESIC state affiliate), CN 029, Trenton, NJ 08625; (609) 292-2576.

RIPARIAN LANDS AND COASTAL WETLANDS

See also Floods and coastal storms, Nautical charts,

N.J. Department of Environmental Protection
Division of Coastal Resources
Bureau of Tidelands
CN 401
Trenton, NJ 08625

Riparian atlas: Riparian lands and conveyances plotted on tracings of tax maps (black-and-white sheets). Scales vary from 1:600 (1 inch equals 50 feet) to 1:6,000 (1 inch equals 500 feet). This series covers the main tidal waterways of the state.

Riparian claim-of-interest maps: Rectified, screened, annotated photomaps (black-and-white). Scale 1:2,400 (1 inch equals 200 feet). Overlays (same scale) on black-and-white prints show claim-of-interest lines as mapped and adopted. An index to these maps, **Lands Subject to Investigation for Areas Now or Formerly Below Mean High Water**, is available for purchase from the N.J. Department of Environmental Protection. A price list is available on request from New Jersey Department of Environmental Protection, Bureau of Revenue, Maps and Publications Sales Office, CN 402, Trenton, N.J., 08625.

Tidelands conveyance maps: Riparian conveyance maps which overlay the riparian claim-of-interest maps. Black and white. Scale 1:24,000. The series is complete for most of the New Jersey coast from the New York border on the Hudson River south through Cape May County.

N.J. Department of Environmental Protection
Division of Coastal Resources
Bureau of Coastal Planning and Development
CN 401
Trenton, NJ 08625

Coastal wetlands maps: Rectified, screened annotated photomaps. Black-and-white. Scale 1:2,400 (1 inch equals 200 feet). Show extent of legally mandated wetlands plants.

Property line overlays: Black-and-white prints corresponding to coastal wetlands maps. Scale 1:2,400 (1 inch equals 200 feet). Block and lot numbers of affected properties shown.

Index to wetlands maps: Map of New Jersey showing locations and numbering system for coastal wetlands maps. Scale 1:250,000.

Coastal zone map: Map of New Jersey (black-and- white) showing the legally mandated Coastal Zone. Scale 1:250,000.

Submerged aquatic vegetation atlas: Rectified, annotated photomaps (black-and-white) showing extent and species of submerged aquatic vegetation in bays along the Atlantic coast of New Jersey. Scale 1:24,000.

ROAD MAPS

In addition to the numerous New Jersey road maps available through travel clubs, automobile associations, book stores, map dealers, gas stations, and in phone books, the **Official New Jersey Transportation Map and Guide** (scale 1:250,000) is available on request from: N.J. Office of Travel and Tourism, CN 826, Trenton, NJ 08625

SATELLITE IMAGERY

See Aerial photography and satellite imagery, Map dealers

SHELLFISHERIES

See Fisheries

SOIL SURVEYS

See also Agriculture

U.S. Department of Agriculture
Soil Conservation Service
1370 Hamilton St.
Somerset, NJ 08873 (201) 246-1205

County soil surveys include maps showing slope and soil type. Maps are on screened photobases. Scale 1:20,000 (1:15,840 for those prepared before about 1975). For county reports contact county Soil Conservation Agent. Offices are listed in phone book.

Rutgers University
Bureau of Engineering Research
College of Engineering
P.O. Box 909
Piscataway, NJ 08854 (201) 932-2225

Engineering soil survey of New Jersey, Rutgers University Press, 1951-1955: County reports on soil conditions from an engineering standpoint. Accompanied by maps at a scale of 1:63,360 (1 inch per mile). For many counties these are out-of-print and available only through the library system.

A generalized soil map for New Jersey and further references on New Jersey soils are in **Soils of New Jersey**, by John C. Tedrow, available for purchase from the N.J. Department of Environmental Protection. A price list is available on request from New Jersey Department of Environmental Protection, Bureau of Revenue, Maps and Publications Sales Office, CN 402, Trenton, NJ 08625.

STATE PARKS

See Parks, forestry, historic sites; Travel and tourism; Recreation

TOPOGRAPHIC AND PLANIMETRIC MAPS

See also Map dealers

N.J. Department of Environmental Protection
Bureau of Revenue
Maps and Publications Sales Office
CN 402
Trenton, NJ 08625 (609) 777-1038

New Jersey Geological Survey price list: Includes topographic and thematic maps, aerial photographs, and state, federal and non-governmental publications on ground water, geology, wetlands, other environmental issues, and parks and forests.

N.J. Department of Transportation
Bureau of Cartography and Graphics
CN 600
Trenton, NJ 08625

New Jersey maps, materials and services available to the public: A sales catalog of maps and aerial photographs produced by the Department of Transportation and its cooperators and contractors. Included are various series showing roadways, railroads, air and water transport facilities, and gas, oil, and electrical utilities.

U.S. Geological Survey
Earth Science Information Center (ESIC)
507 National Center
Reston, VA 22092 (703) 860-6045

Earth Science Information Center (ESIC) catalogs a wide range of federal, state, and commercial cartographic holdings. For further information contact ESIC or the New Jersey Geological Survey (the New Jersey ESIC State Affiliate) to request the ESIC **Catalog of cartographic data.**

Status-of-mapping indexes: available showing the status of maps in the following partially-complete U.S. Geological Survey series:
1:100,000-scale planimetric and topographic quadrangles
1:100,000-scale planimetric and topographic county maps
1:50,000-scale topographic county maps
1:24,000-scale 7.5-minute topographic quadrangles.

Archival maps on microfilm: Most of the topographic and planimetric maps in standard New Jersey Geological Survey and U.S. Geological Survey series are available for examination at the New Jersey Geological Survey, (609) 292-1185, or the New Jersey State Archives (609) 292-6260 and for examination and copying from ESIC.

U.S. Geological Survey
Mid-Continent Mapping Center
1400 Independence Road
Rolla, MO 65401 (314) 341-0351

The Mid-Continent Mapping Center distributes a wide variety of maps and map products including US Geological Survey quadrangle maps, color separates, photoquads, land use/land cover maps, elevation models, and radar imagery. Further information is listed in the **Catalog of cartographic data**, available on request

TRAILS

See Recreation

TRANSPORTATION

See also Recreation (N.J. Department of Transportation), Road maps

New Jersey maps, materials and services available to the public: A sales catalog of maps and aerial photographs produced by the Department of Transportation and its cooperators and contractors. Available on request from: N.J. Department of Transportation, Bureau of Cartography and Graphics, CN 600, Trenton, NJ 08625

TRAVEL AND TOURISM

See also Lakes and streams; Parks, forests, historic sites; Recreation, Road maps

N.J. Office of Travel and Tourism
CN 826
Trenton, NJ 08625 (609) 292-2470

Vacation Packet: available on request, includes maps showing campsites, historic sites, canoeing streams, bicycle routes, park facilities, scenic areas, etc.

Travel guides, a nationwide list of companies which specialize in maps and travel guides, is available on request from U.S. Earth Science Information Center (ESIC), Mid-Continent Mapping Center, U.S. Geological Survey, 507 National Center, Reston, VA 22092, or from the New Jersey Geological Survey (the ESIC state affiliate), CN 029, Trenton, NJ 08625; (609) 292-2576.

WATERWAYS

See Lakes and streams; Nautical charts

WETLANDS

See also Riparian lands and coastal wetlands, Lakes and streams, Floods and coastal storms

National Wetlands Inventory quadrangles: wetlands identified by type plotted on USGS 7.5-minute quadrangle base. Scale 1:24,000. Black-and-white diazo prints. Available for purchase from the N.J. Department of Environmental Protection. A price list is available on request from New Jersey Department of Environmental Protection, Bureau of Revenue, Maps and Publications Sales Office, CN 402, Trenton, NJ 08625.

WILDLIFE MANAGEMENT AREAS

See Parks, forests, historic sites; Public lands; Recreation areas

GLOSSARY

For additional definitions and information see: American Congress on Surveying and Mapping and American Society of Civil Engineers, 1972, Definitions of surveying and associated terms, Falls Church, VA, ACSM and ASCE, 205 p.

Bench mark - a permanent material object, natural or artificial, bearing a marked point whose elevation above or below an adopted datum is known.

Bessel spheroid - the reference ellipsoid adopted by the U.S. Coast and Geodetic Survey from 1841 to 1880 for use on nautical and shoreline charts of North America.

Cadastral map - a map showing the boundaries of subdivisions of land, usually with the bearings and lengths thereof and the areas of individual tracts, for purposes of describing and recording ownership. A cadastral map may also show culture, drainage, and other features relating to the value and use of land.

Clarke spheroid of 1866 - the reference ellipsoid adopted by the U.S. Coast and Geodetic Survey in 1880 for charting North America. It is being replaced by GRS 80 for use in NAD 83.

Datum (geodetic) - A set of constants specifying the size and position of the reference ellipsoid used for geodetic surveying on all or part of the Earth's surface.

Error of closure (traverse) - the amount by which a value of the position of a traverse station, as obtained by computation through a traverse, fails to agree with another value of the same station as determined by a different set of observations or route of survey.

Geodetic Reference System 1980 (GRS 80) - the reference ellipsoid adopted by the National Geodetic Survey for use with the North American Datum 1983 (NAD 83).

Geodetic survey - a survey in which account is taken of the figure and size of the earth.

Geoid - the figure of the earth considered as a sea-level surface extended continuously through the continents. It is a theoretically continuous surface that is perpendicular at every point to the direction of gravity (the plumb line).

Geopotential number (of a point) - the measure of the difference in potential from the reference surface to the equipotential surface passing through the point. It is numerically equivalent to the work required to raise a mass of 1 kilogram against gravity through the orthometric height to the point.

Isogonic line - a line joining points on the Earth's surface having equal magnetic declination at a given date.

Isoporic line - a line on the Earth's surface joining all the points at which the annual magnetic change has a given value at a certain time.

Lambert conformal conic projection - a conformal (showing correct local shapes) map projection of the conical type on which geographic meridians are straight lines which meet in a common point outside the map limits. The geographic parallels are shown as a series of arcs of circles having this common point for a center.

Least-squares adjustment - a method for adjusting observations, based on probability, in which the sum of the squares of all the corrections or residuals derived for the observed data is made a minimum.

Metes and bounds - a method of describing land by measure of length (metes) of the boundary lines (bounds). The most common method is to cite direction and length of each line as one would walk around the perimeter.

Metonic Cycle - A period of 19 years or 235 lunations. Devised by Meton, an Athenian astronomer of the 5th century B.C., to determine the period in which new and full moon would recur on the same days as in the preceeding cycle. The period required for the significant harmonic constituents of the tide at any place to complete a full cycle. See Tidal Epoch.

Monument - a physical structure which marks the location of a corner or other survey point.

NAD 27 - North American Datum of 1927.

NAD 83 - North American Datum of 1983.

NGVD 29- National Geodetic Vertical Datum of 1929.

NAVD 88 - North American Vertical Datum of 1988

Planimetric map - a map showing only the horizontal plane for the area represented; relief of the land surface is omitted.

Polyconic projection - a map projection in which the central geographic meridian is a straight line, along which the spacing for lines representing the parallels is proportional to the distance between the parallels. The parallels are arcs of circles which are not concentric.

Retracement - a survey made to verify the direction and length of lines, and to identify the monuments and other marks of a previous survey.

Riparian - referring to the bank of a stream or other water body. A riparian owner is one who owns the bank; a riparian right is the right to control and use water based on the ownership of the bank

Stadia method - a procedure to measure distance in which the observer reads the intercept subtended on a graduated rod between two hairs or marks on the reticle of the telescope; the distance of the rod is proportional to the rod intercept.

Theodolite - a precision surveying instrument equipped with an alidade and telescope.

Tidal Epoch - a period of 19 years or 235 lunations. See Metonic Cycle. The present National Tidal Datum Epoch is the period 1960-1978, which is utilized by the National Ocean Service (NOS) for determination of mean sea level and local tidal datum planes. For New Jersey, a special Tidal Epoch (1966-1984) is used.

Topographic map - a map of the horizontal and vertical positions of landscape features represented; distinguished from a planimetric map by the addition of relief in measurable form.

Transverse Mercator projection - a so-called cylindrical map projection equivalent to the Mercator projection turned 90°. The central meridian is shown as a straight line at constant scale, but most meridians and parallels are complicated curves. It is conformal, showing local shapes correctly.

Traverse - a method of surveying in which lengths and directions of lines between points on the earth are obtained by or from field measurements; the lines are then used to determine positions of the points.

Triangulation - a method of surveying in which the stations are points on the ground at the vertexes of a chain or network of triangles.

Trigonometric leveling - determination of differences in elevation by trigonometry from observed vertical angles and measured or computed distances (horizontal or inclined).

MAPPING DIGEST FOR NEW JERSEY (New Jersey Geological Survey Report GSR 23)

ISSN 0741-7357