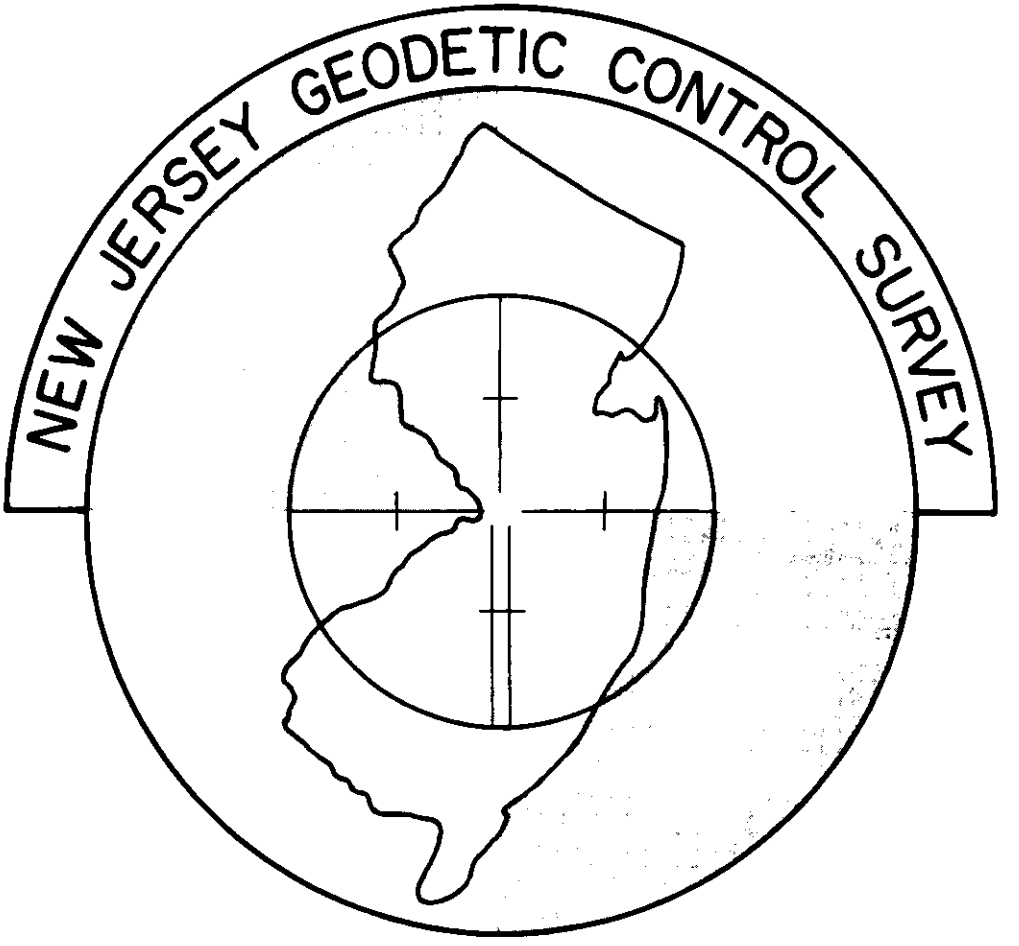
MAPPING DIGEST

FOR

NEW JERSEY



BULLETIN 66

NEW JERSEY GEOLOGICAL SURVEY

DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT

Due to a reorganization (1965) within the Department of Commerce, all references in this booklet to "United States Coast and Geodetic Survey" should read "Environmental Science Services Administration, Coast and Geodetic Survey". City and street addresses are unchanged.

BULLETIN 66

MAPPING DIGEST FOR NEW JERSEY

by

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STATE OF NEW JERSEY

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Trenton, New Jersey
1965

STATE OF NEW JERSEY
DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
OFFICE OF THE COMMISSIONER
TRENTON

February 1965

As part of our State's expanded service to New Jersey citizens and municipalities, this publication has been prepared by the Bureau of Geology and Topography of the Department of Conservation and Economic Development. Prepared with material provided by federal, State and private agencies, Mapping Digest for New Jersey fills a long standing need for a reference volume containing basic mapping data.

Your comments and suggestions are earnestly solicited and we appreciate the opportunity to be of service.

Sincerely yours,

Robert A. Roe
Commissioner

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INTRODUCTION

For several years this Bureau produced an eleven-page publication titled *Sources of Information for New Jersey Engineers and Land Surveyors,* compiled by Robert G. Blanchard, who retired from the position of Topographic Engineer in 1956. This booklet is an expansion of Mr. Blanchard's work. A considerable amount of additional information has been inserted, price schedules have been updated, and the original data has been rewritten and rearranged. The material contained herein cannot be found in any single publication, since general references by their very nature do not dwell upon data related to a single state.

Examination of reference lists at the end of each article should adequately indicate the high degree of indebtedness to the United States Coast and Geodetic Survey. A total of fifty-two personal communications and publications from this organization have been cited or recommended. Personnel of the United States Geological Survey Map Information Office kindly furnished many details concerning Federal maps, and their time spent in research must be gratefully acknowledged. Several additional Federal agencies have contributed to a lesser extent, but their unfailing cooperation cannot go unmentioned. Specific acknowledgement of each fact in the text has not been inserted except in the case of direct quotations, or where a particular article has been judged to be above average in significance.

An expression of appreciation must also be tendered to members of the staff of the Bureau of Geology and Topography for their assistance in the preparation of this publication. Individual recognition must be given to Miss Elaine Ferko, Senior Stenographer, who patiently typed and retyped most of the drafts and final copy.

Since many sources are listed in this publication, it will be to the advantage of both the reader and the agencies involved if careful attention is paid to directions for obtaining materials listed. Time losses in acquiring the desired information can be held to a minimum when the proper originating agency is contacted. In all cases where a specific charge is indicated, requests for material should be accompanied by a check or money order in the proper amount to avoid delay. Prices as shown on succeeding pages are subject to change.

Readers are invited to suggest additional material for inclusion in future reprints of this publication.

HAROLD BARKER, JR.
Topographic Engineer

SECTION I

A BRIEF HISTORY OF SOME NEW JERSEY MAPS, 1654 - 1964

The first map of the entire State of New Jersey was compiled and published by Nicholas Vischero in 1654 and subsequently used by the Duke of York in 1664 to describe the original boundaries of the Province. Due to inaccuracies in Vischero's map and vagueness in the written description, there ensued a boundary controversy between New York and New Jersey which lasted more than a century.[1]

In 1656 Adrian Van derDonck published his *Description of New Jersey as it is now,* which contained a map very similar to that drawn by Vischero. Van derDonck's map (and most probably Vischero's map) has errors of location and distance ranging to twenty-one miles and one hundred percent, respectively.

One of the earliest maps printed in this country was published in 1749 on a scale of .06 inch per mile, (approximately 1:1,000,000), and represents a considerable improvement over any preceding material. It is titled *A map of PENSILVANIA, NEW JERSEY, NEW YORK and the THREE DELAWARE COUNTIES, by Lewis Evans, MDCCXLIX.*

Bernard Ratzer, a Lieutenant in the 60th Regiment, Royal Artillery, drew a map of New Jersey in 1769 to assist the Boundary Commission of the same year in settling the dispute with New York. The Ratzer map is a better portrayal than that drawn by Evans, but lacks many refinements.

In December, 1777, a map was published by Wm. Faden, Charing Cross, London, titled *THE PROVINCE OF NEW JERSEY, Divided into East and West, commonly called THE JERSEYS.* It was compiled from the survey of 1769, a map of the northern regions drawn by Gerard Banker on a scale of .13 inch per mile (1:500,000), and various other military and property maps of limited areas. Errors of location range to twelve miles, but the map nevertheless represents an advance in the art of cartography.

The State Legislature recognized the need for more accurate maps in 1822, when it authorized the loan of $1000 to Thomas Gordon "to enable him to obtain additional surveys, for the purpose of making a Street map".[2] Drawn on a scale of .33 inch per mile (1:192,000), it was compiled for the most part 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 was the only authority until 1860. Errors of position amount to only three-quarters of a mile in latitude, and five-eighths of a mile in longitude, thus greatly reducing the significant disparities of older maps.

A map of New Jersey on a scale of .40 inch per mile (1:158,400) was published privately in 1860 by Dr. William Kitchell, Superintendent of

the inactive New Jersey Geological Survey and G. M. Hopkins, C. E. The data for this map was derived from United States Coast Survey publications and records of mapping performed by the State Geological Survey of 1854-56.

After an eight-year period of inactivity due to a lack of funds (1856-1864), the New Jersey Geological Survey resumed operations. A new map on a scale of .50 inch per mile (1:126,720) was prepared from (1) triangulation and plane-table sheets of the United States Coast Survey, (2) plane-table sheets from the State Geological Survey of 1854-56, and (3) county and city maps and various other local surveys, adjusted to the information obtained from the first two sources.

In 1877 it was found that accurate delineation of geologic features was impossible without more adequate maps, and work was begun on the first series of *Atlas Sheets* which covered the entire State on seventeen overlapping maps (Sheets 1 through 17) on a scale of one inch per mile (1:63,360). New Jersey was the first state in the Union to undertake and complete such a comprehensive mapping program. Assistance was rendered by two Federal organizations during this project: the United States Coast and Geodetic Survey provided funds and personnel to broaden the triangulation net; and on July 16, 1884, the topographic work, previously carried on by the New Jersey Geological Survey, was assumed by the United States Geological Survey and the corps of assistants in New Jersey was transferred to this Federal agency. Prior to this time, mapping had been completed for approximately forty-five percent of the State.

At the completion of the program, a total of $54,744 ($6.93 per square mile) had been expended for field work and manuscript preparation. From the beginning to the end of this project 17,926 man-days were required during which time 14,575 miles of levels, 18,768 miles of odometer traverse, and 956 miles of transit traverse were run. A total of 215,255 odometer and transit stations were established, and 458 triangulation stations were used to adjust the topographic work. Compilation information was derived from (1) United States Coast and Geodetic Survey triangulation and plane-table sheets of the seacoast and Delaware River shore, (2) contemporary city and town surveys, some of the better class of railroad surveys, and (3) an entirely new and complete survey of the State, excepting those items mentioned above.

The manuscript maps were prepared on a scale of three inches per mile (1:21,120) and tolerances were held to one-fiftieth of an inch, or approximately twenty feet. The Tachometric (stadia) method was used for all important traverses, and the barrow odometer, pocket compass, Abney clinometer and aneroid barometer were used to fill in intermediate details. Leveling was accomplished by a Y level where possible and trigonometric leveling was used for the more inaccessible elevations. The map series was drawn on a polyconic projection[3] and has successfully withstood the test of time. Periodic corrections are performed by the Topographic Engineer, and the changes wrought in our State can be

readily ascertained by examination of the older editions. After the passage of three-quarters of a century since the last map of the first series was completed (1887), considerable demand for copies still exists. Examination of records indicates that well over one hundred thousand maps have been distributed since 1900. Since the original series was published, only two major changes in format have occurred. In 1903 the overlapping system was changed to an edge-match series (the sheet numbers were then altered to 21 through 37); and since 1956 two additional colors have been added to each revision to heighten readability and contrast.

When the Atlas Sheet series was completed in 1887, a map of the State on a scale of .20 inch per mile (1:316,800) was produced. For many years this map served in various capacities, being used to show culture (Atlas Sheet No. 18, and later No. 38), relief (Atlas Sheet No. 19), geology (Atlas Sheet No. 20), forests (green overprint), watersheds (red overprint), etc.

In 1898 rapid development of certain population centers indicated the need for a large-scale map series. Field work was begun to revise the original Atlas Sheet manuscripts, and in 1899 the first maps of this series were published by the New Jersey Geological Survey. They cover seven minutes of latitude and thirteen minutes of longitude on a scale of 2.64 inches per mile (1:24,000). Although a total of one hundred and two edge-matching maps would have been required to cover the State, only twenty-four were published, and revision work on this *Name Sheet* series was discontinued over a period of years. The last new edition was published in 1944 (Somerville sheet).

A larger version of the 1887 State map was published in 1915. Titled *County and Municipality Map of New Jersey* (Sheet No. 39), on a scale of .25 inch per mile (1:250,000), it is still published and periodically revised. During the years of its existence, the base map has been overprinted in various colors to show railroads, highway networks, the locations of individual Atlas Sheets and United States Geological Survey Quadrangles (Atlas Sheet No. 39A) and geology (Atlas Sheet No. 40). At present, the first two overprints are not being published.

After the topographic survey of New Jersey was completed, the United States Geological Survey published 15-minute quadrangles of the State on a scale of 1.01 inches per mile (1:62,500); some revision work was accomplished up to about 1909, but the plan of incorporating revisions by State personnel into the 15-minute quadrangle maps was never carried out. Instead, in 1934 large-scale resurveys were started primarily in the northern metropolitan area, the resulting maps being published as 7½-minute quadrangles on a scale of 2 inches per mile (1:31,680). During World War II most of northern New Jersey was mapped in 7½-minute quadrangles by the Army Map Service, with a large group (forty-one) of these sheets published at the 1:31,680 scale and later ones (forty-eight) published on a scale of 2.53 inches per mile (1:25,000). In 1943 the Army Map Service converted to the 1:25,000

scale for 7½-minute maps; the Geological Survey changed from 1:31,680 to a 1:24,000 scale in 1944. Following World War II 7½-minute quadrangle map coverage for the entire State was completed by the United States Geological Survey by one of the following methods: new mapping (including publication of coastal and Delaware River area maps compiled by the Coast and Geodetic Survey), revision of older 7½-minute quadrangle maps of both the Geological Survey and the Army Map Service (with conversion to 1:24,000), and by civil conversion of revised Army Map Service maps for the Fort Dix area.[4]

Plastic relief maps of New Jersey have been available for a number of years. The Army Map Service publishes a set of maps of the State (scale 1:250,000) several of which are plastic raised relief sheets. Two will not be produced by this method since they show southern New Jersey and parts of Delaware and Maryland areas which are practically devoid of relief sufficient to show at the vertical scale used. Private organizations are also publishing many different maps of New Jersey including raised relief sheets. It is doubtful that anyone today cannot find a map suitable for their purposes, except for highly detailed, large-scale engineering requirements.

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1. Cook, George H., *Topography, Magnetism, Climate,* Vol. I of Report of the State Geologist (Trenton: John L. Murphy Publishing Company, 1888) pp. 40-73.

2. Cook, George H., *Annual Report of the State Geologist for the Year 1885* (Trenton: John L. Murphy Publishing Company) p. 187.

3. *Ibid.,* pp. 186-203.

4. Data concerning Federal maps furnished in personal communications from the United States Geological Survey Map Information Office.

Selected References

1. Heusser, Albert H., *The Forgotten General, Robert Erskine, F.R.S. (1735-1780)* (Paterson, N. J.: The Benjamin Franklin Press, 1928).

2. Princeton University Library, *New Jersey Road Maps of the 18th Century* (Meriden, Conn.: Meriden Gravure Company, 1964).

The United States Coast and Geodetic Survey control network was begun in 1816 by Professor Ferdinand Hassler, the first Coast Survey Superintendent, under enabling legislation passed by Congress on February 10, 1807. Because of its central position along the eastern coast of the United States, New Jersey was chosen for the location of the first base line for the coastal triangulation arcs.

In 1864 when the need for accurate maps of New Jersey became apparent, Professor Edward Bowser, Assistant in the United States Coast Survey, began additional triangulation which eventually formed the basis for the New Jersey Atlas Sheet series. The costs for this work were borne entirely by the Federal Government, and upon completion in 1887 a total of 458 geographic positions had been established. Since all triangulation points which had been determined prior to 1880 were computed on the Bessel spheroid, the adoption of the 1866 Clarke spheroid in the former year made it necessary to recompute the positions of many stations, because the equatorial and polar axes were approximately increased by 1:8,000 and 1:13,000, respectively.

Although the value of these stations and their associated geographic positions and azimuths has long been recognized, inherent difficulties prevented use of the information for local cadastral and topographic surveys in more than a limited way prior to 1933. The computational procedures and instrument methods required for the use of geographic positions produced unwieldy and expensive surveys. In addition, few engineers and surveyors were experienced or trained in this type of work, the accurate instruments necessary were rarely available, and tables of functions, factors, etc. to the required refinement were not in common use or nonexistent.

In some areas plane coordinate systems of very limited extent were established, but the projections were based upon a plane tangent to the earth at a point. Accuracy diminished rapidly with increasing distance from central meridians and large areas could not be covered by a single projection. When surveys were made in regions where projections overlapped, cumbersome transformation equations were necessary, and those who undertook such work found expenses mounting. Regions which used the tangent plane projections were of necessity composed of mazes of interlocking systems with different datums.

In 1933 the North Carolina Highway Commission requested the United States Coast and Geodetic Survey to investigate the possibilities of establishing plane coordinate projection systems which would cover large areas without great sacrifice of accuracy. Dr. O. S. Adams, Senior Mathematician in the Division of Geodesy, developed the necessary formulas for a Lambert Conformal Conic Projection which covered the entire State of North Carolina with a single central meridian and scale departure slightly more than 1:10,000. Since North Carolina with its predominant east-west dimension was especially suited to the properties

of a Lambert Projection, Dr. Adams turned his attention to New Jersey for the development of a system for predominately north-south states. As a result of his investigations, a modified Transverse Mercator Projection* was adopted. Since many states are too large for a single projection zone, it was necessary to divide these areas into several zones in order to keep scale departures within the specified standards of 1:10,000. Certain states such as Texas have five zones, and it was necessary in areas such as Florida to use both types of projections in order to take advantage of their particular benefits with regard to land forms. Before the establishment of these systems as many as twenty-one different origins were used within a single state (Massachusetts). Shortly after the development of these projection systems, the Civil Works Administration came into being. Work on computations was expedited and early in 1934 plane coordinate projection information was available for the entire country.

The need for a uniform survey base in each state, coupled with the high rate of unemployment during Depression years, led to the formation of Local Control Surveys in many states, and field work was rapidly undertaken under the auspices of the United States Coast and Geodetic Survey. In New Jersey, Professor Philip Kissam of Princeton University was appointed to the position of Technical Advisor to the State Survey and he served in this capacity until late in 1935. From the latter part of 1933 until May 1934, the program was sponsored by the C.W.A. The Emergency Relief Administration then became the parent organization until October 1935. In November 1935 the survey was reorganized under the Works Progress Administration and sponsored by the New Jersey Department of Conservation and Development. Mr. Arthur Noack was appointed Director and remained as such until the close of the program in 1938. Responsibility for the maintenance of the survey was then delegated to the Topographic Engineer of the Bureau of Geology and Topography and has been retained to the present date.

Professor Kissam, in addition to his duties as consultant to the New Jersey Local Control Survey, became very active as a champion for the cause of plane coordinate systems, and through his efforts many unfavorably inclined persons dropped their objections to the use of coordinates in land description. He has the distinction of having written the first legislative act concerning plane coordinates in the entire country. It was introduced in the State Legislature and signed into law on March 25, 1935. A full quotation of this law, titled *Chapter 116, P.L. 1935* will be found on page 9. Although the Massachusetts Land Court System (established 1898) for many years recognized and accepted rectangular coordinates based upon the geographic positions of U.S.C.&G.S. triangulation stations, the New Jersey Legislation was the

* Refer to the publications marked with (*) in the "Bibliography of Selected References". Complete explanations of the modified Transverse Mercator Projection will be found in these books and in many privately published surveying texts.

first to legalize this major change in the art of plane surveying and property description.

Some of the most vigorous opposition to the enactment of this legislation came from representatives of Title Companies who feared that property descriptions would become unnecessarily and dangerously abbreviated when based solely upon the coordinates of land corners. In order to satisfy these objections, the final draft contained among other amendments a provision which made it clear that those engaged in real estate transactions are not required to accept descriptions based wholly upon coordinate values (par. 4, p. 9).

The uses of plane coordinates are many and varied and each passing year adds to the total. Since every control monument in a system serves as a witness to every other monument, the reestablishment of lost corners with certainty is perhaps one of the most important benefits to be derived from this method. In the event that a corner must be reestablished, a traverse from the nearest pair of stations to the vicinity of the lost corner and closure upon another pair of stations will enable the surveyor to redefine the corner by a simple computation for azimuth and distance from the traverse points. The New Jersey State Highway Department uses the coordinate system to establish alignments and is assured of 1:10,000 accuracy or better for any starting point. Air survey firms are constantly using control for mapping work within the State borders, and private engineering concerns establish coordinate positions from the New Jersey system for bridges, tunnels, etc.

The surveying profession as a whole is using coordinates in increasing amounts; many subdivisions, municipal and county lines, and even small parcels are now coordinated. At a future date when control density and maintenance can satisfy the needs of a large proportion of the population, the use of compass bearings will become passé, except for those cases in which old compass traverse lines must be retraced. The surveyors of future generations will not be encumbered with the difficulties which presently beset the profession, court squabbles will be greatly reduced, and property holders in general will be in a better legal position when their land boundaries do not depend upon the vagaries of the earth's magnetic field.

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1. Cook, George H., *Topography, Magnetism, Climate,* Vol. 1, Report of the State Geologist (Trenton: John L. Murphy Publishing Co., 1888).

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3. N.J. Division of Geology and Topography, *Work of the New Jersey Geodetic Control Survey,* Bulletin 46, Geologic Series (Trenton: 1938).

4. U.S. Department of Commerce, *Formulas and Tables for the Computation of Geodetic Positions,* Special Publication No. 8 (Washington: Government Printing Office, 1933).

5. U.S. Department of Commerce, *Geodetic Letter,* No. 5, Vol. 2 (Washington: Division of Geodesy, U.S. Coast and Geodetic Survey, May 1935).

6. U.S. Department of Commerce, *Geodetic Letter,* No. 7, Vol. 2 (Washington: Division of Geodesy, U.S. Coast and Geodetic Survey, July-August 1935).

7. U.S. Department of Commerce, *Geodetic Operations in the United States 1933-1935,* Special Publication No. 207 (Washington: Government Printing Office, 1936).

8. U.S. Department of Commerce, *Geodetic Letter,* No. 1, Vol. 4 (Washington: Division of Geodesy, U. S. Coast and Geodetic Survey, January 1937).

9. U. S. Department of Commerce, *Cartography,* Special Publication No. 205 (Washington: Government Printing Office, 1943).

10. U.S. Department of Commerce, *Elements of Map Projection,* Special Publication No. 68 (Washington: Government Printing Office, 1945).

STATE OF NEW JERSEY

CHAPTER 116, LAWS OF 1935

AN ACT to establish a system of land boundary descriptions.

BE IT ENACTED *by the Senate and General Assembly of the State of New Jersey:*

Establishing official survey base.

1. The official survey base for New Jersey shall be a system of plane co-ordinates to be known as the New Jersey System of Plane Co-ordinates, said system being defined as a transverse Mercator projection of Clark'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 co-ordinates of the system are expressed in feet, the x co-ordinate being measured easterly along the grid and the y co-ordinate being measured northerly along the grid, the origin of the co-ordinates being on the meridian 74° 40′ west from Greenwich at the intersection of the parallel 38° 50′ north latitude, such origin being given the co-ordinates 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 co-ordinates have been computed on the system defined.

How Indicated.

Use stations in property surveys.

2. Any triangulation and/or traverse station established as described in section one of this act may be used in establishing a connection between a property survey and the above mentioned system of rectangular co-ordinates.

Use prohibited until established.

3. 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 Co-ordinates unless the co-ordinates have been established on that system as herein defined.

Interpretation of act.

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

5. This act is to take effect immediately.

Approved March 25, 1935.

Considering the means at their disposal, the surveyors who produced earlier maps of New Jersey are to be admired for their perseverance. In fact, it is to their everlasting credit that they were able to do this work with any degree of accuracy with Jacob's staff, compass and chain. A review of reports by triangulation parties of the late 19th century indicates the amount of labor which was necessary to fix the position of just one triangulation station, even with the best instruments and methods of the time. Comments such as the following are excellent food for thought, considering the means available today: "Days are frequently spent without a single satisfactory observation, sometimes whole weeks together."[1] "This [triangulation] of New Jersey has now been going on . . . for 11 years, and it will yet require 2 years more for its completion."[2] "The instrument used was a 14-inch repeating theodolite with a large telescope. In measuring the primary angles, each one was determined by not less than 6 sets of measurements . . . making 72 measurements in all."[3]

Two recent advances in techniques which reflect the technological level of present-day surveying are as follows:

1. *The Johnson Elevation Meter*—a device installed in a specially modified vehicle which determines instantaneous slope changes in a road by an integrating circuit. Fourth-order elevations are obtained at vehicle speeds up to twenty-five miles per hour, producing fifty to one hundred mile-per-day level lines.[4]
2. *Inertial Surveying Equipment*—another vehicle-mounted instrument package which utilizes an inertial guidance system and integrator. Fourth-order azimuths, grid declinations, and traverse coordinates are continuously available when surface transport is used. The equipment is also installed in helicopters, determines in-flight position changes, and provides location information for landing points. This device is still in the testing stage, and presently is limited to traverses which can be closed upon the beginning point within one hour since the system is time dependent.[5]

It is to be expected that future refinements of these two instruments will eventually produce accuracies of a higher order, and automated surveying will someday come into common use, where applicable.

In the field of photogrammetry, the newer aerial cameras are fitted with wide-angle, high-resolution lenses. Photographs produced by these optical systems show amazing clarity, and ratioed prints to twelve diameters are possible without seriously affecting readability. Infra-red sensor devices are now being used to obtain surface heat images, and a whole new field of mapping is developing. Important non-military applications of this type of instrument include the location of ground water and the delineation of surface currents in bodies of water.

Since photogrammetry is playing an increasingly important role in all phases of mapping, it is conceivable that maps with a scale of two hundred feet per inch and covering the entire State will someday be available. Recent developments in the art of producing "three-dimensional" photographs make it likely that in the future two-dimensional photo maps with three-dimensional qualities will be in use. Advanced photogrammetric instrumentation, coupled with sophisticated surveying devices which employ light beams and radio waves for the determination of position and distance have in the last few years provided map users with accuracy, speed, and detail unmatched by previous methods. Although the state of the art has progressed immeasurably in the past few years, we can look forward to even more sophistication in the future.

The exotic instrumentation and methodology which are necessary to determine the shape of the earth may never find their way into ordinary surveying and mapping practice. However, highly sophisticated developments in any scientific field eventually produce refinements which are applicable to work at lower levels of accuracy. One promising development in the field of optics is light amplification by stimulated radiation (Laser) which may lead to distance measurement by light beams to accuracies within a few wavelengths.

Advanced surveying and mapping instruments and methods which are in use today require highly skilled personnel, and the time has come to exercise judgement and foresight in the training of men. The era of "old fashioned" surveying is rapidly drawing to a close, and a bright future lies ahead for those who are now entering the field.

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1. Cook, George H., *Annual Report of the State Geologist for the Year 1885* (Trenton: John L. Murphy Publishing Company), p. 9.

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3. Cook, George H., *Topography, Magnetism, Climate,* Vol. I of Report of the State Geologist (Trenton: John L. Murphy Publishing Company, 1888), p. 11.

4. Speert, Julius L., *The Elevation Meter in Topographic Mapping* (Washington: U.S. Geological Survey, Topographic Division, March 1962).

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MAGNETIC DATA

"The original magnetic survey of New Jersey was made in 1887 by the New Jersey Geological Survey. Although confined to declination only, this work served to bring out clearly the widespread irregularities that affect the magnetic lines in the northern part of the State. (Such features are by no means confined to this region but are found in many other States as well.) The Coast and Geodetic Survey made complete observations at some eighty stations throughout the State, mostly during the years 1904-14. More recently, declination observations at several stations were obtained by the New Jersey Geodetic Control Survey (1934-38). Most of the Coast and Geodetic Survey stations were permanently marked for the convenience of local engineers. Anyone desiring to occupy one of these stations for the purpose of testing a compass or transferring an azimuth may obtain a description of the station and a statement of the observed values by making application to the Director, U. S. Coast and Geodetic Survey.

Information on the gradual change in direction of the compass needle, essential in working with old surveys, has been derived from many sources including the reports of observations made in very early times in New Jersey and adjacent regions. Tables of this secular change are available, together with explanations of their use.[1] This change cannot be predicted, nor can it be reduced to any simple mathematical law or formula . . .

Because of the local irregularities already mentioned, it is not possible to give an accurate value of the declination at a specific point unless it has been actually measured at that point. Lacking actual observations, the best estimate may be obtained from the latest isogonic chart of the United States. A value so obtained may be regarded as a kind of normal or mean value for a fair-sized region around the point in question. The actual declination at any particular point is ordinarily more or less than the normal value, but in any region free from magnetite the "probable error" of a value scaled from a good isogonic chart[2] is perhaps one-half degree or less; that is, there is perhaps an even chance that the chart value will be within one-half degree of the actual value. The value is intended as a mean for several days, eliminating diurnal and irregular fluctuations. The [1960] chart shows values ranging from less than 9° West near Delaware Bay to 12° West near the northeast corner of Bergen County.

The 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 a.m., local time; then a westerly motion, with a westerly extreme about 1 or 2 p.m.; and then an easterly motion for hours. From dusk to the 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

in winter, and greater at the eleven-year peak of sunspot activity than at its trough. Both the amplitude and the times of the extremes are also subject to some fluctuation from day to day.

Aside from this systematic daily variation, the direction of the needle occasionally undergoes erratic fluctuations which, if sufficiently severe, constitute a magnetic storm. The surveyor should be on the lookout for such an occurrence. Any unusual activity of the compass needle may have this explanation. Surveys made during the progress of a magnetic storm could be seriously in error, since the declination is then usually changing rapidly, and departures from normal of as much as half a degree may easily occur in the latitude of New Jersey. During the great magnetic storm of September 18 and 19, 1941, the maximum range of the fluctuations amounted in this region to more than four degrees of arc. A magnetic storm may last many hours (sometimes several days) and the more severe ones are known to extend from pole to pole over the entire globe. They are usually associated with the appearance of aurora and with other phenomena of the ionosphere. They have no apparent relation with the weather."[3]

Quoted below is an excerpt from a publication of the New Jersey Geological Survey dated 1888. The discussion could be included in any surveying journal which is presently published without seeming out of place.

"An examination of several instruments, made as a preliminary to the magnetic survey of New Jersey, showed in one case an error of 1¼° in a needle . . . In another case a . . . needle . . . showed an error of 25′. Another six-inch needle showed an error of 10′. These are rather exceptional cases, but as they are instruments of different makers, in good order, and carefully compared, they point out the danger of error from this source . . . While the compass must still be used in retracing old lines, the teaching of the irregularities of magnetic declinations . . . 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.*"[4] (Italics are mine, H.J.B., Jr.)

As a special service to engineers and land surveyors who need to retrace old boundary lines, magnetic declinations for any section of New Jersey will be furnished upon request by:

Bureau of Geology and Topography
P.O. Box 1889
Trenton, New Jersey 08625
Attention Topographic Engineer
Telephone: Area Code 609, 292-2576

References Cited

1. U. S. Department of Commerce, *United States Magnetic Tables for 1960,* Publication 40-2, (Washington: Government Printing Office, 1962).

2. Refer to *Magnetic Declinations Map of New Jersey* in rear pocket of this booklet. This map is republished approximately fourteen months after the end of each five-year magnetic epoch. Requests for future printings should refer to Bulletin No. 66 and include $0.25 to cover the cost of printing and handling. Address order to: **Bureau of Geology and Topography, P.O. Box 1889, Trenton, New Jersey 08625.**

3. Magnetic information excerpted, with a minor date correction from *Handbook of Technical Services by the Coast and Geodetic Survey for the State of New Jersey (Including New York City & Vicinity),* Provisional Edition (Washington: March 1948), pp. 38-40.

4. Cook, George H., *Topography, Magnetism, Climate,* Vol. I of Report of the State Geologist (Trenton: John L. Murphy Publishing Co., 1888), p. 324.

HORIZONTAL CONTROL DATUMS

The nationwide net of triangulation arcs was established by the United States Coast and Geodetic Survey in order to determine precisely the locations of points on the earth's surface by spherical coordinates. The work was begun in the early part of the nineteenth century, and for many years individual arcs remained unconnected. About 1900, extensions and connections of the arcs made it possible to compute 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 datum which had been used throughout New England and along the Atlantic Coast. A considerable amount of recomputation was avoided, yet the datum chosen proved nearly ideal for the entire country. Designated the *United States Standard Datum,* it was based upon Clarke's spheroid of 1866 and originated at station *Meades Ranch* in Kansas (Latitude 39° 13′ 26″.686, Longitude 98° 32′ 30″.506). Inherent errors in the positions of stations throughout the triangulation net balanced out when the latitude and longitude of Meades Ranch was used as a starting point for computations.

In 1913 Canada and Mexico adopted this datum, and in recognition of the continental significance, the name was changed to *North American Datum.* By 1927 the national triangulation network was completed to a sufficient degree 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. In order to correct this situation the western half of the national net, then the eastern half, were readjusted. Since station positions were altered up to 1 second in latitude and 1.4 seconds in longitude, it was necessary to change the name of the datum to prevent confusion of new and old positions. The name *North American Datum of 1927* was adopted and represents changes in position only, since 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.

Although the positions developed were considered to be final, and the Atlantic Coast Arc adjustments were completed by 1933, some minor readjustments have been found to be necessary. During the progress 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 Mt. Holly to Newton to Phillipsburg. Local Control Survey traverses in the area were then recomputed and in every case closure ratios were improved.

Selected References

1. McDonald, Frederick H., and others, *Mapping for National Planning* (New York: American Society of Civil Engineers, 1935).

2. U.S. Department of Commerce, *Geodetic Operations in the United States, 1933-1935,* Special Publication No. 207 (Washington: Government Printing Office, 1936).

3. N.J. Division of Geology and Topography, *Work of the New Jersey Geodetic Control Survey,* Bulletin No. 46 (Trenton: 1938).

4. U.S. Department of Commerce, *Horizontal Control Data,* Special Publication No. 227 (Washington: Government Printing Office, 1941).

5. Whitmore, George D., *Advanced Surveying and Mapping* (Scranton, Pa.: International Textbook Co., 1952).

VERTICAL CONTROL DATUMS

First-order control leveling by the United States Coast and Geodetic Survey was begun in 1878 to provide elevation control for trigonometric leveling which accompanied the Transcontinental Arc of Triangulation. As additional level lines became available and connections to tidal stations increased in number, various adjustments of the level net were required.

Since instrument and rod accuracies improved over a period of years, the weights assigned to level lines in each adjustment were based upon instruments and methods used in each leveling operation. Beginning about 1910, an *orthometric correction* was applied to level circuits. Because the earth is an oblate spheroid, level surfaces are not parallel but converge toward the poles. As altitude above sea level increases, each succeeding level surface has a greater proportional flattening than the sea surface. Hence level surfaces with elevations of 500 and 1000 meters above the sea at the equator rise 497.5 and 995 meters, respectively, above the sea at the poles. The orthometric correction is maximum for north-south lines at high elevations, zero for east-west lines, and probably negligible for a line run along a coastal plain. When applied to leveling in New Jersey, this correction never exceeded three-tenths of a millimeter between two successive bench marks, and the total effect on entire level lines was always less than two millimeters.[1]

The first level net adjustment occurred in 1899 and was followed by partial adjustments in 1903, 1907 and 1912. In 1929 the entire level net was completely readjusted. In addition, *Special Adjustments* were performed in 1927 and 1929 for the express purpose of testing the variation of mean sea level from a level surface. The 1927 Special was based upon the first-order level net of the United States. The 1929 Special extended this study by combining the level nets of the United States and Canada. The results of these Special Adjustments indicate 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; furthermore, mean sea level on the Pacific Coast is measurably higher than sea level along the Atlantic Coast. 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. The *1929 General Adjustment* was computed by holding sea level fixed as observed at twenty-one tide stations in the United States and five in Canada. The resulting datum from which all elevations in the adjustment are based is referred to as the *Sea Level Datum of 1929.*

Preceding the 1929 General Adjustment, mean sea level at the Sandy Hook, New Jersey, tide station was the datum for bench mark elevations. References to the "Sandy Hook Datum" still persist, even though the term has been technically incorrect since the 1929 General Adjustment.[2]

References Cited

1. U. S. Department of Commerce, *First-Order Leveling in New Jersey,* Special Publication No. 172 (Washington: Government Printing Office, 1931), p. 4.

2. Personal communication, United States Coast and Geodetic Survey, Geodesy Division.

Selected References

1. U. S. Department of Commerce, *Fourth General Adjustment of the Precise Level Net in the United States and the Resulting Standard Elevations,* Special Publication No. 18 (Washington: Government Printing Office, 1914).

2. U. S. Department of Commerce, *Geodetic Operations in the United States January 1, 1927 to December 31, 1929,* Special Publication No. 166 (Washington: Government Printing Office, 1930).

3. U.S. Department of Commerce, *Control Leveling,* Special Publication No. 266 (Washington: Government Printing Office, 1941).

4. U.S. Department of Commerce, *Manual of Leveling Computation and Adjustment,* Special Publication No. 240 (Washington: Government Printing Office, 1949).

THE RELATIONSHIP BETWEEN VERTICAL CONTROL DATUMS AND MEAN SEA LEVEL

It is well known that wind and barometric pressure exert a considerable influence upon the level of the sea. These forces produce variations from day to day and year to year. Therefore, a determination of a mean sea level datum must not only take into account the periodic gravitational effects of the sun and moon, but also the nonperiodic variations due to wind and pressure. By means of mathematical procedures (harmonic analysis) recorded tidal fluctuations (marigrams) are analyzed to determine the amplitudes and phases of each constituent member of the tide generating forces. The meteorological effects then remain as a nonperiodic residue, and a mean sea level datum can be established using only those forces which are constant and predictable.

Due to complex phase relationships between the many periodic changes in relative positions of the earth, moon and sun, an accurate determination of mean sea level requires a long series of tidal observations at a primary tidal station. In order to obtain data for a complete cycle of each of these position changes, an observation period extending over 19 years is necessary.[1] This 19-year period is referred to as the *Metonic cycle;* it is the requisite amount of time for new and full moon to recur on the same day of the year.[2] A slow change in the declination of the moon produces the longest individual cycle within a 19-year series; this long-period tidal constituent (node cycle) requires 18.6 years for completion.[3,4]

It is an accepted fact that the mean level of the sea is subject to a progressive rise. Hence, a mean sea level surface derived from one 19-year series (or epoch) of tidal observations will not coincide with a surface derived from another such series. For example, tidal observations began at New York in 1893 and at Baltimore in 1903. Analysis of these records indicates that sea level rose at a rate of less than 0.01 foot per year prior to 1930; after this date the rate increased to approximately 0.02 foot per year.[5] To be specific, at Sandy Hook the average annual rate of change since 1930 is 0.018 foot.[6]

In the 1929 General Adjustment of the level net, mean sea level as observed at each primary tidal station was held at zero. For the station at Sandy Hook this datum was based upon tidal observations of 1876-1881,[7] due to the fact that a large amount of leveling in New York and northeastern New Jersey was based upon data of this period. At the time, a change to a more modern tidal series would not have caused an appreciable modification of elevations. Since 1930, however, the annual rate of change of mean sea level has produced more significant cumulative effects.

The latest published elevations of New Jersey tidal bench marks are based upon the 1941-1959 epoch. Referred to this period of observation, Tidal Bench Mark No. 2 at Sandy Hook is 6.69 feet above mean sea

level. However, the elevation of this bench from the geodetic level net (based upon the 1876-1881 epoch) is 7.27 feet above mean sea level. In the time interval of 78 years from 1881 to 1959, the relationship between the sea and the land at Sandy Hook has changed by 0.58 foot.[8] Considering the evidence given above, it must be concluded without qualification that any references to local mean high water, local mean low water, half tide level, etc. and/or mean sea level *must* specify the epoch used to determine the datum(s).

References Cited

1. U.S. Department of Commerce, *Tidal Datum Planes,* Special Publication No. 135, Revised (1951) Edition (Washington: Government Printing Office, 1951), chap. v, p. 63.

2. U.S. Department of Commerce, *Tide and Current Glossary,* Special Publication No. 228 (Washington: Government Printing Office, 1941), p. 24.

3. U.S. Department of Commerce, *Manual of Harmonic Analysis and Prediction of Tides,* Special Publication No. 98 (Washington: Government Printing Office, 1958), p. 17.

4. U. S. Department of Commerce, *Shore and Sea Boundaries,* Publication 10-1, Vol. 1 (Washington: Government Printing Office, 1962), Appendix A, p. 304.

5. U.S. Department of Commerce, *Tidal Datum Planes,* chap. v, p. 58.

6. Personal communication, United States Coast and Geodetic Survey, Geodesy Division.

7. *Ibid.*

8. *Ibid.*

Selected Reference

1. Defant, Albert, *Ebb and Flow,* The Tides of Earth, Air and Water, (Ann Arbor, Michigan: The University of Michigan Press, 1958).

FEDERAL AGENCY AERIAL PHOTOGRAPHIC REPRODUCTIONS

Various Federal agencies periodically obtain air photo coverage of portions of New Jersey. Summarized below is information relative to sources and types of photography. Since scale, material, and quantity considerations determine prices, highly detailed instructions and price lists are not warranted in this publication. Therefore, only a brief summary of representative costs (which are standard in the Federal Government) will be listed. Correspondence with the proper agency will enable prospective buyers to obtain complete, up-to-date information by return mail. In general, one month should be allowed for delivery after an order for photographs is initiated.

The Map Information Office of the United States Geological Survey maintains records of aerial photographic coverage of the United States and outlying areas, based upon reports from Federal and State agencies and commercial companies. From these records the Map Information Office furnishes data to prospective purchasers on available photography and the agency holding the aerial film.

There is no central sales office from which reproductions of aerial photographs may be obtained; they must be purchased from the agency holding the film.

Requests for data on aerial photography should be addressed to:

United States Geological Survey
Map Information Office
Washington, D. C. 20025

As an adjunct to serving in the capacity of a clearing house for air photography data, the Map Information Office periodically produces *status maps* showing areas for which aerial mosaics or photo maps and unmounted aerial photographs are available. Individuals with a continuing interest in air photo coverage should obtain the *latest editions* of these status maps for their files:

1. *Status of Aerial Mosaics* (United States), Catalog No. I 19.5/3: Ae 8/2, scale 1:5,000,000, 150 m.=1.9 in., 27x41 in. ..... N/C
2. *Status of Aerial Photography* (United States), Catalog No. I 19.5/3: Ae 8/961, scale 1:5,000,000, 150 m.= 1.9 in., 27x41 in. ..... N/C

Due to diversified requirements, photography obtained by Federal agencies will generally range in scale from 1:10,000 to 1:30,000. Aerial camera lens focal length specifications vary from four inches to twelve inches. The special nine-lens camera used by the United States Coast and Geodetic Survey produces prints which look like and can be used as photographs taken with a single lens of 8¼ inch focal length and 130 degree field of view.

Since stereoscopic coverage (60% end lap) requires about twice as many prints as pictorial photography, the prospective purchaser should

carefully analyze needs with respect to cost. Every other print from a stereoscopic flight strip will provide a satisfactory pictorial presentation. In addition, contracts for aerial photography require flights to be made during late spring, summer or early fall. Minute examination of ground details is hindered when deciduous foliage and ground cover appears on a photograph; therefore, the date of photography is an important factor relative to the projected use.

Shown below are representative prices for aerial photo reproductions from Federal agencies, printed on double-weight semimatte paper.

	1 to 5 each	6 to 100 each	101 to 1000 each	over 1000 each
Single lens contact prints (9x9 in.)	$1.00	$0.85	$0.65	$0.60

Costs of ratioed enlargements depend upon the degree of magnification. Photo indexes are essential for selecting prints and should be ordered before photography is obtained.

Federal Government circulars and price lists at times refer to the transfer of early date nitrate base film from the Department of Agriculture to the National Archives. Correspondence with this agency has produced the following information:

> "Aerial photography secured on nitrate film, generally dated 1941 or earlier, has been transferred to the National Archives from the Agricultural Stabilization and Conservation Service and the Soil Conservation Service, Department of Agriculture. Nitrate base photography of other federal agencies has not been transferred.
>
> Since no early date Department of Agriculture aerial photography of New Jersey was secured on nitrate film, we do not have any coverages for this state."

COMMERCIAL AERIAL PHOTOGRAPHY IN NEW JERSEY

New Jersey has been completely photographed a number of times by private concerns. Tax mapping by means of aerial photography at the county and municipality level is increasing throughout the state. Planning organizations, both private and governmental, rely upon aerial photographs and mosaics for base maps, statistical data, and other related purposes. Unless prospective buyers require extremely recent photography, information relative to the existence of suitable coverage may be obtainable from local, county or state government offices.

The New Jersey Bureau of Geology and Topography gathers available data on air photo coverage of the state; thus an information clearing house at the state level has been established as an additional service to the public. Assistance to this program can be provided by

forwarding essential details on existing aerial photography to the address given below:

Bureau of Geology and Topography
P. O. Box 1889
Trenton, New Jersey 08625
Attention Topographic Engineer

A presentation of the detailed information which should accompany a listing of air photo coverage for New Jersey areas is beyond the scope of this publication. Data concerning specific areas will be supplied upon request. The Bureau of Geology and Topography presently has file information for state-wide coverage since 1930. In addition, a recent canvass produced data on post-1960 aerial photography which is available at some county engineering or planning offices.

In the rear pocket will be found a list of aerial survey firms which are known to have produced photography of all or parts of New Jersey. The information is printed as a separate so that revisions and/or additions can be made conveniently. It is not to be construed as an endorsement of any firm by the State of New Jersey or its representatives.

BIBLIOGRAPHY OF SELECTED REFERENCES

Federal publications listed below should be ordered by catalog number and title. Prices are subject to change without advance notice. With the exception of references numbered 2 and 12, these publications can be obtained from:

U. S. Coast and Geodetic Survey
90 Church Street
New York, New York 10007

All publications cited below can be ordered from:

Superintendent of Documents
Washington, D. C. 20402

1. *Application of Theory of Least Squares to Adjustment of Triangulation.* Catalog No. C 4.19:28, 1915, 220 pp, illus. ..... $ .75
2. *EM 1110-2-1000. Engineering and Design: Photogrammetric Mapping.* Catalog No. D 103.6/3:1110-2-1000, 1958, 37 pp, illus., map ..... .55
3. *Formulas and Tables for Computation of Geodetic Positions.* Catalog No. C 4.19:8, 7th ed., 1929, 101 pp, illus. .60
4. *Magnetism of The Earth.* Publication 40-1, 1962, 77 pp, illus., maps 1.00
5. *Manual of First Order Traverse.* Catalog No. C 4.19: 137, 1927, 123 pp. illus. ..... .35
6. *Manual of Geodetic Astronomy, Determination of Longitude, Latitude, and Azimuth.* Catalog No. C 4.19:237, 1952 reprint, 205 pp, illus. pl. 1.25
7. *Manual of Geodetic Leveling.* Catalog No. C 4.19:239, 1948, 94 pp, illus. ..... .55
8. *Manual of Geodetic Triangulation.* Catalog No. C 4.19: 247/2 Rev. 1959, 344 pp, illus. 2.00
9. *Manual of Leveling Computation and Adjustment.* Catalog No. C 4.19:240, 1948, 178 pp, illus. 1.00

*10. *Manual of Plane Coordinate Computation.* Catalog No. C 4.19:193, 1948, 271 pp, illus. 1.00

*11. *Manual of Second and Third Order Triangulation and Traverse.* Catalog No. C 4.19:145, Rev. 1935, 226 pp, illus. 1.00

12. *Maps, Engineering, Surveying.* Price List 53 ..... N/C

*13. *Natural Sines and Cosines to Eight Decimal Places.* Catalog No. C 4.19:231, 1942, 541 pp, cloth 3.75

14. *Plane Coordinate Intersection Tables* (2½ Minute)
    a. *Delaware.* Catalog No. C 4.19/2:65-1/pt. 7, 1959, 11 pp, illus. ..... .15

b. *New Jersey*. Catalog No. C 4.19:333, 1955, 28 pp, illus. ..... .25

c. *New York*. Catalog No. C 4.15:328, 1954, 111 pp, illus. ..... .60

d. *Pennsylvania*. Catalog No. C 4.19:326, 1954, 76 pp, illus. ..... .45

15. *Plane Coordinate Projection Tables*

a. *Delaware*. (Transverse Mercator). Catalog No. C 4.19:305, 1953, 16 pp, illus. ..... .15

**b. *New Jersey*. (Transverse Mercator). Catalog No. C 4.19:316, 1954, 18 pp, illus. ..... .20

c. *New York*. (Lambert and Transverse Mercator). Catalog No. C 4.19:323, 1954, 36 pp, illus. ..... .25

d. *Pennsylvania*. (Lambert). Catalog No. C 4.19:267, 1952, 24 pp, illus. ..... .15

16. *Some Elementary Examples of Least Squares*. Catalog No. C 4.2:L 48, 1924, 1959 reprint, 17 pp ..... .15

*17. *State Coordinate Systems* (A Manual for Surveyors). Catalog No. C 4.19:235, 1945, 62 pp, illus., maps ..... .65

18. *Steel Tape Measurements, Tables and Charts for Correction*. Catalog No. C 4.19:307, 1954, 27 pp, illus. ..... .40

19. *The Preservation of Triangulation Station Marks*. Serial 632, 1949, 13 pp, illus. ..... N/C

†20. *The Universal Grid Systems*. TM 5-241, 1951, 324 pp, illus., (Not available, see footnote below.) .....

21. *Tide Tables*. High and low water predictions, east coast of North and South America including Greenland. (published yearly), 285 pp, illus. 1.00
This publication is for sale by the U.S. Coast and Geodetic Survey and sales agents listed elsewhere in this booklet.

‡22. *United States Magnetic Tables for 1960*. Publication 40-2, 1962, 91 pp, illus., maps 1.50

* Publications especially recommended for explanations of, and computations for, the New Jersey Transverse Mercator Grid System.

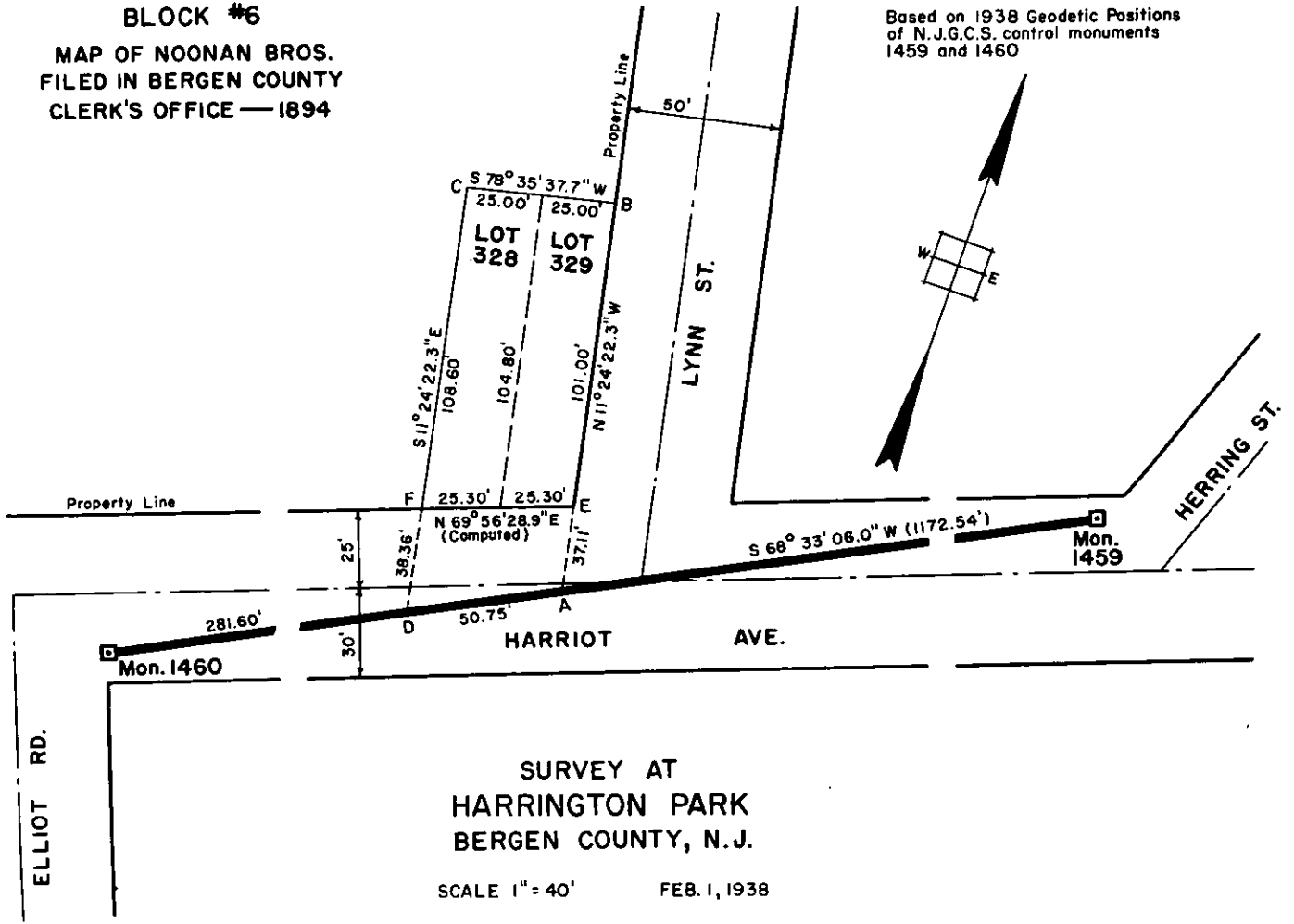
** Contains tables for transposition from geographic position to New Jersey plane coordinates, and for the determination of meridional convergence (grid north to true north and vice versa).

† Contains tables for transposition from geographic position to Universal Transverse Mercator Grid. This publication is not presently available. A copy may be consulted at the New Jersey Bureau of Geology and Topography, Labor and Industry Building, Room 709, John Fitch Plaza, Trenton, New Jersey.

‡ Publication 40-2 is revised and reprinted when magnetic information has been obtained for each succeeding epoch.

SURVEY USING STATE PLANE COORDINATES

On the following four pages will be found a sample plat, description, and computations for a survey based upon the New Jersey State Plane Coordinate System. The material as shown originally appeared in Bulletin No. 46, *Work of the New Jersey Geodetic Control Survey,* and has been changed in two respects: (1) redrafting to provide a better presentation, and (2) recomputation of coordinates and minor revision of figures. Shortly after Bulletin No. 46 was published, an adjustment of triangulation in northern New Jersey shifted traverse monument positions slightly (see article titled "Horizontal Control Datums", page 15). The improved positions have been used in the present computations. It will be noted that the measured lengths have not been reduced to sea level or adjusted for grid scale factor. If first-order points of origin, field methods and closures are required, these corrections should be included.



Description of Lots 328 and 329, Block 6, at the southeast intersection of Harriot Avenue and Lynn Street in Harrington Park, Bergen County, New Jersey, July, 1964.

Beginning at a point formed by the intersection of the westerly line of Lynn Street with the northerly line of Harriot Avenue (x : 2,188,845.13) (y : 784,782.95) and running:

1. Thence N 11° 24′ 22.3″ W along the said westerly line of Lynn Street a distance of 101.00 feet to a point (x:2,188,825.16) (y : 784,881.96);
2. Thence S 78° 35′ 37.7″ W a distance of 50.00 feet to a point (x : 2,188,776.15) (y : 784,872.07);
3. Thence S 11° 24′ 22.3″ E a distance of 108.60 feet to a point (x : 2,188,797.64) (y : 784,765.61);
4. Thence N 69° 56′ 28.9″ E along the said northerly line of Harriot Avenue a distance of 50.60 feet to the westerly line of Lynn Street, the point and place of beginning.

The coordinates referred to in the above description are for the New Jersey Transverse Mercator Coordinate System (1938 positions) as established by the New Jersey Geodetic Control Survey. All bearings refer to grid north. The Central Meridian for this coordinate system is Longitude 74° 40′ 00″W.

SAMPLE COORDINATE COMPUTATIONS

TRAVERSE — Survey at Harrington Park, Bergen County, New Jersey
INITIAL STATION - Mon. 1459
CLOSING STATION - Mon. 1460

COMPUTED BY _____ DATE _____
CHECKED BY _____ DATE _____

Station	Distance	Cumulative Distance	Adjusted* Bearing	Cosine	Sine	Latitude Y	Departure X	Final Grid Coordinates Y	Final Grid Coordinates X
1459 (Fixed)			S W			—	—	785,175.32	2,189,943.80
	1172.54		68-33-06.0	.36566207	.93074768	428.75	1091.34		7
A		1172.54	N W			+	—	784,746.57	2,188,852.46
	37.11		11-24-22.3	.98024980	.19776332	36.38	7.34		3
E		1209.65	N W			+	—	784,782.95	2,188,845.12
	101.00		11-24-22.3	.98024980	.19776332	99.01	19.97		6
B		1310.65	S W			—	—	784,881.96	2,188,825.15
	50.00		78-35-37.7	.19776332	.98024980	9.89	49.01		5
C		1360.65	S E			—	+	784,872.07	2,188,776.14
	108.60		11-24-22.3	.98024980	.19776332	106.46	21.48		4
F		1469.25	S E			—	+	784,765.61	2,188,797.62
	38.36		11-24-22.3	.98024980	.19776332	37.60	7.59		3
D		1507.61	S W			—	—	784,728.01	2,188,805.21
	281.60		68-33-06.0	.36566207	.93074768	102.97	262.10		
1460 (Fixed)		1789.21						784,625.04	2,188,543.11
								784,625.04	2,188,543.13
								0.00	−0.02

Y Corr. Coeff. = $\frac{0.00}{1789.21} = 0.00$

X Corr. Coeff. = $\frac{0.02}{1789.21} = +0.00000111781$

Position Error = $\sqrt{0.00^2 + 0.02^2} = 0.02$

Accuracy = $\frac{1789.21}{0.02} = 1:89,460$

* Bearings are adjusted by equal distribution of angular closing error.

SAMPLE INVERSE COMPUTATION

TRAVERSE—Survey at Harrington Park, Bergen County, New Jersey

		X-COORD	Y-COORD
FROM STATION	F	2,188,797.64	784,765.61
TO STATION	E	2,188,845.13	784,782.95
		+47.49	+17.34

TANGENT $a' = \frac{X}{Y} = \frac{47.49}{17.34}$

TANGENT a' = 2.73875432

GRID BEARING (a') = [N]/[S] 69° 56' 28.9" [E]/[W]

DISTANCE = $\frac{X}{\sin a'}$ or $\frac{Y}{\cos a'}$

DISTANCE = $\frac{47.49}{93934209}$

DISTANCE = 50.56'

COMPUTED BY _____ DATE _____

CHECKED BY _____ DATE _____

NOTE: Use largest of X or Y in distance calculation.

NEW JERSEY GEODETIC CONTROL SURVEY MONUMENTS AND BENCH MARKS

The axes of the New Jersey Plane Coordinate System are coincident with the 38° 50′ North parallel and the 74° 40′ West meridian. At the intersection of these lines X is assigned a value of 2,000,000 feet and Y is assigned a value of 0 feet.

All elevations are based upon the United States Coast and Geodetic Survey mean sea level datum of 1929.

Plane coordinate data is available for approximately six thousand of the eight thousand control monuments established by the New Jersey Geodetic Control Survey. The information is furnished on 8½″ x 11″ prints. Each sheet provides location sketches of a pair of control monuments, brief descriptions, coordinate positions, distance and grid bearing between the monuments, and their elevations. The prints are furnished at $0.25 each.

Descriptions and elevations of more than twelve thousand bench marks are also available on 8½″ x 11″ prints. Each sheet contains information for four to seven benches and the cost per sheet is $0.25.

Index maps of each county showing the identification numbers and general locations of all control stations are available at a cost of $1.00 per map. Bergen, Burlington and Ocean Counties require two maps each.

A new series of eighty-five Geodetic Control Index maps is now being produced. These maps also cost $1.00 apiece. They have a scale ratio of 1:24,000 and each sheet covers the area of two United States Geological Survey 7½-minute quadrangles. The older index maps will be retired from service as the new control index map series coverage extends over entire counties.

New booklets are being published under the title *Geodetic Control Information*, and they contain all of the New Jersey Geodetic Control Survey data for the area encompassed by a new series control index map. With the exception of areas with less than twenty control stations, each new series map will eventually have a corresponding booklet. Binding is accomplished by means of screw fasteners and a pressboard cover to facilitate revision of information; a pocket provided on the rear cover contains the appropriate index map. Since the new control index maps are identified by number (1 through 85), corresponding Geodetic Control Information booklets are also labeled with the same number series. Orders for these publications should therefore specify title *and* number. Prices are adjusted to a quantity discount schedule and are available upon request. Please refer to the Geodetic Control Map Index in the rear pocket of this publication for maps and/or booklets which are presently available. It is to the advantage of users of geodetic control to contact the Topographic Engineer at least semiannually in order to determine the availability of new series control index maps and/or booklets covering areas of interest. Production schedules necessarily vary with Bureau activities.

POLICY STATEMENT OF THE BUREAU OF GEOLOGY AND TOPOGRAPHY

Meetings have been held with officials of the United States Coast and Geodetic Survey in an effort to resolve certain problems which this office has experienced in the distribution of Federal triangulation station and bench mark information. The following points were discussed:

1. Reproduction of United States Government material for resale.
2. Establishment of the New Jersey Bureau of Geology and Topography as an official sales agency of the United States Coast and Geodetic Survey.

Reproducing Federal material for resale has not been recommended. In view of various problems and the availability of printed data in Washington, this practice therefore has been discontinued.

The establishment of this office as an official United States Coast and Geodetic Survey geodetic information sales agency is not possible at this time due to the necessity of obtaining filing cabinets, personnel, office space, etc. for separate maintenance of Federal information.

The United States Coast and Geodetic Survey has initiated a user-charge system for geodetic information, and instructions for obtaining data will be found on succeeding pages. The policy change as stated should not detrimentally affect consumers since orders are quickly processed.

The office of the New Jersey Geodetic Control Survey will continue to provide geodetic information by telephone as follows:

1. Two N.J.G.C.S. or U.S.C.&G.S. bench mark descriptions and elevations, or
2. Two N.J.G.C.S. control monument descriptions, coordinates, and elevations, or
3. Two U.S.C.&G.S. triangulation station descriptions and coordinates.

Dissemination of geodetic data by telephone suffers from a number of disadvantages, the two following being the most important:

1. The possibility of providing improper values.
2. Disruption of office routine by prolonged telephone conversations.

Those who so desire are welcome to visit this office at any time to hand-copy Federal control information. *It must be emphasized that the above statements do not apply to the sale of New Jersey Geodetic Control Survey data which is distributed according to the policies outlined in the previous article.*

DESTRUCTION OF GEODETIC CONTROL STATIONS

When conditions indicate that a Federal or State geodetic control station must be moved, lowered or raised to accommodate construction activities, contact the **Topographic Engineer (telephone number: Area Code 609, 292-2576)** as far in advance as possible. Arrangements will be made to protect the position so that work schedules may proceed efficiently. In cases which preclude this course of action, control stations may be altered in position only under the supervision of a licensed Professional Engineer or Land Surveyor using standard methods. Copies of field notes and instrument, tape, and rod specifications (including calibration data) should be submitted so that computation files may be kept current.

EXPLANATION OF NEW JERSEY GEODETIC CONTROL SURVEY STATION DESIGNATIONS

The following definitions apply generally to traverse stations and bench marks established or used by the New Jersey Geodetic Control Survey. Exceptions occur in cases where strict adherence to rules was not considered expedient due to ground conditions, instrument setup or other adverse factors.

MONUMENT - (MON.), *DISK* - (DK.): A standard United States Coast and Geodetic Survey and State Survey* or New Jersey Geodetic Control Survey disk set in a concrete post, pavement, curb, ledge rock, etc., stamped with a reference number, and used for both horizontal and vertical control.

POINT - (PT.): 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 should be an enclosing box, the rim is stamped with a number.

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

MARK - (MK.): Same as *POINT*, but used only for vertical control. In the description of such marks there should appear our mark number followed by an equality sign and then the original name or elevation of the bench mark, together with the name of the organization which established it in parentheses.

* Before complete responsibility for the maintenance of New Jersey Geodetic Control Survey stations was delegated to a State agency, disks were inscribed "United States Coast and Geodetic Survey and State Survey". This inscription was used to indicate participation of the United States Coast and Geodetic Survey in a cooperative program with the State of New Jersey. At present, all control stations marked in this manner are part of the New Jersey Geodetic Control Survey System.

ABBREVIATIONS USED BY THE NEW JERSEY GEODETIC CONTROL SURVEY

DEPARTMENT OF CONSERVATION AND DEVELOPMENT-STATE OF NEW JERSEY	D.C.D.
HUDSON COUNTY ENGINEERING DEPARTMENT	H.C.E.
NORTH JERSEY DISTRICT WATER SUPPLY COMMISSION	N.J.D.W.S.C.
NEW JERSEY GEODETIC CONTROL SURVEY	N.J.D.C.D.-G.C.S.
NEW JERSEY GEODETIC CONTROL SURVEY	N.J.G.C.S.
NEW JERSEY GEODETIC CONTROL SURVEY	U.S.C.&G.S.&S.S.
NEW JERSEY GEOLOGICAL SURVEY	N.J.G.S.
NEW JERSEY STATE HIGHWAY DEPARTMENT	N.J.
RIPARIAN STREAMS & WATERWAYS SURVEY	"RIPARIAN"
UNITED STATES ARMY ENGINEERS	MAP CONTROL STA.
UNITED STATES ARMY ENGINEERS	U.S.C.E.
UNITED STATES COAST & GEODETIC SURVEY	RV#(D.L.&W.R.R.)
UNITED STATES COAST & GEODETIC SURVEY	RV#(E.R.R.)
UNITED STATES COAST & GEODETIC SURVEY	RV#(N.Y.S.&W.R.R.)
UNITED STATES COAST & GEODETIC SURVEY	U.S.C.&G.S.
UNITED STATES ENGINEERING DEPARTMENT	H.L.R.M.
UNITED STATES ENGINEERING DEPARTMENT	U.S.E.
UNITED STATES ENGINEERING DEPARTMENT	U.S.E.D.
UNITED STATES GEOLOGICAL SURVEY	U.S.G.S.
UNITED STATES WEATHER BUREAU	W.B.

U.S. DEPARTMENT OF COMMERCE

COAST AND GEODETIC SURVEY

GEODETIC CONTROL DATA USER-CHARGE SYSTEM[1]

The Coast and Geodetic Survey instituted a user-charge system for Geodetic Control Data on August 1, 1961. The following price list and these instructions are effective as of this date, but are subject to change without notice. The Bureau is in the process of republishing all data to a new format. This will cause the prices and methods of furnishing data to vary as the republication progresses from state to state.

The following organizations will not be charged for data indicated:

1. Local Governments - Limited quantities of all data within their jurisdiction.
2. Libraries and educational institutions - Limited (usually one copy) to all data within their area or state.

Requests for free data must be made on an official letterhead or purchase order. Occasionally it may be advantageous to this Office to supply data for areas larger than those specified above, but no charge will be made for such extended coverage.

GENERAL INFORMATION

A minimum charge of $1.00 has been established for all orders other than those mailings made under the automatic mailing service. Prepayment for orders under $5.00 may be made at the option of the Bureau. Prepayment is not required for mailings made under the automatic mailing service. Bills will be rendered on C&GS Form 325A, Geodetic Data Charge Statement. The top portion of the form must be returned with the remittance to assure proper credit.

Data may not be returned unless the Bureau made an error in compiling the order.

When a statement is rendered for prepayment and the requestor deletes any items, the complete copy of Form 325A must be returned with the remittance.

C&GS Form 325B will be sent with all non-charge orders. This is an accounting and inventory document, and not a bill.

AUTOMATIC MAILING SERVICE

This service is designed to furnish data for large areas to users who intend to maintain active files and wish to receive the data as soon as they become available. The minimum order for this service is the complete horizontal or vertical data for a State; or, in areas republished by quadrangles, complete horizontal or vertical data for a 1° by 2° area. Orders must be in complete units, i.e., complete States or quadrangles. Initial orders to start a file or to enlarge a file need not be complete

units. The requestor may order any area he desires; however, the automatic mailings to maintain the file will be on the basis of complete units.

All persons requesting the automatic mailing service, other than those receiving free copies, will be required to execute C&GS Form 11A Geodetic Control Data Automatic Mailing List Agreement, and return it in triplicate to the **Director, Coast and Geodetic Survey, U. S. Department of Commerce, Rockville, Md. 20852, Attention (L) 6111.** One copy will be returned to the applicant indicating the action taken by the Government.

A bill, Form 325A, or accounting statement, Form 325B, will accompany each mailing. Prices will be the same as for individual orders except that the $1.00 minimum charge will not apply. A $0.25 service charge per mailing will be added. No advance deposit or prepayment will be required; however, it is important that the top portion of Form 325A be returned with the remittance so that proper credit can be given.

HORIZONTAL DATA - INDIVIDUAL ORDERS

In areas where quadrangles have been published[2], a complete quadrangle should normally be ordered. Most quadrangles will be 30′ of latitude by 30′ of longitude. Individual sheets can be furnished but when a large portion of a quadrangle is requested the Bureau reserves the right to send the entire quadrangle.

In areas where quadrangles have not been published, data should normally be ordered on a county or State basis. Complete data for a State may be ordered at a substantial savings compared to the sheet price. Individual sheets and description books can be furnished at $0.06 per loose leaf sheet or $0.35 per description book. If more than a few horizontal stations in a county are requested and the requestor is unable to furnish the page numbers, the Bureau will generally send data for the entire county. It is recommended that frequent users of the Bureau's geodetic control data use the Bureau's free indexes which are available for most areas upon request.

In areas where the horizontal data are partially republished as quadrangles or are in the process of being republished, the data may be furnished in either or both forms with some duplication. As portions of States are republished, the prices for complete States will be reduced accordingly and the cost of the quadrangles added accordingly. In some States republication of old data has not begun, but some quadrangle units containing recently observed or adjusted data have been published. The cost of these quadrangles is not included in the price for complete States and an extra charge will be made.

VERTICAL DATA - INDIVIDUAL ORDERS

For areas where quadrangles have been published[2], partially republished, or are in process of being republished, the procedures for ordering and filling orders described above for horizontal data apply to vertical data too.

In areas where quadrangles have not been published, data should be ordered by the level line or by complete States. Except in instances where very little data are available in a State, substantial savings can be realized by ordering by complete States rather than individual lines.

DIAGRAMS

A new series of geodetic control diagrams[2] is now being produced in cooperation with the Geological Survey. These diagrams will replace the old triangulation and level diagrams issued by States. An explanation of this net series is included in a leaflet which is available on request. A charge of $0.50 will be made for all diagrams of both new and old series.

The Bureau assumes, unless otherwise specified by the requestor, that a person requesting a sizable quantity of data will require diagrams, and they will be furnished although not specifically requested. The cost of diagrams is not included in the price of quadrangles or complete States. This will be a separate item.

TELEGRAMS

All telegraphic replies to requests for information will be sent "Collect". A confirmation copy of the telegram will be sent by regular mail in all cases of transmission of numerical data.

A copy of the published data from which the telegram was composed will be enclosed with the confirmation copy of the telegram if requested, or if in the judgment of the Bureau the need is indicated. These published data will be accompanied by a bill, Form 325A ($1.00 minimum charge).

SPECIAL HANDLING

The cost of sending data by First Class Mail or Parcel Post is included in the established price. The cost of special mailing or shipping will be added to individual bills when this service is requested.

PRICE LIST - U.S.C.&G.S. TRIANGULATION STATION AND LEVEL LINE DATA

DIAGRAMS. (Horizontal, Vertical, or Combined series, regardless of size or area covered)	each	$0.50
DATA SHEETS	each	.08
Geographic position sheets		
Plane coordinate sheets		
Quadrangle format[2] by sheets (furnished only in unassembled sheets when request is for a few stations by name or station number or when sent, as supplements, to subscribers to automatic mailing service).		

BOOKLETS (assembled data)

Vertical control (state numbered lines)	
Horizontal control description booklets	
Quadrangles (horizontal control)[2]	
Quadrangles (vertical control)[2]	
4 sheets or less, per sheet	.08
5 to 10 sheets, per booklet	.50
11 to 30 sheets, per booklet	1.25
31 to 50 sheets, per booklet	2.50
51 or more sheets, per booklet	3.00

DATA FOR COMPLETE STATE. (Note: Prices do not include diagrams for new unpublished data.

STATE	HORIZONTAL	VERTICAL
Delaware	$10.00	$ 2.00
New Jersey	60.00	6.00
New York	99.00	21.00
Pennsylvania	Prices supplied upon request.	

Minimum charge per order, except automatic mailing list shipments	1.00
Automatic Mailing List - special service charge per shipments (additional to the subscription price)	.25

SPECIAL SUBSCRIPTION SERVICE

Special subscriptions to an automatic mailing service for new and revised data are available. Details concerning this service are available from the United States Coast and Geodetic Survey on request.

TELEPHONE REQUESTS AND OVER THE COUNTER SALES[3]

"The Bureau headquarters and the other major organizational units, except the Office of Cartography, have moved to the Washington Science Center just southeast of Rockville, Maryland. The Center is located at 11800 Old Georgetown Road, just southwest of the intersection of Old Georgetown and Montrose Roads.

Published geodetic data may be obtained in Building 2, room 106, and the telephone number is Area Code 301, 949-5310, extension 183. Technical inquires concerning geodetic information should be made to the Chief of the Geodesy Division, Area Code 301, 949-5310, extension 111."

REFERENCES CITED

1. This information has been quoted, where applicable, from the United States Coast and Geodetic Survey price and policy schedules effective April 1, 1964.

2. A recent communication (December 1964) from the United States Coast and Geodetic Survey indicates that the new horizontal and vertical control format and the companion 1:250,000 geodetic control diagrams for New Jersey will not be completed for about two years.

3. Information excerpted from a personal communication (December 1964) from the United States Coast and Geodetic Survey.

UNITED STATES COAST AND GEODETIC SURVEY
TIDAL BENCH MARK DATA FOR NEW JERSEY[1]

Elevations are derived by determining the mean value of a number of high and low water readings in the vicinity of each bench to establish a mean low water datum. Connecting levels are then run to the benches and the elevation as recorded is the number of feet above mean low water. Recent connections to geodetic bench marks have resulted in the publication of figures for some tidal benches which will produce an elevation referable to the 1929 sea-level datum which is the present basis for all geodetic calculations.

The difference between sea-level datum of 1929 (SLD) and mean low water (MLW) for each location where the tidal bench marks and the geodetic bench marks of the precise level net have been connected by spirit levels is given below.

Bench mark elevations above sea-level datum of 1929 may be obtained by applying the tabular difference to the published elevations above mean low water; subtracting the difference when positive and adding the difference when negative.

There is no charge for tidal bench mark data published by the U.S. Coast & Geodetic Survey. Tidal bench mark data are issued on loose-leaf sheets for individual station locations that are subject to revision whenever new information becomes available. Therefore it is to the interest of users to limit their request to the immediate area in which they are interested. Address orders to either of the offices listed below, specifying locality and page number:

U.S. Coast and Geodetic Survey
90 Church Street
New York, New York 10007

U.S. Coast and Geodetic Survey
Rockville, Md. 20852

Page Number	Locality	SLD-MLW Feet
1	Alpine, Hudson River	1.60
2	Edgewater, Hudson River	2.06
3	Bayonne, Upper Bay	2.06
4	Constable Hook (Standard Oil Co., of N.J. Plant), Upper Bay	1.90
5	Bergen Point, Kill Van Kull	2.11
6	Secaucus, Hackensack River	2.21
6A	Little Ferry, Hackensack River	2.37
6B	Tea Neck (New Bridge), Hackensack River	2.13
7	Kearney Point, Hackensack River	2.06
8	Port Newark, Newark Bay	2.12
9	Elizabethport, Arthur Kill	2.15
10	Carteret, Arthur Kill	2.24

Page Number	Locality	SLD-MLW Feet
11	*Destroyed*	
12	South Amboy, Raritan River	2.18
13	Crossman Dock, Raritan River	
14	Junction of Washington Canal and Raritan River	
15	Sayreville, South River Highway Bridge	
16	New Brunswick (Delaware and Raritan Canal Entrance), Raritan River	
17	Keyport, Raritan Bay	2.29
18	Keansburg (Belvidere Beach), Raritan Bay	2.20
19	Sandy Hook (Fort Hancock)	1.73
20	Highlands Bridge, Shrewsbury River	1.41
21	Normandie, Shrewsbury River	1.42
22	Oceanic, Navesink River	
23	Red Bank, Navesink River	
24	Seabright, Shrewsbury River	0.48
25	*Destroyed*	
26	Gooseneck Bridge, Shrewsbury River	0.06
27	North Long Branch (Shorelands Subdivision), Shrewsbury River	
28	Long Branch	1.96
29	Shark River Inlet (Entrance)	1.92
30	Shark River Inlet (North Channel)	1.29
31	Manasquan Inlet	1.96
32	Brielle (Railroad Bridge) Manasquan River	1.49
33	Upper Highway Bridge, Manasquan River	
34	Bayhead, Metedeconk River Entrance	
35	Upper Metedeconk Boys Camp, Metedeconk River	
36	Mantoloking, Barnegat Bay	—0.27
37	Coates Point (Highway Bridge), Toms River Entrance, Barnegat Bay	—0.40
38	Toms River, Toms River	—0.25
39	Beachwood, Toms River	—0.31
40	Barnegat Pier, Barnegat Bay	—0.34
41	Waretown, Barnegat Bay	—0.19
42	Oyster Creek Channel (East End), Barnegat Bay	—0.15
43	Sunset Shoal, Barnegat Bay	0.06
44	Barnegat City, Barnegat Inlet:	
	East of Lighthouse at Inlet	1.21
	At Lighthouse at Inlet	0.97
45	West of Barnegat City (½ mile S.W. of Barnegat Lighthouse)	0.40

Page Number	Locality	SLD-MLW Feet
46	High Bar Island (¾ mile S.W. of Barnegat Lighthouse)	0.18
47	Long Beach, Barnegat Bay	—0.10
48	Manahawkin Drawbridge, Cedar Bonnet Island, Barnegat Bay	0.27
49	Ship Bottom (Ocean)	1.91
50	Beach Haven, Little Egg Harbor	0.68
51	Long Point, Little Egg Harbor	
52	Tuckerton, Little Egg Harbor	
53	Big Sheepshead Creek Entrance, Shooting Thorofare	
54	Tucker Island, Little Egg Inlet	
55	Crab Island, Seven Islands, Great Bay	
56	Mullica River Bridge (U.S. Highway No. 9)	
57	Main Marsh Thorofare, Great Bay	
58	Brigantine Channel	
59	Grassy Bay (Entrance to Meadow Cut)	
60	Middle Thorofare, Broad Creek	
61	Absecon Creek Entrance, Absecon Bay	
62	Gardner Basin (Municipal Docks), Atlantic City	
63	Atlantic City	1.64
64	Chelsea (Inside Thorofare)	
65	Beach Thorofare (opposite Shelter Island)	
66	Dock Thorofare (Bridge)	
67	Longport (Ventnor Avenue Highway Bridge)	
68	Longport (Nugents Wharf), Risley Channel	
69	Longport-Ocean City Highway Bridge (South End), Great Egg Harbor Inlet	
70	Ocean City (Foot of 9th Street), Back Thorofare	1.78
71	Great Egg Harbor Highway Bridge	1.72
72	Scull Landing, Great Egg Harbor River	
73	Mays Landing, Great Egg Harbor River	
74	*Destroyed*	
75	Devils Island, Crook Horn Creek	
76	Corson Inlet	
77	Ben Hands Thorofare (Inland Waterway)	
78	Sea Isle City:	
	City Pier, Outer Coast	2.14
	Bridge, Ludlam Thorofare	1.81
79	Long Reach (North End)	
80	Great Sound (Entrance to Cresse Thorofare)	
81	Stone Harbor, Great Channel	

Page Number	Locality	SLD-MLW Feet
82	Grassy Sound Channel Highway Bridge	
83	North Wildwood, Hereford Inlet	
84	Grassy Sound (Pennsylvania-Reading Seashore Lines Railroad Bridge)	
85	Swain Channel	
86	Cape May Harbor	2.24
87	Cape May (Municipal Pier)	2.27
88	Cape May Canal (West End)	2.20
89	East Point Light, Maurice River Entrance	
90	Fortescue, Delaware Bay	
91	Millville, Maurice River	
92	Bay Side, Delaware Bay	
93	Trenton, Delaware River	1.60

References Cited

1. Descriptive material and sea level datum to mean low water conversion figures have been derived from United States Coast and Geodetic Survey tidal bench mark data and personal communications.

Selected Reference

1. Some construction activities require elevations based upon *local* tidal intervals. The relative accuracy of a tidal bench mark and, therefore, the accuracy of any level line run from it, is directly related to the period of observation used to establish the datum. For a discussion of the principles involved in the determination of tidal datum planes and the accuracy attainable, the following reference is indispensable:

U.S. Department of Commerce, *Tidal Datum Planes,* Special Publication No. 135 (Washington: Government Printing Office, 1951), price $0.70.

CHART SCALES & EQUIVALENTS*

FRACTIONAL SCALE	MILES PER INCH		INCHES PER MILE		FEET PER INCH
	NAUTICAL	STATUTE	NAUTICAL	STATUTE	
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	63.36	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	36.46	31.68	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
1:6,000	0.082	0.095	12.15	10.56	500.00
1:7,000	0.096	0.110	10.42	9.05	583.33
1:7,200	0.099	0.114	10.13	8.80	600.00
1:7,920	0.109	0.125	9.21	8.00	660.00
1:8,000	0.110	0.126	9.11	7.92	666.67
1:8,400	0.115	0.133	8.68	7.54	700.00
1:9,000	0.123	0.142	8.10	7.04	750.00
1:9,600	0.132	0.152	7.60	6.60	800.00
1:10,000	0.137	0.158	7.29	6.34	833.33
1:10,800	0.148	0.170	6.75	5.87	900.00
1:12,000	0.165	0.189	6.08	5.28	1,000.00
1:13,200	0.181	0.208	5.52	4.80	1,100.00
1:14,400	0.197	0.227	5.06	4.40	1,200.00
1:15,000	0.206	0.237	4.86	4.22	1,250.00
1:15,600	0.214	0.246	4.67	4.06	1,300.00
1:15,840	0.217	0.250	4.60	4.00	1,320.00
1:16,000	0.219	0.253	4.56	3.96	1,333.33
1:16,800	0.230	0.265	4.34	3.77	1,400.00
1:18,000	0.247	0.284	4.05	3.52	1,500.00
1:19,200	0.263	0.303	3.80	3.30	1,600.00
1:20,000	0.274	0.316	3.65	3.17	1,666.67
1:20,400	0.280	0.322	3.57	3.11	1,700.00
1:21,120	0.290	0.333	3.45	3.00	1,760.00
1:21,600	0.296	0.341	3.38	2.93	1,800.00
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	0.986	1.17	1.01	5,208.33
1:63,360	0.869	1.000	1.15	1.00	5,280.00

* United States Air Force, U.S.A.F. Catalog of Aeronautical Charts and Aeronautical Information Publications (St. Louis: Aeronautical Chart and Information Center, 1960), Section I, p. 7.

CHART SCALES & EQUIVALENTS*

FRACTIONAL SCALE	MILES PER INCH		INCHES PER MILE		FEET PER INCH
	NAUTICAL	STATUTE	NAUTICAL	STATUTE	
1:75,000	1.029	1.184	0.97	0.85	6,250.00
1:96,000	1.317	1.515	0.76	0.66	8,000.00
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
1:126,720	1.738	2.000	0.58	0.50	10,560.00
1:200,000	2.743	3.157	0.36	0.32	16,666.67
1:250,000	3.429	3.946	0.29	0.25	20,833.33
1:253,440	3.476	4.000	0.29	0.25	21,120.00
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
1:506,880	6.952	8.000	0.14	0.13	42,240.00
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
1:1,013,760	13.904	16.000	0.07	0.06	84,480.00
1:1,500,000	20.572	23.674	0.05	0.04	125,000.00
1:1,680,000	23.041	26.515	0.04	0.04	140,000.00
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
1:3,000,000	41.145	47.348	0.02	0.02	250,000.00
1:3,500,000	48.002	55.240	0.02	0.02	291,666.67
1:4,000,000	54.860	63.131	0.02	0.02	333,333.33
1:4,500,000	61.717	71.023	0.01	0.01	375,000.00
1:5,000,000	68.575	78.914	0.01	0.01	416,666.67
1:6,000,000	82.290	94.697	0.01	0.01	500,000.00
1:7,000,000	96.005	110.479	0.01	0.01	583,333.33
1:8,000,000	109.719	126.262	0.01	0.01	666,666.67
1:9,000,000	123.434	142.045	0.01	0.01	750,000.00
1:10,000,000	137.149	157.828	0.01	0.01	833,333.33
1:11,000,000	150.864	173.611	0.01	0.01	916,666.67
1:12,000,000	164.579	189.393	0.01	0.01	1,000,000.00
1:13,000,000	178.294	205.176			1,083,333.33
1:14,000,000	192.009	220.959			1,116,666.67
1:15,000,000	205.724	236.742			1,250,000.00
1:16,000,000	219.439	252.525			1,333,333.33
1:17,000,000	233.154	268.308			1,416,666.67
1:18,000,000	246.869	284.090			1,500,000.00
1:19,000,000	260.584	299.873			1,583,333.33
1:20,000,000	274.299	315.656			1,666,666.67
1:21,000,000	288.014	331.439			1,750,000.00
1:22,000,000	301.728	347.222			1,833,333.33
1:23,000,000	315.443	363.005			1,916,666.67
1:24,000,000	329.158	378.787			2,000,000.00
1:25,000,000	342.873	394.570			2,083,333.33
FORMULAS	$\frac{\text{SCALE}}{72913.24}$	$\frac{\text{SCALE}}{63.360}$	$\frac{72913.24}{\text{SCALE}}$	$\frac{63.360}{\text{SCALE}}$	$\frac{\text{SCALE}}{12}$

* United States Air Force, U.S.A.F. Catalog of Aeronautical Charts and Aeronautical Information Publications (St. Louis: Aeronautical Chart and Information Center, 1960), Section I, p. 7.

LIST OF NEW JERSEY MAPS

The following section is devoted to a listing of New Jersey maps and charts which are produced by various State and Federal agencies. The addresses of sales agents are shown immediately preceding each listing. It will be noted that the New Jersey Bureau of Geology and Topography, as a convenience to the public, stocks and sells several types of maps produced by the Federal Government. In all cases caution should be exercised in addressing orders so that the proper sales agency is contacted. Dates where shown indicate the period during which each map series was compiled or published.

Bureau of Geology and Topography
P.O. Box 1889
Trenton, New Jersey 08625

In this section, maps which are not credited to a specific agency are compiled and published by the Bureau of Geology and Topography.

TOPOGRAPHIC MANUSCRIPT MAPS, 1877-1887. Scale 3 inches per mile (1:21,120), sizes vary considerably. Black and white prints, contour intervals vary from 5 feet to 20 feet depending upon the relief of an area, 101 sheets. These maps show state, county and municipal boundaries, drainage, place names, railroads, roads and wooded areas as of the date of the survey. Although the culture is antiquated, the large scale and hypsography often allow a brief and inexpensive solution to a topographic mapping problem. In addition, this series of maps contains information of historical interest.

Copies of these original tracings of the Topographic Survey of New Jersey are produced upon request. Orders should specify the area of interest.

Minimum charge per map $2.00
Additional charge per square foot for maps over six square feet in area $0.25

7½-MINUTE TOPOGRAPHIC QUADRANGLES, 1942-1958 Published by the United States Geological Survey, scale 2.64 inches per mile (1:24,000), 22″x27″ (sizes vary slightly). Five colors, contour intervals vary from 10 feet to 20 feet depending upon the relief of an area, 172 sheets to cover New Jersey. These maps show state, county and municipal boundaries, buildings in rural areas, drainage, place names, railroads, roads, and wooded areas.

Price each $0.50

A 22″x27″ index to this map series is furnished free upon request. This index also provides information concerning the location of sales agents in New York City, Philadelphia, and throughout New Jersey.

Most of the agents carry only those maps for their immediate area; the Bureau of Geology stocks maps which cover the entire state.

TOPOGRAPHIC NAME SHEETS. Scale 2.64 inches per mile (1:24,000), 26"x34". Three colors, contour intervals vary from 10 to 20 feet depending upon the relief of an area. These maps show state, county and municipal boundaries, drainage, place names, railroads and roads as of the date of the survey.

Original plans for this map series called for 102 sheets covering the entire state; only 24 were produced before the program was discontinued and approximately 100 each of the following maps remain in stock:

Amboy (1940)
Atlantic City (1902)
Boonton (1932)
Camden (1900)
Chester (1930)
Dover-Stanhope (1932)
Elizabeth (1930)
Hackensack (1943)
Jersey City (1928)
Long Branch (1931)
Mount Holly (1900)
Navesink (1932)
Newark (1937)
New Brunswick (1939)
New York Bay (1942)
Paterson (1929)
Pluckemin (1944)
Somerville (1944)
Taunton (1900)
Trenton East (1902)
Woodbury (1900)

Since older editions of maps are occasionally required for historical reference purposes and the present stock of originals cannot be replaced, orders for these maps will be limited to single copies of each sheet.

Price each $0.50

TOPOGRAPHIC ATLAS SHEETS, 1946-1963. Scale 1 inch per mile (1:63,360), 27"x37". Three colors on editions printed prior to 1956, and five colors on all editions printed after this date; contour intervals 5 feet to 20 feet depending upon the relief of an area, seventeen sheets. These maps show state, county and municipal boundaries, drainage, place names, railroads, roads, and wooded areas.

Price each $2.00

An 8½"x11" Atlas Sheet index and descriptive price list is furnished free upon request.

SPECIAL HACKENSACK MEADOWS SERIES. Due to a large volume of requests for old maps of the Hackensack Meadows, a special set has been prepared for use in litigation concerning Riparian Lands. These maps are diazo copies of the unaltered originals and are sold in sets of six sheets:

Scale 2.64 inches per mile (1:24,000), 26"x34".

Elizabeth (1900 edition)
Hackensack (1899 edition)
Jersey City (1899 edition)
Newark (1908 edition)

Scale 2 inches per mile (1:31,680), 28″x46″.
Hackensack Meadows (1896 edition)
Scale 1 inch per mile (1:63,360), 27″x37″.
Atlas Sheet No. 7 (1884 edition)
Price per set $12.00

SPECIAL SERVICES. Copies of each edition of the Topographic Atlas Sheets and the Topographic Name Sheets are on file. Original printings of nearly all of the older maps (dating to 1884) are now unavailable. However, exact copies in black and white will be produced upon request. Among other uses, the historical information contained on old maps is of great value in court proceedings. In order to reproduce these maps, camera negatives and direct positive mylar films are required; the Bureau of Geology and Topography will in all cases retain the reproduction media, forwarding only the copies of maps to buyers.

Diazo reproduction of any Atlas Sheet:
First copy cost $19.00
Each additional copy .....$ 2.00
Diazo reproduction of any Name Sheet:
First copy cost $22.00
Each additional copy .....$ 2.00
Atlas Sheets and Name Sheets for which reproduction media are already available:
Price each .....$ 2.00

STREAM MAPS, 1955-1956. Scale 1 inch per mile (1:63,360), sizes vary. Black and white prints showing state and county boundaries, rivers, streams, lakes and ponds, and the names of these water features.

Each county is shown on a single sheet with the exception of Burlington which requires two maps (upper and lower) for full coverage, and Essex, Hudson and Union Counties which appear together on the same sheet.

Price each $0.50

ATLAS SHEET NO. 39, COUNTY AND MUNICIPALITY MAP OF NEW JERSEY, 1956. Scale 0.25 inch per mile (1:250,000), 27″x48″. Five colors, planimetric. This map shows state, county and municipal boundaries in color, drainage, locations and names of all cities, towns and most of the smaller settlements, railroads and roads.

Price each $1.50

ATLAS SHEET NO. 39A, INDEX TO ATLAS SHEETS AND UNITED STATES GEOLOGICAL SURVEY 7½-MINUTE QUADRANGLES, 1963. Scale 0.25 inch per mile (1:250,000), 27″x48″. This map is a special overprint of Atlas Sheet No. 39 described above. A sixth color has been added showing the locations and

designations of Atlas Sheets and 7½-minute quadrangles. In addition, changes in municipality names from 1956 to January 1963 have been listed.

Price each $2.00

UNITED STATES SERIES OF TOPOGRAPHIC MAPS, 1953-1964. This series is compiled by the Army Map Service and published and distributed for civilian use by the United States Geological Survey. Scale 0.25 inch per mile (1:250,000), sizes vary from 22″x32″ to 24″x34″. Six colors, contour interval 100 feet with supplementary contours at 50-foot intervals in areas of low relief, six sheets to cover New Jersey. These maps show state and county boundaries, drainage, place names, railroads, main roads and wooded areas.

Price each $0.75

An index to this map series is furnished free upon request. Certain sheets in this series are available as raised plastic relief maps. Please refer to the Army Map Service listing below for a description and price information.

MAGNETIC DECLINATIONS MAP FOR NEW JERSEY, 1960 EPOCH. Scale 0.13 inch per mile (1:500,000), 23″x28″. This map is a large-scale version of the Magnetic Declinations Map in the rear pocket of this booklet. Isogonic and isoporic values can be interpolated with ease and accuracy. The magnetic information is revised approximately fourteen months after the end of each five-year magnetic epoch.

Price each $2.00

NEW JERSEY (STATE), 1948. Published by the United States Geological Survey. Scale 0.13 inch per mile (1:500,000), 23″x28″. Two colors, planimetric. This map shows state and county boundaries, drainage, locations and names of all cities, towns, and most of the smaller settlements, roads and railroads.

Price each $0.75

NEW JERSEY (TOPOGRAPHIC), 1958. Published by the United States Geological Survey. Scale 0.13 inch per mile (1:500,000), 23″x28″. Four colors, contour interval 200 feet. This map is an overprint of the map described directly above showing, in addition, roads and contours. The physical features are further brought out by shaded-relief in colors on the conventional plan of assumed diagonal illumination from the northwest.

Price each $1.50

NEW JERSEY (RELIEF), 1958. Published by the United States Geological Survey. Scale 0.13 inch per mile (1:500,000), 23″x28″. Two colors, planimetric. This map shows shaded-relief, as on the map described directly above, but is overprinted on a modified map which shows only county boundaries, drainage and the large cities.

Price each $1.50

SOIL SURVEYS. In cooperation with the United States Bureau of Soils, a soil survey of New Jersey was undertaken and completed prior to 1930. Reports on various soil types and accompanying maps were available for many years. Although soil boundaries are somewhat generalized and soil classifications are not in accord with present correlations or boundaries, the information contained in the reports is still valuable in many respects. At present, the following five reports are all that remain in stock. Map scale 1 inch per mile (1:63,360), 26″x35″.

Soil Survey of the Millville Area, New Jersey, Bulletin No. 22, 1921, Reports of the Department of Conservation and Development.

Soil Survey of the Bernardsville Area, New Jersey, Bulletin No. 24, 1923, idem.

**Soil Survey of the Chatsworth Area, New Jersey,* Bulletin No. 25, 1924, idem.

**Soil Survey of the Trenton Area, New Jersey,* Bulletin No. 28, 1926, idem.

Soil Survey of the Camden Area, New Jersey, No. 28, Series 1926, United States Department of Agriculture, Bureau of Chemistry and Soils.

Price each $0.25

*At the present writing, twenty-two copies each of these two reports remain in stock and it is expected that by June 1966 the inventory will be depleted.

Rutgers, The State University
Bureau of Engineering Research
College of Engineering
New Brunswick, New Jersey 08903

ENGINEERING SOIL SURVEY OF NEW JERSEY, 1951-1955. Rutgers University Press, New Brunswick, New Jersey. A series of reports on soil conditions in each county of New Jersey from an engineering standpoint, for use by highway engineers in locating and relocating road alignments and in finding material suitable for fills. Of value also to consulting engineers, planning boards, housing authorities and real estate interests. Accompanied by maps for each county, scale 1 inch per mile (1:63,360). Large maps, scale 2 inches per mile (1:31,680), are available separately at prices listed below. Report No. 22 in this series contains 14 four-color photographs, 31 black-and-white illustrations and 8 tables, and is bound in hard covers.

Engrg Bull No.	Report No.	Title	Large Scale Maps Bull. Price	No. Sheets	Each Sheet	Set
15	1	Soil Environment and Methods of Research (revised edition)	$2.00	....	.....	.....
16	2	Essex County	1.00	2	$1.00	$2.00
17	3	Passaic County	1.00	3	1.25	3.75
18	4	Bergen and Hudson Counties	1.00	5	1.00	5.00
19	5	Union County	1.00	2	1.00	2.00
20	6	Hunterdon County	1.00	5	1.00	5.00
21	7	Somerset County	1.00	4	1.00	4.00
22	8	Ocean County	1.50	9	1.00	4.50
23	9	Morris County	1.50	6	1.00	3.00
24	10	Middlesex County	1.50	3	1.00	3.00
25	11	Sussex County	1.50	6	1.00	3.00
26	12	Mercer County	1.50	4	1.00	2.00
27	13	Warren County	1.50	4	1.00	2.00
28	14	Salem County	1.50	6	1.00	3.00
29	15	Cape May County	1.50	4	1.00	2.00
30	16	Gloucester County	1.50	5	1.00	2.50
31	17	Camden County	1.50	3	1.00	2.00
32	18	Atlantic County	1.50	7	1.00	3.50
33	19	Monmouth County	1.50	6	1.00	3.00
34	20	Burlington County	2.00	10	1.00	5.00
35	21	Cumberland County	1.50	7	1.00	3.50
36	22	Practical Applications of Engineering Soil Maps	3.00	....	.....	.....
		Price of Complete Set	$32.50			$63.76

Listed below are New Jersey Soil Surveys produced by the United States Department of Agriculture, Soil Conservation Service. When available, the material is distributed without charge by the Soil Conservation Agent in each county. This series consists of half-tone photo maps overprinted in five colors. In addition to a legend specifying the type of soil shown by each color, the following data is printed on the reverse side of each sheet: slope information, descriptions of soil types, classes of erosion and an index to adjoining sheets.

Soil Conservation Service
U.S. Department of Agriculture
28 Court Street
Freehold, New Jersey 07728

FREEHOLD SOIL CONSERVATION DISTRICT, MONMOUTH COUNTY, PHYSICAL LAND CONDITIONS, 1948. Scale 4 inches per mile (1:15,840), 18"x22", 33 maps.

Soil Conservation Service
U.S. Department of Agriculture
County Court House
413 Second Street
Belvidere, New Jersey 07823

WARREN COUNTY SOIL CONSERVATION DISTRICT PHYSICAL LAND CONDITIONS, 1953. Scale 4 inches per mile (1:15,840), 18"x22", 28 maps.

Soil Conservation Service
U.S. Department of Agriculture
County Building
Delsea Drive
Clayton, New Jersey 08312

A new format for soil surveys is now in use by the U.S.D.A., Soil Conservation Service. At present (1964), the only report available for New Jersey covers Gloucester County. Work is continuing in other counties of the state and additional surveys will be published as areas are completed.

SOIL SURVEY, GLOUCESTER COUNTY, NEW JERSEY, 1962. Bound report (9"x11") containing 84 pages of illustrated text, 40 maps, scale 4 inches per mile (1:15,840), 11"x21". The half-tone photo maps are overprinted in two colors to show soil and political subdivision boundaries.

When the Gloucester County Soil Conservation Agent is unable to furnish this report, copies may be obtained from:

Superintendent of Documents
Washington, D.C. 20402
Price each $2.25

Bureau of Navigation
P.O. Box 1889
Trenton, New Jersey 08625

RIPARIAN ATLAS SHEETS. Scales vary from 105.6 inches per mile (1:600) to 10.5 inches per mile (1:6,000), 36"x42". Riparian lands and conveyances are sketched on tracings of tax maps and reproduced on black and white prints. This series of maps covers the main tidal waterways of the state.

Price each $2.00

Division of State and Regional Planning
P.O. Box 1978
Trenton, New Jersey 08625

All of the selected maps listed below are reproduced in black and white. Since the titles are more or less self-explanatory, no descriptive statements are necessary.

NEW JERSEY STATE OWNED LANDS UNDER JURISDICTION OF DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT: B2A-25, B4A-37, B10A-13.

NEW JERSEY STATE OWNED LANDS UNDER JURISDICTION OF MAJOR STATE LAND HOLDING AGENCIES: B2A-26, B4A-38, B10A-14.

OCCUPIED AND POTENTIAL INDUSTRIAL LANDS OF NEW JERSEY — 1951 and 1957: B2A-28, B4A-40, B10A-16.

FEDERAL OWNED LANDS WITHIN THE STATE OF NEW JERSEY AS OF 1964: B2A-30, B4A-36.

COUNTY OWNED LANDS IN THE STATE OF NEW JERSEY AS OF 1960: B2A-31, B4A-42.

MAJOR AND SECONDARY DRAINAGE BASINS OF NEW JERSEY: B4A-33, B10A-18.

MAJOR AND SECONDARY DRAINAGE BASINS OF NEW JERSEY SHOWING MAJOR STREAM BEDS: B3A-34.

PUBLIC AND PRIVATELY OWNED POTABLE WATERSHED PROPERTIES IN NEW JERSEY AS OF 1962: B10A-12.

N.J. MUNICIPALITIES THAT HAVE AN APPROVED TAX MAP AS OF JANUARY 1963: B10A-9

NOTE: All number designations listed above concern prices and map scales as follows; those maps for which one or two number designations are shown are available only at the scale listed.

B2A series: 0.5 inch per mile (1:126,720), 54"x96". (These maps are printed only on special order at cost of reproduction).

B4A series: 0.25 inch per mile (1:250,000), 27"x47".
Price each $1.00

B10A series: 0.10 inch per mile (1:601,920), 12"x20".
Price each $0.10

Division of Water Policy and Supply
Bureau of Water Control
P.O. Box 1390
Trenton, New Jersey 08625

RIPARIAN AND STREAM SURVEY MAPS. Scales vary, 24"x36". These maps show the configuration of many of the larger streams and rivers in New Jersey. Since the project was abandoned before completion (1940), all waterways within the state are not completely mapped.

Among the details shown, the most important are: plan and profiles of both banks and channel centerlines, cross sections, structures, and locations of control traverses as of the date of the survey. Many of the surveys are based upon the New Jersey Plane Coordinate System. The vertical datum is, in all cases, mean sea level. Tracings of intra-county streams of Essex and Union Counties are filed at the offices of the County Engineers.

Orders for black and white prints from the Bureau of Water Control are processed by a private contracting company and costs are based upon paper area.

Price per square foot $0.08
(Postage additional when required.)

State Highway Department
Bureau of Planning and Traffic
31 Scotch Road
Trenton, New Jersey 08625

COUNTY BASE MAPS, dates vary*. Scale 2 inches per mile (1:31,680), 18 inches wide, variable length. Blue line prints, planimetric, 122 sheets to cover New Jersey. The number of sheets per county varies. These maps show state, county and municipal boundaries, drainage, place names, railroads, roads, some road names, mileage along state routes and rural buildings.

Price per sheet .....$ 0.50
Complete set $50.00

A key map showing the sheet numbering system is supplied free upon request.

* Most principal and secondary routes and route numbers are revised to 1960.

COUNTY MAPS SHOWING ADT VOLUMES ON STATE HIGHWAYS, 1962. These maps are the same as those described above, with the exception that Average Daily Traffic figures are shown at locations where traffic counts have been made.

Price each sheet $0.50

A key map showing the sheet numbering system is supplied free upon request.

COUNTY MAPS, GENERAL HIGHWAY SERIES, 1955-1962. Scale 2 inches per mile (1:31,680), 19"x42". Black and white, planimetric. These maps are revised editions of the County Base Maps (listed above), and show essentially the same information. The following counties* are now available:

Hunterdon (1960) — 5 sheets
Mercer (1962) — 4 sheets
Middlesex (1956) — 3 sheets
Monmouth (1955) — 6 sheets

Somerset (1960) — 4 sheets

Price each sheet $0.50

* Revisions on a county basis are continuing. It is advisable to intermittently request a price list (free) to determine the status of individual areas.

COUNTY MAPS, GENERAL HIGHWAY SERIES, URBAN AREA ENLARGEMENTS, 1955-1962. Scale 4 inches per mile (1:15,840), 19"x42". Black and white, planimetric. These maps show boundaries, drainage, place names, railroads, roads, all available road and street names, and mileages along main routes. They are a requisite part of the County Map General Highway Series discussed immediately above and provide detailed information for specific urban areas which cannot be shown on the 2 inch per mile sheets. Urban enlargements are available as follows:

Hunterdon (1960) — 1 sheet
Mercer (1962) — 3 sheets
Middlesex (1956) — 5 sheets
Monmouth (1955) — 6 sheets
Somerset (1960) — 2 sheets

Price each sheet $0.50

STATE MAP, GENERAL HIGHWAY SERIES, 1960. Scales 0.50 inch per mile (1:126,720), 60"x108" (three sections); 0.25 inch per mile (1:250,000), 30"x48". Black and white, planimetric. This map shows state and county boundaries, place names, the numbering system and road types of principal and secondary roads with enlarged insets for Camden, Trenton and the Newark area from Perth Amboy to Paterson.

Scale 1:126,720, price each section $1.50
Scale 1:250,000, price each $0.50

STATE MAP, OPERATING STATE HIGHWAYS, 1963. Scale 0.25 inch per mile (1:250,000), 20"x35". Black and white, planimetric. This map shows state and county boundaries, existing principal highways, the names of larger cities, and the proposed alignments of some interstate routes. Also shown are enlarged insets for Camden, Trenton and the Newark area from Perth Amboy to Paterson. It is essentially a less detailed version of the map described directly above.

Price each $0.50

STATE MAP AND URBAN AREA ENLARGEMENT SHEET SHOWING ADT VOLUME, 1964. (Revisions published every two years.) State Map scale 0.20 inch per mile (1:316,800); Urban Area Sheet scale 0.50 inch per mile (1:126,720), both sheets 20"x36". Black and white, planimetric. The State Map shows state and county boundaries, the names of the larger cities, principal routes and route numbers, and the Average Daily Traffic Volume at selected traffic counting locations. The Urban Area Enlargement Map shows Camden, Trenton, the Asbury

Park area, and the Newark area from Perth Amboy to Trenton with ADT volumes at selected points.

Price each set $0.50

STATE MAP, COUNTY LINES AND COUNTY SEATS. Scale 0.20 inch per mile (1:316,800), 20"x36". Black and white. This map shows an outline of the state and county boundaries, and the names of counties and county seats.

Price each $0.25

Army Map Service
San Antonio Field Office
2100 N. New Braunfels Avenue
San Antonio, Texas 78208

Many requests have been received for information concerning the availability of Army Map Service Quadrangles with photo maps printed on the reverse side of each sheet, scale 2.53 inches per mile (1:25,000). Correspondence with the above agency has produced the following statement:

"This installation is not presently authorized to produce or stock photo maps covering the State of New Jersey. The Army Map Service does not produce large scale military maps of the United States for direct civilian purchase. Exceptions to this policy are made when civil editions are not available at the United States Geological Survey."

The Army Map Service does, however, publish a series of plastic relief maps for civilian purchase. Most of the northern half of New Jersey is covered by this series; relief maps of southern New Jersey will not be produced due to the low relief.

PLASTIC RELIEF MAPS OF EASTERN-WESTERN U.S.A., 1953-1961. Horizontal scale .25 inch per mile (1:250,000), vertical scale 1:83,333 (vertical exaggeration 3:1) 20.5"x29.5", six colors, contour interval 100 feet. These maps show state and county boundaries, drainage, place names, railroads, roads and wooded areas.

Price each $4.00

For information concerning the availability of these maps, request index series No. V501P & V502P from the above address.

U.S. Geological Survey
Map Information Office
Washington, D.C. 20025

LARGE-SCALE TOPOGRAPHIC AND PLANIMETRIC MAPS. Scale 8.8 inches per mile (1:7200), 6.34 inches per mile (1:10,000) and 5.28 inches per mile (1:12,000), sizes vary.

Quoted below are excerpts from correspondence with the United States Geological Survey relative to the existence of large-scale maps:

". . . in New Jersey, such manuscripts with contours exist for only three quadrangles and without contours for another 27 quadrangles.

For these 27 maps, the contouring was by plane-table at 1:24,000 scale.

The cost of reproducing any of these manuscripts varies greatly, depending, of course, on the manuscript scale, but primarily on the type of reproductions made: stable film, less expensive film, or paper prints. Specific price quotations can be provided for any quadrangle on request."

Manuscripts of a large portion of New Jersey mapped by the Army Map Service have been destroyed. Therefore, the only large-scale sheets covering portions of this state which are presently available are those listed immediately below and under the heading "United States Coast and Geodetic Survey, *LARGE-SCALE MAPS (T-SHEETS)*." The names used in the following lists are 7½-minute topographic quadrangle map titles.

TOPOGRAPHIC MANUSCRIPTS

Scale 8.8 inches per mile (1:7200):
Alloway (1955)
Bushkill (1944)
Woodstown (1955)

PLANIMETRIC BASES

Scale 5.28 inches per mile (1:12,000):

Atsion (1953)	Elmer (1953)	Mount Holly (1953)
Bridgeton (1953)	Five Points (1956)	Newfield (1953)
Buena (1953)	Green Bank (1956)	Newtonville (1953)
Cedarville (1956)	Hammonton (1953)	Oswego Lake (1955)
Clementon (1953)	Jenkins (1956)	Pitman East (1953)
Dividing Creek (1956)	Mays Landing (1955)	Pitman West (1953)
Dorothy (1956)	Medford Lakes (1953)	Port Elizabeth (1956)
Egg Harbor City (1956)	Millville (1953)	Runnemede (1952)
	Moorestown (1953)	Tuckahoe (1956)
		Williamstown (1953)

U.S. Coast and Geodetic Survey
Rockville, Md. 20852

LARGE-SCALE MAPS (T-SHEETS). Scales 6.34 inches per mile (1:10,000), 3.17 inches per mile (1:20,000), and in the vicinity of New York 12.67 inches per mile (1:5,000), average size 26"x44".

Among many duties, the Coast and Geodetic Survey is responsible for mapping 7½-minute series topographic quadrangles which cover sea coasts and navigable waterways. The completed sheets are then edited and published by the United States Geological Survey on a scale of 2.64 inches per mile (1:24,000).

The large-scale manuscripts are compiled from aerial photographs and supplemental planetable surveys based upon triangulation or traverse control. Permanent survey marks of Federal and State agencies are

shown as well as state plane coordinate systems. The maps *do not* contain contours, elevations, or hydrographic information and are published as reproductions of the original compilation drawing, printed in one color (black) without scale reduction.

When advance prints of manuscripts or drawings are furnished and maps have not reached final reproduction stages, an odd scale may occur, i.e., 1:9,680 instead of 1:10,000.

Three types of large-scale maps are available as follows:

PLANIMETRIC MAPS showing natural and cultural features within the map limits except contours and elevations.

Ozalid prints, price of first copy $2.00
Each additional copy $1.00
Film positive, up to 42"x70", price of first copy $15.00
Each additional copy $10.50

SHORELINE SURVEYS. Similar to planimetric maps but cover only the shoreline and the land adjacent thereto.

Ozalid prints, price of first copy $2.00
Each additional copy $1.00
Film positive, up to 42"x70", price of first copy $15.00
Each additional copy $10.50

TOPOGRAPHIC MAPS. Part of the 7½-minute series of standard topographic quadrangle maps printed at compilation scale.

Prices supplied upon request.

Nine-inch by eleven-inch indexes showing the locations and registry numbers of these maps (T-Sheets) in New Jersey can be obtained free of charge from the above-listed source. Specify the area(s) and date(s) of interest.

HYDROGRAPHIC SURVEYS. Scale from 13.2 inches per mile (1:4800) to 3.17 inches per mile (1:20,000), sizes vary.

The United States Coast and Geodetic Survey will, upon request, reproduce early date hydrographic surveys.

Bromide prints of hydrographic survey sheets, price of first copy $8.50
Each additional copy $5.00
Photostats of portions of hydrographic survey sheets, up to 18"x24", price each:
Negative $8.00
Positive $9.00
Each additional positive from same negative $1.00

Film positive, up to 42″x70″, price of first copy $15.00
Each additional copy $10.50

Nine-inch by eleven-inch indexes showing the locations and registry numbers of these maps (H-Sheets) in New Jersey can be obtained free of charge from the above-listed source. Specify the area(s) and date(s) of interest.

EARLY DATE NAUTICAL CHARTS. Scales and sizes vary.

Photographic copies of early nautical charts of the New Jersey coast are available. Contact the United States Coast and Geodetic Survey at the above address; specify the area(s) and date(s) of interest and request information as to price, scale, etc.

Chart series numbering systems were changed after 1900; an index to the older series can be obtained from the above-mentioned source.

U.S. Coast and Geodetic Survey
90 Church Street
New York, New York 10007

U.S. Coast and Geodetic Survey
Rockville, Md. 20852

MODERN NAUTICAL CHARTS[1]

A listing of New Jersey, New York City and Philadelphia sales agents for nautical charts will be found in the rear pocket.

No.	Description	Price
1215	Approaches to New York-Fire Island Light to Sea Girt Light, scale 1:80,000, size 35″x43″.	$1.00
1216	Sea Girt to Little Egg Inlet, scale 1:80,000, size 35″x42″.	1.00
1217	Little Egg Inlet to Hereford Inlet, scale 1:80,000, size 35″x43″; Absecon Inlet, scale 1:20,000.	1.00
1218	Delaware Bay, scale 1:80,000, size 35″x40″.	1.00
1219	Cape May to Fenwick Island Inlet, scale 1:80,000, size 35″x49″.	1.00
824-SC	Sandy Hook to Little Egg Harbor, scale 1:40,000, size 15″x59″.	.75
826-SC	Little Egg Harbor to Cape May, scale 1:40,000, size 15″x59″.	.75
795	Shark River, Manasquan River and Bay Head Harbor, scale 1:10,000, size 29″x43″.	.75
375	Raritan River-Raritan Bay to New Brunswick, scale 1:20,000, size 28″x36″.	.50
369	New York Harbor, scale 1:40,000, size 35″x46″.	1.00
234	Cape May Harbor, scale 1:10,000, size 23″x27″.	.25

280	Philadelphia and Camden Waterfronts, scale 1:15,000, size 36″x43″.	1.00
294	Delaware River-Smyrna River to Wilmington, scale 1:40,000, size 31″x47″.	1.00
295	Delaware River-Wilmington River to Philadelphia, scale 1:40,000, size 34″x44″.	1.00
296	Delaware River-Philadelphia to Trenton, scale 1:30,000, size 27″x46″.	.75
	Coast Pilot #3: Atlantic Coast, Sandy Hook to Cape Henry 1961	2.50
	Tide Tables, East Coast North and South America	1.00
	Tidal Current Tables, Atlantic Coast of North America	1.00

REFERENCE CITED

1. All data concerning coastal charts and sales agents has been provided by the United States Coast and Geodetic Survey. For additional information contact either address shown above.

EARLY DATE MAPS OF NEW JERSEY

Listed below are major agencies which have valuable map collections filed for research purposes. Since material is most readily accessible through an index card system, it is advisable to contact these agencies directly for data concerning a particular area. All inquiries should be accompanied by a statement which outlines the nature of the information required.

Division of State Library
State House Annex
Trenton, New Jersey 08625

Special Collections Department
Rutgers University Library
New Brunswick,
New Jersey 08903

Morristown National Historical Park
P.O. Box 759
Morristown, New Jersey 07960

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

New Jersey Historical Society
230 Broadway
Newark, New Jersey 07104

Princeton University Library
Maps Division
Princeton, New Jersey 08540

Library of Congress
Map Division
Washington, D. C. 20540

National Archives and Records Service
Cartographic Branch
General Services Administration
Washington, D. C. 20408

The following publication lists most of the local historical societies in New Jersey.

Directory, Historical Societies and Agencies in the United States and Canada.

Price each $2.00

Copies are obtainable from:

American Association for State and Local History
151 East Gorham Street
Madison, Wisconsin 53703

Many of the larger New Jersey libraries have extensive map collections for reference purposes. Anyone with a professional interest in maps should not fail to investigate these sources.

THE EAST AND WEST JERSEY PROPRIETORSHIPS

Mr. I. Snowden Haines, Clerk
Council of Proprietors
Western Division of New Jersey
230 High Street
Burlington, New Jersey 08016

Mr. George J. Miller, Registrar
General Board of Proprietors
Eastern Division of New Jersey
1 Kilmer Drive
Short Hills, New Jersey 07078

Full-time custodians are not maintained in the Eastern or Western Division offices. Appointments for examination of the archives may be obtained by writing to the Eastern Division Registrar or the Western Division Clerk (see above). An office admission fee of $5.00 is charged by both organizations.

Original maps, surveys, property descriptions, grants, etc. are available for the use of surveyors, title searchers, historians, and other professionally interested persons. Photostats of records can be ordered. Contact the respective Divisional representative in order to ascertain reproduction charges.

Surveys which sever titles from the Eastern and Western Divisions may be found in the archives. Beyond the severance, no subsequent conveyance in the chain of title is recorded. Conveyances which follow are recorded either in the office of the Secretary of State or in the county where the land in question is situated.

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NEW YORK CITY

New York: **Coast and Geodetic Survey Office, 90 Church Street
Abercrombie & Fitch Co., Madison Avenue & Forty-Fifth Street
*American Map Co., Inc., 11 West 46th Street
* **The Crow's Nest, 16 East 40th Street
Hagstrom Company, Inc., 311-315 Broadway
* **The Hammond Map Store, Inc., 1 East 43rd Street
Manhattan-Marine & Electric Co., Inc., 116 Chambers Street
* **T. S. & J. D. Negus, 69 Pearl Street
* **New York Nautical Instrument & Service Corp., 40 Water Street
Rand McNally & Company, 7 West 48th Street
Edward W. Sweetman Co., 1 Broadway

PHILADELPHIA

Philadelphia: * **Mr. Victor Auguste Gustin, 105 S. Second Street
* **Riggs & Bro., 310 Market Street

* Agents marked with one asterisk also handle certain U.S. Naval Oceanographic Office publications.

** Agents marked with two asterisks also handle U.S. Coast Guard publications.

BULLETIN 66
(Rear Pocket)

LIST OF OFFICIAL NEW JERSEY, NEW YORK CITY AND PHILADELPHIA SALES AGENTS FOR UNITED STATES COAST AND GEODETIC SURVEY CHARTS OF COASTAL WATERS

NEW JERSEY

Atlantic City: **Marine Mart Inc., Melrose & Mass. Avenues
Bay Head: **Dale Marine Store, 630 Lake Avenue
Beach Haven: **Shelter Harbor Marina, Inc., 317 11th Street
Belford: A & B Boat Sales, Highway 36
Bergenfield: Bergenfield Sports & Auto, 61 So. Washington Avenue
Bridgeton: Cumberland Sports Center, 45 South Laurel Street, Husted Landing

Camden: **M & E Marine Supply Co., Rte. 130 at Collingswood
Cape May: Cape Island Marina
Edgewater: Edgewater Boat Sales Co., 989 River Road
Englewood: Cruiser Sales Co., 137 Route No. 4
Forked River: Mr. Charles R. French, Route 4-9
Fort Lee: **Wilson's Marineland, Inc., Route No. 4
Hoboken: Jonro Nautical Co., 77 River Street
Lyndhurst: Lyndhurst Marine, 221 Riverside Avenue
New Gretna: **Bass River Marina, Route 9
Ocean City: Boyer Marina, 242 Bay Avenue
Pennsville: C. B. Marine Sales & Service, Foot of Ferry Road
Perth Amboy: Levins Sporting Goods Co., 192 Smith Street
Point Pleasant: New Jersey Yacht Sales Corp., Rte. 35 & Intracoastal Waterway
Point Pleasant Beach: **Point Pleasant Hardware Co.
**The Ship Chandlers, Inc., 601 Bay Avenue

Rahway: B & D Cycles, Route U.S. 1 & Scott Avenue
Red Bank: **Jersey Marine Company, Inc., 24 Wharf Avenue
Riverside: Dredge Harbor Yacht Basin, St. Mihiel Drive
Sea Bright: Nauvoo Marina, Inc., 1410 Ocean Avenue
Sea Isle City: Edward H. Dever & Sons, Inc., 44th & Venicean Road
Ship Bottom: Long Beach Marine, 236 West 8th Street
Stone Harbor: Kennedy's Sport Store, 320 96th Street
Toms River: Hotaling's Boat Yard
Zeller Cruiser Sales Co., Inc., 3404 East Washington St.
Westville: Marine Equipment & Supply Co., Route 47 and Harbard Avenue
Wildwood: South Jersey Marine, Inc., 401 W. Rio Grande Avenue

(over)

BULLETIN 66
(Rear Pocket)

LIST OF AIR SURVEY FIRMS

Abrams Aerial Survey Corp.
P.O. Box 536
Lansing, Michigan 48903

Aerial Map Service Co.
1016 Madison Ave.
Pittsburgh, Pennsylvania 15212

Aero Service Corp.
210 E. Courtland Street
Philadelphia, Pennsylvania 19120

Air Survey Corp.
Newton Square, South
Reston, Virginia 22070

American Air Surveys, Inc.
907 Penn Avenue
Pittsburgh, Pennsylvania 15222

*Jack Ammann

Michael Baker, Jr.
Air Maps, Inc.
Baker Building
Rochester, Pennsylvania 15074

Colund Aerial Surveys
P.O. Box 831
125 Pecks Road
Pittsfield, Massachusetts 01203

Fairchild Aerial Surveys, Inc.
10 Rockefeller Plaza
New York, New York 10020

*Geotechnics & Resources, Inc.

International Mapping Corp.
1125 West Washington Boulevard
Los Angeles, California 90015

Albert C. Jones Associates
223 High Street
Mount Holly, New Jersey 08060

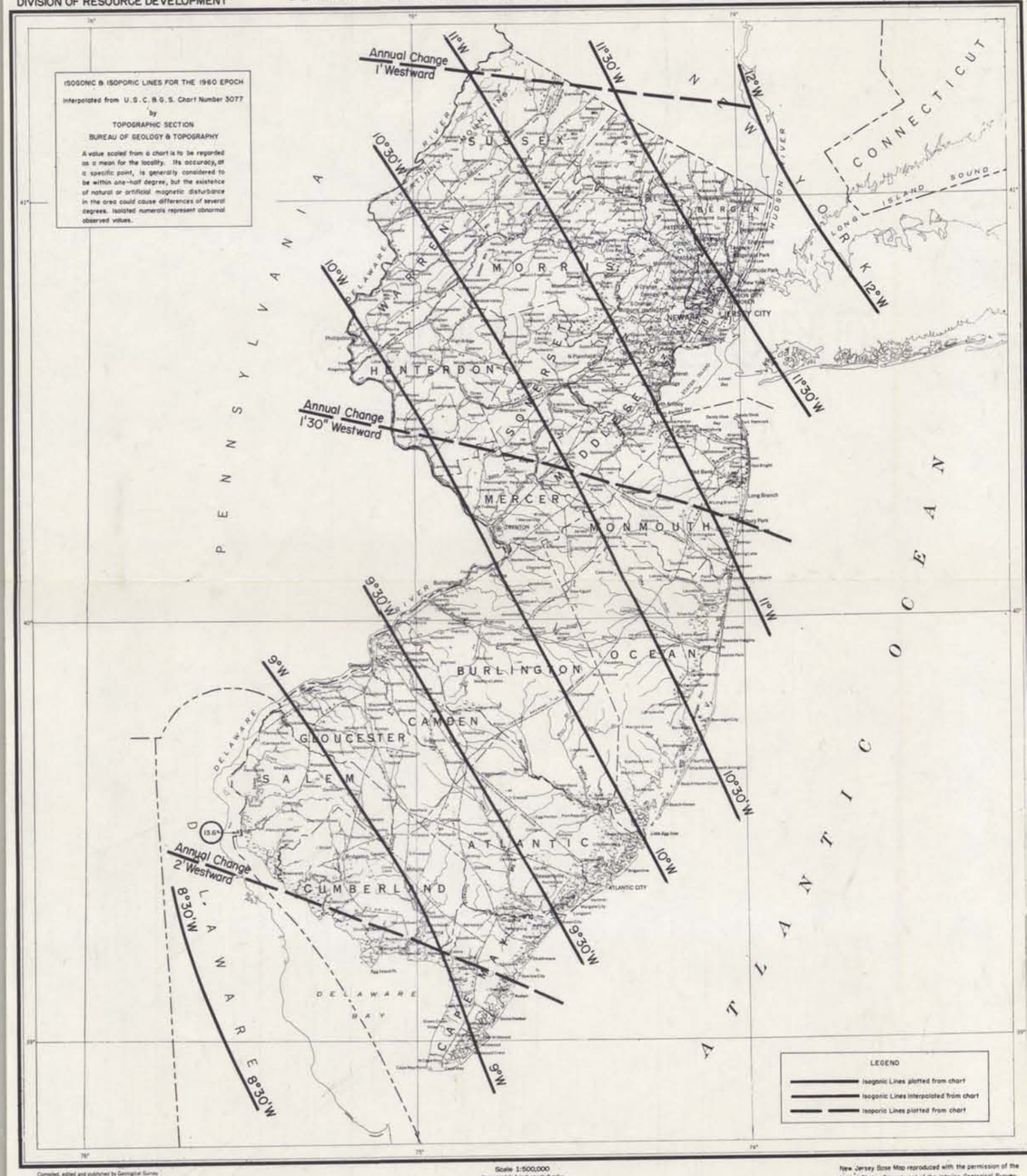
Maps, Inc.
Dundalk Marine Terminal
Baltimore, Maryland 21222

Robinson Aerial Surveys,
43 Sparta Avenue
Newton, New Jersey 07860

***Jack Ammann and Geotechnics & Resources, Inc. are no longer active. The map and film libraries formerly owned by these companies have been purchased by the firm of Knox, Bergman, Shearer and Associates, Inc., 223 10th Street, San Antonio, Texas 78215. The purchase included original negatives, indexes and mosaics of the State of New Jersey. Reproductions are available.**

STATE OF NEW JERSEY
DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT
DIVISION OF RESOURCE DEVELOPMENT

MAGNETIC DECLINATIONS



Compiled, edited and published by Geological Survey
1927 North American datum
Datum is mean sea level

SOURCE DATA
U. S. Dept. of the Interior — Geological Survey Topographic maps
Federal Power Commission — Geological Survey Topographic maps
Federal Works Agency — Public Roads Administration County maps
U. S. Dept. of Commerce — Coast and Geodetic Survey maps
State of New Jersey — Dept. of Conservation and development Maps

Scale 1:500,000
Approximately 1 inch equals 8 miles
0 10 20 30 40 Miles
0 10 20 30 40 50 Kilometers

Lambert conformal conic projection
Standard parallels 33° and 45°

New Jersey Base Map reproduced with the permission of the United States Department of the Interior, Geological Survey.