UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Preliminary digital data for part of a regional, three-dimensional map of Quaternary sediments: southern Lake Michigan area

by

David R. Soller[1]

Open-file Report 91-356-A

1991

[1]Reston, Virginia

CONTENTS

ILLUSTRATION

Abstract

This report contains preliminary digital map data for part of a U.S. Geological Survey (USGS) map that will be produced using digital techniques. The map shows the thickness and character of Quaternary sediments in the glaciated United States east of the Rocky Mountains. When digital data are available for the entire map area, they will be processed into a Geographic Information System (GIS) data base for public release.

Introduction

A USGS map has been compiled that shows the thickness and character of Quaternary sediments in the glaciated United States east of the Rocky Mountains (Soller, in press a,b,c,d). The map was compiled at 1:1,000,000 scale from about 850 sources of information (Soller, in press e). A discussion of the map's scope and format is given in Soller (1989).

The map is in preparation for printing with digitally-produced color separates. The map is divided into more than 20 parts to facilitate digital editing and production of separates. Upon completion of digital files for each part of the map area, all files will be edge-joined and will undergo final inspections of the data prior to assembling into a Geographic Information System (GIS) data base for public release.

In this report, a preliminary version of digital map data for part of the map area are released. These data are in the 4°x6° Chicago quadrangle (International Map of the World series), which is bounded by 40-44° North Latitude and 84-90° West Longitude (see illustration). A full-color image of the map data in that area is shown in Soller (1991). These digital map data have not been thoroughly checked according to USGS editorial standards; prior to map printing and distribution of the digital data in a more formal USGS series, these data will be given more rigorous editorial scrutiny. Because of the regional map scale and the wide variability of data quality and reliability, the digital map data should not be used for any local or site-specific analysis or map display. It is recommended that the data be used at map publication scale (1:1,000,000).

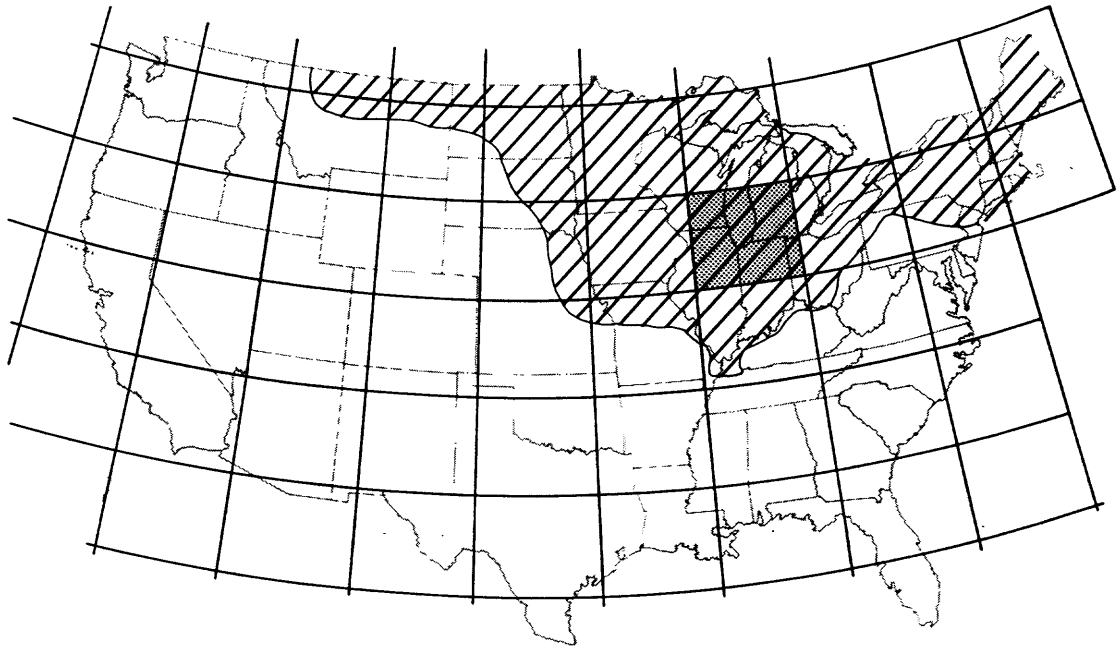
Computer requirements

To use these map data, the following equipment must be available:

- -- a computer with DOS (version 2.01 or higher) operating system, a 3.5" high-density disk drive, and a hard disk drive with at least 8.5 MB of unused storage space;
- -- a computer with ARC/INFO GIS software;
- -- a method of file transfer between these computers, unless the DOS computer also supports ARC/INFO.

Diskette contents

The six accompanying 3.5" high density (about 1.44MB) diskettes are formatted for the DOS operating system. Map data are contained in four files which are in ARC/INFO export format. The largest of the files, about 7.87 MB, has been subdivided to fit on the six diskettes. Diskette #1 contains: the first part of the subdivided file; a program that reassembles that file and writes all files to the hard disk; and an ASCII file ("READ.ME") containing a brief overview of computer requirements and instructions for reading the diskettes. Diskettes #2 through #6 contain



Index map showing the region covered by the Quaternary sediments map of Soller (in press a,b,c,d) in ruled pattern, with the area covered by this report shown in stippled pattern.

subsequent parts of the subdivided file. Diskette #6 also contains the other three ARC/INFO export-format files and an ASCII version of this text.

Accessing the map data

To use these map data, they must be read from the diskettes, written to a hard disk where the largest file is reassembled, and imported into ARC/INFO. To begin this procedure, insert Diskette #1 into the disk drive and view the ASCII file named "READ.ME." This file contains all necessary instructions to read and write the data. To write all files to the hard drive, type the following command and press the Enter or Return key:

system prompt> **a:\combine a c \directory**

where **a** = source disk (the floppy disk drive), **c** = target disk (the hard disk drive), and **\directory** = target directory on drive "c." In this command, the colon after the drive designation ("a:", for example), required by DOS, need not be entered.

The "combine" command automatically writes itself to the designated directory on the target drive and begins reading the subdivided ARC/INFO export file on Diskette #1. When these data have been read, the program will prompt the user for Diskettes #2 through #6 and append these data. When all data have been read for the subdivided file, the program writes the remaining three export files and the ASCII text file from Diskette #6. Finally, the program deletes itself from the target disk. Upon completion of the program, the target directory will contain four ARC/INFO export files (UNION.E00, SUBSURF.E00, MISCLN.E00, and MISCPT.E00) and an ASCII version of this text (EXPLAN.TXT).

To use the map data, transfer the export files to a computer that has ARC/INFO software. Using the IMPORT command, create ARC/INFO map coverages named "UNION", "SUBSURF", "MISCLN", and "MISCPT" as follows:

Arc: **IMPORT COVER UNION.E00 UNION**
Arc: .....etc.....

Map information

The ARC/INFO coverage named "UNION" contains information on the character of surface sediments and the total thickness of Quaternary sediments. This information is contained in items "GEOL" and "THICK" respectively in the polygon attribute table, as follows:

Character of surface sediments

GEOL values		Explanation
101	–	coarse grained, stratified Quaternary sediment occurs at land surface
102	–	fine grained, stratified Quaternary sediment occurs at land surface
103	–	glacial till occurs at land surface
104	–	bedrock is exposed in places, and glacial sediment is patchy
105	–	exposed bedrock

106	–	organic-rich sediment (peat, for example) occurs at land surface
107	–	open water, where subbottom Quaternary sediments are not mapped
0	–	no data

Total thickness of Quaternary sediments

THICK values		Explanation
201	–	Quaternary sediment between 0 and 50 ft thick
202	–	Quaternary sediment between 50 and 100 ft thick
203	–	Quaternary sediment between 100 and 200 ft thick
204	–	Quaternary sediment between 200 and 400 ft thick
205	–	Quaternary sediment between 400 and 600 ft thick
206	–	Quaternary sediment between 600 and 800 ft thick
207	–	Quaternary sediment greater than 800 ft thick
0	–	no data

The "UNION" arc attribute table contains the item "CODE", which identifies the nature of each line. The GIS data base version of this file will contain more complete descriptions for each line, such as thickness contour values and identification of "stacked" thickness contour lines (two or more thickness contours so closely spaced that they form a single line at this map scale).

CODE values		Explanation
0	–	thickness contour line
1	–	contact between surficial geologic units
2	–	contact between till and patchy glacial deposits
4	–	line between geologic unit and open water ("GEOL" = 107)

The "SUBSURF" coverage contains information on the areal extent of certain widespread buried glacial units (aquifers, for example) and certain thin, patchy surface units (described below as "veneers"). Thicknesses of these units and depths to the buried units are not given. Data in this file are based on limited regional subsurface information; they are, therefore, considerably less reliable than data in the coverage described above ("UNION"). Information is contained in the item "CODE" in the polygon attribute table, as follows:

CODE values		Explanation
301	–	buried coarse grained, stratified sediment
302	–	veneer of coarse grained, stratified sediment
304	–	veneer of fine grained, stratified sediment
305	–	buried glacial till
307	–	loess greater than 20 ft thick occurs at land surface
308	–	veneer of organic-rich sediment above more than 50 ft of glacial sediment
0	–	no data

The "MISCLN" coverage contains information on the extent of glaciation, in the arc attribute table as follows:

CODE values		Explanation
404	–	maximum extent of glaciation
405	–	maximum extent of late Wisconsinan glaciation
0	–	edge of map

The "MISCPT" coverage contains only the approximate locations of drumlins, so point attribute items need not be discussed here.

Map projection

Map data are in the Lambert Conformal Conic projection, with projection parameters as follows: standard parallels at 40° 40' and 43° 20' North Latitude; central meridian at 87° West Longitude; and latitude of the projection's origin at 42° North Latitude. Map coordinates are in meters.

Acknowledgments

This work was supported by the Environmental Protection Agency (Office of Ground Water Protection), the USGS National Geologic Mapping Program, and the USGS Director's GIS fund. I thank Wai-See Moy, USGS, for writing the program to extract the map data from the diskettes.

References cited

Soller, D.R., 1989, A regional three-dimensional map of Laurentide glacial sediments in the United States: Overview and applications for hydrogeology and land use: International Symposium on Hydrogeologic Maps as Tools for Economic and Social Development, Hannover, Federal Republic of Germany, May 30-June 2, 1989, Memoires volume, p. 107-114. (Reprinted as Illinois State Geological Survey Reprint 1989J).

Soller, D.R., 1991, Applying GIS to resource management: Geotimes, July, 1991, p. 16-18 and cover illustration.

Soller, D.R., in press a, Map showing the thickness and character of Quaternary sediments in the glaciated United States east of the Rocky Mountains: Northeastern States, the Great Lakes, and parts of southern Ontario and Atlantic offshore area (east of 80°31' West Longitude): U.S. Geological Survey Miscellaneous Investigations Series, Map I-1970 A, scale 1:1,000,000.

Soller, D.R., in press b, Map showing the thickness and character of Quaternary sediments in the glaciated United States east of the Rocky Mountains: Northern Great Lakes States and Central Mississippi Valley States, the Great Lakes, and southern Ontario (80°31' to 93° West Longitude): U.S. Geological Survey Miscellaneous Investigations Series, Map I-1970 B, scale 1:1,000,000.

Soller, D.R., in press c, Map showing the thickness and character of Quaternary sediments in the glaciated United States east of the Rocky Mountains: Northern and Central Plains States (90° to 103° West Longitude): U.S. Geological Survey Miscellaneous Investigations Series, Map I-1970 C, scale 1:1,000,000.

Soller, D.R., in press d, Map showing the thickness and character of Quaternary sediments in the glaciated United States east of the Rocky Mountains: Northern Plains States (west of 103° West Longitude): U.S. Geological Survey Miscellaneous Investigations Series, Map I-1970 D, scale 1:1,000,000.

Soller, D.R., in press e, Text and references to accompany "Map showing the thickness and character of Quaternary sediments in the glaciated United States east of the Rocky Mountains": U.S. Geological Survey Bulletin 1921.