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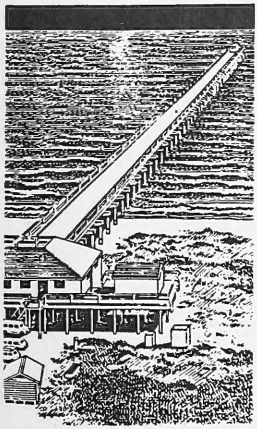

SOURCES OF COASTAL ENGINEERING INFORMATION

by

Yen-hsi Chu, Robert B. Lund, Fred E. Camfield

Coastal Engineering Research Center

DEPARTMENT OF THE ARMY
Waterways Experiment Station, Corps of Engineers
PO Box 631, Vicksburg, Mississippi 39180-0631

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Coastal engineering is a specialized branch of the engineering profession which requires the knowledge of many physical sciences and engineering disciplines in the practice. Typical coastal projects involve planning, design, and/or construction for harbor developments; navigation channel improvements; coastal inlet stabilization; coastal flooding and shoreline erosion protection; and beach restorations and nourishments. Coastal engineers not only have to be familiar with the broad disciplines and the up-to-date technologies in their practices, they must also have appropriate environmental data to ensure the safety, and economical and functional reliability of their undertakings. As the Shore Protection Manual provides a handy reference for the application of techniques and methodologies to the solutions of coastal engineering problems, this report addresses the sources of coastal engineering data and information.

(Continued)

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19. ABSTRACT (Continued).

The success or failure of a particular coastal design is often directly related to the amount and quality of available data and information related to the physical conditions at the project site. In many cases, the designer is unnecessarily restricted because of ignorance of potential sources of useful information, most of which are easily accessible. Knowledge and proper use of these information sources could result both in monetary savings and in an improvement in the quality of the final products.

The importance and economic value of existing data and information have long been recognized. In recent years major efforts have been undertaken to make available to the public vast amounts of information and data generated by Federally funded activities.

The National Environmental Satellite Data and Information Service of the National Oceanic and Atmospheric Administration represents a typical organization which provides a number of Federal data banks and services on data management and data analysis. Numerous information centers and referral services, public and private, are also becoming available to the users. However, ocean engineers, in general, are lacking in awareness and utilization of the available information resources. This publication increases the awareness and promotes the utilization of sources of coastal engineering information by compiling the available sources in a single handy reference volume; directs users to appropriate organizations, personnel, or publications for engineering data or information; and facilitates engineering design or analysis with a minimum effort in site-specific data acquisition activities.

Coastal engineering data or information covered by this report include: (a) meteorology and climatology; (b) water levels; (c) winds and storms; (d) waves and currents; (e) ice information; (f) littoral transport and shoreline erosion; (g) coastal geology and geomorphology; (h) topography, hydrography, and bathymetry; and (i) earthquakes and tsunamis.

There are data sources, particularly sources from the private sector, that may have been left out by this report. Also, new data sources and/or data files may have been established since the publication of this report. In order to benefit the coastal engineering community with complete and up-to-date information, suggestions of new sources and data information are solicited; they should be sent to the authors. The Coastal Engineering Research Center will update the present publication when the needs become apparent.

PREFACE

The investigations summarized in this report were authorized by the Office, Chief of Engineers (OCE), US Army Corps of Engineers, and performed as a part of Civil Works Research Work Unit 31234, "Developing Functional and Structural Design Criteria." Funds were provided through the Coastal Structures Evaluation and Design Research and Development Program administered by the Coastal Design Branch of the Coastal Engineering Research Center (CERC) at the US Army Engineer Waterways Experiment Station (WES).

This report was written by Dr. Yen-hsi Chu, Mr. Robert B. Lund, and Dr. Fred E. Camfield, CERC. Ms. Jamie W. Leach, Information Technology Laboratory, WES, was the technical editor.

The work was conducted under general direction of Mr. C. E. Chatham, Jr., Chief, Wave Dynamics Division; Mr. Charles C. Calhoun, Jr., Assistant Chief, CERC; and Dr. James R. Houston, Chief, CERC.

COL Allen F. Grum, USA, was the previous Director of WES. COL Dwayne G. Lee, CE, is the present Commander and Director of WES. Dr. Robert W. Whalin is Technical Director.

CONTENTS

PART I: INTRODUCTION

Objectives

Coastal engineering is a specialized branch of the engineering profession which requires the knowledge of many physical sciences and engineering disciplines in the practice. Typical coastal projects involve planning, design, and/or construction for harbor developments; navigation channel improvements; coastal inlet stabilization; coastal flooding and shoreline erosion protection; and beach restorations and nourishments. Coastal engineers not only have to be familiar with the broad disciplines and the up-to-date technologies in their practices, they must also have appropriate environmental data to ensure the safety, and economical and functional reliability of their undertakings. As the Shore Protection Manual (SPM) (1984) provides a handy reference for the application of techniques and methodologies to the solutions of coastal engineering problems, this report addresses the sources of coastal engineering data and information.

The success or failure of a particular coastal design is often directly related to the amount and quality of available data and information related to the physical conditions at the project site. In many cases, the designer is unnecessarily restricted because of ignorance of potential sources of useful information, most of which are easily accessible. Knowledge and proper use of these information sources could result both in monetary savings and in an improvement in the quality of the final products.

The importance and economic value of existing data and information have long been recognized. In recent years major efforts have been undertaken to make available to the public vast amounts of information and data generated by Federally funded activities.

The National Environmental Satellite Data and Information Service of the National Oceanic and Atmospheric Administration (NOAA) represents a typical organization which provides a number of Federal data banks and services on data management and data analysis. Numerous information centers and referral services, public and private, are also becoming available to the users. However, according to the findings by the Panel on Marine Engineering Information and Data Exchange of the National Academy of Science (National Academy of Sciences 1975), ocean engineers, in general, are lacking in awareness and utilization of the available information resources. The objectives of this publication are to:

(a) Increase the awareness and promote the utilization of sources of coastal engineering information by compiling the available sources in a single handy reference volume.
(b) Direct users to appropriate organizations, personnel, or publications for engineering data or information.
(c) Facilitate engineering design or analysis with a minimum effort in site-specific data acquisition activities.

It is hoped that this reference will provide the coastal engineers and other professionals with sufficient details to facilitate their effort in searching for site-specific design or planning information.

Guidelines and Criteria

During the earlier phase of this research, questions concerning the subject categories to be covered, types of data to be collected and documented, criteria in terms of spatial and temporal coverages, the extent of information to be presented, etc., have been frequently raised. It was soon realized that there is no obvious answer to most of these questions unless some clear guidelines with respect to information collection can be drawn. The present publication is planned for a handy data reference and is not intended to be a bibliographic listing. Therefore, effort was directed to developing a complete reference without being voluminous. When the usefulness of a particular data set is in doubt, the decision would be made based on whether the inclusion of this data set would reveal an important and valuable data source. If the same source organization had other data sets that have been already included, then the data set in question was not included. Because of this guideline being used in the information collection, the users must be aware that the listing presented in this publication is by no means complete. It is their own responsibility to inquire about the availability of other related data or information from the source agency.

All the information or data referred to by this report are prototype data which can be directly related to site-specific design applications. Simulated data from either physical or mathematical models are generally not included. Exceptions to this guideline are the hindcast wave data, predicted tsunami and surge and meteorological records, and statistical properties derived from the prototype data.

Formats of Presentation

Coastal engineering data or information covered by this report include:

(a) Meteorology and climatology.
(b) Water levels.
(c) Winds and storms.
(d) Waves and currents.
(e) Ice information.
(f) Littoral transport and shoreline erosion.
(g) Coastal geology and geomorphology.
(h) Topography, hydrography, and bathymetry.
(i) Earthquakes and tsunamis.

Information about these data and their sources is presented in the following chapters. In many instances, a publication may contain more than one type of data. Duplicated information sheets are then placed at the appropriate chapters if the data are considered to be "extensive"; otherwise, cross references are given in the form of "additional information." There is no specific effort to cross-reference the data sources presented in Part II, "Meteorology and Climatology." Users should review this Part for their information research.

The information documented is either in the form of a publication or stored as a data file in data banks. On each information sheet, the name, address, and telephone number of the source organization are provided at the top of the page. If the information is in the form of a publication, then the subject title, author's name, and publication number follow. The date of publication or publication interval is also provided. Location and time period in which the data were gathered are also included. The "contents" section provides a brief data description including the specific types of data presented in the publication. The telephone number and address at which the publication can be obtained are provided to benefit the users.

If the data are stored in a data bank, the kind of data or the name of the data file is then given. Additional information concerning the data file includes locations, description of data, response format, qualified users, and point of contact. Minor variation in the format of presentations may occur in this report for the convenience of presentation.

Appendices A-H of this report provide lists and addresses of information sources.

Suggestions and Comments

There are data sources, particularly sources from the private sector, that may have been left out of this report. Also, new data sources and/or data files may have been established since the publication of this report. In order to benefit the coastal engineering community with complete and up-to-date information, suggestions of new sources and data information are solicited; they should be sent to:

Coastal Engineering Research Center
USAE Waterways Experiment Station
ATTN: WESCW-D
PO Box 631
Vicksburg, MS 39180-0631

The Coastal Engineering Research Center (CERC) will update the present publication when the need becomes apparent.

References

National Academy of Sciences, "Information and Data Exchange for Ocean Engineers, An Approach to Improvement," Washington, DC, 1975.

Shore Protection Manual, US Army Engineer Waterways Experiment Station, Coastal Engineering Research Center, US Government Printing Office, 1984.

PART II: METEOROLOGY AND CLIMATOLOGY

National Climatic Data Center
National Oceanic and Atmospheric Administration
US Department of Commerce
Federal Building
Asheville, NC 28801
(704) 259-0682, FTS 672-0682

Publications

Local Climatological Data

Publication Interval: Monthly summaries and an annual summary are published for each individual station.

Location: Approximately 300 stations nationwide. Some stations are added while other stations are deleted from time to time.

Period of Coverage: 1897 to present

Contents: This publication comprises two issues: Local Climatological Data, Monthly Summary; and Local Climatological Data, Annual Summary with Comparative Data. Local Climatological Data, Monthly Summary, presents basic climatological data including temperature (daily maximum, minimum, average, etc.), precipitation, atmospheric pressure, wind speed and direction, sunshine and sky cover, together with a table of hourly precipitation data for the month. Data are presented by daily and 3-hr intervals. Predecessor issues were titled the Monthly Meteorological Summary (1897-1947) and Monthly Climatological Summary (1948-1952). The earlier issues varied greatly in format and content from time to time. Local Climatological Data, Annual Summary with Comparative Data, contains a narrative climatological summary and sequential tables of monthly and annual values of average temperature, total and cooling-degree days. Also included is a station location table, showing in detail a history of, and related information about, changes in location and exposure instruments.

Subscription Rate or Cost: Subscription rate will be quoted upon request by the Director, National Climatic Data Center, Federal Building, Asheville, NC 28801. Nominal costs are charged for copies of back issues. Most issues that are two or more years old are out of print. All issues can be provided on microfiche or as paper copy prepared from the microfiche.

Available From: National Climatic Data Center
National Oceanic and Atmospheric Administration
US Department of Commerce
Federal Building
Asheville, NC 28801
(704) 259-0682, FTS 672-0682

National Climatic Data Center (Continued)

Climatological Data

Publication Interval: Monthly and annually

Location: Published for state or combination of states

Period of Publication: Late 1890s to the present (varies from state to state)

Contents: The current monthly issue contains a temperature and precipitation extremes table, a summarized station and divisional data table, a daily precipitation table, a daily temperature table, a daily snowfall and snow on ground table, an evaporation and wind table, daily soil temperature, and a station index table. The annual issue presents tables as follows: monthly and annual average temperature and departures from normal; monthly and annual total precipitation and departures from normal; temperature extremes and freeze data; monthly and annual total evaporation and wind movement; monthly and annual average and extreme soil temperatures at selected depths; precipitation measured in storage gages; and a station index.

Subscription Rate or Cost: Subscription rate will be quoted upon request by the Director, National Climatic Center, Federal Building, Asheville, NC 28801. Nominal costs are charged for copies of back issues.

Available From: National Climatic Data Center
National Oceanic and Atmospheric Administration
US Department of Commerce
Federal Building
Asheville, NC 28801
(704) 259-0682, FTS 672-0682

Mariners Weather Log

Publication Interval: Bimonthly

Location: North Atlantic and North Pacific Oceans, and Great Lakes

Period of Coverage: 1957 to present

Contents: Current publication contains marine meteorological and climatological information. Special features include Hints to Observers, Tips to Radio Officers, Hurricane Alley, and Marine Weather Diary. Rough logs (incomplete records) of general weather conditions for the second and third months prior to the date of each issue and smooth logs (complete records) of conditions for the fifth and sixth months prior to the date of each issue are furnished. Tables of selected gale and wave observations for the North Atlantic and North Pacific Oceans are presented together with a bimonthly summary of US Ocean Buoy Climatological Data.

Subscription Rate or Cost: Free

Available From: National Oceanographic Data Center (D762)
Page Building 1, Room 400
Washington, DC 20235
(202) 234-7500

Marine Climatological Summaries

Publication Date: N/A

Location: 60 marine areas or fixed ships assigned to the United States by the World Meteorological Organization (WMO)

Period of Coverage: 1961-1970

Contents: This series of publications was prepared and published with cooperation between NOAA and WMO. There are ten volumes, one volume per year for 1961-1970. Each volume contains monthly, seasonal, and annual summaries for selected elements; frequencies of visibility; specific weather conditions; cloud cover; dry-bulb temperature; dew-point temperature; sea surface temperature; air-sea temperature difference; atmospheric pressure; and wind force by 30 direction sectors. Also included are seasonal tables of observed frequencies of wave heights and periods by 30 direction sectors and for all directions combined.

Available From: National Climatic Data Center
National Oceanic and Atmospheric Administration
US Department of Commerce
Federal Building
Asheville, NC 28801
(704) 259-0682, FTS 672-0682

Summary of Synoptic Meteorological Observations (Area of World) Coastal Marine Areas

Publication Date: 1970 and after

Location: 500 selected marine areas throughout world

Period of Coverage: N/A

Contents: This serial publication is produced by a joint effort of the Naval Weather Service's Detachment at Asheville, N. C., and NOAA's National Climatic Data Center and is based upon marine surface observations taken aboard vessels of varying registry in passages. Since ships tend to avoid bad weather when possible, the data may contain a bias toward good weather. There are 21 data tables for each coastal marine area. Tables 1-19 are prepared for each calendar month, with an annual summary for each. Tables 20 and 21 contain both monthly and annual summaries. Because the number of observations may vary from one table to another, no absolute relationship exists between the tables. The period of record used in each volume is indicated. The tables presented (described below) are based upon eight observation times per day (Greenwich Mean Time (GMT)).

Table 1 - Percent frequency of weather occurrence by wind direction.
Table 2 - Percent frequency of weather occurrence by hour.
Table 3 - Percent frequency of wind direction by speed and by hour and hour groups; the mean wind speed by direction is also shown.
Table 4 - Percent frequency of wind speed by hour and mean speed by hour.
Table 5 - Percent frequency of total cloud amount by wind direction and the mean cloud amount by wind direction.
Table 6 - Percent frequency of ceiling heights and no ceiling by wind direction.
Table 7 - Cumulative percent frequency of simultaneous occurrence of ceiling height and visibility, and percent frequency of low clouds.
Table 8 - Percent frequency of wind direction versus occurrence or non-occurrence of precipitation and varying of visibility.
Table 9 - Percent frequency of wind direction versus wind speed with varying values of visibility.
Table 10 - Percent frequency of ceiling heights and no ceiling by hour.
Table 11 - Percent frequency of visibility by hour.
Table 12 - Cumulative percent frequency of ranges of visibility and ceiling height by hour.
Table 13 - Percent frequency of relative humidity by air temperature.
Table 14 - Percent frequency of wind direction by air temperature.
Table 15 - Means, extremes, and percentiles of air temperature by hour.
Table 16 - Percent frequency of relative humidity by hour.
Table 17 - Percent frequency of air temperature and the occurrence of fog (without precipitation) versus air-sea temperature difference.

National Climatic Data Center (Continued)

Table 18 - Percent frequency of surface wind speed and direction versus sea height.
Table 19 - Percent frequency of wave height versus wave period.
Table 20 - Monthly and annual percent frequencies and means of sea surface temperature.
Table 21 - Monthly and annual average sea level pressures by hour. Monthly extremes and percentile values are also shown.

This series of publications covers 17 major coastal marine areas. The following tabulation lists the number of values and sub-areas for each marine area.

Marine Area	Number of Volumes	Number of Sub-areas
East African and selected island areas	5	12
Southwest Asian coastal areas	6	24
Southeast Asian coastal areas	4	14
Indonesian coastal areas	6	40
Australian coastal areas	3	22
Chinese-Philippine coastal areas	5	20
Hawaiian and selected North Pacific Island coastal areas	5	17
Japanese and Korean coastal areas	11	33
Siberian coastal areas	4	28
Alaskan and British Columbian coastal areas	5	18
North American coastal areas	6	41
Caribbean and nearby island coastal areas	6	35
South American coastal areas	5	36
Mediterranean marine areas	9	35
West African and selected island areas	3	22
Western European coastal areas	8	50
South Pacific island areas	4	32

Available From:

National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650

Definite ordering information can be obtained from:
Marine Climatological Branch
D762, Page Building 1, Room 400
Washington, DC 20235

National Climatic Data Center (Continued)

Additional Information: Other marine climatological publications which present narrative, geophysical chart, or both, and which contain information similar to that provided in the Summary of Synoptic Meteorological Observations, Coastal Marine Areas Series, are:

"Climatic Study of the Near Coastal Zone, East Coast of the U.S." (AD A024 991)*

"Climatic Study of the Near Coastal Zone, West Coast of the U.S." (AD A024 992)*

"Northeast Atlantic Environmental Scenario" (AD A781 673)*

"Northeast Pacific Environmental Scenario" (AD A781 673)*

*National Technical Information Service (NTIS) Accession Number.

National Climatic Data Center (Continued)

Summary of Synoptic Meteorological Observations for Great Lakes Areas

Publication Date: N/A

Location: 13 major Great Lakes areas

Period of Coverage: 1960-1973

Contents: This series of publications contains four volumes: Vol 1 - Lake Ontario and Lake Erie, Vol 2 - Lake Huron and Georgian Bay, Vol 3 - Lake Michigan, and Vol 4 - Lake Superior. The data summaries are based on observations taken on board vessels in passage on the Great Lakes. There are 21 data tables for each of the 13 areas. Tables 1-19 are prepared for each calendar month with an annual summary for statistics of wind direction, wind speed, cloud cover, ceiling height and visibility, precipitation, relative humidity, air temperature, air-sea temperature difference, wave height, and wave period. Tables 20 and 21 contain both monthly and annual summaries of sea-surface temperature and sea-level pressure.

Available From: National Climatic Data Center
National Oceanic and Atmospheric Administration
US Department of Commerce
Federal Building
Asheville, NC 28801
(704) 259-0682, FTS 672-0682

Selective Guide to Climatic Data Source Key to Meteorological Records Documentation No. 4.11
Dutson, K. D., and Hatch, W. L.

Publication Date: October 1981

Location: N/A

Period of Coverage: N/A

Contents: This guide is designed to assist potential users of climatological data by informing them of the availability of such data in published and unpublished form. It is arranged to indicate the publication(s) in which these data in their various climatological categories (temperature, precipitation, wind, atmospheric pressure, humidity, etc.) may be found. A brief review of the pertinent historical facts associated with each publication is given where appropriate. The various climatological tables, charts, and graphs included in each publication are listed, and in many cases abbreviated examples are shown.

Several climatological atlases have been prepared by NOAA and by agencies in the Department of Defense. The descriptions provide ordering information for these publications.

All back issues of serial climatological publications and many one-time issues containing specialized climatic data have been placed on 4- by 6-in. microfiche. Future issues will also be filmed in order to maintain continuity and integrity in the microfiche file. In addition, some of the unpublished data compilations have been placed on 100-ft reels of 16mm film. Either film copies of existing microforms or paper copies of the publications or data compilations can be provided as required. Generally, microfilm and microfiche copy costs much less than paper copy. If microforms are desired, contact National Climatic Data Center (NCDC) to determine the availability and cost of the desired materials.

Although this guide refers primarily to published climatological data, it should be noted that a wealth of unpublished climatological data and/or summaries is also available in the NCDC files. Part V herein describes indexes to many of these materials.

Most of the currently published and unpublished materials described in the guide were prepared at NCDC from digitized representations (magnetic tape) of the original records. Information about the content and format of these digital data files and how copies may be obtained is available from NCDC upon request.

Available From: National Climatic Data Center
National Oceanic and Atmospheric Administration
US Department of Commerce
Federal Building
Asheville, NC 28801
(704) 259-0682, FTS 672-0682

Storm Data

Publication Date and Interval: Monthly since January 1959

Location: The 50 states

Contents: This guide contains a chronological listing, by state, of the occurrence of storms and other unusual weather phenomena. The data contain: date, place, and local time of storm; width and length of storm; path of storm; deaths and injuries; property and crop damage; type of storm; and a description of the storm which may or may not include wind and rainfall data.

Available From:

National Climatic Data Center
National Oceanic and Atmospheric Administration
US Department of Commerce
Federal Building
Asheville, NC 28801
(704) 259-0682, FTS 672-0682

Mariners Worldwide Climatic Guide to Tropical Storms at Sea
Crutcher, H., NAVAIR 50-1C-61

Publication Date: 1974

Location: Worldwide

Period of Coverage: N/A

Contents: This 425-page guide provides narrative information about where and when tropical storms occur, their frequency of occurrence, and the general paths they follow. The narrative descriptions are supplemented with numerous charts, graphs, and diagrams. Also included are aerial, satellite, and surface photographs of tropical storms, and average sea conditions from 1/4-ft waves to greater than 37-ft waves associated with wind speeds from calm to 130 knots. The charts are presented in two sections: storm track and frequency maps, and tropical cyclone roses.

The track and frequency maps section provides charts by season and/or by 10- to 30-day intervals during the tropical storm season for the North Atlantic, Eastern, North Pacific, Western North Pacific, Southeast Indian, Southwest Indian, and Southwest Pacific Ocean basins, and the Arabian Sea, Bay of Bengal, and Indochina oceanic areas. Each chart presents tracks preferred by tropical storms and their frequency along these tracks, and isopleths showing the scaler mean (average) speed, in knots, of storm movements based on 12-hr displacements.

The tropical cyclone roses section presents monthly and annual charts for various storm stages (tropical cyclone, tropical storm, hurricane, and tropical storm-hurricane combined) for the North Atlantic (including the Caribbean and Gulf of Mexico), Eastern North Pacific, Western North Pacific, Southwest Pacific and Australian area (including the Southeastern Indian Ocean), South Indian, and North Indian (including the Bay of Bengal and Arabian Sea) Ocean basins. The storm roses are presented for 5-deg latitude-longitude quadrangles. Each storm rose depicts statistics on the direction and speed of 12-hr movements for tropical cyclone centers. The probability, in percent, of having at least one storm in any given year is also shown.

Available From: Superintendent of Documents
US Government Printing Office
Washington, DC 20402
(202) 783-3238
(GPO Stock No. 003-019-00025-0)

Additional Information: This publication was published by the Naval Weather Service Command and was prepared by the NCDC in cooperation with the Naval Weather Service Environmental Detachment, Asheville, NC.

National Hurricane Center
National Climatic Data Center
US Department of Commerce/NOAA
Gables One Tower - Room 631
1320 Dixie Highway
Coral Gable, FL 33146
(305) 666-4612, FTS 350-5547

Publications

Tropical Cyclones of the North Atlantic Ocean, 1871-1980
Neuman, C., Cry, G., Caso, E., and Jarvisen, B.

Publication Date: 1981

Location: US Atlantic coast and the North Atlantic Ocean, including the Caribbean and Gulf of Mexico

Period of Coverage: 1871-1980

Contents: This publication is an update and revision of US Weather Bureau Technical Paper No. 36 (1959) and No. 55 (1965). It consolidates the records of seasonal and chronological occurrence of tropical cyclones in the North Atlantic Ocean. Narrative information provided includes a discussion of the characteristics of tropical cyclones, classification of Atlantic tropical cyclones, data sources used, accuracy of tracks and intensity classifications, North Atlantic tropical cyclone tracks, and the frequency of North Atlantic tropical cyclones with supplemental graphs and tabular material. Two sets of tropical cyclone track charts are included: one shows storm tracks by year (107 charts); the second (26 charts) by month (May through December), and by 10- or 11-day periods (June 1 through November 30).

Available From: Superintendent of Documents
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or

National Climatic Data Center
National Oceanic and Atmospheric Administration
US Department of Commerce
Federal Building
Asheville, NC 28801
(704) 259-0682, FTS 672-0682

Additional Information: Separates are prepared annually of the North Atlantic Tropical Cyclones portion of the annual issue of Climatological Data National Summary published by NCDC. These separates may be obtained from NCDC at the above address.

A Tropical Cyclone Data Type for the North Atlantic Basin, 1886-1983: Contents, Limitations and Uses
Jarvinen, B. R., et al., NOAA Tech. Memo. NWS NHC22

Publication Date: March 1984

Location: US Atlantic coast and North Atlantic Ocean, including the Caribbean and Gulf of Mexico

Period of Coverage: 1886-1983

Contents: The National Hurricane Center (NHC) maintains a computer file on North Atlantic tropical cyclones. The file contains dates, tracks, wind speeds, and central pressure values when available for all tropical cyclones. This report describes the data organization, data formats, and limitations. Several uses of the data are demonstrated.

Available From: National Hurricane Center
National Climatic Data Center
US Department of Commerce/NOAA
Gables One Tower - Room 631
1320 Dixie Highway
Coral Gable, FL 33146
(305) 666-4612, FTS 350-5547

Coastal Engineering Research Center (CERC)
US Army Engineer Waterways Experiment Station
PO Box 631
Vicksburg, MS 39180-0631
(601) 634-3000, FTS 542-3000

Publications

Littoral Environmental Observation (LEO) Data Summaries
Northern California, 1968-78,
Schneider, C. and Weggel, J. R., No. 82-6

Publication Date: August 1982

Location: 25 selected sites in northern California (from the Monterey Peninsula to the Oregon border)

Contents: This publication contains information on: (a) wave conditions (direction, period, breaker height, breaker type); (b) beach data (littoral current speed and direction, beach foreslope, rip current data, beach cusp spacings, monthly photos, tide level, sand sample data); and (c) wind data (speed and direction).

Additional Information: Contact the Coastal Engineering Information Analysis Center, CERC, USAE Waterways Experiment Station, PO Box 631, Vicksburg, MS 39180-0631 (601-634-3000 or FTS 542-3000) for additional information on LEO data and programs.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. A128 551)

CERC Field Research Facility Environmental Data Summary, 1977-1979
Miller, C. H., MR-16

Publication Date: December 1982

Location: Duck, N. C.

Period of Coverage: 1977-1979

Contents: This report, the first in a series of annual reports, provides basic data and summaries of the environmental measurements including water level data, LEO data, weather data, wind and wave roses, sediment size and distribution data, and beach bathymetry.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. A128 551)

Additional Information: Contact the CERC Field Research Facility, Duck, N. C., (919) 261-3511.

Annual Data Summary for 1980, CERC Field Research Facility
Miller, H. C., TR CERC-84-1

Publication Date: February 1984

Location: Duck, N. C.

Period of Coverage: Jan-Dec 1980

Contents: This report provides basic data and summaries of the measurements made during 1980 at the US Army Engineer Waterways Experiment Station (WES) Coastal Engineering Research Center's Field Research Facility (FRF) in Duck, N. C. The report is the second in a series of annual summaries of data collected at the FRF; the first, which summarizes data collected during 1977-1979, was published as Coastal Engineering Research Center Miscellaneous Report 82-16 and is available from the WES Technical Report Distribution Section, Vicksburg, Miss.

Data presented include meteorological data summary, monthly precipitation for 1978-1980, seasonal significant wave height statistics, seasonal peak wave period statistics, tide statistics, aerial photography inventory, foreshore sediment data, etc.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. A128 551)

Additional Information: FRF's data collection is an ongoing program. The CERC Coastal Engineering Information Analysis Center (CEIAC) is responsible for storing and disseminating most of the data presented or alluded to in this report. Tidal data other than the summaries in this report should be obtained directly from the Tides Branch, National Ocean Service (NOS), Rockville, MD 20850. A complete explanation of the exact data desired for specific dates or times will expedite filling any request; an explanation of how the data will be used will help CEIAC or NOS determine if other relevant data are available. For information regarding the availability of data, contact CEIAC at (601) 634-2012. Costs for collecting, copying, and mailing will be borne by the requester.

US Naval Oceanography Command
Weather Service Detachment
Asheville, NC 28801

Publication

U.S. Navy Marine Climatic Atlas of the World

Publication Dates: Volume I (NAVAIR 50-1C-528) - North Atlantic Ocean (Revised 1974)
Volume II (NAVAIR 50-1C-529) - North Pacific Ocean (Revised 1977)
Volume III (NAVAIR 50-1C-530) - Indian Ocean (Revised 1976)
Volume IV (NAVAIR 50-1C-531) - South Atlantic Ocean (Revised 1978)
Volume V (NAVAIR 50-1C-532) - South Pacific Ocean (Revised 1979)

Location: See above tabulations

Period of Coverage: Varies for each volume

Contents: This atlas is published in five volumes. It is a revision of the eight-volume "U.S. Navy Marine Climatic Atlas of the World" that was published during the years 1955 through 1969 and which is now out of print. Each volume is presented in two parts: Part I - Meteorology, and Part II - Oceanography.

Part I - Meteorology presents isopleth analyses, by months, for the following elements:

(a) Surface Winds (percent frequency of speeds less than 11 knots and greater than 33 knots).

(b) Surface Air Temperature (mean air temperature and percent frequency of freezing temperatures and temperatures of 20°C and higher).

(c) Temperature Extremes and Temperature - Humidity Index (99% and 1% quantile values for maximum and minimum temperatures, respectively, and percent frequency of temperature-humidity index values greater than 23°C).

(d) Sea Surface Temperature (mean temperature and the 99% and 1% quantile values for maximum and minimum temperature, respectively).

(e) Humidity (99% and 1% quantile values for dew point temperatures).

(f) Precipitation (percent frequency of precipitation and of snow).

(g) Visibility (percent frequency of visibility less than 2 nautical miles and equal to or greater than 5 nautical miles).

(h) Cloud Cover (percent frequency of total cloud amount equal to or less than 2/8 and equal to or greater than 5/8 for low cloud amount).

(i) Ceiling and Visibility (percent frequency of low cloud amount ceiling equal to or greater than 1,000 ft and visibility equal to or greater than 5 nautical miles, and percent frequency of ceiling less than 600 ft and/or visibility less than 2 nautical miles).

(j) Wind - Visibility - Cloudiness (percent frequency for two specified conditions: poor and optimum).

US Naval Oceanography Command (Continued)

(k) Sea Level Pressure and Mean Wind (mean sea level pressure in millibars and scalar mean winds).
(l) Waves (percent frequency of wave heights of less than 1.5 and 2.5 m and greater than 3.5 and 6.0 m).

Each of the above isopleth analyses is supplemented with graphical presentations and tabular data for selected areas in the ocean basin. Two additional charts are presented for each month: Low Pressure Centers, which depicts the mean storm tracks and principal areas of cyclogenesis; and Tropical Cyclone, which presents eight point tropical cyclone movement roses for each 5-deg latitude-longitude quadrangle in the ocean basin.

Part II - Oceanography presents monthly charts of sea ice concentrations and extremes, seasonal charts of surface currents, types of tides, and tide ranges. Also included are summaries of ice freeze-up and breakup dates where appropriate. The isopleth analyses are multicolor.

Available From:

Individual volumes or the complete five-volume set may be purchased from:
Superintendent of Documents
US Government Printing Office
Washington, DC 20402
(202) 783-3238

The GPO Stock Nos. are:
Volume 1: 008-042-00064-1
Volume 2: 008-042-00068-3
Volume 3: 008-042-00066-7
Volume 4: 008-042-00069-1
Volume 5: 008-042-00070-5

Additional Information:

A volume of the older set that remains unrevised is "US Navy Marine Climatic Atlas of the World, Volume VI, Arctic Ocean" (NAVWEPS 50-1C-533). It was published in February 1963 by the Chief of Naval Operations. This volume may be obtained from GPO.

US Naval Oceanographic Office
Hydrographic Department
NSTL Station, MS 39529
(601) 688-4015, FTS 494-4015

Publication

Oceanographic Atlas of the Polar Seas, Part II, Arctic
H.O. Publication No. 705

Publication Date: 1958 (Reprinted 1968)

Location: Arctic Ocean and vicinity

Period of Coverage: Most of the charts in this atlas were completed in early 1957 from all available data at that time.

Contents: This atlas contains seven main sections: Tides and Currents, Ice, Physical Properties, Distribution of Oceanographic Observations, Marine Biology, Marine Geology, and Wind-Sea-Swell Data.

The Tides and Currents section contains information on the type of tide, cotidal lines, spring tide range, general surface circulation, major drifts of vessels and ice islands, circulation of Atlantic waters in the Arctic Ocean, and other more site-specific data.

The Physical Properties section has data in chart form of water temperature, air-sea temperature differences, water salinity and water density in surface chart and vertical section form, and water color and transparency data.

The Ice data is presented for each month in chart form that shows the percent sea surface covered by ice (concentration). Variability data and maximum and minimum isolines of concentration are drawn on each monthly chart. Many freeze and breakup dates at specific sites are included along with other site-specific data.

The Wind-Sea-Swell Data section contains seasonal surface wind roses and state of sea (chart with isolines showing percent frequency of seas 5 ft and greater) data, seasonal swell charts, an accumulated frequency distribution of height-period combinations and directional distributions of periods of surface waves for specific areas at different seasons, and station wave height data.

The Marine Geology section includes map subsections on geologic structure, ocean basins, coastal plains and continental platforms, continental shields, fold systems, bottom sediments, gravity, magnetism, bathymetry, and seismicity-tsunami-volcanoes.

The Marine Biology section contains fouling, marine algae and seagrass, marine mammals, and the deep scattering layer phenomena.

Available From: Defense Technical Information Center
Defense Logistics Agency
Cameron Station
Alexandria, VA 22314
(Stock No. AD-708-701)

National Environmental Satellite, Data, and Information Service
Environmental Science Information Center (D822)
National Oceanic and Atmospheric Administration
US Department of Commerce
6009 Executive Boulevard
Rockville, MD 20852

Publication

A Climatologic and Oceanographic Analysis of the Georges Bank Region of the Outer Continental Shelf
Williams, Robert G., et al., S/T 78-441

Publication Date: September 1980

Period of Coverage: N/A

Location: Georges Bank and Gulf of Maine, roughly 39°-45° N, 60°-72° W, a total of seven stations

Contents: This report describes the results of an environmental study of the Outer Continental Shelf areas at the Georges Bank and Gulf of Maine. It presents meteorological data including surface wind, air temperature, visibility and superstructure icing, and oceanographic and bathymetric data of the region. Extensive discussions on subjects such as ocean circulation and surface wave conditions are included. It contains 229 figures (181 in the main text and 48 in the five appendices).

Available From: Superintendent of Documents
US Government Printing Office
Washington, DC 20402
(202) 783-3238
(GPO Stock No. 1980-311-046-261)

Additional Information: This publication was prepared for the Bureau of Land Management, US Department of the Interior. The data base for analyses was obtained for those archived at the National Oceanographic Data Center located in Page Building #1, 2001 Wisconsin Ave. NW, Washington, DC 20235.

Arctic Environmental Information and Data Center (AEIDC)
University of Alaska
707 A Street
Anchorage, AK 99501

Publication

Climatic Atlas of the Outer Continental Shelf Waters and Coastal Regions of Alaska

Publication Date: 1977

Location: Gulf of Alaska (Volume I)
Bering Sea (Volume II)
Chukchi and Beaufort Seas (Volume III)

Contents: This publication is the result of a joint effort by AEIDC and the National Climatic Data Center/National Oceanic Atmospheric Administration to present descriptive climatology and data analysis of surface marine and atmospheric parameters for those waters and coastal regions of the Alaskan Outer Continental Shelf. The study was funded by the US Department of the Interior's Bureau of Land Management.

The first section, "Selected Topics in Marine and Coastal Climatology," in each of three volumes contains information on storm surges, superstructure icing, hyperthermia, wind chill, surface currents, bathymetry, sea ice, and aviation weather. The second section, "Marine and Coastal Climatic Atlas," presents a detailed climatic profile in the form of isopleth analyses, graphs, and tables. The following list shows the parameters included in each of the 23 data sets; monthly information is presented for the first 21 sets.

Set No.	Parameter
1	Precipitation/wind direction - graphs Precipitation - maps
2	Precipitation types - graphs Snow - maps
3	Air temperature/wind direction - graphs Air temperature mean and thresholds - maps
4	Wet bulb/relative humidity - graphs Mean dew point temperature - maps
5	Air temperature/wind speed - graphs Air temperature extremes - maps
6	Fog/time and fog/wind direction - graphs Fog - maps
7	Cloud cover/wind direction - graphs Cloud amount thresholds - maps
8	Visibility/wind direction - graphs Visibility thresholds - maps
9	Wind speed/direction - graphs Wind speed thresholds - maps
10	Wind direction/diurnal variation - graphs Vector mean wind - maps

Arctic Environmental Information and Data Center (Continued)

Set No.	Parameter
11	Wind speed diurnal variation - graphs Scalar mean wind - maps
12	Low cloud ceiling/visibility - graphs Low cloud ceiling and visibility thresholds - maps
13	Sea level pressure - graphs Mean sea level pressure - maps
14	Fog/air-sea temperature difference - graphs Mean sea surface temperature - maps
15	Sea surface temperature - graphs Sea surface temperature extremes - maps
16	Wave height/direction - graphs Wave height thresholds (nonhazardous) - maps
17	Wave height/period - graphs Wave height thresholds (hazardous) - maps
18	Low pressure center movement - roses Storm track - maps
19	Persistence of visibility < 2 nautical miles - graphs
20	Persistence of wind ≥ 10 knots - graphs
21	Persistence of wind ≥ 20 knots - graphs
22	Annual maximum winds and waves for selected return periods - marine areas
23	Annual maximum sustained winds for selected return periods

Available From:

Arctic Environmental Information and Data Center
707 A Street
Anchorage, AK 99501
($5.00 per volume plus postage)

PART III: WATER LEVELS

National Ocean Service
National Oceanic and Atmospheric Administration
US Department of Commerce
Rockwall Bldg.
11400 Rockville Pike
Rockville, MD 20852
(301) 443-8858, FTS 443-8858

Publications

Tide Tables

Publication Interval: Annual publication of advance tide predictions

Location: About 200 ports and 6,000 stations worldwide. The tide tables are issued in four volumes according to geographic regions as follows:

- Europe and west coast of Africa (including the Mediterranean Sea)
- East coast of North and South America (including Greenland)
- West coast of North and South America (including Hawaiian Islands)
- Central and Western Pacific Ocean and Indian Ocean

Period of Coverage: 1853 to present

Contents: Advance information with respect to the rise and fall of the tide is given in the annual tide tables. These tables contain the predicted times and heights of high and low waters for every day of the year at a number of designated reference stations. By using the published tidal differences, the user can calculate the approximate times and heights of the tide at many other subordinate stations.

Up to and including the tide table for the year 1884, all the tide predictions were computed by means of auxiliary tables and curves constructed from the results of tide observations at the different ports. From 1885 to 1911, the predictions were made by means of the Ferrel tide-predicting machine. From 1912 to 1965, they were made by means of the USCGS tide-predicting machine No. 2. Since 1966 predictions have been made by electronic computer.

For the most part, tide predictions for US reference stations are based upon analyses of tide observation for periods of at least 1 year. Since the extremes of meteorological conditions have been excluded from the analyses and predictions, the predicted tidal heights should be considered those expected under average weather conditions.

National Ocean Service (Continued)

Available From:	National Ocean Service at Distribution Branch, N/CG-33 National Ocean Service National Oceanic and Atmospheric Administration Riverdale, MD 20737 (301) 436-6990 or its sale agents. The tide tables may also be purchased at marinas and the US Coast Guard District Offices.
Related Publications:	Tidal Bench Marks Tidal Current Tables Tidal Current Charts Tidal Current Diagram United States Coast Pilots Nautical Charts

Sea Level Variations for the United States, 1955-1980
Hicks, S. D., Debaugh, H. A. Jr., and Hickman, E.

Publication Date: January 1983 (Annual Revision)

Location: 67 permanent tide stations along the US coastlines

Period of Coverage: Varies from station to station (range between 1854-1980)

Contents: An introduction to the study of sea level and its applications is presented. Trends, their standard errors, and annual variabilities are computed for 44 US stations that are permanent, continuous, and in operation before 1940. The computations are for the entire length of series at each station and for the common series length, 1940 through 1980. Trends, their standard errors, and annual variabilities are also computed for five area means and the US mean. Graphs of area means, the US mean, and 67 individual stations are depicted, the latter for both yearly and monthly mean sea level. Monthly and yearly mean sea level data are tabulated for the entire length of series at the 67 stations.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650

National Ocean Service (Continued)

Kinds of Data

Tide Observation Station Lists
Tides, 6-min Heights
Tides, Hourly Heights
Tides, Times and Heights of High and Low Waters
Tides, Monthly Mean Summaries
Tidal Bench Mark Sheets with Tidal Datums
Frequency and Duration Analysis of Tidal Water Levels
Tidal Zoning (Area Prediction Factors)
Special Services

Location: Coastal states and territories of the United States

Description of Data: Tidal Observation Station Lists provide information by state of the tide stations maintained by the National Ocean Service (NOS) for the United States and its territories. Each list includes the station number, name, latitude, longitude, dates of observation, bench mark sheet publication date, and tidal epoch. Other station information is available upon request. Specialized tide observation station lists include the National Tide Observation Network (NTON), composed of a list of all NOS long-term operating tide stations; and the Marine Boundary tide stations list, which provides tide stations in states with cooperative/NOS marine boundary programs. The states included are New Jersey, South Carolina, Florida, Mississippi, Louisiana, and California.

Tides, 6-min Heights, are the compilations of the recorded height in hundredths of feet of the water level for every 6 min of each day at tide observation stations. Tidal 6-min heights first became available in the mid-1960s. Data for stations maintained in the NTON after this date are available on digital magnetic tape. Data for a substantial number of stations not in the NTON are also available on digital magnetic tape.

Tides, Hourly Heights, are the records of the height of the water level (in feet) on the hour for each hour of each day at tide observation stations. All heights are referenced to a datum. The records for stations in the NTON are available on either hard copy or on digital magnetic tape. Records for a substantial number of stations not in the NTON are also available on either hard copy or on digital magnetic tape. A large number of stations installed for a short period are not digitized, but data are available in hand-tabulated form.

Tides, Times and Heights of High and Low Waters, are the records of the time and heights (in feet) of the high and low waters for each day at tide observation stations. All heights are referenced to a datum. The records for stations in the NTON are available on either hard copy or on digital magnetic tape. A large number of stations installed for a short period are not digitized, but data are available in hand-tabulated form.

Tides, Monthly Mean Summaries, are the records of the average monthly and yearly water level heights. These include monthly and yearly averages for mean tide level, mean sea level, diurnal tide level, mean higher high water, mean high water, mean lower low water, mean range, diurnal mean range, Greenwich mean high water time intervals, and Greenwich mean low water time intervals. Summary tide records are maintained for approximately 200 past and present stations in the NTON.

Tidal Bench Mark Sheets with Tidal Datums provide vertical elevations and descriptions of tidal bench marks at tide observation stations. The benchmarks are referenced to the tidal datums of mean lower low water and mean high water. Information is also provided to reference tidal benchmarks to other tidal datums and to the National Geodetic Vertical Datum (NGVD) of 1929 when available.

Frequency and Duration of Tidal Inundations is a summary report of a detailed statistical analysis of historic records of tide action at NOS tide stations. This analysis may be performed relative to either high or low waters. The report shows the frequency and duration of inundation of every 10th of a foot of elevation over a period of years. Results of the analysis are reported in five tabular columns: (a) elevations above station datum in feet and meters at increments of every 10th of a foot over the total range of water level at the station; (b) frequency of inundations--the number of times the water level has equaled or exceeded each incremental elevation for a period of the analysis; (c) percent frequency of inundation--the number of inundations in item b, expressed as a percentage of the total number of inundations occurring in the period of the analysis; (d) duration of inundation--the total hours at which the water level remained at or exceeded each incremental height for the period of the analysis; and (e) percent duration of inundation--the number of hours in item d, expressed as a percentage of the total number of hours in the period of the analysis. This service was started in 1979, involving the analysis of long-term tide data for each NOS tide station. Reports are added to the station data file as they are completed.

Tidal Zoning (Area Tide Prediction Factors) is a new category of tide data that provides the tidal corrections for predicting height and time over large areas of US and Caribbean coastal and continental shelf waters. Tidal corrections, in the form of time differences in minutes and tide height factors, are determined by historical tidal characteristics and comparing observed tide data which has been related to the 19-year Metonic cycle. These corrections when applied to the tide predictions for a control tide station determine the predicted time and height of the tides over the area. These computations are based on tide behavior at tide station locations and are prepared by NOS on request.

Special Services includes development of harmonic constants for prediction of tides; long-term tidal mean and extreme data analysis; technical advice on methods for conducting tidal surveys; plots of hourly or 6-min tidal heights; plots of daily, monthly, or yearly mean sea level; and simultaneous plots of two stations or a plot of observed verses predicted tidal heights.

National Ocean Service (Continued)

Response Formats:	Digital magnetic tape, hard copy, or tabulated form (see Description of Data)
Qualified Users:	No limitations, but there is a nominal cost for each data/information/service.
Point of Contact:	Tidal Datum Section, N/OMS 124 National Ocean Service Room 609, WSC-1 6001 Executive Boulevard Rockville, MD 20852 (301) 443-8467

Near Real-time and Real-time Tidal Heights

Location: NOS tide stations

Description of Data: Near real-time and real-time heights are measured and converted into digital signals at 6-min intervals telemetered through telephone lines to selected offices with receiving units. NOS has equipped and is operating 11 tide stations under this program and is in the process of installing telemetry instrumentation on selected stations in areas requiring real-time monitoring. The signals from these stations, telemetered at present to NOS Headquarters in Rockville, Md., meet specific users needs, which range from near-continuous telemetry to random short-term transmissions. The data include unedited measured tide heights to the nearest 10th of a foot for a tide station, the time of measurement, onsite observer input, quality control parameters, and station identification.

Qualified Users: No limitations (service cost on quote)

Point of Contact:
Tidal Requirement Section, N/OMS 121
National Ocean Service
Room 608, WSC-1
6001 Executive Boulevard
Rockville, MD 20852
(301) 443-8807

National Ocean Service
Office of Oceanography and Marine Services
National Oceanic and Atmospheric Administration
US Department of Commerce
6001 Executive Boulevard
Rockville, MD 20852
(301) 443-8443

Kind of Data

Telemetered Water Level Data, Great Lakes
Hourly Water Levels, Great Lakes
Daily Mean Water Levels, Great Lakes
Great Lakes 7-day Water Levels
Great Lakes Data: Monthly Mean Elevations and Monthly Mean Discharge
Great Lakes Annual Maximum and Minimum Levels
Benchmark Descriptions and International Great Lakes Datum Elevations

Location: Great Lakes

Description of Data: Telemetered Water Level Data, Great Lakes, is a biweekly compilation of provisional up-to-date telemetered water level data, hourly values, and daily mean in feet received from 23 key stations located around the Great Lakes. The elevations are referred to the International Great Lakes Datum (1955).

Hourly Water Levels, Great Lakes, is a monthly tabulation of hourly water level data in feet for the month at each of 54 water level gages located around the Great Lakes. The data include the mean water level elevations in feet for each day of the month and the maximum and minimum levels for the month. The elevations are referred to the International Great Lakes Datum (1955). Monthly records are on file for each water level gage, with some records dating back to 1860. Furthermore, annual summaries and an index of stations are available.

Daily Mean Water Levels, Great Lakes, is a monthly tabulation of daily average water level data in feet for each of 54 gages located around the Great Lakes. The elevations are referred to the International Great Lakes Datum (1955). Records are on file for each water level gage, and a data summary sheet is available.

Great Lakes 7-day Water Levels is a weekly tabulation of the latest 7-day daily average water level data in feet and meters for 13 selected gages in the Great Lakes. Records are available back to 1969.

Great Lakes Data: Monthly Mean Elevations and Monthly Mean Discharge is a compilation of recorded monthly mean lake elevations in feet and monthly mean discharge in cubic feet per second of the major rivers, including St. Mary River, St. Clair River, Detroit River, Niagara River, and St. Lawrence River, connecting the Great Lakes. NOAA compiles the monthly elevation data, and the US Army Corps of Engineers compiles the discharge data.

National Ocean Service (Continued)

Great Lakes Annual Maximum and Minimum Levels provides annual compilations of the historic tabulation of water level elevations during stages of highest and lowest water levels for each year at each of 54 water level gages located around the five Great Lakes. The maximum stage data include the month of highest level and the mean elevation for that month, the day of the month with the highest level and mean elevation for that day, the day and elevation for that day, and the day the elevation of the highest hourly level during the year; the minimum stage data include the same information but for the lowest levels. The monthly records on file are available for the 54 Great Lakes observation stations, with some records dating back to 1901. Furthermore, annual summaries and an index of the stations are available.

Benchmark Descriptions and International Great Lakes Datum Elevations describes the locations for approximately 3,000 benchmarks in the Great Lakes area, with published elevations on the International Great Lakes Datum (1955).

Response Format:	Tabulations
Qualified Users:	No limitations (free of charge except benchmark description and International great lakes datum elevation)
Point of Contact:	Water Level Section, N/OMS 124 National Ocean Service Room 626, WSC-1 6001 Executive Boulevard Rockville, MD 20852 (301) 443-8443

Publications

Great Lakes Water Levels--Annual Summary

Publication Date or Interval: Annually

Location: Great Lakes

Period of Coverage: 1952-present

Contents: This publication is a data compilation which contains Great Lakes water level gage records in both feet and meters. It shows, in tabular form for the calendar year, daily and monthly average levels for each gage in the network, the highest and lowest daily average level for each month, and a frequency distribution of daily average levels showing the number of times each month the recorded levels were at or above specific elevations. The locations of the recording water level gages are shown; an index lists the gage locations, identification numbers, and geographic coordinates.

Available From: Distribution Branch, N/CG 33
National Ocean Service
National Oceanic and Atmospheric Administration
Riverdale, MD 20737
(301) 436-6990

Hydrograph of Monthly Mean Water Levels of the Great Lakes

Publication Date or Interval: Annually

Location: Great Lakes and Lake St. Clair

Period of Coverage: 1900-present

Contents: Hydrograph of Monthly Mean Water Levels of the Great Lakes is a graphic depiction of monthly mean levels in feet for each of the Great Lakes and Lake St. Clair since 1900, with low water datums shown. All elevations are referred to the International Great Lakes Datum (1955).

Available From:
Distribution Branch, N/CG 33
National Ocean Services
National Oceanic and Atmospheric Administration
Riverdale, MD 20737
(301) 436-6990

Great Lakes Water Levels--1860-1980

Publication Date or Interval: Every 5 years

Location: Great Lakes

Period of Coverage: 1860-1980

Contents: Great Lakes Water Levels--1860-1980 contains 258 pages of figures, a map, and a geographical index showing the network of over 50 permanent gages, and tabular records of monthly and annual average water surface elevations for each gage for the period of its existence, as well as tables showing summaries of average and extreme levels.

Available From: Distribution Branch, N/CG 33
National Ocean Service
National Oceanic and Atmospheric Administration
Riverdale, MD 20737
(301) 436-6990

Coastal Engineering Research Center
US Army Engineer Waterways Experiment Station
PO Box 631
Vicksburg, MS 39180
(601) 634-2012, FTS 542-2012

Publications

Tides and Tidal Datums in the United States
Harris, D. L., SR-7

Publication Date: February 1981

Location: Data presented in this report are developed specifically for the locations of 50 National Ocean Service (NOS) reference tide stations and 5 secondary stations located along the US coastline from Maine to Alaska.

Period of Coverage: Analyses are based on NOS data for the period 1963 to 1981.

Contents: This report provides a ready reference to information about the tide characteristics. It also provides information about the statistical distribution of astronomical tidal heights which can be used in setting and measuring the elevation of proposed engineering works or combined with similar statistics for storm surges and tsunamis to estimate the probability of extreme water levels.

Several tidal datums of practical importance are described. Sources of detailed information are identified in the report. Statistical characteristics of the astronomical tides at various US ports are investigated and documented with graphs and tables. Specifically, the information presented by this report includes:

(a) Plots which show tide hydrographs for a 1-month period for each NOS reference tide station to display characteristics of the daily and monthly cycles at each location.

(b) Plots which show the predicted annual cycle of mean water levels as defined by the monthly mean of the predicted tides as averaged over the 19-year period.

(c) Plots which show the predicted mean sea level for each year in the Metonic cycle.

(d) Plots which show the annual cycle in tidal range.

(e) Plots which show the variability of each measure of range for the 19-year Metonic cycle.

(f) Plots which give the annual cycle of calculated low water parameters.

(g) Plots which present low-water parameters for the 19-year Metonic cycle.

(h) Plots which present high-water parameters for annual and Metonic cycles.

(i) Probability density distribution tables which provide seven tide parameters: the highest predicted tide for each month, the predicted higher

high water of each solar day, all predicted high waters of the 19-year period, predicted hourly tidal heights, all predicted low waters of the 19-year period, the predicted lower low water of each solar day, the lowest predicted tide level of each month.

A method of combining the probabilistics of astronomical tide and storm effects on sea level is presented with sample calculations.

Available From:

Superintendent of Documents
US Government Printing Office
Washington, DC 20402
(202) 783-3238
(GPO Stock No. 008-022-00161-1)

Atlantic Coast Water Level Climates
Ebersole, B. A., WIS Report 7

Publication Date: April 1982

Location: Information presented in this report is developed specifically for the locations of 20 National Ocean Service (NOS) reference tide stations located along the US Atlantic coast.

Period of Coverage: Analyses are based on NOS tidal observation data. The period of data for each reference tide stations varies.

Contents: This report is part of the Wave Information Study (WIS) series conducted by the Corps of Engineers. WIS Report 7 presents specifically the US Atlantic coast water-level climate at 20 NOS reference tide stations. Statistical data derived for each stations include:

(a) Monthly and yearly mean sea level which shows the trends and variability in mean sea level.
(b) Monthly and yearly probability density and cumulative distribution functions for astronomical tide, storm surge, and total water level.
(c) Average and maximum durations (in hours) at a specific water level elevation for storm surge and total water level.
(d) Extreme storm surge data as a result of extratropical storms, presented as functions of return period (years).
(e) Theoretical Gumbel parameters derived from monthly and yearly extreme storm surge data.

Data presented in this report can be useful in coastal engineering designs and analyses. However, it is important to note that the statistical information derived has excluded storm surges due to tropical storms and hurricanes.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. AD-A117-147)

Type 16 Flood Insurance Study: Tsunami Predictions for the West Coast of the Continental United States
Houston, J. R., and Garcia, A. W., TR H-78-26

Publication Date: December 1978

Location: US Pacific coast (excludes Alaska)

Period of Coverage: N/A

Contents: Calculations of runup due to tsunamis of distant origin were made for most of the west coast of the continental United States. Runup values were determined that were expected to be equaled or exceeded on the average of once per 100 or once per 500 years. Historical data of tsunamic activity in distant generation regions were used in the investigation in conjunction with numerical models that generated tsunamis and propagated them across the deep-ocean and nearshore region. The combined effects of astronomical tides and tsunamis were also incorporated into the analysis. Numerical simulations of actual historical tsunamis and comparisons of calculations with tide gage recordings were presented. Calculations of tsunami runup based upon data of local historical tsunamis (at the few locations on the west coast where there were sufficient historical data to allow reasonable predictions) were compared with predictions based upon the methods presented in the investigation.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
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(703) 487-4650, FTS 737-4650
(NTIS Accession No. AD-A063-663)

Tsunami-Wave Elevation Frequency of Occurrence for the Hawaiian Islands
Houston, J. R., Carver, R. D., and Markle, D. G., TR H-77-16

Publication Date: August 1977

Location: Hawaiian Islands

Period of Coverage: N/A

Contents: An investigation was undertaken to establish frequency-of-occurrence curves for tsunami-wave elevations near the shoreline for the Hawaiian Islands. A hybrid finite element numerical model was used to supplement historical data in determining the ten largest tsunamic elevations from 1837 to 1976 at locations along the coastline of the islands. The numerical model was verified by comparing tide gage recordings at various locations in the Hawaiian Islands during the 1960 and 1964 tsunamis with numerical model calculations. Frequency-of-occurrence curves were established using data from the ten largest tsunami-wave elevations along the Hawaiian coastline. Figures and the table presented in the report can be used to calculate tsunami elevations 200 ft shoreward of the coastline for frequencies of occurrence as high as 1-in-10 years for the entire coastline of the Hawaiian Islands (except the coast of the uninhabited US Navy target island of Kahoolawe). Runup nearly equals tsunami elevation at the shoreline for some of the coastline of the islands, but not for areas where flooding is substantial. A recommendation is given for development of a method to calculate land flooding during a tsunami.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. AD-A045-023)

Type 16 Flood Insurance Study: Tsunami Predictions for Pacific Coastal Communities
Houston, J. R., and Garcia, A. W., TR H-74-3

Publication Date: May 1974

Location: 15 communities of California coast: Carpinteria, Chula Vista, Costa Visa, Huntington Beach, Long Beach, Los Angeles, Los Angeles counties and unincorporated areas, National City, Port Hueneme, San Diego, San Diego County and unincorporated areas, Santa Barbara, Seal Beach, Ventura, and the 3 communities on the Alaska coast of Homer, Seldovia, and Seaward.

Period of Coverage: N/A

Contents: This publication presents calculations of runup due to seismic sea waves (tsunamis) of distant origin. The values given are interpreted as being equaled or exceeded on the average of once per 100 or once per 500 years. The combined effects of astronomical tides and tsunamis are incorporated into the analysis as well as local resonance effects where judged significant. A complete discussion of the methodology is presented in Appendix A. Analysis of the error attributed to each of the various steps in the procedure results in an estimated maximum average error of about ±40 percent for the southern California communities and ±75 percent for the Alaskan communities. It is essential that these runup predictions be reviewed approximately every 5 years in the light of advancements in the theory of tsunami generation, propagation, and runup.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. AD-785-533)

Type 19 Flood Insurance Study: Tsunami Predictions for Southern California
Houston, J. R., TR HL-80-18

Publication Date: September 1980

Location: Southern California, from Santa Barbara Point to Mexican border

Period of Coverage: N/A

Contents: Calculations of shoreline elevations due to tsunamis of distant origin were made for the southern California region. Elevations were determined that were expected to be equaled or exceeded on the average of once per 100 or once per 500 years. In addition, exceedance frequency distributions for arbitrary frequencies of occurrence were presented. Historical data of tsunami activity in distant generation regions were used in the investigation in conjunction with numerical models that generated tsunamis and propagated them across the deep-ocean and nearshore region. The combined effects of the astronomical tides and tsunamis were incorporated in the analysis. Numerical simulations of the 1964 Alaskan tsunami in southern California were performed and comparisons with historical tide gage recordings were presented. Tsunami elevation predictions based upon the methods presented in the investigation were shown to be in good agreement with predictions based solely upon historical data of tsunami activity (at the limited number of locations in southern California with sufficient historical data to allow reasonable predictions to be made).

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. AD-A091-657)

Type 16 Flood Insurance Study: Tsunami Predictions for Monterey and San Francisco Bays and Puget Sound
Garcia, A. W., and Houston, J. R., TR H-75-17

Publication Date: November 1975

Location: Monterey and San Francisco Bays and Puget Sound

Period of Coverage: N/A

Contents: Calculations of runup (presented by 240 figures) due to seismic sea waves (tsunamis) of distant origin were made for Monterey and San Francisco Bays and the greater part of Puget Sound. Those areas which are specifically included and excluded are listed. The values presented are interpreted as being equaled or exceeded on the average of once per 100 or once per 500 years, whichever is indicated. All runup values are referenced to the mean sea level datum. The combined effects of astronomical tides and tsunamis are incorporated into the analysis as the certain local effects. The effects of wind waves superimposed on the tsunami have been neglected. The simultaneous occurrence of a storm surge and tsunami is considered highly improbable and therefore unlikely to constitute a 1-in-100 or 1-in-500-year event.

Analysis of the error attributed to each of the various steps in the procedure results in an estimated maximum average error of about ±40 percent.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. AD-A018-421)

Tsunami Response of Barbers Point Harbor, Hawaii
Farrar, P. D., and Houston, J. R., MP HL-82-1

Publication Date: October 1982

Location: Barbers Point Harbor, Oahu Island, Hawaii

Period of Coverage: N/A

Contents: This publication uses a finite-difference numerical model to simulate the action of long-period waves within the harbor. This model includes the effects of bottom friction, lateral mixing of momentum, radiation losses to the outside ocean, and flooding of surrounding land areas. A large number of cases were simulated, representing tsunami inputs that could be expected in the area. The resulting water elevations, land flooding, and water movement are presented.

The response of the harbor to the many different wave cases was combined with a study of the frequency-of-occurrence of tsunamis to obtain frequency-of-occurrence statistics for different harbor response events. This was done both for infrequent large tsunamis and for more frequent small amplitude tsumanis. Conservative probability methods were used for all results.

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US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. AD-A112-299)

A Numerical Model for Tsunami Inundation
Houston, J. R., and Butler, H. L., HL-79-2

Publication Date: February 1979

Location: Hauula-Punaluu region, Hawaii

Period of Coverage: N/A

Contents: This publication addresses a two-dimensional, time-dependent numerical model which was developed to calculate the land inundation of a tsunami. The model solves long wave equations that include bottom friction terms. A coordinate transformation was used to allow the model to employ a smoothly varying grid that allows cells to be small in the inundation region and large in the ocean. This model was applied to a region of Hawaii and produced 10 figures showing the contours of 50- and 100-year tsunami inundations. These figures can be overlaid on maps referenced in the report to delineate detail extents of flood inundation.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. AD-065-090)

An Open-Coast Mathematical Storm Surge Model With Coastal Flooding for Louisiana; Report 1, Theory And Application
Wanstrath, J. J., MP H-78-5

Publication Date: February 1978

Location: Gulf coast of Louisiana

Period of Coverage: N/A

Contents: This publication documents a two-dimensional, time-dependent, long-wave, shallow-water storm surge model. Surge results simulated for four historical hurricanes, Floossy, Carmen, Hilda, and Betsy, that affected the Louisiana coast are also presented.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. AD-A053-365)

Wave and Lake Level Statistics for Lake Michigan
Saville, T., Jr., BEB TM 36

Publication Date: March 1953

Location: Five stations on Lake Michigan were selected for a comprehensive wave analysis; the locations are as follow:

Latitude	Longitude	Vicinity
45°05' N	87°00' W	Baileys Harbor, Wis.
43°02' N	87°46' W	Milwaukee, Wis.
41°53' N	87°25' W	Chicago, Ill.
43°14' N	86°27' W	Muskegon, Mich.
44°38' N	86°18' W	Frankfort, Mich.

Period of Coverage: Wave characteristics: 1948-1950
Water level: 1860-1951

Contents: This publication is divided into two sections: (a) lake level statistics, and (b) wave statistics.

The lake level data include average seasonal fluctuation, a frequency of occurrence for short period fluctuations, and a probability of occurrence of annual maximum monthly mean lake level for 1, 2, 3, 4, and 5 consecutive years.

The wave statistics section is divided into separate subsections for each location. Each subsection contains statistical hindcast data for each month, statistical hindcast data for a full year, statistical hindcast data for ice-free periods, and statistical energy data for various periods. Wave roses and duration and frequency of waves as a function of wave heights are also included.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. AD-20-097)

Additional Information: This document was published by the Beach Erosion Board, the Coastal Engineering Research Center's predecessor organization.

Wave and Lake Level Statistics for Lake Erie
Saville, T., Jr., BEB TM 37

Publication Date: March 1953

Locations: Four stations on Lake Erie:

Latitude	Longitude	Vicinity
41°50' N	83°10' W	Monroe, Mich.
41°35' N	81°45' W	Cleveland, Ohio
42°12' N	80°05' W	Erie, Pa.
42°49' N	78°57' W	Buffalo, N. Y.

Period of Coverage: Wave characteristics: 1948-1950
Lake levels: 1860-1951

Contents: This publication is divided into two sections: (a) lake level statistics, and (b) wave statistics.

The lake level data include average seasonal fluctuation, a frequency of occurrence for short period fluctuations, and a probability of occurrence of annual maximum monthly mean lake level for 1, 2, 3, 4, and 5 consecutive years.

The wave statistics section is divided into separate subsections for each location. Each subsection contains statistical hindcast data for each month, statistical hindcast data for a full year, statistical hindcast data for ice-free periods, and statistical energy data for various periods. Wave roses and duration and frequency of waves as a function of wave heights are also included.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. AD-20-098)

Additional Information: This document was published by the Beach Erosion Board, the Coastal Engineering Research Center's predecessor organization.

Wave and Lake Level Statistics for Lake Ontario
Saville, T., Jr., BEB TM 38

Publication Date: March 1953

Location: Three stations on Lake Ontario were selected for a comprehensive wave analysis, the locations being as follows:

Latitude	Longitude	Vicinity
43°17' N	79°46' W	Hamilton, Ont.
43°15' N	77°35' W	Rochester, N. Y.
43°49' N	76°18' W	Stony Point, N. Y.

Wave Data: 1948-1950

Period of Coverage: Wave characteristics: 1948-1950
Water levels: 1860-1951

Contents: This publication is divided into two sections: (a) lake level statistics, and (b) wave statistics.

The lake level data include average seasonal fluctuation, a frequency of occurrence for short period fluctuations, and a probability of occurrence of annual maximum monthly mean lake level for 1, 2, 3, 4, and 5 consecutive years.

The wave statistics section is divided into separate subsections for each location. Each subsection contains statistical hindcast data for each month, statistical hindcast data for a full year, statistical hindcast data for ice-free periods, and statistical energy data for various periods. Wave roses and duration and frequency of waves as a function of wave heights are also included.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. AD-20-099)

Additional Information: This document was published by the Beach Erosion Board, the Coastal Engineering Research Center's predecessor organization.

Great Lakes Environmental Research Laboratory
Environmental Research Laboratories
National Oceanic and Atmospheric Administration
US Department of Commerce
2300 Washtenaw Avenue
Ann Arbor, MI 48104
(313) 668-2235, FTS 378-2235

Publications

Lake Ontario Beginning-of-Month Water Levels and Monthly Rates of Change of Storage

Quinn, Frank H., and Derecki, J. A., NOAA Tech. Rept. ERL 365-GLERL-10

Publication Date: March 1976

Location: Lake Ontario

Period of Coverage: 1900-1974

Contents: This report describes the results of a study of Lake Ontario beginning-of-month water levels and monthly changes of storage. The study established that the number and distribution of water level gages in the presently existing gage network are adequate for the computation of beginning-of-month water levels. Computed beginning-of-month water levels and changes of storage for the period 1900-1974 are listed for use in scientific and planning studies.

Available From: Superintendent of Documents
US Government Printing Office
Washington, DC 20402
(202) 275-2091, FTS 275-2051

Lake Michigan Beginning-of-Month Water Levels and Monthly Rates of Change of Storage
Quinn, Frank H., NOAA Tech. Rept. ERL 326-GLERL-2

Publication Date: March 1975

Location: Lake Michigan

Period of Coverage: 1900-1972

Contents: This report describes the results of a study of Lake Michigan beginning-of-month water levels and monthly changes of storage. The study established that the number and distribution of water level gages in the presently existing gage network are adequate for the computation of beginning-of-month water levels. Computed beginning-of-month water levels and changes of storage for the period 1900-1972 are listed for use in scientific and planning studies.

Available From: Superintendent of Documents
US Government Printing Office
Washington, DC 20402
(202) 275-2091, FTS 275-2051

Great Lakes Environmental Research Laboratory (Continued)

Lake Erie Beginning-of-Month Water Levels and Monthly Rates of Change of Storage

Quinn, Frank H., and Derecki, J. A., NOAA Tech. Rept. ERL 364-GLERL-9

Publication Date: February 1976

Location: Lake Erie

Period of Coverage: 1900-1974

Contents: This report describes the results of a study of Lake Erie beginning-of-month water levels and monthly changes of storage. The study established that the number and distribution of water level gages in the presently existing gage network are adequate for the computation of beginning-of-month water levels. Computed beginning-of-month water levels and changes of storage for the period 1900-1974 are listed for use in scientific and planning studies.

Available From: Superintendent of Documents
US Government Printing Office
Washington, DC 20402
(202) 275-2091, FTS 275-2051

Lake Huron Beginning-of-Month Water Level and Monthly Rates of Change of Storage
Quinn, Frank H., NOAA Tech. Rept. ERL-348-GLERL-4

Publication Date: July 1975

Location: Lake Huron

Period of Coverage: 1900-1973

Contents: This report describes the results of a study of Lake Huron beginning-of-month water levels and monthly changes of storage. The study established that the number and distribution of water level gages in the presently existing gage network are adequate for the computation of beginning-of-month water levels. Computed beginning-of-month water levels and changes of storage for the period 1900-1973 are listed for use in scientific and planning studies.

Available From: Superintendent of Documents
US Government Printing Office
Washington, DC 20402
(202) 275-2091, FTS 275-2051

Lake St. Clair Beginning-of-Month Water Level and Monthly Rates of Change of Storage
Kelley, Raymond N., NOAA Tech. Rept. ERL-372-GLERL-13

Publication Date: May 1976

Location: Lake St. Clair

Period of Coverage: 1910-1975

Contents: Lake St. Clair water level gage data are used to determine beginning-of-month water levels and monthly rates of storage change for the years 1910 through 1975 for scientific and planning purposes. Analysis of the results indicates that additional gages, strategically located, are needed for improved accuracy.

Available From: Information Services
Great Lakes Environmental Research Laboratory
National Oceanic and Atmospheric Administration
US Department of Commerce
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Ann Arbor, MI 48104
(313) 668-2235, FTS 378-2235

American Society of Civil Engineers
345 East 47th Street
New York, NY 10017

Publication

Revisions to Hurricane Design Wave Practice,
Coastal Engineering, Volume 1, 1972 Proceedings
Bretschneider, C. L., Chapter 7, pp 167-195

Publication Date: 1973

Location: US east and gulf coasts

Contents: This is a conference paper presented by the author to the Thirteenth Coastal Engineering Conference in Vancouver, B. C., Canada. The 1959 paper by the same author entitled "Hurricane Design Wave Practices" has been widely used in the past for obtaining design wave criteria. The revision presented in this paper applies to the US east and gulf coasts past historical hurricanes and also to the US National Weather Service standard project and probable maximum hurricanes for deep-water conditions. The results are presented in 14 figures and 4 tables and could serve as inputs for particular locations to calculate design storm surge and design wave criteria.

Available From: American Society of Civil Engineers
345 East 47th Street
New York, NY 10017

or most university libraries.

US Army Engineer District, Detroit
PO Box 1027
Detroit, MI 48231-1027

Publication

Monthly Bulletin of Lake Levels for the Great Lakes

Publication Interval: Monthly

Location: The five Great Lakes and Lake St. Clair

Period of Coverage: 1860 to present

Contents: This pamphlet contains information on Great Lakes water levels, their monthly means, and their fluctuations. Recorded levels for the previous year and the current year to date along with the probable levels for the next 6 months and the deviations that can be expected are given in a chart that displays lake level vs. time for each lake. The 1900-1982 average level and the maximum and minimum levels and the year they were recorded are also plotted on the same chart.

Available From: Commander, US Army Engineer District, Detroit
ATTN: NCEED-L
PO Box 1027
Detroit, MI 48231-1027

Additional Information: Copies are free, as this bulletin is a public service. The "Great Lakes and Connecting Channels Water Levels and Depths," a twice monthly publication that provides forecasted channel depths for Great Lakes navigational purposes, may also be obtained free of charge from the same address.

PART IV: WAVES AND CURRENTS

Institute of Oceanographic Sciences
Responsible National Oceanographic Data Center (Wave)
Marine Information and Advisory Service
Wormley, Godalming, Survey, GU8-5UB
Great Britain

Publication

Catalogue of Instrumentally-Measured Wave Data, Issue No. 1

Publication Date: 1979

Location: Worldwide

Period of Coverage: N/A

Contents: This publication lists information about available wave data throughout the world. Information provided includes:

(a) Location - position, period of coverage for the location, mean water depth, mean tidal range, maximum current, local environment.

(b) Data contact - name, organization, address.

(c) Instrument - instrument type, type of mounting, record duration, record interval.

(d) Reason for recording.

(e) Form and medium of data - includes other notes.

Available From: Institute of Oceanographic Sciences
Responsible National Oceanographic Data Center (Wave)
Marine Information and Advisory Service
Wormley, Godalming, Survey, GU8-5UB
Great Britain

Additional Note: This catalogue provides useful information on the availability of wave data which can be easily searched by geographic location. The Responsible National Oceangraphic Data Center (Wave) is continually updating the catalogue information stored in its computers.

National Ocean Service
National Oceanic and Atmospheric Administration
US Department of Commerce
6001 Executive Blvd.
Rockville, MD 20852

Publications

Tidal Current Tables

Publication Interval: Annual publication for the following year

Location: Atlantic coast of North America, Pacific coast of North America and Asia

Period of Coverage: 1890 to the present

Contents: Information relative to tidal currents is given for future dates by the tables which include daily prediction of the times of slack water and the times and velocities of strength of flood and ebb currents for a number of waterways together with differences for obtaining predictions for numerous other places.

Available From: Distribution Division (C44)
National Ocean Service
6501 Lafayette Ave.
Riverdale, MD 20703

or other sales agents.

Tidal Current Charts

Publication Date: N/A

Location: Boston Harbor, Charleston Harbor, Delaware Bay and River, Long Island Sound and Block Island Sound, Narragansett Bay, Narragansett Bay to Nantucket Sound, New York Harbor, Puget Sound, San Francisco Bay, Upper Chesapeake Bay, and Tampa Bay

Contents: Each publication consists of a set of 12 charts which depict, by means of arrows and figures, the direction and speed of the tidal current for each hour of the tidal cycle. The charts, which may be used for any year, present a comprehensive view of the tidal current movement in the respective waterways as a whole and also supply a means of readily determining the direction and speed at various localities throughout the water area covered for any time.

Available From: Distribution Division (C44)
National Oceanic Service
6501 Lafayette Ave.
Riverdale, MD 20737

or other sales agents.

Tidal Current Diagrams

Publication Interval: Annually

Location: Long Island Sound and Block Island, Boston Harbor, New York Harbor, and Upper Chesapeake Bay

Contents: Each publication contains a series of 12 monthly diagrams to be used with the tidal current charts to give the users a convenient method to determine the current flow on a particular day.

Available From: Distribution Division (C44)
National Ocean Service
6501 Lafayette Ave.
Riverdale, MD 20737

or other sales agents.

Coastal Waves Program Field Wave Data

Publication Date: Quarterly Report No. 1:1 (Oct-Dec 1982) May 1983
Quarterly Report No. 1:2 (Jan-Mar 1983) June 1983
Quarterly Report No. 1:3 (Apr-Jun 1983) Sept 1983

Location: Four stations:
(38°58' N - 73°01' W) (40°06' N - 71°40' W)
(38°10' N - 74°50' W) (40°43' N - 72°29' W)

Period of Coverage: Dec 1982 - Jun 1983

Contents: This series of reports publishes the data summaries of an on-going wave data collection program conducted by the National Ocean Service. Wave statistics include monthly summaries of significant wave height and period, time series plots of significant height, histograms of significant height and period of maximum density, and joint distributions of significant height and frequency of maximum density. The first Quarterly Report presents the measurement system description, sampling technique, and data processing.

Available From: Manager, CWP
NOAA/Nx22
WSC5, Room 1005
6010 Executive Blvd.
Rockville, MD 20852

Great Lakes Environmental Research Laboratory
National Oceanic and Atmospheric Administration
US Department of Commerce
2300 Washtenaw Avenue
Ann Arbor, MI 48104
(313) 668-2235, FTS 378-2235

Publications

Winter Currents in Lake Huron
Saylor, J. H., and Miller, G. S., NOAA
Technical Memorandum ERL GLERL-15

Publication Date: December 1976

Location: 21 stations within Lake Huron

Period of Coverage: Winter 1974-1975

Contents: This report presents the results of an investigation of the characteristics of winter current flow in Lake Huron. The investigative effort was undertaken during the winter of 1974-75 as a part of the International Joint Commission Upper Lakes Reference Study. The current surveys were accomplished through a cooperative effort of the Great Lakes Environmental Research Laboratory (GLERL) of the National Oceanic and Atmospheric Administration (NOAA), the Canada Center for Inland Waters (CCIW), and the US Environmental Protection Agency (EPA), Region V. The study reported here represents the first serious attempt to describe the winter circulation of Lake Huron. The data given for each selected time period of the survey gathered by 21 current meter moorings set by GLERL, 12 by CCIW's Canada Survey Ship Limos, and 9 by EPA's research vessel ROGER R. SIMMONS. The study generated a series of 70 maps depicting the current roses for the various mooring sites (stations) at depths of 2 m, 15 m, 25 m, and 50 m above the bottom and wind roses for perimeter shoreline meteorological stations.

Available From: Great Lakes Environmental Research Laboratory
National Oceanic and Atmospheric Administration
US Department of Commerce
2300 Washtenaw Avenue
Ann Arbor, MI 48104
(313) 668-2235, FTS 378-2235

Additional Information: Environmental Protection Agency report EPA-905/4-75-004 contains the same study results.

Visual Wave Observations Along the Lake Michigan Shore
Liu, P. C., and Housley, J. G., US Lake Survey Misc. Paper 70-2

Publication Date: May 1969

Location: Seven sites on Lake Michigan Shore: St. Martin, N. Manifou, Big Sable, Grand Haven, St. Joseph of Michigan; and Wankegan, Port Washington, and Maintowoe of Wisconsin

Period of Coverage: Autumns of 1966 and 1967

Contents: This paper was published by the former US Lake Survey, US Army Corps of Engineers. Information presented for each location contains:

(a) Distribution of wave heights vs. periods.
(b) Histograms of observed wave heights vs. percent of occurrence.
(c) Comparison of wave height observations made at shore stations and ships.
(d) A cumulative distribution of observed wave heights.
(e) A joint distribution of wave height and wave period.
(f) Directional distributions of wave period.

Available From: Great Lakes Environmental Research Laboratory
National Oceanic and Atmospheric Administration
US Department of Commerce
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US Army Engineer Waterways Experiment Station
ATTN: Technical Information Center - Library Branch
PO Box 631
Vicksburg, MS 39180-0613
(601) 634-2355 or 2543, FTS 542-2355 or 2543

National Data Buoy Center
National Weather Service
Bldg. 1100
NSTL Station, MS 39529
(601) 688-2800, FTS 494-2800

Publication

Climatic Summaries for NOAA Data Buoys
Gilhouser, David B., et al.

Publication Date: January 1983

Location: 18 NOAA data buoys: 9 off the Atlantic coast, 3 off the gulf coast, and 6 off the Pacific coast. Locations by latitude and longitude:

(35.0 N, 72.0 W) (32.6 N, 78.7 W)
(32.3 N, 75.2 W) (26.0 N, 90.0 W)
(31.7 N, 79.7 W) (26.0 N, 93.5 W)
(26.0 N, 86.0 W) (38.7 N, 73.6 W)
(40.1 N, 73.0 W) (40.8 N, 68.5 W)
(39.0 N, 70.0 W) (42.7 N, 68.5 W)
(56.0 N, 148.0 W) (42.5 N, 130.0 W)
(52.0 N, 156.0 W) (51.0 N, 136.0 W)
(46.0 N, 131.0 W) (41.0 N, 138.0 W)

Period of Coverage: Varying from buoy to buoy; all data were collected between 1972 and 1982. A minimum of 3 years of data was recorded for each buoy station.

Contents: This publication was prepared by the National Climatic Data Center (NCDC) for the National Data Buoy Center (NDBC). The data contained in the tabulations were obtained from the tape data family 11 (TDF-11) Marine Surface Observation Archive at NCDC. For each buoy station, the following types of tables are given:

(a) Table Type 1 - Monthly and annual means, standard deviations, and extremes for air temperature, sea surface temperature, air-sea temperature difference, sea level pressure, wind speed, and significant wave heights.
(b) Table Type 2 - The monthly and annual frequency distribution of air temperature, sea surface temperature, air-sea temperature differences, sea level pressure, wind speed, and significant wave height.
(c) Table Type 3 - Monthly and annual percent frequency of wind direction versus wind speed based on 3-hr data.
(d) Table Type 4 - The seasonal and annual percent frequency of wind speed versus significant wave height based on data taken every 3 hr.
(e) Table Type 5 - The seasonal and annual percent frequency of significant wave height versus average wave period based on data taken every 3 hr.

NOAA Data Buoy Center (Continued)

(f) Table Type 6 - The seasonal and annual persistence (duration and interval) of wind speed and wave height events based on data taken every 3 hr. The duration tables show the chance that a certain wind or wave event above a given threshold will persist for a specified time period during a given season. The interval tables show the probability of occurrence of a specified time interval between certain wind or wave exceedance events.

Available From:

National Data Buoy Center
National Weather Service
Bldg. 1100
NSTL Station, MS 39529
(601) 688-2800, FTS 494-2800

National Environmental Satellite, Data,
and Information Service
National Oceanic and Atmospheric Administration
US Department of Commerce
6010 Executive Blvd.
Rockville, MD 20852

Publication

Environmental Conditions Within Specified Geographical Regions

Publication Date: April 1973

Location: The offshore east and west coasts of the United States and in the Gulf of Mexico

Period of Coverage: Varies for each type of data presented

Contents: This report was published to provide an analysis of regional climatological environmental conditions for planning data-buoy tests; assistance in definition of requirement; and support of engineering design, deployment, and tests for buoys and buoy networks for NOAA's National Data Buoy Center. It was prepared by an interagency ad hoc task force containing experts from US Navy and various data centers within NOAA coordinated by the National Oceanographic Data Center. A total of 31 tables and 194 figures are presented for physical oceanographic information which include:

(a) Monthly surface wind, sea, and swell.
(b) Wave period-height and period-duration graphs.
(c) Persistency of favorable and unfavorable seas at selected wave conditions.
(d) Percent of days hurricanes and tropical storm originated, by month or combination of months.
(e) Percent of days hurricanes and tropical storms occurred, by month or combination of months.
(f) Percent of days with tropical cyclone winds in speed classes.
(g) Maximum winds from tropical cyclones, by recurrence interval and season.
(h) Tropical cyclone center movement speed roses.
(i) Time cross section of significant wave height.
(j) Wave spectra by wave height interval.
(k) Seasonal vertical temperature structures.
(l) Surface current roses, by region and season.
(m) Maximum observed current speeds.
(n) Mean geostrophic surface currents and flows.
(o) Many other types of data.

National Environmental Satellite, Data,
and Information Service (Continued)

Available From:

National Data Buoy Center
Bldg. 1100
NSTL Station, MS 39529
(601) 688-2800, FTS 494-2800

or on loan from:

US Army Engineer Waterways Experiment Station
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PO Box 631
Vicksburg, MS 39180-0631
(601) 634-2543, FTS 542-2543

National Oceanographic Data Center
National Oceanic and Atmospheric Administration
US Department of Commerce
2001 Wisconsin Ave., NW
Washington, DC 20235
(202) 634-7500

Kind of Data

Surface Current Data System (SCUDS)

Location and Dates: Worldwide; dates of data vary from 1850-present

Description of Data: This data file contains over 4 million current set (direction) and drift (speed) observations made by seamen of The Netherlands, Japan, Great Britain, France, and the United States. Surface currents calculated from ship drifts are sometimes supplemented by Geomagnetic Eletrokinetograph (an instrument which measures currents) observations. Data for the 19th century were collected primarily by The Netherlands; those of the 1960s to present are primarily from US collections.

The basic SCUDS file is organized geographically following National Oceanographic Data Center's (NODC's) Modified Canadian Consecutive Ten Degree square system which divides the world into squares for each 10 deg of latitude and longitude. The file is further broken into 1-deg squares within the 10-deg squares and arranged by months and by years for each month.

Most SCUDS records in the file contain the identity of its 10-deg, 5-deg, 2-deg, 1-deg, 1/4-deg and 1/10-deg square; the month; day and year; current direction and speed; and a data source code.

In addition to current speed and direction, water temperature, wind direction and speed, sea direction and height, and swell direction and height are also included in the data file. The Netherlands' surface current data do not have wave information.

Response Format: The basic outputs of the system are selected records and data summaries. These products are retrievable for a variety of geographic areas and time periods. Summaries are available in a long and short formats. The long format provides area and time (monthly or period) identity, basic statistical computations (area result direction and speed, north and east components, etc.), and a matrix of current speed and direction classes. Percent of observations for each direction and speed class, mean speed, maximum speed (per direction), and standard deviation are also included. The short summary format omits the matrix of direction and speed classes, but contains the area and month identity, the average northern and eastern current vector components for the area, the resultant direction and speed, the total observation for

the area, and the number of calms. Data are available on standard magnetic tape formats and printout listings.

Point of Contact:

Data Service Division
National Oceanographic Data Center
National Oceanic and Atmospheric Administration
2001 Wisconsin Ave., NW
Washington, DC 20235
(202) 634-7500

US Army Engineer District, Alaska
Pouch 898
Anchorage, AK 99506
(907) 552-3461

Publication

Alaska Coastal Data Collection Program Data Report No. 1 and No. 2

Publication Date: No. 1 - April 1983
No. 2 - November 1983

Location: Kodiak, Alaska
(13 additional sites have been scheduled for instrumentation between 1983 and 1987)

Period of Coverage: October 1981 - December 1982 (Report No. 1)
January 1983 - September 1983 (Report No. 2)

Contents: This series of reports contains the results of wind and wave measurements at Kodiak, Alaska, published by the Alaska Coastal Data Collection Program (ACDCP). The ACDCP is a cooperative effort of the State of Alaska Department of Transportation and Public Facilities, the US Army Coastal Engineering Research Center, and the US Army Engineer District, Alaska. The program is designed to facilitate the collection, analysis, and storage of coastal wind and wave data for use in planning, design, construction, and maintenance of coastal facilities in Alaska. The reports contain detailed one-line listings of wind and wave data and statistical summaries of all data collected for each site, including one- and two-dimensional frequency distributions.

Available From: Alaska Coastal Data Collection Program
Navigation and Coastal Planning Section
US Army Engineer District, Alaska
Pouch 898
Anchorage, AK 99506
(907) 552-3461

Coastal Engineering Research Center
US Army Engineer Waterways Experiment Station
PO Box 631
Vicksburg, MS 39180-0631
(601) 634-2027, FTS 542-2027

Publications

Atlantic Coast Hindcast, Deepwater, Significant Wave Information
Corson, W. D., et al., WIS Report 2

Publication Date: January 1981

Location: 13 stations along US Atlantic coast

Period of Coverage: 1956-1975

Contents: Using numerical hindcast techniques, deepwater significant wave data (height, period, and direction) are computed for the 20-year interval, 1956-1975. The wave data are presented for 13 stations in 8 data products:

(a) Seasonal percent occurrence tables.
(b) Percent exceedance diagrams.
(c) Duration table.
(d) Wave rose diagrams (season and year).
(e) Height, period, direction histograms (season and year).
(f) Return period diagrams.
(f) Wave steepness diagrams.
(g) Mean and largest wave-height tables.

Description and method of use of the products are given in the report.

The hindcast data are generated specifically for deepwater conditions which represent Phase I of the Atlantic Coast Wave Information Study (ACWIS) conducted by the US Army Corps of Engineers. Since waves generated from tropical storms or hurricanes are excluded in the analyses, caution must be exercised when the data are applied for design or analysis purposes.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. AD-A095-497)

Costs: Costs of hard copies or microfiches are available from NTIS upon request.

Atlantic Coast Hindcast, Phase II: Wave Information
Corson, W. D., et al., WIS Report 6

Publication Date: March 1982

Location: 33 stations along US Atlantic coast

Period of Coverage: 1956-1975

Contents: Using numerical hindcast techniques, significant wave data (height, period, and direction) are computed under deepwater and intermediate water depth conditions (continental shelf) for the 20-year interval, 1956-1975. The wave data are presented for 33 stations in 9 data products:

(a) Seasonal percent occurrence tables.
(b) Percent exceedance diagrams.
(c) "Over" duration table (duration of waves over a specific height).
(d) "Under" duration table (duration of waves under a specific height).
(e) Wave rose diagrams.
(f) Height, period, direction histograms.
(g) Return period diagrams.
(h) Wave steepness diagrams.
(i) Mean and largest wave-height tables.

Description and method of use of the products are given in the report.

The hindcast data are generated for deepwater and/or intermediate water depths where the geometry of continental shelf-shoreline configuration effects on waves become important. This report summarizes the results of Phase II of the Atlantic Coast Wave Information Study (ACWIS) conducted by the US Army Corps of Engineers. Since waves generated from tropical storms or hurricanes are excluded in the analyses, caution must be exercised when the data are applied for design or analysis purposes.

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(NTIS Accession No. AD-A117-662)

Costs: Costs of hard copies or microfiche copies are available from NTIS upon request.

Additional Information: Extremal analyses were revised for all 73 of the ACWIS Phase II stations. The results are summarized in "Atlantic Coast Hindcast, Phase II Wave Information: Additional Extremal Estimates," by Corson and Tracy, WIS Report 15. Coastal Engineering Research Center, US Army Engineer Waterways Experiment Station, published in May 1985.

Atlantic Coast Hindcast, Shallow-Water, Significant Wave Information
Jensen, Robert E., WIS Report 9

Publication Date: January 1983

Location: 166 stations along the US Atlantic coast

Period of Coverage: 1956-1975

Contents: Using a numerical transformation technique, significant wave data are computed for the 20-year interval, 1956-1975, for the US Atlantic coast. The hindcast wave data are presented for 166 stations in six data products:

(a) Geographical variation in the wave climate (including mean wave height, period, and direction).
(b) Twenty-year percent occurrence tables.
(c) Wave rose diagrams.
(d) Mean and largest wave-height tables.
(e) Return period table (including wave parameter statistics).
(f) "Over" duration tables (duration of waves over a specific wave height).

Description and method of use of the products are given in the report.

This report presents the results of Phase III of the Atlantic Coast Wave Information Study (ACWIS) conducted by the US Army Corps of Engineers. The hindcast data are generated by the transformation of ACWIS Phase II wave data into shallow water where the depth is 10 m. Furthermore, straight and parallel bottom contours have been assumed in the analyses. Waves generated from tropical storms (hurricanes) are excluded in the study.

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Additional Information: A computer-based system (SEAS) has been designed to provide direct access to the hindcast wave data produced by the ACWIS. The use of SEAS is described in the report entitled "Sea-State Engineering Analyses System (SEAS)," by D. S. Ragsdale, WIS Report 10, August 1983. For more information contact:
Information Analysis Center
Coastal Engineering Research Center
US Army Engineer Waterways Experiment Station
PO Box 631
Vicksburg, MS 39180-0631
(601) 634-2027, FTS 504-2027

Wave Climate at Selected Locations Along US Coasts
Thompson, E. F., CERC TR 77-1

Publication Date: January 1977

Location: 11 wave gages along the Atlantic coast
3 wave gages along the gulf coast
5 wave gages along the Pacific coast

Period of Coverage: Varies from gage to gage

Contents: Since 1948, the Coastal Engineering Research Center (CERC) and its predecessor, the Beach Erosion Board (BEB), have gathered data from US coastal locations. Staff and pressure-sensitive gages, generally shore-based, were used to obtain the data; a few gages were operated at offshore locations. Wave records were initially 7-min pen and ink records taken six times a day, but more recently, 1,024-sec digital records on magnetic tape taken four times daily have been used to determine significant wave heights and periods. Summaries of significant heights and periods for 19 gage locations provide useful information on ranges and annual and seasonal variations of wave climates.

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US Department of Commerce
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Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. A-037-904)

Beach Nourishment Techniques, Report 4, Wave Climate for Selected US Offshore Beach Nourishment Projects
Durham, D. L., et al., TR H-76-13

Publication Date: April 1981

Location: Revere Beach, Mass.; Rockaway Beach, N. Y.; Carolina Beach, N. C.; Nassau County, Fla.; Dade County, Fla.; Treasure Island, Fla.; Panama City, Fla.; Redondo Beach, Calif.; Indiana Dunes, Ind.; and Presque Isle, Pa.

Period of Coverage: Not available except Redondo Beach with a data base of 29 years (1946-1974) hindcast wave statistics

Contents: Data are presented describing the average wave climate at 10 selected beach nourishment sites on the coastline of the continental United States. The data were derived by calculating the effects of refraction, shoaling, and island sheltering on the deepwater wave climate applicable to each site. Deepwater wave climates were obtained from Synoptic Shipboard Meteorological Observation data tapes and California Department of Navigation and Ocean development files. Tables and plots of wave height/period frequency distribution on a monthly, annual, and azimuth of approach basis are presented as a means of summarizing the calculated data. The intent of this report is to provide information that can be used later to evaluate the ability of various offshore dredging systems to perform beach nourishment work.

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(NTIS Accession No. AD-A100-472-main text)
(NTIS Accession No. AD-A102-376-appendices)

Design Wave Information for the Great Lakes
Resio, D. T., and Vincent, C. L., TR H-76-1

Publication Dates: Report 1, Lake Erie, January 1976
Report 2, Lake Ontario, March 1976
Report 3, Lake Michigan, November 1976
Report 4, Lake Huron, September 1977
Report 5, Lake Superior, June 1978

Location: 190 points along the US shoreline of the Great Lakes

Period of Coverage: 22-69 years (varying from lake to lake) of wind field data used to hindcast extreme wave conditions

Contents: This series of five reports contains hindcast wave information applicable to many planning and design purposes on the Great Lakes. Historical wave data from stations along the lakes served as input to the numerical hindcast model, and significant wave heights were calculated for 5-, 10-, 50-, and 100-year return periods. These results are provided in tabular form for each point along the lake shoreline. The mean significant period for each of these wave height is also given. Information is provided for four seasons of the year (January-March, April-June, July-September, and October-December) and is separated into three approach directions relative to shore.

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NTIS Accession Nos:
AD-A020-345 (Report 1 - Lake Erie)
AD-A023-210 (Report 2 - Lake Ontario)
AD-A036-029 (Report 3 - Lake Michigan)
AD-A046-414 (Report 4 - Lake Huron)
AD-A057-127 (Report 5 - Lake Superior)

Seasonal Variations in Great Lakes Design Wave Height: Lake Erie
Resio, D. T., et al., MP H-76-21

Publication Date: March 1977

Location: 24 points along the US shoreline of Lake Erie

Period of Coverage: 25 years of storm records used to hindcast extreme wave conditions

Contents: Tables of 5-day extremal parameters are presented along with a methodology for the calculation of return period for a specific design wave height with variable intervals of time during the year, A brief description of the Great Lakes climatology is included to provide a meteorological context of wave height variations throughout the year.

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(NTIS Accession No: AD-A039-153)

Surf Statistics for the Coasts of the United States
Helb, James, R., BEB TM 108

Publication Date: November 1958

Location: 27 stations along the US coasts (17 on Atlantic coast, 3 on gulf coast, and 7 on Pacific coast)

Period of Coverage: 1954-1957

Contents: Visual observations of surf conditions including period and significant height and direction at 27 stations under a cooperative program between the US Coast Guard and the Beach Erosion Board, the predecessor to the Coastal Engineering Research Center, are reported and summarized on a monthly basis in tabular form. Effects of hurricanes on surf conditions along the Atlantic and gulf coasts are discussed. A comparison of observed surf and hindcast wave statistics is presented for the station at Grand Isle, La.

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(NTIS Accession No: AD-216-609)

Littoral Environment Observation (LEO) Data Summaries
Northern California, 1968-78
Schneider, C., and Weggel, J. R., MR No. 82-6

Publication Date: August 1982

Location: 25 selected sites in northern California (from the Monterey Peninsula to the Oregon border)

Contents: This publication contains information on:
(a) Wave conditions (direction, period, breaker height, and breaker type).
(b) Beach data (littoral current speed and direction, beach foreslope, rip current data, beach cusp spacings, monthly photos, tide levels, and sample data).
(c) Wind data (speed and direction).

Additional Information: Other technical publications reporting LEO data are:

Szuwalski, A. 1970 (Feb). "Littoral Environment Observation Program in California, Preliminary Report," MP 2-70.

Balsillie, J. H. 1978 (Mar). "Analysis and Interpretation of Littoral Environment Observation (LEO) and Profile Data Along the Western Panhandle Coast of Florida," TM 49.

Balsillie, J. H. 1975 (Nov). "Surf Observations and Longshore Current Prediction," TM 58.

For additional information on LEO data and programs, contact:
Coastal Engineering Information Analysis Center
Coastal Engineering Research Center
US Army Engineer Waterways Experiment Station
PO Box 631
Vicksburg, MS 39180-0631
(601) 634-2012, FTS 542-2012

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650

Wave Statistics for the Gulf of Mexico
Bretschneider, C. L., and Gaul, R. D., BEB TM 85-89

Publication Date: 1956

Location: Brownsville, Tex.; Caplen, Tex.; Burrwood, La.; Apalachicola, Fla.; and Tampa Bay, Fla.

Period of Coverage: N/A

Contents: These five technical memorandums consist of hindcast wave data for a 3-year period (1950, 1952, 1954). The data are presented for 12-, 24-, 48-, and 96-ft depths and deep water.

Each report has the following figures:

(a) Location map for hindcast stations.
(b) Yearly wind wave rose for deep water.
(c) Yearly swell rose for deep water.
(d) Onshore, offshore, parallel-to-shore yearly wind waves for deep water.
(e) Onshore, offshore, parallel-to-shore yearly swells for deep water.
(f) Cumulative frequency of deep-water wind waves from the north.
(g) Cumulative frequency of deep-water wind waves from the northeast.
(h) Cumulative frequency of deep-water wind waves from the east.
(i) Cumulative frequency of deep-water wind waves from the southeast.
(j) Cumulative frequency of deep-water wind waves from the south.
(k) Cumulative frequency of deep-water wind waves from the southwest.
(l) Cumulative frequency of deep-water wind waves from the west.
(m) Cumulative frequency of deep-water wind waves from the northwest.
(n) Simultaneous occurrence of deep-water wind waves and swell for onshore wind waves.
(o) Simultaneous occurrence of deep-water wind waves and swell for onshore wind waves.
(p) Simultaneous occurrence of deep-water wind waves and swell for parallel-to-shore wind waves.
(q) Cumulative frequency of wave height from the north for various water depths.
(r) Cumulative frequency of wave height from the northeast for various water depths.
(s) Cumulative frequency of wave height from the east for various water depths.
(t) Cumulative frequency of wave height from the southeast for various water depths.
(u) Cumulative frequency of wave height from the south for various water depths.
(v) Cumulative frequency of wave height from the southwest for various water depths.
(w) Cumulative frequency of wave height from the west for various water depths.

(x) Cumulative frequency of wave height from the northwest for various water depths.

(y) Cumulative frequency of wave height for onshore waves for various water depths.

(z) Cumulative frequency of wave height for offshore waves for various water depths.

(aa) Cumulative frequency of wave height for parallel-to-shore waves for various water depths.

In addition to these figures, wave refraction data are given by refraction coefficients and final wave direction as a function of wave period and deep- water wave direction for 12-, 24-, 48-, and 96-ft contour depths.

Both the monthly and yearly statistics are tabulated. Yearly deep-water ocean swell summaries and a summary of the simultaneous occurrence of wind waves are also given.

The last data given are for shallow-water wave statistics at water depths of 12, 24, 36, 48, and 96 ft.

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Additional Information: This publication series was published by the Beach Erosion Board, the predecessor organization to the Coastal Engineering Research Center. It comes as five separate reports as listed below (with NTIS accession number) by location

Location	TM Number	NTIS Accession No.
Brownsville, Tex.	No. 85	AD-115-151
Caplen, Tex.	No. 86	AD-115-152
Burrwood, La.	No. 87	AD-115-153
Apalachicola, Fla.	No. 88	AD-115-154
Tampa Bay, Fla.	No. 89	AD-132-763

North Atlantic Coast Wave Statistics Hindcast by Bretschneider Revised Sverdrup-Munk Method
Saville, T., Jr., BEB TM 55

Publication Date: November 1954

Location: Four stations on the North Atlantic coast as follows:

Latitude	Longitude	Vicinity
43°50' N	68°00' W	Penobscot Bay
41°50' N	69°30' W	Cape Cod
40°15' N	73°45' W	New York Harbor
37°00' N	75°30' W	Chesapeake Bay

Period of Coverage: 1948-1950

Contents: The wave data given for each location contain statistical hindcast data for each month and for a full year, wave energy data for a full year, a directional wave rose, wave duration tables, a wave frequency table, and an energy transmittance table which gives the energy transported shoreward per foot at crest per year.

Available From: National Technical Information Center
US Department of Commerce
5285 Port Royal Road
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(703) 487-4650, FTS 737-4650
(NTIS Accession No: AD-60-787)

Additional Information: This document was published by the Beach Erosion Board, the Coastal Engineering Research Center's predecessor organization.

North Atlantic Coast Wave Statistics Hindcast by the Wave Spectrum Method
Neumann, G., and James, R. W., BEB TR 57

Publication Date: February 1955

Location: Four stations located along the east coast of the United States at the following points:

Latitude	Longitude	Vicinity
43°50' N	68°00' W	Penobscot Bay
41°50' N	69°30' W	Cape Cod
40°15' N	73°45' W	New York Harbor
37°00' N	75°30' W	Chesapeake Bay

Period of Coverage: 1948-1950

Contents: This publication was prepared to compare the hindcast data presented in the Beach Erosion Board's publication "North Atlantic Coast Wave Statistics Hindcast by Bretschneider - Revised Sverdrup-Munk Method," BEB TM 55.

It contains descriptions of waves under different sea conditions and hindcast period histograms for different wind speeds and directions.

Tables A-1 through D-1 present basic wave data which include wave height and period for each month, average duration of waves with specified sea conditions, seasonal wave roses, a wave frequency graph, and a duration table for waves greater than or equal to a slated height.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No: AD-60-788)

Additional Information: This publication was published by the Beach Erosion Board, the Coastal Engineering Research Center's predecessor organization.

Mississippi Sound Wave-Hindcast Study
Jensen, Robert E., TR HL-83-8

Publication Date: April 1983

Location: 23 stations in the Mississippi Sound

Period of Coverage: 20 years (1956-1975)

Contents: This 878-page manual contains hindcast data on wind waves in the Mississippi Sound during the period 1956 to 1975. It is divided into three volumes. Volume one contains the main text and Appendices A and B. The main text discusses the methodology and the shallow-water wave model utilized in the hindcast computations. Appendix A is a verification of the shallow-water wave model, while Appendix B is on the notation used.

Volume two contains Appendices C and D. Appendix C contains water depths, wave directions, fetch length, and frequency data used by the shallow-water wave model. Appendix D contains wave data for stations 1-12. The data given are (a) seasonal and 20-year percent occurrence tables, (b) percent exceedance diagrams, (c) height, period, and direction histograms, and (d) mean and largest significant wave height tables.

Volume three contains Appendices E through G. Appendix E contains similar wave data as Appendix D for stations 13-23. Appendix F contains duration of waves over a specified height, while Appendix G contains duration of waves under a specified height. Both Appendices F and G give data for all 23 stations.

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Hurricane Wave Statistics for the Gulf of Mexico
Wilson, B. W., BEB TM 98

Publication Date: June 1957

Location: 5 deepwater (100 fathoms) stations in the Gulf of Mexico: Brownsville, Tex.; Gilchrist, Tex.; Burrwood, La.; Apalachicola, Fla.; and Tampa, Fla.

Period of Coverage: 1900-1949

Contents: This report contains the results of a statistical hindcast study of the heights and periods of significant waves generated by 11 historical hurricanes (1900-1949) occurring in the Gulf of Mexico.

Twelve-hourly synoptic weather maps were prepared for each of the 11 hurricanes. Space-time wind fields are constructed for each of the five selected locations and are presented as maps. Envelope curves of maximum significant wave height and period as functions of arrival time at the five stations are also given.

Probability distributions of wave height vs. percentage exceedance and frequency of occurrence of hurricane waves of specific significant heights and periods are presented for all five stations.

Spiral diagrams of radial pressure distributions from the hurricane center at selected central pressures as a graphical aid are given in Appendix A. Appendix B is a theoretical and graphical aid in determining the hurricane surface wind velocity over the ocean. Appendix C presents a table of hurricane wave statistics which contains wave period, wave height, fetch, radius to maximum winds, and anomal pressure.

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US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No: AD-158-633)

Additional Information: This document was published by the Beach Erosion Board, the Coastal Engineering Research Center's predecessor organization.

Pipe Profile Data and Wave Observations from the CERC Beach Evaluation Program, January - March 1968
Urban, H. D., and Galvin, C. J., Jr., MP 3-69

Publication Date: September 1969

Location: Five beaches on the New Jersey and Long Island coasts as follows: Westhampton Beach, N. Y.; Jones Beach, N. Y.; Long Beach Island, N. J.; Atlantic City, N. J.; and Ludlam Island, N. J.

Period of Coverage: December 1967 to May 1968

Contents: This publication is intended to present beach erosion and accretion data for the specified locations using pipe profiling techniques. Measured sand elevations at pipes for each of the five beaches are tabulated with the dates of observation and are shown in Appendix A.

The visually observed wave data are given for seven sites: the previous five mentioned, plus Plum Island, Mass., and Misquamicut, R. I. A wave height histogram for each site is given in Figure 11. The visual wave observations include date and time recorded, period, height, direction, type wave, and remarks.

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Lake Erie International Jetport Model Feasibility Investigation; Results of Numerical Steady-State, Wind-Driven Circulation Analysis
Durham, D. L., and Butler, H. L., MP H-76-3

Publication Date: February 1976

Location: Lake Erie

Period of Coverage: N/A

Contents: The wind-driven, steady-state, well-mixed circulation in Lake Erie has been studied for existing conditions and as modified by a proposed jetport island located near Cleveland, Ohio. The report includes data from a parametric study for wind speeds of 17 mph and 35 mph representing average and extreme wind conditions from late September through May. In the study, the lake is assumed to be isothermal, and a solution is obtained for the entire lake and for a nearshore area near Cleveland. The report primarily presents the results of the circulation study and briefly summarizes the hydrodynamic model used. Included in the data are stream function contours and horizontal and vertical velocities at various depths for the entire lake and for the nearshore area. Also included are differences in velocity components and in velocity magnitude with and without the jetport island included in the study.

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US Department of Commerce
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Springfield, VA 22161
(703) 487-4650, FTS 737-4650

Wave and Lake Level Statistics for Lake Ontario
Saville, T., Jr., BEB TM 38

Publication Date: March 1953

Location: Three stations on Lake Ontario were selected for a comprehensive wave analysis:

Latitude	Longitude	Vicinity
43°17' N	79°46' W	Hamilton, Ont.
43°15' N	77°35' W	Rochester, N. Y.
43°49' N	76°18' W	Stony Point, N. Y.

Period of Coverage: 1948-1950 (wave data), 1860-1951 (lake level data)

Contents: This publication is divided into two sections: lake level statistics and wave statistics.

The lake level data include average seasonal fluctuation, a frequency of occurrence for short period fluctuations, and data on probability of occurrence of annual maximum monthly mean lake level for 1, 2, 3, 4, and 5 consecutive years.

The wave statistics section is divided into separate subsections for each location. Each subsection contains statistical hindcast data for each month, statistical hindcast data for a full year, statistical hindcast data for ice-free periods, and statistical energy data for various periods. Wave roses, and duration and frequency of waves as a function of wave heights are also included.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No: AD-20-009)

Additional Information: This document was published by the Beach Erosion Board, the Coastal Engineering Research Center's predecessor organization.

Wave and Lake Level Statistics for Lake Michigan
Saville, T., Jr., BEB, TM 36

Publication Date: March 1953

Location: Five stations on Lake Michigan:

Latitude	Longitude	Vicinity
45°05' N	87°00' W	Baileys Harbor, Wis.
43°02' N	87°46' W	Milwaukee, Wis.
41°53' N	87°25' W	Chicago, Ill.
43°14' N	86°27' W	Muskegon, Mich.
44°38' N	86°18' W	Frankfort, Mich.

Period of Coverage: Wave characteristics: 1948-1950

Lake levels: 1860-1953

Contents: This publication is divided into two sections: lake level statistics and wave statistics.

The lake level data include average seasonal fluctuation, a frequency of occurrence for short period fluctuations, and data on probability of occurrence of annual maximum monthly mean lake level for 1, 2, 3, 4, and 5 consecutive years.

The wave statistics section is divided into separate subsections for each location. Each subsection contains statistical hindcast data for each month, statistical hindcast data for a full year, statistical hindcast data for ice-free periods, and statistical energy data for various periods. Wave roses, and duration and frequency of waves as a function of wave heights are also included.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No: AD-20-097)

Additional Information: This document was published by the Beach Erosion Board, the Coastal Engineering Research Center's predecessor organization.

Wave and Lake Level Statistics for Lake Erie
Saville, T., Jr., BEB, TM 37

Publication Date: March 1953

Location: Five stations on Lake Erie:

Latitude	Longitude	Vicinity
41°50' N	83°10' W	Monroe, Mich.
41°35' N	81°45' W	Cleveland, Ohio
42°12' N	80°05' W	Erie, Pa.
42°49' N	78°57' W	Buffalo, N. Y.

Period of Coverage: Wave characteristics: 1948-1950

Lake levels: 1860-1951

Contents: This publication is divided into two sections: lake level statistics and wave statistics.

The lake level data include average seasonal fluctuation, a frequency of occurrence for short period fluctuations, and data on probability of occurrence of annual maximum monthly mean lake level for 1, 2, 3, 4, and 5 consecutive years.

The wave statistics section is divided into separate subsections for each location. Each subsection contains statistical hindcast data for each month, statistical hindcast data for a full year, statistical hindcast data for ice-free periods, and statistical energy data for various periods. Wave roses, and duration and frequency of waves as a function of wave heights are also included.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No: AD-20-098)

Additional Information: This document was published by the Beach Erosion Board, the Coastal Engineering Research Center's predecessor organization.

American Society of Civil Engineers
345 East 47th Street
New York, NY 10017

Publication

Revisions to Hurricane Design Wave Practices,
Coastal Engineering, Volume 1, 1972 Proceedings
Bretschneider, C. L., Chapter 7, pp 167-195

Publication Date: 1973

Location: US east and gulf coasts

Contents: This is a conference paper presented by the author to the Thirteenth Coastal Engineering Conference in Vancouver, B. C., Canada. The 1959 paper by the same author entitled "Hurricane Design Wave Practices" has been widely used in the past for obtaining design wave criteria. The revision presented in this paper applies to the US east and gulf coasts past historical hurricanes and also to the US National Weather Service standard project and probable maximum hurricanes for deepwater conditions. The results are presented in 14 figures and 4 tables and could serve as inputs for a particular location to calculate design storm surge and design wave criteria.

Available From: American Society of Civil Engineers
345 East 47th Street
New York, NY 10017

or most university libraries.

University of Florida
Coastal and Oceanographic Department
Gainesville, FL 32601

Publication

Florida Coastal Data Network, Annual Report

Publication Date: 1984

Location: Ten coastal stations along the Florida coastline are identified as the coastal data network field stations. Six of the ten stations, St. Mary's Entrance, Marine Land, Cape Canaveral, Miami, Mayport Naval Air Base, and Clearwater, provide data to the report.

Period of Coverage: December 1983 - September 1984

Contents: This publication is a special wave data report. It includes tables and figures which contain joint distributions of wave height and period, marginal and cumulative distribution of height and period, and wave roses for the field stations by month or by season. The report does not contain any discriptive information about the network. Further information may be obtained from the above address.

Available From: University of Florida
Coastal and Oceanographic Department
Gainesville, FL 32601

University of Michigan
Department of Meteorology and Oceanography
College of Engineering
Ann Arbor, MI 48109
(313) 764-7433

Publication

Wave Statistics for Lakes Michigan, Huron, and Superior
Hilfiker, R. C., and Cole, A. L.

Publication Date: August 1970

Location:

Lake Michigan		
Point Betsie, Mich.	44.67 N	86.33 W
Muskegon, Mich.	43.17 N	86.33 W
Burns Harbor, Ind.	41.67 N	87.17 W

Lake Huron		
Port Huron, Mich.	43.17 N	82.33 W
Harbor Beach, Mich.	44.17 N	82.67 W
Douglas Point, Ont.	44.33 N	81.67 W
Alpena, Mich.	45.00 N	83.17 W
Cockburn Island, Ont.	45.83 N	83.17 W

Lake Superior		
Duluth, Minn.	46.83 N	91.67 W
Gland Marias, Minn.	47.67 N	90.33 W
Eagle Harbor, Mich.	47.50 N	88.17 W
Marquette, Mich.	46.67 N	87.33 W
Whitefish Point, Mich.	46.83 N	85.00 W
Slate Island, Ont.	48.67 N	86.83 W

Period of Coverage: 1965-67

Contents: A wave hindcast study for Lakes Michigan, Huron, and Superior was conducted for the years 1965, 1966, and 1967. The purpose of this study was to help in the understanding of shoreline erosion, the design of maritime structures, and the design of Great Lakes ships.

The study produced statistics of significant wave height and period for 11 locations on Lakes Huron and Superior for which such data were not available before. Wave statistics were also produced for three locations on Lake Michigan so that comparisons could be made with an earlier study.

The wind field used to determine the wave parameters was derived from the geostrophic wind based on a pressure analysis of synoptic weather reports taken every 6 hr. The Svendrup-Munk method of wave hindcasting as revised by Bretschneider (the SMB method) was used to hindcast the wave parameters.

University of Michigan (Continued)

Available From:

University of Michigan
Department of Meteorology and Oceanography
College of Engineering
Ann Arbor, MI 48109
(313) 764-7433

National Physical Laboratory
Ministry of Technology
Teddington, Middlesex
England

Publication

Ocean Wave Statistics
Hogben, N., and Lumb, F. E.

Publication Date: 1967

Location: Major shipping routes of the world oceans including the Red Sea, Persian Gulf, China Sea, and Indian Ocean

Period of Coverage: 1953-1961

Contents: A statistical survey of wave characteristics estimated visually from voluntary observing ships sailing along the shipping routes of the world. Its purpose was to provide systematic information about environmental conditions for use in research on the seagoing qualities of ships. A total of 2,500 voluntary ships generated almost 2 million sets of observations consisting of wave direction, period, height of sea, and swell. A total of 1-3/4 million sets of observations made during this 8-year period have been processed at the time of publication and 1 million of these were used to comprise the tables. There are three basic types of tables:

Group I. All Seasons - All directions: This set of tables gives the data for each area taken over the whole year and over all wave directions. The tables therefore summarize the data of each area.

Group II. All Seasons - With Directional Breakdown: This set of tables gives the data for each area taken over the whole year but with directional breakdown.

Group III. Seasonal and Directional Breakdown: This set of tables gives the data for each area according to the season of the year and with directional breakdown.

The boundaries for the 50 areas are based on a Marsden Square Chart.

Available From: H. M. Stationary Office
London, England

US Naval Oceanographic Office
Washington, DC 20390

Publication

Oceanographic Atlas of the North Atlantic Ocean,
Section IV, Sea and Swell
NOO-PUB-700-SEC-4

Publication Date: 1963

Location: North Atlantic Ocean, Gulf of Mexico and Caribbean Sea, and Mediterranean Sea

Period of Coverage: N/A

Contents: This publication is predominantly a presentation of sea, swell, and wave data for the North Atlantic Ocean based on visual wave estimates of the sea surface. The figures include:

(a) Monthly wind roses by location.
(b) Monthly sea states with isolines indicating percent frequency of sea ≥ 5, 8, 12, and 20 ft.
(c) Predominant sea direction and constancy by month.
(d) Monthly swell charts with isolines indicating percent frequency of sea ≥ 12 ft.
(e) Predominant swell direction and constancy by month.
(f) Persistency of waves of specific heights by season.
(g) Wave period-height and period-direction charts by season.
(h) Percent frequency of seas requiring reduction in speed of ship for specific headings by season.

Additional Information: There are six sections in this atlas series. The section number, subject title, and NTIS Accession Nos. are:

Section I, Tides and Currents, AD-835-752
Section II, Physical Properties, AD-658-219
Section III, Ice Properties, AD-846-816
Section IV, Sea and Swell, AD-835-753
Section V, Marine Geology, AD-625-861
Section VI, Sound Velocity, AD-650-880

Available From: National Technical Information Service
ATTN: Operation Division
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650

Scripps Institute of Oceanography
Nearshore Research Group
Institute of Marine Resources
Mail Code A022
University of California, San Diego
La Jolla, CA 92093
(619) 452-2561

Publication

Coastal Data Information Program
Seymour, R. L., et al.

Publication Interval: Monthly and annual

Location: Five stations off California coast from December 1975 to December 1977. The number of stations has been increased to more than 30 since 1978 with the majority located in California, Oregon, and Washington. Other stations are in Hawaii, Lake Michigan, and North Carolina.

Period of Coverage: December 1975 to the present (coverage varies from station to station)

Contents: This series of publications presents the results of the coastal wave data acquisition program conducted by the Nearshore Group at the Scripps Institute of Oceanography. Earlier reports include Coast Engineering Data Network (1975-1976), California Coast Engineering Data Network (1977-1978), California Coastal Data Collection Program (1979-1980), and Coastal Data Information Program (1981-present). The current program is sponsored by the California Department of Boating and Waterways and the US Army Corps of Engineers.

The monthly reports present wave energy spectra (plots and tabulations), maximum daily significant wave height, wave persistence in consecutive days as a function of wave height, and wave direction as a function of wave period bands. Annual data summary includes probability distribution functions of wave height and peak period, seasonal probability of exceeding various significant wave heights, and joint distribution of wave height and peak period.

Available From: Scripps Institute of Oceanography
Nearshore Research Group
Institute of Marine Resources
Mail Code A022
University of California, San Diego
La Jolla, CA 92093
(619) 452-2561

or

Scripps Institute of Oceanography (Continued)

Coastal Engineering Research Center
US Army Engineer Waterways Experiment Station
PO Box 631
Vicksburg, MS 39180-0631
(601) 634-2075, FTS 542-2075

or

California Department of Boating and
Waterways
1629 "S" Street
Sacramento, CA 95814

Meteorology International, Inc.
205 Monecito Avenue
Monterey, CA 93940

Publication

Deep-Water Wave Statistics for the California Coast

Publication Date: 1977

Location: Six stations off California coast:
(42.0° N - 125.0° W) (39.6° N - 124.5° W)
(37.6° N - 123.5° W) (35.5° N - 122.0° W)
(33.5° N - 120.4° W) (31.5° N - 118.4° W)

Period of Coverage: 1951-1974

Contents: This six-volume publication summarizes the statistics derived from 24 years of wave hindcasting using the US Navy Fleet Numerical Weather Central (FNWC) Singular Sea/Swell Model. Hindcasts of seas and swells were made from wind fields developed from shipboard barometer readings taken between 1951 and 1974. The basic approach was to convert actual barometric observations to a pressure field, derive the wind field mathematically, and then use the wind field to generate the wave field. The report presents:

(a) Wave roses.
(b) Wave height duration bar graphs by year and by month.
(c) Direction-period-height frequency of occurrence distribution.
(d) Monthly mean wave height.
(e) Maximum monthly direction-period-height frequency of occurrence distribution.
(f) Minimum monthly direction-period-height frequency of occurrence distribution.
(g) Extreme event listing (ordered by date, by wave height, and by period).

Available From: Meteorology International, Inc.
205 Monecito Avenue
Monterey, CA 93940

or

California State Department of Navigation and Ocean Development (DNOD)
1416 Ninth Street (1629 S. Street)
Sacramento, CA 95814

Additional Notes: Microfiche copies of all tables are available at DNOD.

National Marine Consultants, Inc.
Interstate Electronics Corporation
1001 E. Ball Road
Anaheim, CA 92803
(714) 635-7210

Publications

Wave Statistics for Twelve Most Severe Storms Affecting Three Selected Stations off the Coast of Washington and Oregon, During the Period 1950-1960

Publication Date: January 1961

Location: Three stations off the coast of Oregon and Washington with locations as follow:

Station 1	44°40' N	124°50' W
Station 2	46°12' N	124°30' W
Station 3	47°40' N	125°00' W

Period of Coverage: 1950-1960
The dates of specific storms selected for analysis occurred during the months listed below:

October 1950	February 1951
December 1951	December 1952
February 1954	November 1954
December 1953	March 1956
January 1956	December 1957 (sta 2 and 3 only)
December 1959	
February 1960 (sta 1 only)	
January 1951	

Contents: This publication contains 36 separate tables, one for each station and storm. Wind velocity, fetch length, wind duration, and decay distances were determined from 6-hr synoptic weather charts for the North Pacific Ocean. Significant wave heights, the range of wave periods, the significant wave period, and the mean wave direction were then determined. Wherever possible, observational wave data from ships near the study sites were examined to correlate with the hindcast data.

Available From: National Marine Consultants, Inc.
Interstate Electronics Corporation
1001 E. Ball Road
Anaheim, CA 92803
(714) 635-7210

or on loan from:

National Marine Consultants, Inc. (Continued)

US Army Engineer Waterways Experiment Station
ATTN: Technical Information Center -
Library Branch
PO Box 631
Vicksburg, MS 39180-0631
(601) 634-2543, FTS 542-2543

Additional Information: Microfiche copies of all the tables in the report may be obtained from the California Department of Navigation and Ocean Development.

National Marine Consultants, Inc. (Continued)

Wave Statistics for Three Deep Water Stations Along the Oregon-Washington Coast

Publication Date: May 1961

Location: The general area of study covers the entire coast of Oregon and Washington and is represented by three selected deepwater stations:

Station 1	44°40' N	124°50' W
Station 2	46°12' N	124°30' W
Station 3	47°40' N	125°00' W

Period of Coverage: Results are based upon meteorological records and charts for the years 1956, 1957, and 1958

Contents: The purpose of this report is to compile hindcast deepwater wave statistics and to include the analysis and necessary computations involved, based upon meteorological records and charts. The statistics compiled and presented in this report are wave height, wave direction, and wave period and are presented as monthly and annual averages.

Available From: National Marine Consultants, Inc.
Interstate Electronics Corporation
1001 E. Ball Road
Anaheim, CA 92803
(714) 635-7210

National Marine Consultants, Inc. (Continued)

Wave Statistics for Seven Deep Water Stations
Along the California Coast

Publication Date: December 1960

Location: Seven deepwater stations whose coordinates are:

Station 1	42'0° N	125'0° W
Station 2	39'6° N	124'5° W
Station 3	37'6° N	123'5° W
Station 4	35'5° N	122'0° W
Station 5	34'5° N	121'0° W
Station 6	34'2° N	120'0° W
Station 7	33'5° N	119'5° W

Period of Coverage: This report compiles deepwater wave statistics based upon meteorological records and charts for the years 1956, 1957, and 1958

Contents: Results of a wave hindcast analysis for the seven deepwater sites are presented in the form of average monthly and average annual wave height-period-direction frequency distributions. Wave directions are the directions from which the waves approach; the wave height is in terms of significant height; the wave period is the average period associated with the significant wave height.

Annual wave roses are also presented and are given in combined rose and histogram form. The rose, which is in the center of each diagram, shows a frequency distribution of wave direction. The histograms surrounding the rose give a frequency distribution of wave height for each direction. Two such diagrams are presented for each station, one for sea and one for swell.

Available From: National Marine Consultants, Inc.
Interstate Electronics Corporation
1001 E. Ball Road
Anaheim, CA 92803
(714) 635-7210

or on loan from:

US Army Engineer Waterways Experiment Station
ATTN: Technical Information Center - Library Branch
PO Box 631
Vicksburg, MS 39180-0631
(601) 634-2543, FTS 542-2543

Canada Department of Transport
Meteorological Branch
315 Bloor Street West
Toronto 181, Ontario, Canada

Publication

Synthesized Winds and Wave Heights for the Great Lakes
Richards, T. L., and Phillips, D. W., Climatological Studies Number 17

Publication Date: 1970

Location: Toronto on Lake Ontario, London on Lake Erie, Wiarton on Lake Huron, and Thunder Bay (formally called Lakehead) on Lake Superior

Period of Coverage: 1956-67

Contents: This paper employs an empirical method for developing analyses of what may be termed synthesized over-lake winds based on recently established relationships between over-land and over-lake winds. These synthesized data were used with a wind-wave hindcast technique used by the Directorate of the Canadian Naval Weather Service to develop wave height frequency analyses for each of the Great Lakes bordering Canada.

The over-land and over-lake wind data are presented for each of the four towns and lakes, respectively. It is given by season, and the individual seasons are further broken down into monthly periods. The monthly periods provide wind direction (eight directions) and speed and percent of time during the month that the wind blew at this direction and speed.

Monthly histograms of wave heights (generated by 100-nautical-mile fetch) are given for each lake. The last data given are probability distributions of significant wave heights greater than indicated thresholds for each lake.

Available From: Canada Department of Transport
Meteorological Branch
315 Bloor Street West
Toronto 181, Ontario, Canada

Bedford Institute of Oceanography
PO Box 1006
Dartmouth, Nova Scotia B2Y 4A2
(902) 426-3675

Publication

11 Year Deep Water Wave Climate of Canadian Atlantic Waters
Neu, H. J. A., Canadian Technical Report of Hydrology and Ocean Sciences No. 13

Publication Date: October 1982

Location: The Canadian Atlantic and adjacent areas

Period of Coverage: 1970-1980

Contents: Long-term annual and monthly wave height distributions were developed for the offshore region of the Canadian Atlantic from an 11-year time series of 12-hr wave charts for the North Atlantic Ocean. Largest significant wave heights are presented for return periods of 1, 10, and 100 years. A brief discussion on the long-term variability of sea state is included. Also included are directional period distributions of the 20 largest storms each month during the 11 years of record and monthly directional energy spectra for the Hibernia Oil Field area for every other month.

Available From: Bedford Institute of Oceanography
PO Box 1006
Dartmouth, Nova Scotia B2Y 4A2
(902) 426-3675

Additional Information: Other publications of interest are:

Neu, H. J. A. 1971. "Wave Climate of the Canadian Atlantic Coast and Continental Shelf - 1970," Atl. Oceanogr. Lab., Bedford Inst., Report 1971-10, Dartmouth, N. S., p 103.

Neu, H. J. A. 1976. "Wave Climate of the North Atlantic - 1970," Atl. Oceanogr. Lab., Bedford Inst. of Oceanogr., Report Series, BI-R-76-10, Dartmouth, N. S., p 37.

Vandall, P. E. J. 1976. "Wave Statistics During a North Atlantic Storm," Bedford Inst. of Oceanogr., Report Series, BI-R-76-11, Dartmouth, N. S.

Walker, R. E. 1976. "Wave Statistics for the North Atlantic - 1970," Bedford Inst. of Oceanogr., Data Series, BI-D-76-3, Dartmouth, N. S.

Walker, R. E. 1977. "Wave Statistics for the North Atlantic - 1971," Bedford Inst. of Oceanogr., Data Series, BI-D-77-1, Dartmouth, N. S.

Walker, R. E. 1978. "Wave Statistics for the North Atlantic - 1972," Bedford Inst. of Oceanogr., Data Series, BI-D-78-2, Dartmouth, N. S.

University of Wisconsin-Milwaukee
Center for Great Lakes Studies
Milwaukee, WI 53201
(414) 963-1122

Publication

Time-Series Plots of Lake Ontario Currents, Temperature, and Winds
Marmorino, G. O., Special Report No. 36

Publication Date: June 1978

Location: Nine stations in Lake Ontario: one near mid-lake, about 40 km from shore, and in about 140 m of water; the other eight spaced around the lake, about 50 km apart, 15 km from shore, and in 100 m of water

Period of Coverage: December 1972 - March 1973

Contents: As part of the International Field Year for the Great Lakes program to measure the climatology of Lake Ontario, currents and water temperatures were sampled every 30 min at nine stations with Plessey and Geodyne current meters, from 1 December 1972 through late March 1973 by E. B. Bennett's group at the Canada Center for Inland Waters.

Vector time-series plots of currents and wind stress and scalar plots of water temperature are presented at 10-day intervals using hourly data from Lake Ontario, December 1972 - March 1973. To allow comparisons to be made between currents and wind forcing, time-series plots of wind are also presented. In addition, information on the lake's thermal structure was provided by Airborne Radiation Thermometer flight surveys and by ship surveys.

Available From: University of Wisconsin-Milwaukee
Center for Great Lakes Studies
Milwaukee, WI 53201
(414) 963-1122

PART V: ICE INFORMATION

Great Lakes Environmental Research Laboratory
National Oceanic and Atmospheric Administration
US Department of Commerce
2300 Washtenaw Avenue
Ann Arbor, MI 48104
(313) 668-2235, FTS 378-2235

Publications

Great Lakes Ice Atlas
Assel, R. A., et al.

Publication Date: July 1983

Location: Great Lakes including surrounding bays and harbors

Contents: Over 2,800 historic Great Lakes ice charts spanning 20 winters (1960-79) were digitized and converted to discrete 5- by 5-km grid cells. This data set was analyzed to produce a series of 46 plates, including 9 for each of the five Great Lakes with 1 extra plate for Lake Michigan. The plates portray charts of maximum, minimum, and normal ice concentration patterns and observation density for nine semimonthly periods beginning the last half of December and ending the last half of April. The percent of the surface area covered by ice was calculated for each ice chart and summarized in tabular format. In addition, a 10-year data set of ice thickness in the nearshore zone of the Great Lakes, i.e., primarily in bays and harbors, is presented to identify ice thickness ranges and ice stratigraphic patterns for the Great Lakes Region. To complete this atlas, air temperatures at 25 stations on the perimeter of the Great Lakes for an 80-winter period (1898-1977) were used to classify winter severity into five severity classes, based on freezing degree-days. Winter severity trends for the preice and postice concentration climatology periods are identified on an annual and semimonthly time scale for individual stations and for lake-wide averages.

This atlas is an updated version of NOAA's 1971 publication, Technical Memorandum NOS LSCR1 by Donald R. Rondy. Additional data or information about Great Lakes ice conditions can be obtained from the bibliography and reference list of both publications.

Available From: Information Service
Great Lakes Environmental Research Laboratory
National Oceanic and Atmospheric Administration
US Department of Commerce
2300 Washtenaw Avenue
Ann Arbor, MI 48104
(313) 668-2235, FTS 378-2235

Additional Information: Contact appropriate Coast Guard Offices listed in Appendix E for additional ice information.

Summary of Great Lakes Weather and Ice Conditions

Publication Interval: Annual

Location: Great Lakes and their immediate vicinity

Period of Coverage: Winter 1962-1963 to winter 1979-1980

Former Title: Prior to Winter 1974/75, publications are entitled Great Lake Ice Cover, Winter 19__ - 19__

Contents: This series of publication presents the ice information of each winter season of the Great Lakes beginning in 1962. Data included are freezing degree-day statistics; composite ice charts illustrating the seasonal pattern of ice formation, growth, and decay; and/or ice charts illustrating synoptic ice conditions. The summaries of meteorological data including barometric pressure and air temperature were added to the publication.

Available From: Information Service
Great Lakes Environmental Research Laboratory
National Oceanic and Atmospheric Administration
US Department of Commerce
2300 Washtenaw Avenue
Ann Arbor, MI 48104
(313) 668-2235, FTS 378-2235

Additional Information: Earlier publications were prepared by the Lake Survey of the US Army Corps of Engineers. Later issues were by the Lake Survey Center of the National Ocean Survey, NOAA. In 1974, the Limnology Division of Lake Survey Center was transferred to the Great Lakes Environmental Research Laboratory, NOAA. The author(s), title, and publication agency for each issue are:

Wilshaw, R., and Rondy, D. R. 1965. "Great Lake Ice Cover, Winter 1964-65," Research Report No. 5-1, US Lake Survey, Corps of Engineers.

Rondy, D. R. 1966. "Great Lake Ice Cover, Winter 1965-66," Basic Data Report 5-2, US Lake Survey, Corps of Engineers.

Rondy, D. R. 1967. "Great Lake Ice Cover, Winter 1966-67," Basic Data Report 5-3, US Lake Survey, Corps of Engineers.

Rondy, D. R. 1968. "Great Lake Ice Cover, Winter 1967-68," Basic Data Report 5-4, US Lake Survey, Corps of Engineers.

Rondy, D. R. 1969. "Great Lake Ice Cover, Winter 1962-1963 and 1963-1964," Basic Data Report 5-5, US Lake Survey, Corps of Engineers.

Assel, R. A. 1972. "Great Lake Ice Cover, Winter 1970-1971," NOAA Tech. Memo. NOS LSCD 4, National Technical Information Service, Springfield, VA 22161.

Assel, R. A. 1972. "Great Lake Ice Cover, Winter 1971-1972," NOAA Tech. Memo. NOS LSCD 6, National Technical Information Service, Springfield, VA 22161.

Assel, R. A. 1974. "Great Lake Ice Cover, Winter 1972-1973," NOAA Tech. Memo. NOS LSCD 7, National Technical Information Service, Springfield, VA 22161.

Assel, R. A. 1974. "Great Lake Ice Cover, Winter 1973-1974," NOAA Tech. Rept. ERL 325-GLER 1, National Technical Information Service, Springfield, VA 22161.

Leshkevich, G. A. 1976. "Great Lake Ice Cover, Winter 1974-1975," NOAA Tech. Rept. ERL 370-GLERL 11, National Technical Information Service, Springfield, VA 22161.

Leshkevich, G. A. 1977. "Great Lake Ice Cover, Winter 1975-1976," NOAA Tech. Rept. ERL 370-GLERL 12, National Technical Information Service, Springfield, VA 22161.

Quinn, F. H., et al. 1978. "Summary of Great Lakes Weather and Ice Conditions, Winter 1976-1977," NOAA Tech. Memo. ERL GLERL-20, National Technical Information Service (NTIS PB 292 613/75T), Springfield, VA 22161.

Assel, R. A., et al. 1979. "Summary of Great Lakes Weather and Ice Conditions, Winter 1977-1978," NOAA Tech. Memo. ERL GLERL-26, National Technical Information Service, Springfield, VA 22161.

DeWitt, B. H., et al. 1980. "Summary of Great Lakes Weather and Ice Conditions, Winter 1978-1979," NOAA Tech. Memo. ERL GLERL-31, National Technical Information Service, Springfield, VA 22161.

A Computerized Ice Concentration Data Base for the Great Lakes
Assel, R. A., NOAA Data Report ERL GLERL-24

Publication Date: April 1983

Location: Great Lakes

Period of Coverage: N/A (See Contents)

Contents: This report describes the computerized data set and an ice concentration climatology developed from the data set. The data base being described contains 20-winter observations made by GLERL and its predecessor. Data reduction and analysis procedures, computer file structure and record format, and availability of the data are given by this report.

Available From:

Information Service
Great Lakes Environmental Research Laboratory
National Oceanic and Atmospheric Administration
US Department of Commerce
2300 Washtenaw Avenue
Ann Arbor, MI 48104
(313) 668-2235, FTS 378-2235

Lake Erie Regional Ice Cover Analysis: Preliminary Results
Assel, Raymond A., NOAA Tech. Memo. ERL GLERL-48

Publication Date: July 1983

Location: Lake Erie

Period of Coverage: 1960-1979

Contents: A 20-year digital ice concentration data set was divided into nine half-month periods, starting with the last half of December and ending in the last half of April. Observation density, average regional ice cover, and percentage of ice cover exceedance were calculated for three regions of the lake: the entire lake, the lake east of Long Point, Ont., and the lake east of Port Colborne, Ont. Results of the analysis are presented in tables and graphs of percentage of region observed, average ice cover, and percentage exceedance from average ice cover. Seasonal and regional trends in ice cover extent are discussed.

Available From:

Information Service
Great Lakes Environmental Research Laboratory
National Oceanic and Atmospheric Administration
US Department of Commerce
2300 Washtenaw Avenue
Ann Arbor, MI 48104
(313) 668-2235, FTS 378-2235

Canada Department of Transport
Meteorological Branch
315 Floor Street West
Toronto 181, Ontario, Canada

The following list of publications provides additional ice information of Great Lakes region:

Canada Department of Transport, Meteorological Branch. 1960. "Aerial Ice Observing and Reconnaissance--The Great Lakes," Tech. Cir. 3361, TEC 328, Canada Department of Transport, Toronto, Ont., 15 pp.

Canada Department of Transport, Meteorological Branch. 1961. "Aerial Ice Observing and Reconnaissance--The Great Lakes," Tech. Cir. 3350, TEC 371, Canada Department of Transport, Toronto, Ont., 57 pp.

Canada Department of Transport, Meteorological Branch. 1962. "Aerial Ice Observing and Reconnaissance--The Great Lakes," Tech. Cir. 3372, TEC 440, Canada Department of Transport, Toronto, Ont., 57 pp.

Canada Department of Transport, Meteorological Branch. 1963. "Aerial Ice Observing and Reconnaissance--The Great Lakes," Tech. Cir. 3987, ICE 13, Canada Department of Transport, Toronto, Ont., 26 pp.

Canada Department of Transport, Meteorological Branch. 1964. "Ice Observations--Canadian Inland Waterways," Canada Department of Transport, Toronto, Ont., pp 1-5, 35 fig.

Canada Department of Transport, Meteorological Branch. 1965. "Ice Observations--Canadian Inland Waterways," Canada Department of Transport, Toronto, Ont., pp 1-5, 46 fig.

Canada Department of Transport, Meteorological Branch. 1966. "Ice Observations--Canadian Inland Waterways," Canada Department of Transport, Toronto, Ont., pp 1-6, 60 fig.

Canada Department of Transport, Meteorological Branch. 1967. "Ice Observations--Canadian Inland Waterways," Canada Department of Transport, Toronto, Ont., pp 1-11, 104 fig.

Canada Department of Transport, Meteorological Branch. 1968. "Ice Observations--Canadian Inland Waterways," Canada Department of Transport, Toronto, Ont., 63 pp.

Canada Department of Transport, Meteorological Branch. 1969. "Ice Observations--Canadian Inland Waterways," Canada Department of Transport, Toronto, Ont., 90 pp.

Canada Department of Transport, Meteorological Branch. 1970. "Ice Observations--Canadian Inland Waterways," Canada Department of Transport, Toronto, Ont., pp 1-16, 169 fig.

Canada Department of Transport, Meteorological Branch. 1971. "Ice Observations--Canadian Inland Waterways," Canada Department of Transport, Toronto, Ont., pp 1-11, 187 fig.

Canada Department of Transport (Continued)

Canada Department of Transport, Meteorological Branch. 1975. "Ice Thickness Summary for Selected Canadian Stations Means, Extremes, and Standard Deviations of Ice Thickness and Snow Depth on Ice," Tech. Cir. ICE 1-75, Toronto, Ont., 60 pp.

Available From:

Canada Department of Transport
Meteorological Branch
315 Floor Street West
Toronto 181, Ontario, Canada

US Army Cold Regions Research and Engineering Laboratory
72 Lyme Road
Hanover, NH 03755-1290
(603) 646-4100

Publication

Ice Thickness Observations, North American Arctic and Subarctic
Bilello, M. A., USA CRREL Special Report 43

Publication Dates: 1961, 1964, 1966, 1968, 1971, 1972, and 1975

Location: The number of ice stations selected for ice observation varies from year to year. They are widely distributed to cover lakes, rivers, and coastline of Alaska and Canada. As of 1972, a total of 46 stations were located in Alaska and 43 in Canada.

Contents: Special Report 43 contains seven reports on lake, river, and land-fast sea ice. It presents ice thickness measurements throughout the North American arctic and subarctic during 14 winter seasons (1958-1972).

Information on surface ice conditions, dates of first ice, freeze-over and breakup dates, and detailed measurements of ice thickness across Alaskan rivers is included. Isoline maps showing the maximum observed ice thickness and average date of maximum ice thickness are also included.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650

or: US Army Cold Regions Research and Engineering Laboratory (CRREL)
72 Lyme Road
Hanover, NH 03755-1290
(603) 646-4100, FTS 836-4100

Additional Information: CRREL has conducted numerous researches on ice mechanics and ice engineering. Users should contact CRREL at the above address for more information and assistance.

US Naval Oceanographic Office
Hydrographic Department
NSTL Station, MS 39529
(601) 688-4015, FTS 494-4015

Publication

Oceanographic Atlas of the Polar Seas, Part II, Arctic
H. O. Publication No. 705

Publication Date: 1958 (Reprinted 1968)

Location: Arctic Ocean and vicinity

Period of Coverage: Most of the charts in this atlas were completed in early 1957 from all available data at that time.

Contents: This atlas contains seven main sections: Tides and Currents, Ice, Physical Properties, Distribution of Oceanographic Observations, Marine Biology, Marine Geology, and Wind-Sea-Swell Data.

The Tides and Currents section contains information on the type of tide, cotidal lines, spring tide range, general surface circulation, major drifts of vessels and ice islands, circulation of Atlantic waters in the Arctic Ocean, and other more site-specific data.

The Physical Properties section has data in chart form of water temperature, air-sea temperature differences, water salinity and water density in surface chart and vertical section form, and water color and transparency data.

The Ice data are presented for each month in chart form that shows the percent sea surface covered by ice (concentration). Variability data and maximum and minimum isolines are drawn on each monthly chart. Many freeze and breakup dates at specific sites are included along with other site-specific data.

The Wind-Sea-Swell Data section contains seasonal surface wind roses and state of sea (chart with isolines showing percent frequency of seas 5 ft and greater) data, seasonal swell charts, and an accumulated frequency distribution of height-period combinations and directional distribution of periods of surface waves for specific areas at different seasons, and station wave height data.

The Marine Geology section includes map subsections on geologic structure, ocean basins, coastal plains and continental platforms, continental shields, fold systems, bottom sediments, gravity, magnetism, bathymetry, and seismicity-tsunami-volcanoes.

The Marine Biology section contains fouling, marine algae and seagrass, marine mammals, and the deep scattering layer phenomena.

Available From: Defense Technical Information Center
Defense Mapping Agency
Cameron Station
Alexandria, VA 22314
(Stock No. AD-708-701)

Canada Department of Mines and Technical Surveys
Surveys and Mapping Branch
Ottawa, Ontario, Canada

Publication

Ice Atlas of Arctic Canada
Swithinbank, C.

Publication Date: 1960

Location: 324 stations in the Canadian Arctic, Greenland, and the Beaufort Sea

Period of Coverage: 1900-1959

Contents: This document contains sea ice-frequency-concentration data for the years between 1900 and 1959 that were recorded on ship logs and by aerial observers.

Concentration data are given in terms of percent sea surface covered by ice. It is broken down into four categories: (a) ice traversed without difficulty (10- to 50-percent concentration); (b) ice traversed with difficulty (51- to 80-percent concentration); (c) all but icebreakers brought to standstill (81- to 99-percent concentration); and (d) unnavigable (100-percent concentration).

Data are given between 1 March and 30 November (it is assumed frozen solid between December and February). Fast ice data are given for each month for April to August. Ice summaries are also given for the period between 1 March and 30 November.

Available From: Queen's Printer, Canada
Vanguard Building
Ottawa, Ontario, Canada
(Catalog No. DR3-1000)

Additional Information: This document was prepared for the Canada Defense Research Board.

PART VI: BEACH EROSION AND LITTORAL TRANSPORT

Coastal Engineering Research Center
US Army Engineer Waterways Experiment Station
PO Box 631
Vicksburg, MS 39180-0631
(601) 634-2012, FTS 542-2012

Publications

Catalog of Tidal Inlet Aerial Photography

Brawis, J. H., GITI2

Publication Date: June 1975

Location: Tidal inlets along the Atlantic, gulf, and Pacific coasts of the United States

Period of Coverage: 1938-1974

Contents: Data on approximately 6,000 aerial photographic coverages of tidal inlets are presented in tabular form, along with information on how any photograph may be obtained. Information is also given on sources of additional photography, and on obtaining photography of beach areas between any two inlets. Data include inlet names; geographic coordinates; navigational chart numbers covering the inlets; month and year of the photography; Federal, state, or commercial agencies holding the films; and pertinent exposure numbers and scales.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. A012 789)

Analysis of Coastal Sediment Transport Processes from Wrightsville Beach to Fort Fisher, North Carolina
Winton, T. C., et al., Misc. Rept. No. 81-6

Publication Date: June 1981

Location: North Carolina shoreline from Wrightsville to Fort Fisher

Period of Coverage: 1964-1975

Contents: This report describes a comprehensive engineering analysis of the coastal sediment transport processes along a 42-km segment of the North Carolina beach. Included in the analysis is an interpretation of the littoral processes, longshore transport, and behavior and success of beach nourishment projects at Wrightsville Beach and Carolina Beach.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. A103 168)

Beach Changes at Misquamicut Beach, Rhode Island, 1962-1973
Morton, R. W., et al., MP CERC-84-12

Publication Date: November 1984

Location: Misquamicut Beach, R. I.

Period of Coverage: 1962-1973

Contents: Beach profile data were collected at profile lines on Misquamicut Beach, 8.5 km from Watch Hill Point to Weekapaug Point, between November 1962 and June 1973. The data were examined for temporal and spatial patterns and variability along the beach face, as well as to identify and assess the forces which influence beach behavior. Appendices B-G are on file at CERC and available for loan.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650

or

US Army Engineer Waterways Experiment Station
ATTN: WESTP-R
PO Box 631
Vicksburg, MS 39180-0631
(601) 634-2571, FTS 542-2571

Coastal Engineering Research Center (Continued)

Shoreline Movements, Report 1, Cape Henry, Virginia, to Cape Hatteras, North Carolina, 1849-1980
Everts, C. H., Battley, J. P., Jr., and Gibson, P. N.
Technical Report CERC-83-1

Publication Date: July 1983

Location: US Atlantic coast from Cape Henry, Va., to Cape Hatteras, N. C.

Period of Coverage: 1849-1980

Contents: This report is one of a series of publications which documents the historical shoreline position of the US coast. Report 1 deals with position changes between about 1850 and 1980 along the ocean coastal reach from 12 km west of Cape Henry, Va., to 8 km west of Cape Hatteras, N. C. In places where the ocean shoreline is on an island or spit, shoreline changes in the sound or bay are also given. Shoreline movement maps at a scale of 1:24,000 constitute the basin data set. Composite reproductions of these maps are shrink-wrapped separately. In addition, ocean and sound shoreline changes coveraged for 1-min-latitude- (or longitude-) distance increments are provided.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650

or

US Army Engineer Waterways Experiment Station
ATTN: WESTP-R
PO Box 631
Vicksburg, MS 39180-0631
(601) 634-2571, FTS 542-2571

Beach Changes at Milford and Fairfield Beaches, Connecticut, 1962-1971
Morton, R. W., et al., MP CERC-83-5

Publication Date: December 1983

Location: Milford and Fairfield Beaches, Conn.

Period of Coverage: 1962-1971

Contents: Beach profile line data collected as part of the Beach Evaluation Program were examined for sites located at Milford and Fairfield, Conn. A total of seven profile lines were examined using standard measurements such as mean sea level intercept, above mean sea level volume, and linear wave refraction plots, as well as empirical eigenfunction analyses. All these methods showed erosion at all the lines at Milford, while Fairfield showed accretion at two out of the three lines. Profile data are included in appendices.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650

or

US Army Engineer Waterways Experiment Station
ATTN: WESTP-R
PO Box 631
Vicksburg, MS 39180-0631
(601) 634-2571, FTS 542-2571

Beach Changes at Long Beach Island, New Jersey, 1962-1973
Miller, M. C., et al., Misc. Report 80-9

Publication Date: October 1980

Location: Long Beach Island, N. J.

Period of Coverage: 1962-1973

Contents: Beach profile line data from 32 profile sites along Long Beach, N. J., were collected and presented in this report as part of the Beach Evaluation Program. The island has an east-southeast exposure of 32 km of sandy beach from Beach Haven Inlet to Barnegat Inlet. A total of 2,158 profile line surveys were examined, using empirical eigenfunction analysis and other measures of beach variability. Profile data can be useful in future evaluation on the littoral transport of the nearshore region.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. A101 844)

Beach and Inlet Changes at Ludlam Beach, New Jersey
Everts, C. H., et al., MR 80-3

Publication Date: May 1980

Location: Ludlam Beach (7.5 miles long), N. J.

Period of Coverage: 1962-1972

Contents: Repetitive surveys of the above mean sea level beach were made along 20 profile locations on Ludlam Beach, N. J. The surveys provided data on temporal and spatial beach volume changes and shoreline position. Appendix B presents the profile line locations; Appendix C graphically exhibits the changes in the position of the shoreline at mean sea level elevations. Sand volume changes are presented in Appendix C. Volume changes are referenced to the mean volume above mean sea level on each profile. Data are analyzed and discussed in terms of coastal processes and coastal engineering, i.e., littoral transports, beach fill, inlet behavior, etc.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. A087 796)

Beach Changes At Westhampton Beach, New York, 1962-1973
DeWall, A. E., MR 79-5

Publication Date: August 1979

Location: Westhampton Beach, N. Y.

Period of Coverage: 1962-1973

Contents: This report presents an analysis of beach profile changes at Westhampton Beach, documents the precise location of the surveyed profile lines, and describes the survey procedures used and accuracy obtained in repetitive surveys to wading depth. Profile changes are analyzed in three parts: (a) short-term changes, including storm-induced changes and other changes between surveys; (b) long-term changes, including seasonal and yearly changes; and (c) some effects of a groin field and beach fill constructed during the study period. The variables analyzed include the mean sea level shoreline position and the volume of sand stored on the beach above the mean sea level datum. Apparent trends in beach changes are correlated with observed wave conditions.

Volumetric change data to -6 m mean sea level obtained before, during, and after groin construction are also presented.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. A073 605)

Beach Erosion and Accretion at Virginia Beach, Virginia, and Vicinity
Goldsmith, V., et al., MR 77-12

Publication Date: December 1977

Location: Virginia Beach, Va.

Period of Coverage: September 1974 - December 1976

Contents: Eighteen profile lines from Fort Story south to the Virginia-North Carolina state line were surveyed monthly for 27 months. This publication presents the survey data along with analyzed results and discussions. It contains 9 appendices, 12 tables, and 23 figures. References for earlier data for the study area are also documented.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. A049 563)

Additional Information: Additional data on beach changes may be obtained from "Beach Changes at Virginia Beach, Virginia," by Harrison and Wagner, MP 6-64, published by CERC, Nov 1974.

Size Analysis of Sand Samples from Southern New Jersey Beaches
Ramsey M. D., and Galvin, C. J., Jr., MR 77-3

Publication Date: March 1977

Location: Southern New Jersey beaches: Island Beach, Long Beach Island, Brigantie, Atlantic City, and Ludlam Island

Period of Coverage: N/A

Contents: This publication presents beach sand data (788 sand samples) and results of analysis for the Atlantic coast of southern New Jersey. It provides site-specific engineering data for New Jersey beaches and suggestions to improve beach fills at these study areas.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. A040 082)

Beach Changes at Holden Beach, North Carolina, 1970-1974
Miller, M. C., MR 83-5

Publication Date: March 1983

Location: Holden Beach, N. C.

Period of Coverage: November 1970 - December 1974

Contents: Beach profile lines at 21 near-evenly spaced intervals along 7-mile-long Holden Beach, N. C., between Lockwoods Folly and Shallotte Inlets were measured. These have been analyzed to determine the spatial and temporal variabilities on long-term, seasonal, and short-term scales. Cited references contain additional sources of information for the study area.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. A127 986)

Beach Changes at Atlantic City, New Jersey, 1962-1973
McCann, D. P., MR 81-3

Publication Date: March 1981

Location: Atlantic City, N. J.

Period of Coverage: 1962-1973

Contents: Repetitive surveys of the above mean sea level beach were made along seven profile lines at Atlantic City, on the northeast end of Absecon Island, New Jersey. Major beach-fill projects were accomplished in 1963 and 1970 which introduced approximately 428,000 and 635,000 cu m of fill material, respectively, to the northernmost half of the study area; movements of this material are discussed. Seventeen storms were reasonably well documented during the study, and their effects are reported. This publication contains 6 appendices (including survey data), 5 tables, and 50 figures.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. A101 902)

Littoral Environment Observations and Beach Changes Along the Southeast Florida Coast

DeWall, A.E., TP 77-10

Publication Date: October 1977

Location: Southeastern coast of Florida

Period of Coverage: January 1969 - June 1973

Contents: This report presents an analysis along with data on beach changes at three beaches: Jupiter, Boca Raton, and Hollywood of the southeastern Florida coast. A total of 1,560 littoral environment observations (LEO) regarding winds, waves, and currents in the nearshore environment were collected for the period from January 1969 to June 1973. Annual summaries of the monthly averages of breaker height, period, and type; net and gross longshore current velocities; foreshore slope; and percent of occurrence and spacing of rips and cusps are presented in Appendix C. Other data included are Boca Raton's monthly wind roses and monthly breaker height roses, and changes in mean sea level position and sand volumes along profile lines at all three beach locations.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. A047 608)

Coastal Changes, Eastern Lake Michigan, 1970-1974
Birkemeir, W. A., MR 81-2

Publication Date: January 1981

Location: Eastern Lake Michigan, from Lakeside to Frankfort, Mich.

Period of Coverage: August 1970 - December 1974

Contents: Bluff recession and volumetric losses at 17 profile lines along the eastern shore of Lake Michigan were measured monthly from August 1970 to December 1974. This report discusses both the final period of study (October 1973 to December 1974) and the combined data collected during the entire study, with primary emphasis on measurements of bluff recession. Section III discusses the study area and the primary processes which affect beach changes; Section IV discusses previous research; Sections V and VI present an analysis of the beach profile and sediment data; and Section VII summarizes the results and presents recommendations for future research. Beach and bluff changes, which were computed for the final period of study only, are discussed in Appendix A. Representative ground photos plus documentation of each benchmark location and a short discussion of each profile line are given in Appendix B.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. A097 985)

Additional Information: Two previous CERC reports: TP 76-16 by R. A. Davis, Jr. (NTIS Accession No. A033 297), and MP-75 by R. A. Davis, Jr., et al. (NTIS Accession No. A018 891), discuss the results of the study program up to July 1973.

Prediction of Shore Retreat and Nearshore Profile Adjustments to Rising Water Levels on the Great Lakes
Hands, E. B., TP 80-7

Publication Date: October 1980

Location: Little Sable Point, Mich.

Period of Coverage: 1967-1976

Contents: Although the main themes of this report are to demonstrate the increased shore retreat as the visible expression of massive adjustments of the nearshore area and to provide a rational approach for estimating the response of sandy shore areas of the Great Lakes to the water level changes, the data monitored between 1967 and 1976 along a 50-km stretch of shore centered on Little Sable Point, Mich., may be valuable to future engineering applications. Data presented in the appendices include shore and nearshore profiles of the study area and volumes of the profile changes along with narrative discussion of the study results in the main text.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650
(NTIS Accession No. A098 531)

Additional Information: Additional reports by the same author on Lake Michigan shoreline published by Coastal Engineering Research Center are:

"Observation of Barred Coastal Profiles Under the Influence of Rising Water Levels, Eastern Lake Michigan, 1967-1971," TR 76-1, Jan 1976 (NTIS Accession No. A023 191).

"Changes in Rates of Shore Retreat, Lake Michigan, 1967-1976," TP 79-4, Dec 1979 (NTIS Accession No. A081 863).

Texas A&M University
Coastal and Ocean Engineering Division
Civil Engineering Department
College Station, TX 77843

Publications

Investigation of Shoreline Changes at Sargent Beach, Texas
Seelig, W. N., and Sorenson, R. M.

Publication Date: September 1973

Location: 47 miles of coast between San Luis Pass and Brown Cedar Cut of Texas

Period of Coverage: Historical topographic maps - 1850 to 1966
Other data set - 1930 to 1973

Contents: This report outlines and documents historical coastal changes which have occurred at Sargent Beach from 1850 to 1973. Appendices include computed rates of erosion changes in mean sea level intercept positive; changes in beach volumes and littoral transport rates; sources of shoreline information, wave information, and predicted sediment load of the Brazos River.

Available From: Texas A&M University
Department of Marine Resources Information
Center for Marine Resources
College Station, TX 77843

Historical Shoreline Changes in Texas
Seelig, W. N., and Sorensen, R. M., TAMU-59-73-206

Publication Date: April 1973

Location: Texas coastline

Period of Coverage: 1850-1972, varies from location to location

Contents: This report documents the net changes in mean low water position at 226 points on the Texas coast using both historical and recent topographic data.

Available From: Texas A&M University
Department of Marine Resources Information
Center for Marine Resources
College Station, TX 77843

US Geological Survey
US Department of the Interior
507 National Center
12201 Sunrise Valley Drive
Reston, VA 22092

Publication

Water Resources Data

Publication Interval: Yearly

Location: The 50 states

Period of Coverage: Varies

Contents: For the water year and state or states of interest, this publication consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells.

The stream discharge data include location of the measuring site, the drainage area in square miles, the period of record, information on the measuring gages, the discharge in cubic feet for each day of the year, and some mean and extreme discharge data.

The lake level data include location, drainage area, period of record, gage information, mean and extreme data, and the lake level contents and change in contents for each month.

The water quality stations report stream flow, weather conditions, conductance, pH, water temperature, turbidity, and dissolved mineral contents. The date and time of observations are included with the data.

Sediment data include concentration of particles, load carried in tons per day, water temperature, and information on the size of the particles (percent finer than a given sieve size). These data can be useful to sediment budget analysis for littoral transport study. That is why reports are grouped in this part, "Beach Erosion and Littoral Transport."

Available From: These reports carry an identification number consisting of the two-letter state abbreviation, the last two digits of the water year, and the volume number. For example, MT-78-1 is the first volume of the 1978 Montana Water Resources Data publication.

These reports are not in the same format as later reports but consist of the same general contents. All of these water data reports can be purchased from:

National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650

Additional Information: Records of discharge or stage of streams, and contents or stage of lakes and reservoirs were first published in a series of US Geological Survey water-supply papers entitled "Surface Water Supply of the United States." Through 30 September 1960, these water-supply papers were in an annual series and then in a 5-year series for 1961-65 and 1966-70. Records of chemical quality, water temperatures, and suspended sediments were published from 1941 to 1970 in an annual series of water-supply papers entitled "Quality of Surface Waters of the United States." Records of ground-water levels were published from 1935 to 1974 in a series of water-supply papers entitled "Ground-Water Levels in the United States." Water-supply papers may be consulted in the libraries of the principal cities of the United States or may be purchased from the Branch of Distribution, US Geological Survey, 1200 South Eads St., Arlington, VA 22202.

For information on the water program in each individual state, write to:

District Chief, Water Resources Division
US Geological Survey
(District addresses are given in Appendix C)

Hawaii Institute of Geophysics
University of Hawaii
2525 Correa Road
Honolulu, HA 96822

Publication

Erosion and Accretion of Selected Hawaii Beaches, 1962-1972
Campbell, J. H., HIG-72-02

Publication Date: November 1972

Location: 60 beaches from Kauai, Oahu, Molokai, Maui, and Hawaiian Islands

Period of Coverage: 1962-1972

Contents: Sixty Hawaii beaches were surveyed in 1972 as part of the University of Hawaii Sea Grant Program. The measured volumes and beach width are presented in tables. Surveillance on Kauai, Molokai, and Maui was conducted in winter and in summer; on some Oahu beaches it was monthly, and on others quarterly. This report summarizes the 1972 work and compares it directly with the earlier measurements.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650

Additional Information: Data such as locations of cemented metal range-markers, sand samples, fathometer profiles, and surveying data are stored at Hawaii Institute of Geophysics and are available upon request. Additional sources of information on Hawaii beaches are provided as cited references of this report.

Bayfield Laboratory for Marine Science
and Surveys
Ocean Science and Surveys
Department of Fisheries and Oceans
PO Box 5050
Burlington, Ontario L7R 4A6 Canada

Publication

Great Lake Erosion Monitoring Programme
Boyd, G. L., Final Report

Publication Date: December 1981

Location: 162 sites on the Canadian shoreline of the Great Lakes ranging from the Georgian Bay to Lake Ontario

Period of Coverage: 1973-1980

Contents: This report documents the results of a joint study conducted by the Government of Canada and the Province of Ontario to monitor and assess erosion on the Great Lakes shoreline. Data for each lake region include a location map of water level gages, erosion stations and reaches, a map illustrating the available littoral drift from bluff erosion, monthly mean water levels, top of bluff recession rates, bluff volumetric erosion rates, representative erosion rates (site, base period, annual recession, annual volume loss, bluff height, volume height), a breakdown of type and location of shore protection structures presented, and photos and profiles of representative bluff types.

Data for each of the 162 erosion stations include station identification code numbers, geographic coordinates, profile line orientation, net water's edge charge (meters per year), net volume change (cubic meters per year), and net zone intercept change. Each station represents a profile line surveyed on an annual basis. Data for bluff reaches and for vegetation inventory are also included in the report.

Available From: Bayfield Laboratory for Marine Science
and Surveys
Ocean Science and Surveys
Department of Fisheries and Oceans
PO Box 5050
Burlington, Ontario L7R 4A6 Canada

or on loan from

US Army Engineer Waterways Experiment Station
Technical Information Center - Library Branch
PO Box 631
Vicksburg, MS 39180-0631
(601) 634-2542, FTS 542-2542

Bayfield Laboratory for Marine Science
and Surveys (Continued)

Additional Information: Bound separately are three appendices containing a master plan, log data sheet, and profile plots for all measurement stations for Lakes Huron, Erie, and Ontario.

US Army Corps of Engineers
Washington, DC 20314

Publications

Report on the National Shoreline Study
Shore Protection Guidelines
Shore Management Guidelines
Regional Inventory Reports

Publication Date: August 1971

Location: US coastline including Puerto Rico and Virgin Islands

Period of Coverage: N/A

Contents: In 1968, the 90th Congress authorized a national appraisal of shore erosion and shore protection needs. This National Shoreline Study and the existing Federal shore protection programs recognize beach and shore erosion as problems for all levels of government and all citizens. To satisfy the purposes of the authorizing legislation, 12 related reports have been published.

Regional Inventory Reports (one for each of the nine major drainage areas) assess the nature and extent of erosion; develop conceptual plans for needed shore protection; develop general order-of-magnitude estimates of cost for the selected shore protection; and identify shore owners.

Shore Protection Guidelines describe typical erosion control measures and present examples of shore protection facilities, and present criteria for planning shore protection programs.

Shore Management Guidelines provide information to assist decision-makers to develop and implement shore management programs.

Report on the National Shoreline Study, addressed to the Congress, summarizes the findings of the study and recommends priorities among serious problem areas for action to stop erosion.

These reports can be useful in the planning and design of coastal protection structures.

Available From: National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650

PART VII: TOPOGRAPHY, HYDROGRAPHY, AND BATHYMETRY

National Geophysical Data Center
Environmental Satellite, Data, and
Information Service
National Oceanic and Atmospheric
Administration
325 Broadway
Boulder, CO 80303
(303) 497-6215, FTS 320-6215

Publication

Summary of Digital Marine Geophysical Data Holdings (Bathymetric, Magnetic, and Gravimetric Data)
Hittelman, A. M., et al., KGRD No. 11

Publication Date: September 1978

Location: Worldwide

Period of Coverage: 1953-1976

Contents: This publication contains a summary of information on the digital marine geophysical data holdings of the National Geophysical Data Center (the file contains over 3.5 million bathymetric observations, 2.7 million magnetic observations, and 1.3 million gravimetric observations). The general description of the bathymetric, magnetic, and gravimetric data includes discussions on exchange formats, data sources, assimilation procedures, and geographic distribution. Data summaries are presented as trackline plots, a geographical listing (by 10-deg squares), and by institutional listing. Complementary data files, such as US coastal bathymetry, analog marine geophysical data (i.e., seismics), site survey data of the Outer Continental Shelf, and marine geological data, are reviewed briefly.

Available From: National Geophysical Data Center
Environmental Satellite, Data, and
Information Service
National Oceanic and Atmospheric
Administration
325 Broadway
Boulder, CO 80303
(303) 497-6215, FTS 320-6215

Additional Information: This catalog supersedes KGRD (Key to Geophysical Records Documentation) No. 4, Marine Geophysical Data Catalog - 1975.

Kinds of Data

Gridded Bathymetric Data Base for the Coastal United States

Location: Atlantic coast, gulf coast, Pacific coast, Great Lakes, Alaska, and Hawaii

Description of Data: The National Geophysical Data Center (NGDC), in cooperation with the US Geological Survey, has compiled this gridded bathymetric data base for the coastal United States. The entire data were obtained by the National Ocean Survey as part of the program to automate nautical charts.

This data base comprised 3.4 million records. The grid is based on a latitude and longitude mesh which defines a 15-sec grid cell. Each file contains one square degree of area, and each data record contains north latitude, west longitude, average depth, maximum depth, minimum depth, standard deviations, and number of observations.

Response Format: The data are available on magnetic tapes. The user specifies the latitude and longitude limits of the desired data area and the required tape characteristics. The usual tape characteristics are 9-track ASC11 coding 1600-BPI and blocked at 7,680 characters per block.

Qualified Users: No limitations

Point of Contact: National Geophysical Data Center, Code 64
325 Broadway
Boulder, CO 80303
(303) 497-6338, FTS 320-6338

Gridded Depths for the North Pacific

Location: Northern Pacific Ocean

Description of Data: This is a digital bathymetric data base for the north Pacific Ocean compiled by the US Naval Ocean Research and Development Activities. The data consist of minimum, maximum, and average depths for 30- by 30-nautical-mile-square areas. The file comprises 29,250 records.

The coordinates of position are keyed to the southwest corner of the 30-nautical-mile-square grid in which the data are located. "The Bathymetric Atlas of the North Pacific," Naval Oceanographic Office Publication 1301-2-3 (1971) constitutes the data base from which the gridded file was derived. Survey control, which is highly variable, may be determined by reference to the atlas.

Response Format: Available on magnetic tape

Qualified Users: No limitations

Point of Contact:
National Geophysical Data Center
Environmental Satellite, Data, and Information Service
National Oceanic and Atmospheric Administration
325 Broadway
Boulder, CO 80303
(303) 497-6215, FTS 320-6215

Global Gridded Bathymetric Data: Synthetic Bathymetric Profiling System (SYNBAPS-II)

Location: All ocean areas except the Artic Ocean

Description of Data: The gridded data base was compiled by the Naval Ocean Research and Development Activity (NORDA) and the Naval Oceanographic Office. It was interpolated with digitization of bathymetric maps available up to 1981. This enlarged global data base is called SYNBAPS-II and contains some 7.8 million depth values on 5-min by 5-min latitude/longitude grids.

Response Format:
(a) Documentation: two manuals on microfiche or paper copy.
(b) SYNBAPS 5-min by 5-min gridded depth data on 9-track magnetic tape.
(c) Synthetic Bathymetric Profile System, software (CDC FORTRAN) and user's manual on 9-track ASCII magnetic tape.

Qualified Users: No limitations

Point of Contact:
National Geophysical Data Center
Environmental Satellite, Data, and Information Service
National Oceanic and Atmospheric Administration
325 Broadway
Boulder, CO 80303
(303) 497-6215, FTS 320-6215

Technical inquiry should be directed to:

Dr. Peter W. Sloss
NOAA/NGDC Code E/GC 3
325 Broadway
Boulder, CO 80303
(303) 497-6119, FTS 320-6119

Additional Information: NGDC has topographic data files for 1-deg size area; S10 global topography, R and/S10 global topography, DMA 1-deg topography, and DMA 1-deg geoidal heights. Contact NGDC for more information about these files.

National Ocean Service
National Oceanic and Atmospheric
Administration
US Department of Commerce
6001 Executive Blvd.
Rockville, MD 20852
(202) 426-9076, FTS 443-8060

Kind of Data

Nautical Charts, Bathymetric Maps, and Special Purpose Charts

Location: Atlantic and gulf coasts including Puerto Rico and Virgin Islands; Pacific coast including Hawaii, Guam, and Samoa Islands; Alaska including Aleutian Islands; and Great Lakes and adjacent waterways

Description of Data: National Ocean Service (NOS) nautical charts are very useful in the planning, design, and analysis of coastal engineering projects. All charts contain bathymetric data, tidal and/or water level information, and information important to navigation such as submarine cables and pipelines, dredging disposal areas, and dump sites. NOS periodically revises and updates the charts.

The scale of the charts ranges from 1:2,500 to about 1:5,000,000, depending on the type. Harbor charts usually have scales larger than 1:50,000. Coast charts have scales from 1:50,000 to 1:150,000, general charts from 1:150,000 to 1:600,000, and sailing charts have scales smaller than 1:600,000.

Bathymetric maps which present the detailed depth contours are prepared by NOS specifically for scientific, engineering, marine geophysical, and marine environmental studies. The scales of bathymetric maps range from 1:50,000 to 1:1,000,000.

Topographic/bathymetric maps show both the NOS bathymetry and the US Geological Survey (USGS) land topographic information. These maps are cooperatively produced by NOS and USGS to support the Coastal Zone Management and Energy Impact Program and the offshore oil and gas program.

Shoreline movement maps, which show the historical shoreline positions, include Part 1, Cape Henry, Va., to Cape Hatteras, N. C.; Part 2, Cape Henopen, Del., to Cape Charles, Va.; and Part 3, Imperial Beach-San Pedro, Calif. All maps have a scale of 1:24,000.

Other special maps include Florida coastal zone maps, geophysical maps, marine boundary charts, storm evacuation maps, etc. Free catalogs are provided by NOS for additional information.

National Ocean Service (Continued)

Point of Contact:

Distribution Division, OA/C44
National Ocean Service
Riverdale, MD 20737
(301) 436-6990, FTS 436-6990

or additional NOS offices at:

Atlantic Marine Center
439 West York Street
Norfolk, VA 23510
(804) 441-6616

Pacific Marine Center
1801 Fairview Avenue East
Seattle, WA 98102
(206) 442-7657

Chart Sales & Geodetic Control
Federal Building & US Coast House
701 C St., Box 38
Anchorage, AK 99513
(907) 271-5040

National Ocean Service (Continued)

Publications

Nautical Chart Catalog 1, Atlantic and Gulf Coast, Including Puerto Rico and the Virgin Islands
Nautical Chart Catalog 2, Pacific Coast, Including Hawaii, Guam and Samoa Islands
Nautical Chart Catalog 4, Great Lakes and Adjacent Waterways - Great Lakes Connecting Channels, Minnesota - Ontario Border Lakes, Lake Winnebago, Inland Route - Michigan, New York Canals, Lake Champlain
Map and Chart Catalog 5, United States, Bathymetric Maps and Special Purpose Charts

Publication Dates: NOS updates the catalogs periodically

Location: See information under Publications

Contents: Each catalog contains location maps, chart number, title, and scale for each chart; and general information about the nautical charts; a related publication list; NOS authorized sales agents (except catalogs); and name, address and phone number of other agencies issuing maps and charts (except catalog 5).

Available From: (Free upon request)

Distribution Division, N/CG33
National Ocean Service
Riverdale, MD 20737
(301) 436-6990, FTS 436-6990

or additional NOS offices at:

Atlantic Marine Center
4390 West York Street
Norfolk, VA 23510
(804) 441-6616

Pacific Marine Center
1801 Fairview Avenue East
Seattle, WA 98102
(206) 442-7657

Chart Sales & Geodetic Control
Federal Building & US Court House
701 C St., Box 38
Anchorage, AK 99513
(907) 271-5040

National Ocean Service (Continued)

Dates of Latest Editions, Nautical Charts, and Miscellaneous Maps

Publication Interval: Issued quarterly

Period of Coverage: N/A

Contents: For nautical charts, this publication lists chart number, scale, price, edition number, edition date, and latest revised date. For other NOS publications, maps, charts, and tables, this publication lists price and date.

Available From: (Free upon request)

Distribution Division, N/CG33
National Ocean Service
Riverdale, MD 20737
(301) 436-6990, FTS 436-6990

or additional NOS offices at:

Atlantic Marine Center
439 West York Street
Norfolk, VA 23510
(804) 441-6616

Pacific Marine Center
1801 Fairview Avenue East
Seattle, WA 98102
(206) 442-7657

Chart Sales & Geodetic Control
Federal Building & US Court House
701 C St., Box 38
Anchorage, AK 99513
(907) 271-5040

United States Coast Pilots

Publication Interval: Annual

Location: US coastal and intracoastal waters and waters of the Great Lakes

Period of Coverage: N/A

Contents: The NOS Coast Pilots are a series of nine nautical books that cover a wide variety of important information to navigators. They provide narrative descriptions as supplements to the usage of the standard nautical charts published by the NOS. The books contain local marine navigational and regulation data such as buoy positions, water depths, current variations, and sandbar or rocky reef locations. The nine-volume set is broken up geographically as follows:

- Volume One - Eastport, Maine, to Cape Cod, Mass.
- Volume Two - Cape Cod, Mass., to Sandy Hook, N. J.
- Volume Three - Sandy Hook, N. J., to Cape Henry, Va.
- Volume Four - Cape Henry, Va., to Key West, Fla.
- Volume Five - The Gulf of Mexico, Puerto Rico, and the Virgin Islands
- Volume Six - The Great Lakes
- Volume Seven - California, Oregon, Washington, Hawaii, and the Midway Islands
- Volume Eight - Dixon Entrance, Ala., to Cape Spencer, Ala.
- Volume Nine - Cape Spencer, Ala., to Beaufort Sea, Ala.

Available From: NOS offices at:

Atlantic Marine Center
439 West York Street
Norfolk, VA 23510
(804) 441-6616

Pacific Marine Center
1801 Fairview Avenue East
Seattle, WA 98102
(206) 442-7657

Chart Sales & Geodetic Control
Federal Building & US Court House
701 C St., Box 38
Anchorage, AK 99513
(907) 271-5040

or NOS sales agents.

National Ocean Service (Continued)

Publication

Tidal Bench Marks

Publication Date: N/A

Location: At each NOS tide station along the US coast

Period of Coverage: N/A

Contents: A system of benchmarkers has been established by NOS at each tide station to provide permanent points for the observed height of the tide and tidal datum planes determined therefrom. This publication provides descriptions and elevations of these benchmarks. Request for such benchmark data should specify the coastal locality for which the information is desired.

Available From:

Tide Datum Section
National Ocean Service
National Oceanic and Atmospheric Administration
US Department of Commerce
6001 Executive Blvd.
Rockville, MD 20852
FTS 443-8867

National Cartographic Information Center
US Geological Survey
507 National Center
Reston, VA 22092
(703) 860-6045, FTS 928-6045

Publications

Map Data Catalog, National Mapping Program

Publication Date: 1981

Period of Coverage: N/A

Contents: The catalog tells how to order a wide range of mapping products that may answer special engineering needs. The mapping products are catalogued by publication and include advance prints, color separates, feature separates, out-of-print maps, maps on microfilms, land-use and land-cover and associated maps, slope maps, orthophotoquad digital terrain tapes (map data in digital form), aerial and space imagery, and geodetric control data.

For each product, the catalog describes and illustrates the product offered, explains the scope of geographic coverage available, lists typical uses of the product, and explains how to order the product.

Available From:

Superintendent of Documents
US Government Printing Office
Washington, DC 20402
(202) 275-2091, FTS 275-2051

Additional information may be obtained from:

National Headquarters
National Cartographic Information Center
US Geological Survey
507 National Center
Reston, VA 22092
(703) 860-6045, FTS 928-6048

Western Mapping Center
National Cartographic Information Center
US Geological Survey
345 Middlefield Road
Menlo Park, CA 94025
(415) 323-8111, ext. 2427; FTS 267-2427

National Cartographic Information Center (Continued)

Rocky Mountain Mapping Center
National Cartographic Information Center
US Geological Survey
Box 25046, Stop 504 - Federal Center
Denver, CO 80225
(303) 234-2326, FTS 234-2326

Mid-Continent Mapping Center
National Cartographic Information Center
US Geological Survey
1400 Independence Road
Rolla, MO 65401
(314) 341-0851, FTS 277-0851

Eastern Mapping Center
National Cartographic Information Center
US Geological Survey
536 National Center
Reston, VA 22092
(703) 860-6336, FTS 928-6336

Maps for America
Thompson, M. M.

Publication Date: 1979

Location: The 50 states and selected territories

Period of Coverage: 1879-1979

Contents: This 265-page guide is a centennial volume and celebrates 100 years of existence of the USGS.

This single volume contains a complete description of the cartographic products of the USGS and other agencies. This book contains many samples of the types of products available and also a number of other useful items (such as the addresses of all map-producing agencies and a table of map products and sources). It is designed to help the engineer know what type of information he is looking for and where he may find the information.

It is well prepared and a good choice for any engineer's ready-reference bookshelf.

Available From: Superintendent of Documents
US Government Printing Office
Washington, DC 20402
(202) 783-3238
(GPO Stock No. 024-001-03145-1)

Kind of Data

Topographic and Other Maps

Location: The standard topographic map series covers the United States, Puerto Rico, Guam, American Samoa, and the Virgin Islands. Information concerning the coverage of special maps can be obtained from the National Cartographic Information Center (NCIC) or the index map of each individual state published by the USGS.

Dates: All the maps are periodically revised and/or field checked by the USGS.

Description of Data: Under its National Mapping Program, the USGS has produced multipurpose published maps and basic map data for a variety of cartographic data needs (see information given under Map Data Catalog, National Mapping Program). The published maps include a series of topographic maps, orthophotoquads, orthophotomaps, state maps, county maps, special maps, US maps, national park maps, and selected national atlas maps.

The unit of survey for the standard topographic map is a quadrangle bounded by parallels of latitude and meridians of longitude. Quadrangles covering 7-1/2 min of latitude and longitude are published at the scale of 1:24,000 (1 in. = 2,000 ft). Quadrangles covering 15 min of latitude and longitude are published at the scale of 1:62,500 (1 in. = approximately 1 mile). The maps graphically present the natural and man-made features of the land surface, and the shape and elevation of the terrain are portrayed by contour lines.

The standard orthophotoquad consists of an orthophotograph (a nearly distortion-free black and white rectified aerial photograph) or mosaic of orthophotographs in 7-1/2-min quadrangles. Orthophotoquads are useful as up-to-date companions to standard topographic maps or as interim maps for areas not previously mapped. Orthophotomaps are full-color versions of the topographic maps based on orthographs.

The standard topographic maps are very useful to engineers. Information concerning other published maps can be obtained from the NCIC at the following address:

National Cartographic Information Center
US Geological Survey
507 National Center
Reston, VA 22092
(703) 860-6045, FTS 928-6045

Ordering Information: A map should be ordered by name, series, and state in which it is located. It is noted that each quadrangle is designated by the name of a city, town, or prominent natural feature.

Maps of areas east of the Mississippi River, including Minnesota, Puerto Rico, the Virgin Islands, and Antarctica can be ordered at:

Eastern Distribution Branch
US Geological Survey
1200 South East Street
Arlington, VA 22202

Maps of areas west of the Mississippi River including Alaska, Hawaii, Louisiana, American Samoa, and Guam can be ordered at

Western Distribution Branch
US Geological Survey
Box 25286 Federal Center
Denver, CO 80225

Additional Information:

An index map of each state or states may be obtained free of charge at the above addresses.

The NCIC, established by the USGS in 1974, provides a national information service to make cartographic data of the United States more easily accessible to the public and to various Federal, state, and local agencies. At present, more than 30 Federal agencies collect and prepare cartographic data. These data include more than 1.5 million maps and charts, 25 million aerial and space photographs, records on 1.5 million geodetic control points, and a growing collection of map data in computer-compatible form.

NCIC uses the latest techniques of microphotography and computer technology to manage the vast amount of information and to provide a focal point for information on data produced and distributed by many Federal sources. NCIC also provides information on some Federal plans for future data collection.

NCIC does not obtain the cartographic data from present holders; rather it collects and organizes descriptive information about the data, tells where they are located, ensures their availability, and provides ordering assistance. Government and private data centers continue to hold and distribute cartographic data. Some of these centers also provide local users

with direct access to NCIC information through their public service facilities; thus, many government and private organizations are cooperating with the USGS in forming a network of NCIC facilities.

The USGS and the National Oceanic and Atmospheric Administration are the principal affiliates in the network.

NCIC provides different levels of service for the various types of cartographic data. For general-purpose data-topographic maps and aerial photographs, the objective is to provide complete service, including the identification of specific products and assistance in ordering these products. On the other hand, only general information and referral service are provided for special-purpose cartographic data. The types of cartographic data for which NCIC offers assistance are listed below:

Multiuse maps and charts including:

- Aeronautical charts
- Bathymetric maps
- City maps
- Extraterrestrial maps
- Floodplain maps
- Forest maps
- Geologic maps
- Highway maps
- Land-use maps
- Map and chart feature separates
- Nautical charts
- Orthophotomaps and orthophotoquads
- River surveys and damsite maps
- Slope maps
- Soil maps
- Topographic maps
- US maps
- World maps

Survey data including:

- First- and second-order control from any source
- Third-order control from any source that is useful
- Selected fourth-order control
- Photogrammetrically derived control
- Selected private control
- Land plats
- Census subdivisions

National Cartographic Information Center (Continued)

Aerial and space imagery from Federal, state, and private sources including:

Photographs
Satellite computer-compatible tapes
Photomosaics
Other remote-sensor data

Closely related data such as:

Cartographic educational materials, atlases, gazetteers, and other related literature
Digital data representing detail on maps and charts
Geographic names

Point of Contact: NCIC at

Eastern Distribution Branch
US Geological Survey
1200 South East Street
Arlington, VA 22202

Western Distribution Branch
US Geological Survey
Box 25286 Federal Center
Denver, CO 80225

Defense Mapping Agency
Office of Distribution Service
Washington, DC 20315
(202) 227-2495, FTS 227-2495

Publication

Defense Mapping Agency Catalog of Maps, Charts, and Related Products

Publication Date: Varies with individual volume

Location: Worldwide

Period of Coverage: N/A

Contents: This catalog provides a comprehensive reference of all Defense Mapping Agency (DMA) maps, charts, and related products available to the Department of Defense (DOD) users. Most products are available for non-DOD users or civil users. The catalog contains four parts. Parts 2 and 3, which list hydrographic products and topographic products, respectively, are useful for coastal engineering reference.

There are 12 volumes in Part 2 and 6 volumes in Part 3:

Part 2 - Hydrographic Products, currently published as:

- Volume I - United States and Canada (REGION 1)
- Volume II - Central and South America and Antarctica (REGION 2)
- Volume III - Western Europe, Iceland, Greenland, and the Arctic (REGION 3)
- Volume IV - Scandinavia, Baltic, and USSR (REGION 4)
- Volume V - Western Africa and the Mediterranean (REGION 5)
- Volume VI - Indian Ocean (REGION 6)
- Volume VII - Australia, Indonesia, and New Zealand (REGION 7)
- Volume VIII - Oceania (REGION 8)
- Volume IX - East Asia (REGION 9)
- Volume X - Miscellaneous and Special Purpose Navigational Charts, Sheets, and Tables (PUB1NA)
- Volume XI - (SECRET) Catalog of Classified Nautical Charts and Publications (PUB1NS) (U)
- Volume XII - Allowance Requirements for Nautical Charts and Publications (PUB1NP) (DL)

Part 3 - Topographic Products, currently published as:

- Volume I - World--Small and Median Scale Maps
- Volume II - Europe, Africa, and Middle East--Large Scale and City Maps
- Volume III - Asia Mainland--Large Scale and City Maps

Defense Mapping Agency (Continued)

Volume IV - Australia and Islands of the Pacific--Large Scale and City Maps
Volume V - Western Hemisphere--Large Scale and City Maps
Volume VI - (SECRET)-Classified Topographic Maps and Related Products (U)--All Scales

A complete list of sale agents (both inside and outside the United States) is provided in each volume of the catalog.

Available From: DMA Office of Distribution Services
ATTN: DOA
Washington, DC 20315

or sales agents.

Special Libraries Association
235 Park Avenue South
New York, NY 10003
(212) 477-9250

Publication

Map Collections in the United States and Canada

Publication Date: 1970, 2nd edition

Location: The 50 states, Canada, District of Columbia, Panama Canal Zone, Puerto Rico, and Virgin Islands

Period of Coverage: Statistics were taken in October-December, 1968

Contents: This guide lists 605 different map collections in the United States and Canada. The guide is arranged in alphabetical order by states, then by town or organization.

The collecting agency's phone number, map collection size, annual map accesion rate, areas of specialization, subject of specialization, reproduction facilities, and people that it serves are all included for each collection. It also tells if a library loan is available.

Most organizations are libraries, universities, and geological agencies. This guide can be a very useful reference tool.

Available From: This document may be in your local library's reference section. If not, contact:

Special Libraries Association
235 Park Avenue South
New York, NY 10003
(212) 477-9250

PART VIII: GEOLOGY AND GEOMORPHOLOGY

National Geophysical Data Center
National Environmental Satellite, Data,
and Information Service
National Oceanic and Atmospheric
Administration
Code E/GC3
325 Broadway
Boulder, CO 80303
(303) 497-6338, FTS 320-6338

Kinds of Data

Marine Geology and Geophysical Data Set

Location: Outer Continental Shelf of the United States, includes Atlantic coast, Pacific coast, Gulf of Mexico, and Alaska

Description of Data: The Marine Geology and Geophysical Data Set contains more than 60 sets of data files provided by the US Geological Survey (USGS), the Bureau of Land Management (BLM), and other agencies for public dissemination. The majority of the collected data can be characterized by two categories: seismic reflection data, gathered by the USGS to identify potentially hazardous geologic structures or other constraints to offshore oil and gas exploration; and well logs and auxiliary information obtained from privately drilled test wells.

The content of each data file varies; however, the geophysical data files usually contain subbottom profiles, sparker recordings, sidescan sonar records, and supporting technical reports and interpretative maps. Well log data contain core analysis reports and information on physical formation.

Response Format: Most of the data are on microfilm (35-mm), while most of the technical reports are on microfiche. Maps are available in either sepia or blackline forms. The cost of the data varies from hundreds of dollars to thousands of dollars. Users are urged to send inquiries to the National Geophysical Data Center (NGDC) for specific site information and Data Announcements associated with the particular data file.

Point of Contact: National Geophysical Data Center
National Environmental Satellite, Data,
and Information Service
National Oceanic and Atmospheric
Administration
Code E/GC3
325 Broadway
Boulder, CO 80303
(303) 497-6338, FTS 320-6338

Index to Marine Geological Samples or the Core Curators' File

Location: Worldwide

Description of Data: This data file is designed to provide an inventory of marine geological samples archived by major US oceanographic institutions and government agencies. The Core Curators' Data Base contains the information on curating facility, ship, cruise sample number, geographic position, water depth, type of sample device, sample dimensions, method of storage, basin lithology, age, and comments. Each data listing is accompanied by a complete list of contacts at various sample repositions (including name, address, and phone number).

NGDC can supply analytical data of the portion of the samples listed in the data file. However, only a few of the analyses for which NGDC archives data are grain size, engineering properties, geochemistry, paleontology, and detailed sediment description.

Response Format: The standard format for data listing or inventory information is a computer printout. However, listings on magnetic tape or 35-mm microfilm are available upon request.

Cost Information: Searches/data listing from the file cost an average of $25. Data are available at cost of reproduction.

Point of Contact:
National Geophysical Data Center
National Environmental Satellite, Data, and Information Service
National Oceanic and Atmospheric Administration
Code E/GC3
325 Broadway
Boulder, CO 80303
(303) 497-6338, FTS 320-6338

National Cartographic Information Center
US Geological Survey
Department of the Interior
MS 507, National Center
12201 Sunrise Valley Drive
Reston, VA 22092
(703) 860-6045, FTS 928-6045

Kind of Data

Geologic Maps

Location: The 50 states and selected territories

Dates: All of the maps are periodically revised and/or field checked by the USGS.

Description of Data: Geologic maps show the distribution of rocks and surficial material by age, and their physical and structural relations with one another. Inferences can be drawn from these maps about an area's geologic history, geologic processes, orientation of rock layers, faults, fractures, and shape of rock bodies beneath the surface.

Geologic maps published by the USGS range in scale from 1:20,000 to 1:2,500,000 depending on the type of information to be portrayed and the purpose of the mapping (see table on next page).

Geologic maps at 1:250,000 or larger scales are available for nearly 50 percent of the United States. Most of the maps are contained in the Geologic Quadrangle Maps series. These maps cover an individual 7-1/2- (scale 1:24,000) or 15- (scale 1:62,500) min quadrangle. Geologic or sections of individual quadrangles are published in other series and make up a smaller fraction of all geologic maps of the United States. The maps may be supplemented by structure sections, columnar sections, and other graphic means of presenting geologic data, plus a brief explanatory text. There are well over 1,500 geologic quadrangle maps now available in the United States.

There is also a wide range of special geologic maps for specific purposes. For example, maps are prepared, generally at a scale of 1:7,500,000, that are useful for understanding environmental problems and for making decisions on land use and mineral and energy resource development on a national scale. The following maps of the National Environmental Overview Program have been completed in preliminary form:

(a) Map showing areas of Karst topography and related terrains.
(b) Map showing areas subject to volcanic hazards.
(c) Map showing possible areas of landslides.
(d) Map showing present and proposed nuclear reactor sites.
(e) Map showing streams with flow rates of 300 ft^3/sec or more.
(f) Map showing surficial clay, sand, silt, and gravel deposits.

National Cartographic Information Center (Continued)

Map Scale	Type of Information	Purpose
1:2,500,000	Very general distribution of limited number of very large and heterogeneous rock units.	General planning and resource evaluation over very large regions (Federal regions, very large states).
1:500,000	General distribution of a larger number of somewhat heterogeneous rock units. Little information on depth.	General planning and resource evaluation over large regions (large states, river basins). Common scale for older state maps.
1:250,000	Semidetailed distribution of large numbers of fairly homogeneous rock units. Some information on depth. Often has topographic base.	More detailed planning and resource evaluation in medium-sized areas (small states, large counties, national forests, mineralized belts).
1:100,000 1:63,360 (Alaska) 1:62,500	Detailed distribution of large number of homogeneous rock and surficial units and considerable information on thickness and depth. Generally has topographic base.	Detailed planning, land-management, and resource studies (mining districts, urban areas, many counties).
1:24,000 1:20,000 (Puerto Rico)	Very detailed distribution of large number of quite homogeneous rock units. Surficial deposits may be shown on separate map. Much information on thickness and vertical extent of rock units. Has topographic base.	Detailed planning, site selection, resource evaluation, and exploration (cities and towns, subdivisions, mining districts, mine sites, large construction projects).

Other maps include coal investigation maps, oil and natural gas maps, geophysical investigation maps, and maps in the Miscellaneous Geologic Investigation Series which include the following types:

(a) Geologic maps, in many cases in preliminary reconnaissance form.
(b) Geologic maps of the moon, Apollo land sites, etc.
(c) Glacial features and surficial deposits.
(d) Bedrock topography and subcrop of selected beds.
(e) Engineering and surficial geologic maps.
(f) Photogeologic maps.
(g) Geologic and biostratigraphic maps.
(h) Maps of recently active fault breaks.
(i) Geochemical maps.
(j) Maps showing relation of land and submarine topography.
(k) Maps showing locations of fault traces and historic surface ruptures.
(l) Earthquake epicenter maps.
(m) Maps of ocean floors, continental shelves, and slopes.
(n) Maps of locations of Pleistocene lakes.
(o) Geologic and crustal cross sections of the United States.
(p) Gravity maps.
(q) Magnetic maps.
(r) Maps showing radiometric ages of rocks.
(s) Maps of world subsea mineral resources.
(t) Maps showing distribution of landslides.
(u) Maps of shoreline features.

Still more maps exist in the Mineral Investigations Resources series and the Special Geological Map series.

Additional Information: The National Cartographic Information Center (NCIC), established by the USGS in 1974, provides a national information service to make cartographic data of the United States more easily accessible to the public and to various Federal, state, and local agencies. At present, more than 30 Federal agencies collect and prepare cartographic data. These data include more than 1.5 million maps and charts, 25 million aerial and space photographs, records on 1.5 million geodetic control points, and a growing collection of map data in computer-compatible form.

NCIC uses the latest techniques of micro-photography and computer technology to manage the vast amount of information and to provide a focal point for information on data produced and distributed by many Federal sources. NCIC also provides information on some Federal plans for future data collection.

NCIC does not obtain the cartographic data from present holders; rather it collects and organizes descriptive information about the data, tells where they are located, ensures their availability, and provides ordering assistance. Government and private data centers continue to hold and distribute cartographic data. Some of these centers also provide local users with direct access to NCIC information through their public service facilities; thus many government and private organizations are cooperating with the USGS in forming a network of NCIC facilities.

The USGS and the National Oceanic and Atmospheric Administration are the principal affiliates in the network.

NCIC provides different levels of service for the various types of cartographic data. For general-purpose data-topographic maps and aerial photographs, the objective is to provide complete service, including the identification of specific products and assistance in ordering these products. On the other hand, only general information and a referral service are provided for special-purpose cartographic data. The types of cartographic data for which NCIC offers assistance are listed on the following page.

Multiuse maps and charts including:

- Aeronautical charts
- Bathymetric maps
- City maps
- Extraterrestrial maps
- Floodplain maps
- Forest maps
- Geologic maps
- Highway maps
- Land-use maps
- Map and chart feature separates
- Nautical charts
- Orthophotomaps and orthophotoquads
- River surveys and damsite maps
- Slope maps
- Soil maps
- Topographic maps
- US maps
- World maps

Survey data including:

- First- and second-order control from any source
- Third-order control from any source that is useful
- Selected fourth-order control
- Photogrammetrically derived control
- Selected private control
- Land plats
- Census subdivisions

Aerial and space imagery from Federal, state, and private sources including:

- Photographs
- Satellite computer-compatible tapes
- Photomosaics
- Other remote-sensor data

Closely related data such as:

- Cartographic educational materials, atlases, gazetteers, and other related literature
- Digital data representing detail on maps and charts
- Geographic names

Point of Contact:

National Cartographic Information Center
US Geological Survey
Department of the Interior
MS 507, National Center
12201 Sunrise Valley Drive
Reston, VA 22092
(703) 860-6045, FTS 928-6045

Coastal Engineering Research Center
US Army Engineer Waterways Experiment Station
PO Box 631
Vicksburg, MS 39180-0631
(601) 634-2012, FTS 542-2012

Publications

Carter, C. H., et al. 1982 (Dec). "Regional Geology of the Southern Lake Erie (Ohio) Bottom: A Seismic Reflection and Vibracore Study," MR 82-15, NTIS Accession No. A126 565.

Duane, D. B., and Meisburger, E. P. 1969 (Nov). "Geomorphology and Sediments of the Nearshore Continental Shelf, Miami to Palm Beach, Florida," TM 29, NTIS Accession No. 699 339.

Field, M. E. 1979 (Jun). "Sediments, Shallow Subbottom Structure, and Sand Resources of Inner Continental Shelf, Central Delmarva Peninsula," TP 79-2, NTIS Accession No. A074 022.

Field, M. E., and Duane, D. B. 1974 (Mar). "Geomorphology and Sediments of the Inner Continental Shelf, Cape Canaveral, Florida," TM 42, NTIS Accession No. 779 513.

Meisburger, E. P. 1972 (Jun). "Geomorphology and Sediments of Chesapeake Bay Entrance," TM 38, NTIS Accession No. 749 545.

Meisburger, E. P. 1976 (Apr). "Geomorphology and Sediments of Western Massachusetts Bay," TP 76-3, NTIS Accession No. A025 444.

Meisburger, E. P. 1979 (Jul). "Sand Resources on the Inner Continental Shelf of the Cape Fear Region, North Carolina," MR 77-11, NTIS Accession No. A049 132.

Meisburger, E. P. 1979 (Sep). "Reconnaissance Geology of the Inner Continental Shelf, Cape Fear Region, North Carolina," TP 79-3, NTIS Accession No. A076 974.

Meisburger, E. P., and Duane, D. B. 1971 (Feb). "Geomorphology and Sediments of the Inner Continental Shelf, Palm Beach to Cape Kennedy, Florida," TM 34, NTIS Accession No. 724 135.

Meisburger, E. P., and Field, M. E. 1975 (Jul). "Geomorphology, Shallow Structure, and Sediments of the Florida Continental Shelf, Cape Canaveral to Georgia," TM 54, NTIS Accession No. A015 022.

Meisburger, E. P., and Williams, S. J. 1980 (Jul). "Sand Resources on the Inner Continental Shelf of the Cape May Region, New Jersey," MR 80-4, NTIS Accession No. A088 636.

Meisburger, E. P., and Williams, S. J. 1982 (Oct). "Sand Resources on the Inner Continental Shelf Off the Central New Jersey Coast," MR 82-10, NTIS Accession No. A123 087.

Meisburger, E. P., et al. 1979 (Jul). "Sand Resources of Southeastern Lake Michigan," MR 79-3, NTIS Accession No. A073 817.

Williams, S. J. 1976 (Mar). "Geomorphology, Shallow Subbottom Structure, and Sediments of the Atlantic Inner Continental Shelf Off Long Island New York," TP 76-2, NTIS Accession No. A025 467.

Williams, S. J. 1981 (May). "Sand Resources and Geological Character of Long Island Sound," TP 81-3, NTIS Accession No. A104 082.

Williams, S. J., and Duane, D. B. 1974 (Jul). "Geomorphology and Sediments of the Inner New York Bight Continental Shelf," TM 45, NTIS Accession No. 785 577.

Williams, S. J., and Meisburger, E. P. 1982 (Oct). "Geological Character and Mineral Resources of South Central Lake Erie," MR 82-9, NTIS Accession No. A123 085.

Williams, S. J., et al. 1979 (Jul). "Sediment Distribution, Sand Resources, and Geologic Character of the Inner Continental Shelf Off Galveston County, Texas," MR 79-4, NTIS Accession No. A074 393.

Williams, S. J., et al. 1980 (Nov). "Sand Resources of Southern Lake Erie, Connecticut to Toledo, Ohio - A Seismic Reflection and Vibracore Study," MR 80-10, NTIS Accession No. A097 984.

Publication Date:	See above list
Location:	Given in the titles of publications
Period of Coverage:	Data were taken from 1968-1980 and vary from location to location

Contents: The above 19 publications form a series of reports covering the results of the Inner Continental Shelf Sediment and Structure (ICONS) study program undertaken by the Coastal Engineering Research Center using high-resolution continuous seismic reflection profiles and vibracore techniques. Most seismographs are microfilmed and stored at the National Geophysical Data Center, and the core samples are stored at regional universities or USGS Offices as indicated by the individual report. Each report presents the regional geological character with an extensive bibliography. Most reports contain the core sediment descriptions, based on both microscopic and megascopic examinations.

Available From:

National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650

(NTIS Accession number is provided after the title of each report)

US Geological Survey
US Department of the Interior
National Center
12201 Sunrise Valley Drive
Reston, VA 22092

Publications

The National Atlas of the United States of America

Publication Date: 1970

Location: The 50 states

Period of Coverage: Varies for each map

Contents: The atlas serves as a comprehensive documentation of the Nation's physical features, resources, and human activities. It has been prepared by the USGS with the cooperation of more than 80 Federal agencies which supplied data, reviewed compilation of subject matter, and provided advice on atlas maps. Geological and marine maps include tectonic features, geology, glacial geology, karstlands and caverns, coastal landforms, ocean sediments and currents, tides, sea temperature and salinity, and wave heights. The geologic and tectonic sections also contain discussion sections.

Other categories of maps include soils, climate, and water. The soil section has maps on soil type and vegetation; while the climate section contains data for solar radiation, monthly sunshine, annual sunshine and evaporation, precipitation, monthly precipitation, snowfall, dew point and humidity, monthly average, maximum and minimum temperatures, temperature extremes, heating and cooling degree-days, freeze-free period, seasonal pressures and winds, air pollution, and storms. Lastly, the water section offers maps on surface water, floods, droughts, ground water, minerals in water, water impurities, water use, and water resources.

Available From: Most libraries stock this atlas as a standard reference; however, it may also be purchased at USGS headquarters:

US Geological Survey
US Department of the Interior
National Center
12201 Sunrise Valley Drive
Reston, VA 22092

US Geological Survey (Continued)

A Descriptive Catalog of Selected Aerial Photographs of Geologic Features in the United States
Denny, C. S., Warren, C. R., Dow, D. H., and Dale, W. J.
Geological Survey Professional Paper 590

Publication Date: 1968

Location: The 50 states

Period of Coverage: Each photograph or set of photographs gives the date the pictures were taken.

Contents: The USGS has selected 857 photographs that illustrate numerous types of geologic features in the United States. This catalog lists these special sets of photographs that are available for purchase and describes the features illustrated by one reduced photograph displayed for each set.

The latitude and longitude, number of photos in the set, photographic scale, focal length, date the photo set was taken, and map and geologic references are all included with a description of the photo set.

Additional Information: A similar document, "A Descriptive Catalog of Selected Aerial Photographs of Geologic Features in Areas Outside the United States," Geological Survey Professional Paper 591, was published in 1969 and contains similar information. This catalog may also be purchased from the Government Printing Office.

Available From: Superintendent of Documents
US Government Printing Office
Washington, DC 20402
(202) 275-2091, FTS 275-2051

US Soil Conservation Service
US Department of Agriculture
PO Box 2890
Washington, DC 20250
(202) 447-4543

Publication

Soil Surveys

Publication Dates: Varies from location to location

Location: 50 US states, Puerto Rico, and Virgin Islands

Period of Coverage: N/A

Contents: The US Department of Agriculture, in cooperation with state agricultural experiment stations and other Federal and state agencies, has been making soil surveys and publishing them since 1899. These surveys furnish soil maps and interpretations needed in giving technical assistance to farmers and ranchers; in guiding other decisions about soil selection, use, and management; and in planning research and disseminating the results of the research. They are also used in educational programs about soil use and conservation. Sound scientific and technical standards are used in a nationwide system of soil classification, nomenclature, interpretation, and publication.

Published soil surveys contain, in addition to soil maps, general information about the agriculture and climate of the area and descriptions of each kind of soil. They include a discussion of the formation and classification of the soils in the area and also soil laboratory data when available.

Soil surveys published since 1967 contain many different kinds of interpretations for each of the different soils mapped in the area. The kinds of interpretations included in these recent surveys vary with the needs of the area, but the following interpretations are in most of them: estimated yields of the common agricultural crops under defined levels of management, land-capability interpretations, soil-woodland interpretations, rangeland interpretations, engineering uses of soil, interpretations for community planning, suitability of the soil for drainage and irrigation, and suitability of the soil for wildlife and recreation.

Most of the soil surveys published since 1957 contain soil maps printed on a photomosaic base. The usual map scale is 1:24,000, 1:20,000, or 1:15,840, depending on the needs of the area.

For planning farms, engineering structures, parks, urban developments, and other uses of land, the recent published soil surveys are more useful. The older surveys can be of considerable assistance for many users, but their maps are more general than those in recent surveys and some of the interpretations need to be updated.

Available From: Published soil surveys may be found in most public libraries or local state and county agencies.

US Soil Conservation Service (Continued)

Additional Information: Additional information on soil surveys may be obtained from the state conservationist listed in Appendix D.

American Geological Institute
5205 Leesburg Pike
Falls Church, VA 22041
(703) 379-2480

Publication

Maps and Geological Publications of the United States: A Layman's Guide
Pampe, W. R.

Publication Date: 1978

Location: The United States and Puerto Rico

Period of Coverage: Most maps are revised from time to time

Contents: This reference guide lists maps that are used by rock hounds and professional engineers everywhere. Books and maps of local geology are abundant in this guide.

It is arranged by states in alphabetical order (Puerto Rico and District of Columbia included). Most of the information in this directory is supplied by state geologists, while only a small amount is furnished by the USGS.

The guide also lists publishers who sell each map. Other useful information supplied includes the addresses of state geologic agencies and other map publishers. Please note that this is a map directory independent of the USGS (most of the publications or maps in this catalog cannot be obtained through the USGS).

Available From: American Geological Institute
5205 Leesburg Pike
Falls Church, VA 22041
(703) 379-2480

Maritime Sediments and Atlantic Geology
Box 2050
Fredericton, New Brunswick, Canada E3B 5G4

Publication

Maritime Sediments and Atlantic Geology

Publication Interval: Three times a year

Location: Northern Appalachian area (with an emphasis on Canada)

Period of Coverage: N/A

Contents: This periodical is primarily designed to report on all aspects of geology, geomorphology, and oceanography of the northern Appalachian area. It contains a wide variety of articles for a large number of locations. A check in a periodicals listing should be most helpful in locating the type of information desired and the correct issue.

Available From: Maritime Sediments and Atlantic Geology
Box 2050
Fredericton, New Brunswick, Canada E3B 5G4

Additional Information: This periodical publishes various subjects in the areas of geology, geomorphology, and geophysics. However, retrieving the subjects related to specific geographic location(s) may require a careful search through the entire article listing of the journal.

Atlantic Oceanographic and Meteorological
Laboratories
Ocean Chemistry Division
Environmental Research Laboratories
National Oceanic and Atmospheric
Administration
4301 Rickenbacker Causeway Virginia Key
Miami, FL 33149
(305) 361-4300, FTS 350-1300

Publication

The Central North Atlantic Ocean Basin and Continental Margins: Geology, Geophysics, Geochemistry, and Resource Including the Trans-Atlantic Geotravers (TAG)
Rona, P. A., NOAA Atlas-3

Publication Date: February 1980

Location: Latitude 10° to 50° N, longitude 0° to 82°30' W

Period of Coverage: 1960s to 1979

Contents: This atlas presents a comprehensive overview of the geology, geophysics, geochemistry, and energy and mineral resources of the central North Atlantic Ocean basin and continental margins. The information, compiled from extensive published and unpublished sources, is presented in the form of 22 maps on Mercator projection at scale 1:13,228,000 from latitude 30° N, a trans-Atlantic ocean bottom photographic traverse, two trans-Atlantic crustal sections based on seismic refraction measurements, trans-Atlantic single and multichannel seismic reflection profiles, 12 original trans-Atlantic geotracerses, magnetic, and three tables of crustal properties comprising seismic reflection and refraction measurements, and the description and chemical composition of rock samples recovered from the ocean basin. Sources of information including the Trans-Atlantic Geotraverse (TAG) and deep-sea drilling projects are thoroughly documented. This atlas is designed to fulfill the need for a multipurpose information base for scientific investigation, marine environmental management, resource exploration, sea floor engineering, oceanographic education, and general interest.

Available From: Superintendent of Documents
US Government Printing Office
Washington, DC 20402
(202) 783-3238

PART IX: EARTHQUAKE INFORMATION AND TSUNAMIS

National Geophysical Data Center
National Environmental Satellite, Data,
and Information Service
National Oceanic and Atmospheric
Administration
325 Broadway
Boulder, CO 80303
(303) 497-6215, FTS 320-6215

Kind of Data

Seismic Data and Activities

Location and Dates: Information for the 50 states is available. Period of coverage varies greatly from site to site, but sometimes pre-1850 data can be found.

Description of Data: The services provided include preparing local and regional seismic histories for engineers, actuaries, and other scientists and answering direct inquiries from the public on all aspects of historical earthquakes. Additional services and products include publishing annual earthquake reports, and making available copies of seismograms, accelograms, displacement meter records, digitized strong-motioned seismograms, and epicenter lists in several formats. Many of these products and services are based on seismic records or other data that have originated with US Geological Survey (USGS) recording networks or with USGS data-reduction facilities.

Qualified Users: No limitations

Point of Contact:
National Geophysical Data Center
National Environmental Satellite, Data,
and Information Service
National Oceanic and Atmospheric
Administration
325 Broadway
Boulder, CO 80303
(303) 497-6215, FTS 320-6215

Publications

Earthquake History of the United States
Eppley, R. A., et al., No. 41-1

Publication Date: Part 1, 1965; Part 2, 1966

Location: The 50 states and their immediate vicinity

Period of Coverage: Both parts were revised to contain data from the earliest times to the close of 1963.

Contents: This publication covers the most important earthquakes of the United States. It is composed of two parts. The first part is subdivided into seven regions: New England and New York, the Eastern Region, the Central Region, the Western Mountain Region, Washington and Oregon, Alaska, and Hawaii. Part two contains earthquake information on California and western Nevada.

The information on each region is divided into three sections. The first is a list of earthquakes which contains year, date, time, geographical location, longitude, latitude, and intensity (modified Mercalli) of the quake's epicenter. The affected area in square miles and the reporting authorities are also given. The second section gives a listing of major earthquakes. It includes a description or account of the quake. The third section gives a listing of intermediate and minor quakes. A brief description is given. All lists are given in chronological order.

Additional Information: This publication was revised in 1973 to cover data through 1970. The two older volumes have been combined to make one volume. A supplement was then issued in 1982 to cover data from 1971 to 1980. The 1973 revised edition and the 1982 supplement were then combined to make one volume.

Available From: Superintendent of Documents
US Government Printing Office
Washington, DC 20402
(202) 783-3238

Catalog of Significant Earthquakes 2000 B.C. - 1979
Ganse, R. A., and Nelson, J. B., Report SE-27

Publication Date: July 1981

Location: Worldwide

Period of Coverage: 2000 B.C. - 1979

Contents: The catalog consists of some 2,484 events drawn from more than 100 different sources. Multiple entries are made when different sources offer substantially different information. There are 3,107 entries representing the 2,484 unique events. References for epicenter information, reported deaths, and damage are indicated for each entry. It lists the following seismological parameters for each event: time, latitude and longitude, depth, magnitude/intensity, deaths, damage class, references, and geographical location.

Available From: World Data Center A for Solid-Earth Geophysics
National Geophysical Data Center, EGC1
National Environmental Satellite, Data, and Information Service
325 Broadway
Boulder, CO 80303
(303) 497-6472, FTS 320-6472

Additional Information: This catalog is an expansion of a file originally created to produce the World Map of Significant Earthquakes 1900 to Present. This map may be obtained from NOAA/NGDC (D622), 325 Broadway, Boulder, CO 80303. The map may be obtained folded or rolled.

Catalog of Tsunami Photographs

Nelson, J. B., KGRD No. 13

Publication Date: October 1980

Location: Pacific Ocean

Period of Coverage: Photographs come from the tsunamis of 7 Dec 1944, 1 Apr 1946, 4 Nov 1952, 9 Mar 1957, 22 May 1960, 27 Mar 1964, 16 May 1968, 20 July 1975, and 29 Nov 1975.

Contents: This document contains a chronological listing of tsunami-related photographs. The photographs listed in this catalog form a subset of the National Geophysical Data Center's larger set of earthquake-related photographs.

Most of the photos are from the 1 April 1946 and the 27 March 1964 earthquake and tsunamis. The quality and a brief description of each photo are given.

Color prints, black and white negatives, and color and black and white 35-mm transparencies can also be ordered from this catalog.

Available From:

National Geophysical Data Center
National Environmental Satellite, Data, and Information Service
National Oceanic and Atmospheric Administration
325 Broadway
Boulder, CO 80303
(303) 497-6119, FTS 320-6119

Catalog of Tsunamis in Hawaii
Pararas-Carayannis, G., Report WE-4

Publication Date: March 1977

Location: Hawaiian Islands

Period of Coverage: 1813-1976

Contents: The objective of this report is to present a systematic compilation of all data pertaining to tsunamis observed and recorded in Hawaii.

All available information has been compiled from historical accounts, newspaper archives, and other reports. The data given include: (a) earthquake data which include date, coordinates of epicenter, and Richter magnitude; (b) tsunami data which include area of origin, relative magnitude, places of observation, height and period of the initial three waves, time taken to travel from origin to place of observation, and observations and remarks; and (c) references which list where the data were obtained.

Available From: World Data Center A
for Solid-Earth Geophysics
National Environmental Satellite,
Data, and Information Services
National Oceanic and Atmospheric Administration
Boulder, CO 80302
(303) 497-6472, FTS 320-6472

Additional Information: Predictions on tsunami wave runup are included in Part III of this report.

Catalog of Tsunamis in Alaska
Pararas-Carayannis, G., and Cox, D. C., Report SE-1

Publication Date: March 1976

Location: Alaska

Period of Coverage: 1788-1976

Contents: The objective of this report is to present a systematic compilation of all data pertaining to tsunamis observed and recorded in Alaska.

All available information has been compiled from historical accounts, newspaper archives, and other reports. The data given include: (a) earthquake data which include date, coordinates of epicenter, and Richter magnitude; (b) tsunami data which include area of origin, relative magnitude, places of observation, height and period of the initial three waves, time taken to travel from origin to place of observation, and observations and remarks; and (c) references which list where the data were obtained.

Available From: World Data Center A
for Solid-Earth Geophysics
National Environmental Satellite,
Data, and Information Services
National Oceanic and Atmospheric Administration
Boulder, CO 80302
(303) 497-6472, FTS 320-6472

Additional Information: Predictions of tsunami wave runup are included in Part III of this report.

National Geophysical Data Center
World Data Center A for Solid-Earth
Geophysics
National Environmental Satellite, Data,
and Information Service
National Oceanic and Atmospheric
Administration
Boulder, CO 80303
(303) 497-6521, FTS 320-6521

Publication

Catalog of Seismograph and Strong-Motion Records
Morris, L., et al., SE-6

Publication Date: May 1977

Location: Worldwide

Period of Coverage: N/A

Contents: The present catalog lists the World Data Center A's holdings of seismograms and strong-motion records, provides price lists, and describes formats in which the records are available.

Seismograph information such as a list of stations participating in seismogram exchange programs and a list of international data exchange earthquakes is included.

Strong-motioned information includes station locations, a chronological listing (1933-1975) of earthquakes that triggered strong-motioned instruments, a list of available strong-motioned records, strong-motioned data services, a list of agencies that furnished strong-motioned data, and additional data and publications.

Available From: World Data Center A for Solid-Earth
Geophysics
National Environmental Satellite, Data,
and Information Service
National Oceanic and Atmospheric
Administration
Boulder, CO 80302
(303) 497-6521, FTS 320-6521

US Geological Survey
National Earthquake Information Service
US Department of the Interior
Stop 967, Box 25046
Denver Federal Center
Denver, CO 80225
(303) 234-3994, FTS 234-3994

Publications

Seismograph Station Abbreviations and Coordinates
Covington, P. A.

Publication Date: March 1974

Location: Worldwide

Period of Coverage: All worldwide seismograph stations that were in operation as of January 1974 are included in this report.

Contents: This report is composed of two lists. List one contains the stations' abbreviations, name, geographic location, latitude, longitude, and elevation. It is arranged in alphabetical order by station abbreviation. List two contains a listing of seismographical stations and abbreviations by geographical order.

Available From: US Geological Survey
National Earthquake Information Service
US Department of the Interior
Stop 967, Box 25046
Denver Federal Center
Denver, CO 80225
(303) 234-3994, FTS 234-3994

Additional Information: A similar publication entitled "Seismograph Station Codes and Characteristics" was published in 1978 as the Geological Survey Circular 791. It was written by Barbara B. Poppe, Debbi A. Naab, and John S. Derr. It is available free upon application to:

Eastern Distribution Branch
US Geological Survey
1200 South Eads Street
Arlington, VA 22202
(703) 557-2751, FTS 557-2751

United States Earthquakes

Publication Interval: Yearly

Location: The 50 states

Period of Coverage: From 1928 to present

Contents: This series describes all the earthquakes that were reported felt in the United States and nearby territories during the period of record. Its purpose is to provide a continuous history of US earthquakes for studying seismic risk, evaluating nuclear power plant sites, designing earthquake resistive structures, and answering inquiries from the scientific and general public.

The publication is composed of four major chapters: "Earthquake Descriptions," which includes a summary of macroseismic data reported for each earthquake and a chronological list of earthquakes by state; "Network Operations," which summarizes the results from local seismic networks; "Miscellaneous Activities," which contains information on crustal movement studies, tsunamis, and principal earthquakes of the world; and "Strong-Motioned Seismograph Data."

The intensity and macroseismic data in "Earthquake Descriptions" are compiled through questionnaires, newspaper articles, and reports prepared by the government and various other sources. Each description includes date, origin, time, hypocenter, the source of the hypocenter calculation, maximum intensity (modified Mercalli), and macroseismic effects felt in the area. Pre-1980 issues may vary in form and content.

The US Geological Survey publishes preliminary intensity data in its quarterly circular, "Earthquakes in the United States." Copies of these reports are available on request from: Eastern Distribution Branch, US Geological Survey, 1200 South Eads Street, Arlington, VA 22202 (703) 557-2751, FTS 557-2751.

The final information is published in the "United States Earthquakes" series.

Additional Information: This series is published jointly by US Department of the Interior, Geological Survey; and US Department of Commerce, National Oceanic and Atmospheric Administration. This publication is a consolidation of the monthly publication "Preliminary Determination of Epicenters, Monthly Listing." The data are compiled and analyzed for all 12 months and the "United States Earthquakes" series is then presented. The later publication may be of more value if information other than raw data is desired.

US Geological Survey (Continued)

Available From: Superintendent of Documents
US Government Printing Office
Washington, DC 20402
(202) 783-3238

US Geological Survey
Office of Earthquakes, Volcanoes,
and Engineering
904 National Center
Reston, VA 22092
(703) 860-8471

Publication

Earthquake Information Bulletin

Publication Interval: Published bimonthly

Location: Emphasis is on the United States, but some information is given for worldwide sites

Period of Coverage: Since 1969

Contents: The earthquake information bulletin is intended to be a means of conveying information on earthquakes, seismological activities, and related natural hazards to both general and specialized readers. A check in a periodicals index should be most helpful in locating the type of information desired and the correct issue.

Available From: Superintendent of Documents
US Government Printing Office
Washington, DC 20402
(202) 275-2091, FTS 275-2051

Single copies are available from: Eastern Distribution Branch
US Geological Survey
1200 South Eads Street
Arlington, VA 22202
(703) 557-2751, FTS 557-2751

Canada Department of Energy, Mines,
and Resources
Earth Physics Branch
1 Observatory Cresc.
Ottawa, Ontario K1A OY3, Canada
(613) 995-5558

Publication

Canadian Earthquakes, Seismological Series of the Dominion Observatory

Publication Interval: Yearly

Location: Canada

Period of Coverage: 1960 to present

Contents: This yearly guide contains a chronological listing of seismic disturbances in Canada. It is divided into four parts according to region. The four parts are the Artic Region, the Eastern Region, the Central Region, and the Western Region. The regions have latitudinal and longitudinal boundaries.

The data given in each part for each disturbance include date, time, geographical coordinates (latitude and longitude) and location of the epicenters, Richter magnitude, and a few remarks.

Maps plotting the epicenters of the more significant quakes are also included.

Available From: Dominion Observatory
Department of Energy, Mines, and Resources
Ottawa, Canada
(613) 995-5558

Naval Construction Battalion Center
Civil Engineering Laboratory
Port Hueneme, CA 93043

Publication

Earthquake Occurrence and Effects in Ocean Areas
Wilson, B. W., Technical Report CR 69.027

Publication Date: February 1969

Location: Worldwide

Period of Coverage: Varies from site to site; however, this document deals mainly with the 1900s.

Contents: This document evaluates earthquake hazards in ocean areas throughout the world. It seeks to examine some of the available earthquakes and their associated ground movements, and hence to appraise the potential effects of such motions on ocean bottom structures, both from the standpoint of the ground-motion itself as well as the hydrodynamic effects of the surrounding water.

Data include a map of the distribution of seismic zones in the world, cross-sectional maps of high-risk earthquake zones showing earthquake epicenters and hypocenters, maps of oceanic plates, seafloor spreading, and oceanic trenches and ridges. Other data and information are given (see table of contents).

This report presents collectively a large number of undersea earthquake information and data for engineers; however, none of the data presented here are original.

Additional Information: This report was prepared by:

Basil W. Wilson
Consulting Oceanographic Engineer
529 South Winston Avenue
Pasadena, CA 91107

Shannon and Wilson Inc.
1105 North 38th Street
Seattle, WA 98103
and
Agbabian Associates
250 North Nash Street
El Segundo, CA 90245

Publication

Geotechnical and Strong Motion Earthquake Data from U.S. Accelerograph Stations
NUREG/CR-0985 and NUREG-0029

Publication Date: This is a five-volume set. The publishing dates for each volume are:

Volume 1	September 1976
Volume 2	June 1978
Volume 3	September 1980
Volume 4	September 1980
Volume 5	September 1980

Location:

Volume 1 - Ferndale, Calif.; Cholame, Calif.; and El Centro, Calif.
Volume 2 - Pasadena, Calif.; Santa Barbara, Calif.; Taft, Calif.; and Hollister (Melendy Ranch Barn), Calif.
Volume 3 - Gilroy, Calif.; Logan, Utah; Bozeman, Mont.; Tacoma, Wash.; and Helena, Mont.
Volume 4 - Anchorage, Alaska; Seattle, Wash.; Olympia, Wash.; and Portland, Oreg.
Volume 5 - Fairbanks, Alaska; Petrolia, Calif.; Hollister (City Hall), Calif.; Los Angles, Calif.; and New Madrid, Mont.

Period of Coverage: Varies from site to site

Contents: This five-volume set was prepared for the US Nuclear Regulatory Commission. It contains site-specific information describing the station building and instrumentation, geology and seismicity of the area, and site conditions.

The report compiles basic geotechnical and strong-motion earthquake data for selected accelerograph stations. These earthquake records constitute a set of maximum ground-motion values, time-histories of acceleration, and response spectra, upon which seismic design recommendations are formulated.

Tables of significant seismic events, maps of local and general geology, boring logs, and geologic cross sections can be found in the last three volumes for each site. Similar data exist for the first two volumes, but the data are not given in the same format.

Shannon and Wilson Inc. (Continued)

Available From:

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Division of Technical Information
and Document Control
US Nuclear Regulatory Commission
Washington, DC 20555

or

National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650, FTS 737-4650

Additional Information:

These reports were prepared for:

Division of Reactor Safety Research
Office of Nuclear Regulatory Research
US Nuclear Regulatory Commission
Washington, DC 20555

The first two volumes were published as reports NUREG-0029, Vol 1, and NUREG-0029, Vol 2, while the last three were published as NUREG/CR-0985 Vols 3, 4, and 5.

Woodward-Clyde Consultants
1 Walnut Creek Center
100 Pringle Avenue
ATTN: Library
Walnut Creek, CA 94596
(415) 945-3000

Publication

Geotechnical Data Compilation for Selected Strong Motion Seismograph Sites in California
Hansen, W. R., et al.

Publication Date: 28 December 1973

Location: Data are given for 78 sites. These sites are subdivided into seven regions as follows: Sacramento, San Francisco Bay area, Hollister, Bakersfield, Santa Barbara, Lake Hughes, and the Imperial Valley.

Contents: This report is a compilation of available geotechnical information for 78 selected strong-motioned seismograph sites in California. This information is presented for each site at three levels of detail: regional, areal, and site.

The information is intended to allow: (a) evaluation of present and future instrument locations, (b) identification of sites for which there is insufficient subsurface information, and (c) evaluation of existing and anticipated records from strong-motion seismographs. The ultimate goal of such analysis is improved design of earthquake-resistant structures through better understanding of seismic ground response. Data for 78 sites are provided.

Available From: Woodward-Clyde Consultants
1 Walnut Creek Center
100 Pringle Avenue
ATTN: Library
Walnut Creek, CA 94596
(415) 945-3000

Additional Information: Woodward-Clyde Consultants was formally Woodward-Lundgren and Associates.

Coastal Engineering Research Center
US Army Engineer Waterways Experiment
Station
PO Box 631
Vicksburg, MS 39180
(601) 634-2012, FTS 542-2012

Publication

Annotated Bibliography on Tsunamis
Cueller, M. P., No. 30

Publication Date: February 1953

Location: N/A

Period of Coverage: 1836-1948

Contents: This 69-page guide chronologically lists 195 references on tsunamis and other sea-wave phenomena. It gives the author, title, date, publishing agency, and a brief description of the contents for each source.

This report was prepared for the Committee for the Study of Tsunamis, American Geophysical Union. It serves as a quick index for persons in need of tsunami literature.

Additional Information: This document was published by the Beach Erosion Board, the Coastal Engineering Research Center's predecessor organization.

Available From: National Technical Information Service
US Department of Commerce
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(NTIS Accession No. AD-699-405)

Tetra-Tech Inc.
630 North Rosemead Boulevard
Pasadena, CA 91107
(213) 449-6400

Publication

Tsunami Atlas for the Coasts of the United States
Brandsma, M., et al., TC-486, NUREG/CR-1106

Publication Date: November 1979

Location: 19 Pacific coast sites ranging from 31° N (Punta Colnett, Mexico) to 48° N (Cape Flattery, Wash.) and 27 Atlantic coast sites ranging from 25° N (Cape Sable, Fla.) to 44° N (Bay of Fundy, Maine)

Contents: This report presents hypothetical tsunamis generated by large-magnitude earthquakes. The results, which consist primarily of wave traces at offshore stations in 600 ft of water, show that potential tsunami hazard exists along the US Pacific coast and Atlantic coast.

The results are intended as the first step of design calculations for coastal installations at specific sites. The computations used a canonical tsunami source somewhat larger than any known to have occurred and are the result of worst-case computations.

The atlas lists hypothetical tsunamis arriving offshore of each station. They are listed in order of maximum wave displacement from the still water level. Water displacement, hypothetical generation region, and the time taken to arrive from the region of generation are all given. Graphs of water displacement versus time after first wave arrival are included for the larger tsunamis.

Miscellaneous data include maps of continental plates, ocean areas capable of generating large tsunamis, and distribution of world earthquakes occurring between 1961 and 1967 at depths of less than 100 km.

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and Document Control
US Nuclear Regulatory Commission
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Tetra-Tech Inc. (Continued)

Additional Information: This report was prepared for:

Division of Reactor Safety Research
Office of Nuclear Regulatory Research
US Nuclear Regulatory Commission
Washington, DC 20555

Predictions on tsunami wave runup are included in Part III of this report.

Hawaii Institute of Geophysics
Room 252
University of Hawaii
2525 Correa Road
Honolulu, HA 96822

Publications

Preliminary Catalog of Tsunamis Occurring in the Pacific Ocean
Iida, K., et al., Data Report No. 5 HIB-67-10

Publication Date: 7 August 1967

Location: This publication is broken down into separate regions as follows:

Region	Contents
A	New Zealand, Kermadec Islands, Tonga, Samoa, and Fiji
B	New Hebrides, New Caledonia, and Solomon Islands
C	New Guinea, Bismarck Archipelago, and Pacific side of Halmahera Island
D	Philippines, Taiwan Pacific coast
E	Ryukyu Islands, Kyushu Island
F	Nankaido-Tokaido area (Shikoku-Sagami)
G	Northeast Honshu Island (Boso-Sanriku)
H	Hokkaido Island
I	Kuril Islands
J	Kamchatka Peninsula and Komandorskiye (Commander Islands)
K	Aleutian Islands
L	Mainland Alaska and British Columbia
M	Washington, California, Oregon, Baja California
N	Mexico, Central America, North Columbia
O	South Columbia, Ecuador, Peru
P	North Chile
Q	South Chile
R	Hawaiian Islands
S	Marshall Islands-Marianas Islands
T	Indonesia
U	South China Sea
V	East China Sea and Yellow Sea
W	Sea of Japan
X	Sea of Okhotsk

Period of Coverage: 173 A.D. to 1967

Hawaii Institute of Geophysics (Continued)

Contents: This publication consolidates tsunami data for the Pacific Ocean dating back to 173 A.D. It is based upon written data, geological data, and other researcher's reports. The data include: (a) earthquake data (time, epicenter coordinates, magnitude, and depth of quake); (b) tsunami data (region of generation, tsunami severity, locations where the tsunami was observed, height and period of waves, time taken to travel from the quake epicenter, and effects and remarks which contain damage reports, deaths, and effects of the tsunami); and (c) references which give the names of previous researchers of the tsunami.

Some of the older data are incomplete due to lack of written information or uncertainty of data. Many of the older times and Richter quake magnitudes are approximations, as accurate data were unavailable.

Available From:	Hawaii Institute of Geophysics Room 252 University of Hawaii 2525 Correa Road Honolulu, HA 96822
Additional Information:	This publication may be revised from time to time. It would be advantageous to obtain the latest revision.

Tsunami Wave Runup Heights in Hawaii
Loomis, H. G., HIG-76-5, NOAA-JTRE-161

Publication Date: May 1976

Location: Hawaiian Islands

Period of Coverage: 1946-1975

Contents: This report presents maps of the shorelines of the Hawaiian Islands on which are recorded the wave heights of tsunamis in 1946, 1952, 1957, 1960, 1964, and 1975. Some islands do not have complete records for all of the above tsunamis. The larger, more populated islands have the more complete data. Islands that data are given for are as follows: Oahu, Maui, Hawaii, Kauai, Molokai, and Lanai.

Additional Information: This report is a joint publication by the Hawaii Institute of Geophysics and the Joint Tsunami Research Effort, Pacific Marine Environmental Laboratory, Environmental Research Laboratories, NOAA.

Predictions on tsunami wave runup are included in Part III of this report.

Available From: Hawaii Institute of Geophysics
Room 252
University of Hawaii
2525 Correa Road
Honolulu, HA 96822

International Tsunami Information Center
PO Box 50027
Honolulu, HA 96850
(808) 546-2847

Publication

Tsunami Newsletter

Publication Interval: Quarterly

Location: Pacific Ocean and vicinity

Period of Coverage: 1968 to present

Contents: This newsletter is intended to provide news and information to scientists, engineers, educators, community protection agencies, and governments throughout the world. A check in a periodicals index should be most helpful in locating the type of information desired and the correct issue.

Additional Information: The International Tsunami Information Center is maintained by the National Oceanic and Atmospheric Administration. The Center's mission is to mitigate the effects of tsunamis throughout the Pacific.

Available From: International Tsunami Information Center
PO Box 50027
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APPENDIX A: LIST OF OFFICES OF THE US ARMY CORPS OF ENGINEERS

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Memphis, TN 38103-1894

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Chicago, IL 60604-1797

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Detroit, MI 48231-1027

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Clock Tower Building
Rock Island, IL 61204-2004

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Seattle, WA 98124-2255

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Location	Address	Phone Number
Anchorage, Alaska	Public Inquiries Office US Geological Survey Room 101 4230 University Drive Anchorage, AK 99508-4664	(907) 561-5555 FTS 907-272-4320
	Public Inquiries Office Earth Science Information and Sales US Geological Survey E-146 Federal Building, Box 53 701 C Street Anchorage, AK 99508-4664	(907) 271-4307
Dallas, Tex.	Public Inquiries Office US Geological Survey 1-C-45 Federal Building 1100 Commerce Street Dallas, TX 75242	(214) 767-0198 FTS 729-0198
Denver, Colo.	Public Inquiries Office US Geological Survey 169 Federal Building 1961 Stout Street Denver, CO 80294	(303) 844-4169 FTS 564-4169
Los Angeles, Calif.	Public Inquiries Office US Geological Survey 7638 Federal Building 300 North Los Angeles Street Los Angeles, CA 90012	(213) 894-2850 FTS 798-2850
Menlo Park, Calif.	Public Inquiries Office US Geological Survey Building 3, Room 122 Mail Stop 533 345 Middlefield Road Menlo Park, CA 94025	(415) 323-8111 Ext. 2817 FTS 467-2817

* Information in this appendix was derived from the US Geological Survey (USGS) Circular 900, guide to obtaining USGS information.

Public Inquiries Offices (Continued)

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Reston, Va.	Public Inquiries Office US Geological Survey 503 National Center Room 1-C-402 12201 Sunrise Valley Drive Reston, VA 22092	(703) 860-6167 FTS 928-6167
Salt Lake City, Utah	Public Inquiries Office US Geological Survey 8105 Federal Building 125 South State Street Salt Lake City, UT 84138	(801) 525-5652 FTS 588-5652
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Room 110
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2800 Cottage Way
Sacramento, CA 95825
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Mail Stop 415
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Hartford, CT 06103
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DISTRICT OF COLUMBIA
See listing for Maryland

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Tallahassee, FL 32301
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Water Resources Division
District Office
US Geological Survey, Suite B
6481 Peachtree Industrial Boulevard
Doraville, GA 30360
(404) 221-4858
FTS 242-4858

HAWAII
Water Resources Division
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PO Box 50166
300 Ala Moana Boulevard,
Room 6110
Honolulu, HI 96850
(808) 546-8331
FTS 808-546-8331

IDAHO
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US Geological Survey
230 Collins Road
Boise, ID 83702
(208) 334-1750
FTS 554-1750

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102 East Main, Fourth Floor
Urbana, IL 61801
(217) 398-5353
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US Geological Survey
6023 Guion Road, Suite 201
Indianapolis, IN 46254
(317) 927-8640
FTS 336-8640

IOWA
Water Resources Division
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PO Box 1230
269 Federal Building
400 South Clinton Street
Iowa City, IA 52244
(319) 337-4191
FTS 863-6521

KANSAS
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1950 Constant Avenue-
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University of Kansas
Lawrence, KS 66044
(913) 864-4321
FTS 752-2300

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600 Federal Place
Louisville, KY 40202
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FTS 352-5241

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(617) 223-2822
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702 Post Office Building
St. Paul, MN 55101
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Nevada Office
Water Resources Division
US Geological Survey
229 Federal Building
705 North Plaza Street
Carson City, NV 89701
(702) 882-1388
FTS 598-6011 (operator)

NEW HAMPSHIRE
See listing for Massachusetts

NEW JERSEY
Water Resources Division
District Office
US Geological Survey
430 Federal Building
402 East State Street
Trenton, NJ 08608
(609) 989-2162
FTS 483-2162

NEW MEXICO
Water Resources Division
District Office
US Geological Survey
720 Western Bank Building
505 Marquette, Northwest
Aubuquerque, NM 87102
(505) 766-2246
FTS 474-2246

NEW YORK
Water Resources Division
District Office
US Geological Survey
PO Box 1669
343 US Post Office and
Courthouse Building
Albany, NY 12201
(518) 472-3107
FTS 562-3107

NORTH CAROLINA
Water Resources Division
District Office
US Geological Survey
PO Box 2857
300 Fayetteville Street Mall
436 Century Station
Raleigh, NC 27602
(919) 755-4510
FTS 672-4510

NORTH DAKOTA
Water Resources Division
District Office
US Geological Survey
821 East Interstate Avenue
Bismarck, ND 58501
(701) 255-4011, ext. 601
FTS 783-4601

OHIO
Water Resources Division
District Office
US Geological Survey
975 West Third Avenue
Columbus, OH 43212
(614) 469-5553
FTS 943-5553

OKLAHOMA
Water Resources Division
District Office
US Geological Survey
Room 621
215 Dean A. McGee Avenue
Oklahoma City, OK 73102
(405) 231-4256
FTS 736-4256

OREGON
Water Resources Division
District Office
US Geological Survey
847 NE 19th Avenue, Suite 300
Portland, OR 97232
(503) 231-2009
FTS 429-2009

PENNSYLVANIA
Water Resources Division
District Office
US Geological Survey
PO Box 1107
Federal Building, Fourth Floor
228 Walnut Street
Harrisburg, PA 17108
(717) 782-4514
FTS 590-4514

PUERTO RICO
Water Resources Division
District Office
US Geological Survey
GPO Box 4424
GSA Center, Building 652
Highway 28, Pueblo Viejo
San Juan, PR 00936
(809) 783-4660
FTS 809-753-4414

RHODE ISLAND
See listing for Massachusetts

SOUTH CAROLINA
Water Resources Division
District Office
US Geological Survey
Suite 658
1835 Assembly Street
Columbia, SC 29201
(803) 765-5966
FTS 677-5966

SOUTH DAKOTA
Water Resources Division
District Office
US Geological Survey
317 Federal Building
200 Fourth Street, SW
Huron, SD 57350
(605) 352-8651, ext. 258
FTS 782-2258

TENNESSEE
Water Resources Division
District Office
US Geological Survey
A-413 Federal Building and
US Courthouse
Nashville, TN 37203
(615) 251-5424
FTS 852-5424

Water Resources Division District Offices (Continued)

TEXAS
Water Resources Division
District Office
US Geological Survey
649 Federal Building
300 East Eighth Street
Austin, TX 78701
(512) 482-5766
FTS 770-5766

UTAH
Water Resources Division
District Office
US Geological Survey
Room 1016 Administration Building
1745 West 1700 South
Salt Lake City, UT 84104
(801) 524-5663
FTS 588-5663

VERMONT
See listing for Massachusetts

VIRGINIA
Virginia Office
Water Resources Division
US Geological Survey
200 West Grace Street, Room 304
Richmond, VA 23220
(804) 771-2427
FTS 925-2427

WASHINGTON
Water Resources Division
District Office
US Geological Survey
1201 Pacific Avenue, Suite 600
Tacoma, WA 98402
(206) 593-6510
FTS 390-6510

WEST VIRGINIA
Water Resources Division
District Office
US Geological Survey
3416 Federal Building and
US Courthouse
500 Quarrier Street, East
Charleston, WV 25301
(304) 347-5130
FTS 930-5132

WISCONSIN
Water Resources Division
District Office
US Geological Survey
1815 University Avenue
Madison, WI 53705
(608) 262-2488
FTS 262-2488

WYOMING
Water Resources Division
District Office
US Geological Survey
PO Box 1125
4007 J.C. O'Mahoney Federal Center
2120 Capitol Avenue
Cheyenne, WY 82003
(307) 772-2153
FTS 328-2153

Geology and Others

Geologic Inquiries Group
US Geological Survey
907 National Center
Reston, VA 11097
(703) 860-6517
FTS 928-6517

National Earthquake Information
Service
US Geological Survey
Mail Stop 967
Box 25046, Federal Center
Denver, CO 80225
(303) 236-1500
FTS 776-1500

Hydrologic Information Unit
US Geological Survey
417 National Center
Reston, VA 22092
(703) 860-7531
FTS 928-7531

EROS Data Center
US Geological Survey
Sioux Falls, SD 57198
(605) 594-6151
FTS 784-7151

APPENDIX D: LIST OF STATE CONSERVATIONISTS, SOIL CONSERVATION SERVICE, US DEPARTMENT OF AGRICULTURE

ALABAMA
Wright Building
138 South Gay Street
Auburn, AL 36830

ALASKA
Suite 129, Professional Building
2221 East Northern Lights Boulevard
Anchorage, AK 99504

ARIZONA
230 North 1st Avenue
3008 Federal Building
Phoenix, AZ 85025

ARKANSAS
Room 5029
Federal Office Building
700 West Capitol
Little Rock, AR 72203

CALIFORNIA
2828 Chiles Road
Davis, CA 95616

COLORADO
2490 West 26th Avenue
Diamond Hill, Building A
Denver, CO 80217

CONNECTICUT
Mansfield Professional Park
Route 44A
Storrs, CT 06268

DELAWARE
Treadway Towers--Suite 2-4
9 East Loockerman Street
Dover, DE 19901

FLORIDA
Federal Building
PO Box 1208
Gainesville, FL 32602

GEORGIA
Federal Building
355 East Hancock Avenue
PO Box 832
Athens, GA 30603

HAWAII
Prince Jonah Kuhio Kolanianaola Building
300 Ala Moana Boulevard
Room 4316
Honolulu, HI 96850

IDAHO
Room 345
304 North 8th Street
Boise, ID 83702

ILLINOIS
Federal Building
200 West Church Street
PO Box 678
Champaign, IL 61820

INDIANA
Atkinson Square-West
Suite 2200
5610 Crawfordsville Road
Indianapolis, IN 46224

IOWA
693 Federal Building
210 Walnut Street
Des Moines, IA 50309

KANSAS
760 South Broadway
PO Box 600
Salina, KS 67401

KENTUCKY
333 Waller Avenue
Lexington, KY 40504

LOUISIANA
3737 Government Street
PO Box 1630
Alexandria, LA 71301

MAINE
USDA Building
University of Maine
Orono, ME 04473

MARYLAND
Hartwick Building
Room 522
4321 Hartwick Road
College Park, MD 20740

MASSACHUSETTS
29 Cottage Street
Amherst, MA 01002

MICHIGAN
Room 101
1405 South Harrison Road
East Lansing, MI 48823

MINNESOTA
200 Federal Building and
US Courthouse
316 North Robert Street
St. Paul, MN 55101

MISSISSIPPI
Federal Building, Suite 1321
100 West Capitol Street
PO Box 610
Jackson, MS 39201

MISSOURI
555 Vandiver Drive
Columbia, MO 65201

MONTANA
Federal Building
PO Box 970
Bozeman, MT 59715

NEBRASKA
Federal Building-US
Courthouse, Room 345
Lincoln, NE 68508

NEVADA
Room 308
US Post Office Building
PO Box 4850
Reno, NV 89505

NEW HAMPSHIRE
Federal Building
Durham, NH 03824

NEW JERSEY
1370 Hamilton Street
PO Box 219
Somerset, NJ 08873

NEW MEXICO
517 Gold Avenue SW
PO Box 2007
Albuquerque, NM 87103

NEW YORK
US Courthouse and Federal
Building
100 South Clinton Street
Room 771
Syracuse, NY 13260

NORTH CAROLINA
310 New Bern Avenue, Room 544
Federal Office Building
PO Box 27307
Raleigh, NC 27611

NORTH DAKOTA
Federal Building
PO Box 1458
Bismarck, ND 58501

OHIO
Federal Building, Room 522
200 North High Street
Columbus, OH 43215

OKLAHOMA
Agricultural Center Office
Building
Farm Road and Brumley Street
Stillwater, OK 74074

OREGON
Federal Building, 16th Floor
1220 SW 3rd Avenue
Portland, OR 97209

PENNSYLVANIA
Federal Building and
US Courthouse
PO Box 985
Federal Square Station
Harrisburg, PA 17108

PUERTO RICO
Room 633, 6th Floor
Federal Building
Chardon Avenue
Hato Rey, PR 00918

RHODE ISLAND
46 Quaker Lane
West Warwick, RI 02893

SOUTH CAROLINA
Room 950
1835 Assembly Street
Columbia, SC 29201

SOUTH DAKOTA
Federal Building
200 4th Street, SW
Huron, SD 57350

TENNESSEE
675 US Courthouse
Nashville, TN 37203

TEXAS
W. R. Poage Federal Building
101 South Main Street
PO Box 648
Temple, TX 76501

UTAH
4012 Federal Building
125 South State Street
Salt Lake City, UT 84138

VERMONT
1 Burlington Square
Suite 205
Burlington, VT 05401

VIRGINIA
Federal Building, Room 9201
400 North 8th Street
PO Box 10026
Richmond, VA 23240

WASHINGTON
360 US Courthouse
West 920 Riverside Avenue
Spokane, WA 99201

WEST VIRGINIA
75 High Street
PO Box 865
Morgantown, WV 26505

WISCONSIN
4601 Hammersley Road
Madison, WI 50711

WYOMING
Federal Office Building
PO Box 2440
Casper, WY 82601

APPENDIX E: US COAST GUARD DISTRICTS AND ADDRESSES

District	Address	Waters of Jurisdiction
First	150 Causeway Street Boston, MA 02114 Phone: 617-223-3634	Main, New Hampshire, Massachusetts, and Rhode Island to Watch Hill
Second	1430 Olive Street St. Louis, MO 63103 Phone: Day - 314-425-4605 Night - 314-425-4614	Mississippi River System, except that portion of the Mississippi River south of Baton Rouge, Louisiana, and the Illinois River north of Joliet, Illinois
Third	Governors Island New York, NY 10004 Phone: Day - 212-668-7195 Night - 212-668-7055	Rhode Island from Watch Hill, Connecticut, New York, New Jersey, Pennsylvania, and Delaware, not including the Chesapeake and Delaware Canal
Fifth	431 Crawford Street Portsmouth, VA 23705 Phone: 804-398-6225	Maryland, Virginia, North Carolina, District of Columbia, and the Chesapeake and Delaware Canal
Seventh	51 Southwest First Avenue Miami, FL 33130 Phone: 305-350-5621	South Carolina, Georgia, Florida to 83°50' W, and Puerto Rico and adjacent islands of the United States
	Commander, Greater Antilles Section, US Coast Guard San Juan, Puerto Rico 00903 Phone: 809-722-5500	Immediate jurisdiction of waters of Puerto Rico and adjacent islands of the United States
Eighth	Hale Boggs Federal Building 500 Camp Street New Orleans, LA 70130 Phone: 504-589-6225	Florida from 83°50' W, thence westward, Alabama, Mississippi, Louisiana, and Texas
Ninth	1240 East 9th Street Cleveland, OH 44199 Phone: 216-522-3991	Great Lakes and St. Lawrence River above St. Regis River
Eleventh	Union Bank Building 400 Oceangate Blvd. Long Beach, CA 90822 Phone: 213-590-2222	California, south of latitude 34°58' N

District	Address	Waters of Jurisdiction
Twelfth	Building 51, Government Island Alameda, CA 94501 Phone: 415-437-3506	California, north of latitude 34° 58' N
Thirteenth	915 Second Avenue Seattle, WA 98174 Phone: 206-442-5876	Oregon, Washington, Idaho, and Montana
Fourteenth	9th Floor 300 Ala Moana Blvd. Honolulu, HI 96850 Phone: Day - 808-546-7130 Night - 808-546-7109	Hawaii and the Pacific Islands belonging to the United States west of longitude 140° W and south of latitude 42° N
Seventeenth	PO Box 3 - 5000 Juneau, AK 99802 Phone: Day - 907-586-7367 Night - 907-586-2680	Alaska

APPENDIX F: LIST OF CONTACTS FOR COASTAL ZONE MANAGEMENT

ALABAMA
Director
Office of State Planning and
Federal Programs
State Capitol
Montgomery, AL 36130
(205) 832-6400

ALASKA
Director
Office of Management and Budget
Office of the Governor
Pouch AD
Juneau, AK 99811
(907) 465-35411

AMERICAN SAMOA
Director
Development Planning Office
Government of American Samoa
Pago Pago, American Samoa 96799
(Overseas operator) 633-5155

CALIFORNIA
Director
California Coastal Commission
631 Howard Street
San Francisco, CA 94105
(415) 543-8555

CONNECTICUT
Director
Department of Environmental
Protection
71 Capitol Avenue
Hartford, CT 06115
(203) 566-7404

DELAWARE
Secretary
Department of Natural Resources and
Environmental Control
89 Kings Highway
PO Box 1401
Dover, DE 19903
(302) 736-4403

FLORIDA
Secretary
Department of Environmental
Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32301
(904) 488-4807

GEORGIA
Commissioner
Department of Natural Resources
2770 Washington Street
Atlanta, GA 30334
(404) 656-3508

GUAM
Director
Bureau of Planning
Government of Guam
PO Box 2950
Agana, Guam 96910
(Overseas operator) 477-9502

HAWAII
Director
Department of Planning and Economic
Development
PO Box 2359
Honolulu, HI 96804
(808) 548-3042

ILLINOIS
Secretary
Department of Transportation
Transportation Administration
Building
2300 South Dirksen Parkway
Springfield, IL 62764
(312) 793-3126

INDIANA
Director
Department of National Resources
State Office Building, Room 608
Indianapolis, IN 46204
(312) 793-3123

LOUISIANA
Secretary
Department of Natural Resources
PO Box 44396
Capitol Station
Baton Rouge, LA 70804
(504) 342-4500

MAINE
Director
State Planning Office
184 State Street
Augusta, ME 04330
(207) 289-3261

MARYLAND
Secretary
Department of Natural Resources
Tawes State Office Building
Annapolis, MD 21401
(301) 269-3041

MASSACHUSETTS
Secretary
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, MA 02202
(617) 727-9530

MICHIGAN
Director
Department of Natural Resources
PO Box 30028
Lansing, MI 48909
(517) 373-2329

MINNESOTA
Director
State Planning Agency
100 Capitol Square Building
550 Cedar Street
St. Paul, MN 55101
(612) 297-2997

MISSISSIPPI
Executive Director
Bureau of Marine Resources
PO Box 959
Long Beach, MS 39560
(601) 864-4602

NEW HAMPSHIRE
Acting Director
Office of State Planning
2-1/2 Beacon Street
Concord, NH 03301
(603) 271-2155

NEW JERSEY
Commissioner
Department of Environmental Protection
CN 402
Trenton, NJ 08625
(609) 292-2885

NEW YORK
Secretary of State
162 Washington Street
Albany, NY 12231
(518) 474-4750

NORTH CAROLINA
Secretary
Department of Natural Resources and Community Development
Box 27687
Raleigh, NC 27611
(919) 733-4984

NORTHERN MARIANAS
Director
Coastal Resources Management Office
Office of the Governor
Room 505 - 5th Floor Nauru
Saipan, Mariana Islands 96950
(Overseas operator for Saipan) 6623

OHIO
Director
Department of Natural Resources
Fountain Square Court (Bldg. D)
Columbus, OH 43224
(614) 265-6730

OREGON
Director
Department of Land Conservation and Development
1175 Court Street, NE
Salem, OR 97310
(503) 378-4926

PENNSYLVANIA
Secretary
Department of Environmental Resources
PO Box 1467
Harrisburg, PA 17120
(717) 783-9500

PUERTO RICO
Secretary
Department of Natural Resources
PO Box 5887
Pureto de Tierra, PR 00906
(809) 723-3090

RHODE ISLAND
Chairman
Coastal Resources Management Council
60 Dairs Street
Providence, RI 02908
(401) 277-2476

SOUTH CAROLINA
Chairman
South Carolina Coastal Council
PO Box 1026
Beaufort, SC 29902
(803) 524-5053

TEXAS
Executive Director
Natural Resources Advisory Council
200 East 18th Street
Austin, TX 78701
(512) 475-0414

VIRGINIA
Administrator
Council on the Environment
Ninth Street Office Building (9th floor)
Richmond, VA 23219
(804) 786-4500

VIRGIN ISLANDS
Commissioner
Department of Conservation and Cultural Affairs
PO Box 4340
Charlotte Amalie, St. Thomas, VI 00801
(809) 774-3320

WASHINGTON
Director
Department of Ecology
State of Washington (PV-11)
Olympia, WA 98504
(206) 459-6168

WISCONSIN
Deputy Secretary
Department of Administration
101 South Webster
General Executive Facility 2
Madison, WI 53702
(608) 266-1741

APPENDIX G: LIST OF STATE GEOSCIENCE AGENCIES

ALABAMA
Geological Survey of Alabama
PO Drawer O
University, AL 35486
(205) 349-2852
FTS 205-349-2852

ALASKA
Division of Geological and Geophysical Survey
3001 Porcupine Drive
Anchorage, AK 99701
(907) 786-2179
FTS 907-786-2179

ARIZONA
Bureau of Geology and Mineral Technology
845 North Park Avenue
Tucson, AZ 85719
(602) 621-7906
FTS 602-621-7906

ARKANSAS
Arkansas Geological Commission
3815 West Rooservalt Road
Little Rock, AR 72201
(501) 371-1488
FTS 740-5011 (operator)

CALIFORNIA
California Division of Mines and Geology
1416 Ninth Street, Room 1341
Sacramento, CA 95814
(916) 445-1923
FTS 916-445-1923

COLORADO
Colorado Geological Survey
1313 Sherman Street, Room 715
Denver, CO 80203
(303) 866-2611
FTS 303-866-2611

CONNECTICUT
Department of Environmental Protection
Natural Resource Center
165 Capitol Avenue, Room 553
Hartford, CT 06106
(203) 556-3450
FTS 203-556-3540

DELAWARE
Delaware Geological Survey
University of Delaware
101 Penny Hall
Newark, DE 19711
(302) 738-2833
FTS 302-738-2833

FLORIDA
Bureau of Geology
903 West Tennessee Street
Tallahassee, FL 32304
(904) 488-4191
FTS 904-488-41191

GEORGIA
Georgia Geologic Survey
Room 400
19 Martin Luther King Drive, SW
Atlanta, GA 30334
(404) 656-3214
FTS 404-656-3214

HAWAII
Department of Land and Natural Resources
Division of Water and Land Development
PO Box 373
Honolulu, HI 96809
(808) 548-7533
FTS 808-548-7533

IDAHO
Idaho Geological Survey
University of Idaho Campus
Moscow, ID 83843
(208) 885-7991
FTS 554-1111 (operator)

ILLINOIS
Illinois State Geological Survey
615 East Peabody Drive, Room 121
Champaign, IL 61820
(217) 344-1481
FTS 217-344-1481

INDIANA
Indiana Geological Survey
Department of Natural Resources
611 North Walnut Grove
Bloomington, IN 47401
(812) 335-2862
FTS 812-335-2862

IOWA
Iowa Geological Survey
123 North Capitol
Iowa City, IA 52242
(319) 338-1173
FTS 319-338-1173

KANSAS
Kansas Geological Survey
1930 Avenue A, Campus West
University of Kansas
Lawrence, KS 66044
(913) 864-3965
FTS 913-864-3965

KENTUCKY
Kentucky Geological Survey
University of Kentucky
311 Breckinridge Hall
Lexington, KY 40506
(606) 257-5863
FTS 606-257-5863

LOUISIANA
Louisiana Geological Survey
Department of Natural Resources
Box G, University Station
Baton Rouge, LA 70813
(504) 342-6754
FTS 504-324-6754

MAINE
Maine Geological Survey
Department of Conservation
State House, Station 22
Augusta, ME 04330
(207) 289-2801
FTS 207-289-2801

MARYLAND
Maryland Geological Survey
The Rotunda
711 West 40th Street, Suite 440
Baltimore, MD 21211
(301) 338-7084
FTS 922-3311 (operator)

MASSACHUSETTS
Department of Environmental Quality Engineering
Division of Water Ways
1 Winter Street, Seventh Floor
Boston, MA 02108
(617) 292-5690
FTS 617-292-5690

MICHIGAN
Geologic Survey Division
Michigan Department of Natural Resources
Stevens T. Mason Building
PO Box 30028
Lansing, MI 48909
(517) 373-1256
FTS 517-373-1256

MINNESOTA
Minnesota Geological Survey
2642 University Avenue
St. Paul, MN 55114
(612) 373-3372
FTS 612-373-3372

MISSISSIPPI
Mississippi Geological, Economic and Topographical Survey
PO Box 5348
Jackson, MS 39216
(601) 354-6228
FTS 601-354-6228

MISSOURI
Department of Natural Resources
Division of Geology and Land Survey
PO Box 250
Rolla, MO 65401
(314) 364-1752
FTS 314-364-1752

MONTANA
Montana Bureau of Mines and Geology
Montana College of Mineral Science and Technology
Butte, MT 59701
(406) 496-4181
FTS 585-5011 (operator)

NEBRASKA
Conservation and Survey Division
University of Nebraska
Lincoln, NE 68588
(402) 472-3471
FTS 402-472-3471

NEVADA
Nevada Bureau of Mines and Geology
University of Nevada
Reno, NV 89557-0088
(702) 784-6691
FTS 598-6011 (operator)

NEW HAMPSHIRE
Department of Resources and Economic Development
117 James Hall
University of New Hampshire
Durham, NH 03824
(603) 862-1216
FTS 834-7011 (operator)

NEW JERSEY
New Jersey Geological Survey
CN-029
Trenton, NJ 08625
(609) 292-2576
FTS 609-292-2576

NEW MEXICO
New Mexico Bureau of Mines and Mineral Resources
Campus Station
Socorro, NM 87801
(505) 835-5420
FTS 505-835-5420

NEW YORK
New York State Geological Survey
State Science Service, Room 3140
Cultural Education Center
Albany, NY 12230
(518) 474-5816
FTS 518-474-5816

NORTH CAROLINA
North Carolina Geological Survey Section
PO Box 27687
Raleigh, NC 27611
(919) 733-2423
FTS 919-733-2423

NORTH DAKOTA
North Dakota Geological Survey
University Station
Box 8156-58202
Grand Forks, ND 58201
(701) 777-2231
FTS 783-5771 (operator)

OHIO
Ohio Division of Geological Survey
Fountain Square, Building B
Columbus, OH 43224
(614) 265-6605
FTS 614-265-6605

OKLAHOMA
Oklahoma Geological Survey
University of Oklahoma
830 Van Vleet Oval, Room 163
Norman, OK 73019
(405) 325-3031
FTS 736-4011 (operator)

OREGON
Department of Geology and Mineral Industries
1005 State Office Building
Portland, OR 97201
(503) 229-5580
FTS 503-229-5580

PENNSYLVANIA
Bureau of Topographic and Geological Survey
Department of Environmental Resources
PO Box 2357
Harrisburg, PA 17120
(717) 787-2169
FTS 717-787-2169

PUERTO RICO
Servicio Geologico de Puerto Rico
Department de Recursos Naturales
Apartado 5887
Puerta de Tierra
San Juan, PR 00906
(809) 723-2716
FTS 809-723-2716

RHODE ISLAND
Statewide Planning Program
265 Melrose Street
Providence, RI 02907
(401) 277-2656
FTS 838-1000 (operator)

SOUTH CAROLINA
South Carolina Geological Survey
Harbison Forest Road
Columbia, SC 29210
(803) 758-6431
FTS 803-758-6431

SOUTH DAKOTA
South Dakota Geological Survey
Science Center
University of South Dakota
Vermillion, SD 57069
(605) 624-4471
FTS 782-7000 (operator)

TENNESSEE
Department of Conservation
Division of Geology
701 Broadway
Nashville, TN 37203
(615) 742-6691
FTS 615-742-6691

TEXAS
Bureau of Economic Geology
University of Texas at
Austin
University Station, Box X
Austin, TX 78712
(512) 471-1534
FTS 729-4011 (operator)

UTAH
Utah Geological and Mineral Survey
606 Black Hawk Way
Salt Lake City, UT 84108
(801) 581-6831
FTS 801-581-6831

VIRGINIA
Virginia Division of Mineral
Resources
PO Box 3667
Charlottesville, VA 22903
(804) 293-5121
FTS 937-6011 (operator)

WASHINGTON
Division of Geology and Earth
Resources
Department of Natural Resources
Olympia, WA 98504
(206) 459-6372
FTS 206-459-6372

WEST VIRGINIA
West Virginia Geological and
Economic Survey
PO Box 879
Morgantown, WV 26507
(304) 594-2331
FTS 923-1511 (operator)

WISCONSIN
Wisconsin Geological and Natural
History Survey
University of Wisconsin Extension
1815 University Avenue
Madison, WI 53705
(608) 262-1705
FTS 608-262-1705

WYOMING
Geological Survey of Wyoming
PO Box 3008
University Station
Laramie, WY 82071
(307) 742-2054, 766-2286
FTS 328-1110 (operator)

APPENDIX H: COASTAL AND MARINE INFORMATION CENTERS

Speciality Libraries - Coastal

Atlantic Coastal Resource Information Centre Library
Council of Maritime Premiers
Box 310
Amherst, NS, Canada B4H 3Z5
(902) 667-7231

Coastal Engineering Archives
Coastal and Oceanographic Engineering Department
University of Florida
433 Weil Hall
Gainesville, FL 32611
(904) 392-2710

Coral Gables Library
National Oceanic and Atmospheric Administration
Gables 1 Tower, 6th Floor
Coral Gables, FL 33146
(305) 666-0413

Denver Library
US Geological Survey
Denver Federal Center
Stop 914, Box 25046
Denver, CO 80225
(303) 236-1000

The Earth Resource Observation System (EROS) Data Center
US Geological Survey
Sioux Falls, SD 57198
(605) 594-6511

Great Lakes Environmental Research Laboratory Library
National Oceanic and Atmospheric Administration
2300 Washtenaw Avenue
Ann Arbor, MI 48104
(313) 668-2242

Library
Flagstaff Field Center
US Geological Survey
2255 N Gemini Drive
Flagstaff, AZ 86001
(602) 779-3311

Library
Moss Landing Marine Laboratories
California State University and Colleges
Box 223
Moss Landing, CA 95039
(408) 633-3304

Library
Ocean and Coastal Law Center
School of Law
University of Oregon
Eugene, OR 97403

Library
US Army Engineer Waterways Experiment Station
Vicksburg, MS 39180-0631
(601) 634-2543
FTS 542-2543

Library
US Geological Survey
Federal Building
300 E 8th Street
Austin, TX 78701
(512) 482-5520

Library
US Geological Survey
345 Middlefield Road
Menlo Park, CA 94025
(415) 323-8111

Library
US Geological Survey
National Center
Mail Stop 950
Reston, VA 22092
(703) 860-6671
FTS 928-6671

Main Library
Library and Information Services Division
National Oceanic and Atmospheric Administration
6009 Executive Blvd.
Rockville, MD 20852
(301) 443-8358

Map Library
National Ocean Service
National Oceanic and Atmospheric Administration
6501 Lafayette Avenue
Riverdale, MD 20737
(301) 436-6978

National Referral Center for Science and Technology
Library of Congress
John Adams Building, Room 5228
Washington, DC 20540
(202) 287-5670

Navy Library
Naval Oceanographic Office
US Navy
NSTL
Bay St. Louis, MS 39522
(601) 688-4597

Ocean Engineering Information Centre
Memorial University of Newfoundland
St. John's, NF, Canada A1B 3X5
(709) 737-8377

Ralph M. Parsons Laboratory
Department of Civil Engineering
Masschusetts Institute of Technology
Building 48-411
Cambridge, MA 02139
(617) 253-2994

Research Library
Woods Hole Oceanographic Institution
Woods Hole, MA 02543
(617) 548-1400

Scripps Institute of Oceanography Library
University of California, San Diego
LaJolla, CA 92093
(619) 452-3274

Sea World, Inc. - Library
1720 S Shores Road
San Diego, CA 92109
(619) 222-6363

Technical Library
Naval Ocean Systems Center
US Navy
San Diego, CA 92152
(619) 225-6171

Technical Library
Oceanographic Services, Inc.
25 Castilian Drive
Goleta, CA 93117
(805) 685-4521

Water Resources Center Archives
University of California, Berkeley
410 O'Brien Hall
Berkeley, CA 94720
(415) 642-2666

Retrieval and Referral Centers

Coastal Engineering Information Analysis Center
Coastal Engineering Research Center
US Army Engineer Waterways Experiment Station
Vicksburg, MS 39180-0631
(601) 634-2012

Coastal Zone Information Center/ N-OR M4
Office of Ocean and Coastal Resources Management
2001 Wisconsin Avenue, NW
Washington, DC 20235
(202) 634-4255

Defense Documentation Center
US Department of Defense
Defense Supply Agency
Cameron Station
Alexandria, VA 22314

Dialog Information Services, Inc.
3460 Hillview Avenue
Palo Alto, CA 94304
(800) 227-1960

Maritime Research Information Service
US Department of Commerce
Maritime Administration
Maritime Information Committee
National Academy of Science
2101 Constitution Avenue, NW
Washington, DC 20418

National Climatic Data Center
National Environmental Satellite, Data, and Information Service
National Oceanic and Atmospheric Administration
Federal Building
Asheville, NC 28801

National Environmental Data Referral Service
National Environmental Satellite, Data, and Information Service
National Oceanic and Atmospheric Administration, E/AIX3
3300 Whitehaven Street, NW
Washington, DC 20235
(202) 634-7722

Coastal Information System
Department of Environmental Sciences
University of Virginia
Charlottesville, VA 22903
(804) 924-3809

National Geophysical Data Center
National Environmental Satellite, Data, and Information Service
National Oceanic and Atmospheric Administration
3100 Marine Avenue
Boulder, CO 80302

National Oceanic Data Center
National Environmental Satellite, Data, and Information Service
National Oceanic and Atmospheric Administration
2001 Wisconsin Avenue, NW
Washington, DC 20235

National Referral Center for Service and Technology
Library of Congress
10 First Street, SE
Washington, DC 20540

National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
FTS 737-4650

National Water Data Storage and Retrieval System
Water Resources Division
US Geological Survey
National Center, Mail Stop 437
Reston, VA 22092
(703) 860-6871

Smithsonian Science Information Exchange
Smithsonian Institute
1730 M Street, NW
Washington, DC 20036

Water Resources Scientific Information Center
Office of Water Resources Research
US Department of Interior
Washington, DC 20240

World Data Center A for Marine Geology and Geophysics
National Oceanic and Atmospheric Administration, D64
325 Broadway
Boulder, CO 80303
(303) 497-6487