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The Development of the Illinois Statewide Inventory of Land-Based Disposal Sites

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Illinois State Geological Survey

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HWRIC RR 010

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ABSTRACT

The Statewide Landfill Inventory is a computerized data file of all known waste disposal sites in the State of Illinois. In addition to such basic information, as name, location, size, type of disposal, and sources and types of waste, the Inventory identifies agencies with background data and miscellaneous information on file. The types of possible additional information include hydrogeologic reports, site plans, operational records, monitoring data, permit information, dates discovered, opened and closed, and CERCLA/RCRA identification. This Inventory is part of the database of the Illinois Hazardous Waste Research and Information Center, 1808 Woodfield Drive, Savoy, IL 61874.

EXECUTIVE SUMMARY

The Illinois State Geological Survey compiled the data for the Statewide Landfill Inventory to determine those sites in Illinois where all types of wastes have been intentionally disposed of through burial, surface impoundment, or land application practices. The information was obtained from various governmental agency data files, published reports, and local records. The Inventory, which has been established through this project, is part of the database of the Hazardous Waste Research and Information Center (HWRIC). The Inventory is accessible now either on the PRIME computer of the Department of Energy and Natural Resources (DENR), where it can interact with a Geographic Information System (GIS) or independently on the HWRIC Prime Computer.

The early part of the project was described in an Interim Report (Dixon, 1985) and a Progress Report (Dixon and Hensel, 1985). The purpose of this report is to describe the work completed to date on the project and to identify the need for ongoing maintenance and increased accessibility to the database.

Current Work

Current work for this project was divided into seven tasks, based on the contract proposal. Three of the tasks have been terminated with this study, but the other four tasks were open-ended. All tasks are described in detail in the report.

The completed work included two pilot studies utilizing data from the Inventory, and this report. One pilot study correlated the locations of historical generators of hazardous wastes with the locations of landfills for Mc Henry County, and the other pilot study evaluated hydrogeologic conditions of five selected sites at which hazardous wastes had been disposed. The other work involved compiling landfill data from state and county sources, developing an empirical ranking system for those sites that have no hydrogeologic evaluation on file, adding sites that have received permits, and incorporating all this data into the HWRIC database. Distribution of the different types

of disposal sites described in this report is represented on a series of small scale maps (Appendix C).

Additional Needs

To be effective, the Inventory must be maintained by adding those sites that are either permitted for the first time or reclassified as disposal sites by IEPA. The Inventory should be updated with information requested but not yet received from all the counties in Illinois as well as information from federally owned facilities, which have not yet been contacted. In addition, hydrogeologic information from ISGS files, which will soon be computerized, as well as information from a recent ISGS study on filled quarry sites in the Chicago area should be included in the Inventory. Preliminary hydrogeologic studies should be performed for those sites with a high rank based on the empirical procedure established as part of this phase of the project.

Both the importance of the problem of hazardous waste disposal and the fact that its coordination cuts across many federal, state, and local agencies make it imperative that a user access system be developed to facilitate wider use of the database. It is suggested that this user access system be available to state and local government agencies on a cooperative basis, and, to the general public, on a user fee basis.

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1. INTRODUCTION

1.1. Purpose

The function of the Hazardous Waste Research and Information Center (HWRIC) is to provide technical support, research, and service for the development of a comprehensive hazardous waste management strategy for Illinois (Barcelona and Garrison, 1985). The Statewide Inventory of Land-Based Disposal Sites, which will be referred to as the "Inventory", is a computerized database that supplements the problem characterization and assessment portion of HWRIC's Research Program. The Inventory was funded for 18 months through two consecutive grants from the Department of Energy and Natural Resources (DENR) of eight and ten month duration, respectively, in fiscal years 1985 and 1986. The study has resulted in the most complete database of landfill, impoundment, and land application disposal sites in Illinois.

As part of defining the magnitude and extent of the hazardous waste problem, it is necessary to have information on locations and characteristics of past and present waste-disposal methods. The purpose of this study has been to gather and list the available sources of basic data on all known waste disposal sites in the state. The Inventory contains information collected from agencies of the federal, state, and county governments, and it is open-ended to allow for the addition of data on either existing or newly identified sites. Each site is described by the known available information: location, type of disposal site, hydrogeologic setting, waste types or sources, and background data (site history, previous studies, and records of operation and monitoring). This information has been incorporated into the HWRIC database where it is available not only to HWRIC but also to other researchers and the public. The site locations have been placed into a computer mapping system, called a Geographic Information System (GIS), which contains data on a broad range of environmental subjects (Treworgy, 1984; and Hines et al., 1986). Thus, the GIS allows the direct comparison of the spatial relationships of waste disposal sites to a number of other subjects (such as groundwater, surface hydrography, administrative units, and infrastructure) either individually or in combination.

1.2. Scope

This study has focused on the identification of sites where both solid and liquid waste-disposal activities either are occurring or have occurred on land. This includes three methods of disposal: land burial, impoundment, and land application. An effort has been made to exclude those sites that either are or have been used only for other associated activities (treatment, transportation, generation, and storage) involving waste materials. However, as discussed later, many non-disposal surface impoundments could not be omitted. The types of operations that have been intended to be excluded from the Inventory are sites associated with: the generation of wastes (unless a portion of

the facility is used intentionally for on-site disposal); the storage of wastes (some of these sites may be de facto disposal sites; e.g., oil field brine pits); waste transfer stations; the transportation of wastes; and waste-treatment facilities. (Municipal impoundments are included in the impoundment file). Incineration is included in the computer format, but this disposal method is only identified where it occurs as an adjunct to a land disposal site. Disposal of liquids by discharge into surface waterways or by underground injection is, by definition, outside the scope of the Inventory. Some construction sites in urban areas use demolition debris as fill material under driveways and parking lots. These sites, as well as cemeteries and archaeological sites, are not considered to be waste-disposal sites in the sense of this Inventory. The three methods of waste disposal included in this study involve the intent to permanently dispose of waste on land.

Land burial is a common method of waste disposal that has been occurring either accidentally or purposely since prehistoric time in Illinois. Techniques in land burial have been extensively modified over the past several decades, and current studies of burial practices are leading to the development of procedures intended to protect the environment more effectively. Although the expanded use of recycling and incineration in the future may reduce the volume of wastes requiring land burial, some residue will ultimately remain and will probably be buried at a land disposal site.

Another method of waste disposal is the use of impoundments or lagoons that allow materials to either precipitate or settle from a fluid waste stream. A study performed by the Illinois Environmental Protection Agency (IEPA), The Surface Impoundment Assessment (SIA) (Piskin, 1980), identified over 5000 impoundment facilities in Illinois. Approximately one-fourth of the facilities were assessed for operational features and potential for groundwater pollution. The remaining impoundments were characterized by the owners. Due to an apparent reluctance on the part of impoundment owners to describe their own facilities as waste disposal operations, less than one percent of the facilities were classified as disposal impoundments. More than half of the facilities were "evaporation" pits for brines collected along with the production of oil and gas. Unfortunately, in this climatic zone the annual rate of evaporation does not exceed the annual rainfall, and the brines, rather than evaporating, have infiltrated the shallow groundwater system. This practice, which is regulated by the Illinois Department of Mines and Minerals (IDM&M), is now being replaced by underground injection of the brines back into source formations. With the recognition of the possible loss of a large number of de facto disposal sites, if the descriptions in the SIA were accepted at full face value, it was decided to incorporate all the computerized data from the SIA into a separate file, the Impoundment File, within the Inventory. The main reason for establishing the separate file was to simplify data handling of the large number of sites and thereby speed up computer operation. As more accurate descriptions of impoundment

facilities become available, the sites which are definitely not related to disposal activities can be deleted from the Impoundment File.

The land application of wastes or land farming of wastes is a disposal method in which materials with potentially beneficial properties, primarily nutrients, are worked into surficial soils. This method has been used to a relatively limited extent to dispose of some types of waste in Illinois. These types of wastes include treated effluents, and thickened sludges. Treated effluents have been used extensively for irrigation in some of the western states, but irrigation has not been a pressing need in Illinois, and consequently, most effluents are discharged into surface waterways according to permit requirements. Thickened sludges are derived, for example, from the dredging of waterways, the refining of petroleum, or the treatment of municipal sewage. Although efforts to establish the regular use of this method have been made, land application has not been used extensively because many high-volume sources of sludge contain trace amounts of a few chemicals such as heavy metals and some organic compounds, and there is public conern that these components might enter the food chain with unfavorable results.

One part of this study has been to identify waste-disposal sites that closed prior to the establishment of IEPA. It has been arbitrarily decided that a former waste-disposal site with an area less than one acre in size need not be included in the Inventory unless it is suspected of containing hazardous waste.

1.3. Previous Reports and Related Work

This is the third report prepared on the Inventory; an Interim Report was prepared in June 1985, and a Progress Report in October 1985. This report draws heavily on both reports, but it is organized in a slightly different manner.

Some related work being supported by HWRIC includes current or newly completed studies listed among the references at the end of this report (Schock et al., 1986, and Colten, 1986).

2. PLAN OF STUDY

The plan of study for this portion of the creation of the Inventory is an extension of the three original tasks (current Tasks 1, 5, 6, and 7) and an amplification of the previous study by the inclusion of three additional tasks (current Tasks 2, 3, and 4). These additional tasks are related in part to the recommendations of the previous study. This section of the report describes the tasks individually.

2.1. Task 1

This was a continuation of Task 1 of the previous contract. The inventory of all known disposal sites in Illinois has continued to be compiled from state and county level sources, and each site has been described with regard to: (A) Location, (B) Type, (C) Hydrogeologic setting, (D) Waste source(s), and (E) Background data (site history, previous studies, records of operation and monitoring, etc.)

2.2. Task 2

A pilot study was carried out for Mc Henry County to correlate the location of past generators of hazardous wastes with contemporaneous waste-disposal site locations, to determine potential disposal areas at which hazardous wastes may have been unwittingly disposed. This was an effort to demonstrate an application of information from the Inventory. Mc Henry County was selected because information on generators of hazardous wastes was available (Schock et al., 1986). The geographic focus of the task was influenced by the availability of information on generators at the time work on the task was started.

2.3. Task 3

At the time of the submittal of the proposal, the study had progressed sufficiently that it was evident that for most sites no hydrogeologic evaluations had been performed. To the staff members in the Groundwater Section of the ISGS who were establishing the Inventory, this was obviously a major deficiency that needed careful and thorough evaluation. This task involved sorting out the sites for which no hydrogeologic information was on file and ranking them in order of apparent need according to empirical criteria. The three original criteria selected were: the types of waste in a site (presence of hazardous wastes would be most critical, and presence of only nonputrescible wastes would be least critical); the volume of waste in a site (accurate information on this parameter was not readily available for most sites, thus the volume was assumed to be relatively proportional to the area); and the relative susceptibility to pollution of a site. Regional maps have been developed, based on various hydrogeologic parameters, to show areas of susceptibility (Berg and Kempton, 1984; and Berg, Kempton, and Cartwright, 1984). A fourth criterion--type of disposal--was added. This prioritization ideally would have been a serial list of the sites in the order of need for

evaluation; however, in practice it was clustered into several groups of sites with similar characteristics based on the four criteria.

2.4. Task 4

This was a pilot study of five sites selected from the group with greatest need for evaluation as determined in Task 3. This had been planned as a general analysis of the entire list with specific recommendations for additional studies at individual sites, but the use of an example was considered more effective.

2.5. Task 5

To emphasize that the Inventory is open-ended and that new sites are continually being permitted or discovered, this task was separated from Task 1. An independent effort was made to add newly permitted sites to the Inventory, and each site was described as to: (A) location, (B) type, (C) hydrogeologic setting, (D) waste source(s), and (E) background data (site history, previous studies, records of operation and monitoring, etc.)

2.6. Task 6

This is a continuation of Task 2 from the previous contract. All pertinent information from the above tasks has been incorporated into the HWRIC data base.

2.7. Task 7

This task, as a repetition of Task 3 from the previous contract, is the means of accountability for the project and provides the tangible results of the work accomplished during the contract period. A report and maps have been prepared to show the status of the Inventory at the close of the reporting period for fiscal year 1986.

3. IMPLEMENTATION OF STUDY

3.1. Gathering of Data

Information for the Inventory was obtained from a number of sources at the federal, state, and county levels of government. Copies of magnetic tapes containing computer files that included information on waste-disposal sites were obtained during the previous contract period through the Illinois State Water Survey (ISWS) from the following sources: the National Technical Information Service (NTIS) file of sites for the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) more commonly known as Superfund; the NTIS file of sites for the Resource Conservation and Recovery Act (RCRA); the United States Environmental Protection Ageny (USEPA) file of Illinois data from the Surface Impoundment Assessment System (SIA); the Illinois Environmental Protection Agency (IEPA) Selected Inventory File; and the Metropolitan Sanitary District of Greater Chicago (MSDGC) list of Cook County waste facilities. Of these magnetic tape records the most useful for this study were the Selected Inventory File and the SIA file which were both used as the original sources of primary information for the Landfill File and Impoundment File, respectively, in this Inventory. All the magnetic tape files were out of date to various degrees, including the two files used. However, the Selected Inventory and SIA files provided the most complete information on their respective subjects. The CERCLA and RCRA files contain information provided to USEPA by IEPA. All disposal sites in these two files are listed in the Selected Inventory File. A cross check of the MSDGC file with the Selected Inventory file showed that all Illinois disposal sites in the MSDGC file (some sites were in other states) were also listed in the Selected Inventory File.

The IEPA Selected Inventory File is also produced for IEPA internal use in microfiche form which is updated monthly. The format used in the microfiche copies has been modified from that which was used at the time the magnetic tape copy was produced. The information in microfiche is more accurate and up to date, but it must be processed manually site-by-site. Updated copies of the microfiche file were obtained periodically from IEPA personnel.

Other sources of written information related to waste-disposal sites, not listed above include: 1) "Inventory of Open Dumps" (USEPA, 1983). The publication, which is periodically revised, contains information provided by IEPA. 2) "Inventory and Assessment of Surface Impoundments in Illinois" (Piskin et al., 1980). This report describes and tabulates statistical information for the data contained on the SIA magnetic tape file. 3) "Inventory of Historic Solid Waste Disposal Sites in Winnebago County" (Nickolai and Gregory, 1981, and Nickolai, 1982). The memorandum and addendum contain the results of a thorough study which includes data obtained from state and county agencies as well as information from confidential interviews of numerous local citizens. Most of the included sites identified through interviews were

corroborated by multiple references. The Winnebago County study which contains admitted gaps is a benchmark for other counties to emulate. And 4) "Industrial Wastes in the Calumet Area, 1869-1970, An Historical Geography" (Colten, 1985). This report is a thoroughly documented description and analysis of the waste disposal activities that occurred, before the formation of IEPA, in a heavily industrialized area on the south side of Chicago.

3.2. Organization and Filing of Data

As the initial data were being gathered a computer form was designed for data storage to print out on 8 1/2 x 11 inch paper. The form was modifed several times as the file developed. An example of the current form is shown in Figure 1. The maximum amount of pertinent information was transferred from the magnetic tape copy of the IEPA Selected Inventory File into the Landfill File of the Inventory in the DENR Prime computer using INFO, a relational data base management system (Henco Software, Inc., no date).

Permission was obtained from IEPA to examine all files of waste-disposal sites. IEPA provided the above mentioned microfiche copy of the Selected Inventory and the Federal Information Processing System (FIPS) code book. Cross checking the microfiche against the printout of the Landfill File identified some storage, transporter, and generator sites that had been erroneously transferred into the Inventory, and some illegal dumps. The FIPS code, as currently used by IEPA in assigning identification numbers to sites, determines the first six digits of the 10-digit IEPA number in which the first three digits indicate the county, the next three digits indicate the city or township, and the last four digits indicate individual sites. The county numbers for Illinois are listed in Table 1.

After a record for an individual disposal site was updated with information from the microfiche file, numerous blank items remained. These blanks were filled in where possible from the IEPA files. This portion of the work was done county-by-county in the order shown in Table 2. Winnebago and De Witt Counties were studied first because special studies were carried out for those counties. The next 15 counties were the counties containing larger industrial centers, and they were reviewed in order of decreasing potential of landfill sites. The remainder of the list was addressed alphabetically.

A special subclass of disposal sites was identified in the process of gathering data from the IEPA files. This unofficial subclass is referred to as nuisance or complaint sites. These are sites for which complaints have been filed with IEPA, but subsequent inspection revealed them to be insignificant. Most of these sites are listed as having an area of zero, and little descriptive information is available for them. These sites are probably regulated by local ordinance.

FIGURE 1: Sample Form, Landfill File

```
                        LANDFILL INVENTORY
A  IEPA NO. 0000000000              RECORD    2
   PROVISIONAL NO. 123456ABCD       SITE NAME: SAMPLE SITE

B  LOCATION:
   COUNTY: CAPITOL                  CITY/TOWNSHIP: HOME TOWN
   LATITUDE: 234456    LEGAL: SWNESENW  SEC.24  T.10N  R.03E   3 PM
   LONGITUDE: 123456   LAMBERT-FEET:X 1234567    Y 1234567

C  OWNER: ACME SUPPLY CO.                        LANDFILL SIZE
   OPERATOR: MR. JOHN DOE                       IN ACRES:     15

D  SOURCES OF DATA:
        1) IEPA            X          5) DPH
        2) ISGS            X          6) LOCAL HD          X
        3) PCB                        7) OTHER AGENCY
        4) IDM&M                      8) OTHER

E  TYPE OF DISPOSAL: A B
        1) OPEN DUMP = A              4) INCINERATION = D
        2) SECURED CONTAINERS = B     5) SURFACE IMPOUNDMENT = E
        3) LANDFILL = C               6) LAND APPLIC. = F

F  HYDROGEOLOGIC REPORT AT: (P=PRILIMINARY, D=DETAILED, PD, NO)
        1) HWRIC     2) IEPA NO  3) ISGS P   4) OTHER

G  SOURCE(S) AND TYPES OF WASTE:
        1) HAZARDOUS SOLIDS           11) ANIMAL WASTE
        2) HAZARDOUS LIQUIDS     X    12) PATHOLOGICAL WASTE
        3) NONHAZARDOUS WASTE         13) FOUNDRY SAND
        4) SPECIAL                    14) SLAG
        5) RADIOACTIVE WASTE          15) INCINERATOR ASH
        6) GENERAL SOLID WASTE        16) DEMOLITION DEBRIS
        7) INDUSTRIAL WASTE           17) CONCRETE/ASPHALT
        8) OIL FIELD BRINE            18) LANDSCAPING WASTE
        9) MUNI SEWAGE SLUDGE         19) OTHER (SPACE RESERVED FOR COMMENTS)
       10) SEPTIC SLUDGE              20) UNKNOWN              X

H  BACKGROUND DATA: (Y=YES, N=NO)
   1) STATUS: INACTIVE                          7) RCRA SITE:
   2) PERMIT STATUS: UNPERMITTED UNAUTHORIZED   8) FORMER DISPOSAL SITE:
   3) DATE PERMITTED:      0                    9) ILLEGAL DUMP: Y
   4) DATE OPENED: 121281                      10) DATE DISCOVERED: 111483
   5) DATE CLOSED: 111583                      11) DATE CLEANED:      0
   6) CERCLA SITE: Y                           12) GW MONITORING: Y
      COMMENTS: (THIS LINE STORES 61 SPACES FOR GENERAL COMMENTS.)
                (THIS LINE STORES 61 SPACES FOR GENERAL COMMENTS.)

I  MISCELLANEOUS INFORMATION: (ON FILE AT)
   1) PREVIOUS STUDIES:
   2) SITE PLANS:
   3) OPERATION RECORDS:
   4) MONITORING DATA: ISGS
   5) OTHER RECORDS: IEPA & ACME SPLY. CO
   6) LEGAL ACTIONS:
   7) IMPOUNDMENT INVENTORY RECORD:
```

Table 1: List of County Codes

County Name	Code	County Name	Code
Adams	001	Lee	103
Alexander	003	Livingston	105
Bond	005	Logan	107
Boone	007	Mc Donough	109
Brown	009	Mc Henry	111
Bureau	011	Mc Lean	113
Calhoun	013	Macon	115
Carroll	015	Macoupin	117
Cass	017	Madison	119
Champaign	019	Marion	121
Christian	021	Marshall	123
Clark	023	Mason	125
Clay	025	Massac	127
Clinton	027	Menard	129
Coles	029	Mercer	131
Cook	031	Monroe	133
Crawford	033	Montgomery	135
Cumberland	035	Morgan	137
De Kalb	037	Moultrie	139
De Witt	039	Ogle	141
Douglas	041	Peoria	143
Du Page	043	Perry	145
Edgar	045	Piatt	147
Edwards	047	Pike	149
Effingham	049	Pope	151
Fayette	051	Pulaski	153
Ford	053	Putnam	155
Franklin	055	Randolph	157
Fulton	057	Richland	159
Gallatin	059	Rock Island	161
Greene	061	St. Clair	163
Grundy	063	Saline	165
Hamilton	065	Sangamon	167
Hancook	067	Schuyler	169
Hardin	069	Scott	171
Henderson	071	Shelby	173
Henry	073	Stark	175
Iroquois	075	Stephenson	177
Jackson	077	Tazewell	179
Jasper	079	Union	181
Jefferson	081	Vermilion	183
Jersey	083	Wabash	185
Jo Daviess	085	Warren	187
Johnson	087	Washington	189
Kane	089	Wayne	191
Kankakee	091	White	193
Kendall	093	Whiteside	195
Knox	095	Will	197
Lake	097	Williamson	199
La Salle	099	Winnebago	201
Lawrence	101	Woodford	203

Table 2: List of Preferred Order of Counties For Study
(Arranged Vertically)

Winnebago	De Kalb	Marion
De Witt	Douglas	Marshall
Cook	Edgar	Mason
Will	Edwards	Massac
Du Page	Effingham	Menard
Lake	Fayette	Mercer
Kane	Ford	Monroe
Mc Henry	Franklin	Montgomery
St. Clair	Fulton	Morgan
Madison	Gallatin	Moultrie
Peoria	Greene	Ogle
Tazewell	Grundy	Perry
Rock Island	Hamilton	Piatt
Sangamon	Hancock	Pike
La Salle	Hardin	Pope
Vermilion	Henderson	Pulaski
Macon	Henry	Putnam
Adams	Iroquois	Randolph
Alexander	Jackson	Richland
Bond	Jasper	Saline
Boone	Jefferson	Schuyler
Brown	Jersey	Scott
Bureau	Jo Daviess	Shelby
Calhoun	Johnson	Stark
Carroll	Kankakee	Stephenson
Cass	Kendall	Union
Champaign	Knox	Wabash
Christian	Lawrence	Warren
Clark	Lee	Washington
Clay	Livingston	Wayne
Clinton	Logan	White
Coles	Mc Donough	Whiteside
Crawford	Mc Lean	Williamson
Cumberland	Macoupin	Woodford

The Impoundment File in the Inventory was modified from the SIA magnetic tape file into a form similar to that used in the Landfill Inventory. A sample form of the Impoundment File is shown in Figure 2. This file contains information obtained in 1980, and no effort has been made to bring it up to date. Impoundment facilities in this file, which are described as disposal impoundments, are also listed in the Landfill File.

Each county in Illinois has been contacted to provide information on any known waste-disposal sites that would have closed before IEPA began to keep records in about 1970. Winnebago County was an exception in that a thorough inventory had already been performed (Nickolai and Gregory, 1981; and Nickolai, 1982) although the county has since been contacted. Also a De Witt County pilot study to locate landfill sites was performed jointly by the Planning and Zoning, and Health Departments. For these two counties, one heavily industrialized, and one predominantly rural, the numbers of disposal sites both on file and not on file with IEPA are compared in Table 3.

Before the remaining 100 counties were contacted, the records in the Landfill File and Impoundment File for each county were checked for accuracy and completeness using available information. Each county was provided with a packet of information including copies of: a printout of the county records in the Landfill File; a list of County impoundments; two computer-generated maps, at a scale of 1:125,000, showing the approximate locations of waste disposal sites and impoundment facilities, respectively, in the county; and blank forms on which to identify additional sites.

Table 3: Known Disposal Sites in De Witt and Winnebago Counties

County	Sites on File at IEPA	Sites Not on file with IEPA
De Witt	18	10
Winnebago	79	126

Before any maps could be produced, the information describing the location of each site had to be converted into coordinates which could be used on the GIS. ILLIMAP is a computer-based coordinate system founded on the Lambert Conformal Conic Projection (DuMontelle et al., 1968; and Swann et al., 1970). ILLIMAP programs can convert either legal land descriptions (section, township, and range) or latitude and longitude positions into X and Y coordinates expressed in Lambert "feet". These special units change slightly in length (approximately 1 part in 200 for Illinois) from north to south because points on the spherical earth have been projected onto a conic surface. The flattened cone is the map. Any site which does not have a pair of Lambert feet coordinates on the record will not plot on a map. Some areas in the

FIGURE 2: Sample Form, Impoundment File

IMPOUNDMENT INVENTORY

A ID No. ILXXXXXXXX RECORD 99999
IEPA No. 0 SITE NAME: SAMPLE SITE

B LOCATION
COUNTY: CAPITOL CITY/TOWNSHIP: HOME TOWN
LATITUDE: 234567 LEGAL: SWSWSWSW SEC. 1 T. 01N R. 01S 3 PM
LONGITUDE: 876543 LAMBERT FEET: X: 567890 Y: 123456

C OWNER: J DOE No. OF IMPOUNDMENTS: 4
OPERATOR: J DOE SITE AREA: 20 ACRES
IMPOUNDMENT AREA: 16 ACRES

D SOURCES OF DATA:

1) IEPA	X	5) DPH	
2) ISGS	X	6) LOCAL HD	
3) PCB		7) OTHER AGENCY	
4) IDM&M		8) OTHER	

E IMPOUNDMENT USE: MUN

F HYDROGEOLOGIC REPORT AT: (P=PRELIMINARY, D=DETAILED, PD, NO)
1) HWRIC 2) IEPA 3) ISGS P 4) OTHER

G SOURCE(S) AND TYPES OF WASTE:

1) HAZARDOUS LIQUIDS		7) MUNI SEWAGE SLUDGE	
2) NONHAZARDOUS LIQUIDS	X	8) SEPTIC SLUDGE	X
3) SPECIAL WASTE		9) ANIMAL WASTE	
4) RADIOACTIVE WASTE		10) OTHER	
5) INDUSTRIAL WASTE		11) UNKNOWN	
6) OIL FIELD BRINE			

H BACKGROUND DATA: (Y=YES, N=NO)

1) STATUS: CLOSED	7) RCRA SITE: N
2) PERMIT STATUS: NONE	8) FORMER DISPOSAL SITE: N
3) DATE PERMITTED: 0	9) ILLEGAL IMPOUNDMENT: Y
4) DATE OPENED:	10) DATE DISCOVERED:
5) DATE CLOSED: 0	11) DATE CLEANED:
6) CERCLA SITE: N	12) GW MONITORING WELLS: 10

COMMENTS: (THIS LINE STORES 61 SPACES FOR GENERAL COMMENTS.)
(THIS LINE STORES 61 SPACES FOR GENERAL COMMENTS.)

I MISCELLANEOUS INFORMATION: (ON FILE AT)
1) PREVIOUS STUDIES:
2) SITE PLANS: IEPA
3) OPERATING RECORDS: IEPA
4) MONITORING DATA: ISGS
5) OTHER RECORDS: IEPA
6) LEGAL ACTIONS:
7) LANDFILL-INVENTORY RECORD:

state have peculiarities in the legal land description that cannot be translated through the computer program, and coordinates for such sites must be determined by an alternate method. The software used to process the maps in the Prime computer is ARC/INFO (copyright by ESRI, October 1975).

Sufficient time was not available to contact the counties by letter asking for voluntary cooperation in this study and soliciting their response. Instead, telephone contact was established with a responsible person in a county government or large city agency on a trial and error basis. Contacts were established with: departments of health or environment; departments of planning, zoning, development or public works; departments of highways; county boards; an assessor; and a civil defense coordinator. Two contacts were established for Cook County, one for Chicago, and another for the remainder of the county. Some counties do not have a health department; some counties are served by multi-county departments that do not identify counties in the department name; and some county health departments are concerned only with human diseases. A current list of addresses of county health departments can be secured from the Illinois Department of Public Health.

At the time of the first telephone contacts, the computer-generated county maps were not yet available, and there was a lag time of about two weeks between the time of initial contact and the time the packet of information with cover letter was sent. Later, when the production of maps became routine, contact with a county was not initiated until maps were available. Some unavoidable delays developed between the time of initial contact and the time the packet of information was mailed to some counties. The process began December 13, 1985, and ended May 1, 1986. As of June 27, 1986, a response had been received from 11 of the first 20 counties contacted and from 16 of the last 80 counties contacted.

Task 2 was a pilot study attempting to correlate the locations of historical hazardous waste generators with the locations of known landfills for Mc Henry County. In order to conduct this study, information about historical generators was obtained from the ISWS, which is gathering this information for nine counties in the state (Schock et al., 1986).

In addition, the ISWS also provided a Dual Independent Map Encoding (DIME) file for an area that included the site of the pilot study. The DIME file contains data compiled from the U.S. Census Bureau and served as the data base for locating the historical generators of hazardous waste. The Landfill File was used to locate all known landfills in the county.

Information for Tasks 3 and 4 was derived from: the Landfill File, the GIS, well records in the Geological Records Unit of ISGS, reports in the files of the Groundwater Section of ISGS describing hydrogeologic

conditions at proposed or existing waste disposal sites, regional maps prepared by ISGS, and USGS topographic quadrangle maps.

3.3. Processing of Data

The headings and items used in the two Inventory data forms evolved to accommodate the different types of information found to be available. The form for the Landfill File in Figure 1 was developed at the beginning of this study to cover all the anticipated circumstances. Subsequently, it had to be modified two or three times to provide for other items. The headings in the form are identified by the letter A through I.

Heading A contains the basic identification. The IEPA number was adopted as the primary identifier because all of the original information came from IEPA records. This number, as previously discussed, was derived from the FIPS code. A secondary identifier, the provisional number, was adopted to identify all other disposal sites. This number is also based on the FIPS code except that the last four characters are letters (excluding I and O) instead of numbers. Any site identified by a provisional number can be redesignated if it is later given a number by IEP±. The city/township code numbers for some IEPA sites do not coincide with the respective current geographic locations, which may be due to changes in political boundaries through annexation or to initial error, but once assigned they are not changed. The record number is assigned to a record at the time the record is printed (or displayed). This number is subject to frequent change and is only useful to the computer operator. The site name is the commonly used name.

Heading B contains location information that is self-explanatory or has been discussed above. The city/township names used are those listed in the FIPS Code Book. Chicago is divided into numbered neighborhoods (601 to 677); however, the IEPA has only used the general number 600 for disposal sites in Chicago.

Heading C contains the names of the owner and operator, and the size in acres. The accuracy of the size data is questionable. This may be just the size of the disposal area but it may be the size of the entire parcel of land containing the landfill. The information transferred from the magnetic tape was off by a factor of ten for many sites, therefore this item was compared with the file information at the IEPA office wherever possible. In cases where the uncertainty of the area value could not be resolved, a question mark has been entered to the right of the value of the area.

Heading D contains the identification of all the different sources of information contained in the record. PCB is the Illinois Pollution Control Board, DPH is the Illinois Department of Public Health, Local HD is the local city or county health department, and all the others have been mentioned previously.

Heading E contains the identification of all the various types of disposal operations used at the site.

Heading F contains information on the location of file copies of hydrogeologic reports for the site. A preliminary hydrogeologic report is defined as one based on pre-existing data such as well records from the local vicinity, and regional maps. A detailed report is defined for this study as one based on a subsurface investigation performed specifically for the site as required in the application for a permit from IEPA for a disposal site.

Heading G contains information on sources and types of waste. The list of items under this heading has been modified twice. The original list contained 18 items; tires were dropped from the list, and nonhazardous waste, special, and oil field brine were added to the list. Eight of the items are not used by IEPA as descriptors in the Selected Inventory. These eight additional items are used in the file information at the IEPA office, and these terms may be useful in describing old sites added to the Inventory. The item "special waste" is confusing for persons learning the terminology of waste disposal because it may or may not include hazardous wastes as defined under RCRA. Where hazardous wastes could be identified from the files, the appropriate item was also marked on the record.

Heading H contains background information such as whether or not the site is active, permitted, etc. Four types of CERCLA sites are identified: National Priority List (NPL); Proposed NPL; State Remedial Action Priority List (SRAPL); and Immediate Hazardous Waste Removal Projects. An empirical method of scoring is used by the USEPA and its agents to rank sites on their environmental impact. Any site with 28.5 points or more out of a possible 100 is placed on the NPL. Each site ranking 28.5 or more must spend a specified amount of time, as required by law, on the Proposed NPL before being placed on the NPL. This time lapse is to allow for public review and rebuttal to the ranking of an individual site. Any site receiving between 10 and 28.5 points is included in SRAPL. Occasionally sites that have yet to be ranked are found releasing large amounts of hazardous contaminants into the environment. Rather than wait for these sites to be ranked by the USEPA method, the IEPA can place these sites onto the Immediate Hazardous Waste Removal Projects list. Action taken on these sites is either funded by the responsible party, or by the State of Illinois through the Clean Illinois Act. The IEPA is responsible for monitoring the work done at these sites.

A number of sites under jurisdiction of RCRA are being reclassified from storage sites to disposal sites when the length of storage time becomes excessive. A routine procedure is being established whereby IEPA will provide information from these sites for inclusion in the Inventory.

This heading also contains two lines, each 61 spaces in length, for additional descriptive comments that would not fit into the standard format.

Heading I contains miscellanceous types of information about the site, such as previous studies, site plans, operating records, monitoring data, legal actions, or other records that may be on file at an indicated location.

3.4. Map Generation

The series of maps accompanying this report in Appendix C is presented in an 8 1/2 x 11-inch format to accentuate the different types of sites, to make the maps easier to handle, and to reduce the printing costs.

Only the 2617 sites for which Lambert coordinates have been converted are plotted by the computer. An additional 279 sites cannot be plotted at this time. The accuracy of the map is affected by several factors including the degree of accuracy of the property description, and the fit of the computer program for converting the location into Lambert feet. The degree of accuracy for the maps in this report appears to be good because the scale is quite small; however, the maps for the individual counties were found to contain some inaccurately plotted sites. For example, sites located just outside county boundaries were obviously in error. Also, several of the persons who reviewed a map of an individual county indicated the need for corrections.

The preliminary map accompanying the Interim Report (Dixon, 1985) was plotted and printed at a scale of 1:1,000,000 (approximately 1 inch equals 16 miles). The map accompanying the Progress Report (Dixon and Hensel, 1985), was plotted and printed at a scale of 1:500,000 (approximately 1 inch equals 8 miles), and that map utilized a set of symbols to identify different types of sites. The maps accompanying this report were plotted at a scale of 1:1,000,000 and printed at a scale reduced to 37 percent of the former, which is approximately 1 inch equals 43 miles. Most of the maps have been generated by selecting different sets of data from within the Inventory to be plotted on a base map containing only state and county boundaries. Two of the maps combine data sets from the Inventory with data sets from the GIS, and the map of counties is adapted from an ISGS map. The original maps at a scale of 1:1,000,000 will be maintained on open file at the ISGS and ozalid copies of the individual maps will be available for purchase through the ISGS Order Department.

3.5. Special Studies

Three of the tasks in this study are supplementary. They are direct uses of the Inventory in combination with outside information to provide examples of the practical application of the Inventory.

3.5.1. Task 2

The objective of this study was to develop a map showing the spatial relationship of two items--historical hazardous waste generators and known landfills. In this study, historical hazardous waste generators are defined as those businesses that produced hazardous waste before 1970. Some of these businesses still generate hazardous waste; however, others have closed or have ceased generating hazardous waste. The impetus behind this study was to analyze the spatial relationship of the generators and known disposal sites. Before 1970, no strict laws governed the disposal of hazardous waste. Therefore, it was assumed that economics was the dominant factor in selecting the method of waste disposal. In most cases, landfilling would have been the most economical method for hazardous waste disposal. Further, in order to minimize transportation costs, one would expect wastes to have been landfilled near the site of generation. Therefore, a map depicting the spatial relationship of the hazardous waste generators and known landfills could indicate, in a qualitative manner, known landfills that might contain hazardous waste or potential areas of abandoned landfills. Thus, the map developed would provide a simple method for predicting potential locations of abandoned hazardous landfills.

A pilot study was conducted to develop a method for efficiently producing a map showing the locations of both landfills and historical hazardous waste generators. Computer-based data of hazardous waste generators was obtained from the ISWS, which was assembling this information for a 9-county area in Illinois (Schock et al., 1986). One facet of this project was to collect historical data of hazardous waste generators. Generator data for Mc Henry County was selected for use in this pilot study. The following is a description of the methods used to process these data, which would ultimately render them in a mappable form.

The generator data obtained from the ISWS contained the following information: generator name; date operation began; date operation closed; and information about previous operations at that location and/or by that generator. The generator data first had to be modified to a format consistent for use by the computer software ARC/INFO. Once reformatted, the data were sorted to find those generators in operation before 1970. This year was chosen since strict environmental laws, by current standards, had not yet been promulgated. After sorting the data, a method to translate the generator address to an x, y coordinate system suitable for mapping had to be developed. GEOCODING, a subsystem of ARC/INFO NETWORK software, is a software package that will generate mapping coordinates for addresses of interest given a suitable address data base. This address data base may be described as a collection of address information and associated mapping information. The ISWS has successfully implemented GEOCODING using DIME files as the address data base. DIME files are only available for municipalities with populations greater than 50,000. Since there are no towns in Mc Henry County with

populations greater than 25,000, another address data base had to be used. An attempt was made to use census tract files, compiled by Geographic Data Technology, Inc., as the address data base in this study. GEOCODING was then used to perform an operation known as address matching. Basically, GEOCODING is a four-step process which matches addresses in the file of interest to addresses in the address data base and assigns x, y coordinates to the addresses in the file of interest. Unfortunately, the GEOCODING process was not successful when the census tract files were used for the address data base. The software company that developed GEOCODING has been contacted to correct the problem in the software application.

Due to the failure of GEOCODING, the generators were mapped by hand on the city base maps and then transferred to a county map. The county map was plotted using ARC/INFO and contained the locations of all known landfills in Mc Henry County. The landfill locations were obtained from the Landfill Inventory.

3.5.2. Task 3

The implementation of this task was purposely scheduled for relatively late in the study to take advantage of a large amount of filed data. Two additional criteria, to the original three, were contemplated in establishing the empirical ranking system: type of disposal, and age. However, only the type of disposal was used as the fourth and final criterion since the information in the Inventory relating to age was not considered to be of sufficient accuracy to correlate into this ranking system. If the ages of closed sites can be determined more accurately at a future time, then the ranking system can be appropriately modified.

The basis for ranking is a cumulative scoring with a maximum score of 27 points and a minimum score of 6 points. The ranking system is shown in Table 4. The values for the parameters were selected arbitrarily to indicate relative ranking within a criterion, and the maximum values for the criteria were balanced accordingly. If more than one parameter in a column applied, only the higher number was used. The types of waste in the first column were taken from item G in the data form. The only data in the inventory that correlated with the amount of waste contained in disposal sites were the areas. The second column lists six arbitrary size divisions and an unknown or questionable symbol to call attention to some sites for which the size was not available or the listed figure was doubted. The third column ranked disposal methods according to past operating practices as compared to a planned and controlled sanitary landfill. This ranking may be unfair to some well designed impoundments, but this method is decreasing in use. The fourth column rated the geologic setting. The basis for ranking was adapted from a map of potential for contamination by Berg and Kempton (1984). The 18 original categories were regrouped into five categories which were combined into the two categories used in this study. The values two and five represent the upper limits of the combined groups. It would have been preferable to have more rankings in this column, but

TABLE 4: Ranking System For Sites In Need Of Preliminary Hydrogeologic Evaluation

Type of Waste	#	Area of Site (in Acres)	#	Type of Disposal	#	Geologic Setting	#
Radioactive	10	151 to 500	6	Open Dump	6	Potential Aquifer within 20 ft. of land surface	5
Hazardous Solids	7	71 to 150	5	Unpermitted landfill	6		
Hazardous Liquids	7	31 to 70	4			Potential Aquifer 20 ft. or more beneath land surface	2
Special (Non-RCRA)	5	11 to 30	3	Surface Impoundment	6		
Industraial	5	2 to 10	2	Land Application	4		
Oil Field Brine	5	0 to 1	1	Landfill (permitted)	2		
Sewage Sludge	3	Unknown or questionable	*				
Septic Sludge	3						
General	3						
Nonputrescible	1						

insufficient parameters were available in the GIS to provide any more than the two rankings in the time available.

3.5.3. Task 4

Five sites were selected for this portion of the study. The selection process was computer-assisted by successive sortings of sites that contained hazardous wastes, sites for which no hydrogeologic report was on file, and sites located on shallow sand and gravel aquifers or alluvial deposits. Shallow sand and gravel aquifers and alluvial deposits were taken from the GIS. This selection yielded 18 sites; five sites were arbitrarily chosen from this set. The hydrogeologic evaluations of these sites are presented in Appendix B.

4. RESULTS

4.1. Tasks 1 and 5

The Inventory, as of May 20, 1986, contained a total of 7,897 records. The Impoundment File contained records of the 5,063 sites from the Surface Impoundment Assessment (Piskin et al., 1980), and as the material was discussed in that report, no further comments will be made here except to note that some sites had multiple impoundments and the total number of impoundments was 7,420. The Landfill File contained records of 2,834 sites, and less than 100 additional records were in preparation for inclusion into that file. A summary of the data on disposal sites in Illinois is shown in Table 5.

Selected data from the Landfill File displayed in Appendix A shows the distribution of different aspects of the Inventory on a county-by-county basis.

The Inventory lists all the data items available on waste-disposal sites in the files of IEPA. A recent double-check of IEPA files was made to review files which had been previously unavailable and to review records of CERCLA and RCRA sites. The only IEPA information that could not be reviewed was a small number of files being used in active litigation cases, and these will be cataloged later as they become available. A separate contact with IDNS provided a list of sites at which radioactive wastes have been disposed. This list of sites with radioactive wastes was cross-checked against the IEPA information to eliminate any duplication. IEPA does not have primary responsibility for radioactive wastes, but some sites containing radioactive wastes are included in the IEPA records. A separate contact with the Region V office of USEPA determined that IEPA has jurisdiction over waste disposal activities on federally owned lands in Illinois, including military installations. All waste-disposal sites that operated on federal lands since the formation of IEPA should be on record with IEPA; and a list of all federal properties in Illinois was obtained to use in locating former disposal sites that closed before the formation of IEPA. The individuals contacted at the county level continue to respond either with information on former disposal sites or to state that they could not identify any sites in addition to the ones already on file for the particular county. A formal agreement is pending with IEPA through which a regular notification would be made to ISGS or HWRIC of all newly recorded waste-disposal sites in Illinois.

4.2. Task 2

The goal of Task 2 was to investigate the spatial relationship between the historical hazardous waste generators and known landfills in Mc Henry County. All information about known landfills was obtained from this Inventory. Data of historical hazardous waste generators were obtained from the ISWS. As defined previously, historical hazardous waste generators are those businesses that generated hazardous waste

TABLE 5: Summary of Data on Disposal Sites in Illinois
(as of June 10, 1986)

Total number of disposal sites		2896
Disposal sites on file with:	IEPA	2635
	Local agencies	261
	Other state agencies	20
Types of disposal sites:*	Landfill	2716
	Open dump	77
	Surface impoundment	44
	Land application	38
	Incineration	16
	Secured container	46
	Unknown	26
Types of waste in disposal sites:**	Radioactive	14
	Hazardous solids	58
	Hazardous liquids	109
	Special***	71
	General	878
	Industrial	85
	Sewage sludge	98
	Unknown	708

*Multiple methods are used at some sites.
**Non-Putrescible wastes are not included in this list.
***Some hazardous wastes may possibly be included.

before 1970. In this study, it is assumed that waste disposal was controlled by economics and that landfilling was the most economical method of waste disposal available to hazardous waste generators. Therefore, all wastes produced would have been disposed offsite at a landfill. In addition, in order to minimize transportation costs, one would expect landfills to be located in the proximity of the generators. On-site disposal of wastes was not considered a viable disposal option since many of the generators are located in areas, such as the main business district or in industrial parks, with limited space for long-term waste disposal.

Figure 3 is a map of all known historical hazardous waste generators and known landfills in Mc Henry County. The number of generators shown on Figure 3 does not represent all known generators. Approximately 75 percent of the 139 generators had sufficient information to allow mapping. Most of the generators mapped are located within city limits.

At first glance, the location of the generators correlates fairly well with the locations of the known landfills. There appears to be an adequate number of landfills to dispose of all types of wastes (including hazardous waste) produced in the county with one exception. Woodstock, near the center of the county, appears to have an inadequate number of nearby landfills. In and around Woodstock, in the northwest corner of T. 44 N., R. 7 E., there are a large number of generators; however, there are only two known landfills near the town. Also, in the eastern portion of the of the county, there appears to be an excessive number of landfills to meet the needs of Mc Henry County generators. These landfills probably were used for disposal of wastes from Lake and Cook Counties. This indicates the need to conduct this type of study on a regional basis since waste generated in one county may be disposed of in another county.

Records in the Inventory indicate that the type of waste disposed is unknown for the majority of the landfills in the county. It is safe to assume that many of these landfills probably contain hazardous wastes from small quantity generators. Also, landfills operating before the promulgation of stringent environmental laws (such as RCRA and subsequent federal and state regulations) probably contain larger quantities of hazardous waste.

Upon closer inspection of the landfill data, it appears that most of the landfills plotted on Figure 3 are closed. The landfills, according to the information in the Landfill Inventory, began closing in 1972. Unfortunately, no data are available in the Landfill Inventory for the date these landfills opened. However, given the small size of the landfills (see Table 6), one may speculate that the majority of these were not operating before the early 1960s. Table 7 shows the date when the historical hazardous waste generators began operation. Greater than 50 percent of the generators opened business before 1960. Many generators have been active from that date to today. Therefore, it

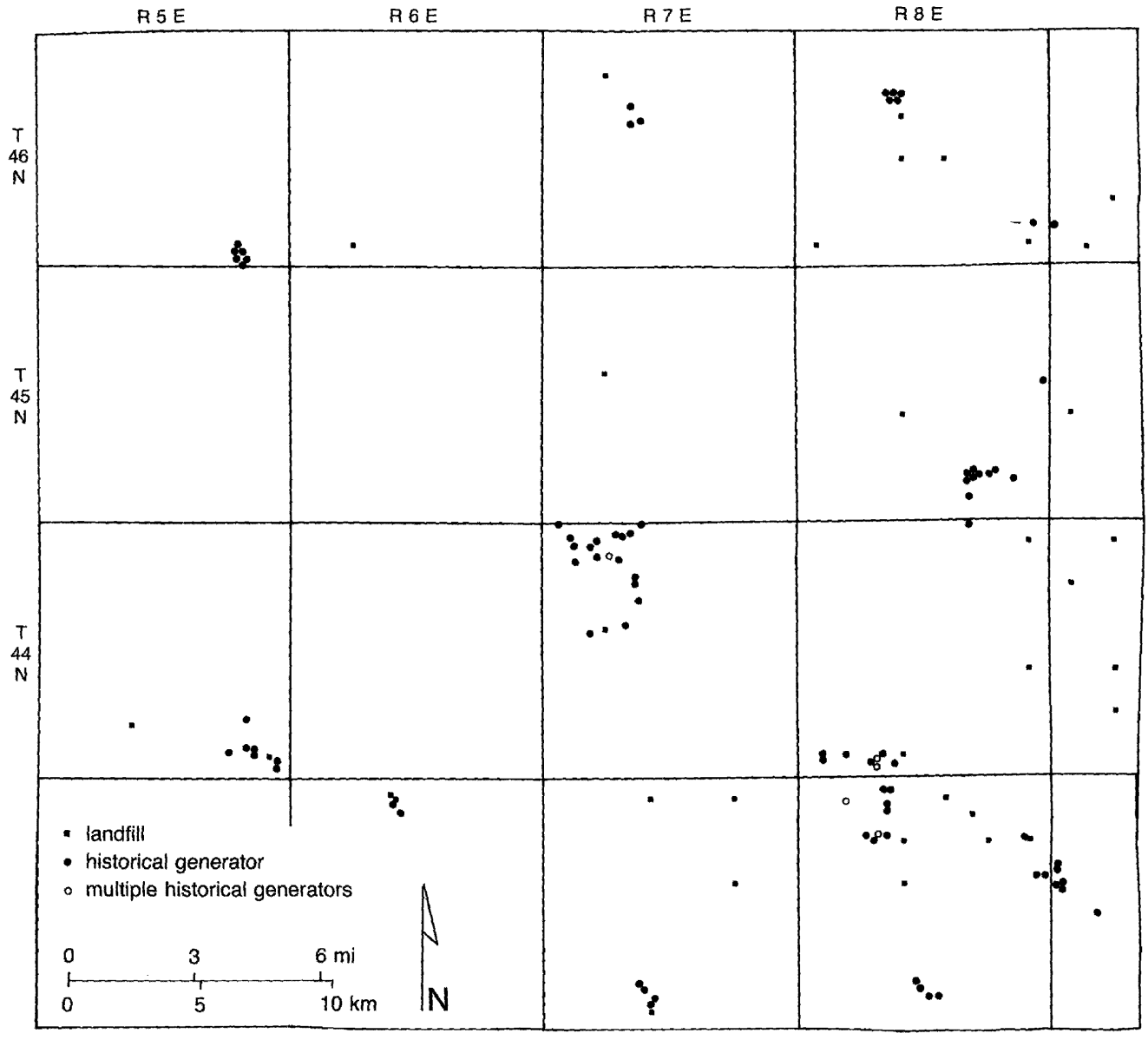

Figure 3. Historical Hazardous Waste Generators and Land Disposal Sites in McHenry County

appears that two conclusions are possible. Either the information in the Landfill Inventory is not totally correct or there are a number of unknown landfill sites. Both conclusions are probabaly true to a certain extent. Since records of landfills are generally not available before 1970 (the year IEPA was formed), one would expect that a number of the older landfills may not yet be incorporated into the Inventory.

TABLE 6: Landfill Size in Acres for Mc Henry County

Size	No.
0 to 20	11
21 to 50	7
51 to 100	4
Greater than 100	9
Unknown	13

TABLE 7: Year Generators Began Operation in Mc Henry County

Date	No.
before 1950	11
1951-1955	23
1956-1960	45
1961-1965	0
1966-1970	60

Due to the limitations of the data used and the assumptions involved in this study, the results are not conclusive. Additional data such as the quantity of the waste produced, landfill volume, and date landfill opened are some examples of information which would have allowed a more accurate estimation of known landfill capacity required by generators. One assumption of this study was that all generators disposed of all wastes at off-site landfills. This assumption may not be totally correct. Generators could have landfilled their waste on-site or used some other disposal technique such as discharging liquid hazardous wastes to a sewer. Knowledge of contemporary waste-disposal practices and the type of waste produced (solid, liquid, etc.) is needed to determine the accuracy of this assumption.

Although there is a need for improvement in the data used, this type of study seems to be useful for determining the type of waste in known landfills and for locating potential areas of abandoned landfills. Landfills pose a potential threat to contaminate groundwater and surface water. Combining other parameters such as susceptibility for groundwater contamination and locations of shallow wells with the results of this study may allow the development of a method to prioritize known landfills or potential areas of abandoned landfills for

assessment of groundwater quality. However, before this can be accomplished, a technique must be developed that allows the locations of generators to be mapped by computer techniques. Also, the historical data for the generators needs to be developed for other areas of the state.

4.3. Task 3

More than 2600 waste-disposal sites for which no hydrogeologic studies are on file have been ranked according to the empirical system previously described. Three maps included in Appendix C (Figures C-14, C-15, and C-16) show, respectively, the locations of disposal sites with no hydrogeologic evaluations, areas in which potential aquifers are within 20 feet of the ground surface, and the locations of disposal sites in areas with a high potential for groundwater contamination. The possible scores range from 6 to 27, and the sites were divided into a series of groups, with each group containing sites with the same score. The ranking within a single group, which must be done subjectively, has not as yet been accomplished. The scored sites are identified by site number and site name. The list is on open file at the ISGS.

4.4. Task 4

Preliminary hydrogeologic evaluations of five selected sites are presented in Appendix B. The descriptions of the geologic conditions at the five sites are similar because all the sites are above shallow sand and gravel aquifers. Other conditions such as geographic location, and distribution of nearby water wells, are unique for each site.

4.5. Task 6

In June 1986, a magnetic computer tape of the complete Inventory on was provided to HWRIC for storage in the HWRIC Prime computer. The Inventory will be maintained on the DENR Prime computer until the HWRIC computer is modified to interact with the GIS.

4.6. Task 7

This report, and the accompanying appendices are the printed results of this project. A set of technical records, filed by county, was acquired in the process of creating the computer files, and this information is available for examination at ISGS.

The series of small scale maps in Appendix C was developed to take the place of the one large scale map, which accompanied the Summary Report (Dixon and Hensel, 1985). All but two of the maps were generated from data in the Landfill File. Figure C1 is a standard ISGS base map identifying the counties in Illinois, and Figure C15 was constructed by combining selected elements from the GIS. Figures C2 through C12 were generated to replace the previous single larger scale map, and Figures C13 through C16 were prepared in conjunction with Tasks 3 and 4. Figure

C10, Active Disposal Sites, shows the 404 sites that are recorded as being active according to the data in the Inventory. The true number of active sites is approximately 270 according to IEPA, and this discrepancy will be corrected when a list of active sites is received.

The series of small scale maps in Appendix D was developed to represent the larger scale maps which accompanied the SIA report (Piskin et al., 1980).

A users guide was developed to describe the basic steps of using the Inventory. The guide describes the commands to access and manipulate data and the procedures for generating statewide or county maps. This guide is on open file at ISGS.

5. ADDITIONAL NEEDS

During the course of this study a list of additional items related to the Inventory was developed. This section of the report discusses these additional data needs.

5.1. Maintenance of Inventory

The following items are those which related to maintaining the Inventory as an active data base.

5.1.1. Add New Sites

The number of sites issued permits per year has been less than five for the past several years, but the number of sites regulated under RCRA that are reclassified as waste disposal sites is expected to increase for at least the next few years.

5.1.2. Add Information Returned by Counties

Approximately 25 percent of the individuals contacted at county agencies have responded either providing information on additional sites or indicating that no additional sites are known at this time. The distribution of this report is expected to call attention to the usefulness of the inventory and serve as a reminder to respond.

5.1.3. Add Information from Federally Owned Facilities

A list of 44 federally owned facilities in Illinois was recently received from USEPA. Some of these sites would likely not contain former disposal sites. All of the larger properties, such as military bases and arsenals, should be contacted to cover these possible sources of information.

5.1.4. Add Appropriate ISGS Waste Disposal Reports

A file of letter reports on actual or proposed waste-disposal sites has been developed over a number of years at ISGS. These reports are scheduled to be placed in a computer file in the near future. After this is done it will be comparatively easy to match these reports with sites in the Inventory.

5.1.5. Add ISGS Studies on Filled Quarries

A separate study is in progress by Donald G. Mikulic of ISGS on former quarries in the Chicago area which have been filled in. This information, when it becomes available, should be added to the Inventory as either former disposal sites or as supplemental information for sites recorded in the Inventory.

5.2. Develop User Access System

The Inventory currently can only be used directly by HWRIC staff on the HWRIC Prime computer and by those staff members of the three scientific surveys who have a recognized password for access to the file in the DENR Prime computer. All other users, at this time, must obtain computer-generated products through one of these current sources. Therefore, a user access system should be developed to allow wider use of the system.

5.2.1. Governmental Agency Access

The first step in providing a user access system to the Inventory would be to issue passwords to approved state and local government agencies. The specific details of this system would be developed in conjunction with the three scientific surveys and HWRIC. The DENR computer is operated under specific accounting procedures. A schedule of costs for different types of computer users is in effect, but some of the costs are borne as part of the public service function of the Surveys.

5.2.2. General Public Access

The logical extension of a user access system would be to provide it for use to the general public on a paid-for-services basis. The implementation of public access to computer records is part of a basic policy decision which will probably not be fully resolved for several years.

5.3. Hydrogeologic Evauation of Waste-Disposal Sites

Task 3 of this study demonstrated how sites can be prioritized according to their relative need for hydrogeologic evaluation as determined by a scoring system based on several criteria. However, the impact of a waste-disposal site on the surrounding vicinity depends on specific local conditions. In addition to the type and amount of wastes many other factors affect contaminant migration including: geologic factors such as geomorphology, stratigraphy, and lithology; and groundwater factors such as top of the zone of saturation, aquifers, flow systems, and groundwater use. These other factors could not be considered for most landfills currently in the Inventory because of lack of information.

The large majority of waste-disposal sites in Illinois have had no hydrogeologic evaluation, and this should be done beginning with the sites with the highest scores.

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APPENDIX A

Tabulation of Data by County

TABLE 8: Tabulation of Data by County

County	Number of Sites	Sources of Information		Methods of Disposal						Types of Waste				Hydro Reports
		IEPA	Other	Landfills	Surface Impoundments	Land Application	Secured Containers	Open Dumps	Incineration	Haz-Sol	Haz-Liq	Rad	Unknown	
ADAMS	37	36	1	36	0	0	0	1	0	2	4	0	2	2
ALEXANDER	10	10	0	10	1	1	1	0	0	1	1	0	7	0
BOND	12	12	0	12	0	0	1	0	0	0	0	0	5	1
BOONE	8	8	0	8	0	0	0	0	0	0	1	0	3	3
BROWN	17	15	2	17	0	0	0	2	0	0	0	0	2	0
BUREAU	20	19	1	20	0	0	1	0	0	0	2	1	8	2
CALHOUN	6	5	1	5	0	0	0	0	0	0	0	0	1	0
CARROLL	28	17	11	22	2	0	0	4	0	0	0	0	12	2
CASS	15	15	0	14	0	0	0	1	0	0	1	0	10	1
CHAMPAIGN	28	28	0	27	0	0	1	0	0	0	0	0	4	4
CHRISTIAN	16	16	0	15	1	0	0	0	0	0	1	0	2	1
CLARK	15	15	0	14	0	0	1	0	0	1	1	0	4	0
CLAY	10	10	0	10	0	0	0	0	0	0	0	0	6	0
CLINTON	14	14	0	14	0	0	0	0	0	0	0	0	8	0
COLES	34	31	3	32	0	0	0	0	0	0	0	0	3	0
COOK	168	167	1	161	10	3	9	3	1	6	16	1	41	33
CRAWFORD	17	17	0	16	1	1	1	0	0	0	1	0	10	1
CUMBERLAND	5	5	0	5	0	0	0	0	0	0	0	0	1	0
DEKALB	23	23	0	23	0	0	0	0	0	1	0	0	11	1
DE WITT	30	20	10	29	1	0	0	0	0	0	1	0	1	0
DOUGLAS	14	14	0	13	1	0	0	0	0	0	1	0	0	0
DU PAGE	58	44	14	47	1	1	0	6	1	1	1	7	19	8
EDGAR	9	9	0	9	0	0	0	0	0	0	0	0	1	0
EDWARDS	5	5	0	5	0	0	0	0	0	0	0	0	1	0
EFFINGHAM	10	10	0	10	0	0	0	0	0	0	0	0	3	1
FAYETTE	14	14	0	12	2	0	0	0	0	1	2	0	6	0
FORD	8	8	0	8	0	0	0	0	0	0	0	0	0	1
FRANKLIN	13	13	0	13	0	0	0	0	0	0	0	0	8	0
FULTON	24	24	0	24	0	0	1	0	0	0	1	0	1	5
GALLATIN	6	6	0	6	0	0	0	0	0	0	0	0	3	1
GREEN	10	10	0	10	0	0	0	0	0	0	0	0	1	0
GRUNDY	7	7	0	6	1	0	0	0	0	0	1	0	2	1
HAMILTON	2	2	0	2	0	0	0	0	0	0	0	0	0	0
HANCOCK	24	24	0	24	0	1	0	0	0	0	0	0	1	1

County	Number of Sites	Sources of Information		Methods of Disposal						Types of Waste				Hydro Reports
		IEPA	Other	Landfills	Surface Impoundments	Land Application	Secured Containers	Open Dumps	Incineration	Haz-Sol	Haz-Liq	Rad	Unknown	
HARDIN	7	7	0	7	0	0	0	0	0	0	0	0	5	0
HENDERSON	4	4	0	4	0	0	0	0	0	0	0	0	0	0
HENRY	27	27	0	23	1	1	4	0	0	1	3	0	8	5
IROQUOIS	20	20	0	20	0	0	0	0	0	0	0	0	0	0
JACKSON	22	22	0	20	1	0	2	0	0	0	1	0	9	0
JASPER	6	6	0	6	1	0	0	0	0	0	0	0	3	1
JEFFERSON	19	19	0	19	0	0	0	0	0	0	0	0	9	2
JERSEY	15	15	0	15	0	0	0	0	0	0	0	0	1	1
JO DAVIES	25	25	0	23	0	1	2	0	0	1	2	0	7	3
JOHNSON	11	11	0	11	0	0	0	0	0	0	0	0	5	0
KANE	63	58	5	59	0	1	0	0	0	1	2	2	13	5
KANKAKEE	21	21	0	19	0	1	0	0	0	0	0	0	9	0
KENDALL	11	11	0	11	0	0	0	0	0	0	1	0	1	1
KNOX	19	19	0	16	0	0	2	3	0	0	1	0	2	3
LAKE	118	73	45	79	0	1	2	22	14	3	3	0	21	10
LA SALLE	61	60	1	60	0	1	1	0	0	1	1	1	23	6
LAWRENCE	12	7	5	6	0	1	0	4	0	1	1	0	0	1
LEE	27	27	0	27	0	0	0	0	0	0	0	0	3	4
LIVINGSTON	29	25	4	27	0	0	0	2	0	0	0	0	3	4
LOGAN	10	10	0	10	0	0	0	0	0	0	0	0	0	0
MC DONOUGH	16	16	0	16	0	0	0	0	0	0	0	0	0	1
MC HENRY	64	54	10	61	0	1	0	1	0	1	4	0	24	0
MC LEAN	36	36	0	34	0	0	2	0	0	0	0	0	1	3
MACON	65	64	1	65	0	0	0	0	0	0	0	0	0	7
MACOUPIN	39	39	0	39	0	0	1	0	0	3	3	0	5	2
MADISON	65	64	1	59	5	0	4	2	0	4	8	0	32	0
MARION	25	25	0	25	0	0	0	0	0	0	0	0	9	3
MARSHALL	11	11	0	11	0	0	0	0	0	0	0	0	0	0
MASON	11	10	1	9	0	1	1	0	0	0	0	0	2	0
MASSAC	13	13	0	12	1	0	0	0	0	1	1	0	8	1
MENARD	9	9	0	9	0	0	0	0	0	0	0	0	0	0
MERCER	10	10	0	10	0	0	0	0	0	0	0	0	0	1
MONROE	17	17	0	16	0	0	0	1	0	1	1	0	7	0
MONTGOMERY	38	38	0	38	0	0	0	0	0	0	0	0	2	2

County	Number of Sites	Sources of Information		Methods of Disposal						Types of Waste				Hydro Reports
		IEPA	Other	Landfills	Surface Impoundments	Land Application	Secured Containers	Open Dumps	Incineration	Haz-Sol	Haz-Liq	Rad	Unknown	
MORGAN	38	38	0	38	0	0	0	0	0	0	0	0	4	1
MOULTRIE	6	6	0	6	0	0	0	0	0	0	0	0	1	1
OGLE	41	41	0	39	0	0	1	2	0	2	2	0	19	2
PEORIA	45	42	3	41	1	0	0	2	0	1	2	0	5	0
PERRY	8	8	0	8	0	0	0	0	0	0	0	0	4	1
PIATT	4	4	0	4	0	0	0	0	0	0	0	0	1	2
PIKE	39	39	0	39	0	0	0	0	0	0	0	0	4	0
POPE	14	13	1	13	0	0	0	0	0	0	0	0	4	0
PULASKI	19	19	0	19	0	0	0	0	0	0	0	0	11	1
PUTNAM	7	7	0	6	1	0	0	0	0	0	1	0	2	0
RANDOLPH	28	28	0	28	0	0	0	0	0	0	0	0	11	3
RICHLAND	11	9	2	11	0	0	0	0	0	0	0	0	6	1
ROCK ISLAND	59	59	0	58	0	0	0	1	0	0	0	0	20	5
ST. CLAIR	131	131	0	126	1	0	2	4	0	6	7	0	53	0
SALINE	15	15	0	15	0	0	0	0	0	0	0	0	6	1
SANGAMON	94	94	0	93	0	0	0	0	0	1	1	1	0	6
SCHUYLER	6	6	0	6	0	0	0	0	0	0	0	0	0	0
SCOTT	31	31	0	31	0	0	0	0	0	0	0	0	3	0
SHELBY	12	12	0	12	0	0	0	0	0	0	0	0	0	1
STARK	8	8	0	8	0	0	0	0	0	0	0	0	0	1
STEPHENSON	23	23	0	22	1	0	1	0	0	0	1	0	12	1
TAZEWELL	80	78	2	77	0	0	0	2	0	0	0	0	12	7
UNION	11	11	0	11	0	1	0	2	0	0	1	0	4	1
VERMILION	64	64	0	60	1	3	0	0	0	1	5	0	3	7
WABASH	10	10	0	10	0	0	0	0	0	0	0	0	2	0
WARREN	2	2	0	2	0	0	0	0	0	0	0	0	0	1
WASHINGTON	10	10	0	10	0	0	0	0	0	0	0	0	4	1
WAYNE	9	9	0	9	0	0	0	0	0	0	0	0	3	1
WHITE	5	5	0	5	0	0	0	0	0	0	0	0	2	0
WHITESIDE	30	30	0	29	0	1	1	0	0	2	2	0	17	1
WILL	76	75	1	71	4	2	1	4	0	6	8	0	21	10
WILLIAMSON	71	69	2	68	0	0	1	2	0	1	1	0	21	1
WINNEBAGO	209	82	127	180	5	14	2	8	0	7	11	0	49	6
WOODFORD	16	16	0	16	0	0	0	0	0	0	0	0	0	1

APPENDIX B

Preliminary Hydrogeologic Site Evaluations

APPENDIX B

Site 1

The US Army-Incinerator site, IEPA number 0858080001 is located in Section 10, T. 26 N., R. 1 E., 4 PM, Jo Daviess County. The site is permitted for the land application of hazardous wastes, but it is currently inactive. No records of groundwater monitoring are on file at IEPA.

The site lies on the bank of the Mississippi River, one-half mile east of Lock and Dam No. 12, at the north end of the Savanna Army Depot. Relief in the area is low, characteristic of lowland river valley terranes. Total relief in the area is approximately 10 feet. Groundwater at the site lies about 5 feet below land surface. Drainage in the area is poor, and due to the site's close proximity to the river, periodic flooding is possible.

Review of the well records at the Geological Survey show only two water supply wells within a one-mile radius of the site; however, these records are not complete and other wells may also be present. Additional records may be available at the Illinois State Water Survey or Illinois Department of Public Health. Information as to the specific geologic deposits found at this site is not available. The lack of information for this site demonstrates the potential of the Landfill Inventory in selecting sites that may be in need of further evaluation and monitoring. Accurate assessment of the environmental impact of this site will be dependent upon several factors. These factors include the type and extent of the surficial deposits on site, the exact character of the applied waste, the quantity and frequency of waste applications, and the characteristics of the groundwater flow system.

Examination of the Bellevue and Hanover 7.5-minute quadrangle maps shows the valley terrane to extend to the north, south, and east. However, to the northeast, the relief becomes higher, characteristic of dissected uplands. In the valley, depth to bedrock based on the available well logs is estimated to be about 75 feet. The surfical deposits at the site can be generalized based on available information on Mississippi Valley deposits. The top few feet may consist of alluvial silts and clays of the Cahokia Alluvium. Below the aluvium, the remaining unconsolidated deposits probably consist of sands and gravels, as is characteristic of Mississippi River Valley deposits in general. In the far northeast corner of Section 10, close to the upland slopes, colluvium or landslide deposits may be present. These deposits, if present, would likely consist of silts, clays, and sands. The uppermost bedrock units in this area are the Ordovician age Galena and Platteville Groups. These units generally consist of jointed and fractured limestone or dolomite. They are commonly local aquifers throughout the northern one-third of the state.

Any liquid waste or leachate generated by waste applied to the surface in this area would quickly find its way into the surficial

groundwater flow system. The waste would flow down into the sand and gravel and mix with the local groundwater flow system. The probable direction of waste migration would be southward beneath the Savanna Army Depot toward the Mississippi River. No information is available as to the quantity or location of water supply wells within the Savanna Army Depot. A significant withdrawal of water from these wells could cause a redirection of the shallow groundwater flow system, and any contaminants in this flow system, towards these wells.

As previously mentioned, the environmental impact of this site is dependent upon the character and volume of the waste and the nature of the surficial soils. Frequent applications, heavy applications, or disposal of highly hazardous wastes could all introduce unacceptably high levels of contaminants into the groundwater system. Likewise, the small amount of attenuating clays in the subsurface would allow even low concentrations of waste to migrate into the groundwater flow system. The exact flow rate and direction of flow in the groundwater environment is unknown for this site. Monitoring of the site and surrounding area is needed to both correctly identify these groundwater flow parameters and to accurately assess the acceptable volume of waste applied.

In summary, after evaluation of regional surficial deposit information and site topography, there appears to be a high potential for shallow groundwater contamination from the disposal of hazardous waste at this site. The amount and character of the waste will undoubtedly influence the environmental impact of this disposal operation, but the exact relationships between these variables cannot be determined without a groundwater monitoring system. Installation of a monitoring system is recommended to provide data for an environmental assessment of various possible contaminant plume parameters through time.

Site 2

The Southeast Rockford Landfill, IEPA number 2010300074, is located in Section 1, T. 43 N., R. 1 E., 3 PM, Winnebago County. According to Illinois EPA files, this site is an illegal dump of unknown size which contains hazardous wastes. No records of groundwater monitoring are on file at IEPA.

The Rockford South 7.5-minute quadrangle map shows this area to be located along the edge of the Rock River Valley. The valley boundary runs northeast to southwest through the middle of Section 1, with the area to the west being the Rock River Valley, and the area to the east being the adjacent dissected uplands. Drainage is west to southwest toward the nearby Rock River. In the event of flooding, it is possible that the entire lowland area could be inundated, while the uplands may experience local flooding.

The overall thickness of the glacial drift deposits varies from 9 feet in the uplands to nearly 270 feet in the valley. The valley

deposits consist of Cahokia Alluvium overlying the Mackinaw Member of the Henry Formation. The Cahokia Alluvium is generally a silt, clay, and clayey sand deposit with local lenses of sand and gravel. However, in this vicinity the sand and gravel deposits are more prevalent and extensive, and silt and clay units are generally thin and discontinuous. The underlying Mackinaw Member of the Henry Formation is a thick sand and gravel glacial outwash deposit of Wisconsinan age.

Surficial deposits in the upland areas are composed of the Parkland Sand overlying the Argyle and Nimitz Till Members of the Winnebago Formation. The Parkland Sand is a well sorted eolian (windblown) deposit which, although generally common in the upland region of Winnebago County, is very limited and discontinuous in this area. The Argyle and Nimitz Till Members are thin but extensive sandy tills which contain sand and gravel units of variable thickness and extent. Both lateral and vertical migration of groundwater can occur due to the permeable nature of both the tills and the sand and gravel. The Nimitz Till in this area often overlies an unnamed sand and gravel unit, but sometimes it is found directly overlying Ordovician bedrock.

The bedrock units in this area are generally limestone or dolomite deposits of the Ordovician age Galena or Platteville Groups. These units are generally jointed and fractured and are the source of water for several private wells within one mile of the site. Beneath the Platteville Group is the Ancell Group, which contains an important regional aquifer, the St. Peter Sandstone.

Geological Survey records indicate that more than 50 water supply wells are located within a one-mile radius of this site. Of these, approximately 25 wells are within a half-mile radius of the site. However, our records are not complete, and there may be other unrecorded wells which may be in use. Of the 50 wells on record, more than 30 are finished in glacial outwash sand and gravel deposits. The rest are finished in either limestone or till deposits.

The Argyle and Nimitz Till Members of the Winnebago Formation are both high in sand content and low in clay content. The clay is predominantly illite, which possesses a low to moderate attenuation capacity.

Natural groundwater flow in this area is toward the Rock River one and one-half miles southwest of the site. Local changes in flow direction could be induced by water withdrawal from individual wells.

In summary, any leachate generated by this landfill may readily join the natural local and regional groundwater flow systems due to the abundance of thick, highly permeable, continuous sand and gravel units, and the lack of any clay-rich attenuating till deposits. In the uplands potential for contamination of the shallow bedrock aquifer system is relatively high as there is only a thin soil cover to offer protection. Installation of a groundwater monitoring system in and

around this site would detect any groundwater contamination, and changes in contaminant concentration through time. Frequent monitoring of the water supply wells to the west and southwest of the site is suggested since these wells are downgradient of this site, and hence are most likely to be degraded by any possible contamination. Additional information for this report was obtained from Berg, Kempton, and Stecyk, (1984), and Sasman et al., (1982).

Site 3

The New Jersey Zinc Company landfill, IEPA number 0110300003 is located in the NE 1/4 of the SW 1/4 of Section 35, T. 16 N., R. 10 E., 4 PM, in Bureau County, Illinois. The site was permitted for operation on January 1, 1967, and was used for disposal of hazardous liquids prior to closure on December 31, 1971. Some records of groundwater monitoring are on file at IEPA, but no hydrogeologic evaluation is available.

The DePue 7.5-minute quadrangle map, on which the site is located, displays a varied topography within a one-mile radius of the site. The site is situated on the flat-lying floodplain of the Illinois River, and the land surface slopes gradually toward DePue Lake and the Illinois River, 1/4 mile and 1 mile south, respectively. Information from topographic and geologic maps indicate that the site is probably moderately to well drained. However, as its location is near the Illinois River it has, in the past, been subject to flooding. Directly north of the site are steep slopes with an overall relief of approximately 200 feet.

Well logs and maps on file at the Illinois State Geological Survey indicate various types of glacial drift deposits within the study area. These deposits range in total thickness from 50 to 300 feet. The regional geologic setting of the area is a till plain transected by a glacial sluiceway formed during a later period of glaciation. The resulting outlet was partially filled with glacial outwash deposits. The Illinois River, with a comparably small flow, now occupies this gorge formerly cut by the glacial meltwater. Downslope from the site, deposits are poorly sorted sands, silts, and clays of Cahokia Alluviuim which also may contain localized deposits of sandy gravel. The maximum thickness of the Cahokia Alluvium is 40 feet. The Cahokia Alluvium overlies the glacial outwash deposits of the Henry Formation. These terrace deposits of the Henry Formation contain fine to coarse gravel, and the site is located on these deposits which range in thickness from 20 to 50 feet. Further upslope, overlying the Henry Formation, are steeply sloping, lenticular, slopewash deposits of the Peyton Colluvium. These deposits largely consist of clayey and pebbly silt, generally less than 20 feet thick. Forming the valley wall at the northern edge of the study area is the Radnor Till Member of the Glasford Formation. The till is mostly grey, compact, silty clay with scattered boulders and localized gravels and sands.

The bedrock, of Pennsylvanian age, is composed of the Modesto and Carbondale Formations. The Modesto is a sequence of shale, limestone, clay, and coal beds; and the Carbondale is a sequence of shale, sandstone, coal, and clay beds.

Records of well logs show that 12 water wells have been drilled within a one-mile radius of the site and five of these are within a half-mile radius. It is possible that the records may not contain recent wells completed in this area. Two municipal wells have been drilled to the St. Peter Sandstone at depths of 1485 feet and 1487 feet. Six area wells penetrate drift aquifers and four others have been completed in the shallow bedrock aquifer.

Drift deposits have a range of relative permeabilities from high to low. The Henry Formation terrace deposits have high relative permeability; the till and colluvium which contain significant amounts of clay would have relatively low permeability; and the alluvium has a moderate permeability. The Pennsylvanian bedrock has a low to moderate permeability.

Shallow, local groundwater at this location can be expected under natural conditions to be discharged into DePue Lake, and the groundwater discharge area for regional flow is the Illinois River. Cones of depression resulting from pumped wells can alter the natural groundwater flow direction, and a detailed investigation of flow patterns would be needed to determine if any area wells have had such an effect. Altering the flow direction could result in possible leachate migration into wells. Finally, since the site was closed prior to 1972 an investigation of site materials and water from area wells is needed to determine if any possible contaminants still exist in the nearby groundwater flow system.

In summary, groundwater from this site discharges ultimately into the Illinois River. A hydrogeologic study of the area would be needed to detect any modifications to the direction of groundwater flow and to determine if any contaminants are still present in the groundwater. Knowledge of the disposal procedures used, and of the design and development of the facility would give valuable insight to any such study.

Site 4

The Roxite Fiberglass-Hass & Hass dump site, IEPA number 1950450006 is located in the NE 1/4 of the NW 1/4 of Section 34, T. 21 N., R. 7 E., 3PM, in Whiteside County, Illinois. The site was used for disposal of hazardous liquids and solids prior to January 1, 1977. No records of groundwater monitoring are on file at IEPA.

The Sterling 7.5-minute quadrangle map shows this site to be situated on a well drained flat glacial outwash plain, where total relief within the site area is about 3 feet. Slope is to the southeast

toward the adjacent Hennepin Canal. One mile to the north is the Rock River; ground beyond the northern boundary of the site slopes gently in that direction. The site's location near the canal and river makes it vulnerable to flooding.

Maps of Quaternary deposits and well logs on file at the Illinois State Geological Survey indicate two types of surficial materials within a one-mile radius of the site. The site is located on glacial outwash deposits of the Batavia Member of the Henry Formation. These deposits are well-sorted sands and gravels with a thickness of about 70 feet. North of the site along the Rock River are channel deposits of Cahokia Alluvium which overlay the Henry Formation deposits. The Cahokia Alluvium deposits are poorly sorted sands, silts, and clays, containing local deposits of sandy gravel. The thickness of these channel alluvium deposits ranges from 20 to 40 feet. The Batavia Member deposits have high relative permeability since they are well sorted, and the alluvium deposits, which contain some clays, have a moderate permeability.

Bedrock within a one-mile radius of the site consists of Ordovician limestones and Silurian dolomites. These formations are moderately permeable due to their fractured nature and constitute the shallow bedrock aquifer. Well log records indicate that 22 wells have been drilled within a one-mile radius of the site and three of these are within a half-mile radius. Logs of wells that have been drilled recently may not be in the records, but those on file indicate that approximately twice as many wells are completed in the bedrock as are completed in the drift.

Under natural conditions two plumes of hazardous materials could possibly form beneath the site, their migration would be governed by local groundwater flow. A shallow plume might migrate toward the Hennepin Canal, the zone of local groundwater discharge. The second plume might migrate at a greater depth toward the Rock River which is the zone of regional groundwater discharge. Cones of depression from pumping may have altered the natural flow dirctions. A detailed investigation of groundwater flow within the area would be needed to determine the effects of local pumpage on natural flow directions. Also, since the site has been closed since 1977, it is difficult to estimate the amount of hazardous materials still present, their types, and whether or not any area wells are subject to possible contamination. Evaluation of materials and local water samples near the site would help determine the answers to such questions.

In summary, groundwater from the site area is discharged locally into the Hennepin Canal and regionally into the Rock River. However, a study of the subsurface would be needed to detect any modifications of flow directions due to pumping. The nature of the drift and bedrock indicates that they have little capacity to attenuate contaminants, and they also have high permeability; therefore, wells in the area risk contamination if wastes at the site have been disposed in large quantity. Further studies of groundwater flow, site geology, and wastes

disposed at the site are needed to determine the risk of contamination from materials that may still remain on site. Knowledge of the design and operation of the facility would also provide valuable insight into its possible impact on the environment.

Site 5

The illegal dump site owned and operated by Walter Schnellbecher, IEPA number 1338090001 is located in Section 13, T. 2 S., R. 11 W., 3PM, in Monore County, Illinois. The site was discovered on February 9, 1983. the actual size of the site and its specific location in Section 13 are still unknown, although it has been determined by IEPA that hazardous liquids and solids were disposed of here. No records of groundwater monitoring are on file at IEPA.

The site is located on parts of the Waterloo, Valmeyer, Columbia, and Oakville 7.5-minute quadrangle maps which indicate a varied topography for the area. Topography for the western two-thirds of Section 13 is that of a flat floodplain, and the overall relief is approximately two feet. In the eastern one-third of Section 13, the topography consists of steeply sloped loess bluffs with relief of approximately 250 feet. Some karst topographic features (sink Holes) are present on the upland. The lowland has moderate drainage whereas the upland is well drained, and location near the Mississippi River makes the lowland subject to flooding.

Maps of Quaternary deposits and well logs on file at the Illinois State Geological Survey indicate four distinct deposits within a one-mile radius of the site. The uplands consist of Peoria Loess, Roxana Silt and Peyton Colluvium which is a mixture of Peoria Loess and Roxana Silt formed by slopewash and creep. These complex, steep sloped deposits of silt have a combined thickness of approximately 20 to 40 feet. Also on the uplands along the northern branch of Fountain Creek, overlying the colluvial deposits, are lake bed sediments of the Carmi Member of the Equality Formation. These sediments are largely well-bedded silts and some clays, usually 25 to 50 feet thick. At the base and western edge of the upland overlying the colluvium are eolian (windblown) deposits of Peoria Loess and Roxana Silt. These silt deposits have a combined thickness of approximately 20 feet, and contain local lenses of fine-grained sand. Further to the west on the floodplain, overlying the eolian deposits, are the channel deposits of the Cahokia Alluvium. These deposits are mostly poorly sorted sand, silt, or clay containing local deposits of sandy gravel, and are commonly less than 20 feet thick. All of the Quaternary deposits have a relatively low permeability.

The bedrock in the area consists of Mississippian age limestones and shales. Limestones in this area have a very high permeability due to solution-enlaged crevices and bedding planes, whereas the shales have low permeability.

Examination of well logs on record indicate that eight wells have been drilled within a one-mile radius of the site, and two of these are within a half-mile radius. Recent well logs may not yet be in the files. Virtually all area wells are producing from the shallow limestone aquifers.

Shallow groundwater flow in this area, under natural conditions, would discharge locally into Fountain and Bond Creeks, while groundwater at greater depths would discharge into the Mississippi River. Since the actual location of the site in Section 13 is not known, it is difficult to determine if one or more plumes of contaminates may result due to possible leakage from the site into local and regional groundwater flow zones. Further investigation is needed to determine the site's precise location and whether or not groundwater withdrawal from wells within the area is affecting the natural flow gradient.

In summary, groundwater within Section 13 discharges into Fountain Creek, Bond Creek, and eventually into the Mississippi River. The direction of leachate migration from the dump depends on the site's location, amounts of waste, and subsurface geology. Migration of harmful materials, once they reach bedrock aquifers, would almost certainly contaminate area wells since the contaminants would flow relatively quickly in the bedrock, where most wells are completed. Although some attenuation would be provided by the silts and clays in the surficial deposits, the bedrock would be unlikely to attenuate possible contaminants. Since the site is an illegal dump, it is probable that no measures were taken to safely dispose of the materials.

APPENDIX C

Waste Disposal Maps

Figure C1
COUNTIES IN ILLINOIS

Figure C2

ALL KNOWN
DISPOSAL SITES

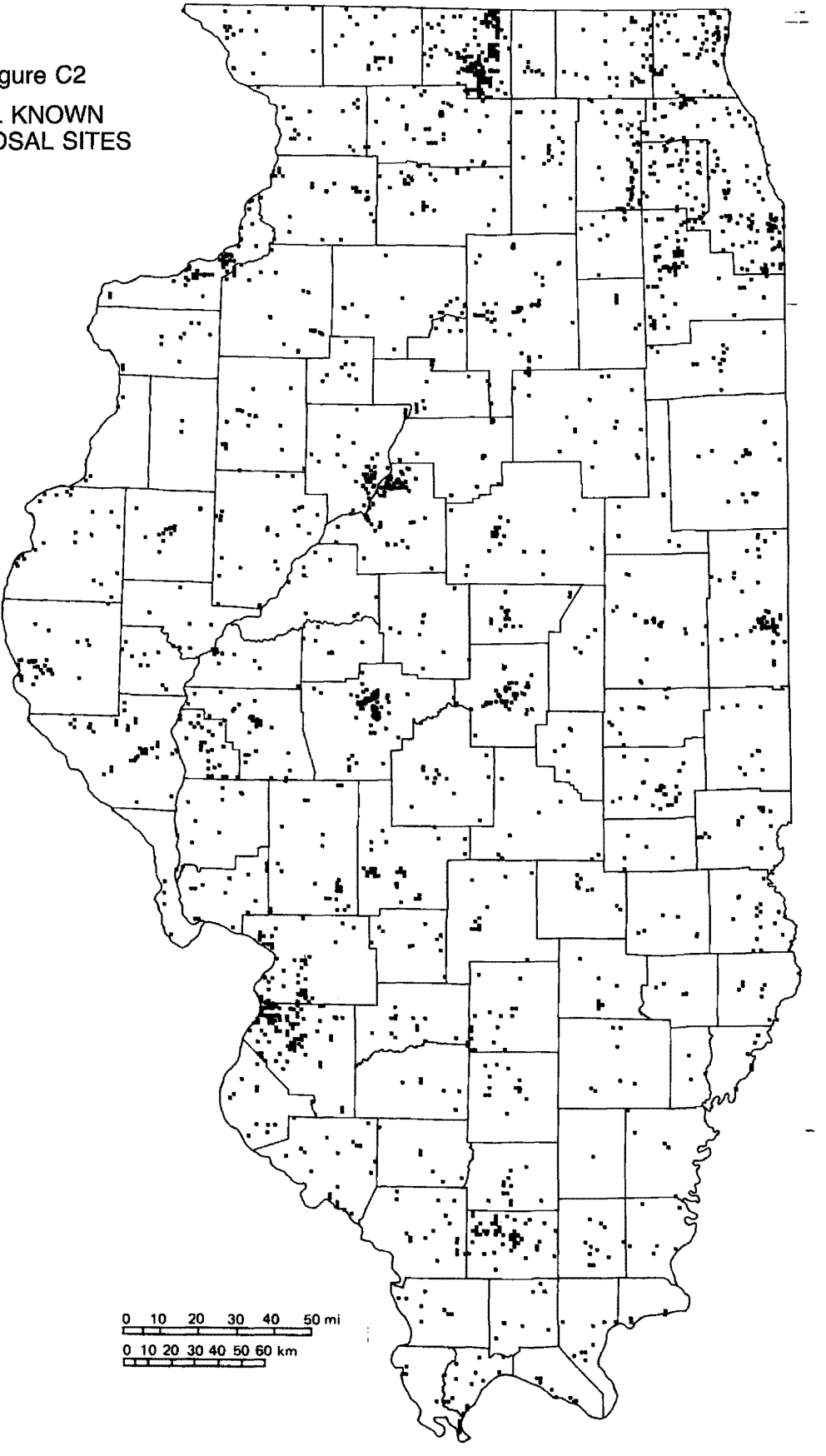


Figure C3

SITES OF DISPOSAL
BY LAND BURIAL

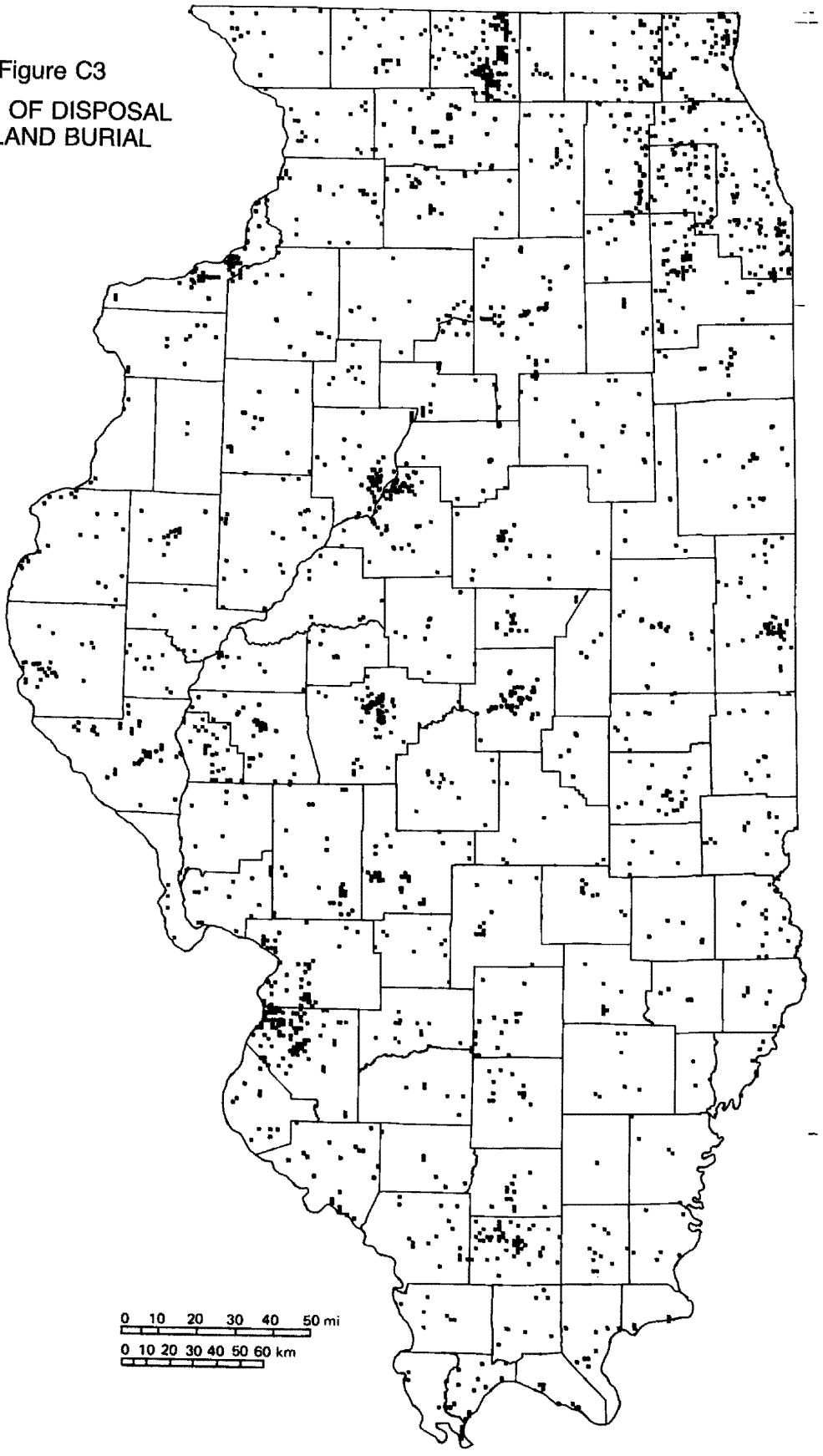


Figure C4

SITES OF DISPOSAL
BY SURFACE IMPOUNDMENTS

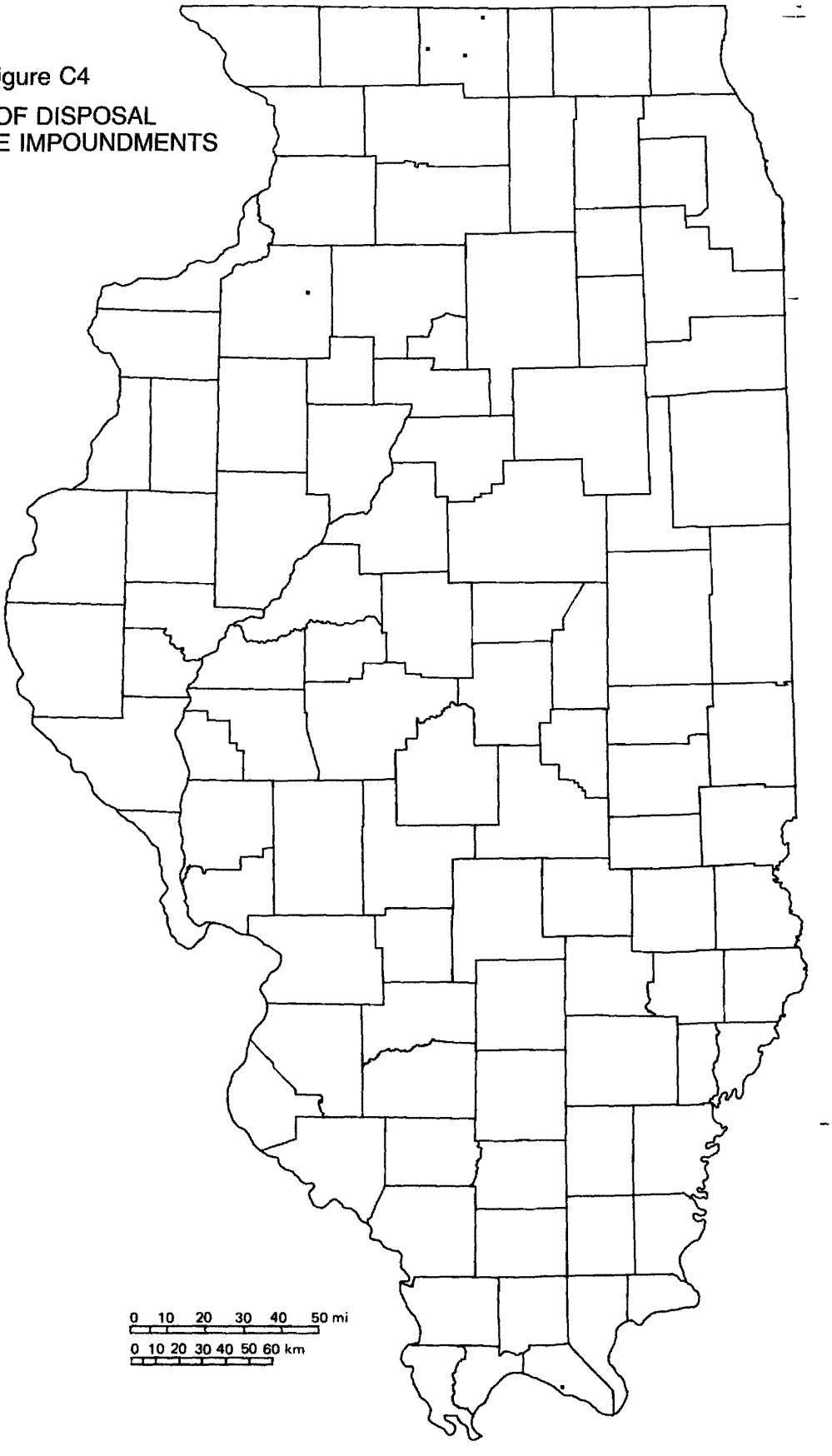


Figure C5

SITES OF DISPOSAL
BY LAND APPLICATION

Figure C6

DISPOSAL SITES
CONTAINING HAZARDOUS WASTES

Figure C7

DISPOSAL SITES
CONTAINING RADIOACTIVE WASTES

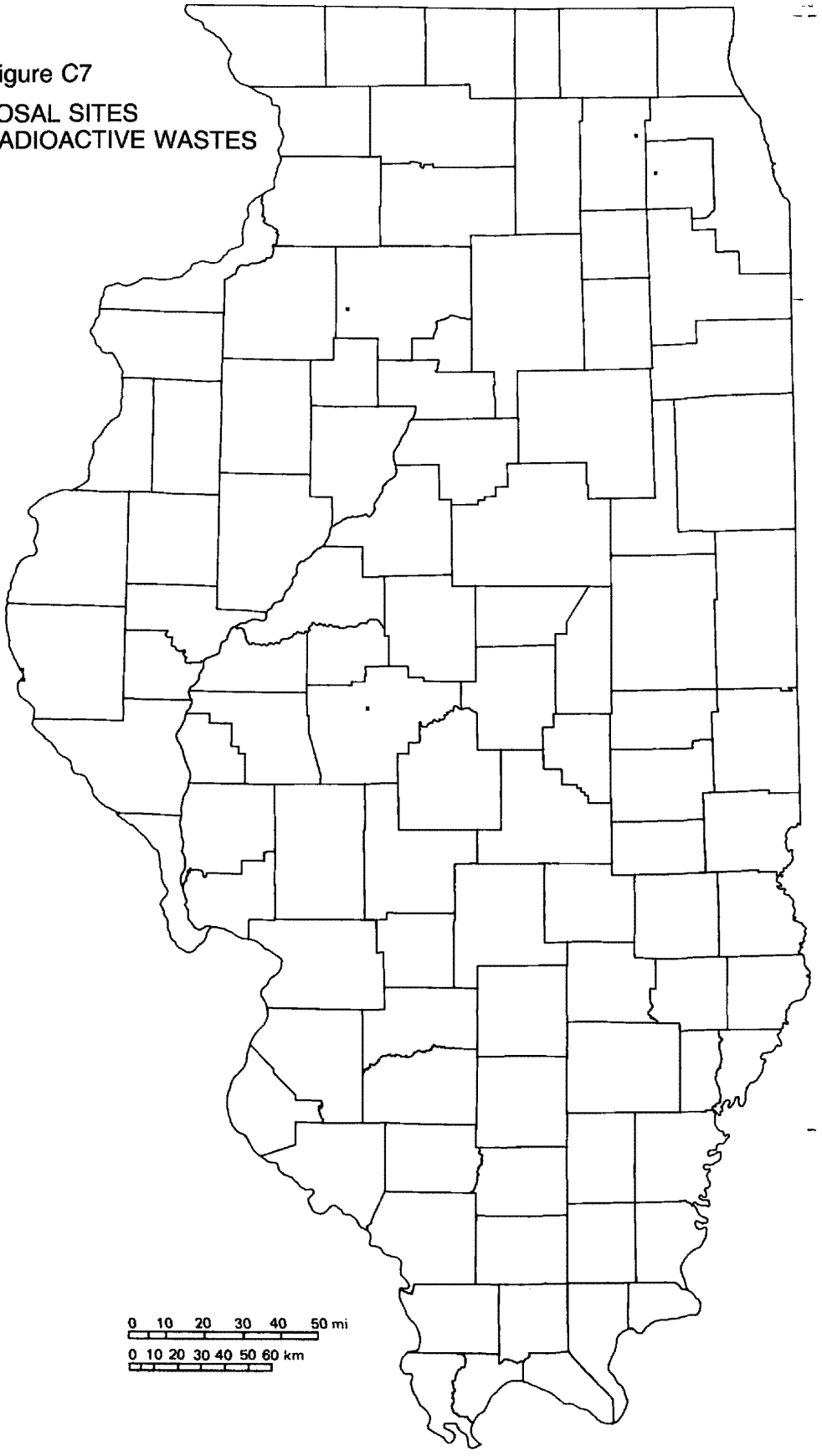


Figure C8

DISPOSAL SITES
CONTAINING NON-HAZARDOUS WASTES

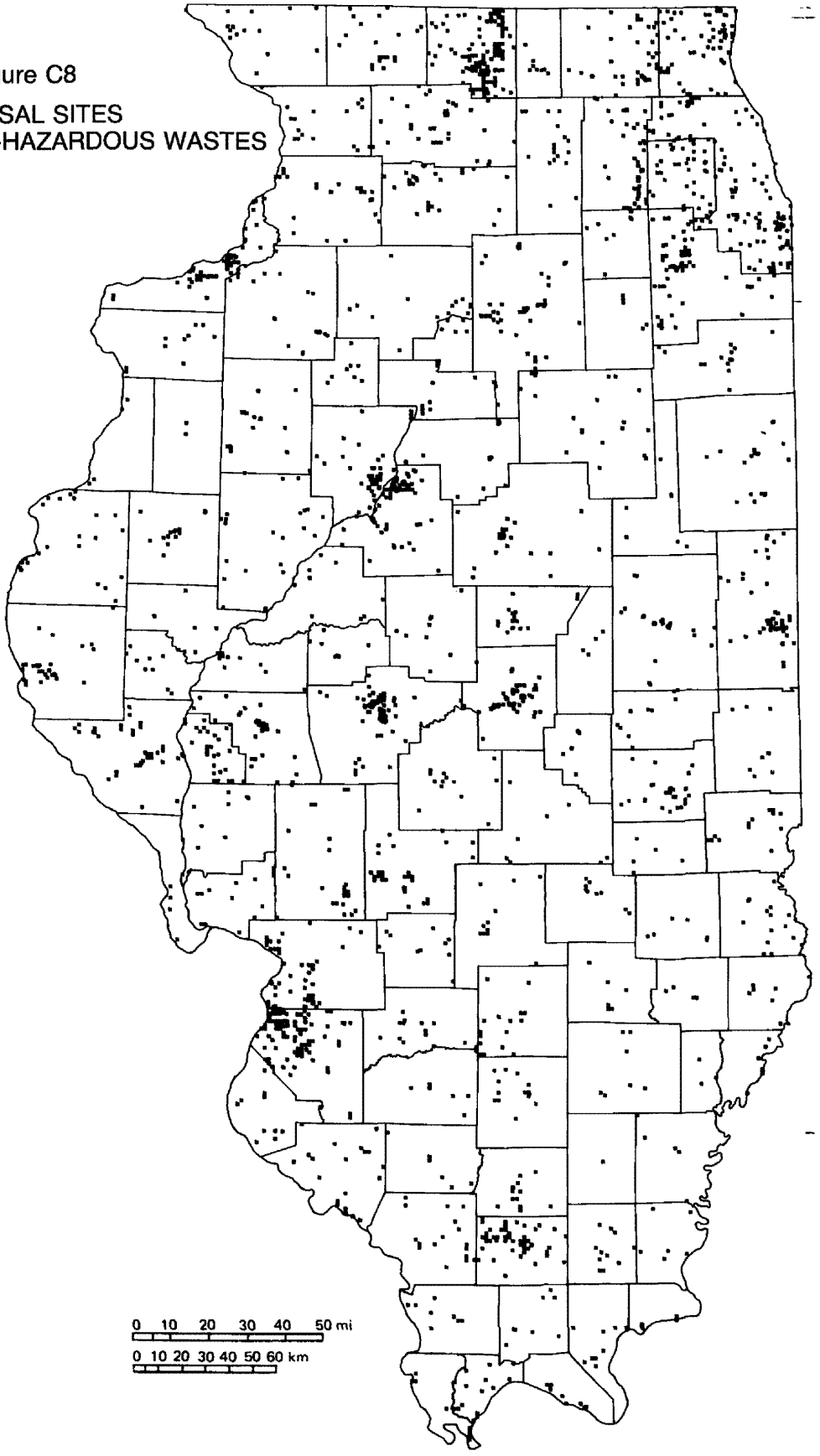


Figure C9

DISPOSAL SITES
CONTAINING UNKNOWN WASTES

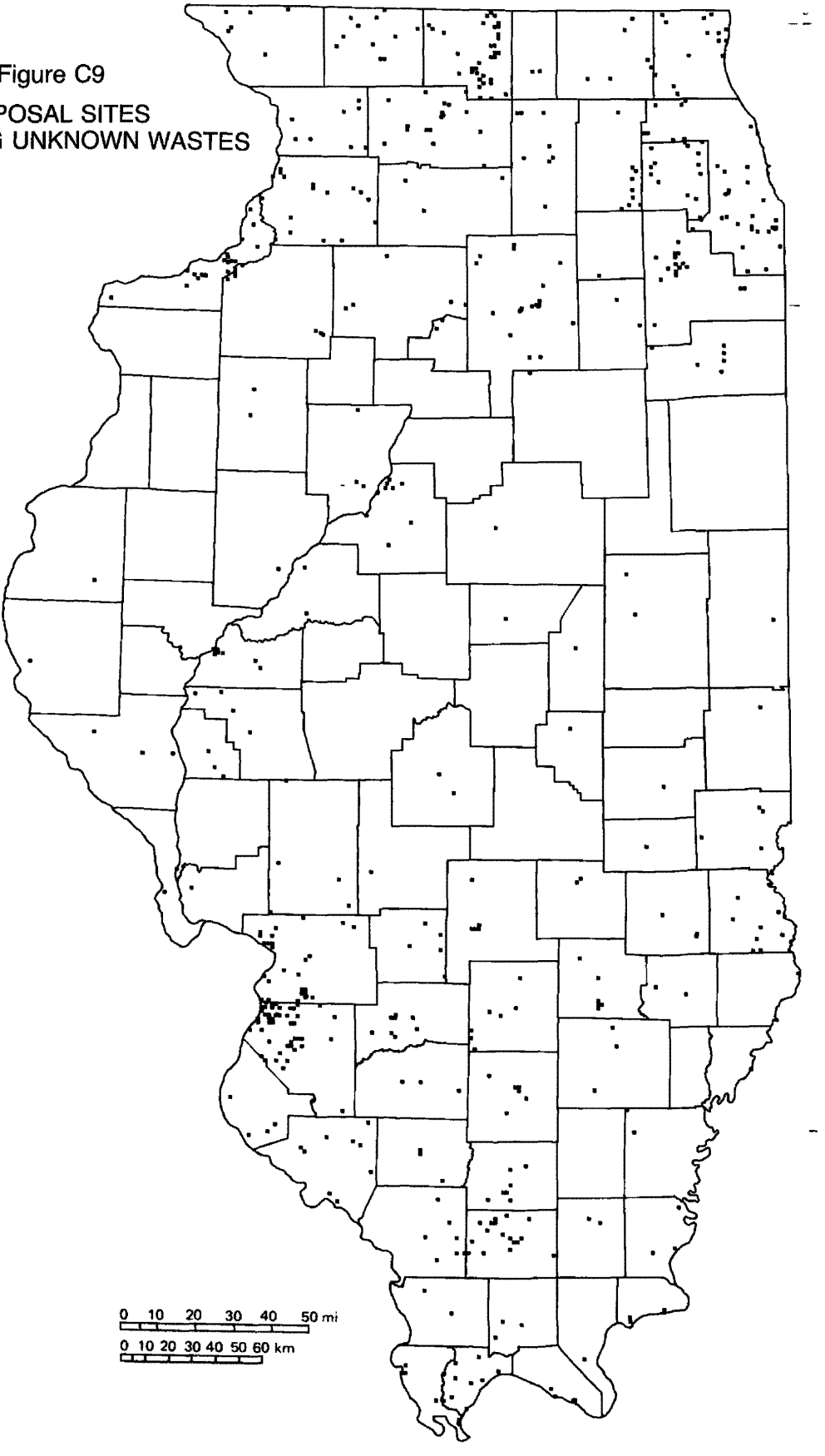


Figure C10

ACTIVE DISPOSAL SITES

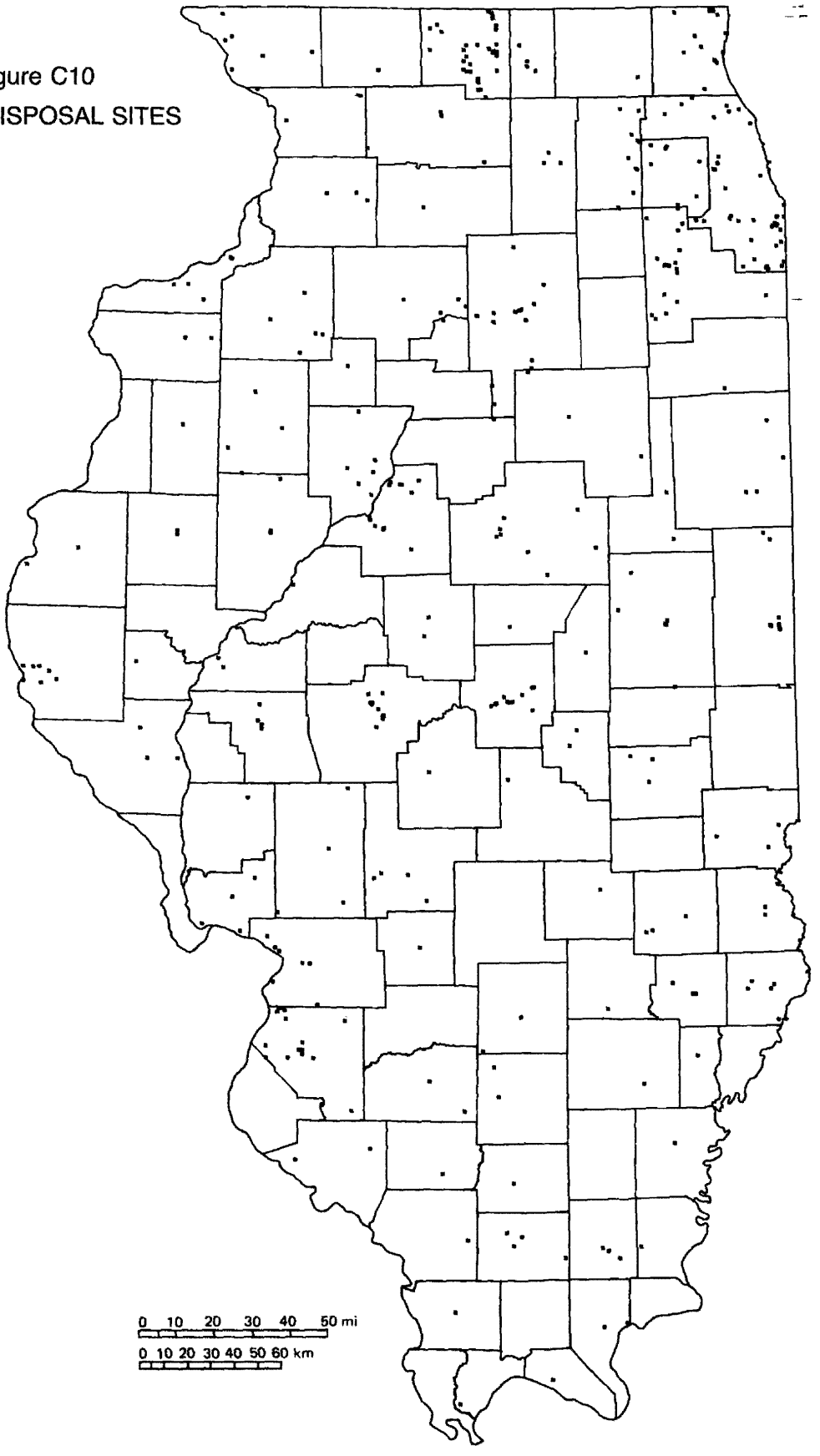


Figure C11
CERCLA DISPOSAL SITES

Figure C12
RCRA DISPOSAL SITES

Figure C13

DISPOSAL SITES
WITH HYDROGEOLOGIC EVALUATIONS

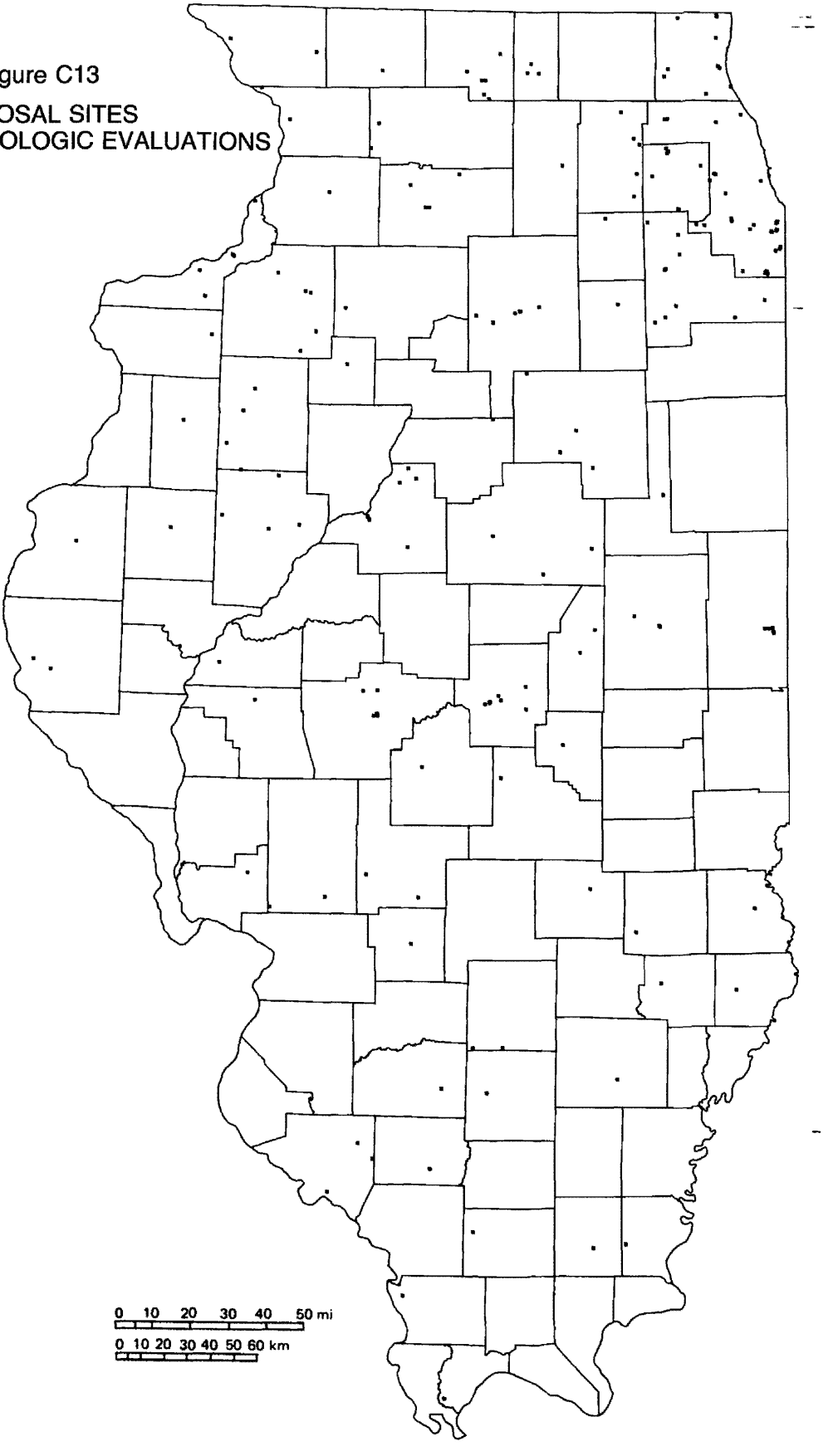


Figure C14

DISPOSAL SITES
WITH NO HYDROGEOLOGIC EVALUATIONS

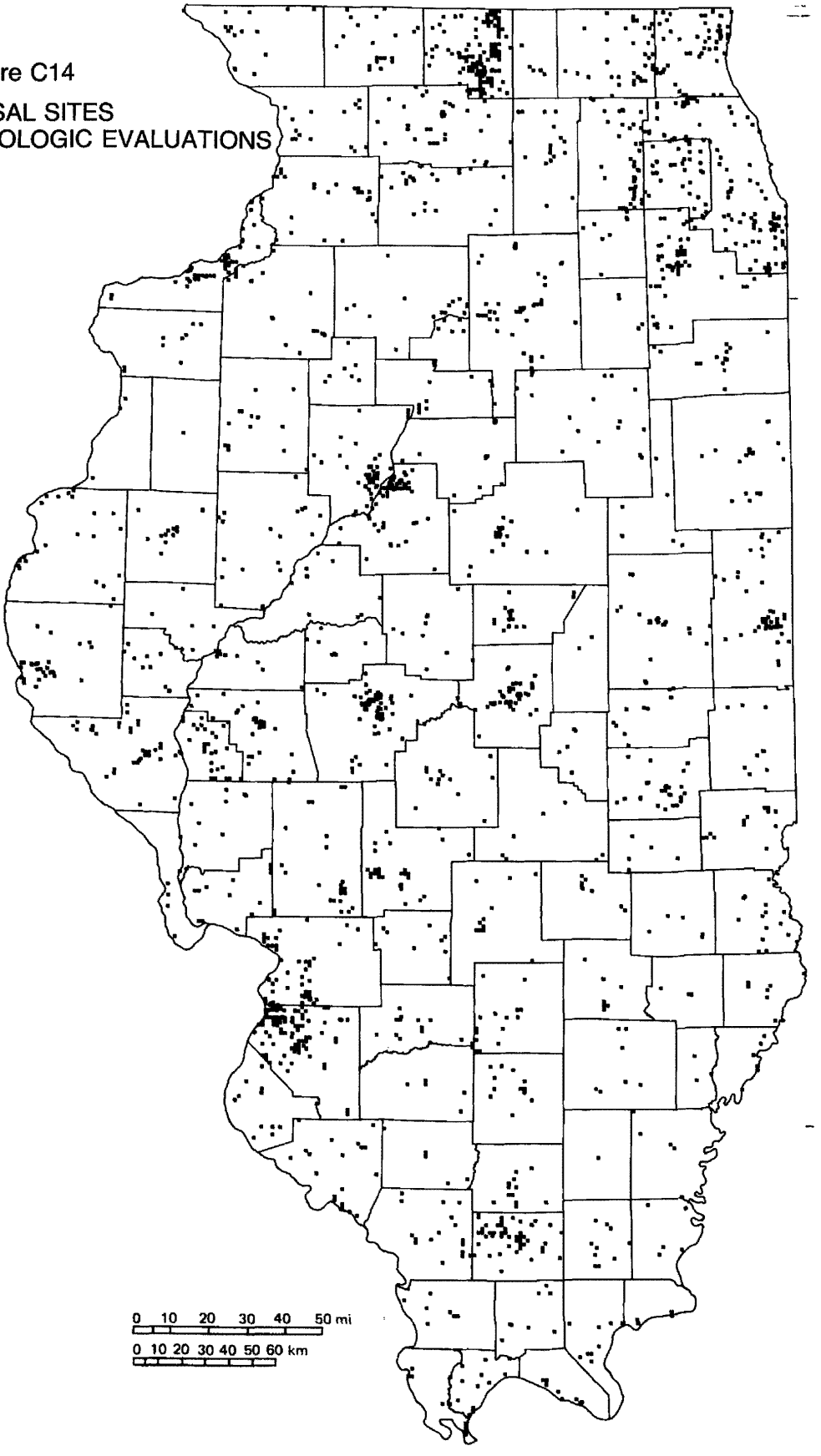


Figure C15

POTENTIAL AQUIFERS
WITHIN 20 FEET OF GROUND SURFACE

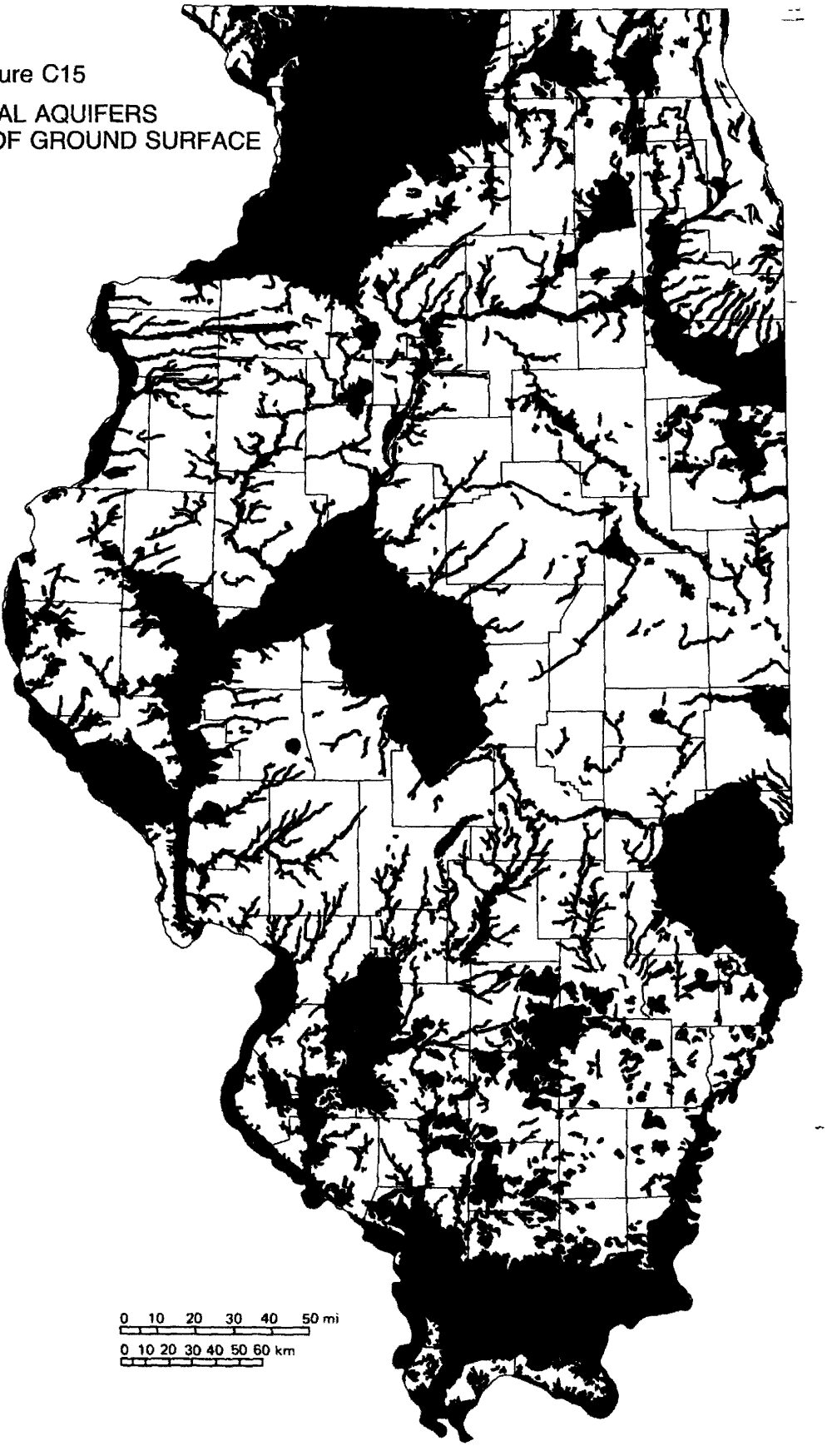
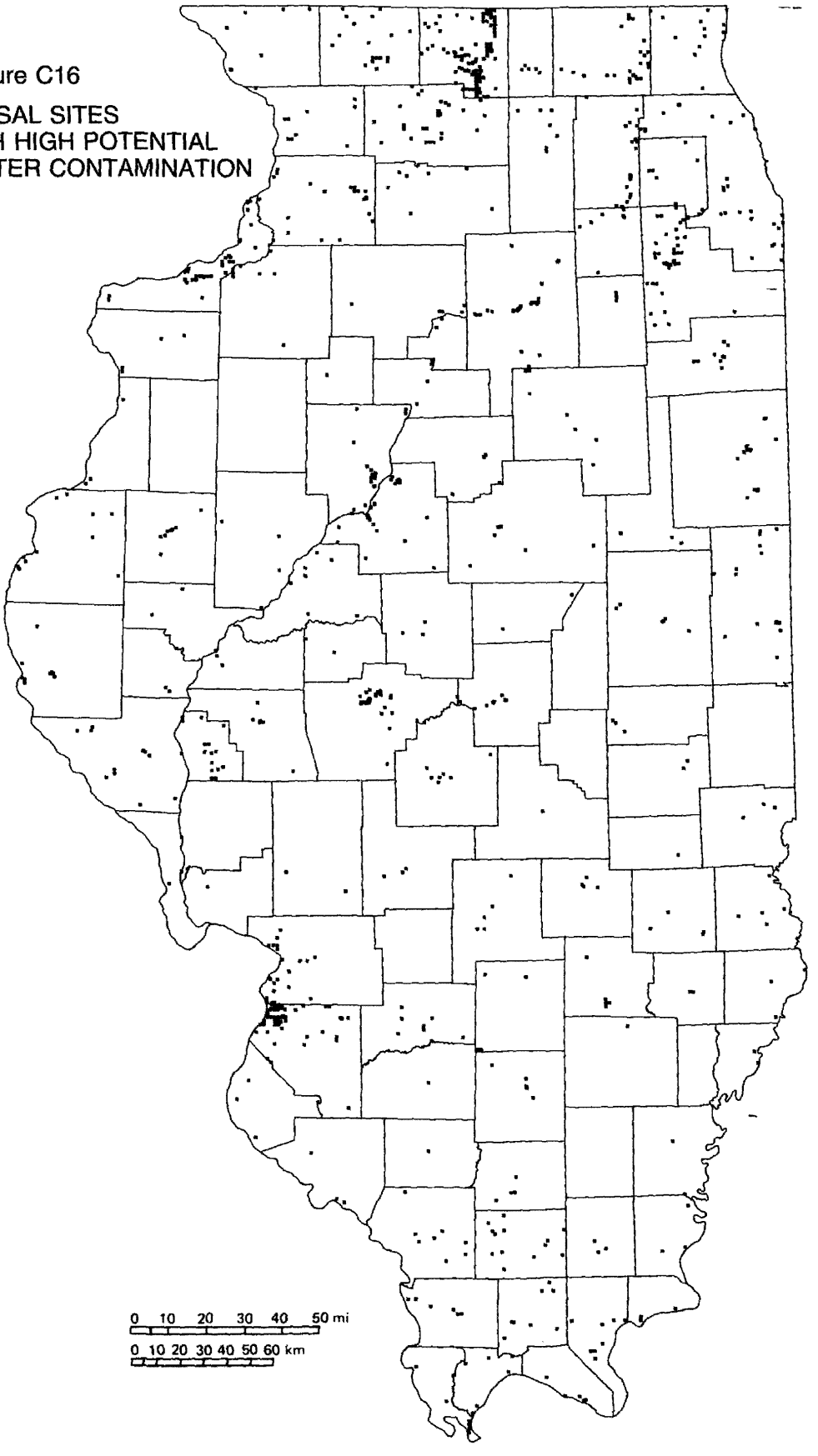


Figure C16

DISPOSAL SITES
IN AREAS WITH HIGH POTENTIAL
FOR GROUNDWATER CONTAMINATION



APPENDIX D

Impoundment Maps

Figure D1

ALL IMPOUNDMENT FACILITIES

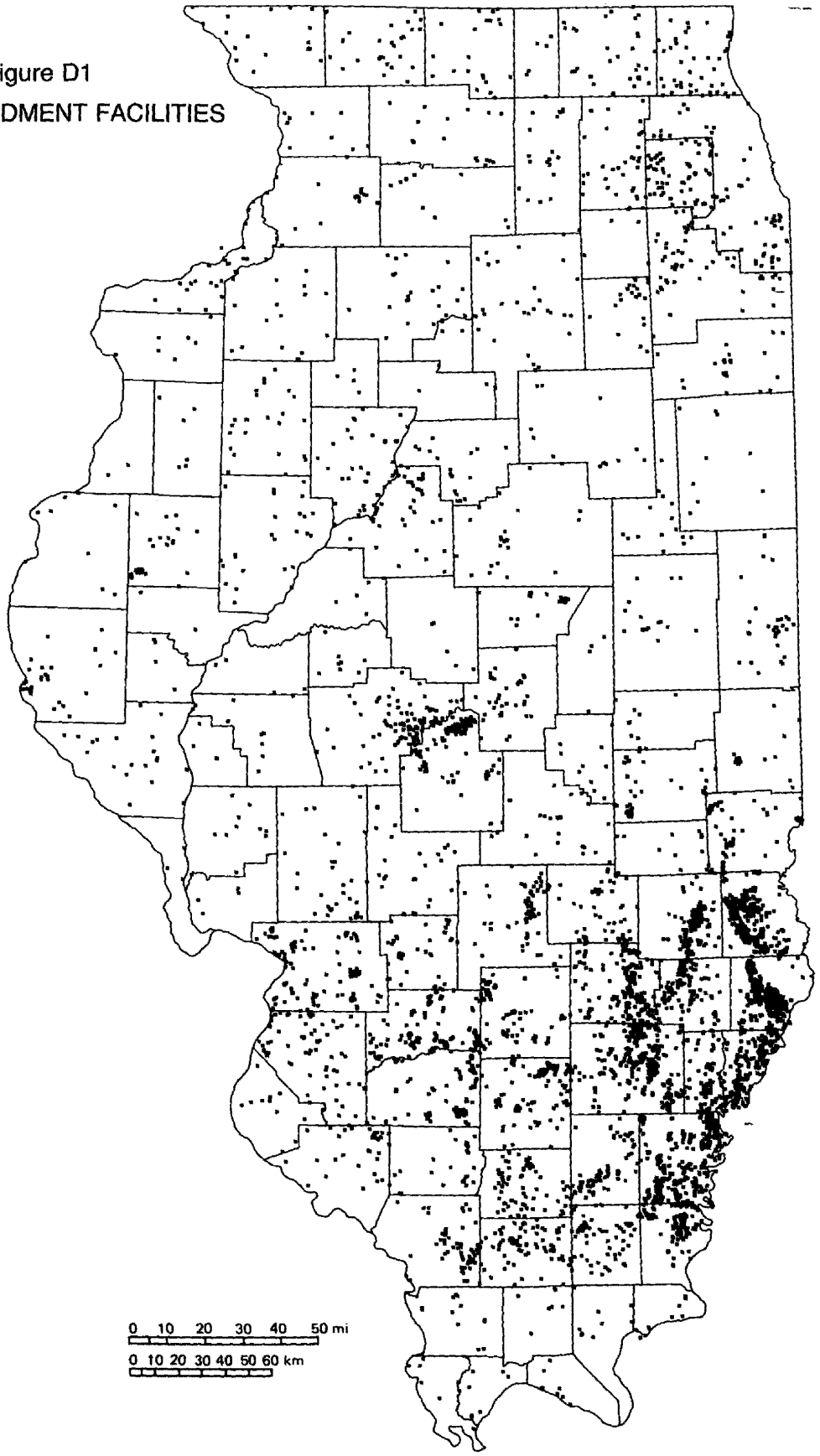


Figure D2

INDUSTRIAL
IMPOUNDMENT FACILITIES

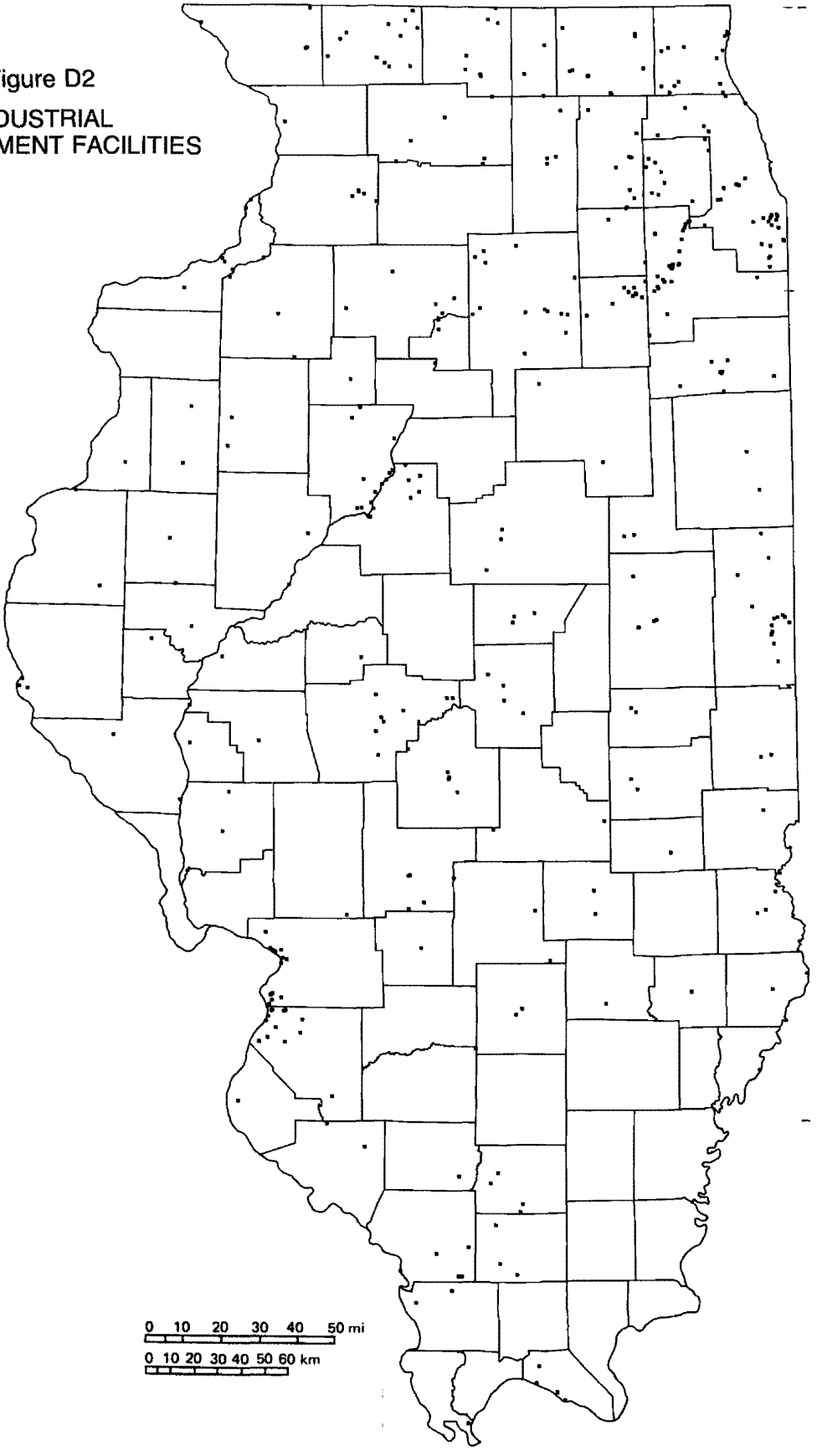


Figure D3

OIL AND GAS
IMPOUNDMENT FACILITIES

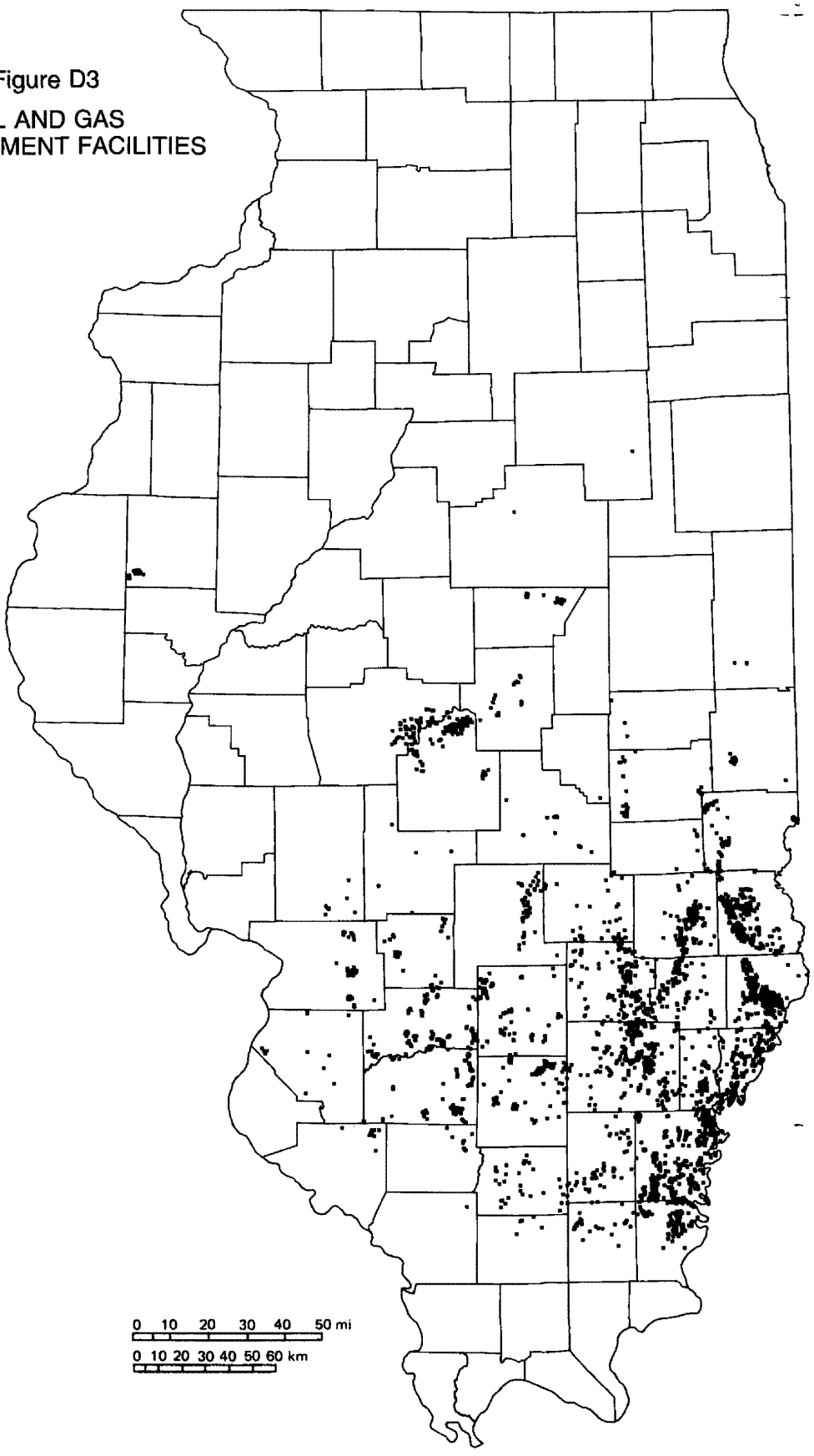


Figure D4

MINING
IMPOUNDMENT FACILITIES

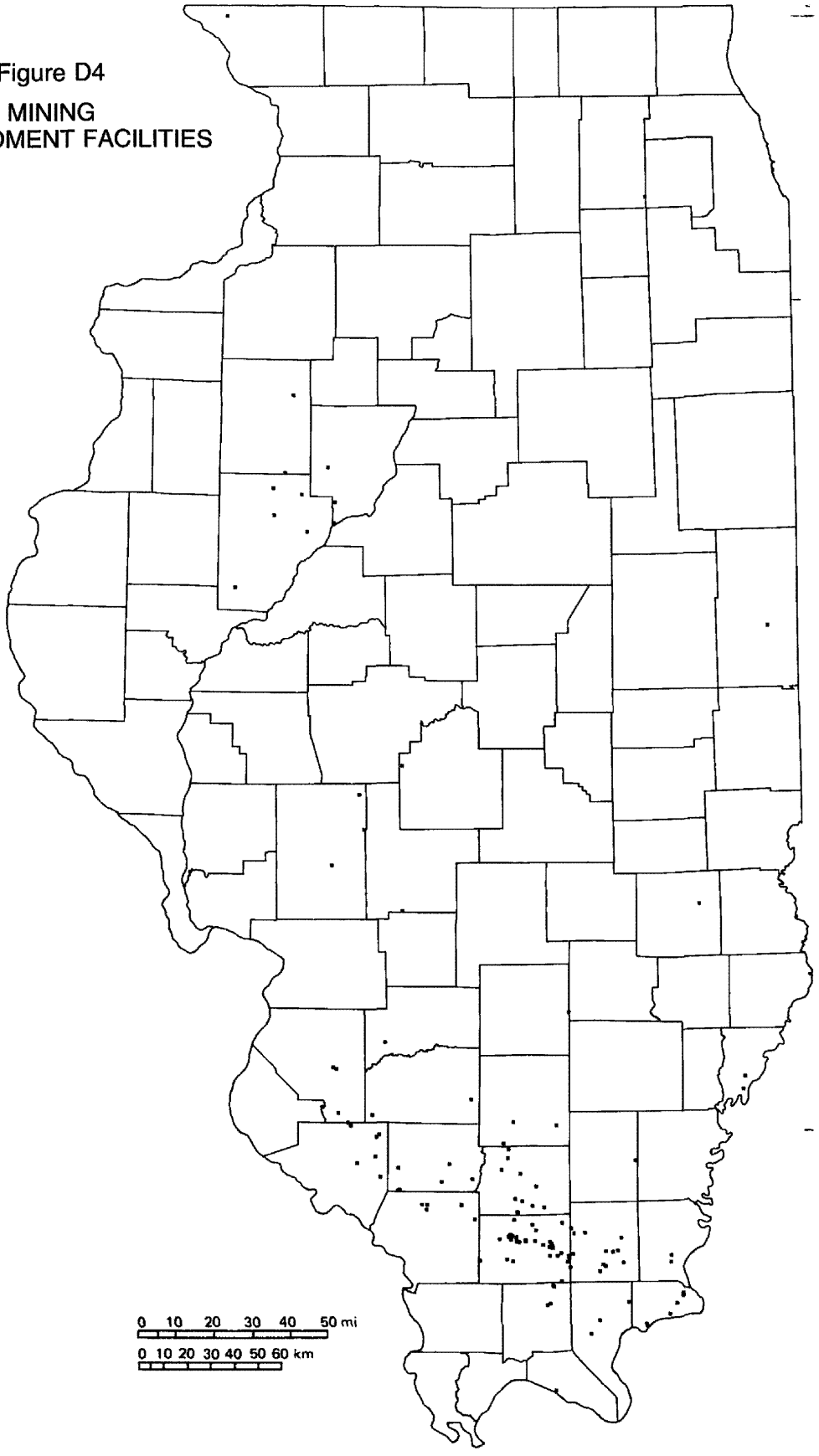


Figure D5

MUNICIPAL
IMPOUNDMENT FACILITIES

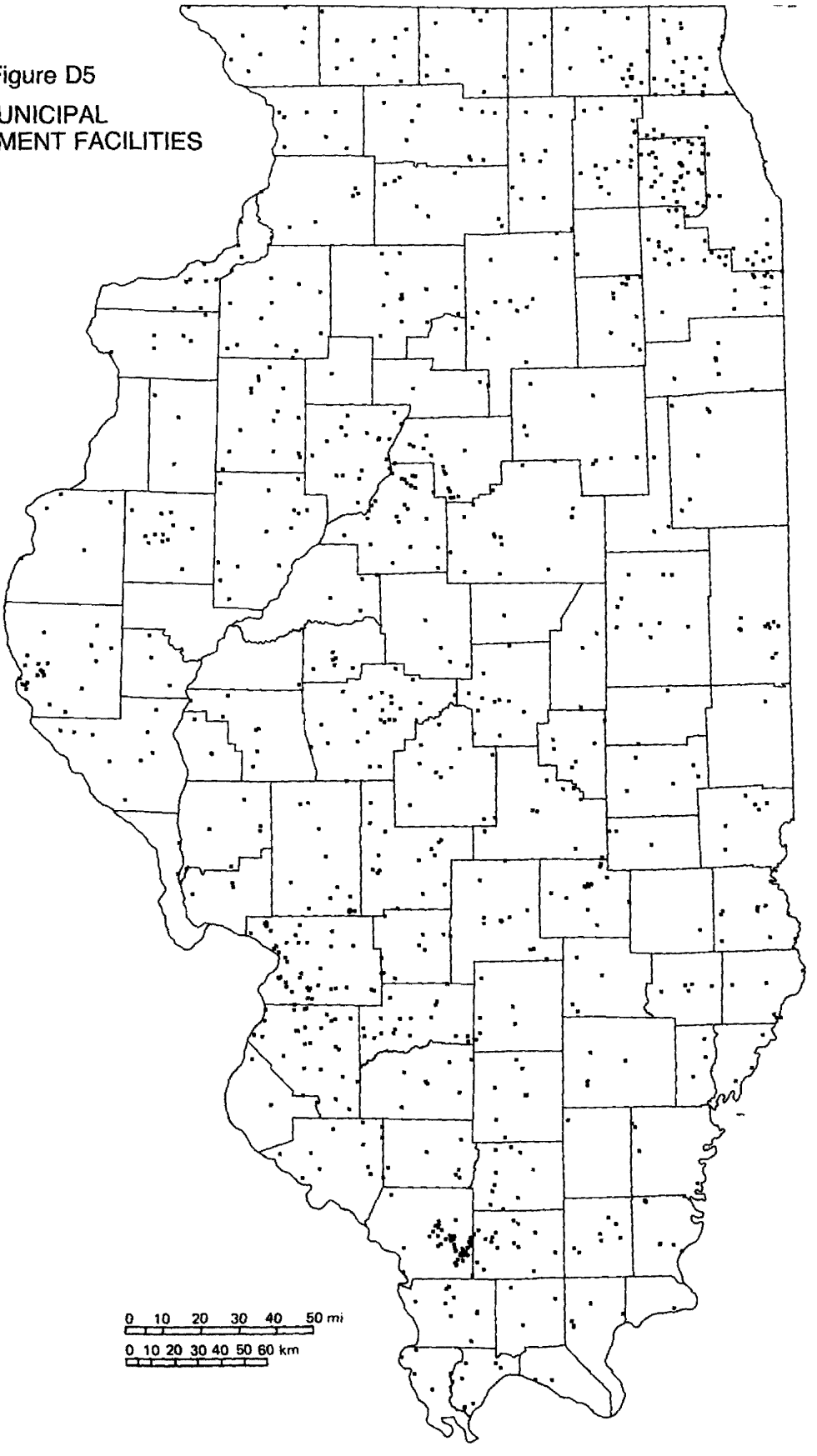


Figure D6

AGRICULTURAL
IMPOUNDMENT FACILITIES

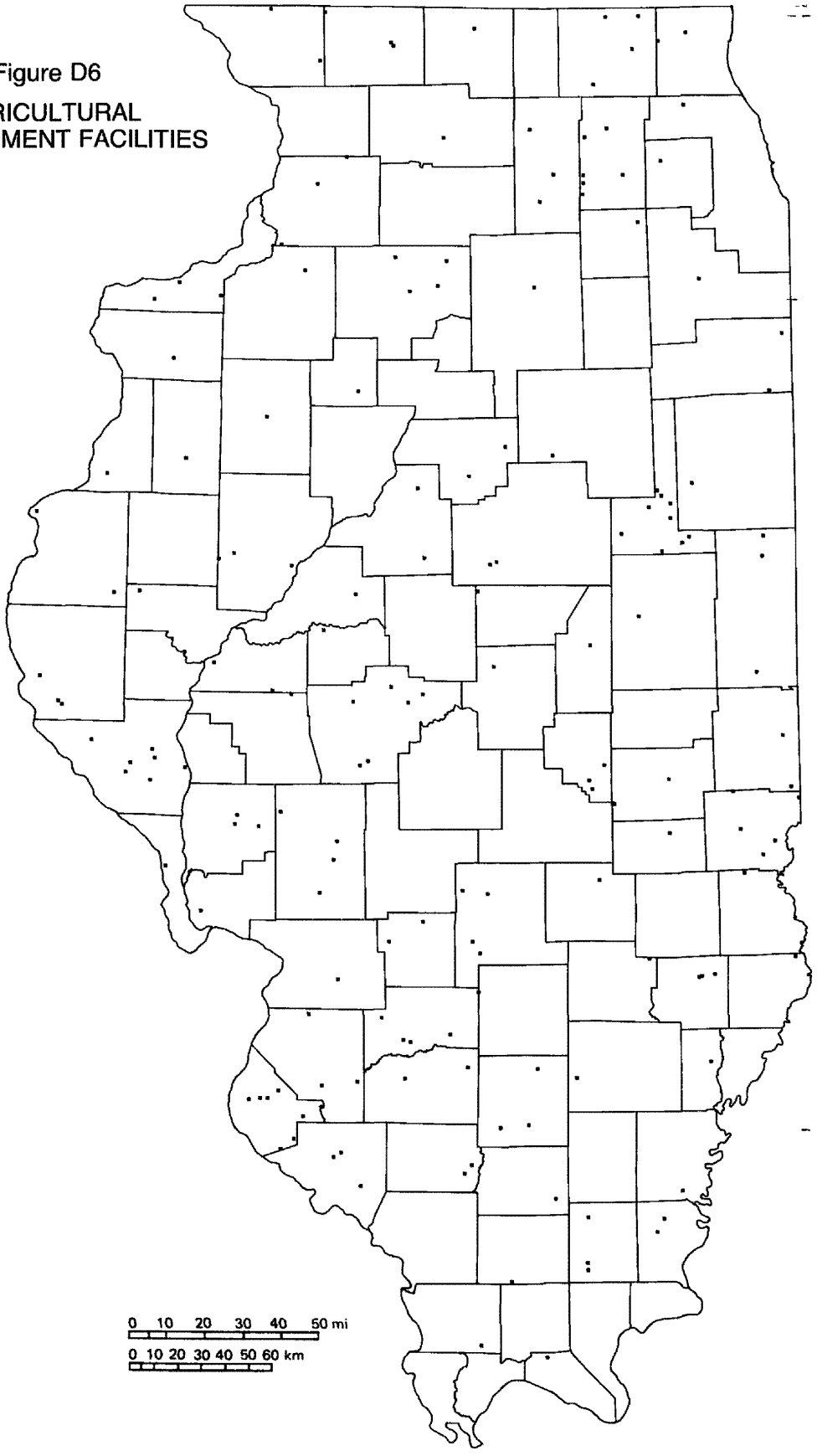


Figure D7

MISCELLANEOUS
IMPOUNDMENT FACILITIES