



**CATALOGUE AND DIRECTORY OF NEW ENGLAND STATES  
AND REGIONAL GIS ORGANIZATIONS AND ACTIVITIES,  
AND AN ASSESSMENT OF THEIR FUTURE GIS NEEDS**

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STATES AND REGIONAL GIS ORGANIZATIONS  
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**Final Report**

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## **1.0 INTRODUCTION**

This section describes the purpose and background of the project. It also includes a description of the content of this document and discussion of how the information contain herein is likely to be utilized.

### **1.1 BACKGROUND**

EPA Region I has developed a substantial GIS capability in its Boston offices. The GIS group plays a role within the Agency that is similar to the roles played by most of the GIS entities within each state: to support the activities of program offices and to enable project managers to better meet their goals through use of GIS technology. Data development and maintenance is also done. However, to a large degree, the data utilized or needed by EPA is data that is either maintained, in development, or is similarly needed by one or more state GIS organizations.

Data development efforts are usually expensive and require thoughtful planning. Therefore, it is important that duplicative development efforts be avoided and that thorough research go into development efforts before they are initiated. Unfortunately it is not easy to know who has what data, where the data reside and how to acquire them. No comprehensive directory or catalog exists identifying state GIS organizations in New England or the data these organizations have developed. This project was conceived by EPA as a first step toward remedying this problem. It was also conceived as a means of instigating thought and discussion about issues of regional GIS cooperation and whether EPA can play a useful role in this area.

### **1.2 PURPOSE OF THE PROJECT**

The purpose of this project is to survey and report on the use of geographic information systems (GIS) technology to support environmental protection-related activities in New England.

The objectives in undertaking this work were as follows:

- to develop a directory of GIS organizations (and contacts) throughout New England which have a significant role in the use, development or maintenance of statewide environmental data;
- to summarize the mission and general nature of activities undertaken by these organizations, with emphasis on those with statewide GIS and/or environmental protection responsibilities;
- to develop a catalog of existing GIS data, resources and applications of statewide or regional environmental significance;
- to summarize the data, resource and applications needs of these organizations, including issues related to global positioning systems use and training; and
- to explore and document the need for regional GIS cooperative efforts and the role EPA Region I might play in their development.

### 1.3 PROJECT FUNDING AND SUPPORTERS

This project was funded through a grant from EPA Region I Waste Management Division, Solid Waste and Geographic Information Section. The grant was issued to the Northeast Waste Management Officials' Association (NEWMOA) who have administered the project. Camp Dresser & McKee Inc. (CDM) was contracted by NEWMOA to execute this assignment and to produce this document.

A steering committee was convened to develop the study methods and clarify objectives. This committee included members of NEWMOA, CDM, and EPA's Waste Management Division, and Information Management Branch.

During the initial planning of this project CDM made arrangements with GeoManagement Associates of Syracuse, NY to provide background data on the GIS organizational structure of each New England state. This information had recently been collected for the Council of State Governments for inclusion in their soon to be published document entitled The State Geographic Information Activities Compendium. The document was acquired by CDM and used by the committee primarily to avoid duplication of effort and to better prepare the project team for discussions with project participants.



#### **1.4 ORGANIZATION OF THIS DOCUMENT**

**This document is organized into nine Sections and five Appendices.**

**The remainder of Section 1 discusses the intended uses of the information contained herein.**

**Section 2 describes the conduct of the study, including the criteria used for selecting the organizations that are discussed and the methods used to collect the information described.**

**Sections 3 through 8 address each of the six New England states, respectively. Topics discussed include the GIS organizational structure, the role of environmental agencies and a summary of each organization, including:**

- **Mission, staffing and funding;**
- **Data maintenance, distribution, standards and availability;**
- **Hardware and software resources;**
- **Environmental applications of GIS; and**
- **Future needs, including thoughts on regional cooperative efforts.**

**Section 9 includes a summary of needs as described in Section 3 through 8 and a collection of ideas regarding regional GIS cooperative efforts in New England and EPA's role in achieving them.**

**The appendices contain a collection of tables which summarize the results of this investigation. The appendices are prefaced with an introduction describing these tables and the method used to develop them. The five appendices cover the following: 1) NEWMOA GIS Survey Questionnaire; 2) GIS Organizations and Contacts; 3) GIS Data; 4) GIS Resources, and GIS Applications.**

## **1.5 USE OF THIS INFORMATION**

**This document, along with its appendices, will serve as a reference manual for individuals and organizations interested in the GIS activities of EPA Region I and the New England states. The document is organized in a way to encourage this use. The Sections on each state are subdivided into detailed sub-sections with clear headings. Each state Section follows an identical format. The language of the document is intended to be brief and clear. The Appendices are organized into a variety of tables designed to enable quick referencing of information either by state, organization or subject matter.**

**It is hoped that the information contained herein, particularly the data summaries contained in the Appendices, will be maintained, updated and made accessible to interested parties. Section 2, which discusses the methods used to conduct the study, contains information relative to this concern.**

**It is also intended that this document, and the process by which it was researched, will serve as a catalyst for the development of cooperative GIS efforts throughout the region. The contents of Section 9 are intended specifically to encourage such activity.**

## **2.0 STUDY METHODS OF THE PROJECT**

This Section describes the methods used in conducting this research and preparing this document. It includes Sections on which organizations were selected for study, the criteria used for selection and the methods of research and analysis.

### **2.1 BASIS OF STUDY**

The basis of this study was communication with a select group of organizations having GIS responsibilities at the state level. The method of communication included a combination of personal interviews, telephone interviews, and written survey. Thirty-two organizations and 40 individuals were included in the study. The ideal study would have involved a greater number of organizations and individuals, and personal interviews with each. Time, budget and logistical issues made this impractical.

The three methods employed served different functions. Written surveys were mailed to all participant organizations. These provided information about GIS data layers, resources, and applications in use by each organization.

Personal interviews were conducted with primary GIS organizations and primary environmental protection organizations. A select group of other organizations was also engaged in personal interview. Telephone interviews was conducted with the remaining organizations. The information acquired from the interviews was more focused on the GIS activities and interests of the interviewed organization.

In all cases, the interest and availability of representatives from each organization determined how communication was made.

## **2.2 PARTICIPANT ORGANIZATIONS**

The project steering committee, described in Section 1, was used as a forum for discussions and decisions about which organizations should be included in the study, and which individuals contacted. The original list included federal, state, regional planning, private and non-profit (universities and research centers) organizations. The committee felt that the focus, interest and accessibility of this large group was so varied, efforts would be more fruitful with a smaller, more focused group.

### **2.2.1 CANDIDATE LIST**

A group of candidate organizations was developed which included primarily state organizations, and in addition the United States Geological Survey (USGS) offices, Soil Conservation Service (SCS) offices, National Estuary Program offices (NEP), one regional planning organization (RPO) and one regional Water/Wastewater Authority. The USGS, SCS and NEP offices were included because of their tradition of state-focused programs and offices, and because of the relevance of their work to environmental protection.

The two regional organizations were included because of their substantial GIS databases and applications development experience. These are: (1) the Massachusetts Water Resources Authority (MWRA), a water and wastewater Authority serving eastern Massachusetts; and (2) the Cape Cod Commission, a Massachusetts state regional planning Agency for Barnstable County (Cape Cod).

An additional category of organization included on the candidate list is universities. Two universities were included: University of New Hampshire and University of Rhode Island. They were included because of their integral involvement in the GIS programs of those two states. Their participation was limited to the statewide functions which they serve.

### **2.2.2 PRIMARY STATE CONTACTS**

A primary contact was identified for each state. This individual was either the titled state GIS coordinator, whose authority was through a

state GIS program office, or the defacto GIS coordinator for environmental programs, by virtue of his or her involvement with the GIS community.

### **2.2.3 FINAL LIST OF ORGANIZATIONS**

A final list of participant organizations was prepared after conferring with the primary state contacts. This was facilitated by letter and follow-up telephone discussions. Each primary contact was asked if he/she felt the statewide GIS activities of significance would be adequately represented through interviews with members of the candidate list and, if not, what modifications should be made.

The requests of each primary contact were honored and the final list reflects their input. Tables in Appendix B list the organizations and individuals contacted for this study. Table B-1 lists those organizations recommended by the primary contacts and is annotated to identify:

- were personal or telephone interviews conducted; and
- were survey materials returned (those organizations which were contacted but did not return surveys are not discussed in this report).

Tables B-2 and B-3 list individuals associated with each organization. Primary state contacts are noted on Table B-3.

## **2.3 STUDY METHODS**

### **2.3.1 WRITTEN SURVEY**

The representative of each organization in Table B-3 was telephoned in order to introduce the study and request their participation. If they agreed (they all did), a survey packet was mailed to them. In a few instances, it was not possible to contact the individual and a survey packet was mailed with a detailed explanatory letter.

A copy of the survey material is included as Appendix A. It includes four Sections. Section A is a list of questions which were discussed in

follow-up interviews. Sections B, C and D are questionnaires. Section B deals with hardware, software and personnel resources. Section C deals with data and Section D deals with environmental applications. In addition to the participant organizations, EPA Region I also completed a survey.

#### **2.3.2 PERSONAL INTERVIEWS**

Personal interviews were conducted with all primary GIS organizations and all primary environmental protection organizations. Other organizations were included in personal interviews if such interviews could be conveniently arranged. This meant that the organizations consented to be interviewed with another organization. The point of departure for these interviews was the information requested in the surveys and the general categories of questions indicated in Section A of the survey packet. These interviews, along with supplemental information included with the returned surveys, are the basis of what is discussed in Sections 3 through 8 of this document.

#### **2.3.3 TELEPHONE INTERVIEWS**

Telephone interviews were conducted as follow-up to returned survey material. Examples of the types of questions asked are listed in Section A of Appendix A. Generally, there were five basic themes to the discussion: (1) organizational structure and funding of GIS activity, (2) database issues, such as discussions about data development, maintenance, and distribution, (3) current and future uses of GIS, (4) future GIS needs in terms of data layers, funding, trained personnel, etc., and (5) regional GIS cooperation and EPA's role.

#### **2.3.4 DATABASE DEVELOPMENT**

In order to manage and effectively present the information contained in the returned surveys, a database of responses to Sections B, C and D of the surveys was created. The database and interface were created using Progress relational database software, version 6.2h. A preface to the appendices describes the database in more detail.

### **3.0 CONNECTICUT**

This section describes the organizational structure of GIS activities in Connecticut and summarizes the GIS activities of the organizations which partook in the study.

#### **3.1 ORGANIZATIONAL STRUCTURE**

Figure 3-1 is a generalized chart of organizations within the state of Connecticut which are or may be involved in GIS activities that could have a bearing on environmental protection. This Figure is intended to help orient the reader with respect to which organizations were interviewed for this project and why; and also as a reference for the organizational information included in the survey responses. There is no formal GIS program in the State of Connecticut, and, therefore, no single agency has a GIS-specific mandate.

##### **3.1.1 ENVIRONMENTAL AGENCIES**

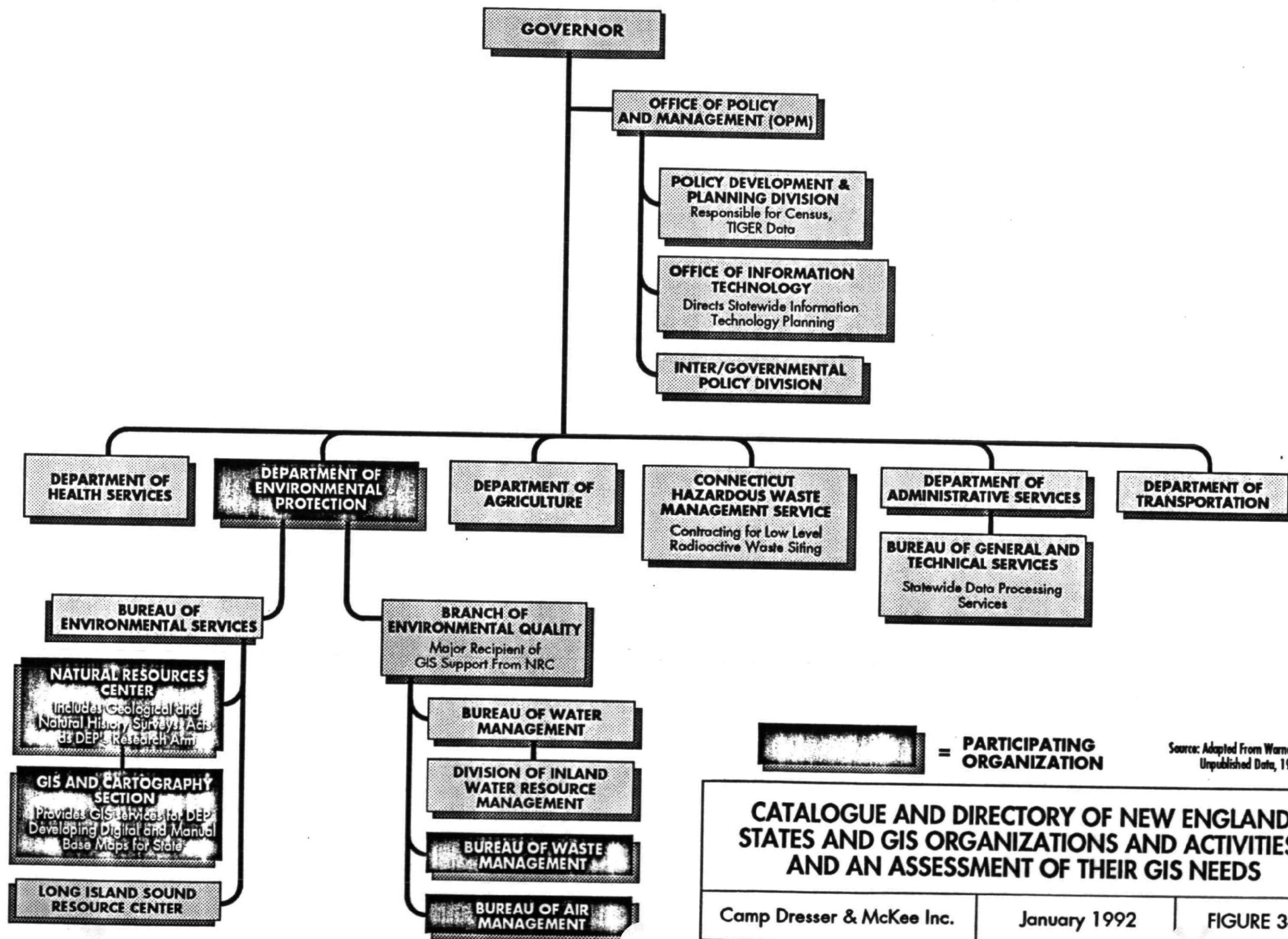
All of the environmental GIS activities in Connecticut are undertaken by, or coordinated through the Department of Environmental Protection (DEP). Within the DEP, The GIS and Cartography Section of the Natural Resources Center (NRC) is responsible for this GIS function. The NRC is the organizational entity generally identified with GIS in the state. The NRC is a part of the Bureau of Environmental Services (See Figure 3-1).

Other Bureaus within DEP that have substantive GIS activities or needs are the Bureau of Waste Management and the Bureau of Air Management.

##### **3.1.2 INTER-AGENCY AND INTER-STATE COORDINATION**

Early in 1991 a GIS work group was convened. The intent of the group is to coordinate the GIS activities of state agencies. All of the Department level organizations on Figure 3-1 participate in the workgroup. The group is chaired by the Director of the Policy Development and Planning Division

# GIS ORGANIZATIONAL CHART OF CONNECTICUT





of the Office of Policy and Management. Environmental protection related GIS activities are represented within the group by the Department of Environmental Protection (DEP), Natural Resources Center.

### **3.1.3 ORGANIZATIONS INTERVIEWED**

The organizations interviewed for this project are The Natural Resources Center, The Bureau of Waste Management and the Bureau of Air Management. Salient aspects of our discussions and summaries of each organization's response to the written survey are presented below.

## **3.2 NATURAL RESOURCE CENTER**

### **3.2.1 MISSION**

The Natural Resources Center coordinates state and related federal agency programs to produce, maintain and distribute natural resource information and environmental data for the state of Connecticut. It is a non-regulatory branch of DEP and its function is to provide information to DEP and other state program offices and to the public.

GIS has become central to the efficiency and utility of many NRC functions. Map publishing is one such function. Natural Resource data acquisition, maintenance and distribution is another. The Center also plays a role in providing GIS training to DEP program staff.

### **3.2.2 STAFFING**

There are six core GIS program staff at the NRC: four Technical specialists a program manager and a systems manager. Several other part-time GIS workers rotate through NRC periodically; some are from other DEP program offices doing program-specific work.

### **3.2.3 FUNDING**

There is no regular source of GIS-specific funding for the NRC. Most of the GIS work is supported by virtue of its utility to NRC as a data

management, analysis and map production tool. That is, in general, GIS staff are a regular part of the NRC operating budget. GIS resources (hardware, software, etc.) are not. The General Fund supports approximately four staff, and grant-specific funding supports the remainder. Currently EPA grants support two GIS staff.

Resources are acquired on an ad-hoc basis, when possible, based on funding. Often times resource needs are met in order to meet the needs of DEP programs which NRC is requested to support.

The NRC has netted about \$30,000 from sales of GIS data over the last 3 years.

#### **3.2.4 DATA MAINTENANCE/DISTRIBUTION**

The NRC maintains and distributes all statewide environmental GIS data in the state. These data are maintained as ARC/INFO coverages. The NRC draft publication entitled Directory of Digital Cartographic Data, last updated in February, 1990 summarizes these data, cost, maintenance updates and distribution policies.

#### **3.2.5 GIS STANDARDS**

GIS standards are also summarized in the above-referenced document. These standards address accuracy (National Map Accuracy Standards have been adopted), attribute data verification, coordinate referencing, datums and documentation. These standards are very general. There is no locational standards policy.

#### **3.2.6 DATA LAYERS AND COVERAGES**

##### **3.2.6.1 General**

The data layers used, maintained and distributed by the NRC are summarized in Appendix D.

The NRC GIS database is called the Digital Cartographic Data Base (DCDB). The data are listed and described in NRC documentation based on resolution: high resolution data are those with scales greater than 1:25,000 and low resolution data are those with scales less than 1:25,000. This scale (1:25,000) has been adopted as the base-map scale for NRC. Substantial effort goes into developing data at this scale. For example, effort is underway to rectify TIGER demographics and address data against 1:25,000 digital line graphs (DLGs). USGS 7.5 minute quadrangle boundaries are the basic tile structure of the high-resolution data.

In addition, data are categorized in NRC documentation according to "principal data" and "other data." Principal data are those data that meet specific accuracy and coding standards, and are maintained/updated on a regular basis. Other data are those that do not necessarily meet specific quality standards or are not updated with regularity. They are usually program-specific, or project-specific data.

#### 3.2.6.2 Noteworthy Data Layers

In total, the NRC database is large and varied; however most of the data are not principal data, and, therefore should be used with particular cognizance of the limitation of the data. The Comments Section of Tables D-1 through D-3 provide some general information in this regard.

Some of the more interesting and unique data maintained by the NRC include a variety of geologic coverages, aeroradioactivity and radon, point coverages of regulated facilities and water quality classifications. The DCDB catalog of data is reflective of NRC's mission to provide environmental and natural resource data to the public.

#### 3.2.7 RESOURCES

Appendix C presents a summary of hardware and software resources in use by the NRC. The NRC uses ARC/INFO GIS on the PC, SUN Workstation and Data General mainframe. The NRC owns a substantial amount of equipment, of

particular interest are two Trimble, low resolution global positioning system (GPS) units (used primarily by the Bureau of Waste Management) and two E-size Electrostatic plotters.

### **3.2.8 ENVIRONMENTAL APPLICATIONS OF GIS**

The NRC supports environmental applications of GIS for various DEP program offices, the USGS, private water companies, towns, the Department of Health and universities. These are summarized in Appendix E. Applications do not drive the NRC GIS program, however, and there are many more planned and needed applications than are currently existing. Applications of particular relevance to EPA are described under the discussion of the Bureau of Waste Management (BWM) and the Bureau of Air Management (BAM) in Section 3.3, below.

### **3.2.9 FUTURE NEEDS**

Future needs as indicated by NRC staff are itemized in the Appendices. Discussed below are particular needs as discussed during the interview process.

#### **3.2.9.1 Data**

There is a need for a data archival system for historical data. This is particularly necessary because of the dynamic nature of much of the data maintained by NRC. It is not likely that this need can be met through traditional sources of funding under the current operational constraints.

The data layers which are needed most, and considered to be of greatest long-term and widespread utility include high resolution: (1) soils, (2) wetlands (which meet regulatory criteria, as opposed to the existing wetlands coverage), and (3) pesticide incidence/application areas.

#### **3.2.9.2 Applications**

Applications needs of relevance to EPA are described under the Sections on BAM and BWM.

### **3.2.9.3 Resources/Organizational**

A particular problem for NRC is that the state does not have a Master Agreement with the Environmental Systems Research Institute (ESRI), and therefore have difficulty obtaining ARC/INFO licenses. The DEP has six idle SUN Workstations because of this.

The NRC is also working on development of a distributed network system, but is finding this a difficult endeavor without a defined mission in this area and without specific funding for this purpose. For NRC to fulfill its mission they believe that more users need to be trained within DEP, by NRC staff, and that decentralization of data be implemented to provide for flexibility and autonomy by data developers and users. Ultimately, NRC would like to maintain only statewide data with multi-purpose applications, and allow program-specific data to be maintained by program offices.

Lastly, with respect to organizational issues, NRC perceives GIS to be a "lightening rod" for Inter-Agency depth development and coordination problems. NRC would like to be able to define "minimum classifications" standards to guide data development efforts throughout DEP to ensure a baseline, multipurpose utility for all data.

### **3.2.9.4 Regional Cooperative Efforts & EPA's Role**

Some of the NRC comments to questions in this area were less related to regional cooperative efforts than to the relationship between EPA and DEP/NRC. All of their comments are summarized below:

1. Since NRC has no explicit GIS mission, much of their GIS program is dependent on project-specific funding. The largest single source of this funding is EPA Region I. Generally, the funding does not come directly to NRC, but to other DEP program offices, like BAM and BWM. A specific action on EPA's part to help ensure the health and viability of the NRC GIS program would be to structure grants to be long-term in duration (beyond a 1 fiscal year horizon) and to include provisions in each grant that require certain GIS tasks or products as a component of the overall grant.
2. EPA could serve as a regional clearinghouse for environmental GIS data.

3. EPA could help coordinate data development efforts among state GIS program offices, both in terms of funding/organizing work and in terms of establishing attribute and coding standards. The utility of land use classifications, for example, would be greatly enhanced if standardized classifications were used throughout New England.
4. EPA Region II should be included in regional cooperative undertakings.
5. A need exists for federal agencies, particularly USGS and Soil Conservation Service (SCS), to communicate with EPA regarding data standards and coordination.

### **3.3 BUREAU OF AIR MANAGEMENT AND BUREAU OF WASTE MANAGEMENT**

These organizations are briefly described, together in this Section. This discussion is structured this way because of the similarity in GIS activity and need between the Bureau of Air Management (BAM) and the Bureau of Waste Management (BWM), their analogous roles as program bureaus within DEP, and because they were jointly interviewed.

Neither organization returned a Survey because neither organization has a matured GIS program. Information regarding each organization was included in the NRC Survey.

#### **3.3.1 MISSION, FUNDING AND STAFFING**

The mission of both organizations is similar. BAM has regulatory responsibility for implementation and enforcement of Clean Air Act and related air programs and BAM has regulatory responsibility for Waste Management programs.

Neither organization has a GIS mission, however both have funding for specific projects which can greatly benefit from GIS. The BAM funding does not require GIS use or products, the BWM funding does.

Both organizations have a single staff person responsible for implementing the project-specific activities for which they are funded. These individuals have received ARC/INFO training from NRC staff, but do not currently have access to an ARC/INFO workstation because of the procurement problem described in Section 3.2.9.3, above.

### **3.3.2 DATA, STANDARDS AND RESOURCES**

**These categories are not relevant to these organizations.**

### **3.3.3 ENVIRONMENTAL APPLICATION OF GIS AND FUTURE NEEDS**

#### **3.3.3.1 Bureau of Air Management**

**The Bureau of Air Management is developing an emissions inventory of pre-cursors for ozone. This work is required of BAM, by EPA, in response to the new Clean Air Act. New York and New Jersey are doing identical work. Each state is developing the inventory based on a "gridded network" of emissions. This network data will be input to a computer code called the "Urban Airshed Model."**

**BAM is convinced that GIS is an indispensable tool for the successful completion of this project. Since three states are involved, and since this project is in direct response to an EPA directive, it is hoped that EPA Region I and Region II offices could provide goals and guidance with respect to the use of GIS to facilitate this work. It is believed that a GIS data layer of street names and address ranges, rectified to 1:25,000 DLGs would be of great benefit to this and other BAM applications.**

#### **3.3.3.2 Bureau of Waste Management**

**The Bureau of Waste Management is responsible, among other things, for hazardous site remediation and closure. Much of the funding for this program comes from a core grant from the EPA Region I Waste Management Division. An addition to this grant was recently made to provide specifically for creation of a point coverage of remediation and closure sites throughout the state.**

**There is interest on the part of both BWM and EPA Region I that BWM implement a scheme for prioritizing site cleanups and closure. It is envisioned that GIS could be useful for this purpose. Coordination between EPA and BWM regarding EPA Region I ongoing research in this area would be welcome.**

## **4.0 MAINE**

This section describes the organizational structure of GIS activities in Maine and summarizes the GIS activities of the organizations which partook in the study.

### **4.1 ORGANIZATIONAL STRUCTURE**

Figure 4-1 is a generalized chart of organizations within the state of Maine which are or may be involved in GIS activities which could have a bearing on environmental protection. This figure is intended to help orient the reader with respect to which organizations were interviewed for this project and why; and also as a reference for the organizational information included in the survey responses.

The State of Maine is currently in the planning stages of a seven year GIS implementation plan. The plan consists of prioritizing business functions, GIS applications, data layer and resource needs (with regard to state government), then addressing those needs over the seven year period. The Office of GIS which operates within the Department of Conservation is to play a key role in executing this plan by acting as a GIS data repository and distribution center.

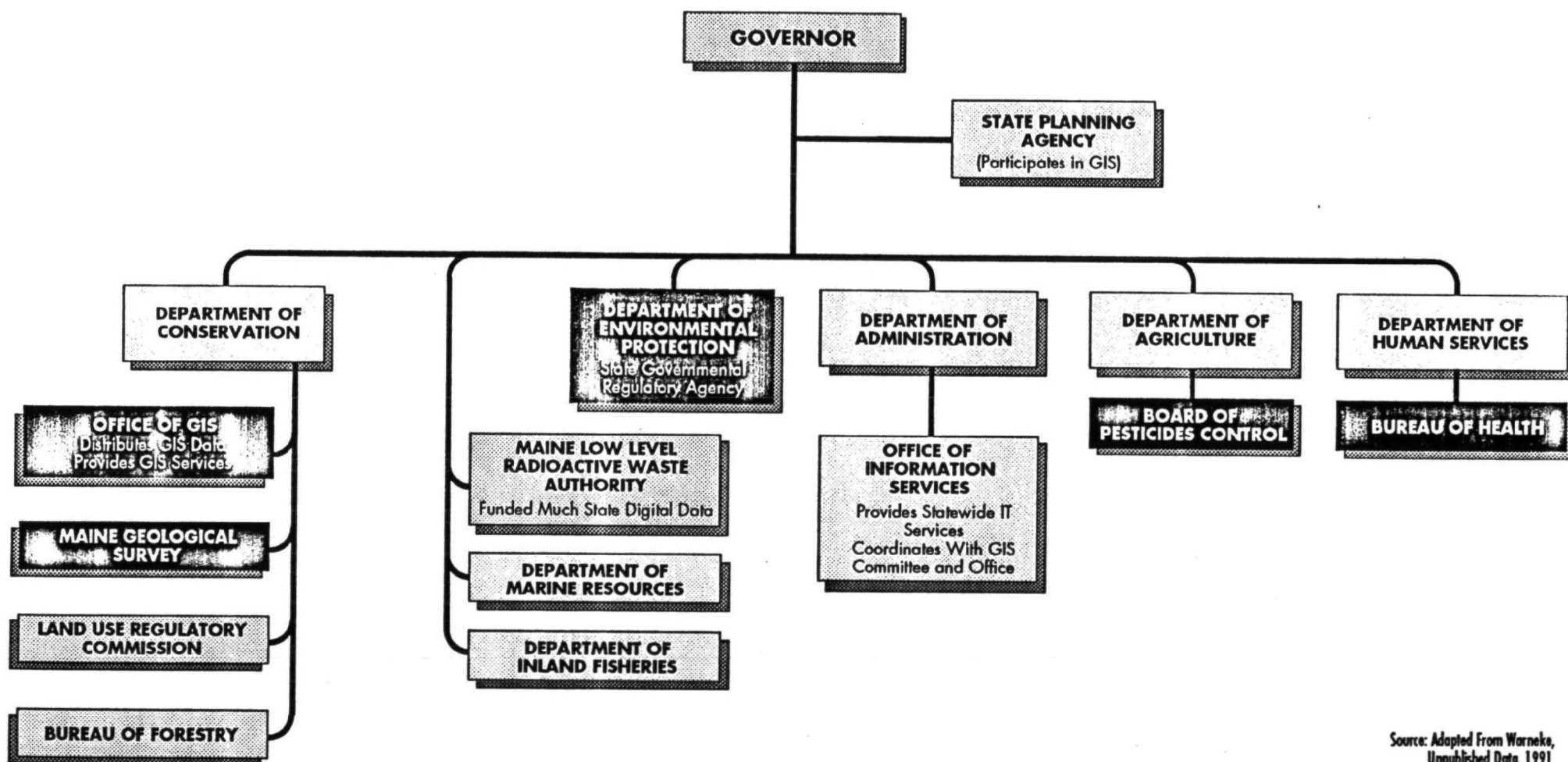
#### **4.1.1 ENVIRONMENTAL AGENCIES**

The Department of Environmental Protection (DEP) coordinates and/or plays a large role in the majority of environmental GIS applications in the State of Maine. The DEP works in conjunction with the Office of GIS (OGIS) which acts as a distribution center for Maine GIS data and is responsible for maintaining multi-purpose data layers.

Other Maine state agencies that have significant GIS activities or needs are the Maine Geological Survey, Bureau of Health, and Board of Pesticides Control.



# GIS ORGANIZATIONAL CHART OF MAINE



Source: Adapted From Warneke,  
Unpublished Data, 1991

**CATALOGUE AND DIRECTORY OF NEW ENGLAND  
STATES AND GIS ORGANIZATIONS AND ACTIVITIES,  
AND AN ASSESSMENT OF THEIR GIS NEEDS**

Camp Dresser & McKee Inc.

January 1992

FIGURE 4-1

 = PARTICIPATING ORGANIZATION

#### **4.1.2 INTER-AGENCY AND INTER-STATE COORDINATION**

There is a high level of coordination that takes place between the agencies shown in Figure 4-1. This coordination is facilitated by physical proximity (most agencies are located in State House Station in Augusta), and also by the wide area network (WAN) that currently links many of the state offices. At the time of this writing, the Office of GIS did not have a link to the WAN. It is anticipated that such a link will exist in the future. Additional cooperative efforts are evidenced by data sharing agreements between the Bureau of Health and other agencies.

#### **4.1.3 ORGANIZATIONS INTERVIEWED**

The Maine organizations interviewed for this project are the Office of GIS, Department of Environmental Protection, Maine Geological Survey, Bureau of Health, and Board of Pesticide Control. Prominent aspects of our discussions and summaries of each organization's response to the written survey are presented below.

### **4.2 OFFICE OF GIS**

#### **4.2.1 MISSION**

The Office of GIS (OGIS) coordinates state GIS efforts through a number of activities. OGIS is responsible for organizing data and distributing it to organizations that request it, as well as collecting multi-purpose data layers. They also act as a GIS training center and provide in-house resources to agencies requiring technical assistance or contractual services.

#### **4.2.2 STAFFING**

OGIS currently employs a full-time GIS Administrator and a GIS Coordinator.

#### **4.2.3 FUNDING**

Funding for OGIS salaries and operational costs comes primarily from the state's General Fund. Additional funding may be available from individual projects, such as the Northern Forest Lands Study and the Marine Oil Spill Contingency Plan Sensitive Area Mapping Project.

#### **4.2.4 DATA MAINTENANCE/DISTRIBUTION**

Part of the OGIS mission is to act as a GIS data repository for the State of Maine. OGIS is responsible for: (1) ensuring that data layers have the appropriate documentation, including ownership, and meet the required data standards; (2) managing the data in such a way that facilitates an evolving distributed agency GIS network; and (3) distributing the data from the Maine statewide GIS database to agencies and the public. The office also maintains and updates any multipurpose data layers that are not specific to one particular state agency; data specific to a particular agency is maintained by that agency.

#### **4.2.5 GIS STANDARDS**

Data residing at and distributed by OGIS must be maintained at a level that is compliant with the standards outlined in the Data Standards for Maine Geographic Information Systems (March 1990). This document addresses issues including but not limited to scale, media, projection, compatibility with state GIS, attribute coding and documentation.

#### **4.2.6 DATA LAYERS AND COVERAGES**

##### **4.2.6.1 General**

Data layers used, maintained or distributed by OGIS are summarized in Appendix D.

Data in use at OGIS is generally at a scale of 1:24,000 or smaller. Maine has assessed that the 1:24,000 scale achieves the proper balance between economic and accuracy considerations for most planning and natural resource activities.

#### **4.2.6.2 Noteworthy Data Layers**

Data maintained at OGIS was funded by many sources including the Maine Low-level Radioactive Waste Authority which provided data including bedrock, metamorphic and surficial geology, soils, and earthquake epicenters. A multi-agency cooperative effort is underway to digitize the USGS 7.5 minute quadrangles. Approximately 300 of the 709 quadrangles covering Maine are digitized or in progress.

#### **4.2.7 RESOURCES**

Resources in use at OGIS are summarized in Appendix C. The OGIS operates both mainframe and workstation ARC/INFO software. Since OGIS acts as a resource and training center for other agencies using GIS, its resources, which include three Sun workstations, two graphic terminals, two E-size digitizers, and two E-size plotters, must meet both the OGIS internal needs as well as those of other agencies.

#### **4.2.8 ENVIRONMENTAL APPLICATIONS OF GIS**

OGIS does not hold primary responsibility for any GIS applications, but rather contributes its services to agencies such as the Department of Environmental Protection (DEP), Bureau of Health (BOH), and Board of Pesticide Control (BOPC). Applications of relevance are described in the sections below, dedicated to these agencies.

#### **4.2.9 FUTURE NEEDS**

Future needs as indicated by OGIS staff are itemized in the Appendices. Presented below are particular needs as discussed during the interview process.

#### **4.2.9.1 Data**

OGIS has indicated that their data needs include soils, wetlands, land use, land cover, bathymetry, and topography. These data will be of use for projects such as the Gulf of Maine Initiative and the Casco Bay National Estuary Program. A complete prioritization of data needs appears in Toward a Statewide Geographic Information System: A Strategic Plan. Ideally, OGIS would like the State of Maine to approve the findings proposed in this document of \$25 million over seven years to create the needed data.

#### **4.2.9.2 Applications**

OGIS has no current environmental application needs as they are primarily an organization to service the GIS needs of other state agencies. In terms of data distribution, however, OGIS has envisioned a system in which a person or agency can dial into the OGIS system to view a data inventory, determine the appropriate contact person for the needed data, obtain permission to receive a copy of the data layer, then download the data from the OGIS system.

#### **4.2.9.3 Resources/Organizational**

In addition to the resource needs outlined in Appendix C, the OGIS is in need of an ethernet connection to the state's wide area network. This will facilitate the distribution of GIS data and will reduce the redundant storage and maintenance conditions that currently exist.

#### **4.2.9.4 Regional Cooperative Efforts & EPA's Role**

In an interview with representatives from OGIS, Department of Environmental Protection (DEP), and Maine Geological Survey (MGS), the following suggestions were made as to how the EPA might direct its efforts to help the development of GIS in Maine.

1. EPA could coordinate meetings of GIS representatives from New England states in order to promote a more regional view of GIS applications and capabilities and to ensure that GIS development efforts are made known to all areas.

2. In addition to helping coordinate state GIS efforts, EPA could help to include federal agencies such as the Department of Transportation, Department of Agriculture, and Department of the Interior into GIS needs analyses and design.
3. EPA could help to coordinate standards for data digitization and transfer.
4. EPA could help program areas within Region I to focus on issues.
5. EPA could help to coordinate GIS efforts of different studies (e.g., Gulf of Maine Initiative, Casco Bay National Estuary Program) in an effort to minimize duplication of effort and maximize data sharing and productivity.

#### **4.3 DEPARTMENT OF ENVIRONMENTAL PROTECTION**

##### **4.3.1 MISSION**

The Department of Environmental Protection (DEP) is the State's environmental regulatory agency. It does not have a GIS-specific mandate, but rather, uses GIS to support environmental protection related projects such as Oil Spill Preparedness, Fore River, and the Casco Bay National Estuary Program. As a result, DEP has become one of the primary GIS users in the state.

##### **4.3.2 STAFFING AND FUNDING**

The DEP currently has one staff member acting as an unofficial GIS program manager.

Funding for GIS efforts is primarily on a project by project basis; there is currently no line item included in the state budget for this funding. The EPA, for example, recently funded a menu-driven interface for the Casco Bay GIS, and also toxic analysis of sediment data. Additionally, the Water Bureau has channeled some of its EPA funding toward the DEP's GIS effort.

##### **4.3.3 DATA MAINTENANCE/DISTRIBUTION AND GIS STANDARDS**

As is the norm throughout the State of Maine, DEP is responsible for maintaining those data layers that apply only to that agency. Once a data

layer becomes multi-purpose, distribution responsibility should be transferred to OGIS while the DEP will retain ownership and maintenance responsibilities.

As mentioned previously, in order for data to be considered acceptable for distribution by OGIS, it must comply with the standards outlined in the Data Standards for Maine Geographic Information Systems.

#### 4.3.4 DATA LAYERS AND COVERAGES

Appendix D contains a summary of data used, maintained and distributed by DEP.

Data in use at the DEP consist primarily of layers digitized in the area of the Fore River watershed and Casco Bay, at scales of 1:24,000 and larger.

#### 4.3.5 RESOURCES

Resources in use at DEP are summarized in Appendix C. DEP runs workstation ARC/INFO and owns an E-size digitizer and E-size plotter which are used in conjunction with ARC/INFO. In addition, DEP owns copies of ARC/INFO TIN and Oracle DBMS.

#### 4.3.6 ENVIRONMENTAL APPLICATIONS OF GIS

Environmental applications of GIS at the DEP are summarized in Appendix E.

To date, a number of GIS efforts have been directed toward Casco Bay. One such application is a menu driven interface, written by DEP, which allows users with limited ARC/INFO experience to "pull down" from menus such information as critical habitats and point source discharges.

In addition, in conjunction with the Department of Conservation (DOC), Maine Geological Survey (MGS), Department of Marine Resources (DMR) and Inland Fish & Wildlife (IFW), the DEP will be using GIS in the development of an emergency oil spill cleanup system for the coast of Maine.

#### **4.3.7 FUTURE NEEDS**

Future GIS needs for DEP are itemized in the Appendices. Presented below are specific needs discussed during the interview process.

##### **4.3.7.1 Data, Applications and Resources**

Digital elevation model (DEM) data currently exist at 30 meter resolution, primarily for North Central Maine; the remainder requires digitizing. The DEP has also indicated that global positioning system (GPS) generated point data would be of use to many state agencies and that statewide locational standards should be documented. In addition, DEP would like to implement a stormwater management application for the Casco Bay National Estuary Program. As a result of haphazard funding, however, a DEP representative has indicated that too much time is wasted chasing GIS funding and there is never adequate funding to "do the job right."

In terms of resources, the DEP currently relies on EPA Region I for the use of its color electrostatic plotter and Trimble GPS unit. DEP would like to invest in this equipment as well as hire additional GIS talent for the Oil, Solid Waste and Land Bureaus of the Department.

##### **4.3.7.2 Regional Cooperative Efforts & EPA's Role**

During the interview process, a joint meeting was held with OGIS, DEP and MGS. Suggestions for EPA involvement discussed in that meeting have been detailed in Section 4.2.9.4, above.

#### **4.4 MAINE GEOLOGICAL SURVEY**

##### **4.4.1 MISSION, STAFFING, FUNDING**

The primary function of the Maine Geological Survey (MGS) is to publish maps and maintain data to support geological work in the state. The GIS staffing for the MGS consists solely of geologists and cartographers who have become proficient in GIS. One geologist brought GIS expertise with him from a previous job and manages the Survey's GIS program.



MGS has justified funding for GIS by using it as a tool for general cartographic work. MGS receives approximately half of its funding from the State of Maine. The Low Level Radioactive Waste Authority has contributed to additional funding of equipment and data creation through a tax on energy generators.

#### 4.4.2 DATA MAINTENANCE/DISTRIBUTION AND GIS STANDARDS

As is the norm throughout the State of Maine, MGS is responsible for maintaining those data layers that apply only to that agency. MGS contracts out some of its data automation tasks and automates much in-house. Once a data layer becomes multi-purpose, distribution responsibility should be transferred to OGIS while MGS will retain ownership and maintenance responsibilities.

As mentioned previously, in order for data to be considered acceptable for distribution by OGIS, it must comply with the standards outlined in the Data Standards for Maine Geographic Information Systems.

#### 4.4.3 DATA LAYERS AND COVERAGES

Appendix D contains a summary of the data used, maintained and distributed by MGS.

Data in use by MGS consist primarily of earth and water characteristics digitized at a scale of 1:24,000 or smaller. Some of the more interesting and unique data include sand dune locations, earthquake epicenters and snow survey data. Many of the data layers in use have not yet been completely digitized. Programs are ongoing to complete the digitizing of several of those data layers.

#### 4.4.4 RESOURCES

Resources in use at MGS are summarized in Appendix C. MGS runs workstation ARC/INFO on a Sun Sparcstation and has the capability to digitize and plot

in-house through the use of two D-size digitizers, an E-size digitizer and two E-size pen plotters. Additionally, MGS can run contouring applications via ARC/INFO's TIN module.

#### **4.4.5 ENVIRONMENTAL APPLICATIONS OF GIS**

Environmental applications of GIS at MGS are summarized in Appendix E.

MGS plays host to a number of GIS applications that serve state and federal agencies and municipalities. These applications include community growth management planning, land use planning, waste facility siting and map production.

#### **4.4.6 FUTURE NEEDS**

Future needs as indicated by MGS staff are itemized in the Appendices. Presented below are particular needs as discussed during the interview process.

##### **4.4.6.1 Data, Applications and Resources**

As previously mentioned, the majority of data coverages in use by MGS are only partially complete. The remainder of those coverages for the state require digitizing. In addition, MGS would like to expand its GIS resources by hiring a technical specialist and acquiring GPS capabilities and additional plotting capabilities.

Finally, for a number of years, MGS has been discussing the implementation of applications for water supply and demand, and for wetland studies.

##### **4.4.6.2 Regional Cooperative Efforts & EPA's Role**

During the interview process, a joint meeting was held with OGIS, DEP and MGS. Suggestions for EPA involvement discussed in that meeting have been detailed in section 4.2.9.4.

#### **4.5 BUREAU OF HEALTH**

##### **4.5.1 MISSION, STAFFING AND FUNDING**

The Bureau of Health (BOH) is in the beginning stages of setting up GIS capabilities to perform analyses on conditions that could have an effect on health issues in the State of Maine. The GIS program will be the responsibility of the Wellhead Protection Program, to which there is currently only one person assigned. This person will handle all GIS responsibilities until additional staff is hired.

A grant for the Wellhead Protection Program provided the initial funding for the purchase of GIS equipment. Ongoing funding will be provided by the Maine Drinking Water Program, under which the BOH operates.

##### **4.5.2 DATA MAINTENANCE/DISTRIBUTION AND GIS STANDARDS**

As is the norm throughout the state of Maine, BOH is responsible for maintaining those data layers that apply only to that agency. The BOH currently owns no such layers, although there are plans to develop wellhead protection area coverages as well as other data. In order for this data to be considered acceptable for distribution by OGIS, it must comply with the standards outlined in the Data Standards for Maine Geographic Information Systems.

##### **4.5.3 DATA LAYERS & COVERAGES**

Appendix D contains a summary of data used, maintained and distributed by BOH.

Data currently in use at the BOH consists primarily of political boundaries and roads, with some additional information digitized for surface water and hypsography. The BOH also has agreements with other agencies for the sharing of existing data.

#### **4.5.4 RESOURCES**

Resources in use at the BOH are summarized in Appendix C.

Since the BOH GIS is in its beginning stages, its GIS resources are currently very limited. The BOH is, however, planning to purchase an array of equipment that will enable its GIS to mature. This equipment includes a 386 personal computer, a plotter and a digitizer. It is also planning to purchase a Trimble high resolution GPS system and the software to accompany it.

#### **4.5.5 ENVIRONMENTAL APPLICATIONS OF GIS**

Environmental applications of GIS at the BOH are summarized in Appendix E. The GIS applications at the BOH are currently limited to demographics, epidemiology and socio-economic studies.

#### **4.5.6 FUTURE NEEDS**

Future GIS needs for the BOH are itemized in the Appendices. Presented below are specific needs discussed during the interview process.

##### **4.5.6.1 Data, Applications and Resources**

The primary data layers needed by the BOH deal with hazardous waste and water supply. EPA is assisting BOH in the location of water source information. In addition, contracts are planned to fund the location of point source contaminants and to build the appropriate database for each.

Once the appropriate data has been digitized or obtained, overlays are to be used for wellhead protection and for assessment of water sources at risk of contamination.

##### **4.5.6.2 Regional Cooperative Efforts & EPA's Role**

BOH suggestions for EPA involvement focus on the location of GPS expertise. There is concern that since the EPA GPS base station is located in

Lexington, MA, there is not enough of a transfer of knowledge and training to allow GPS to be used most effectively in eastern Maine.

An additional suggestion for a cooperative effort involves deciding upon and maintaining standardized GIS data formats in order to facilitate data exchange within and between states.

#### **4.6 BOARD OF PESTICIDES CONTROL**

##### **4.6.1 MISSION, STAFFING AND FUNDING**

The Board of Pesticides Control (BOPC) is evaluating GIS technology to see if it can be productive and cost-effective for use by the Board. The BOPC currently has no staff dedicated to GIS. Funding for the GIS effort thus far has been provided by federal grants.

##### **4.6.2 DATA MAINTENANCE/DISTRIBUTION AND GIS STANDARDS**

As is the norm throughout the state of Maine, BOPC is responsible for maintaining those data layers that apply only to that agency. At this time, BOPC does not have ownership of any such layers and anticipates using only data that already exist with OGIS.

##### **4.6.3 DATA, RESOURCES AND ENVIRONMENTAL APPLICATIONS.**

Appendices C, D, and E contain summaries of data used, maintained and distributed, and of resources and applications in use by the BOPC. The BOPC has obtained from OGIS data dealing primarily with geology and water characteristics, but at this point has not performed any significant analysis using those data. As mentioned previously, the BOPC is in the process of finding out how GIS can contribute to its productivity, but has not yet undertaken any significant projects.

##### **4.6.4 FUTURE NEEDS**

Future GIS needs for the BOPC are itemized in the Appendices. Presented below are specific needs discussed during the interview process.

#### **4.6.4.1 Data, Applications and Resources**

As the BOPC expands its GIS program, it would like to do so by implementing applications to handle pesticide permitting and pesticide storage facility siting, to track pesticide leaching, and to perform groundwater vulnerability assessments. In order to implement these, the BOPC will need to obtain the appropriate data layers, such as pesticide application and storage areas, spill sites and groundwater wells. BOPC will also need to expand its GIS personnel and equipment.

The major obstacle to performing vulnerability assessments thus far has been a lack of current farmland and crop locational data. The BOPC recently let a public procurement for a pilot farmland mapping project for the quadrangles of Caribou, Goodwin, Presque Isle and Easton.

#### **4.6.4.2 Regional Cooperative Efforts & EPA's Role**

In an effort to facilitate development of GIS in New England, the BOPC suggests that EPA could direct its efforts toward coordination between and within states in the areas of:

1. Pooling GIS resources
2. Funding to assist in coordination between state agencies via network connection or modem and phone line connection.

## **5.0 MASSACHUSETTS**

This section describes the organizational structure of GIS activities in Massachusetts and summarizes the GIS activities in the organizations which partook in the study. These included: the Executive Office of Environmental Affairs (EOEA); Department of Environmental Protection (DEP); Coastal Zone Management (CZM); Department of Food and Agriculture (DFA); the Massachusetts Water Resources Authority (MWRA), and the Massachusetts Office of the U.S. Geological Survey, Water Resources Division (USGS WRD).

### **5.1 ORGANIZATIONAL STRUCTURE**

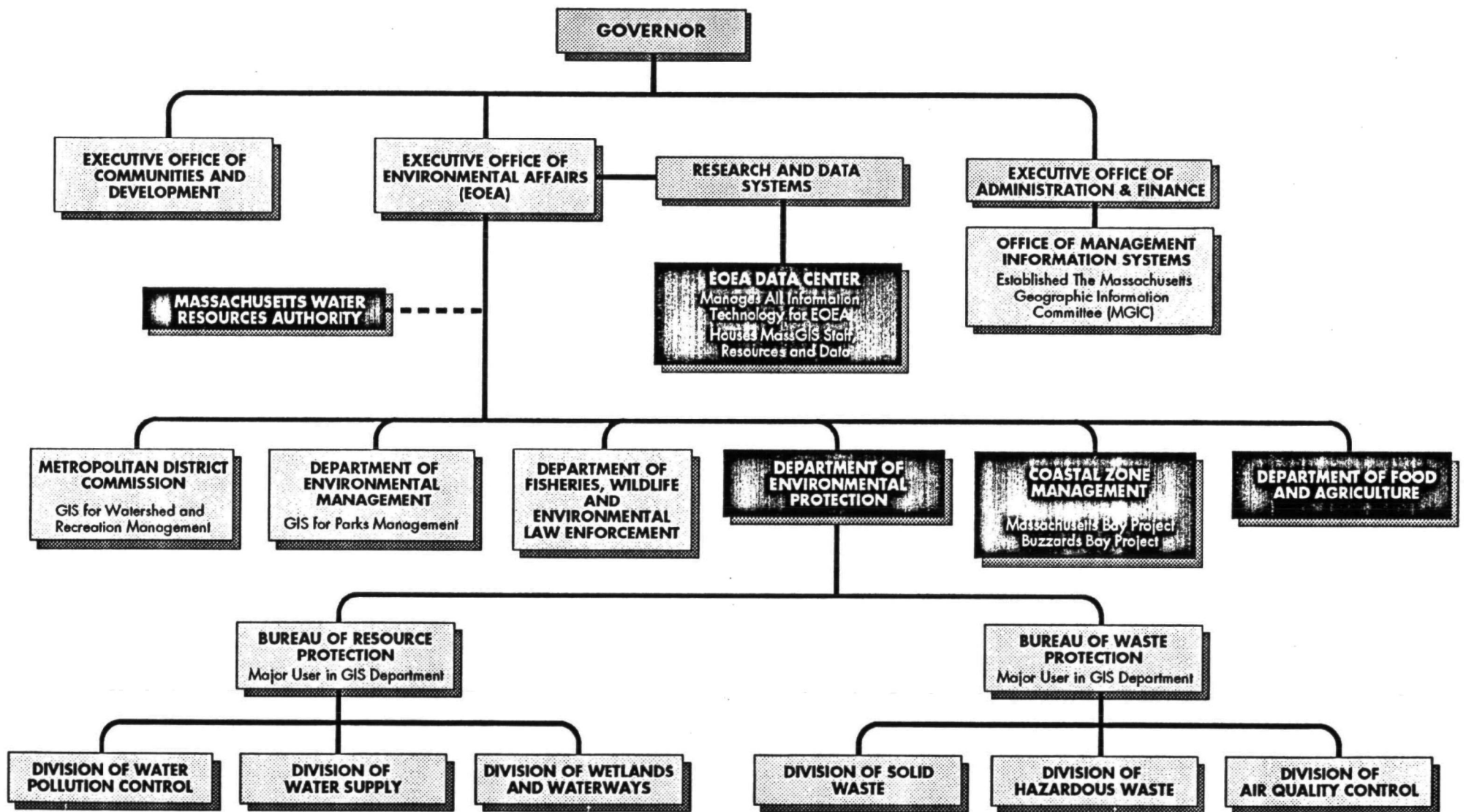
Figure 3-1 is a generalized chart of organizations within the state of Massachusetts which are or may be involved in GIS activities which could have a bearing on environmental protection. This Figure is intended to help orient the reader with respect to which organizations were interviewed for this project and why; and also as a reference for the organizational information included in the survey responses.

The majority of GIS activity in the state is undertaken by environmental organizations. The Office of Management Information Systems (OMIS), however, plays a statewide GIS coordinating role through the formally-designated Massachusetts Geographic Information Committee (MGIC). A MGIC Executive Committee, which includes representation from each of the Executive Offices indicated in Figure 5-1, meets regularly. The Committee is elected by the membership, except for two positions which are appointed by the Legislature. The Executive Office of Environmental Affairs (EOEA) is strongly represented through several of its Departments, including the Department of Environmental Protection (DEP). The committee is chaired by the EOEA Assistant Secretary for Research and Data Systems.

#### **5.1.1 ENVIRONMENTAL AGENCIES**

Although OMIS plays a statewide coordinating role, the Executive Office of Environmental Affairs is the seat of the majority of GIS activity in the

# GIS ORGANIZATION OF MASSACHUSETTS



Sources: Adapted From Warnke,  
Unpublished Data, 1991



= PARTICIPATING ORGANIZATION

**CATALOGUE AND DIRECTORY OF NEW ENGLAND STATES AND GIS ORGANIZATIONS AND ACTIVITIES, AND AN ASSESSMENT OF THEIR GIS NEEDS**

Camp Dresser & McKee Inc.

January 1992

FIGURE 5-1



state. The EOE Data Center, which is a part of the Research and Data Systems branch of EOE, is the entity that manages the Agency's GIS program. That program, and the associated GIS database is called MassGIS.

MassGIS began as a cooperative project in 1985 between the United States Geological Survey (USGS) Water Resources Division and the Hazardous Waste Facility Siting Council. Data were developed using the USGS computer facilities. By the end of the 3-year project, EOE had agreed to support MassGIS, and a copy of the database was transferred to the EOE computer.

Over the years, the EOE Data Center has encouraged and supported the GIS efforts of many of the environmental agencies within EOE. The Department of Environmental Protection, the principal environmental regulatory entity in the state is a committed user of GIS. Nearly all the departments within EOE, and various other state, regional and municipal organizations use, and contribute to the MassGIS database.

#### **5.1.2 INTER-AGENCY AND INTER-STATE COORDINATION**

The Massachusetts Geographic Information Committee is the principal vehicle for coordinating GIS activities in the state. Formal Memoranda of Understanding exist between EOE and several of the state's Regional Planning Agencies regarding use, resale and sharing of MassGIS data.

Massachusetts has a Memorandum of Agreement with the State of Rhode Island. The Agreement is between EOE and the RI Department of Administration and provides for a long-term data sharing agreement.

#### **5.1.3 ORGANIZATIONS INTERVIEWED**

The organizations interviewed for this project are the EOE Data Center, the Department of Environmental Protection (DEP), the Department of Food and Agriculture (DFA), Coastal Zone Management (CZM), the Massachusetts Water Resources Authority (MWRA), and the Massachusetts Office of the U.S. Geological Survey, Water Resources Division.

Due to scheduling difficulties, only the Buzzards Bay Project under Coastal Zone Management was contacted for a telephone interview, so the CZM section of this report focuses on that project. A survey questionnaire was received from the CZM Massachusetts Bay Project, however, so the information from that is listed in the Appendices along with survey information from the Buzzards Bay Project.

## **5.2 EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS DATA CENTER**

### **5.2.1 MISSION**

The EOE Data Center manages the MassGIS database and service center as one of the various data processing services it provides agency-wide. MassGIS exists to provide GIS resources to EOE and its Departments for use in managing the Massachusetts environment.

### **5.2.2 STAFFING**

There are four core staff at MassGIS, including one program manager, one GIS technical specialist, one programmer/analyst and one cartographer/database administrator. These staff are full-time employees involved in hands-on data and applications development and the servicing of data requests from public and private organizations.

### **5.2.3 FUNDING**

The Data Center is funded through two primary mechanisms: 1) the EOE Systems Modernization Program and 2) an agency charge-back policy. The EOE Systems Modernization Program is a multi-year program to modernize computerized data management, hardware and software systems throughout EOE and its departmental program offices (see Figure 5-1). Most of the capital and non-salary funds come from this source. Most of the salary and other operational expenses are funded through an agency charge-back program, under which EOE departmental program offices contribute a fee to the Data Center to the degree of service support the center provides.

A summary of annual expenditures by the center is included in Appendix C.

#### 5.2.4 DATA MAINTENANCE/DISTRIBUTION

The EOE Data Center maintains most, and distributes all statewide environmental GIS data in the state. These data are maintained as ARC/INFO coverages. The MassGIS publication entitled GIS Data Standards for the Executive Office of Environmental Affairs, last updated in March, 1990 describes the structural, networked design of the MassGIS database, including a directory tree which identifies nodes and special directories for archived data, in-use data and so on. The data distribution policy, particularly as related to non-state entities, is briefly stated in the publication Digital Data Layer Description and Guide to User Services, last updated in July, 1991. EOE legislative authority to distribute and charge a fee for statewide digital and cartographic data is detailed in the publication Digital Data Distribution Policies, December, 1990.

#### 5.2.5 GIS STANDARDS

GIS standards are summarized in the GIS Data Standards for the Executive Office of Environmental Affairs. These standards cover data development, documentation and cartographic quality. There are no point accuracy standards. MassGIS has implemented a strict policy of tagging MassGIS coverages with documentation files that travel with the coverages whenever they are exported for distribution.

The data center makes it a point not to discourage data development efforts based on resultant data accuracy. If such efforts are necessary to meet programmatic needs, if they result in data layers useful to those specific purposes, and if they meet the general documentation and quality standards noted above, they are acceptable candidates for the MassGIS database.

#### 5.2.6 DATA LAYERS AND COVERAGES

##### 5.2.6.1 General

The data layers maintained by the EOE Data Center are summarized in Appendix D.

Most data which are in operational use are at 1:25,000-scale or smaller. Tile structure varies by data layer. For example, the hydrography data layer is divided into five tiles based on groups of major drainage basins. Other tile units include: 7.5 minute quadrangles, state, towns, and groups of counties. The database is fairly large, and general-purpose in nature. Many coverages are sub-sets of USGS DLG data and/or enhancements of same. The MassGIS base map scale is currently a mixture of 1:25,000 scale political boundaries, and 1:100,00 scale hydrography and roads. It is working toward a scale of 1:25,000.

#### **5.2.6.2 Noteworthy Data Layers**

MassGIS data layers which are particularly interesting or unique among the New England states include: (1) Protected Open Space - indicating state, federal, local, and private non-profit protected lands in the state; (2) statewide hypsography at 30 foot contour intervals; (3) value-added TIGER data; (4) sole-source aquifer areas and wellhead protection areas statewide.

#### **5.2.7 RESOURCES**

Appendix C presents a summary of hardware and software resources in use by the EOE Data Center.

#### **5.2.8 ENVIRONMENTAL APPLICATIONS OF GIS**

The EOE Data Center supports a wide array of environmental applications of GIS for various EOE program offices. These are summarized in Appendix E. The majority of environmental GIS activity in the state is reliant upon MassGIS data, resources and/or expertise. Many of these applications directly support the regulatory programs of DEP and the Department of Environmental Management. Most of the applications are on-going. Some noteworthy ones include: (1) the assessment of non-point source pollution potential in support of CZM (see Section 5.5); (2) the tracking of eastern equine encephalitis L in support of a preventative spraying program; (3) mapping of water use, by river basins in support of the state's Water

Management Act permit programs; (4) evaluation of underground storage tank risk to groundwater resources; (5) the assessment of solid waste sites using overlay techniques to determine which present the greatest risk to a broad range of environmental resources. This analysis integrated Oracle and ARC/INFO databases and processing to produce a primary listing for mitigation measures, and (6) the implementation of regulations requiring the registration of certain pesticides used within Zone II areas.

#### **5.2.9 FUTURE NEEDS**

Future needs as indicated by MassGIS staff are itemized in the Appendices. Discussed below are particular needs as discussed during the interview process.

##### **5.2.9.1 Data**

Several data layers are needed to expand breadth and utility of the MassGIS database. These are summarized in Appendix D. Of particular interest is the creation of a high-quality wetlands data layer and the improvement of existing land use and protected open space data layers.

The need for wetlands data is primarily in support of DEP's Wetlands Conservancy Program, in which the identification and accurate location of wetlands is necessary (this is discussed in greater detail in Section 5.3). The process of developing this data layer, however, is likely to result in the enhancement or creation of several other layers of more general utility. This is because the Conservancy Program requires an accuracy consistent with 1:5,000 scale mapping which can only be obtained through a statewide orthophotographic production process. Once statewide orthophotos are developed, they can be a source for the enhancement of existing data layers which were created at smaller scales. The wetlands data layer, therefore, is of primary interest to EOE. Efforts are being made by both the Data Center and DEP to solicit funding and other means of support for this project.

The enhancement of the state's land use data layer is of great importance to the Data Center. This is probably the most requested data layer in

MassGIS, yet there are inconsistent codings between state regions, and the data are, in general, old and of limited site-specific utility. A state wide flight to develop the photography necessary for an adequate revision has already been funded and is underway. A current project is to update the 1985 land use datalayer, and funding has been dedicated to update this data layer for at least 200 cities and towns in the state. An ideal to which the Data Center aspires is that of a single land use/land cover data layer that includes wetlands of regulatory significance and forest/habitat types, in addition to the standard land use classifications.

Finally, the MassGIS Protected Open Space data layer is potentially one of great interest to the environmental community, but which is very incomplete. This data layer is one of the few that the Data Center sees benefitting from parcel-level accuracy for state-owned parcels, although current development efforts will be focused on local and non-profit ownership. Its enhancement will require a substantial effort, including coordination with and cooperation from local community officials.

#### 5.2.9.2 Applications

Application needs and interests are summarized in Appendix E. As indicated earlier, the Data Center supports many applications throughout the EOE, and the MassGIS database is used extensively by EOE Departments to support applications specific to their missions. The Data Center, therefore, is not in a position to "need" applications. They are mostly responsive to the needs of others. Several applications of general utility were mentioned by the Data Center staff. These are: (1) development of a hydrological network coverage for the state, which will enable users to take advantage of the network analysis and dynamic segmentation capabilities in ARC/INFO for such applications as the coding of stream segments meeting 305(a) stream segment water quality reporting requirements or of anadromous fish habitats; (2) development of expanded address coverage for the state to assist in facility location and in routing of field visits, (3) derivation of DEM data from the proposed orthophotos (see Section 5.2.9.1) which would enable the derivation of point specific watersheds for hydrological studies using generic software developed by the USGS.

#### **5.2.9.3 Resources/Organizational**

MassGIS is eagerly seeking cooperators in funding for the data development efforts described herein. They have an overall production environment and an organizational structure ready to expand - what is lacking is funding for staff and for additional seats at the GIS. Internally, increased resources devoted to GIS would enable the program to take advantage of developments in software and hardware - specifically to make the transition to a windowing environment (whether UNIX or VMS based remains an issue) and thereby more fully exploit the application oriented features of the latest ARC/INFO release.

#### **5.2.9.4 Regional Cooperative Efforts and EPA's Role**

Several ideas were suggested regarding New England Regional GIS cooperative activities and EPA's role in facilitating these efforts. They are summarized below

1. A standard, edge-matched base map of New England is needed. It was suggested that EPA undertake this development, and that a scale of 1:25,000 be used.
2. The Data Center is interested in the data layers resident on the EPA Region I system (see Appendix D).
3. There is a need for on-line access to information about data layers in the region. EPA could maintain a bulletin board for users to call in to communicate about data development, data needs, and to query a database for information about existing or planned data layers.
4. EPA could bring the interests of the New England states to the National Geographic Data Coordination Committee, and play an active role in data development and distribution issues with other federal agencies.
5. Although believed to be an "unrealistic expectation", EPA could become a repository of and distribution center for regional GIS data.
6. All the New England states need direct, dedicated communications wires between each other and EPA. This should be considered by the State/EPA Data Management Program.

7. Regional data documentation standards are needed, including both attribute and feature documentation. Guidance on how best to document growing/changing data layers is needed.
8. The Data Center would support the development of a GPS training center at EPA Region I.

### **5.3 DEPARTMENT OF ENVIRONMENTAL PROTECTION**

#### **5.3.1 MISSION**

The Department of Environmental Protection is the prime environmental regulatory agency in Massachusetts. It does not have a GIS-specific mandate, but rather, uses GIS to support environmental protection related activities for which it is responsible.

#### **5.3.2 STAFFING**

Currently there are two positions within the agency with specific responsibilities related to GIS coordination. One position is that of a GIS Program Manager, the other is a GIS Technical Manager. The Program Manager works under the Division of Water Supply, and the Technical Manager works under the Division of Management Information Systems. The purpose of the positions is to coordinate and focus GIS efforts within the Department, and to develop standards to facilitate this.

In addition to these positions there are 14 staff which are formally trained in ARC/INFO, the GIS software used at DEP. Some of these staff members serve as liaisons between the various programs and the GIS Program and GIS Technical Managers.

#### **5.3.3 FUNDING**

Currently there is no separate GIS budget, however the Program and Technical Managers are working toward adding a line-item GIS budget. Most expenditures related to GIS come from the specific programs for which GIS is used. These programs rarely call explicitly for GIS activity or expenditures.



#### **5.3.4 DATA MAINTENANCE/DISTRIBUTION**

DEP is in the early stages of data development. Certain data layers in the process of development are not distributed because the data are still being verified, or the nature of the data requires that it be classified.

The data which are not sensitive and have gone through proper QA/QC procedures are incorporated into MassGIS. All requests for these data layers are referred to the EOE Data Center.

#### **5.3.5 GIS STANDARDS**

The DEP is working toward creating data standards. These standards will address true locational or positional accuracy requirements of newly collected and mapped data. Currently, the DEP's data collection policy is fashioned after EPA's policy, except that the DEP has implemented some more stringent standards.

Although MassGIS has developed a set of GIS data standards, it is of a different nature than that which concerns DEP; it addresses mostly cartographic and documentation standards for data.

#### **5.3.6 Data Layers and Coverages**

##### **5.3.6.1 General**

The DEP has compiled a list of data layers which it considers "critical to the performance of its mission of protecting the environment." These data layers are defined and outlined in DEP's Mission Critical Geographic Data - DRAFT (July 25, 1991). These data layers either already exist, are currently being developed, or are a future requirement. The list includes the name of the DEP program which has jurisdiction over the data, the data theme, the source organization, the name of the source attribute database, and a list of types of data to be included.

#### **5.3.6.2 Noteworthy Data Layers**

There are numerous important data layers listed in the above mentioned report. A few of these are: parcel deed restrictions, wetlands, approved wellhead protection areas, air quality data, solid waste facilities, hazardous waste sites, underground storage tanks and combined sewer overflows.

The approved wellhead protection areas are presently being developed, and as they become available they are incorporated into MassGIS.

The DEP is presently developing wetland data from 1:12,000 scale infrared photography. The classification and automation are being conducted at the University of Massachusetts.

#### **5.3.7 RESOURCES**

The DEP has recently purchased both a high and low-resolution GPS unit, and a base station. The low-resolution unit will be used for mapping linear features such as landfill boundaries, and the high-resolution unit will be used to locate point features. The DEP plans to tie the units into its local area network (LAN) for easy access of atlas data, such as satellite positions, from the field.

#### **5.3.8 ENVIRONMENTAL APPLICATIONS OF GIS**

To support the Water Supply Contamination Correction Program, the DEP, with assistance from MassGIS, developed an on-line application written in Arc Macro Language (AML) which allows a user to view selected underground storage tanks on a terminal screen and to access an associated ORACLE database of the selected tank. The user may then select data layers from a menu, such as wellhead protection areas, which are potentially threatened by the tank.

### 5.3.9 FUTURE NEEDS

Future needs, as indicated by USGS WRD staff, are itemized in the Appendices. Discussed below are particular needs as discussed during the interview process.

#### 5.3.9.1 Data

As mentioned in Section 5.3.6, the GIS data needs of DEP are outlined in the draft report DEP's Mission Critical Geographic Data, (July 25, 1991).

In discussions with the GIS Program and GIS Technical managers at DEP, they mentioned a few of these specifically, such as the need for parcel data for its Wetlands Conservancy Program, and accurate locations of facilities.

DEP is pleased that the Massachusetts Department of Transportation (DOT) has expressed an interest in obtaining aerial orthophotos to update the roads data layer. This would be a significant improvement over the existing roads data layer, but might require an approximate \$1.5 million contribution from DEP. The DEP would like to see cooperative funding from EPA, DOT, DPW, DEP, and others to fund this effort.

#### 5.3.9.2 Applications

The Wetlands Conservancy Program, which is currently funding the wetlands data layer development, has many ideas of how GIS may be used in support of its "no net loss" mission. Foremost, parcel data must be developed with associated attributes such as property owner. Then these properties may be assessed as to whether deed restrictions need be imposed.

As part of EOE's Systems Modernization Program, a study is being made of the possibility of creating an application called the Geographic Point Entity Model. The purpose of the application would be to link geographic locations of regulated sites with the "engineering" type information in the Integrated Facility Management System files (FMF) which is used for billing purposes.

The FMF would ultimately be populated with data related to each and every entity regulated by DEP. Each entity (wetland, sewage discharge, etc.) would have a unique identifier in the FMF, and would be related to a unique ARC/INFO point, line or polygon. The Geographic Point Entity Model, when complete, will enable DEP to perform both geographic and tabular queries regarding facilities, activities and environments under their jurisdiction.

This application is of greatest immediate benefit to DEP, but would be useful to many other Departments within the EOEa as well.

The DEP would like to map and prioritize all confirmed or "to be investigated" hazardous waste sites in the state. These are often referred to as "21E sites", after the Massachusetts General Laws, Chapter 21E program.

#### 5.3.9.3 Resources/Organizational

DEP is exploring the possibility of acquiring the workstation technology necessary to digitize data from raster orthophotographic images.

#### 5.3.9.4 Regional Cooperative Efforts & EPA's Role

The DEP survey participants feel that EPA can help define state agency roles in collecting and maintaining data, and help coordinate quality control and standards. In addition, it was suggested that the EPA GIS program should focus on developing a closer relationship with DEP rather than focusing on EOEa, since the DEP is the state's environmental regulatory authority.

DEP feels that there is a need for region-wide GIS and GPS committees in addition to the state committees which exist. It wants to see GIS issues dealt with on both the program and regional level.

## **5.4 MASSACHUSETTS WATER RESOURCES AUTHORITY**

### **5.4.1 MISSION**

The Massachusetts Water Resources Authority (MWRA) was established in 1985 primarily to provide water and wastewater services to sixty communities in eastern Massachusetts and to meet state and federal wastewater treatment and disposal requirements under court-ordered mandate. It is the primary entity responsible for the "cleanup" of Boston Harbor.

The MWRA has developed a substantial GIS capability since 1989 when it contracted a consultant to assist with GIS implementation. The first report out of this work was entitled "GIS User Needs Assessment and Conceptual Data Base Design" (December, 1989).

### **5.4.2 STAFFING**

At the MWRA there are currently several staff who have GIS-related responsibilities. There are two people acting as GIS Program Managers: one is under the Sewerage Division, Environmental Quality Department, and the other is under the MWRA Waterworks Division, Capital Engineering and Development. Most of the active users are within the Waterworks Division.

### **5.4.3 FUNDING**

A GIS Implementation Project was initiated in 1989 jointly by the Waterworks Division and Harbor Studies. Since that time, the Waterworks Division has supported most of the GIS maintenance and development costs. These funds come from capital budgets. All computer system maintenance costs are incurred by the Administrative Services group as overhead.

### **5.4.4 DATA MAINTENANCE/DISTRIBUTION**

The MWRA does not have a data distribution policy. It occasionally receives data requests from the communities which it serves, and it has thus far provided in-house developed data at no charge. The MWRA and the

EOEA have a Memorandum of Understanding which provides for ARC/INFO data exchanges. This may provide a course by which MWRA could give EOE data layers for which it gets many requests, and then EOE could distribute and charge for the data.

The Harbor Studies section is working on developing a distribution policy for its enormous amount of tabular data which reside in an ORACLE database. It is collaborating with staff from the Massachusetts Bay Project to develop this policy.

#### 5.4.5 GIS STANDARDS

As part of the GIS Implementation project, a draft report was prepared, Standards and Procedures Manual (DRAFT), January, 1990. This report discusses basic concepts of scale, accuracy, projection, and attribute codes for digital data. It details all aspects of data automation from manuscript preparation to QA/QC procedures and documentation.

A second draft report, GIS Update Procedures (DRAFT), September, 1990 covers issues related to database updates. Topics included are: preparation of update manuscripts, update of spatial features, update of attributes, update flows between GIS and ORACLE, and updates to the MWRA Map LIBRARIAN which is the ARC/INFO utility used to manage, store, and display data layers "seamlessly" although the data layer may be split into several pieces or "tiles".

#### 5.4.6 DATA LAYERS AND COVERAGES

##### 5.4.6.1 General

When the MWRA started its GIS program it purchased most of the MassGIS data layers for its area of jurisdiction. It has also developed many data layers and database information of its own. These data are summarized in Appendix D.

#### 5.4.6.2 Noteworthy Data Layers

The MWRA has created a data layer of its water service area. This data layer was initially drafted in AutoCAD, but has been translated to ARC/INFO format and edited. Additionally, the water service lines were developed in AutoCAD, have been translated and are presently being edited. Data layers of pollution sources and watershed/wellhead protection areas have also been developed for several dozen eastern Massachusetts communities in, or adjacent to the MWRA service area.

The Harbor Studies section of MWRA has developed an extensive database of harbor-related data, such as water and sediment sampling data. This was developed in ORACLE and are linked to spatial data in ARC/INFO.

The Sewerage Division has begun digitizing sewer lines and tributary areas for its own and member community facilities.

#### 5.4.7 RESOURCES

Appendix C presents a summary of GIS resources available to the MWRA. The MWRA runs ARC/INFO software on a Vax mini-computer and PC ARC/INFO on a 386 PC. The ARC/INFO on the Vax is linked to an ORACLE database. MWRA also uses McDonnell Douglas GDS software for much of its harbor design applications. Other peripherals include: four graphic terminals, an E-size pen plotter, an E-size electrostatic plotter which is shared by the GDS users, a screen dump plotter, and two digitizers.

#### 5.4.8 Environmental Applications of GIS

The MWRA uses GIS in numerous applications, most of which have been centered around water supply protection and planning. There is a growing interest, however, to develop applications in support of other divisions.

There have been ongoing studies using GIS to assist in protecting MWRA water supplies and the supplies of its member communities. Several of these have involved identifying and mapping potential sources of pollution

within watersheds and wellhead protection areas. One particular project involves "giardia" tracking using data provided by the Department of Public Health.

It is the MWRA's goal that in-house projects, and those contracted to consultants, make intelligent use of the GIS database. The Authority presently uses GIS maps and analysis capability for facility siting studies, archival and referencing of historical data and studies (by geographic area), marine water quality evaluations and a variety of land-use-related and spatial analysis applications.

In addition, GIS maps are used extensively for the purposes of public presentations and general communication. GIS is also used to facilitate and display data related to water distribution system and wastewater facility modeling.

#### **5.4.9 FUTURE NEEDS**

Future needs as indicated by MWRA staff are itemized in the Appendices. Discussed below are particular needs as discussed during the interview process.

##### **5.4.9.1 Data**

Members of the Harbor Studies section expressed a need for bathymetry data for the Gulf of Maine. Currently, the MWRA only has bathymetry data for Massachusetts Bay.

The Waterworks Division has a need for updated land use, a larger-scale annotated roads coverage, and 30 meter DEM data for its entire service area (only select quads exist presently).

A large data development project planned for the future involves automating all the MWRA sewer and water distribution pipes. About 98% of these exist on paper drawings and the rest are in digital CAD files and they are generally at 1"=40' scale.



#### **5.4.9.2 Applications**

The MWRA has identified substantial GIS applications requirements, and is presently in the planning stages of detailing and assigning specific tasks to the Divisions, particularly the Waterworks and Sewerage Divisions, and outside consultants. Because the Authority is in the midst of planning for the "future", the following discusses GIS applications for which there are no concrete plans but that the Authority would be likely to develop.

The Waterworks Division has an interest in creating a Drought Model using GIS techniques. The model would use detailed bathymetry and surface water elevation of the Quabbin Reservoir to calculate and display the areas of exposed mud flats which would occur with a given water-level drop in the reservoir.

An application which has not been funded but which has been deemed important would support the Device Retrofit Program. This would require address-to-coordinate matching of MWRA database files to TIGER line data. Once the addresses are geographically located along the TIGER roads, maps can be generated for use in the field. These maps would be used by field crews in their efforts to distribute water saving devices throughout the MWRA service area.

#### **5.4.9.3 Resources/Organizational**

One of the biggest obstacles to the growth of GIS applications is the lack of trained users at the MWRA, particularly those trained in ORACLE. There are a multitude of data in ORACLE, including what is known as the Water System Database, and much of the harbor sampling data. The MWRA survey participants would like see its Management Information Systems group provide ORACLE training to MWRA staff so that these data may be more easily accessed and possibly linked to the GIS.

#### **5.4.9.4 Regional Cooperative Efforts & EPA's Role**

The survey participants feel that there should be more regional cooperation in developing important large data layers, such as updated land use and

larger-scale roads data layers, as mentioned in Section 5.4.9.1. It was suggested that there be a regional clearinghouse for all state data.

It was also suggested that GPS base stations be strategically located for access by anyone in the region.

## **5.5 COASTAL ZONE MANAGEMENT, BUZZARDS BAY PROJECT**

### **5.5.1 MISSION**

The Buzzards Bay Project is part of the federal National Estuary Programs. Its overall aim is to improve the water quality in Buzzards Bay. GIS is used in part to assist in identifying sources of pollution to support project staff, and to create maps for purposes of educating the public.

### **5.5.2 STAFFING**

There is one full-time GIS Project Manager who also does all the technical GIS work. This person has been spending most of his time on database development, and expects this situation to continue for at least another year.

### **5.5.3 FUNDING**

The Buzzards Bay Project is almost entirely funded by EPA. It has no separate GIS budget.

### **5.5.4 DATA MAINTENANCE/DISTRIBUTION**

Presently the Buzzards Bay Project distributes its own digital data (not MassGIS) and map products, at no charge, to any entity which it feels is working toward the overall mission of the project. For example, digital data have been provided to the Cape Cod Commission and the Southeast Regional Planning and Economic Development Division (SRPEDD) for use in their programs.

#### **5.5.5 GIS STANDARDS**

The ARC/INFO data developed by the Buzzards Bay Project is in conformance with the digital standards adopted by EOEa (see Section 5.2.5).

#### **5.5.6 DATA LAYERS AND COVERAGES**

The Buzzards Bay Project uses MassGIS data, however it has also generated many GIS data layers of its own.

Station locations for water quality sampling have been automated. These are linked to water quality data stored in ORACLE.

For the purposes of this project major and sub-drainage basins were recompiled using a variety of existing sources. Basically, the MassGIS basin data layers were edited based on USGS water table elevation data and surface topography. These boundaries were recompiled and then digitized from 1:25,000 scale basemaps.

#### **5.5.7 RESOURCES**

The Buzzards Bay Project runs PC ARC/INFO and PC ORACLE, on-site, and uses the ARC/INFO and ORACLE systems on the EOEa Vax computer. It also has an A-size pen plotter, and an E-size digitizer.

#### **5.5.8 ENVIRONMENTAL APPLICATIONS OF GIS**

The applications of GIS have focused on data development and graphic displays for public education, and on assisting in identifying potential non-point pollution sources.

The Project has used the MassGIS land use data layer in conjunction with its own watersheds to assist in correlating nitrogen loads to embayments from certain land uses.

Many GIS maps are created upon request as part of the Projects' goal to increase public awareness about how land practices affect water quality in

the bay. Some of the organizations for which maps have been produced are: Westport Conservation Commission, U. Mass. Extension in Barnstable, Town of Wareham, and the Soil Conservation Service.

#### **5.5.9 FUTURE NEEDS**

Future needs as indicated by Buzzards Bay Program staff are itemized in the Appendices. Discussed below are particular needs as discussed during the interview process.

##### **5.5.9.1 Data**

The Buzzards Bay Program would like to automate the station locations used for sampling sediments as this will be useful in conjunction with the water quality data and sampling locations.

Other wishes for digital data are: a data layer depicting shellfish habitats as opposed to shellfish beds, updated land use, and 1:25,000 scale DLG hydrography.

##### **5.5.9.2 Applications**

The Buzzards Bay Program would like to conduct an analysis of non-point sources of pollution entering the bay, particularly of areas tributary to storm drains; however all the necessary data are not available.

##### **5.5.9.3 Resources/Organizational**

To facilitate its GIS activities, the Buzzards Bay Project would like to acquire a Sun workstation and workstation ARC/INFO software. During the interview it was also indicated that a GPS unit "would be nice", however not necessary. The GPS could be used in locating the monitoring station locations rather than having to locate them on 1:25,000 scale basemaps and then digitize the points.

If GIS activity is to increase, the Buzzards Bay Project would like to add one additional GIS technician to its staff.

#### **5.5.9.4 Regional Cooperative Efforts & EPA's Role**

It was suggested that EPA encourage all agencies to focus more on properly collecting geographic information from the beginning of a project. For example, when a site is first visited, the geographic location should be recorded by proper methods, whether on a map or by GPS. Too often program staff spend time re-visiting sites in order to verify locations based on poorly mapped data, or when the site was first identified, information was entered about the site but no effort was made to map it.

### **5.6 DEPARTMENT OF FOOD AND AGRICULTURE**

#### **5.6.1 MISSION**

The primary mission of the Department of Food and Agriculture (DFA) is to promote sustainable agricultural practices in the state. There are two major divisions in the Department which use GIS; the regulatory Bureau and the planning Bureau.

#### **5.6.2 STAFFING**

There are three GIS staff at the DFA. GIS applications are apportioned between the Division of Agricultural Development's Bureau of Land Use and the Division of Regulatory Services' Pesticide Use.

#### **5.6.3 FUNDING**

There is no separate budget for GIS expenditures.

#### **5.6.4 DATA MAINTENANCE/DISTRIBUTION**

The DFA has developed some GIS data, as described below and in Appendix D, but has no distribution policy.

#### **5.6.5 GIS STANDARDS**

The Department of Food and Agriculture abides by the standards adopted by EOEa (see Section 5.2.5).

#### **5.6.6 DATA LAYERS AND COVERAGES**

The Department of Federal Agriculture primarily uses MassGIS data. With limited GIS resources, they have focused on using already existing data as opposed to launching substantial data development efforts.

#### **5.6.7 RESOURCES**

The Department of Food and Agriculture uses the resources at the EOEa Data Center (see Appendix C). It has one PC with Tektronix emulation software in its Boston office, which is used to access the Vax computer at the EOEa Data Center.

#### **5.6.8 ENVIRONMENTAL APPLICATIONS OF GIS**

Most of the GIS applications at the Department of Food and Agriculture center around agricultural land use planning, and pesticide regulation and management.

One of the first uses of GIS in the DFA was to identify agricultural lands (using the MassGIS 1985 land use data layer) within Interim wellhead protection areas (Interim Zone IIs) of public supply wells. The pesticide regulations now promulgated (333 CMR 12.00), were designed to reduce pesticide application within these areas. The GIS analysis provided baseline data to determine how much agricultural land these regulations could potentially impact.

#### **5.6.9 FUTURE NEEDS**

Future needs as indicated by DFA are itemized in the Appendices. Discussed below are particular needs as discussed during the interview process.

#### **5.6.9.1 Data**

The DFA has mapped all active agricultural lands in the state using assessors maps dated from 1985 to 1989. These data were recompiled onto 1:25,000-scale USGS quads. The DFA has a very definite need to digitize these maps. The attributes which could be incorporated into the GIS include; parcel number, ownership, whether land is leased, plus the following:

- o all parcels which fall under Chapter 61A (agricultural lands which qualify for government tax breaks)
- o full-time agricultural lands
- o part-time or leased lands
- o lands which fall under agricultural preservation restrictions

Additionally, much of the pesticide permitting information reside in an ORACLE database and may be linked to the ARC/INFO data layer.

In addition to the above data layer soils classification, updated land use, and aquifers have been identified as essential data layers for future GIS applications.

#### **5.6.9.2 Applications**

The active agricultural lands data layer mentioned above would be used for a number of applications once it is automated. It could be used to the display where certain pesticides are applied, and currently permitted application rates in relation to other natural features.

The Pesticide Bureau will be entering pesticide use information into the ARC/ORACLE system to assess groundwater contamination potential.

#### **5.6.9.3 Resources/Organizational**

The single biggest obstacle to GIS growth at the DFA is the cumbersome nature of remote access to the MassGIS computer at the EOE Data Center.

The GIS Coordinator is stationed at a field office in central Massachusetts, and it is problematic to travel to Boston to do GIS work. A great deal of data is generated at the field office on a day-to-day basis and access to a GIS on-site would be a great benefit to the planning staff.

The GIS Coordinator is working to purchase a standalone GIS, such as PC or workstation ARC/INFO, and associated hardware. The problem has been finding the funds to do this. One possibility may be to release bond money from the Open Space Acquisition and Planning program. Another possibility might be to establish a retained revenue account with money acquired from the leasing of state-owned farm land.

The DFA would like to acquire a GPS unit for use in locating private water supply wells to support its Zone II pesticide regulations program.

#### **5.6.9.4 Regional Cooperative Efforts & EPA's Role**

The DFA feels that environmental programs should be undertaken using a more regional approach. The concept of political boundaries should be replaced by natural boundaries, such as watersheds, whenever possible.

### **5.7 U.S. GEOLOGICAL SURVEY, WATER RESOURCES DIVISION**

#### **5.7.1 MISSION**

The mission of the Water Resources Division of the U.S. Geological Survey is to "provide the hydrologic information and understanding needed for the best use and management of the Nation's water resources...".

The Massachusetts office of the USGS WRD has been using GIS, specifically ARC/INFO software, in support of its mission since 1985 when it entered into a cooperative project with the Massachusetts Hazardous Waste Facility Site Safety Council. The 3-year project resulted in what is now known as MassGIS, the state's environmental GIS database (see section 5.1.1).



### **5.7.2 STAFFING**

In the Massachusetts office of the USGS WRD there are two full-time GIS staff, and a few others who use it occasionally.

### **5.7.3 FUNDING**

GIS applications are supported by cooperative projects between the WRD and other organizations for which GIS is usually written into the work plan.

### **5.7.4 DATA MAINTENANCE/DISTRIBUTION**

The WRD has no policy specifically regarding the distribution of GIS digital data, however, the WRD as a whole has very strict policies regarding the dissemination of any data or documents created by the WRD. The policy requires that all data or documents go through a formal review process by WRD personnel and cooperators before it is suitable for "publication". This process oftentimes takes several years.

### **5.7.5 GIS STANDARDS**

The WRD strives to adhere to U.S. National Map Accuracy Standards for the positional accuracy of its digital spatial data.

### **5.7.6 DATA LAYERS**

The GIS data residing on the WRD computer is essentially the same as the MassGIS database at the EOE Data Center (see section 5.2) since the majority of the MassGIS data was created jointly by the WRD and what is now the EOE Data Center. These data are summarized in Appendix D. So all of the major data layers such as: hydrography, roads, political boundaries, drainage basins, aquifers, land use, etc., are a part of the WRD GIS database. The only MassGIS data layers which the WRD does not have would be data which has been created by EOE or the agencies under EOE since the cooperative project ended in 1989.

Since that initial extensive data development project, the WRD has not automated any significant data layers.

#### **5.7.7 Resources**

##### **5.7.7.1 General**

Appendix C presents a summary of GIS resources available to the Massachusetts USGS WRD office. Currently the entire USGS is using ARC/INFO as its GIS software, however this may change in April when the federal GIS II contract is awarded. The federal contract has already been awarded to the hardware vendors, so the WRD will be phasing out its Prime mini-computer in lieu of DG Avion workstations.

##### **5.7.7.2 Hardware/Software**

As stated above, the WRD is switching to workstation technology. The office will be receiving 10 DG Avion workstations, two of which will be used for GIS. These two workstations will each run ARC/INFO software with a 3-person limit license. Additional hardware and software in use by the WRD include: INGRES DBMS software (comes with the workstations), AutoCAD, an E-size pen plotter, five page size pen plotters, two E-size digitizers, graphic terminals, and a screen dump plotter.

#### **5.7.8 Environmental Applications**

##### **5.7.8.1 General**

The Massachusetts WRD office uses GIS in a number of projects related to surface and groundwater studies. These applications are summarized in Appendix E.

##### **5.7.8.2 Noteworthy Applications**

In support of a low-flow basin yield project in cooperation with the Massachusetts Department of Environmental Protection, the WRD has used GIS

to automate the delineation of drainage areas to selected points. They have written a series of macros, including FORTRAN and AML programs, which allow the user to define a location for which the macros will calculate the upstream drainage areas. The macros make use of an existing sub-drainage basin data layer, surface topography (DEM data), and a DEM-derived stream network.

The WRD is in the second year of a cooperative project with the Cape Cod Commission called "Screening for Potential Remaining Public Water Supplies on Cape Cod using GIS". The first screening pass has been completed which subtracted out areas determined to be unsuitable for water supplies, such as: (1) known plumes of groundwater contamination, (2) certain land uses, (3) salt water intrusion areas, (4) and buffers around the coastline and inland hydrography. Statistical analysis is being made to determine the effect certain land use types have on water quality.

The USGS WRD has developed a federal program called the National Water Quality Assessment Project (NAWQA). This is a long-term project the goal of which is to describe the status and trends of a large representation of the nation's ground and surface waters. The Massachusetts WRD office is responsible for studying the Connecticut/Hoosatic/Thames River Basin, one of 60 study units nationwide. GIS will be used to help identify sources and potential sources of pollution to these waters. For example, an important aspect will be to relate land use to water quality. A nationwide committee has been formed to design protocols and standards for all data gathered for NAWQA projects so that a national NAWQA database library may be established.

#### 5.7.9 FUTURE NEEDS

Future needs, as indicated by USGS WRD staff, are itemized in the Appendices. Discussed below are particular needs as discussed during the interview process:

#### **5.7.9.1 Data**

Data layers which are desired by the WRD office are: underground storage tank locations, hazardous waste sites, water quality data, Approved Zone IIs, bedrock geology, soils, and water table contours.

#### **5.7.9.2 Applications**

The GIS applications at the WRD are project-driven, and the projects are mainly a function of the needs of the cooperators (e.g. state agencies). Therefore, future needed applications will be primarily determined by organizations who seek the research assistance of the WRD.

One particular cooperative project with the Massachusetts Department of Transportation plans to use GIS to locate all bridges in the state and determine how stream erosion might affect them.

#### **5.7.9.3 Resources/Organizational**

GIS staff at the Massachusetts WRD office have indicated a need for a GPS unit and an electrostatic plotter. The GPS unit would have immediate use in the above-mentioned project with the MA DOT for locating bridges in the state.

#### **5.7.9.4 Regional Cooperative Efforts & EPA's Role**

The WRD staff have suggested that environmental programs should take on a more regional approach. For example, research study areas should not stop at state boundaries. They recognize that this is beginning to happen more, especially with the start-up of such projects as NAWQA.

### **5.8 COASTAL ZONE MANAGEMENT, MASSACHUSETTS BAY PROGRAM**

#### **5.8.1 MISSION**

The Massachusetts Bay Program is part of the federal National Estuary Programs. Its overall aim is to improve water quality in Massachusetts

Bay, Cape Cod Bay, and the Merrimack Embayment (coastal areas north from Cape Ann to the mouth of the Merrimack River). GIS is used to assist planning efforts and educate the public by portraying the sources of pollution and status of natural resources.

#### **5.8.2 STAFFING**

There is one full-time Data Manager who does GIS and ORACLE work.

#### **5.8.3 FUNDING**

Data management in the program was originally funded by the Massachusetts Environmental Trust, with funds from the Boston Harbor Settlement. In the future, data management funds will come from the National Estuary Program budget.

#### **5.8.4 DATA MAINTENANCE/DISTRIBUTION**

The Massachusetts Bays Program distributes GIS maps of towns included in the watersheds draining to the bays. When scientific studies are completed, some of the data will be plotted on maps using the ARC/INFO-ORACLE link. Most data is distributed for no charge, except for data that requires use of outside resources. The program maintains a list of available data products and a data distribution policy, which can be obtained from the Data Manager.

#### **5.8.5 GIS STANDARDS**

The ARC/INFO data developed by the Massachusetts Bays Program is in conformance with the digital standards adopted by EOEa (see Section 5.2.5).

#### **5.8.6 DATA LAYERS AND COVERAGES**

The Massachusetts Bays Program for the most part uses MassGIS data. However, it will generate a few GIS data layers, including the groundwater divide defining the watershed for areas on Cape Cod that drain to Cape Cod

Bay (from the 1:48000 U.S. Geological Survey Hydrologic Atlas). Future data layers may include, segmentation of the program's coastline for purposes of analysis. In addition, the program is funding five-year planning and research projects in three selected embayments. In these "MiniBays," GIS coverages of shellfish management areas, locations of NPDES discharges, living resources of the coastal zone, and sub-drainage basins may be developed at the largest scale possible.

#### 5.8.7 RESOURCES

The Massachusetts Bays Program accesses ARC/INFO, ORACLE, a Precision Images electrostatic plotter, and digitizers on the EOE VAX computer, over a Banyan WAN with a PC386 running TNET.

#### 5.8.8 ENVIRONMENTAL APPLICATIONS OF GIS

Maps have been produced for public education that illustrates the watershed area draining to Massachusetts Bay, Cape Cod Bay, and the Merrimack Embayment. These maps are available in the 1991 publications of the program (Progress Report, Comprehensive Conservation and Management Plan), which has been widely distributed in the program area.

The Massachusetts Bays Program has compiled the extent of land use types by drainage basin for the entire state of Massachusetts for use in estimation of nonpoint source potential. The groundwater divide defined for Cape Cod was also used in this calculation to estimate acreage of land use types in the watershed area for the Cape Cod Bay. The divide for Buzzards Bay has also been defined by the Buzzards Bay Project. The Cape Cod Bay and Buzzards Bay delineations will allow estimation of nonpoint source potential for different areas of Cape Cod.

#### 5.8.9 FUTURE NEEDS

Future needs as indicated by the Massachusetts Bays Program staff are itemized in the Appendices. Discussed below are particular needs as discussed during the interview process.

#### **5.8.9.1 Data**

The Massachusetts Bays Program would like to have: 1:5000 basemap of state, 1:5000 coastline, and accurate wetlands; updated land use; accurate NPDES locations for entire coastline; USGS sediment data; shellfish habitats; living resources of the marine environment; a statewide offshore basemap comparable to land-based information (including bathymetry, navigational hazards, sediment type, waste disposal, level of high and low tide); velocity zone and floodplain data for coast and rivers; extent of saltwater intrusion in estuaries including location of dams; annual volume of river flow; anadromous fish runs including location of dams; data that will allow estimates of nonpoint source input including actual area (acres) of impervious surfaces, density of population, type of sewage disposal by area, etc.; types of coastline features for oil spill and emergency response (e.g., marsh, dune, armored shoreline, piers, marinas, bird nesting areas, fish spawning areas).

Adequate information for analyzing pollution inputs, uses, and effects on coastal and offshore resources of Massachusetts is available. Other states such as Maine have invested in marine data for improved resources management and emergency response. Massachusetts would benefit from GIS marine data, which would improve management of recreational and commercial uses of the coast and effective response to pollution, storms, oil spills, and other problems.

#### **5.8.9.2 Applications**

The Massachusetts Bays Program would like to conduct analysis of nonpoint source inputs for the three selected embayments in its MiniBays Program. However, the data is not accurate enough at 1:25000 for detailed analysis of the one to three towns surrounding each embayment.

#### **5.8.9.3 Resources/Organizational**

The Massachusetts Bays Program would like to upgrade to Windows on a PC and remain connected to the EOE VAX. In the future, the program may use GPS

equipment maintained by other organizations (DEP or EPA) to locate monitoring stations and point sources.

Additional GIS or database personnel would be extremely beneficial to productivity.

#### **5.8.9.4 Regional Cooperative Efforts & EPA's Role**

The Massachusetts Bays Program shares and develops data with the Massachusetts Water Resources Authority and the Cape Cod Commission, since their interests are in Massachusetts Bay and the Cape Cod Bay.

EPA should assist and support development of large-scale data (1:25000 and greater), since it provides the most detail for water resource-focused analyses (e.g., for a single bay, or watershed), and allows the most compatibility with state and local data. In the long run, this approach will increase the amount of data available for any scale of analysis and save money by allowing cost- and data-sharing among all players.



## **6.0 NEW HAMPSHIRE**

### **6.1 ORGANIZATIONAL STRUCTURE**

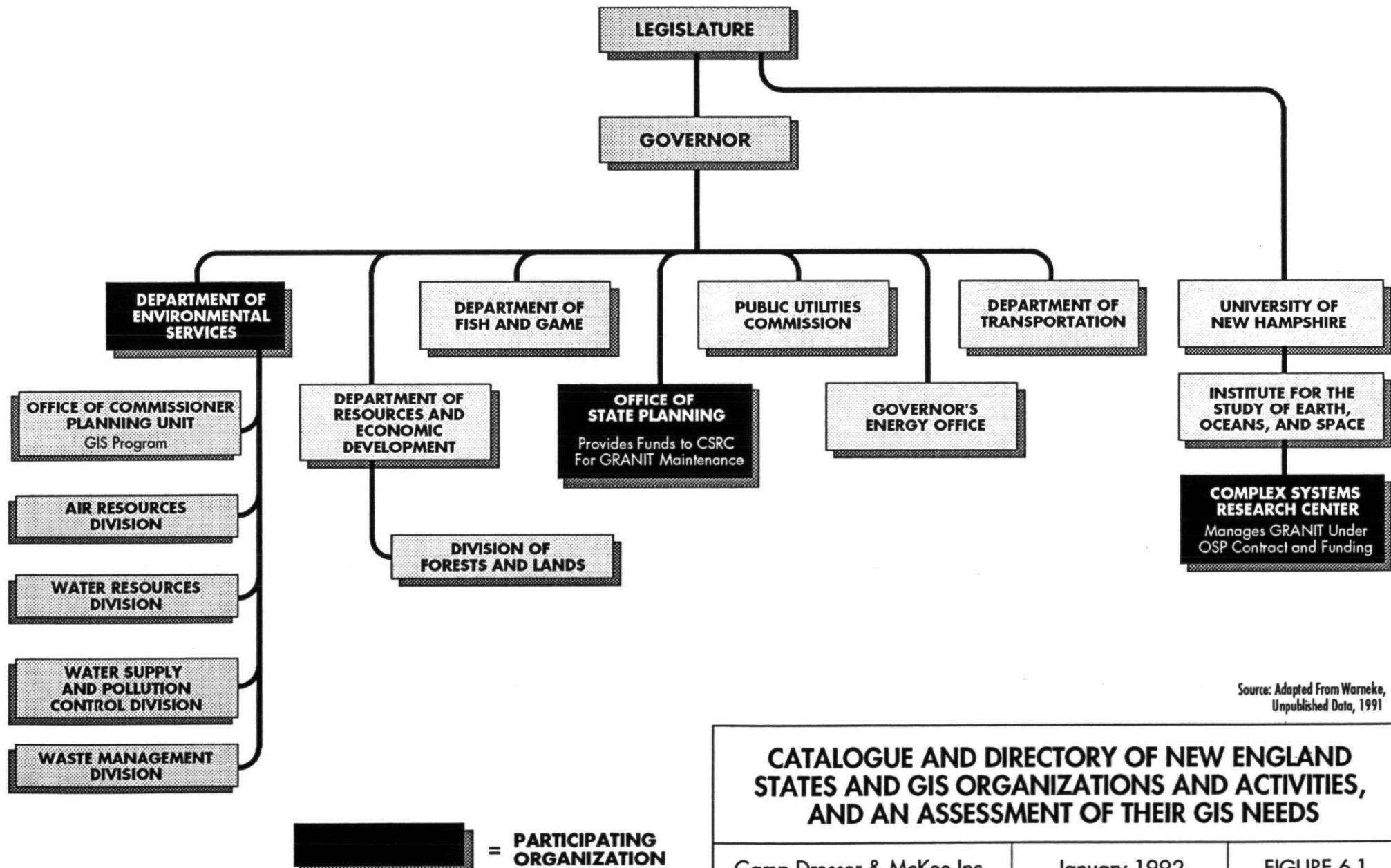
Figure 6-1 is a generalized chart of organizations within the State of New Hampshire which are, or may be involved in GIS activities which could have a bearing on environmental protection. This figure is intended to help orient the reader with respect to which organizations were interviewed for this project and why; and also as a reference for the organizational information included in the survey responses.

New Hampshire has several state and federal agencies, and one state university which utilize GIS technology to store and analyze environmental and cultural resources. Through cooperation among these various agencies, the state has developed a database which is called GRANIT (Geographically Referenced Analysis and Information Transfer System).

The primary state agency responsible for funding and managing the GRANIT database is the Office of State Planning (OSP). They were assigned this responsibility by the legislature in 1989 after having assumed this lead role by implementing a cooperative GIS project in 1984 with the University of New Hampshire's Complex Systems Research Center (CSRC). After this initial project, OSP and CSRC have maintained an agreement wherein OSP provides funding to CSRC to house and maintain the GRANIT database at the University of New Hampshire.

Most of the state GIS activity to date comes from the Office of State Planning, the nine Regional Planning Agencies (RPAs), the Department of Environmental Services (DES), and Complex Systems Research Center. OSP provided GIS start-up funds to each of the nine Regional Planning Agencies in 1988 (\$30,000 each) for the purchase of PC ARC/INFO software, PCs, and training. OSP continues to provide the RPAs with technical assistance, and continues to initiate the majority of projects utilizing GIS. Because of this, GIS applications in the state have focused on state and regional planning programs.

# GIS ORGANIZATIONAL CHART OF NEW HAMPSHIRE



Source: Adapted From Warneke,  
Unpublished Data, 1991

## CATALOGUE AND DIRECTORY OF NEW ENGLAND STATES AND GIS ORGANIZATIONS AND ACTIVITIES, AND AN ASSESSMENT OF THEIR GIS NEEDS

Camp Dresser & McKee Inc.

January 1992

FIGURE 6-1

The RPAs use GRANIT data for local and regional projects in which they also create regional digital data. However, much of these data have yet to be incorporated into GRANIT generally because of the site-specific nature.

#### 6.1.1 ENVIRONMENTAL AGENCIES

The Department of Environmental Services is the primary environmental regulatory agency in the state. The lead role in all departmental GIS activities is provided by the GIS Program which is located in the Planning Unit of the Office of the Commissioner. Established in 1989, the program provides support to Bureaus and Programs in each of the department's four divisions, the most active of which is the Water Supply and Pollution Control, Groundwater Protection Bureau. The Water Resources Division has also been very active and has been using PC ARC/INFO since 1987.

#### 6.1.2 INTER-AGENCY AND INTER-STATE COORDINATION

A Technical Advisory Committee on GIS was established in 1987 by the Council on Resources and Development (CORD). The GIS Advisory Committee members include staff from state and federal agencies, the regional planning agencies, and the University of New Hampshire. It is chaired by OSP. The aim of the Committee is to coordinate GIS activities, and to recommend GIS policies and standards to CORD for endorsement and implementation.

The Office of State Planning and Complex Systems Research Center hosted the first New Hampshire GIS Conference in August, 1991. The intention is that this will become an annual event providing a forum for GIS users to share information regarding projects which utilize GIS, provide a status report of GRANIT data, and allow users to communicate ideas concerning GIS policies and activities. At this first annual conference, the NH GIS Users Guide was distributed to all attendees. This document provides information critical to GRANIT users, such as:

- GRANIT objectives
- Roles and activities of participating GRANIT agencies

- Access to GRANIT
- Database catalog and status maps
- GRANIT standards and guidelines
- Descriptions of GIS applications

New Hampshire does not have any comprehensive formal data sharing agreements with other New England states. Its mode of data sharing has been through specific inter-state projects, such as the Connecticut River Open Space Project. This project is discussed further in Section 6.3.8.2.

### 6.1.3 ORGANIZATIONS INTERVIEWED

Three organizations in New Hampshire were interviewed for this study. They include: the Office of State Planning, Complex Systems Research Center, and the Department of Environmental Services. Representatives from each completed the written survey questionnaire as well as attended an in-person interview.

## 6.2 OFFICE OF STATE PLANNING

### 6.2.1 MISSION

The primary mission of the Office of State Planning is to monitor the State's growth and development which it achieves primarily through assisting state and local governments in land use planning. To this end, OSP provided GIS start-up assistance to the nine Regional Planning Agencies, as mentioned in Section 6.1. OSP now also has the responsibility of overseeing the development and management of the GRANIT database.

### 6.2.2 STAFFING

OSP maintains two GIS staff. One position serves the function of a GIS Program Manager, whose responsibilities also include management of the GRANIT database, membership in the GIS Advisory Committee, and co-organizer of the first annual New Hampshire GIS Users Group meeting. The other position is that of a GIS project manager and technical specialist.

### 6.2.3 FUNDING

OSP has a line item budget of \$50,000 for GIS expenditures. The agency also utilizes federal and other grants to augment its GIS budget. Currently grants come from the Community Development Block, Coastal Zone Management, and EPA, which result in a total annual GIS budget of about \$200,000.

GIS expenditures are divided about one-third/two-thirds between those used to support in-house GIS staff and equipment, and those appropriated to CSRC to maintain the GRANIT database. Current annual funding for in-house operations is about \$75,000 and the amount provided to CSRC is between \$150,000 and \$200,000.

### 6.2.4 DATA MAINTENANCE/DISTRIBUTION

This section is intended to discuss the data maintenance and distribution policies of the Office of State Planning, however since OSP adheres to the guidelines and policies governing the GRANIT database, this and the following section (6.2.5, GIS Standards) will, in fact cover the policies governing GRANIT data.

The distribution policy for GRANIT data is outlined in the NH GRANIT USERS GUIDE (August, 1991). Digital data is distributed to any requesting party for a fee equal to the cost of reproduction. This fee varies depending on the data requested, form of the data, media, etc., and may be waived for active contributors to GRANIT, or those who agree to add to or enhance GRANIT data. The money collected as fees for data goes back into the GRANIT program funds. Any products generated using GRANIT data must be accompanied with the following message:

"For planning purposes only, not to be used for legal boundary determination or for regulatory purposes."

Currently Complex Systems' base charge for hardcopy maps is \$100 per original plot. If map requests involve complex data manipulation or map

design, then the rate will be increased accordingly. The fees collected for hardcopy maps goes to Complex Systems Research Center to cover the cost of staff and computer time, and plotter supplies. The fee for multiple copies of maps reflects only computer time and plotter supplies.

#### 6.2.5 GIS STANDARDS

The data standards adopted by GRANIT cover the full spectrum from field collection to manuscript preparation to automation and quality assurance. These standards and guidelines are described in detail in the NH GRANIT USERS GUIDE (August, 1991). The remainder of this section paraphrases what are considered the key components of the Users Guide for the purposes of this study.

Data entering the GRANIT database is required to be referenced to the New Hampshire State Plane Coordinate System using NAD 83 (North American Datum 1983) geodetic control, and be automated from source maps of 1:24,000 scale or larger. NH GRANIT standards require that all manuscript maps be compiled onto 1:24,000 USGS topographic maps using specific methods of registration. Positional accuracy of map features are to conform to U.S. National Map Accuracy Standards or as close to these standards as is feasible.

The NH GRANIT USERS GUIDE recommends specific methods for field data collection and photo interpretation. It is the objective of GRANIT that by adhering to these methods the positional accuracy of point data will be within 100 feet of true ground location. For polygon features, GRANIT recommends that data be interpreted from aerial imagery. This recommendation takes into consideration that more accurate methods of mapping, such as using field survey techniques or Global Positioning Systems (GPS) are either too expensive or not available.

The GIS Advisory Committee has placed much emphasis on determining standard feature coding systems for GRANIT data layers. It makes use of coding schemes in which many state and federal agencies have had input, so that the data will be as useful as possible to potential users. The coding

systems used for several important data layers are adoptions of federal standard codes. For example, the GRANIT political boundaries data layer uses the Federal Information Processing Standard (FIPS) coding system, and the land cover data layer will consist of an enhanced version of classifications developed by the U.S. Geological Survey (modified from a detailed coding scheme developed in Vermont). The soils data layer will be coded according to a classification system developed by the U.S. Soil Conservation Service, and the attribute information for the soil units will be generated from the SCS SOILS-5 database.

A prime example of the importance which NH GRANIT places on coding schemes, is the hydrographic coding system which was developed over a period of two years. This system which was developed and recommended by the GIS Advisory Committee consists of a 23-digit code assigned to each hydrographic feature. Among other things, these codes describe the water-flow relationships among features, and provide a way of relating features to many other types of tabular and descriptive data maintained by various state and federal agencies.

## 6.2.6 DATA LAYERS

### 6.2.6.1 General

The GIS Advisory Committee assigns the responsibility of creating particular data layers to agencies willing to take on the task, and OSP is currently coordinating the automation of several of these. This and the next section are divided into two parts under the headings GRANIT, and OSP Involvement. The information under GRANIT discusses some general aspects and particularly noteworthy data layers of the GRANIT database. The information under OSP Involvement describes data layers to be included in GRANIT for which OSP is overseeing the development. Each of these OSP data layers is a product of joint efforts between OSP and CSRC, with CSRC performing all the automation.

A listing of all GRANIT data layers is summarized in Appendix D.

## GRANIT

The GRANIT database is currently composed of approximately 25 data layers which are available to some extent in digital form. Of these, about 13 are available statewide; and of these, five are at 1:24,000 which is the basemap scale the GIS Advisory Committee has adopted for GRANIT. There are approximately 12 additional data layers which are either planned for automation or are being considered, and most of these are in the process of being mapped.

The GRANIT data layers are based on a 7.5 minute USGS quadrangle tile structure. That is, each data layer (assuming statewide coverage) is divided into 213 ARC/INFO coverages as this is the number of quadrangles encompassing the state. Currently, about 50 percent of the entire database resides on-line at any given time with the rest archived on tape.

### 6.2.6.2 Noteworthy Data Layers

## GRANIT

The state is in the process of producing statewide 1:24,000 basemap data layers (political boundaries, transportation, hydrography) from the USGS DLG files. The New Hampshire Department of Transportation and U.S. Geological Survey are co-funding this development (about \$600,000 total). This project calls for the USGS to create all the DLGs for the state within three years - two years have passed thus far. Before inclusion in GRANIT, the data are being processed by CSRC in the following manner: (1) DLG files are converted to ARC/INFO coverages and to NAD 83 coordinates, (2) attribute tables are streamlined and refined, (3) hydrographic features are named, (4) features are coded with a GRANIT ID so that they may be related back to the original DLG attribute tables.

## OSP Involvement

OSP is overseeing the development of a statewide wetlands data layer which is being funded jointly by EPA, NH DES, NH DOT, and OSP. NH DES is



conducting some of the field verification. This data layer is to be derived from LANDSA Thematic Mapper (TM) imagery. Some of the imagery are newly acquired - ordered in the fall of 1991 - and some are pre-existing imagery dating back to 1986. Complex Systems Research Center is performing the classification using ERDAS image processing and ARC/INFO. Present funding only requires that imagery be interpreted for wetland areas vs. upland areas. However, for a three town pilot project the imagery were interpreted for about 12 classes. The entire statewide data layer is scheduled to be completed by December, 1992.

Using the above TM imagery, OSP and CSRC are also developing land cover data. There are two projects which are currently supporting this effort, with both project areas covering approximately 1/3 of the state. Most of the data will be used for the Northern Forest Lands resource inventory whose study area includes Coos County in the northern part of New Hampshire, as well as parts of Maine, Vermont, and New York. Currently, the imagery is being classified for 20 land cover categories.

The automation of surficial materials is still in its infancy stage. About 1/4 of the state has been, or is being mapped, and of this, six quadrangles have actually been digitized. Efforts are continuing cooperatively between the state and the USGS for further mapping.

Soil units have been digitized for approximately 1/2 of the state. The data is being provided by the US Soil Conservation Service mostly in the form of orthophotos which are suitable for digitizing. Some maps consist of air photo mosaics that need to be recompiled onto orthophoto bases for digitizing. The SCS is still in the process of mapping three counties, with schedule for completion (except the White Mountain National Forest) by 1996.

#### 6.2.7 RESOURCES

The Office of State Planning has in-house GIS capabilities, although it also makes use of CSRC's wealth of computer resources and expertise by providing grants for particular projects. For a complete list of resources refer to Appendix C.

The GIS equipment residing at the OSP offices include a 386 personal computer running PC ARC/INFO software, one color graphic terminal, and an E-size pen plotter and digitizing board. The agency hopes to purchase a workstation and upgrade to workstation ARC/INFO software. There has also been discussion concerning networking several state offices directly to the computer at CSRC. By networking directly into the GRANIT database, the state offices would be able to access and directly download data to their own computers thus ensuring the use of the most up-to-date data. There is also discussion about providing a mechanism by which state agencies will be able to set up accounts on the CSRC computer and be charged for its use.

## **6.2.8 ENVIRONMENTAL APPLICATIONS OF GIS**

### **6.2.8.1 General**

OSP utilizes GIS mainly for projects which involve land use planning and management. The nature of these projects require many natural and cultural resource data layers in order to perform the complex spatial overlays necessary for planning responsible land management. This section highlights a few applications which were focused primarily on natural resource planning in which OSP has been involved. Refer to Appendix E for a more complete listing of GIS applications.

### **6.2.8.2 Applications**

The "Northern Forest Lands Resource Inventory" is an inter-state cooperative project involving New York, Vermont, New Hampshire and Maine. OSP acts as Resource Inventory Coordinator for New Hampshire, and CSRC serves as the GIS contact.

A project of note which was conducted using in-house GIS facilities was the "Upper Merrimack River Corridor Plan". The purpose of this project was to identify the natural and cultural resources in a 30 mile corridor along the Merrimack River and to recommend strategies for their protection. The project was conducted over a 3 year period from June, 1988 to July, 1991. Many GIS data layers were created for the study area as part of this project such as: slope, soils, land use, and property boundaries.

The "Squam Lakes Watershed Plan" is another project in which OSP utilized GIS. GIS processing and map production was conducted by CSRC from 1987 to 1991 through funding from OSP. The purpose of this project was twofold: 1) to develop a management plan for the Squam Lakes watershed, and 2) to demonstrate the use of GIS technology and GRANIT data in such an application. Many data layers were employed in order to perform various overlay analyses including: a buildout scenario, identification of areas suitable for agriculture and forest production, and analysis of land use impacts on water quality.

OSP is also currently involved in an air pollution study. By combining TIGER data which includes census tracts and blocks, and air pollution sources, an air pollution model is used to simulate fallout of certain chemicals to determine the number of people affected by them.

#### **6.2.9 FUTURE NEEDS**

Future needs, as indicated by OSP staff, are itemized in the Appendices. Discussed below are particular needs as discussed during the interview process.

##### **6.2.9.1 Data**

At the top of the list of needed data layers for OSP, is land use and land cover. The TM imagery which is being used to create the wetlands data layer (mentioned in Section 6.2.6) will yield land cover data, however OSP has need for a greater detail of classification than is currently being interpreted. Some land use data has been automated by the Regional Planning Agencies and will be evaluated as a source for statewide purposes.

##### **6.2.9.2 Applications**

Since there are so many extensive data layers in development and projects supporting these, OSP is focusing most of its attention on completion of these data and projects. However, small scale applications are being

undertaken. One example is support being given to the National Park Service to conduct resource analysis on the Pemigewasset River as part of a wild and scenic river study. Another is providing assistance to NH DES in lake watershed modeling involving water budget and nutrient budget analyses.

#### **6.2.9.3 Resources/Organizational**

As mentioned in Section 6.2.7, OSP is considering purchasing workstation ARC/INFO software and a UNIX workstation. It also foresees a need for an X-terminal.

#### **6.2.9.4 Regional/Cooperative Efforts & EPA's Role**

OSP would like to see EPA coordinate regional coding standards, for example, (1) what categories to use in classifying land use, and (2) what coding method is most useful for hydrography.

### **6.3 COMPLEX SYSTEMS RESEARCH CENTER**

#### **6.3.1 MISSION**

Complex Systems Research Center is located in the Institute for the Study of Earth, Oceans, and Space at the University of New Hampshire. It is purely a research facility whose activities range from maintaining the New Hampshire GRANIT database to supporting GIS applications which are global in scope.

Although not a governmental entity in and of itself, CSRC is instrumental to the use of GIS in state government. It receives annual funding from OSP to develop and maintain the GRANIT database, and it also performs many project-specific applications for various state agencies.

#### **6.3.2 STAFFING**

There are currently four staff members at CSRC who assist the state GIS program to some extent. The GIS Program Manager is a member of the state

GIS Advisory Committee and a co-organizer of the first annual New Hampshire GIS Users Group meeting. There are two GIS technical specialists and a system manager.

#### 6.3.3 FUNDING

As mentioned above, CSRC receives annual funding from OSP to develop and maintain the GRANIT database using CSRC's computer resources and personnel. In FY '91 it received approximately \$130,000 from OSP. It also receives numerous grants from other agencies to carry out program-specific work.

#### 6.3.4 DATA MAINTENANCE/DISTRIBUTION

It is incumbent upon CSRC to distribute GRANIT digital data, and to provide map products as staffing and time permit. The policies governing the distribution and maintenance of GRANIT data are those outlined in the NH GRANIT USERS GUIDE (see Section 6.2, Office of State Planning).

#### 6.3.5 GIS STANDARDS

The standards to which the GRANIT data are subject are outlined in the NH GRANIT USERS GUIDE (see Section 6.2, Office of State Planning).

#### 6.3.6 DATA LAYERS

CSRC is automating many of the GRANIT statewide data layers, for a complete listing refer to Appendix D. Most of these data layers are the result of cooperative efforts between CSRC and OSP, and are mentioned in Section 6.2.

#### 6.3.7 RESOURCES

CSRC has computer and software resources which it uses both for state governmental GIS projects and other research projects.

The CSRC runs ARC/INFO software on a Prime mini-computer, and PC ARC/INFO on a 386 PC. It also has both mainframe and PC ERDAS software for image

processing, and Surfer modeling software. Other peripherals include: five graphic terminals, an E-size pen plotter and digitizer, and a screen dump plotter.

#### 6.3.8 ENVIRONMENTAL APPLICATIONS

At the CSRC many GIS applications are conducted for a variety of organizations. Refer to Section 6.2.8.2, under Office of State Planning for a discussion of a few OSP-funded applications which were conducted at CSRC.

The "Connecticut River Open Space Project" was an inter-state cooperative effort involving five New England states. This project was born out of a plan developed at the 1989 New England Governor's Conference. Complex Systems Research Center compiled and processed the GIS data from the participant states. The final product was a map which was composed and plotted at the EOE Data Center in Massachusetts.

#### 6.3.9 FUTURE NEEDS

Future needs, as indicated by OSP staff, are itemized in the Appendices. Discussed below are particular needs as discussed during the interview process.

##### 6.3.9.1 Data

Probably the most prolific map producer in the state, CSRC expresses a desire for annotated DLG data - a would-be prime commodity for producing high quality maps. CSRC also has an immediate need for statewide coverage of 1:24,000 DEM data for use in a variety of applications, most notably the Wetlands TM data layer in which they use elevation data to assist in the classification.

At present the GRANIT database is stored in 7.5 minute quadrangle tiles, however it is not managed by the LIBRARIAN utility in ARC/INFO. CSRC is

considering implementing LIBRARIAN to accommodate users of the proposed statewide data network which will allow state offices to directly access the GRANIT data on the CSRC computer.

#### 6.3.9.2 Applications

A commitment has been made by the Division of Public Health Services to fund a project related to cancer incidence.

There have been discussions about linking the Computerized Fish and Wildlife Information System, a database describing habitats of a number of species, with GRANIT land cover data. If successful, this would allow the generation of maps of specific species' habitats. Of course, this application could not begin until the land cover data are automated.

#### 6.3.9.3 Resources/Organizational

CSRC would like to purchase workstation ARC/INFO including the ARC/INFO GRID package, an electrostatic plotter, a scanner, and a high-resolution GPS. The GPS would be immediately useful in supporting field work related to CSRC's image processing activities.

#### 6.3.9.4 Regional Cooperative Efforts & EPA's Role

CSRC feels that one way in which EPA could assist the New England GIS community is by providing a lending warehouse of resources. For example, GPS units, scanners, and electrostatic plotters are pieces of equipment which are too expensive to justify purchasing by many agencies, but which would be of value for specific tasks in a project. By loaning or leasing such resources to agencies it would alleviate this dilemma.

It was also suggested that EPA provide an on-line data browsing database, so that one could "call up" an EPA computer to find out currently available data layers in the Region.

## **6.4 DEPARTMENT OF ENVIRONMENTAL SERVICES**

### **6.4.1 MISSION**

The Department of Environmental Services is the prime environmental regulatory agency in the New Hampshire. It has an agency-wide GIS program in the Planning Unit of the Office of the Commissioner.

### **6.4.2 STAFFING**

The GIS Program at DES is staffed by one full-time GIS Coordinator and one part-time GIS Technician.

### **6.4.3 FUNDING**

DES receives state funding for a full-time GIS position and partial funding for a part-time GIS position. In addition, it receives some federal funds to maintain its GIS program. DES is exploring ways to collect revenues through charging specific programs (e.g. Superfund) for computer time or per plot fees.

### **6.4.4 DATA MAINTENANCE/DISTRIBUTION**

DES is in the process of working out a data distribution policy for those of its data layers which are not a part of GRANIT. To date, digital data distribution has not been an issue, and when it has received map requests it has referred to CSRC's policies.

### **6.4.5 GIS STANDARDS**

DES is striving to comply with GRANIT standards with the data layers it is developing (see Section 6.3.2 for overview of GRANIT standards).



#### 6.4.6 DATA LAYERS

##### 6.4.6.1 General

The DES has its own standalone GIS with which it creates and stores data independently from GRANIT, although it also contributes to and uses GRANIT data as well. Most of the data layers it develops in-house are related to water pollution control.

##### 6.4.6.2 Noteworthy Data Layers

The DES Groundwater Protection Bureau has completed the field-location and digitizing of about 85 percent of the state's existing and potential sources of groundwater contamination, including hazardous waste sites, underground storage tanks, and landfills. The sites were located on 7.5-minute quadrangles using traditional methods; the estimated locational accuracy of the data is  $\pm 200$  feet. At this time, the Bureau is expanding its UST inventory using a GPS receiver on loan from EPA Region I. The Bureau has two full-time staff devoted to the creation and maintenance of this inventory. DES has provided about \$5,000 to each of the nine NH RPAs to begin to map and digitize specific sources of water pollution. These sources include: sand/gravel operations, pesticide application areas, snow dumps, storm drains, and combined sewer overflows. Currently about 15 percent of the state is complete, and the estimated locational accuracy of the data is  $\pm 200$  feet.

The Water Resources Division (WRD), Water Well Board, has mapped and digitized about half of the water supply well locations in the state. The locations are based on well location maps which have been required for all wells drilled since 1983. WRD field checks each location and then compiles the points on 7.5 minute quadrangles. Along with the points there are numerous attributes, including: property owner's name and address, date of well completion, type of well, total depth, depth to bedrock, and yield.

WRD has also compiled and digitized the state's 110 sub-watersheds at a scale of 1:24,000. The GIS Program has created a map of this data for public distribution.

DES is considering digitizing wetlands which have been mapped by the U.S. Fish and Wildlife Service as part of its National Wetlands Inventory. The source scale is 1:24,000 and the maps are available for the entire state. In addition, DES is contributing to the development of wetlands data from the TM imagery discussed in Section 6.2 by conducting some of the field verification.

#### 6.4.7 RESOURCES

The GIS Program uses Workstation ARC/INFO (multi-user license) on a stand-alone workstation. The workstation is accessed through four terminals (the workstation's X monitor, two Tektronix 4208 monitors, or a PC which runs Graftpoint TGRAF-4200 terminal emulation software). Peripheral devices include one E-size pen plotter, one E-size digitizer, and one Tektronix screen-dump printer.

The Water Resources Division, Water Well Board, runs PC ARC/INFO on a 386 microcomputer. Their peripherals include one E-size pen plotter and one E-size digitizer.

#### 6.4.8 ENVIRONMENTAL APPLICATIONS OF GIS

The GIS applications at DES have been directed primarily at inventorying potential sources of surface and groundwater contamination. Two such applications are discussed briefly below:

As part of the Wellhead Protection Program, many pollution sites are being mapped and digitized, with the hopes that these data will not only help this program, but will also aid the Groundwater Protection Bureau in its groundwater hazards inventory which it will use to prioritize remediation of contaminated sites. A menu driven application has been created to view the data and create maps.

Watersheds are also being prioritized using the above mentioned pollution sites and TIGER census data.

#### **6.4.9 FUTURE NEEDS**

Future needs, as described by DES staff, are itemized in the Appendices. Discussed below are particular needs as discussed during the interview process.

##### **6.4.9.1 Data**

DES has immediate need for: (1) completed aquifer data layer, (2) 1:24,000 planimetric DLG features, (3) and wetland data. It would also like to quicken the development of the non-point pollution sources data layer, however the funding which it can provide to the RPAs is limited.

##### **6.4.9.2 Resources/Organizational**

The agency has a need for three or so global positioning system (GPS) receivers. The NH DOT is considering locating a base station on its roof right next to the DES offices.

##### **6.4.9.3 Regional Cooperative Efforts & EPA's Role**

The DES suggested that EPA concentrate more on helping the State's GIS projects rather than building its own applications and data which result in duplication of effort. EPA could focus on inter-regional projects rather than on coordinating regional data development. Thus, an application-driven program, as opposed to a data-driven program, is perceived as most useful.

DES would also like to see EPA coordinate the establishment of locational accuracy standards for mapped data, and procedures for dissemination of data (e.g. how much to charge, etc.).

## **7.0 RHODE ISLAND**

This section describes the organizational structure of GIS activities in Rhode Island and summarizes GIS activities in the organizations which partook in the study.

### **7.1 ORGANIZATIONAL STRUCTURE**

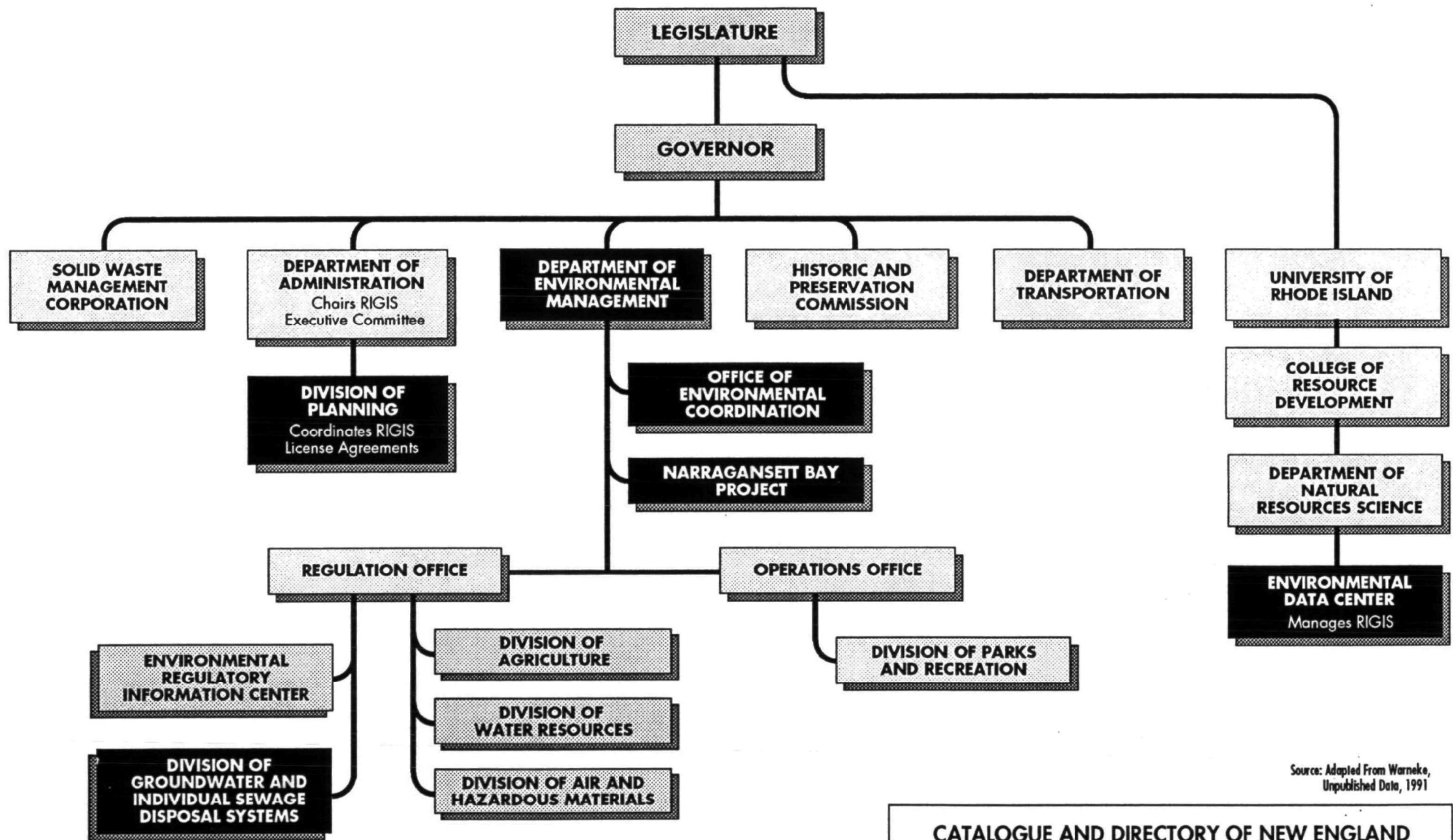
Figure 7-1 is a generalized chart of organizations within the State of Rhode Island which are or may be involved in GIS activities which could have a bearing on environmental protection. This figure is intended to orient the reader with respect to which organizations were interviewed for this project and why; and also as a reference for the organizational information included in the survey responses.

In 1984 the Department of Environmental Management (DEM) initiated GIS activity in the state by conducting a study of the feasibility of GIS in Rhode Island. On the basis of this study, DEM entered into a cooperative agreement with the Department of Natural Resources Science at the University of Rhode Island (URI). This agreement led to the establishment of the Environmental Data Center at URI and the development of a statewide geographic information system.

Agreements between URI and DEM continued and eventually led to the establishment of an official RI Geographic Information System (RIGIS) in 1990. RIGIS is the name for the statewide natural resources GIS database which is housed and maintained at the University of Rhode Island's Environmental Data Center. Currently, there are several state agencies which actively use and contribute to RIGIS. They are: URI, DEM, RI Department of Transportation, Department of Administration's Division of Planning, and the Solid Waste Management Corporation.

The Division of Planning is directed by the Legislature to administer RIGIS. It accomplishes this by supporting the RIGIS Executive Committee and serving as the RIGIS Coordinator. In addition, DOP in the past has

# GIS ORGANIZATIONAL CHART OF RHODE ISLAND



Source: Adapted From Warneke,  
Unpublished Data, 1991

CATALOGUE AND DIRECTORY OF NEW ENGLAND  
STATES AND GIS ORGANIZATIONS AND ACTIVITIES,  
AND AN ASSESSMENT OF THEIR GIS NEEDS

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January 1992

FIGURE 7-1

 = PARTICIPATING ORGANIZATION

administered monies from state bonds for municipal comprehensive planning efforts and environmental management. From these funds it has provided partial funding to the EDC to help manage and support the RIGIS database. However, this funding is not the sole source of revenue contributing to RIGIS maintenance.

#### 7.1.1 ENVIRONMENTAL AGENCIES

The Department of Environmental Management is the primary environmental agency in the state. It is comprised of several divisions; many are using GIS in some capacity. The most active users are the Groundwater Section of the Division of Groundwater and Individual Sewage Disposal Systems, and the Office of Environmental Coordination, Nonpoint Source Pollution Management Program. The Division of Agriculture has immediate plans for a substantial increase in GIS activity once it receives GIS hardware and software which are on-order.

#### 7.1.2 INTER AGENCY AND INTER-STATE COORDINATION

##### GIS Committees and User Groups

There is a RIGIS Executive Committee whose members are appointed by the State Planning Council. The State Planning Council and the RIGIS Executive Committee are both chaired by the Associate Director of the Division of Planning. The RIGIS Executive Committee Executive Secretary, also with DOP, is the RIGIS Coordinator as well. The purpose of the committee is to establish standards and policies for RIGIS, prioritize development of data layers, and to assist URI with database management. It is also mandated by Rhode Island law to coordinate statewide GIS efforts.

The University of Rhode Island hosted a GIS and Automated Mapping Conference in August, 1991. This was the first conference of this kind in the state. Featured speakers included members from: the RI House of Representatives, state and federal agencies, local and regional governments, University of Rhode Island, and the private sector. Topics ranged from "big picture" issues surrounding GIS in state government to

description of specific macros integrating GIS with stormwater runoff models. The University would like to hold the conference annually, but funding for future events is questionable.

### Inter-state Agreements

Rhode Island has signed a Memorandum of Understanding with the State of Massachusetts. The agreement was signed by the RIGIS and the MA Executive Office of Environmental Affairs (EOEA). This agreement formalizes long term data sharing between the states' GIS. It calls for each state to abide by the terms and conditions regarding use of the other state's data. There is no plan to exchange entire databases. To avoid piece-meal data requests, the two states are considering exchanging agreed upon data layers for all bordering quadrangles.

RIGIS and the primary GIS organizations of the other New England states have been conferring about the possibility of a GIS data sharing agreement between all six New England states. The RIGIS Coordinator was asked to provide the language of the Memorandum of Understanding between Rhode Island and Massachusetts to the other interested parties, as an example of an existing agreement between two states.

RIGIS has also signed data sharing agreements with the U.S. Soil Conservation Service, the Town of East Greenwich, the Aquidneck Foundation, Block Island, and is working on ones with U.S. Fish and Wildlife, and the U.S. Geological Survey.

### 7.1.3 ORGANIZATIONS INTERVIEWED

The organizations interviewed for this study are: the Environmental Data Center at the University of Rhode Island, the Division of Planning under the Department of Administration, three Divisions under DEM, and the Narragansett Bay Project.

## **7.2 UNIVERSITY OF RHODE ISLAND, ENVIRONMENTAL DATA CENTER**

### **7.2.1 MISSION**

The Environmental Data Center at the University of Rhode Island is responsible for maintaining and distributing RIGIS data. It also provides GIS technical assistance to: the University community; state, federal and municipal organizations; and the general public through URI's Cooperative Extension Program.

### **7.2.2 STAFFING**

The EDC employs about five part-time staff. The GIS Program Manager devotes about 50 percent of his time to RIGIS administration and the other half to academic activities. There is a Database Administrator, two Applications Managers, and a varying number of student interns at any given time.

### **7.2.3 FUNDING**

The EDC relies on grants from various state and federal organizations - particularly the DOP and DEM - which have provided grant monies to help support maintenance of the RIGIS database.

The EDC and DOP are considering line item funding to provide for RIGIS maintenance costs. These would include: partial funding and full funding for the Program Manager and Database Administrator positions, respectively; database maintenance; hardware and software.

The Database Administrator position has been supported by several University projects. One of the Applications Managers is funded entirely by a grant from the EPA Environmental Monitoring and Assessment Program (EMAP) and works primarily for that project. The other Applications Manager position is funded partially by a grant from the Groundwater section of the DEM Division of Groundwater and Freshwater Wetlands, and partially by other University projects.



The EDC depends to a large extent on various grants for project-specific GIS work. Recent federal grants have been received and projects carried out for: EPA EMAP (mentioned above), the National Park Service, and the National Oceanic and Atmospheric Administration (NOAA).

#### **7.2.4 DATA MAINTENANCE/DISTRIBUTION**

This, and the following section describe some general policies and standards governing the RIGIS database. Although RIGIS is the result of cooperation between many organizations, it is described here because of the EDC's role in pioneering many of these policies.

The policy regarding distribution of RIGIS data was developed by the RIGIS Executive Committee. It requires that all users of RIGIS data sign the "RIGIS License Agreement" which sets the conditions for its use. The data are considered "intellectual property of the University of Rhode Island", ownership residing with the RI Board of Governors for Higher Education. Portions of the data are copyrighted so all products of the data must display the copyright symbol:

**(c) 1989 RIGIS All Rights Reserved**

All requests for data or map products must be processed through the RIGIS Coordinator at the DOP. When processed, the requests are sent to the Database Administrator at the EDC. The EDC then compiles and downloads the necessary data, and sends it to the requesting party.

For some time the cost of RIGIS data have been different for public and private entities, however the private sector fees have recently been suspended. Now data are under one fee schedule - the same as that charged the public sector - fees based on cost of recovery only. The RIGIS License Agreement allows any purchaser of data to retain and use those data for any purpose, with the stipulation that data not be re-distributed. It should be noted that the fee schedule for private organizations is only a suspension and is subject to change.

### 7.2.5 GIS STANDARDS

RIGIS data standards were developed by the EDC and approved by the RIGIS Executive Committee, and are explained fully in the Digital Database Standards for the Rhode Island Information System (1988). This document was prepared by the Environmental Data Center and describes guidelines and requirements for creating digital data to be incorporated into RIGIS. Examples of some topics covered are:

- source map media
- map projection and coordinate system
- standard tic registration points
- digital tolerances, such as "RMS" and "fuzzy" tolerances
- cartographic accuracy
- documentation
- attribute coding
- QA/QC procedures

Data entering the RIGIS database is required to be referenced to the Universal Transverse Mercator (UTM) coordinate system using NAD 27 (North American Datum 1927) geodetic control. The accuracy of RIGIS data requires that 90 percent of planimetric features in digitized coverages be within 1/100 inch of the centerline of that feature on the source map, and 100 percent of all features be within 1/50 inch. RIGIS also suggests that all digital data submitted should be accompanied by mylar proof plots at the same scale as the digitized manuscript.

### 7.2.6 DATA LAYERS AND COVERAGES

#### 7.2.6.1 General

The RIGIS Executive Committee determines and prioritizes data layers to be automated for inclusion in RIGIS. Out of 58 originally recommended data layers, about 46 have been completed statewide. At present, there are no more major initiatives for statewide data development, as RIGIS participants are concentrating efforts on updating existing data layers.

Refer to Appendix D for a complete listing of RIGIS data layers. It should be noted that RIGIS does not include, and does not aim to include, all GIS data in Rhode Island. Data layers targeted for inclusion are those considered to have statewide significance. The EDC sees no need to include, for example, all parcel data for the state. This type of data is better maintained by the local governments that have need for these data.

Most RIGIS data layers were automated from source material at 1:24,000 scale or better. All basemap features, e.g. roads, hydrography, political boundaries, were digitized at this scale. The database is structured based on 7.5 minute quadrangle tiles. That is, complex data layers are divided into 37 ARC/INFO coverages as this is the number of quadrangles encompassing the state. Simpler data layers are stored in statewide coverages.

The EDC experimented with using the LIBRARIAN utility in ARC/INFO to manage and access the RIGIS database. However, it found certain aspects of the utility troublesome particularly with regard to its handling of tile boundaries, so LIBRARIAN has not been implemented. Currently all RIGIS data layers reside on-line.

#### 7.2.6.2 Noteworthy Data Layers

When asked which data layers are the most requested, besides basemap data layers, the EDC responded with soils, land use, and wetlands. Rhode Island is fortunate to have statewide coverage of these data layers at large scales, and from relatively current source data. Both the land use and wetlands data were interpreted from 1988 aerial photography. Land use data are classified by 34 Anderson Level II and III classes. Wetlands are divided into 16 classes based on the Cowardin, et al. classification system. Soils are classified according to the 112 soil types listed in the Soil Survey of Rhode Island.

RIGIS includes many data layers related to groundwater. Most of these data layers were automated in cooperation with the DEM Groundwater Section of

the Division of Groundwater and Freshwater Wetlands. These data layers are: glacial deposits, groundwater recharge areas, groundwater reservoirs, and sole source aquifers.

#### 7.2.7 RESOURCES

##### 7.2.7.1 General

All of the hardware and software resources used by the EDC are shared with the University community, especially with the Department of Natural Resources Science in which the EDC is located.

##### 7.2.7.2 Hardware/Software

The EDC uses ARC/INFO software on a Prime 6350 mini-computer which is shared with other University departments. However, the EDC plans to phase out use of the Prime by the spring of 1993 in lieu of two Digital Avion workstations each running ARC/INFO. The University also owns two 286 PCs, 12 386 PCs, and 10 PC ARC/INFO software packages which are used in courses offered through the Department of Natural Resources Science.

Other peripheral devices include: five color graphic terminals, an E-size pen plotter, a D-size electrostatic plotter which is shared with other departments, two E-size digitizers, and one screen dump plotter. On-order are: two DG Avion workstations, one 386 PC, and another screen dump plotter.

The EDC has just received one low-resolution Trimble GPS unit and base station. The GPS unit is initially planned to be used for research.

The University purchased PC ERDAS software, not for a specific project, but because it saw utility for many applications. It is currently being used to map coastal wetlands from LANDSAT Thematic Mapper data.

## **7.2.8 ENVIRONMENTAL APPLICATIONS OF GIS**

### **7.2.8.1 General**

The applications of GIS are many and varied at the EDC. Since two of the staff at the EDC are directly funded by state and federal programs, many of the applications revolve around those particular interests. However, there are other programs which have or are providing grants to the EDC to perform GIS analyses. For a summary listing of applications, refer to Appendix E.

### **7.2.8.2 Noteworthy Applications**

The RI Solid Waste Management Corporation, a quasi-governmental organization, has provided several grants to the EDC to perform siting studies for solid waste disposal. The most recent study completed in June, 1991 used GIS to help determine suitable locations for a new major landfill in the state.

The EDC has been recognized as a "center of excellence" for its GIS Lab, and for this has been selected as a grant recipient for the EPA Environmental Monitoring and Assessment Program (EMAP). The grant provides for the use of the EDC facilities and technical assistance by the "Near Coastal" task group of the program which is being conducted from the EPA office in Narragansett, RI. The nationwide EMAP program is funded by EPA's Office of Research and Development. It is a long-term monitoring program the goal of which is to "document the condition of the nation's ecosystems in an integrated manner on a continuing basis." The EDC is assisting in combining ARC/INFO spatial data for coastal areas all over the U.S. (e.g., sampling locations, 1:100,000 DLG hydrography, watersheds, and land use) with the extensive sampling data contained in EPA's SAS database.

URI and the University of Connecticut are jointly involved in the Coastal Watch Program for the National Oceanic and Atmospheric Association (NOAA). This is a pilot project to map and determine coastal wetland changes from 1984 to 1988 using LANDSAT TM imagery. The EDC is using the current RIGIS wetlands coverage to help "supervise" the classification utilizing PC ERDAS software.

The EDC is also involved in two projects for the National Park Service. One project involves creating a digital inventory of submerged aquatic resources in the Cape Cod National Seashore. The other is an ecological assessment of Minute Man National Park in Concord, MA.

#### **7.2.9 FUTURE NEEDS**

Future needs, as indicated by EDC staff, are itemized in the Appendices. Discussed below are particular needs as discussed during the interview process.

##### **7.2.9.1 Data**

The EDC is especially interested in acquiring updated land use (current source material are 1988 aerial photos), digital orthophotos at 1:12,000 scale or larger, and complete address-matched roads.

##### **7.2.9.2 Applications**

Once the EDC receives the GPS unit and base station which it has ordered, it plans to conduct research comparing locational accuracy of data collected using GPS methods and data collected using other methods. Comparisons may also be made on how locations differ as a function of distance from the base station. For example, GPS data rectified using the University base station might be compared to the same data rectified by the EPA base station in Lexington, MA. This type of research could be highly useful to organizations considering purchase of GPS units.

##### **7.2.9.3 Resources/Organizational**

The use of GIS is fast expanding at the University. The University Academic Computer Center is currently assessing different means to provide GIS and data support to the University academic community.

Although two workstations have been ordered by the EDC, it foresees the need for several more. It also needs many more peripherals, like

digitizers, plotters, X terminals, slide matrix, etc. For a complete listing of these resources refer to Appendix C.

#### **7.2.9.4 Regional Cooperative Efforts & EPA's Role**

Rather than limiting funding to program-specific activity, the EDC would like to see EPA implement a grants program for data development, maintenance, and capital investments. This kind of funding would ensure that the data be kept current and managed in a way to promote quick turnaround for GIS requests.

### **7.3 DIVISION OF PLANNING**

#### **7.3.1 MISSION**

The Division of Planning, under the Department of Administration, is the central planning agency for the state. Among other responsibilities, it must assist Rhode Island's cities and towns in preparing community comprehensive plans in compliance with the Comprehensive Planning Act of 1988. The DOP is directed by legislation to coordinate RIGIS, which it accomplishes by acting as the state GIS Coordinator and appropriating funds to the development and maintenance of RIGIS data.

#### **7.3.2 STAFFING**

There are two staff at DOP with GIS responsibilities. The RIGIS Coordinator position, in the past, has been funded by both DOP and the Solid Waste Management Corporation. Currently, this position is funded by DOP and the person in this position also serves as the RIGIS Executive Committee Secretary. The other position is that of Senior Planner, with GIS technical expertise.

#### **7.3.3 FUNDING**

The DOP requested approximately \$110,000 for GIS-related expenditures for FY '92.

#### 7.3.4 DATA MAINTENANCE/DISTRIBUTION

DOP provides a grant to the EDC to help support and maintain the RIGIS database.

Portions of the funding which DOP provided to municipalities to assist in the development of comprehensive plans, were tied to the requirement that RIGIS data be used. All map products prepared by the municipalities are required to be submitted to the state to be used for review of comprehensive plan packages and for possible future inclusion in the RIGIS database.

#### 7.3.5 GIS STANDARDS

DOP adheres to the standards adopted by the RIGIS Executive Committee, as described in the Digital Database Standards for the Rhode Island Geographic Information System (see Section 7.2.5).

#### 7.3.6 DATA LAYERS AND COVERAGES

The DOP uses RIGIS data almost exclusively and it does not maintain any data that are not included in RIGIS. Refer to Section 7.2.6 under "Environmental Data Center" for a general overview of RIGIS data, and to Appendix D for a summarized listing of data layers. The following briefly describes a RIGIS data layer which DOP was primarily responsible for developing.

The DOP contracted the University of Massachusetts to interpret, recompile, and digitize land use/land cover for the state based on 1988 aerial photography. The classification scheme is based on modified Anderson et al. (1976) hierarchical classification, and includes 34 categories. Although all the data have been automated, the data is still going through RIGIS QA/QC procedures and release of these preliminary data are accompanied by a note of disclaimer.



### **7.3.7 RESOURCES**

The DOP office is outfitted with GIS equipment and presently uses GIS heavily on a daily basis. It runs ARC/INFO software on both the PC and workstation platforms. It also has an E-size pen plotter, D-size digitizer, and an A-size thermal plotter.

### **7.3.8 ENVIRONMENTAL APPLICATIONS OF GIS**

The DOP in cooperation with the RI DEM are using GIS in the Greenspace 2000 Management Plan. The purpose of this is to identify areas in the State that qualify as greenspace according to the state definition. All the GIS work is being conducted at DOP by DOP staff.

To assist the cities and towns in preparing their comprehensive plans, the DOP created and disseminated maps showing certain RIGIS data layers. First, the DOP determined which parts of the RIGIS database would be most useful to the communities. This became a standard package of 17 RIGIS data layers which could be provided to the communities in digital format, or if digital data were not suitable, a standard package of six thematic maps were provided. The staff at DOP created AML (ARC Macro Language) programs to stream-line the production process.

### **7.3.9 FUTURE NEEDS**

Future needs as indicated by DOP staff are itemized in the Appendices. Discussed below are particular needs as discussed during the interview process.

#### **7.3.9.1 Data**

The DOP requires a map or digital file of future land use be submitted by each community as part of the community comprehensive plans. These data are meant to be incorporated into RIGIS with the idea that this will facilitate comprehensive plan updates which are meant to occur every five years.

#### **7.3.9.2 Regional Cooperative Efforts & EPA's Role**

There is no formal agreement between Rhode Island and the EPA. However, the RIGIS Coordinator indicated that the EPA would be welcome as a partner in any future data sharing arrangement with the RIGIS.

#### **7.4 DEPARTMENT OF ENVIRONMENTAL MANAGEMENT**

Currently, there is no centralized GIS activity within DEM and each Division has conducted its own GIS applications independently. DEM recently formed an internal GIS Steering Committee to look into hiring a full-time GIS Coordinator. This person would coordinate all the GIS activity within the Department.

Because of DEM's de-centralized GIS activity, representatives from three Divisions were contacted to participate in this study. These Divisions are: the Office of Environmental Coordination (OEC), the Groundwater Section of the Division of Groundwater and Individual Sewage Disposal Systems, and the Environmental Regulatory Information Center (ERIC). The Division of Groundwater and Individual Sewage Disposal Wetlands, and the Office of Environmental Coordination were able to provide information relative to their Division's involvement with GIS and ERIC was able to provide some general overview information, so this is not intended to paint a comprehensive picture of DEM as a whole. These three participants, however, were chosen based on conversations with the RIGIS Coordinator, the Director of the EDC, and the DEM participants, and probably represents the majority of GIS activity within DEM. The following section briefly describes these three Divisions jointly.

##### **7.4.1 MISSION**

The Department of Environmental Management is the primary environmental regulatory agency in Rhode Island. In addition, its mission includes among others: resource management (forestry, wildlife, etc.), parks and recreation, recycling, and planning.

#### 7.4.2 STAFFING

Between all the Divisions at DEM there are several staff who participate in GIS-related activity. Of these, there are approximately four who use GIS "hands on" either full-or part-time. In addition, the Groundwater Section of the Division of Groundwater and Individual Sewage Disposal Systems has contracted a full-time person to work at the University of Rhode Island's Environmental Data Center on groundwater applications for DEM. This particular position may become part-time in FY '92.

As mentioned above, the DEM is looking to hire a GIS Coordinator.

#### 7.4.3 FUNDING

There is no line-item funding for GIS-specific expenditures in the DEM annual budget. It does receive numerous grants from federal agencies for programs which may utilize GIS.

#### 7.4.4 DATA MAINTENANCE/DISTRIBUTION

The DEM distributes some of the data which it has created and maintains. In order to release digital data it requires that first, a RIGIS license agreement be secured from the RIGIS Coordinator at the Division of Planning, and second, standard request forms be submitted to the particular DEM Division or Section that is responsible for the data layer.

For example, the Groundwater Section has created a request form for its Facility Inventory data layer. This form notifies the potential user of the contents, limitations, and conditions for its use of the data. It asks for the desired format of the data, and how the data will be used. Lastly, it requires the signature and agency of the requesting party, and then authorization by a representative of the Groundwater Section.

#### 7.4.5 GIS STANDARDS

The DEM abides by RIGIS digital database standards. Refer to Section 7.2.5 for a general overview of these standards.

#### **7.4.6 DATA LAYERS AND COVERAGES**

##### **7.4.6.1 General**

DEM primarily uses RIGIS data and, in fact, has been responsible for initiating the development of many of the data layers now in RIGIS. Particularly, the Groundwater Section has been responsible for the development of the several groundwater-related data layers. Described below are a few particular data layers which have been developed by DEM. For a summary listing of data layers used by DEM, refer to Appendix D.

##### **7.4.6.2 Noteworthy Data Layers**

Three watershed data layers were developed under the lead of the Nonpoint Source Pollution Program in the Office of Environmental Coordination. These were: major watersheds, sub-watersheds, and drinking water supply watersheds. A Basin Committee was formed by the Nonpoint Source Program, and included representatives from the U.S. Geological Survey, Narragansett Bay Project, RI Water Resources Board, DEM, and others. The purpose of forming the committee was to gain statewide consensus on the delineation of these watersheds. Formerly, each agency had its own delineations which could vary a great deal from one another. After reaching consensus, these three watershed data layers, as defined by the committee, were compiled onto maps and digitized. Now all agencies in Rhode Island use the same watershed boundaries.

The Division of Air and Hazardous Materials has developed a coverage of federally-designated CERCLIS (Comprehensive Environmental Responses Compensation and Liability Information System) sites in the state.

As part of the DEM Groundwater Facility Inventory, many types of point sources of pollution have been located in the field and mapped on quad sheets. All of these have been digitized into one ARC/INFO coverage including features such as: landfills and dumps, surface impoundments, salt storage, DEM-registered underground storage tanks (UST), leaking USTs, above-ground tanks, underground injection control sites, dry cleaning

facilities, and miscellaneous sites (spills, defense department sites, etc.). Many of these sites have also been designated as CERCLIS sites.

#### 7.4.7 RESOURCES

There are relatively few hardware and software resources located at the offices of DEM considering the numbers of GIS applications, and the growing interest in the technology. The resources that are available are shared by all the Divisions, these are: two color graphic terminals which can access ARC/INFO on the URI Prime computer, an E-size pen plotter, and a screen dump plotter.

#### 7.4.8 ENVIRONMENTAL APPLICATIONS OF GIS

##### 7.4.8.1 General

To date, most GIS applications have been initiated by the Groundwater Section of the Division of Groundwater and Individual Sewage Disposal Systems, however probably all the various Divisions use or plan to use GIS to some extent.

##### 7.4.8.2 Noteworthy Applications

The Groundwater Section, in accordance with its mission to help protect the state's groundwater resources, has used GIS extensively to create a groundwater database and perform analyses. One such ongoing application involves linking GIS with groundwater flow models to determine wellhead protection areas (WHPA). GIS overlays are used to calculate critical statistics for input to the model, such as transmissivity and hydraulic gradient around the well. These statistics are input into the Uniform Flow Model which is a public domain groundwater modeling package. The model outputs a file of X,Y coordinates which defines portions of the boundary of the WHPA. This file is then used to generate an ARC/INFO coverage of the WHPA, which is then further modified by DEM hydrogeologists using site-specific information. This final delineation is then input into the GIS.

The Nonpoint Source Pollution Program is utilizing GIS to conduct an analysis of land use within the watersheds to drinking water supplies. Land use polygons in each watershed will be ranked according to their potential threat to drinking water, and recommendations on mitigation will be developed. Soils are being considered with respect to their susceptibility to Individual Sewage Disposal System (ISDS) failure. Zoning issues will be considered as well to assess threat from future land uses.

#### 7.4.9 FUTURE NEEDS

##### 7.4.9.1 Data

The Groundwater Section has clearly stated that it requires update and maintenance of all of its digital data layers, an expansion of its groundwater inventory to include additional types of facilities, continuation of WHPA development, and increased map production.

Updated land use was cited as being critical to the Nonpoint Pollution Source Program. The program would also like to digitize the locations of "best management practices" for non-point source management which exist statewide. The locations have been manually compiled on maps by the Land Management Project, and include detention basins and animal waste management structures. Once digitized, this information might be useful in estimating reductions in pollutant loadings to specific waterbodies.

##### 7.4.9.2 Applications

An application of GIS which has been proposed but not funded involves conducting a pilot project to delineate the state's jurisdictional wetland boundaries in one watershed. These might be created by buffering the existing wetland coverage by the distances specified in the Freshwater Wetlands Regulations. The results could be used to assist the Division of Freshwater Wetlands in determining whether a wetland permit is required for a given project.

#### 7.4.9.3 Resources/Organizational

The DEM would like to purchase more hardware. Specifically, the need for a digitizer and PC ARC/INFO have been stated. The Division of Agriculture within DEM has recently ordered a GPS unit, a Sun workstation, and workstation ARC/INFO software, however, these have not yet been received.

As mentioned above, the DEM is considering hiring a GIS Coordinator. This person's responsibilities might include: performing data updates, preparing maps, coordinating GIS applications, assisting in DEM GIS financial administration and grant applications, and ensuring that all existing and potential users of GIS understand both the benefits and limitations of the technology.

One of the goals of the DEM GIS Steering Committee is to sign a Memorandum of Agreement with RIGIS. DEM is also in the process of negotiating an agreement with URI to pay for the use of the university computer. DEM would like to set up one large administrative account rather than have to track computer costs for each project and account, which has been the agreement for the past three years.

#### 7.4.9.4 Regional Cooperative Efforts & EPA's Role

Traditionally, EPA funding provides only for products and hardware, not "people". The DEM would like to see this change so that grant money may be used for staff instead of only "administrative" costs.

### 7.5 NARRAGANSETT BAY PROJECT

#### 7.5.1 MISSION

The Narragansett Bay Project is part of the National Estuary Program. The office is located within the RI Department of Environmental Management although it acts as an independent body. The purpose of this office is to carry out a regional program which was developed to analyze existing

conditions and develop a Comprehensive Conservation and Management Plan document including a long-term monitoring plan to protect resources of the Bay and its watershed.

This initial mission has nearly been completed so the project is likely to end in 6-12 months. The long-term monitoring responsibilities most likely will be assumed by RI DEM.

#### 7.5.2 STAFFING

There is currently one full-time GIS staff at the Bay office whose responsibilities include project management, database administration, and technical GIS applications.

#### 7.5.3 FUNDING

The Narragansett Bay Project is funded mostly by EPA with assistance from DEM. As stated above, the program is near completion as its initial goals have been completed.

#### 7.5.4 DATA MAINTENANCE/DISTRIBUTION

Many data have been generated as part of this project. Much of these are sampling data which are transitory by nature. So according to the Long Term Monitoring Plan, these data should be sampled and updated regularly.

#### 7.5.5 GIS STANDARDS

The Bay project tries to adhere to RIGIS digital data standards, and has sought much technical assistance from the EDC to this end.

#### 7.5.6 DATA LAYERS AND COVERAGES

##### 7.5.6.1 General

The GIS data layers used in the Bay project were obtained from a variety of sources. Some of these include: RIGIS, MassGIS, EPA, and NOAA. These



data, as well as those data created by the Project, are stored on the Prime computer at the University of Rhode Island but are not a part of the RIGIS database.

#### 7.5.6.2 Noteworthy Data Layers

Some of the spatial data unique to the Narragansett Bay Project include: drainage basins, wildlife habitats; and distributions of dominant marine invertebrates, marine macrophytes, and marine finfish.

The Bay Project, in cooperation with EPA, has developed an extensive amount of tabular sampling data which are stored in FOCUS database management system software. These data may be related to ARC/INFO point locations by outputting an ASCII file and importing it into ARC/INFO's INFO database.

#### 7.5.7 RESOURCES

The Narragansett Bay Project shares resources with the rest of the Department of Environmental Management, these are: two color graphic terminals which can access ARC/INFO on the URI computer, an E-size pen plotter, and a screen dump plotter.

#### 7.5.8 ENVIRONMENTAL APPLICATIONS OF GIS

The Bay Project has conducted many GIS applications, most of which revolve around identifying sources and potential sources of contamination to the Bay. These applications are summarized in Appendix E.

A particularly interesting application involved using GIS to assist in preparing an emergency response to the World Prodigy oil spill in 1989. The extent of the oil slick was delineated on maps by field crews flying over Narragansett Bay. These areas were then digitized and assigned a date and time. The resultant data layers, representing time and extent of the oil slick, were then displayed on maps along with areas of critical concern (e.g. fish habitats, marshes), and statistics generated to support the development of cleanup recommendations.

#### **7.5.9 FUTURE NEEDS**

##### **7.5.9.1 Data**

To carry forth the Long-Term Monitoring Plan, data generated as part of the project must be updated. For example, the marine sediment sampling which is currently planned must continue to be so, and the same is true for the marine biota sampling.

##### **7.5.9.2 Applications/Resources/Organizational**

The long-term monitoring plan developed by Narragansett Bay Project will require one part or full-time staff to carry out the sampling program for the next five years or so. This program, wherever it may be housed after the official project ends, could greatly benefit from the continued use of GIS. To facilitate this, it would require its own stand-alone GIS, such as workstation ARC/INFO, and could benefit from the use of a low-resolution GPS unit.

##### **7.5.9.3 Regional Cooperative Efforts & EPA's Role**

The Bay Project feels that EPA can, and has played a valuable role in instigating cooperation among organizations which cross state boundaries. The Narragansett Bay Project is a good example of this kind of cooperation since Narragansett Bay watershed is located in Massachusetts and Rhode Island.

## **8.0 VERMONT**

This section describes the organizational structure of GIS activities in Vermont and summarizes the GIS activities of the organizations which partook in the study.

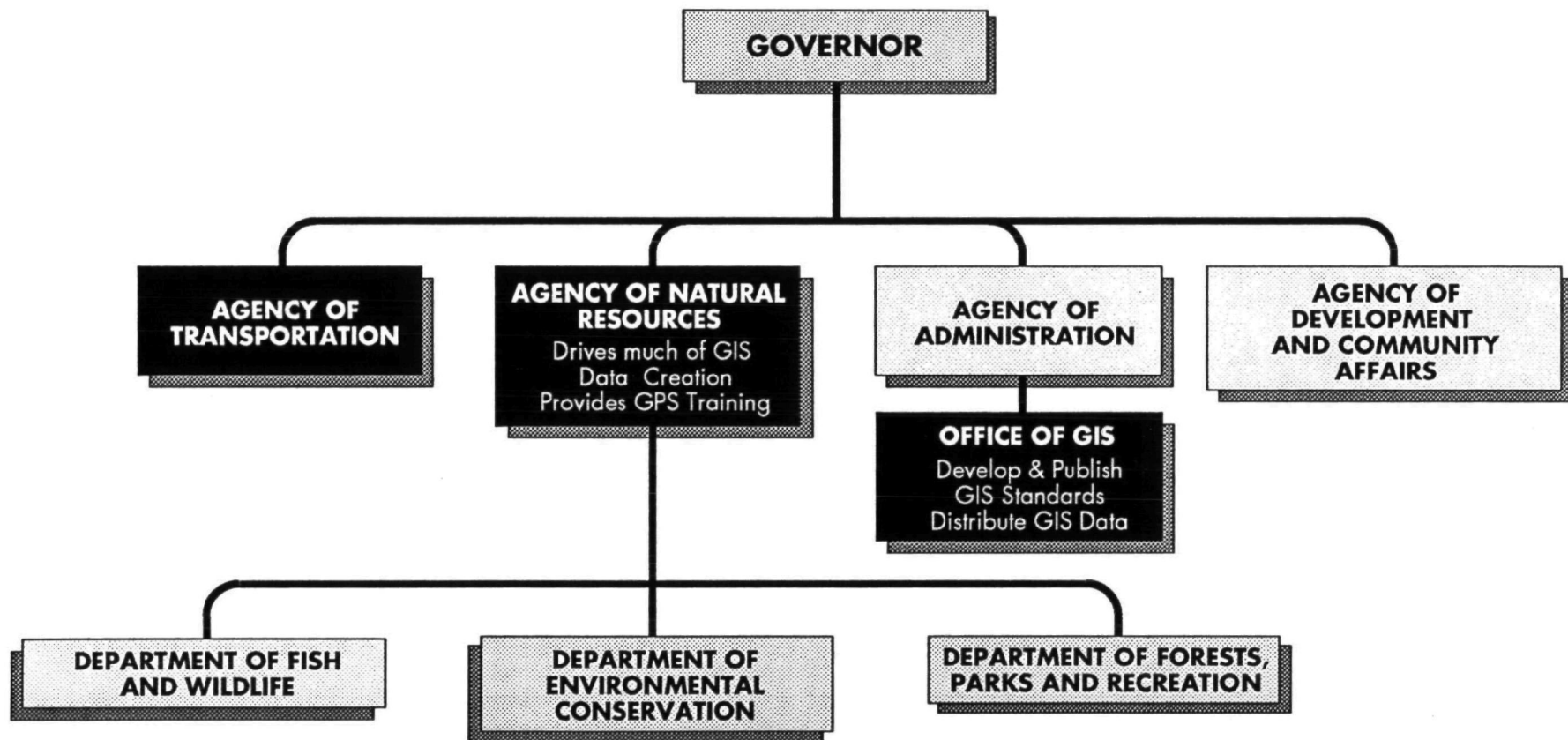
### **8.1 ORGANIZATIONAL STRUCTURE**

Figure 8-1 is a generalized chart of organizations within the state of Vermont which are or may be involved in GIS activities which could have a bearing on environmental protection. This Figure is intended to help orient the reader with respect to which organizations were interviewed for this project and why; and also as a reference for the organizational information included in the survey responses.

In addition to the structure of organizations noted on Figure 8-1, the Vermont Geographic Information System (VGIS), which is the entity that oversees GIS in Vermont, has a substructure of its own. As defined in the Annual Report to the Vermont General Assembly (March 1991), the VGIS consists of five major groups:

1. VGIS Advisory Board - a fifteen member board whose historical responsibilities have included policy, standards and budget review; public discussion of projects affecting VGIS; and commissioning of subcommittees on data priorities, pricing and public access.
2. Office of GIS (OGIS) - which falls under the Agency of Administration and is responsible for development of data, standards and applications and for support of a decentralized, multi-governmental, multi-program GIS. Additional information regarding OGIS may be found in Section 8.2.
3. Other State and Federal Agencies - with which OGIS collaborates in an effort to most effectively utilize GIS resources.
4. Regional Planning Commissions (RPC) - which number 12 and which are working toward the capabilities to provide GIS service to every Vermont town. In general, data which exists at RPCs includes local parcels, refined wetlands delineations and zoning.
5. VGIS Network - an informal voluntary organization whose purpose is to facilitate access to and dissemination of GIS information.

# GIS ORGANIZATIONAL CHART OF VERMONT



Source: Adapted From Warneke,  
Unpublished Data, 1991

 = **PARTICIPATING ORGANIZATION**

**CATALOGUE AND DIRECTORY OF NEW ENGLAND  
STATES AND GIS ORGANIZATIONS AND ACTIVITIES,  
AND AN ASSESSMENT OF THEIR GIS NEEDS**

Camp Dresser & McKee Inc.

January 1992

FIGURE 8-1

### **8.1.1 ENVIRONMENTAL AGENCIES**

The primary environmental agency in Vermont that contributes to GIS is the Agency of Natural Resources (ANR). Regional Planning Commissions' (RPC) activities are often based on EPA grants to the ANR. The ANR has instituted an unofficial GIS Coordinating Committee to address GIS policy decisions within the Agency.

### **8.1.2 INTER-AGENCY AND INTER-STATE COORDINATION**

Vermont GIS has achieved a high level of coordination both between agencies in the state and with surrounding states. VGIS policies, standards, data applications and concepts have been well documented in three separate manuals, one of which is called GIS for Vermont Communities: Applications and Concepts (1990). This manual contains guidelines for communities that wish to investigate GIS solutions and refers to examples of GIS applications implemented in Vermont. Regional Planning Commission and local government roles in the development of GIS are also documented extensively in the Policies, Standards, Guidelines and Procedures Handbook (April 1991). As a result GIS work will be directed to the appropriate organization and there will be little duplication of effort. The aforementioned manuals are available to anyone upon request at a cost of approximately \$50 each.

The following are some examples that illustrate coordination of GIS efforts between Vermont agencies and surrounding states:

1. Interstate River Corridor Project - management of the area surrounding the Connecticut River running from Canada to Long Island Sound.
2. Air Quality Project - a cooperative effort with the state of New Hampshire to track the effects of acid rain on vegetation quality over time.
3. Lake Champlain Management Conference - a cooperative effort involving the use of GIS to properly manage the Lake Champlain environment. The project involves the states of Vermont and New York, the U.S. Geological Survey, and EPA.

### 8.1.3 ORGANIZATIONS INTERVIEWED

The Vermont organizations interviewed for this project are the Office of GIS and the Agency of Natural Resources. Salient aspects of our discussions and summaries of each organization's response to the written survey are presented below.

As a result of scheduling difficulties, no personal interview was conducted with the Agency of Transportation, however, some survey responses are reflected in the appendices.

## 8.2 OFFICE OF GIS

### 8.2.1 MISSION

The mission of the Office of GIS (OGIS) is to facilitate the development of GIS in the state of Vermont. It does so by providing GIS services and support to regional planning commissions, local and state agencies, and the public; establishing GIS standards; collecting, creating and distributing GIS data; ensuring that all data for distribution meet the established standards; and delegating GIS responsibilities to the appropriate agencies. A detailed account of the duties of the OGIS can be found in GIS for Vermont Communities; Applications and Concepts (1990).

### 8.2.2 STAFFING

The OGIS currently employs five staff members dedicated to GIS. Responsibilities of those staff include GIS program management, GIS project management, database administration and technical specialization. Allocation of staff is itemized in Appendix C.

### 8.2.3 FUNDING

Funding for GIS development work is provided largely under Act 200 Special Municipal Planning Grants (1988). Act 200 established an initial \$4.75 million, five year appropriation to develop priority data layers. Costs

beyond that appropriation are defrayed by cooperative agreements with local governments and the private sector, and by additional appropriations from programs such as the Housing and Conservation Trust Fund, Vermont Community Development Program, and the Federal Land and Water Conservation Fund.

OGIS is authorized by state to charge a fee for the distribution of GIS data, products and services. The VGIS Data Catalog (July 1991), discussed in Section 8.2.6 contains a complete listing of available items, and describes the fee structure associated with each.

#### **8.2.4 DATA MAINTENANCE/DISTRIBUTION**

As part of its mission, OGIS is responsible for collecting and organizing periodic data layer updates, and distributing them to organizations and individuals that request them. Custodianship of particular data layers is usually delegated by OGIS to a specific agency or organization, but there are some coverages that are maintained by OGIS. OGIS generally determines which organizations to delegate to based on need for and use of the particular data layer being delegated. Before OGIS will accept data into the VGIS system (for distribution), however, the OGIS must ensure that it meets the standards established for the state. Finally, the OGIS must be able to track ongoing GIS development well enough to be able to coordinate data criteria and maintenance efforts between agencies.

#### **8.2.5 GIS STANDARDS**

The OGIS is the organization that has the primary responsibility for developing and publishing VGIS standards and policies. The Policies, Standards, Guidelines and Procedures Handbook (April 1991) outlines standards for digital data conversion, map coordinate systems and data layer documentation. In addition, it contains guidelines for functions such as maintaining an SML library, exchanging data and configuring hardware and software.

#### 8.2.6 DATA LAYERS AND COVERAGES

Data layers used, maintained or distributed by OGIS are summarized in Appendix D. A detailed account of available data is also presented in the VGIS Data Catalogue (July 1991). This Data Catalog is available on a paid subscription basis, and is updated regularly.

Since the OGIS plays the role of data distribution center for Vermont, it has possession of a wide range of data layers available for distribution at scales of generally 1:24,000 or smaller. Data layers of note include statewide coverages of endangered species, broken down into plants, vertebrates, invertebrates and natural communities; and statewide coverages of wellhead protection areas and watersheds. In addition, OGIS has been coordinating the authorization of town assessing maps at a scale of 1:5,000. Approximately 35 town assessors maps, showing parcel boundaries and identification, are available through OGIS. Many more are available through RPCs and communities. Data are available in a variety of quad and orthophoto based tile structures which are documented in the VGIS Data Catalog (July 1991).

#### 8.2.7 RESOURCES

Resources in use at the OGIS are summarized in Appendix C. These resources consist primarily of two copies of PC ARC/INFO operating on two 386 PCs, a copy of workstation ARC/INFO, an E size pen plotter and a D size digitizer. These resources must meet both the internal data development needs of the OGIS as well as the needs of agencies and communities requesting GIS services.

#### 8.2.8 ENVIRONMENTAL APPLICATIONS

While the function of the OGIS is primarily as statewide GIS data and service facilitator, it does manage some applications for various end users. These applications include, among others, community growth planning, wildlife management, stormwater management and watershed/wellhead protection.



### **8.2.9 FUTURE NEEDS**

Future needs as indicated by OGIS staff are itemized in the Appendices. Presented below are particular needs as discussed during the interview process.

#### **8.2.9.1 Data, Applications and Resources**

In an effort to continue the development of the VGIS, the OGIS has indicated a need to expand their resources in terms of hardware, software and personnel specifically in the case of database management capability, network access, plotting capabilities and GIS technical talent.

In terms of environmental applications, the OGIS has expressed a need to invest in a number of air pollution-related applications including, among others, emissions tracking, industrial facility siting, pesticide studies and air quality studies.

#### **8.2.9.2 Regional Cooperative Efforts & EPA's Role**

The primary issue that the OGIS would like to see addressed by EPA is the full integration of states as data partners when deciding matters of policy and finance. It is essential that parties involved in determining GIS policy review that determination process and be sure that the resources, program needs and time frames of all participating states are taken into consideration. Individual states have different data and application needs than perhaps the EPA or federal government, but by addressing those differences, it may be possible to devise solutions to meet everyone's needs.

### **8.3 AGENCY OF NATURAL RESOURCES GEOGRAPHIC INFORMATION SYSTEM**

#### **8.3.1 MISSION**

The Agency of Natural Resources Geographic Information System (ANR/GIS) is responsible for providing GIS applications and services to all of the

Departments within the Agency of Natural Resources (ANR), and also for providing ANR data to the OGIS for distribution in formats meeting VGIS standards. The ANR itself is the state's environmental agency, included within which are both regulatory and non-regulatory environmental and Natural Resource Management Departments.

#### 8.3.2 STAFFING AND FUNDING

GIS staff at ANR/GIS consists of a GIS program manager whose other duties include Agency automation coordination; and one full-time technical specialist. There are several staff with ANR Departments that have knowledge and limited GIS experience. These individuals have been trained by ANR/GIS staff to perform project-specific GIS tasks. The current plan is for the GIS program manager to devote 100% of his time to GIS by the end of 1991.

ANR/GIS currently has no formal funding mechanism for GIS efforts. At this time, ANR/GIS receives funding from the general fund and from grants by other state departments. It is anticipated that in November of 1991, ANR/GIS will become part of the State Geologists Office.

#### 8.3.3 DATA MAINTENANCE/DISTRIBUTION

ANR/GIS is responsible for maintaining data layers specific to that agency. This includes keeping the appropriate coverages up to date, making sure that they comply with the standards outlined in the Policies, Standards, Guidelines & Procedures Handbook (April 1991), and periodically sending updated coverages to OGIS. ANR/GIS also possesses a number of data layers which do not yet meet VGIS standards. These data are used internally only and are not sent to OGIS for distribution.

#### 8.3.4 GIS STANDARDS

Vermont GIS standards are determined by the OGIS, with input from other agencies including ANR/GIS, and are outlined in the Policies, Standards, Guidelines & Procedures Handbook (April 1991). This manual outlines

standards for such tasks as digital data conversion, map coordinate systems and data layer documentation. In addition, it contains guidelines for functions such as maintaining an SML library, exchanging data and configuring hardware and software.

#### **8.3.5 DATA LAYERS AND COVERAGES**

Data layers used, maintained or distributed by ANR/GIS are summarized in Appendix D. Data currently in use at ANR/GIS consist primarily of earth and water information such as hydrography, soils, surface water and wellhead protection areas, digitized at scales ranging from 1:5,000 to 1:100,000.

#### **8.3.6 RESOURCES**

Resources in use at ANR/GIS are summarized in Appendix C. These include three copies of PC ARC/INFO running on three 386 personal computers as well as additional database management, drafting, digitizing and plotting resources. The agency uses Auto/CAD and the Foxpro database management system extensively.

Several data layers of point sources of pollution and/or EPA-regulated facilities either exist or are in development. Global positioning systems (GPS) units are being used to collect these data.

#### **8.3.7 ENVIRONMENTAL APPLICATIONS OF GIS**

Environmental applications of GIS in use at ANR/GIS are summarized in Appendix E. At this time, ANR/GIS considers itself to be primarily a map making shop, with little or no data analyses incorporated in their final products. The Agency has developed a standard map-making application which is utilized by several Agency Departments. This SML-driven application will create a paper map, at any specified scale, of all data currently residing on the ANR/GIS system, for a buffered area about any user-selected point.

ANR/GIS is preparing to develop GIS analytical routines for wellhead protection and watershed protection.

#### **8.3.8 FUTURE NEEDS**

Future GIS needs for ANR/GIS are itemized in the Appendices. Presented below are specific needs discussed during the interview process.

##### **8.3.8.1 Data**

ANR/GIS has performed its own data needs analysis and developed a prioritized list of data layers. The analysis identifies needed data layers, the current status of the data layers (3-complete and meets VGIS standards, 2-complete but doesn't meet VGIS standards, 1 in progress, 0-wishlist) and the Agency Departments that have a need for the data. This information has been processed and the result is a matrix of data layers prioritized by the number of agencies that need them. This matrix is included here as Table 8-1. An additional data priority discussed during the interview process is the need for data for low level radioactive waste siting.

##### **8.3.8.2 Applications**

There are a number of application needs that have had an impact on the type and priority of data required. One such application is the zoning of lakeshore recreational lands in an effort to control boating traffic and decrease risk as a result of high speed boating. Other applications include buffering wetlands to extend protection limits and tracking public land offerings and determining the potential effect on adjoining recreational lands.

##### **8.3.8.3 Resources**

In order to meet the data and application needs discussed above, ANR/GIS will need to expand its resources, largely by hiring additional GIS talent. It would also like to add to its GIS and database capabilities through the

# AGENCY OF NATURAL RESOURCES GEOGRAPHIC INFORMATION SYSTEM NEEDS ANALYSIS SUMMARY TABLE

	DATA LAYER	SCORE	STATUS	CIVIL SERVICE				FISH AND WILDLIFE			FOREST, PARKS, AND RECREATION					ENVIRONMENTAL CONSERVATION										WATER QUALITY LAKE SPECIAL POND STUDIES	LAKES SPECIAL POND STUDIES	LAKES SPECIAL POND STUDIES	RIVERS WETLANDS	WETLANDS ENGINEERING	FLOOD PLAIN	WATER SUPPLY	ENVIR PROG
				PLAN	GEOL	LOW LEVEL	ENFORCE	FISH	WILD- LIFE	NON GAME	ENVI- RONMENTAL	FOREST	RECR	STATE LANDS	STATE PARKS	CONSERV TRAIL	AGENCY FACIL	HAZ MAT	AIR QUAL	SOLID WASTE	PUBLIC FACIL	WATER QUALITY	WATER QUALITY	WATER QUALITY	WATER QUALITY	WATER QUALITY	WATER QUALITY	WATER QUALITY	WATER QUALITY	WATER QUALITY	WATER QUALITY	WATER QUALITY	
HIGHEST PRIORITY	COUNTY JURISDICTIONS	27	3																														
	OLC POWER LINES	27	3																														
	OLC RAILROADS	27	3																														
	OLC ROADS	27	3																														
	OLC TRANS LINES	27	3																														
	GEOGRAPHIC NAMES	27	3																														
	ORTHOPHOTO GRID	27	3																														
	REGIONAL PLANNING COMMISSIONS	27	3																														
	TOWNS	27	3																														
	USGS QUADRANGLE GRID	27	3																														
SCORE 24-25	LAKE & POND	27	2																														
	AGENCY AUTOMATION COORDINATION	27	1																														
	GLOBAL POSITIONING SYSTEM	27	1																														
	RIVERS & STREAMS	27	1																														
	ROADS	27	1																														
	STATE LAND BOUNDARIES	27	1																														
	SURFACE WATERS	27	1																														
	TOPOGRAPHY	27	1																														
	USGS REFERENCE MAPS	27	1																														
	WETLANDS	25	1																														
SCORE 16-19	WASTEWATER TREATMENT FACILITIES	25	1																														
	SOILS	24	1																														
	HAZARDOUS WASTE SITES	23	2																														
	SOURCE PROTECTION AREA	22	2																														
	CULTURAL FEATURES	22	1																														
	MINERAL RESOURCES	21	1																														
	RIVER DRAINAGE BASINS	21	2																														
	FISHERIES	21	1																														
	POLLUTION SOURCE INVENTORY	21	1																														
	ANALYSIS	20	1																														
SCORE 13 OR BELOW	LAKE/POND DRAINAGE BASIN	20	2																														
	EROSION HAZARDS	20	2																														
	STATE LAND ROADS	20	2																														
	ROCK SITES	19	1																														
	UNDERGROUND STORAGE TANKS	19	1																														
	ENFORCEMENT ACTION TRACKING	19	0																														
	PERMIT TRACKING SYS	19	0																														
	SOLID WASTE	19	0																														
	RAIL LOCATIONS	18	0																														
	FLOODPLAIN MAPPING	18	0																														
SCORE 13 OR BELOW	RADIOACTIVITY	18	0																														
	SURFICIAL GEOLOGY	18	0																														
	AIR QUALITY	17	2																														
	NATURAL HERITAGE	17	2																														
	SEABED GEOLOGY	17	1																														
	LANDSLIDE SUSCEPTIBILITY	17	1																														
	PETROLEUM PRODUCTION SITES	17	1																														
	RECREATIONAL ACCESS	17	1																														
	BRIDGE LOCATIONS	17	0																														
	USGS GAGING STATIONS	17	0																														
SCORE 13 OR BELOW	BOATING ACCESS AREAS	16	1																														
	OUTSTANDING WATERS	16	1																														
	LAKE ENGINEERING SUPPORT	16	2																														
	TRUCK STAGES	15	2																														
	OPEN SPACES	14	1																														
	UNDERGROUND INJECTION CONTROL	14	1																														
	MACROINVERTEBRATES	14	0																														
	OUTSTANDING FEATURES	14	0																														
	DEER FARMS	13	2																														
	PRIVATE WATER WELLS	13	2																														
SCORE 13 OR BELOW	TRAILS AND GREENWAYS	13	1																														
	CONTIGUOUS - 2500 FOOT	12	3																														
	FOREST PEST TRACKING	12	1																														
	BEAR HABITAT	12	0																														
	INJECTION WELLS	12	0																														
	STORET STATIONS	12	0																														
	MONITORED WELLS	12	0																														
	TOTAL DIVISION DEMAND																																
				67	69	58	54	34	41	52	64	39	60	57	33	47	49	48	38	40	26	34	47	38	58	61	33	47	38	58	61	33	47

NOTES: FROM STUDY COMPILED IN FOXPRO, AUGUST 1991

purchase of additional ARC/INFO licenses, database management systems, 386 personal computers, and plotting devices. Finally, ANR/GIS feels that in order for data analysis to become widely used, they will need to implement a data distribution network and a user friendly data access system such as ArcView.

#### **8.3.8.4 Regional Cooperative Efforts and EPA's Role**

During the interview with a representative from ANR/GIS, the following suggestions were made as to how EPA might direct its efforts to help the development of GIS in Vermont and throughout the northeast.

1. EPA could compile a catalogue of data available throughout Region I and make that catalogue available for viewing through a computerized bulletin board. In addition, the bulletin boards could also include almanac updates and satellite availability.
2. EPA could facilitate communication between agencies in Region I and Region II. Communication between Vermont and New York regarding Lake Champlain is essential.
3. EPA could institute a regional GPS training center. Currently, although ANR/GIS provides GPS training, the demand for such training exceeds its capabilities to provide it.
4. The New England Governors' Conference could be used as a vehicle for communication regarding GIS efforts and resources.

## **9.0 RECOMMENDATIONS**

This section presents recommendations to EPA which are intended to further regional cooperative GIS efforts in New England, and to determine the role of EPA as a facilitator of this effort. These recommendations were formulated based on the responses of the survey participants and ideas from the project steering committee. General concepts are presented here which may necessitate further study by EPA.

First, an overview is presented of the organizational nature and status of regional cooperative efforts in New England. This overview draws from relevant portions of Sections 3 through 8, and sets the backdrop for the specific recommendations discussed later in this Section.

### **9.1 OVERVIEW**

It is clear from the information collected during this study, that a large number of public organizations throughout New England utilize GIS technology to help solve environmental problems. Generally speaking, GIS activities are coordinated between the organizations within a particular state; however, coordination between states is limited.

The level of coordination within each state varies (see Sections 3 through 8), but in general, each state has a primary GIS organization and a primary environmental regulatory agency that uses GIS, and coordinates its efforts with the primary GIS organization.

For example, the Maine Office of GIS (MEOGIS) coordinates GIS activities undertaken by Maine state organizations and acts as a central repository of, and distribution center for GIS data. The Maine Department of

**NOTE:** The state of Connecticut is unique in that the primary GIS organization (the Natural Resources Center) is within the primary environmental regulatory agency (the Department of Environmental Protection), and there are no other substantial GIS users involved in environmental applications.

Environmental Protection (MEDEP) is a user of GIS that coordinates its activities with the Maine Office of GIS. Whereas MEDEP has, by nature of its mission, a formal relationship with EPA program offices (waste, water, air, etc.), it has no formal relationship with EPA's GIS group. MEOGIS, on the other hand, has no formal relationship with EPA whatever, yet communicates with some regularity, with members of the EPA GIS group.

If EPA Region I is to facilitate cooperative GIS efforts throughout New England, strong and intentional relationships between the EPA GIS group and both the primary GIS organization and primary environmental regulatory agency, in each state, is important. In addition, relationships between the states themselves are also important.

Cooperative GIS efforts and agreements presently exist among certain of the organizations participating in this study, and EPA; but these efforts tend to be project-specific and time-limited. Nevertheless, they appear to have been (or are currently) productive learning experiences for the participants, and might serve as a point of departure for future activities.

Two specific examples are relevant: (1) the Lake Champlain Management Conference, in which EPA is engaged in a cooperative GIS effort with the Vermont Office of GIS, Vermont Agency of Natural Resources (and other federal and New York State agencies) to develop a GIS database and data management plan for the Lake Champlain basin (see Section 8.1.2); and (2) the Connecticut River Open Space Project in which the states of Connecticut, Massachusetts, New Hampshire, Rhode Island and Vermont coordinated GIS activities to compile relevant data and prepare a map of the Connecticut River Basin (see Section 6.3.8). The Lake Champlain effort was authorized by Act of the US Congress and the Connecticut River effort was authorized by directive of the Governors of each state, pursuant to a resolution passed by the 1989 New England Governors' Conference.

It is important to note that these and other cooperative efforts, as well as the degree of coordination that exists within each state, is greatly facilitated by software uniformity: every participant organization,



including EPA, has established ARC/INFO as standard GIS software. The opportunity this presents for cooperative efforts should not be underestimated.

Every organization participating in this study conveyed the sentiment that regional cooperative GIS efforts are necessary in order for the true power and benefit of GIS technology to be realized. Most believe that EPA is in a logical position to facilitate this cooperation, while at the same time, recognizing the substantial effort of such an undertaking.

Nevertheless, there is strong support for cooperative efforts to be coordinated, and for EPA to take a lead role in the process. Certain precedents for this sort of activity already exist (as described above, and as mentioned throughout Sections 3 through 8) and circumstances are favorable for further activity in this area.

## **9.2 RECOMMENDATIONS**

The thoughts and ideas of project participants regarding cooperative GIS efforts, and a refinement of these thoughts by the authors and project steering committee, have resulted in 17 specific recommendations described below. The recommendations, as presented here, are not listed in any particular order as no attempt was made to rank them by importance. Each recommendation is discussed in detail in Section 9.3. The individual comments of survey participants, as they relate to these recommendations, can be found in Sections 3 through 8, in the subsections entitled "Regional Cooperative Efforts and EPA's Role."

The recommendations are for implementation by EPA Region I. They include the following:

1. provide long-term grants with provisions specifying GIS tasks or products.
2. serve as a regional clearinghouse for GIS data.
3. establish attribute coding, documentation, distribution policy, and data exchange format standards - NEVMOA, NEIWPCC (New England Interstate Water Pollution Control Commission), and NESCAUM

(Northeast States Coordinated Air Use Management) are regional organizations that could be used to assist in coordinating such standards.

4. form regional GIS and GPS committees; generally promote more communication among all state and federal agencies. Use Northeast ARC/INFO Users Group, Northeast Governor's Conference, or the State-EPA Data Management Program as a forum.
5. support regional programs based on natural boundaries as opposed to political boundaries.
6. strategically locate GPS base stations; provide GPS training.
7. establish physical communications links between GIS systems of New England state agencies and EPA.
8. develop a computer bulletin board listing data availability and need.
9. become a repository for all New England GIS data.
10. assist in important large-scale data development efforts, e.g. edge-matched basemap and land use data for New England.
11. establish data collection policy and locational accuracy standards for GIS data.
12. provide a lending warehouse of resources, e.g. GPS units, scanners, etc.
13. provide grants for data development, maintenance, and capital investments.
14. be involved with state environmental program offices in GIS data development decisions. State and EPA GIS offices should be liaisons between State and EPA environmental program offices.
15. include New York and New Jersey in cooperative efforts, because they border on New England states and are a part of NEWMOA.
16. update this survey data with some regularity.
17. arrange a meeting with all the participants of this survey to discuss the recommendations.

### **9.3 DISCUSSION**

Each of the above comments is addressed in this discussion which has been grouped into the following categories and subsequent sub-sections. The

numbers of the corresponding specific recommendations are listed in parentheses next to the sub-section(s) in which they are discussed.

- GRANTS/FUNDING (1,13,14)
- INFORMATION CENTER (2,7,8,9)
- HARDWARE/SOFTWARE (6,12)
- STANDARDS (3,10,11,16)
- COORDINATION (4,6,10,11,15,17)

#### 9.3.1 GRANTS/FUNDING

Several comments from the participants centered around how EPA should provide grants of longer duration, and which provide for specific GIS requirements (e.g., data development, maintenance, hardware). To effectively address this concern, the EPA program offices and GIS staff must arrive at a common vision of the value of GIS to environmental protection in the Northeast. Based on this, a consensus policy may be formulated which will help to ensure that each program, and thus each project, be conducted in a way which is consistent with other programs and projects, and in accordance with the consensus policy.

To develop a common vision about the value of GIS will require a four step process. First, information should be compiled and distributed to EPA program offices on how GIS has been, or can be used, more in terms of its technical capabilities than specific applications. This will be particularly useful to any program offices which have not yet utilized GIS or are in the beginning stages of utilizing it. This information would answer questions pertaining to the assets or limitations of the technology, for example, ARC/INFO software is not well suited to handling time-series data, however, its spatial overlay capabilities are practically limitless.

Second, EPA should document how GIS can benefit specific EPA and related state programs, especially delegated projects (such as wellhead protection). Each program should be assessed according to its own individual needs and goals, and the "payoff" each program could expect in utilizing GIS should be quantified as best as possible.

Third, EPA and the state environmental programs should develop a consensus policy (including goals, objectives, and priorities) on the use of GIS in State-EPA environmental programs. The consensus policy should be developed with advice and technical assistance from EPA and state GIS offices. GIS offices should also ensure that there is coordination among the programs and states.

Finally, using the consensus policy as a backbone, EPA could negotiate specific GIS tasks and products as a condition of grants, where appropriate. A policy in place should alleviate the difficulties some of the state programs have had in appropriating funding for GIS tasks when such funds were not clearly earmarked, but the utility of GIS was recognized. EPA GIS office participation and approval should occur early in the program grant development process. If a GIS component is established, the EPA GIS office will be responsible for coordinating with the state on specific GIS tasks and the use of funds.

In summary, developing a common understanding of GIS utility to environmental programs can be seen as a unifying force for all EPA and state program offices; primarily because it will foster communication between EPA and state programs, impress upon them that each project cannot be conducted in isolation, and provide for a more regulated and consistent approach to GIS-based environmental work.

### 9.3.2 INFORMATION CENTER

The last step mentioned above, to include specific GIS tasks in project grants, may seem simple and straightforward. However, in practice the process may require a substantial effort on the part of the EPA GIS office. Just determining the availability and suitability of existing data can be time consuming. Even more difficult, is to coordinate with many GIS users in the region on the development of GIS data. In order to facilitate this, the idea of EPA as a central repository for regional GIS information is almost essential.

The simplest way to achieve this would be to develop a database of GIS information similar to the one developed as part of this project. The

major GIS users in the region should have input as to the structure and fields of the database. It could be made accessible to everyone by being made user-friendly and accessible via modem or direct lines. In effect, it would be an electronic bulletin board.

The database might contain the type of information which is contained in the appendices of this report, albeit enhanced to some degree. In addition to listing data layers "in use" by each organization, it would be useful to list each unique data layer only once along with the organizations responsible for maintaining and distributing the data.

A procedure needs to be developed for updating the database. The easiest way would be to receive a standard notification form from state, local, and other federal organizations informing EPA of any changes in ongoing or planned data development, applications, needs, etc. This cooperation should be established formally through the signing of Memoranda of Understanding between EPA and each agency, or EPA and the primary GIS organization in each state.

The idea of EPA assuming the responsibility of storing all GIS data in the region is conceptually intriguing. Practically speaking, though, it is not a viable course to pursue at this time. The effort and resources would be enormous to store, manage, and update all data in the Region. Comparatively, the benefits would be marginal, considering that most GIS applications are still localized, and data are very much in development.

In place of a physical repository, EPA could serve as a regional clearinghouse for all data requests. This might serve the same function more efficiently. EPA could become a quasi-official GIS information center for the Region, with requests for data going through its office. With the help of the bulletin board, EPA could then direct specific requests to the appropriate organizations in each state responsible for data distribution, thus allowing EPA to keep logs on the demand for data layers, and where they go. This would alleviate the burden to EPA of housing and distributing the data.

### **9.3.3 HARDWARE/SOFTWARE**

The use of GPS is highly suited to locating non-interpretive data, such as point and certain non-point sources of pollution, which is of primary concern to many environmental agencies. Virtually all organizations surveyed expressed an interest in GPS technology, however, many organizations cannot afford it, or other expensive GIS peripherals, for that matter (e.g., scanners, electrostatic plotters). Because of this, it was suggested that EPA provide a lending warehouse of resources, including GPS units. While it is impractical for EPA to purchase and loan larger pieces of equipment, such as the scanners and plotters, it does currently loan GPS units to state organizations. Such is the case with New Hampshire DES Groundwater Protection Bureau which is borrowing an EPA GPS receiver for updating its Underground Storage Tank inventory, and Maine DEP which also relies on EPA GPS units.

In lieu of actually providing these hardware devices for loan, the GIS bulletin board could provide information about which organizations have hardware they are willing to make accessible.

In addition to the GIS information bulletin board, the EPA could initiate a networking of GPS base stations. There are several GPS base stations planned for installation in New England by various state and federal agencies. If the data from each were shared across the Region, then data collected by mobile GPS receivers could be rectified using the most appropriate base station data. This should minimize the number of cases where receivers and base stations are not able to read the same satellites, thereby introducing more error into the data.

As GPS technology becomes more accessible there will be demand for GPS training to ensure that data are collected efficiently and accurately. The EPA should provide guidance on data collection procedures, how to assign descriptive information about a location, and how to input GPS-generated data into the GIS. Also, EPA could provide guidance on which base station data to use if a network of base stations is established. Some of this

information, including EPA's base station data, is currently provided by the Lexington, MA laboratory to any state upon request, but the process is informal.

#### **9.3.4 STANDARDS**

Developing GIS standards will be an essential part of any EPA GIS consensus policy (as mentioned in section 9.2.1). Standards will ensure that data generated for one EPA project will be compatible with data generated by another. The survey participants were particularly interested in EPA's involvement in developing the following kinds of standards:

- attribute codes
- documentation
- locational accuracy
- distribution/dissemination policy

Examples can be drawn from each state GIS program regarding all of the above. In fact, the larger users of GIS in each state have created documents describing their own data standards. There is similarity among these because these issues have been the topic of discussion at GIS meetings and conferences for years. The "newer" users have traditionally borrowed ideas from the "veteran" users and tailored standards and policies to their specific organization's needs.

##### **9.3.4.1 Attribute Coding**

Many organizations participating in this study have developed or are developing attribute coding standards. For example, the organizations active in the State of New Hampshire GRANIT program have gone to lengthy efforts to involve many state and federal agencies in the process of determining the ways in which features are described in several of its data layers. This is best demonstrated by its hydrographic coding system which was developed cooperatively by several agencies over a two-year period (see section 6.2.5).

EPA should follow this example in coordinating the development of standard codes and classifications for future data layers common to all states (e.g., land use/land cover, hydrography). The data layers of most importance to each organization are described in Sections 3 through 8. This would be an important first step in solving some of the difficulty of combining data layers from adjacent states.

The example of combining data layers from adjacent states brings up the issue of edge-matching. Not only will data layers from adjacent states require the same classifications and attribute codes, but they will need to match along boundary lines. Developing an edge-matched basemap of the Region would help, although not solve, this problem. Roads, hydrographic, and political boundary features usually constitute a basemap to which other features are positionally aligned. Because this would be a tremendous undertaking, especially given the relatively large scales which are desired, EPA should form a committee of interested organizations to further study the matter.

#### 9.3.4.2 Documentation

A certain degree of documentation or data history is recorded by each state GIS program as the data are developed. Documentation can take many forms: log sheets which track daily automation steps; documents which describe generalized development procedures; documents which describe the data itself and how it can/should be used; documents which describe attribute codes; "on-line" documentation for specific data layers; database documentation (e.g., lists of all data layers, tile structure, sizes); "on-line" data dictionaries.

The amount of detail and the form in which information can be stored which describes GIS data is quite varied. There is no single best way to convey everything there is to know about a GIS data layer to a prospective user except, perhaps, personal communication with someone familiar with development of the data. In fact, usually a combination of written and/or digital information is used, plus personal communication. The fact is that reliance on "first hand" information, while still extremely useful, will



become less dependable as GIS databases mature - people forget, move, etc. It is paramount to GIS efficiency and effectiveness that all data be well documented, on paper or digitally, for subsequent generations of GIS users.

While specific formats of documentation need not be established, EPA should establish minimum information requirements for describing GIS data developed for its programs. The documentation should provide the information necessary for EPA state environmental regulatory programs to use the data without having to rely on word-of-mouth. Massachusetts and Vermont have each developed certain forms of documentation that are worthy of acknowledgment and may serve as models for related EPA standards.

Massachusetts' MassGIS was the first New England state GIS program to adopt the idea of tagging a digital .DOC file to each of its ARC/INFO coverages, and several have followed suit. This file contains a generalized history of the coverage, how it was automated, agency responsible for automating, contact person, etc. The file will remain attached to the coverage as long as the coverage retains its original topology, that is, it is not topologically merged with another. It should also be noted that EPA has also adopted this .DOC file method for documenting its data layers.

Vermont's OGIS has developed a data catalog format which is very effective and pragmatic. The Data Catalog is available by subscription. It comes in a 3-ring binder to allow for updates, replacement pages, and other changes/additions which are made available to subscribers on a regular basis. The description of each data layer is concise but informative. Everything is date-tagged and caveats are liberally provided. A separate data layer summary document is also provided which describes all data layers in a few pages of text and tables.

#### 9.3.4.3 Locational Accuracy

The issue of true locational accuracy of GIS data has not been addressed by the participating organizations as fully as other database issues. Insofar as each state strives to achieve National Map Accuracy Standards (NMAS), there is considerable variation even in the interpretations of what

constitutes NMAS. Each organization has developed procedures by which to check the accuracy of the digital data against the source map data (e.g. hardcopy maps), but most organizations are unable to define the accuracy of their data with any degree of certainty (see Appendix D).

While not practical to require that organizations determine the exact locational accuracy of data which have already been mapped, there should be standards developed which define accuracy requirements for any new data to be mapped for environmental projects. This should especially apply to data which consist of non-interpretive features, such as: facility locations, USTs, sampling sites.

EPA's existing point source locational policy which requires an accuracy of 25 meters for point data, is an important example of existing policy that could be expanded upon. It is important to note that many project participants were unaware of this policy.

#### 9.3.4.4 Distribution/Dissemination Policy

Data distribution policies are varied among the organizations interviewed. Some have no policy at all, mostly because the GIS program is small or relatively new. Others have very formalized, well-defined policies. Some charge for data, others do not.

Rhode Island has, perhaps, the best example of a formalized policy. The data in the RIGIS database are copyrighted and owned by the University, but licensed by the state's planning agency. The University actually disseminates the data upon licensing, and makes it a point to provide written documentation along with the digital files. Included in the data descriptions are any disclaimers which warn the user of potential errors in the data.

The RI DEM, in addition to the RIGIS license agreement, also requires that a request form be signed for certain sensitive data layers it maintains. The purpose of the form is to make sure the requester is well informed as to the exact nature of the data and limitations to its use.

EPA should develop and make known a set of in-house guidelines on GIS data distribution. Guidelines should address issues such as, 1) form of documentation provided with the data (mentioned above), 2) suitability of data for distribution (i.e., is it ready to be used/for what?), and 3) data formats.

#### **9.3.5 COORDINATION**

The formulation of a consensus policy, as discussed in Section 9.2.1, will be dependent upon extensive coordination between the various EPA-State programs with support from the EPA GIS section, and possible technical assistance from other state and regional organizations using GIS. To accomplish the recommendations discussed thus far, it is suggested that several sub-committees be formed to address specific issues. Examples of possible sub-committees are:

- GPS Committee
- Data Attribute Coding/Classification Committee(s)
- Data Distribution Policy Committee
- Data Maintenance/Documentation Committee
- New England/Northeast-wide Data Layer Development Committee

Finally, it is recommended that a meeting be convened between EPA and all the survey participants to discuss this study and the recommendations described herein. A SEDM, NEARC, or other similar group or committee meeting could be used as a gathering ground. This survey can be used as a spring board for more discussion and debate concerning coordinated GIS activities for environmental protection.

## PREFACE TO APPENDICES

The following Appendices contain a copy of the written survey which was the primary research vehicle for this study (Appendix A), and a series of tables which summarize responses to the survey (Appendices C through E). Appendix B contains summaries of organizations which participated in the project and the individuals representing those organizations. The contents of each Appendix is summarized on a contents list which prefaces each Appendix.

The tables which comprise Appendices B through E were generated using Progress version 6.2h software. Progress is a relational database management system which was utilized by the project team to organize the information received from survey respondents. The database developed for this project contains five separate files, each related by an organizational reference. These files describe: (1) Organizations; (2) Contacts; (3) Resources; (4) Data; and (5) Applications.

A series of look-up tables define organization names, types of data, resources and applications reported by survey respondents, as well as abbreviations for each of these data elements. The relational database structure, and the look-up table format allow for easy on-line location of data, and easy modifications or additions to the database.

The formats selected for display of the data (the tables of Appendices B through E) were designed for easy reference. Appendix B contains three tables, each organized by state. Table B-1 is a summary of organizations surveyed, Table B-2 is a summary of individuals contacted and Table B-3 is a list of addresses and phone numbers for each.

Appendices C through E contain information regarding GIS resources (hardware, software, personnel), data and applications, respectively. Each of these Appendices contains 6 tables each. Tables 1 summarize existing data elements (an organization has 5 workstations, a 1:25,000 scale wetlands coverage, etc.); Tables 2 summarize planned data elements (already

funded acquisitions or activities), and Tables 3 summarize needed data elements (e.g., certain data are needed, but not currently funded). Each of these tables is organized by state and by organization. Tables 4 through 6 contain the same information as Tables 1 through 3, respectively, but are organized by data element.

The information contained in the database (and summarized in these tables) was taken directly from the survey materials returned by each participating organization. Questionable survey responses were clarified in follow-up telephone discussions and all data were reviewed by respondents for completeness and accuracy, prior to publishing the final report.

The tables are largely self-explanatory with the exception of those tables in Appendix D (Data Summaries). In reviewing Appendix D, it should be noted that one or more identical data layers may be identified as "in-use" by one or more organizations. This is often the case with "official" statewide data layers (e.g., GRANIT or RIGIS data) that are in use by many organizations. Efforts have been made to annotate these multiple listings in the comments section of Table D-1. Often these comments describe modifications or additions to the "official" data which, in actuality, make the data layers unique.

**APPENDIX A**  
**Survey Questionnaire**

**REGIONAL GIS NEEDS ASSESSMENT OF THE NEW ENGLAND STATES**

**Organizational and User Needs Survey**

**NEW ENGLAND WASTE MANAGEMENT OFFICIALS ASSOCIATION AND  
THE ENVIRONMENTAL PROTECTION AGENCY, REGION I**

**Camp Dresser & McKee, Inc.  
Ten Cambridge Center  
Cambridge, MA 02142**

**REGIONAL GIS NEEDS ASSESSMENT OF THE NEW ENGLAND STATES**  
**Organizational and User Needs Survey**

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**ATTACHMENTS**

<b>Attachment A:</b>	<b>Sample Interview Questions</b>
<b>Attachment B:</b>	<b>Resource Questionnaire</b>
<b>Attachment C:</b>	<b>Database Questionnaire</b>
<b>Attachment D:</b>	<b>Applications Questionnaire</b>



# **REGIONAL GIS NEEDS ASSESSMENT OF THE NEW ENGLAND STATES**

## **Welcome**

Thank you very much for agreeing to participate in our project. Your completion of the survey material in this packet along with any follow-up discussions will provide a valuable contribution to a successful project -- one that will be of value to your organization, and the New England GIS community at large.

## **General Information For Survey Respondents**

This survey is an important component of an investigation into the use of Geographic Information systems (GIS) technology to support environmental protection-related activities in New England.

The results of this investigation will allow NEWMOA and the EPA to establish priorities to meet regional and state GIS needs. The investigation is being conducted by Camp, Dresser & McKee, Inc. (CDM), under contract to NEWMOA.

The products of this investigation will include an inventory of existing digital data in the region, a directory of GIS organizations, a summary of GIS applications in environmental management and a prioritized list of regional data needs that are not being met by existing state programs.

The results of this study will help to direct EPA's future activities to support individual state as well as cooperative efforts in the development and enhancement of data, hardware, software, technical ability, and region-wide quality assurance/control standards.

## **Survey Materials**

Four items are included in the survey. They are labeled as Attachments A through D. Attachment A is a list of questions for you simply to read and think about. Your responses to the survey will be followed by discussions with the project team, and this list is a sample of the type of information which will be discussed. Feel free to rip out this list and save it prior to returning the survey material.

Attachments B, C and D are questionnaires. Attachment B deals with RESOURCES, i.e., hardware, software and personnel resources available to or needed by your organization. Attachment C deals with DATA, i.e., geographic data maintained, in development or desired by your organization. Attachment D deals with APPLICATIONS, i.e., GIS Applications executed or supported by your organization.

### **Instructions**

**Each questionnaire is preceded by a set of instructions. In general, complete each questionnaire to the best of your ability. Hand-write answers in pen and remember to fill out the identification information at the top of each instruction sheet. If you wish to attach additional pages, simply slip them inside the back cover of the packet.**

**Please return the survey packet within three weeks using the mailing label enclosed. We recommend that you keep a copy of the completed survey packet to refer to during the follow-up interview or telephone discussion.**

**THANK YOU**

## **ATTACHMENT A**

The following questions are examples of the type of questions planned for the interview or follow-up telephone discussions.

### **ORGANIZATIONAL**

- Discussion of Resources Questionnaire (Attachment B)
- How are your GIS-related functions funded?
- What are the primary GIS-related functions of your organization?
- How is GIS related to other data management functions within your organization?

### **DATABASE ISSUES**

- Discussion of Database Questionnaire (Attachment C)
- Are you maintaining this data (updating) on a regular basis?
- Do you distribute your data? Do you have distribution policy, do you charge for data?
- What existing/available geographic data is most important to your organization?
- What future/currently unavailable data is most important?
- Do you have a geographic data development program? What is in development? What is planned?
- Do you have documentation, accuracy and/or QA/QC standards?

### **APPLICATION ISSUES**

- Discussion of Application Questionnaire (Attachment D)
- Can you describe important/typical applications of GIS technology in your organization?
- Are your GIS efforts primarily service or support oriented?
- Are there significant data adequacy, availability or access issues that have limited application of GIS technology in your organization?
- What are other key limiting factors to GIS application development?
- To what extent are you using Global Positioning Systems? Do you have/desire a GPS training program?

### **REGIONAL NEEDS**

- What would you set as priorities for regional GIS Cooperative efforts?
- What would your desire be for EPA's role in those efforts?

ATTACHMENT B  
RESOURCES QUESTIONNAIRE

---

New England Waste Management Officials Association  
Geographic Information Systems Catalogue

---

Name \_\_\_\_\_

Organization \_\_\_\_\_

Date \_\_\_\_\_

**Note:** Please fill this out to the extent that you are comfortable with the answers. Comments and essay answers are welcome as well. We will be able to discuss your answers during the interview.

**Brief Instructions:** Please check the box on the left-hand margin to indicate categories in use within your organization.

If you can, please indicate three types of numbers in the columns on the right:

Existing: the number that currently exists or is certain to be available

On Order: the number that is on order or is currently funded for order

Needed: the number anticipated to meet future needs (i.e. year 2000)

Thank you very much for your time and cooperation.

[illegible]

**ATTACHMENT B: RESOURCES QUESTIONNAIRE**

ATTACHMENT B: RESOURCES QUESTIONNAIRE					
SOFTWARE IN USE					
IN USE	ITEM	EXISTING	ON ORDER	NEEDED	COMMENTS
	<b>Geographic Information Systems</b>				
	pcARC/INFO				
	Workstation ARC/INFO				
	Mainframe ARC/INFO				
	MapInfo				
	GeoSQL				
	GeoVision				
	Other (please specify)				
	<b>Additional DBMS used in Conjunction with GIS</b>				
	Please Specify				
	<b>Computer Aided Design and Drafting Systems</b>				
	AutoCADD				
	Intergraph				
	McDonnell/Douglas				
	Other (please specify)				
	<b>Computer Mapping Software</b>				
	Please Specify				

[illegible]

ATTACHMENT B: RESOURCES QUESTIONNAIRE					
HARDWARE IN USE					
IN USE	ITEM	EXISTING	ON ORDER	NEEDED	COMMENTS
	<b>Workstations</b>				
	286-chip PCs				
	386-chip PCs				
	SUN workstations				
	Tek workstations				
	IBM workstations				
	Other workstations				
	VAX mainframe				
	Data General mainframe				
	Prime mainframe				
	Graphic terminals (please specify monochrome/color, X-terminals, etc.)				
	Other (please specify)				
	<b>Plotters</b>				
	Pen Plotter: E-sized (36x48)				
	Pen Plotter: D-sized (24x26)				
	Pen Plotter: smaller than D-sized				
	Electrostatic Color Plotter: E-sized				
	Electrostatic Color Plotter: D-sized				
	Electrostatic B/W Plotter: E-sized				
	Electrostatic B/W Plotter: D-sized				
	Screen-Dump Plotter				
	Other (please specify)				



[illegible]

ATTACHMENT C  
DATABASE QUESTIONNAIRE

---

New England Waste Management Officials Association  
Geographic Information Systems Catalogue

---

Name \_\_\_\_\_

Organization \_\_\_\_\_

Date \_\_\_\_\_

**Note:** If you can provide us with a copy of a data catalogue or other description of the data maintained by your organization, feel free to simply reference that document, where appropriate.

**Brief Instructions:** Please check the box in the left-hand margin to indicate categories of data in use within your organization, as follows:

**Status:** A - existing (where data exists, but the extent of coverage is limited, this should be noted under **Extent**, see below)

B - planned (funded)

C - desired, but not funded

If you can, please fill in the right-hand columns to indicate:

- **Scale:** the scale which best represents the resolution of the source data (map scale); not necessary for data generated from coordinates (e.g., point data).
- **Accuracy:** the accuracy of the data (map accuracy)
- **Unit:** the unit or organization of the data, or how each coverage is subdivided (e.g., 0 - statewide, 1 - town, 2 - quadrangle, 3 - drainage basin, 4 - county, 5 - other. Feel free to add codes for units we have missed.
- **Extent:** the existing geographic extent of the data (e.g., 25% of state, 'County X only', Quads A,B, etc.). If additional geographic coverage is planned or desired, please note so in the **comments** section.
- **Date:** the date of the source data (to the best of your knowledge)
- **Comments:** Clarifications, caveats, other additional information (e.g., coverage source data). Feel free to append pre-printed material or additional pages.

Thank you very much for your time and cooperation.





ATTACHMENT C: DATA QUESTIONNAIRE							
ENVIRONMENTAL CHARACTERISTICS							
STATUS	ITEM	SCALE	ACCURACY	UNIT	EXTENT	DATE	COMMENTS
	Water						
	Surface water (ponds and streams)						
	Aquifers						
	Groundwater classifications						
	Sole Source Aquifers						
	Surface water classifications						
	Wells (community)						
	Wells (non-community)						
	Wells (private)						
	Wells (Ind, Ag, Comm.)						
	Wellhead protection areas						
	Reservoirs						
	River basins						
	Drainage basins						
	Water Supply Watersheds						



		ATTACHMENT C: DATA QUESTIONNAIRE				
		CULTURAL INFORMATION				
<b>STATUS</b>	<b>ITEM</b>	<b>SCALE</b>	<b>ACCURACY</b>	<b>UNIT</b>	<b>EXTENT</b>	<b>DATE</b>
	<b>Political Boundaries</b>					
	Town boundaries					
	County boundaries					
	State boundaries					
	Political districts					
	Census tracts					
	Zip Codes					
	TIGER (if reprocessed)					
	Other (more space on last page)					
	<b>Infrastructure</b>					
	Roads					
	Buildings					
	Water					
	Water Service Areas					

ATTACHMENT C: DATA QUESTIONNAIRE							
CULTURAL INFORMATION							
STATUS	ITEM	SCALE	ACCURACY	UNIT	EXTENT	DATE	COMMENTS
	Sewer						
	Sewer Service Areas						
	Drainage						
	Electric						
	Telephone						
	Gas						
	Other (more space on last page)						
	Land Use						
	Population or population density						
	Land use						
	Land cover						
	Publically-owned lands						
	Protected areas						
	Historic Sites						



ATTACHMENT C: DATA QUESTIONNAIRE							
CULTURAL INFORMATION							
STATUS	ITEM	SCALE	ACCURACY	UNIT	EXTENT	DATE	COMMENTS
	Archaeological Sites						
	Recreation Facilities						
	Zoning						
	Other (more space on last page)						
	Hazardous Materials						
	Underground Storage Tanks						
	RCRA Facilities						
	CERCLIS Sites						
	Landfills						
	Spill Sites						
	Other (more space on last page)						

[illegible]

ATTACHMENT D  
APPLICATIONS QUESTIONNAIRE

---

New England Waste Management Officials Association  
Geographic Information Systems Catalogue

---

Name \_\_\_\_\_

Organization \_\_\_\_\_

Date \_\_\_\_\_

**Brief Instructions:** This questionnaire should be used to describe categories of GIS applications in use within your organization. Please complete the questionnaire as follows:

- Status:**
- A - Existing, single application in this category
  - B - Existing, multiple, applications in this Category
  - C - Planned Application(s) (already funded)
  - D - None planned, but need and concept(s) exist

Where appropriate, please indicate on the right-hand margin who the end users (i.e., the program office, municipality, corporation, etc.) of those applications are.

Please use the comments section for clarifying remarks, references to printed material describing the applications, or any other notes you feel may be useful.

If you are involved in environmentally-related GIS applications which do not fit into one of the categories identified, please add them in an appropriate location.

Also, if **already printed** material exists which describes the applications please attach this information or, if this is inconvenient, please reference it in the comments column.

Thank you very much for your time and cooperation.

ATTACHMENT D: APPLICATIONS QUESTIONNAIRE			
SPECIFIC APPLICATIONS			
STATUS	ITEM	END USER	COMMENTS
	<u>Air Pollution</u>		
	Emmissions inventory and tracking		
	Fate and Transport analysis and modeling		
	Air quality studies		
	Pesticide studies		
	Facility siting		
	Permitting/licensing/registration		
	Other (please specify)		
	<u>Waste Management</u>		
	Municipal Solid waste management		
	Industrial waste management		
	Recycling and waste minimization		

ATTACHMENT D: APPLICATIONS QUESTIONNAIRE			
SPECIFIC APPLICATIONS			
STATUS	ITEM	END USER	COMMENTS
	Waste hauling		
	Waste generation studies and analysis		
	Hazardous waste		
	Facility siting		
	Permitting/licensing/registration		
	Other (please specify)		
	Water Management		
	Aquifer Mapping		
	Watershed/wellhead Protection		
	Wetlands studies		
	Water Supply/Demand		
	Water pollution control		
	Stormwater management		

ATTACHMENT D: APPLICATIONS QUESTIONNAIRE			
SPECIFIC APPLICATIONS			
STATUS	ITEM	END USER	COMMENTS
	Inland water quality		
	Marine studies		
	Non-point source pollution		
	Facility siting		
	Permitting/licensing/registration		
	Other (please specify)		
	Other		
	Global warming/Climate change		
	Acid rain		
	Epidemiologic studies		
	Demographics		
	Socio-economic factors		

[illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible]





**APPENDIX B**  
**Organizations and Contacts**

**Table B-1 Participating Organizations**

**Table B-2 Organizational Contacts Summaries**

**Table B-3 Organizational Contacts**

**TABLE B-1**

**Participating Organizations**

Table B-1: Participating Organizations

CONNECTICUT  
=====

Organization Name	Organization Abbreviation	Function/Comments
Connecticut Bureau of Air Management	CT-BAM	P Division of the Connecticut DEP.
Connecticut Bureau of Environmental Services	CT-BES	T Division of the Connecticut DEP.
Connecticut Bureau of Waste Management	CT-BWM	P Division of Connecticut DEP.
Connecticut Department of Environmental Protection	CT-DEP	T State environmental regulatory agency
*Connecticut - Natural Resources Center	CT-NRC	P Division of the DEP. Responsible for distribution of Connecticut GIS data.

MASSACHUSETTS  
=====

Organization Name	Organization Abbreviation	Function/Comments
CZM Buzzards Bay Project	MA-BBP	T A project of Mass. Coastal Zone Management.
Cape Cod Commission	MA-CCC	N Regional planning commission for Cape Cod.
Mass Department of Environmental Protection	MA-DEP	P State environmental regulatory agency under EOEa.
Mass Department of Food and Agriculture	MA-DFA	T Provides support to the agricultural industry/community; administers programs for agricultural preservation, land use planning and regulatory actions. Under EOEa.
*Mass Executive Office of Environmental Affairs	MA-EOEA	T Umbrella agency for all state environ agencies. Manages MassGIS from Research and Data Systems office, which handles all information technology for EOEa
Mass EOEa Data Center	MA-EOEAD	P Under EOEa. Maintains and distributes many state environmental data layers. MassGIS located in Data Center.
CZM Massachusetts Bay Project	MA-MBP	T A project of Mass. Coastal Zone Management.
Mass Water Resources Authority	MA-MWRA	P Water and sewer authority serving 60 communities in the Boston Metro area.
Mass Office of USGS, Water Resources Division	MA-USGS	T Federal agency engaged in hydrologic research

MAINE  
=====

Organization Name	Organization Abbreviation	Function/Comments
Maine Bureau of Health	ME-BOH	T
Maine Board of Pesticides Control	ME-BOPC	T
Maine Department of Environmental Protection	ME-DEP	P Project specific GIS applications
Maine Geological Survey	ME-GS	P
Maine State Office of GIS	ME-OGIS	P Resource center, distribution of GIS data, training and

- Personal interview conducted
- T - Telephone interview conducted
- N - No survey materials returned
- \* - Organization to which primary contact belongs

Organization Name	Organization Abbreviation	Function/Comments
-----	-----	-----
		resource center, owner of multi-use data layers.

NEW HAMPSHIRE  
=====

Organization Name	Organization Abbreviation	Function/Comments
-----	-----	-----
University of NH, Complex Systems Research Center	NH-CSRC	P Houses and manages GRANIT database. Provides technical expertise for state and regional GIS projects.
New Hampshire Department of Environmental Services	NH-DES	P State environmental regulatory agency.
*New Hampshire Office of State Planning	NH-OSP	P State's GIS coordinating agency. Manages state growth and development by monitoring land use planning.

RHODE ISLAND  
=====

Organization Name	Organization Abbreviation	Function/Comments
-----	-----	-----
*Rhode Island Dept. of Admin., Division of Planning	RI-DADP	T State's central planning agency and GIS coordinating agency. Licenses RIGIS data.
RI DEM, Groundwater Section of ISDS	RI-DEMGW	T Under RI DEM. Responsible for protecting state's groundwater.
Rhode Island Environmental Data Center	RI-EDC	P Within URI's Department of Natural Resources Science. Houses and maintains RIGIS database.
RI DEM Environmental Regulatory Information Center	RI-ERIC	T
Rhode Island Narragansett Bay Project	RI-NBP	T Monitor and protect Narragansett Bay. Under RI-DEM, primary funding from EPA. Nearing project completion.
RI DEM Office of Environmental Coordination	RI-OEC	T Under RI DEM. Responsible for non-point source program.
RI Office of Soil Conservation Service	RI-SCS	N Federal agency. Maps country's soil, provides assistance to farmers.
RI Office of USGS, Water Resources Division	RI-USGS	N Federal agency engaged in hydrologic research.

UNITED STATES - FEDERAL  
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Organization Name	Organization Abbreviation	Function/Comments
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*Environmental Protection Agency - Region I	US-EPAI	N

VERMONT  
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Organization Name	Organization Abbreviation	Function/Comments
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Vermont Agency of Development & Community Affairs	VT-ADCA	N
Vermont Agency of Natural Resources	VT-ANR	P Maintenance of data layers and applications specific to ANR.

P - Personal interview conducted  
T - Telephone interview conducted  
N - No survey materials returned  
\* - Organization to which primary contact belongs

Organization Name	Organization Abbreviation	Function/Comments
.....	.....	.....
Vermont Agency of Transportation	VT-AOT	
*Vermont State Office of GIS	VT-OGIS	T 1) Develop data - state & local level. 2) Data maint & dist, develop standards & docs. 3) Develop applications. 4) Public education, training, support for decentralz, mulitgovt GIS.
University of VT - School of Natural Resources	VT-UVM	N GIS training and education resources.

P - Personal interview conducted  
T - Telephone interview conducted  
N - No survey materials returned  
\* - Organization to which primary contact belongs

**TABLE B-2**

**Organizational Contacts Summaries**

Table B-2:Organizational Contacts Summary

CONNECTICUT

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Contact Name	Position Title	Organization Name
Chris Mulcahy	Project Manager	Connecticut Bureau of Air Management
Richard Hyde	Assistant Director	Connecticut Bureau of Environmental Services
Hugo Thomas	Director	Connecticut Bureau of Environmental Services
Beth Doran	Project Manager	Connecticut Bureau of Waste Management
Sandy Prisloe	Supervising Environmental Analyst	Connecticut - Natural Resources Center

MASSACHUSETTS

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Contact Name	Position Title	Organization Name
Neil MacGaffey		CZM Buzzards Bay Project
Christina Dirker		Cape Cod Commission
Donovan Bowley	GIS Program Manager	Mass Department of Environmental Protection
Steve Travis	GIS Technical Manager	Mass Department of Environmental Protection
Lee Corte-Real		Mass Department of Food and Agriculture
Barbara Hopson	GIS Coordinator	Mass Department of Food and Agriculture
Rick Taupier	Assistant Secretary	Mass Executive Office of Environmental Affairs
Christian Jacqz	MassGIS Data Manager	Mass EOE Data Center
Dillon Scott	Data Manager	CZM Massachusetts Bay Project
Stephen Estes-Smargiassi	GIS Coordinator	Mass Water Resources Authority
Daniel Nvule	GIS Project Manager	Mass Water Resources Authority
Peter Steeves	Cartographer	Mass Office of USGS, Water Resources Division
Michael Yurewicz	Massachusetts Office Chief	Mass Office of USGS, Water Resources Division

MAINE

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Contact Name	Position Title	Organization Name
Terry Mingo		Maine Bureau of Health
Tammy Gould		Maine Board of Pesticides Control
Christopher Kroot	GIS Specialist	Maine Department of Environmental Protection
Robert Marvinnay	Physical Geologist	Maine Geological Survey
Dan Walters	Director - Office of GIS	Maine State Office of GIS

NEW HAMPSHIRE

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Contact Name	Position Title	Organization Name
Fay Rubin	GIS Coordinator	University of NH, Complex Systems Research Center
Hastings George	GIS Coordinator	New Hampshire Department of Environmental Services
Chris Simmers	Senior Planner	New Hampshire Department of Environmental Services
James McLaughlin	Senior Planner	New Hampshire Office of State Planning

RHODE ISLAND

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Contact Name	Position Title	Organization Name
John Stachelhaus	RIGIS Coordinator	Rhode Island Dept. of Admin., Division of Planning
Ernest Panciera	Senior Environmental Planner	RI DEM, Groundwater Section of ISDS
Peter August	Director	Rhode Island Environmental Data Center
Charles LaBash	Database Manager	Rhode Island Environmental Data Center
Pam Annarumo		RI DEM Environmental Regulatory Information Center
Andrew MacLachlan		Rhode Island Narragansett Bay Project
Lynn Carlson		RI DEM Office of Environmental Coordination
Jackie Pashnik		RI Office of Soil Conservation Service
Virginia Delima	Rhode Island Office Chief	RI Office of USGS, Water Resources Division
Jack Kliever	Hydrologist	RI Office of USGS, Water Resources Division

UNITED STATES - FEDERAL

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Contact Name	Position Title	Organization Name
Greg Charest	GIS Program Manager	Environmental Protection Agency - Region I

VERMONT  
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Contact Name	Position Title	Organization Name
Bill Shouldice	Deputy Secretary	Vermont Agency of Development & Community Affairs
John Dudley		Vermont Agency of Natural Resources
Lloyd Robinson	Deputy Secretary	Vermont Agency of Transportation
Bruce Wescott	Director	Vermont State Office of GIS
Gary Smith	GIS Program Coordinator	University of VT - School of Natural Resources



**TABLE B-3**

**Organizational Contacts**

Table B-3:Organizational Contacts

CONNECTICUT

=====

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MASSACHUSETTS

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MAINE

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#### NEW HAMPSHIRE

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RHODE ISLAND

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UNITED STATES - FEDERAL

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VERMONT

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**APPENDIX C**  
**Resource Summaries**

**Table C-1 Existing GIS Resources by Organization**

**Table C-2 Planned GIS Resources by Organization**

**Table C-3 Needed GIS Resources by Organization**

**Table C-4 Existing GIS Resources by Resource**

**Table C-5 Planned GIS Resources by Resource**

**Table C-6 Needed GIS Resources by Resource**

**TABLE C-1**

**Existing GIS Resources by Organization**

Table C-1: Existing GIS Resources by Organization

CONNECTICUT =====						
Organization Reference	Resource Type	Resource	How Many?	Total Cost	Annually or Total	Additional Comments
CT-NRC	Hardware	286 chip PC	6.0			
		386 chip PC	5.0			Includes 2 at Long Island Sound Resource Center (LISRC) at Avery Point, Groton, CT which is a remote stand-alone GIS facility of NRC.
		Aviion workstation	1.0			
		D size digitizer	1.0			
		Data General mainframe	1.0			MVIS,000
		Digitizer 44 x 60	1.0			
		Digitizer smaller then D size	2.0			CalComp + Summagraphics
		E size color electrostatic plotr	2.0			
		E size digitizer	2.0			CalComps, one at LISRC
		E size pen plotter	2.0			CalComp 1044GT (one at LISRC)
		Graphic terminal	4.0			Tek 4125, 4109, 4107, Pericom
		Pen plotter smaller than D size	1.0			
		Screen dump plotter	1.0			
		SUN workstation	5.0			One as LISRC
	Personnel	Trimble low-res GPS	2.0			
		GIS program manager	1.0			
		GIS technical specialist	4.0			
	Software	System manager	1.0			
		ARC/INFO's TIN model	3.0			Minicomputer, workstation & PC.
		AutoCAD drafting	1.0			Used within property management and planning.
		Mainframe ARC/INFO GIS	1.0			Will move to UNIX file servers in future primarily in other state agencies.
		MapInfo GIS	1.0			
		PC ARC/INFO GIS	5.0			
		Surfer contour/3D modelling	1.0			
		Trimble global postioning	2.0			
		Workstation ARC/INFO GIS	4.0			
MASSACHUSETTS =====						
Organization Reference	Resource Type	Resource	How Many?	Total Cost	Annually or Total	Additional Comments
MA-BBP	Expenditures	Hardware		15,000.00	Total	For Compaq 386, A-size pen plotter, E-size digitizer, dot matrix printer, and two 9600 bpi modems.
		Personnel		45,000.00	Annual	
		Software		11,200.00	Total	For PC ARC/INFO and PC Oracle.
	Hardware	System Maintenance	1.0			
		386 chip PC	1.0			
		E size digitizer	1.0			Summagraphics Microgrid II

Organization Reference	Resource Type	Resource	How Many?	Total Annually Cost or Total	Additional Comments
MA-DFA	Personnel	Pen plotter smaller than D size	1.0		HP 7475A pen plotter.
		VAX mainframe	1.0		Use MassGIS Vax 6400
		GIS project manager	1.0		
	Software	ARC/INFO's TIN model	1.0		On EOEa Vax
		Mainframe ARC/INFO GIS	1.0		At EOEa Data Center
		Oracle Database Management Sys	1.0		Vax ORACLE
	Expenditures	PC ARC/INFO GIS	1.0		
		PC ORACLE	1.0		PC ORACLE
		Hardware	1.0		
	Personnel	Personnel	2.0		There are 2 people each half-time
		Software	1.0		
		User support and training	4.0		MassGIS staff and EOEa staff
	Hardware	Graphic terminal	1.0		Color
		VAX mainframe	1.0		
		GIS coordinator	1.0		
	Software	GIS technical specialist	2.0		
		ARC/INFO's TIN model	1.0		
		Mainframe ARC/INFO GIS	1.0		
MA-EOEAD	Expenditures	Data development and maintenance		100,000.00 Annual	
		Hardware		10,000.00 Annual	
		Personnel		180,000.00 Annual	Rough breakdown: 60% user support, 25% data development, 10% R+D.
	Hardware	System Maintenance		30,000.00 Annual	
		E size color electrostatic plotr	1.0		
		E size digitizer	2.0		
	Personnel	E size pen plotter	2.0		
		Graphic terminal	13.0		10 PC, 3 tek. Need to move to x-terminals.
		VAX mainframe	1.0		VAX 6440, GIS takes about 3 gigabytes.
	Software	Cartographer/Database Administr	1.0		
		GIS program manager	1.0		
		GIS technical specialist	1.0		
	Expenditures	Programmer/Analyst	1.0		
		ARC/INFO's TIN model	1.0		
		Mainframe ARC/INFO GIS	1.0		30 users.
	Software	Oracle Database Management Sys	1.0		
		PC ARC/INFO GIS	1.0		
MA-MBP	Hardware	386 chip PC		0.00 Total	Survey indicates that access to other hardware resources is provided by MassGIS and DEM.
	Personnel	GIS project manager	1.0		Data manager for ARC/INFO and Oracle. Relies on assistance from MassGIS staff and users for technical support.
	Software	ARC/INFO's TIN model	1.0		Use MassGIS software
		Mainframe ARC/INFO GIS	1.0		Use MassGIS software
		Oracle Database Management Sys	1.0		Use MassGIS software.

Organization Reference	Resource Type	Resource	How Many?	Total Cost	Annually or Total	Additional Comments
MA-MWRA	Expenditures	Data development and maintenance		895,000.00	Total	There costs are broken down as follows: ORACLE devt=\$200k (one-time), GIS devt=\$525K(one-time), Project related data=\$100K (annual), Ongoing data collection=\$50K (annual)
		Hardware		200,000.00	Total	
		Personnel		200,000.00	Annual	
		Software		100,000.00	Total	
	Hardware	386 chip PC	1.0			
		E size color electrostatic plotr	1.0			Shared with other users
		E size digitizer	2.0			
		E size pen plotter	1.0			
		Graphic terminal	4.0			Color Tektronix
		Screen dump plotter	1.0			
		VAX mainframe	1.0			
	Personnel	Active trained users	4.0			
		GIS program manager	1.0			This person spends 25% of time on GIS-related activity.
		GIS project manager	1.0			This person spends 3/4 time on GIS-related activity.
		GIS technical specialist	3.0			
		Interns	1.0			
	Software	ARC/INFO's TIN model	1.0			On the Vax.
		AutoCAD drafting	4.0			
		Mainframe ARC/INFO GIS	1.0			
		McDonnel/Douglas drafting	25.0			For Harbor design.
		Oracle Database Management Sys	1.0			
		PC ARC/INFO GIS	1.0			
MA-USGS	Hardware	E size digitizer	2.0			
		E size pen plotter	1.0			
		Miscellaneous workstation	1.0			Unix workstation.
		Pen plotter smaller than D size	3.0			
		Screen dump plotter	1.0			
	Personnel	GIS project manager	1.0			If GIS is incorporated into a project, the GIS expert assigned to that project fulfills most of the roles.
		GIS technical specialist	1.0			
	Software	ARC/INFO's TIN model	1.0			
		AutoCAD drafting	1.0			
		Ingres DBMS	1.0			
		Workstation ARC/INFO GIS	1.0			

MAINE  
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Organization Reference	Resource Type	Resource	How Many?	Total Cost	Annually or Total	Additional Comments
ME-BOH	Hardware	Unspecified scanner	1.0			
	Personnel	GIS project manager	1.0			The GIS program will be the responsibility of the Wellhead Protection Program, to which there is presently only one person assigned.

Organization Reference	Resource Type	Resource	How Many?	Total Annually Cost or Total	Additional Comments
ME-BOPC	Hardware	386 chip PC	1.0		Unisys PW2/Series 500, 120 MB, 3 MB extended
		Hewlett-Packard Scanjet Plus	1.0		
ME-DEP	Expenditures	Hardware		60,000.00 Total	
		Software		20,000.00 Total	
		System Maintenance		8,000.00 Total	
	Hardware	E size digitizer	1.0		
		E size pen plotter	1.0		
		IBM workstation	1.0		
		Tek workstation	1.0		
	Personnel	GIS program manager	1.0		
	Software	ARC/INFO's TIN model	1.0		
		Oracle Database Management Sys	1.0		
		Workstation ARC/INFO GIS	1.0		
ME-GS	Expenditures	Hardware		50,000.00 Total	30,000 from LLRWA.
		Software		15,000.00 Total	10,000 from LLRWA.
	Hardware	286 chip PC	1.0		
		386 chip PC	2.0		
		D size digitizer	2.0		
		E size digitizer	1.0		
		E size pen plotter	2.0		
		Pen plotter smaller than D size	1.0		
		SUN workstation	1.0		
		ARC/INFO's TIN model	1.0		
	Software	PC ARC/INFO GIS	3.0		
		Workstation ARC/INFO GIS	1.0		
ME-OGIS	Expenditures	Hardware		200,000.00 Total	
		Personnel		94,000.00 Annual	
		Software		127,000.00 Total	
		System Maintenance		27,000.00 Annual	
	Hardware	E size digitizer	2.0		
		E size pen plotter	1.0		
		Graphic terminal	2.0		Tektronix 4211
		Screen dump plotter	1.0		Tektronix 4693DX thermal wax printer w/ 4511 network interface.
		Sun Sparcserver	1.0		Sun 4/390 Sparcserver.
		SUN workstation	3.0		
	Personnel	GIS Administrator	1.0		
		GIS coordinator	1.0		
	Software	ARC/INFO's NETWORK module	1.0		
		ARC/INFO's TIN model	1.0		
		Mainframe ARC/INFO GIS	1.0		Class 5 multi; Sun Sparcserver 4/390.
		Oracle RDBI	1.0		

Organization Reference	Resource Type	Resource	How Many?	Total Cost	Annually or Total	Additional Comments
		Workstation ARC/INFO GIS	3.0			
<b>NEW HAMPSHIRE</b> =====						
Organization Reference	Resource Type	Resource	How Many?	Total Cost	Annually or Total	Additional Comments
NH-CSRC	Expenditures	Data development and maintenance		40,000.00	Annual	
		Personnel		80,000.00	Annual	All expenditures are only those made from State GIS-related account, but these do not create an accurate representation of the overall facility since there are many sources of fund
	Hardware	386 chip PC	1.0			
		E size digitizer	1.0			
		E size pen plotter	1.0			
		Graphic terminal	5.0			4 color terminals, 1 monochrome.
		Prime mainframe	1.0			
		Screen dump plotter	1.0			
		SUN workstation	1.5			
	Personnel	GIS program manager	1.0			
		GIS technical specialist	2.0			
		System manager	1.0			This position is supported by a number of projects, not only by State funds related to GRANIT.
	Software	ARC/INFO's TIN model	1.0			
		ERDAS Satellite Imaging	1.0			
		Mainframe ARC/INFO GIS	1.0			
		PC ARC/INFO GIS	1.0			
		PC ERDAS Satellite Imaging	2.0			
		Surfer contour/3D modelling	1.0			
NH-DES	Hardware	E size digitizer	2.0			Calcomp 9100 - GIS Program has one, and Water Resources Division has one.
		E size pen plotter	2.0			Calcomp 1043GT - GIS Program has one, and Water Resources Division has one.
		Graphic terminal	2.0			Tektronix 4208 - GIS Program.
		IBM workstation	1.0			IBM RISC/System 6000 Powerstation Model 320 - GIS Program.
		Screen dump plotter	1.0			Tektronix - GIS Program.
		SUN workstation	1.0			Water Resources Division
	Personnel	GIS coordinator	1.0			GIS Program.
		GIS technical specialist	1.0			GIS Program.
	Software	Grapoint software	1.0			Grapoint TGRAF-4200 - GIS Program.
		PC ARC/INFO GIS	1.0			Water Resources Division
		Workstation ARC/INFO GIS	1.0			Multi-user license - GIS Program.
NH-OSP	Expenditures	Data development and maintenance		150,000.00	Annual	OSP provides CSRC \$90 - 150,000 annually through an agreement to manage GRANIT Database.
		Hardware		16,000.00	Total	
		Personnel		100,000.00	Annual	GIS program manager also has other responsibilities.
		Software		7,500.00	Total	Workstation ARC/INFO needed.
		System Maintenance		1,000.00	ual	

Organization Reference	Resource Type	Resource	How Many?	Total Cost	Annually or Total	Additional Comments
	Hardware	386 chip PC	1.0			
		E size digitizer	1.0			
		E size pen plotter	1.0			
		Graphic terminal	1.0			Color terminal
	Personnel	GIS program manager	1.0			
		GIS project manager	1.0			Project manager is also GIS technical specialist.
	Software	PC ARC/INFO GIS	1.0			

RHODE ISLAND  
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Organization Reference	Resource Type	Resource	How Many?	Total Cost	Annually or Total	Additional Comments
RI-DADP	Expenditures	General operations		2,000.00	Annual	
		Hardware		2,000.00	Annual	
		Personnel		65,000.00	Annual	For 1.5 full time employees.
		Software		4,000.00	Annual	
		System Maintenance		500.00	Annual	
		User support and training		2,000.00	Annual	
	Hardware	386 chip PC	1.0			
		D size digitizer	1.0			
		E size pen plotter	1.0			
		Screen dump plotter	1.0			
		SUN workstation	1.0			
	Personnel	Database Administrator	0.3			Also performs system management and program management duties.
		GIS program manager	0.3			Also performs system management and database administrative duties.
		GIS project manager	1.0			Varies as applications projects are needed.
		GIS technical specialist	1.0			
		System manager	0.3			Also performs database administrative and program management duties.
	Software	PC ARC/INFO GIS	1.0			
		Workstation ARC/INFO GIS	1.0			
RI-DEMGW	Hardware	E size pen plotter	1.0			CalComp 1026 located at DEM.
		Graphic terminal	2.0			Tektronix terminals located at DEM.
		Prime mainframe	1.0			Tied into URI/EDC.
		Screen dump plotter	1.0			Tektronix 4296 located at DEM.
	Personnel	GIS technical specialist	1.0			Groundwater has one full-time person at EDC doing groundwater work. In FY '92 this was decreased to one half-time person.
	Software	ARC/INFO's TIN model	1.0			URI/EDC
		Mainframe ARC/INFO GIS	1.0			Tied into URI/EDC
RI-EDC	Expenditures	Personnel	5.0			About 5 full or part-time staff at EDC with split responsibilities. Also, varying number of workstudy students.
	Hardware	286 chip PC	2.0			
		386 chip PC	14.0			Used mainly to support GIS courses offered by the University



Organization Reference	Resource Type	Resource	How Many?	Total Cost	Annually or Total	Additional Comments
RI-ERIC	Personnel	Avion workstation	2.0			These will replace the Prime computer in 1993.
		D size color electrostatic plotr	1.0			This is shared with other departments.
		E size digitizer	2.0			
		E size pen plotter	1.0			
		Graphic terminal	5.0			All color.
		Prime mainframe	1.0			This will be phased out by spring of 1993.
		Screen dump plotter	1.0			
		Trimble low-res GPS	1.0			GPS unit and base station.
		Database Administrator	1.0			50% of time spent on this
		GIS program manager	1.0			Program Manager spends 50% of time on RIGIS-related work.
	Software	GIS project manager	4.0			3 part-time, 1 full-time
		GIS technical specialist	1.0			part-time
		System manager	2.0			2 people spend 25% on this.
		ARC/INFO's TIN model	1.0			ARC/INFO TIN on the Prime?
		ERDAS Satellite Imaging	1.0			PC ERDAS software
		Intergraph drafting	10.0			These are used by the Department of Landscape Architecture.
		PC ARC/INFO GIS	10.0			These support University courses in GIS, both extention courses and regular curricula courses.
		Surfer contour/3D modelling	1.0			
		Trimble global postioning	2.0			
		E size pen plotter	1.0			Calcomp
RI-NBP	Hardware	Graphic terminal	2.0			Tektronix 4207
		Screen dump plotter	1.0			Tektronix inkjet 4696
		GIS technical specialist	1.0			Exists for 1 Division within DEM only
	Software	ARC/INFO's TIN model	1.0			Use URI's ARC/INFO TIN via special projects from Groundwater contracted to EDC.
		AutoCAD drafting	1.0			Air & Hazardous Materials has some type of CADD system - may not be AutoCAD.
		Contouring software	1.0			Groundwater Division has been importing modeling data from Uniform Flow Model.
		Mainframe ARC/INFO GIS	1.0			Use URI's Prime computer.
	Hardware	E size pen plotter	1.0			Shared by several DEM divisions.
		Graphic terminal	2.0			Shared by several DEM divisions.
		Screen dump plotter	1.0			Shared by several DEM divisions.
	Personnel	GIS program manager	1.0			Resources at NBP include on GIS staff person handling all aspects including program mgmt, project mgmt, database administration and technical work.
RI-OEC	Software	ARC/INFO's TIN model	1.0			Use URI's software.
		Mainframe ARC/INFO GIS	1.0			Use URI's software.
		E size pen plotter	1.0			
		Graphic terminal	2.0			Tektronix terminals shared by all DEM employees.
		Prime mainframe	1.0			Accesses Prime at URI via modem.
	Personnel	Screen dump plotter	1.0			Ink-jet
		GIS technical specialist	1.0			Part-time
		ARC/INFO's TIN model	1.0			

Organization Reference	Resource Type	Resource	How Many?	Total Cost	Annually or Total	Additional Comments
		Mainframe ARC/INFO GIS	1.0			

UNITED STATES - FEDERAL  
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Organization Reference	Resource Type	Resource	How Many?	Total Cost	Annually or Total	Additional Comments
US-EPAI	Expenditures	Hardware		150,000.00	Total	
		Personnel		360,000.00	Annual	
		Software		60,000.00	Total	
		System Maintenance		30,000.00	Annual	
	Hardware	D size digitizer	1.0			Not currently in use.
		Data General workstations	5.0			One is a server.
		E size color electrostatic plottr	1.0			
		E size pen plotter	1.0			
		Graphic terminal	8.0			Three X-terminals, three 4207, one 4107, one 4125, several PCs with tek emulation software.
		Miscellaneous big digitizer	1.0			Backlit 48" by 62".
		Prime minicomputer	1.0			Will be phased out over the next year.
		Screen dump plotter	5.0			
		SUN workstation	2.0			
		Tek workstation	1.0			
		Trimble low-res GPS	8.0			Seven Pathfinders and one 4000 series base stations.
	Personnel	GIS project manager	1.0			
		GIS technical specialist	4.0			
		System manager	1.0			
	Software	ARC/INFO's TIN model	7.0			
		Minicomputer ARC/INFO	1.0			Prime minicomputer
		Trimble global positioning	2.0			Once copy at GIS center and one copy at Environmental Services Division.
		Workstation ARC/INFO GIS	8.0			

VERMONT  
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Organization Reference	Resource Type	Resource	How Many?	Total Cost	Annually or Total	Additional Comments
VT-ANR	Expenditures	Data development and maintenance		50,000.00	Total	
		General operations		5,000.00	Total	
		Hardware		80,000.00	Total	
		Personnel		65,000.00	Total	
		Software		20,000.00	Total	
	Hardware	386 chip PC	3.0			
		Digitizer smaller then D size	2.0			
		E size digitizer	1.0			
		E size pen plotter	1.0			
		Trimble low-res GPS	3.0			

Organization Reference	Resource Type	Resource	How Many?	Total Annually Cost or Total	Additional Comments
VT-AOT	Personnel	GIS program manager	1.0		Manager half-time until 11/1/91
		GIS technical specialist	1.0		
	Software	AutoCAD drafting	1.0		
		DCA contour/3D modelling	1.0		
		FoxPro Database Management Sys	2.0		With FOXBASE+
		PC ARC/INFO GIS	3.0		
		Quatro Pro	2.0		
		Trimble global positioning	3.0		
	Hardware	386 chip PC	2.0		Used sparingly for GIS.
		D size digitizer	1.0		
		Graphic terminal	2.0		Color
		Miscellaneous workstation	2.0		
		VAX mainframe	1.0		
	Personnel	Database Administrator	1.0		
		System manager	1.0		
	Software	Intergraph drafting	1.0		Int 250, Int 380 and workstations. Only Int 250 workstations are used for GIS as this equipment is not the standard GIS platform.
		Mainframe ARC/INFO GIS	1.0		
		PC ARC/INFO GIS	2.0		Currently used only for training and some elementary prototyping. Not on dedicated equipment - all equipment has other primary uses.
VT-OGIS	Expenditures	Data development and maintenance		100,000.00 Annual	
		General operations		40,000.00 Annual	
		Hardware		20,000.00 Annual	
		Marketing and public relations		10,000.00 Annual	
		Personnel		180,000.00 Annual	
		Research and development		20,000.00 Annual	
		Software		10,000.00 Annual	
		System Maintenance		20,000.00 Annual	
		User support and training		20,000.00 Annual	
	Hardware	386 chip PC	2.0		
		D size digitizer	1.0		
		E size pen plotter	1.0		
		Screen dump plotter	1.0		
	Personnel	Database Administrator	1.0		
		GIS program manager	1.0		
		GIS project manager	1.0		
		GIS technical specialist	2.0		
	Software	FoxPro Database Management Sys	2.0		
		PC ARC/INFO GIS	2.0		
		Workstation ARC/INFO GIS	1.0		

**TABLE C-2**

**Planned GIS Resources by Organization**

Table C-2:Planned GIS Resources by Organization

CONNECTICUT  
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Organization Reference	Resource Type	Resource	How Many?	Total Cost	Annually or Total	Additional Comments
CT-NRC	Hardware	486 chip PC	1.0			
		Aviion workstation	2.0			One ordered by DEP, one to be loaned to DEP by EPA.
		D size digitizer	2.0			
		E size pen plotter	1.0			
		SUN workstation	1.0			
	Software	PC ARC/INFO GIS	1.0			
		Workstation ARC/INFO GIS	4.0			

MASSACHUSETTS  
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Organization Reference	Resource Type	Resource	How Many?	Total Cost	Annually or Total	Additional Comments
MA-USGS	Personnel	GIS technical specialist	1.0			

MAINE  
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Organization Reference	Resource Type	Resource	How Many?	Total Cost	Annually or Total	Additional Comments
ME-BOH	Hardware	386 chip PC	1.0			80386/33 PC, 150 MB, 4 MB RAM, 80387 math coprocessor, 3.5 and 5.25 floppy drives.
		D size pen plotter	1.0			HP DraftPro 7576 Ext Plotter
		E size digitizer	1.0			CalComp 23360 24"x36" table w/ 16 button cursor
		Graphic terminal	1.0			14" flat tension color monitor
		Trimble high-res GPS	2.0			Trans Pac II systems
	Software	Trimble global positioning	1.0			Establishment of a Maine base station is planned.
ME-BOPC	Personnel	Geologist technician	1.0			Hiring of a geologist technician has been approved for state FY 93 (July 1, 1992).
ME-DEP	Expenditures	Data development and maintenance		400,000.00	Annual	
		Hardware		36,000.00	Total	
		User support and training		10,000.00	Annual	
	Hardware	E size digitizer	1.0			
		IBM workstation	2.0			
	Personnel	GIS technical specialist	2.0			Techs in training for Air and Water Bureaus.
ME-OGIS	Expenditures	Hardware		22,000.00	Total	3 IPI 1.3 Gbyte disk packs; CD ROM; 2.6 Gbyte backup system.

NEW HAMPSHIRE  
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Organization Reference	Resource Type	Resource	How Many?	Total Cost	Annually or Total	Additional Comments
NH-DES	Software	Grafpoint software	1.0			Grafpoint software to run on PC

MAINE  
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Organization Reference	Resource Type	Resource	How Many?	Total Cost	Annually or Total	Additional Comments
ME-BOH	Personnel	GIS technical specialist	1.0			
	Software	Contouring software	1.0			EPA WHPA codes are available. Purchase of MOD Flow and Flow Path is planned.
ME-BOPC	Hardware	D size digitizer	1.0			
		D size pen plotter	1.0			
		GPS Pathfinder	1.0			Needed to get long/lat on domestic wells used in monitoring surveys
	Personnel	Database Administrator	1.0			
		GIS technical specialist	1.0			Will rely primarily on the ME Dept. of Conservation GIS Division (OGIS), therefore minimal personnel will be needed.
	Software	Workstation ARC/INFO GIS	1.0			When we get GIS, we would like to link by modem to the GIS mainframe in the Department of Conservation.
ME-DEP	Hardware	E size color electrostatic plotr	1.0			Would like to either have one in house or have access to one nearby. Currently must send large plots to EPA Region 1.
		Graphic terminal	3.0			
		Trimble high-res GPS	6.0			Have been borrowing EPA Region I units, but availability is limited.
		Unspecified scanner	1.0			
	Personnel	GIS technical specialist	3.0			Techs for Oil, Solid Waste and Land Bureaus.
		System manager	1.0			
ME-GS	Software	Trimble global postioning	1.0			
	Hardware	D size color electrostatic plotr	1.0			
		Global Positioning System	2.0			Some kind of GPS receiver needed for data acquisition.
		Screen dump plotter	1.0			
	Personnel	GIS technical specialist	1.0			All geologists and cartographers who have become proficient in GIS. One geologist brought GIS expertise with him from a previous job and manages the Survey's GIS program.
ME-OGIS	Expenditures	Data development and maintenance		100,000.00	Annual	Seed money to match state and local funds.
		Hardware		200,000.00	Total	Sparc server upgrades, electrostatic plotter, image processing, disk packs.
		Personnel		90,000.00	Annual	Database/System Manager; GIS Technician
	Hardware	E size color electrostatic plotr	1.0			Provide central access to plotter - all agencies on network.
		Global Positioning System	2.0			Central resource for all state agencies involved in GIS.
		Graphic terminal	1.0			Need very high resolution machine for use in facility screen dumps - demos.
	Personnel	GIS technical specialist	2.0			Additional technical ARC/INFO specialists needed to support agency applications and to deliver GIS data to the public (comprehensive town planning etc.)
	Software	Oracle Database Management Sys	1.0			
		Satellite image processing	1.0			Provide satellite image processing capabilities to agency programs at central location.

NEW HAMPSHIRE  
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Organization Reference	Resource Type	Resource	How Many?	Total Cost	Annually or Total	Additional Comments
NH-CSRC	Expenditures	Hardware		25,000.00	Total	There were no hardware purchases made out of State GIS-related funds this year, however there is a need for

Organization Reference	Resource Type	Resource	How Many?	Total Cost	Annually or Total	Additional Comments
						more hardware.
		Software		10,000.00	Total	There were no software purchases made from State GIS-related funds this year, however there is a need for more software.
	Hardware	E size color electrostatic plottr	1.0			
		Global Positioning System	1.0			Need Trimble high-resolution GPS to support field work related to image processing activities. Survey didn't state how many needed, just checked off column.
		SUN workstation	1.0			Survey didn't state how many needed, just checked off column.
		Unspecified scanner	1.0			Need high-resolution scanner. Survey didn't state how many needed, just checked off column.
	Personnel	GIS program manager		30,000.00	Annual	
	Software	ARC/INFO GRID module	1.0			
		Workstation ARC/INFO GIS	1.0			
NH-DES	Hardware	Global Positioning System	3.0			To minimize field-verification time.
	Software	Trimble global postioning	3.0			To minimize field-verification time.
NH-OSP	Expenditures	Hardware		12,000.00	Total	UNIX workstation needed - COMPAQ and PC ARC/INFO system existing. Need E-size plotter and digitizer.
	Hardware	Graphic terminal	1.0			X-terminal
		Miscellaneous workstation	1.0			UNIX workstation being considered; no specific model.
	Software	Workstation ARC/INFO GIS	1.0			

RHODE ISLAND  
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Organization Reference	Resource Type	Resource	How Many?	Total Cost	Annually or Total	Additional Comments
RI-DEMGW	Hardware	E size digitizer	1.0			DEM needs digitizer for several divisions.
RI-EDC	Hardware	Avilion workstation	5.0			
		Graphic terminal	1.0			Need one more color graphic terminal.
		Screen dump plotter	1.0			
		Slide Matrix	1.0			
	Personnel	System manager	1.0			
	Software	Workstation ARC/INFO GIS	5.0			Needed are the equivalent of 5 single user licenses - or possibly one multi-user license?
RI-ERIC	Hardware	E size digitizer	1.0			
RI-NBP	Hardware	E size digitizer	1.0			
		Miscellaneous workstation	1.0			Long-term needs demand a work station be acquired. Specifications as yet unknown.
		Trimble low-res GPS	1.0			Assuming low resolution is 2-5m accuracy.
	Personnel	GIS technical specialist	1.0			Future needs for staff depend upon the amount of long-term monitoring of the Bay that the Project will perform.
	Software	Mainframe ARC/INFO GIS	1.0			
		Trimble global postioning	1.0			Has potential for use during long-term monitoring planned for next 5+ years. Details being developed. Perhaps share equipment with RI Dept. of Environmental Management.
RI-OEC	Software	PC ARC/INFO GIS	1.0			

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Organization Reference	Resource Type	Resource	How Many?	Total Annually Cost or Total	Additional Comments
US-EPAI	Expenditures	Hardware		500,000.00 Total	
		Personnel		60,000.00 Annual	
		Software		100,000.00 Total	
		System Maintenance		100,000.00 Annual	
	Hardware	386 chip PC	1.0		
	Personnel	Database Administrator	1.0		
	Software	Oracle Database Management Sys	1.0		

VERMONT  
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Organization Reference	Resource Type	Resource	How Many?	Total Annually Cost or Total	Additional Comments
VT-ANR	Expenditures	Data development and maintenance		25,000.00 Total	
		General operations		5,000.00 Total	
		Hardware		100,000.00 Total	
		Personnel		40,000.00 Total	
		Software		30,000.00 Total	Upgrade from PC versions to host Arc/INFO.
		System Maintenance		2,500.00 Total	
		User support and training		5,000.00 Total	
	Hardware	386 chip PC	1.0		
		E size color electrostatic plotr	1.0		
		E size digitizer	1.0		
		PC Server	1.0		
		Screen dump plotter	1.0		
		Trimble low-res GPS	3.0		
		Unspecified scanner	1.0		
	Personnel	GIS technical specialist	0.5		
	Software	FoxPro Database Management Sys	1.0		
		Mainframe ARC/INFO GIS	1.0		
		PC ARC/INFO GIS	1.0		
		Quattro Pro	1.0		
VT-AOT	Personnel	GIS program manager	1.0		No staff dedicated to GIS works. Still in process of establishing direction and defining needs.
		GIS project manager	1.0		
		GIS technical specialist	1.0		
VT-OGIS	Expenditures	Data development and maintenance		250,000.00 Annual	VT operates under a 5 year data development plan. If avail, could spend 400 - 600 thousand/year responsibly w/ good control, direction & application.
		General operations		60,000.00 Annual	
		Hardware		40,000.00 Annual	
		Marketing and public relations		20,000.00 Annual	
		Personnel		300,000.00 Annual	



Organization Reference	Resource Type	Resource	How Many?	Total Cost	Annually or Total	Additional Comments
		Research and development		20,000.00	Annual	
		Software		20,000.00	Annual	
		System Maintenance		30,000.00	Annual	
		User support and training		30,000.00	Annual	
	Hardware	386 chip PC	3.0			
		E size b/w electrostatic plotter	1.0			
		E size color electrostatic plottr	1.0			
		Screen dump plotter	1.0			
		SUN workstation	1.0			Multi-user, networked
	Personnel	Database Administrator	2.0			
		GIS program manager	1.0			
		GIS project manager	2.0			
		GIS technical specialist	6.0			
		System manager	1.0			
	Software	ARC/INFO's TIN model	1.0			
		ARC/VIEW end user interface	1.0			Multi-user, public walk-in and dial-up access
		FoxPro Database Management Sys	3.0			
		Oracle Database Management Sys	1.0			
		PC ARC/INFO GIS	3.0			
		Workstation ARC/INFO GIS	4.0			

**TABLE C-3**

**Needed GIS Resources by Organization**

**RHODE ISLAND**  
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Organization Reference	Resource Type	Resource	How Many?	Total Annually Cost or Total	Additional Comments
RI-DADP	Expenditures	Data development and maintenance		25,000.00 Total	
		General operations		2,000.00 Annual	
		Hardware		5,000.00 Annual	
		Personnel		65,000.00 Annual	For 1.5 full time employees.
		Software		5,000.00 Annual	
		System Maintenance		6,500.00 Annual	6K for maintenance contracts.
		User support and training		3,000.00 Annual	
RI-EDC	Software	ARC/INFO's TIN model	2.0		2 TIN modules ordered for workstation ARC/INFO.
		Workstation ARC/INFO GIS	2.0		These will replace ARC/INFO on the Prime. Each will be a single-user license.
RI-ERIC	Hardware	D size color electrostatic plottr	1.0		Agricultural Division
		SUN workstation	1.0		On-order by Division of Agriculture.
		Trimble low-res GPS	1.0		Division of Agriculture - I believe they ordered low-resolution.
	Personnel	GIS program manager	1.0		Attempting to hire 1 position for administration and some technical, for immediate future need 1 technical person MINIMUM, but have enough work for 2 people.
	Software	Trimble global postioning	1.0		On-order by Division of Agriculture.
		Workstation ARC/INFO GIS	1.0		On-order for the Division of Agriculture.

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Organization Reference	Resource Type	Resource	How Many?	Total Annually Cost or Total	Additional Comments
US-EPA1	Software	AutoCAD drafting	1.0		Unix workstation release 11

**VERMONT**  
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Organization Reference	Resource Type	Resource	How Many?	Total Annually Cost or Total	Additional Comments
VT-ANR	Expenditures	Hardware		30,000.00 Total	
		Software		5,000.00 Total	
VT-OGIS	Hardware	E size digitizer	1.0		
		E size pen plotter	1.0		
	Personnel	Database Administrator	2.0		
		GIS program manager	1.0		
		GIS project manager	1.5		
		GIS technical specialist	3.0		
		System manager	1.0		

Table C-3: Needed GIS Resources by Organization

CONNECTICUT  
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Organization Reference	Resource Type	Resource	How Many?	Total Cost	Annually or Total	Additional Comments
CT-NRC	Hardware	486 chip PC	3.0			
	Personnel	Database Administrator	1.0			
		GIS technical specialist	1.0			
	Software	PC ARC/INFO GIS	1.0			

MASSACHUSETTS  
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Organization Reference	Resource Type	Resource	How Many?	Total Cost	Annually or Total	Additional Comments
MA-BBP	Hardware	D size pen plotter	1.0			To be truly a standalone operation, need bigger plotter.
		Global Positioning System	1.0			
	Software	ARC/VIEW end user interface	1.0			Some form of access to GPS would be useful for data collection; not a must, but "would be nice"
		Trimble global postioning	1.0			
		Workstation ARC/INFO GIS	1.0			
MA-DFA	Expenditures	Hardware	2.0			
		Personnel	2.0			
		Software	2.0			
		GIS technical specialist	2.0			
	Software	Mainframe ARC/INFO GIS	2.0			
		Workstation ARC/INFO GIS	1.0			
MA-EOEAD	Expenditures	Data development and maintenance		200,000.00	Annual	
		Hardware		25,000.00	Annual	
		System Maintenance		50,000.00	Annual	
	Hardware	Graphic terminal	30.0			
	Personnel	Cartographer/Database Administr	1.0			
		GIS technical specialist	2.0			
		Programmer/Analyst	3.0			
	Software	ARC/INFO GRID module	1.0			Use with ERDAS for overlay of imagery development internally of digital elevation data.
		ARC/VIEW end user interface	10.0			
		ERDAS Satellite Imaging	2.0			User with ARC/INFO's GRID module for overlay of imagery development internally of digital elevation data.
		Workstation ARC/INFO GIS	2.0			
MA-MBP	Hardware	Miscellaneous workstation	1.0			Actual need noted as 1-3.
	Personnel	GIS project manager	1.0			
		GIS technical specialist	1.0			
MA-MWRA	Software	Trimble global postioning	1.0			For both survey and GIS.
MA-USGS	Personnel	GIS program manager	1.0			

**TABLE C-4**

**Existing GIS Resources by Resource**

Table C-4: Existing GIS Resources by Resource

Resource Type	Resource	Organization Reference	How Many?	Total Cost	Annually or Total
Expenditures	Data development and maintenance	MA-EOEAD		100,000.00	Annual
		MA-MWRA		895,000.00	Total
		NH-CSRC		40,000.00	Annual
		NH-OSP		150,000.00	Annual
		VT-ANR		50,000.00	Total
	General operations	VT-OGIS		100,000.00	Annual
		RI-DADP		2,000.00	Annual
		VT-ANR		5,000.00	Total
		VT-OGIS		40,000.00	Annual
		MA-BBP		15,000.00	Total
	Hardware	MA-DFA	1.0		
		MA-EOEAD		10,000.00	Annual
		MA-MWRA		200,000.00	Total
		ME-DEP		60,000.00	Total
		ME-GS		50,000.00	Total
	Marketing and public relations	ME-OGIS		200,000.00	Total
		NH-OSP		16,000.00	Total
		RI-DADP		2,000.00	Annual
		US-EPAI		150,000.00	Total
		VT-ANR		80,000.00	Total
	Personnel	VT-OGIS		20,000.00	Annual
		VT-OGIS		10,000.00	Annual
		MA-BBP		45,000.00	Annual
		MA-DFA	2.0		
		MA-EOEAD		180,000.00	Annual
	Research and development	MA-MWRA		200,000.00	Annual
		ME-OGIS		94,000.00	Annual
		NH-CSRC		80,000.00	Annual
		NH-OSP		100,000.00	Annual
		RI-DADP		65,000.00	Annual
	Software	RI-EDC	5.0		
		US-EPAI		360,000.00	Annual
		VT-ANR		65,000.00	Total
		VT-OGIS		180,000.00	Annual
		VT-OGIS		20,000.00	Annual
	System Maintenance	MA-BBP	1.0	11,200.00	Total
		MA-DFA			
		MA-MWRA		100,000.00	Total
		ME-DEP		20,000.00	Total
		ME-GS		15,000.00	Total
	User support and training	ME-OGIS		127,000.00	Total
		NH-OSP		7,500.00	Total
		RI-DADP		4,000.00	Annual
		US-EPAI		60,000.00	Total
		VT-ANR		20,000.00	Total
Hardware	286 chip PC	VT-OGIS		10,000.00	Annual
		MA-BBP	1.0		
		MA-EOEAD		30,000.00	Annual
		ME-DEP		8,000.00	Total
		ME-OGIS		27,000.00	Annual
	386 chip PC	NH-OSP		1,000.00	Annual
		RI-DADP		500.00	Annual
		US-EPAI		30,000.00	Annual
		VT-OGIS		20,000.00	Annual
		MA-DFA	4.0		
		RI-DADP		2,000.00	Annual
		VT-OGIS		20,000.00	Annual
		CT-NRC	6.0		
		ME-GS	1.0		
		RI-EDC	2.0		
		CT-NRC	5.0		
		MA-BBP	1.0		
		MA-MBP	?		
		MA-MWRA	1.0		
		ME-BOPC	1.0		
		ME-GS	2.0		
		NH-CSRC	1.0		
		NH-OSP	1.0		
		RI-DADP	1.0		
		RI-EDC	14.0		
		VT-ANR	3.0		

Resource Type	Resource	Organization Reference	How Many?	Total Annually Cost or Total
		VT-AOT	2.0	
		VT-OGIS	2.0	
	Aviion workstation	CT-NRC	1.0	
		RI-EDC	2.0	
	D size color electrostatic plottr	RI-EDC	1.0	
	D size digitizer	CT-NRC	1.0	
		ME-GS	2.0	
		RI-DADP	1.0	
		US-EPAI	1.0	
		VT-AOT	1.0	
		VT-OGIS	1.0	
	Data General mainframe	CT-NRC	1.0	
	Data General workstations	US-EPAI	5.0	
	Digitizer 44 x 60	CT-NRC	1.0	
	Digitizer smaller then D size	CT-NRC	2.0	
		VT-ANR	2.0	
	E size color electrostatic plottr	CT-NRC	2.0	
		MA-EOEAD	1.0	
		MA-MWRA	1.0	
		US-EPAI	1.0	
	E size digitizer	CT-NRC	2.0	
		MA-BBP	1.0	
		MA-EOEAD	2.0	
		MA-MWRA	2.0	
		MA-USGS	2.0	
		ME-DEP	1.0	
		ME-GS	1.0	
		ME-OGIS	2.0	
		NH-CSRC	1.0	
		NH-DES	2.0	
		NH-OSP	1.0	
		RI-EDC	2.0	
		VT-ANR	1.0	
	E size pen plotter	CT-NRC	2.0	
		MA-EOEAD	2.0	
		MA-MWRA	1.0	
		MA-USGS	1.0	
		ME-DEP	1.0	
		ME-GS	2.0	
		ME-OGIS	1.0	
		NH-CSRC	1.0	
		NH-DES	2.0	
		NH-OSP	1.0	
		RI-DADP	1.0	
		RI-DEMGW	1.0	
		RI-EDC	1.0	
		RI-ERIC	1.0	
		RI-NBP	1.0	
		RI-OEC	1.0	
		US-EPAI	1.0	
		VT-ANR	1.0	
		VT-OGIS	1.0	
	Graphic terminal	CT-NRC	4.0	
		MA-DFA	1.0	
		MA-EOEAD	13.0	
		MA-MWRA	4.0	
		ME-OGIS	2.0	
		NH-CSRC	5.0	
		NH-DES	2.0	
		NH-OSP	1.0	
		RI-DEMGW	2.0	
		RI-EDC	5.0	
		RI-ERIC	2.0	
		RI-NBP	2.0	
		RI-OEC	2.0	
		US-EPAI	8.0	
		VT-AOT	2.0	
	Hewlett-Packard Scanjet Plus	ME-BOPC	1.0	
	IBM workstation	ME-DEP	1.0	
		NH-DES	1.0	
	Miscellaneous big digitizer	US-EPAI	1.0	
	Miscellaneous workstation	MA-USGS	1.0	
		VT-AOT	2.0	

Resource Type	Resource	Organization Reference	How Many?	Total Annually Cost or Total
Personnel	Pen plotter smaller than D size	CT-NRC	1.0	
		MA-BBP	1.0	
		MA-USGS	3.0	
		ME-GS	1.0	
	Prime mainframe	NH-CSRC	1.0	
		RI-DEMGW	1.0	
		RI-EDC	1.0	
		RI-OEC	1.0	
	Prime minicomputer	US-EPAI	1.0	
	Screen dump plotter	CT-NRC	1.0	
		MA-MWRA	1.0	
		MA-USGS	1.0	
		ME-OGIS	1.0	
		NH-CSRC	1.0	
		NH-DES	1.0	
		RI-DADP	1.0	
		RI-DEMGW	1.0	
		RI-EDC	1.0	
		RI-ERIC	1.0	
		RI-NBP	1.0	
		RI-OEC	1.0	
		US-EPAI	5.0	
		VT-OGIS	1.0	
	Sun Sparcserver	ME-OGIS	1.0	
	SUN workstation	CT-NRC	5.0	
		ME-GS	1.0	
		ME-OGIS	3.0	
		NH-CSRC	1.5	
		NH-DES	1.0	
		RI-DADP	1.0	
		US-EPAI	2.0	
	Tek workstation	ME-DEP	1.0	
		US-EPAI	1.0	
	Trimble low-res GPS	CT-NRC	2.0	
		RI-EDC	1.0	
		US-EPAI	8.0	
		VT-ANR	3.0	
	Unspecified scanner	ME-BOH	1.0	
	VAX mainframe	MA-BBP	1.0	
		MA-DFA	1.0	
		MA-EOEAD	1.0	
		MA-MWRA	1.0	
		VT-AOT	1.0	
	Active trained users	MA-MWRA	4.0	
	Cartographer/Database Administrator	MA-EOEAD	1.0	
	Database Administrator	RI-DADP	0.3	
		RI-EDC	1.0	
		VT-AOT	1.0	
		VT-OGIS	1.0	
	GIS Administrator	ME-OGIS	1.0	
	GIS coordinator	MA-DFA	1.0	
		ME-OGIS	1.0	
		NH-DES	1.0	
	GIS program manager	CT-NRC	1.0	
		MA-EOEAD	1.0	
		MA-MWRA	1.0	
		ME-DEP	1.0	
		NH-CSRC	1.0	
		NH-OSP	1.0	
		RI-DADP	0.3	
		RI-EDC	1.0	
		RI-NBP	1.0	
		VT-ANR	1.0	
		VT-OGIS	1.0	
	GIS project manager	MA-BBP	1.0	
		MA-MBP	1.0	
		MA-MWRA	1.0	
		MA-USGS	1.0	
		ME-BOH	1.0	
		NH-OSP	1.0	
		RI-DADP	1.0	
		RI-EDC	4.0	
		US-EPAI	1.0	



Resource Type	Resource	Organization Reference	How Many?	Total Annually Cost or Total		
Software	GIS technical specialist	VT-OGIS	1.0			
		CT-NRC	4.0			
		MA-DFA	2.0			
		MA-EOEAD	1.0			
		MA-MWRA	3.0			
		MA-USGS	1.0			
		NH-CSRC	2.0			
		NH-DES	1.0			
		RI-DADP	1.0			
		RI-DEMGW	1.0			
		RI-EDC	1.0			
		RI-ERIC	1.0			
		RI-OEC	1.0			
		US-EPAI	4.0			
		VT-ANR	1.0			
		VT-OGIS	2.0			
		Interns	MA-MWRA	1.0		
			Programmer/Analyst	MA-EOEAD	1.0	
			System manager	CT-NRC	1.0	
		ARC/INFO's NETWORK module	NH-CSRC	1.0		
	RI-DADP		0.3			
	RI-EDC		2.0			
	US-EPAI		1.0			
	VT-AOT		1.0			
	ME-OGIS		1.0			
	CT-NRC		3.0			
	MA-BBP		1.0			
	MA-DFA		1.0			
	MA-EOEAD		1.0			
	MA-MBP		1.0			
	MA-MWRA		1.0			
	MA-USGS		1.0			
	ME-DEP		1.0			
	ME-GS		1.0			
	ME-OGIS		1.0			
	NH-CSRC		1.0			
	RI-DEMGW		1.0			
	ARC/INFO's TIN model		RI-EDC	1.0		
			RI-ERIC	1.0		
		RI-NBP	1.0			
		RI-OEC	1.0			
		US-EPAI	7.0			
		CT-NRC	1.0			
		MA-MWRA	4.0			
		MA-USGS	1.0			
		RI-ERIC	1.0			
		VT-ANR	1.0			
		Contouring software	RI-ERIC	1.0		
		DCA contour/3D modelling	VT-ANR	1.0		
		ERDAS Satellite Imaging	NH-CSRC	1.0		
		RI-EDC	1.0			
FoxPro Database Management Sys		VT-ANR	2.0			
		VT-OGIS	2.0			
Grafpoint software		NH-DES	1.0			
Ingres DBMS		MA-USGS	1.0			
Intergraph drafting		RI-EDC	10.0			
		VT-AOT	1.0			
Mainframe ARC/INFO GIS	CT-NRC	1.0				
	MA-BBP	1.0				
	MA-DFA	1.0				
	MA-EOEAD	1.0				
	MA-MBP	1.0				
	MA-MWRA	1.0				
	ME-OGIS	1.0				
	NH-CSRC	1.0				
	RI-DEMGW	1.0				
	RI-ERIC	1.0				
	RI-NBP	1.0				
	RI-OEC	1.0				
	VT-AOT	1.0				
MapInfo GIS	CT-NRC	1.0				
McDonnel/Douglas drafting	MA-MWRA	25.0				
Minicomputer ARC/INFO	US-EPAI	1.0				

Resource Type	Resource	Organization Reference	How Many?	Total Annually Cost or Total
	Oracle Database Management Sys	MA-BBP	1.0	
		MA-EOEAD	1.0	
		MA-MBP	1.0	
		MA-MWRA	1.0	
		ME-DEP	1.0	
	Oracle RDBI	ME-OGIS	1.0	
	PC ARC/INFO GIS	CT-NRC	5.0	
		MA-BBP	1.0	
		MA-EOEAD	1.0	
		MA-MWRA	1.0	
		ME-GS	3.0	
		NH-CSRC	1.0	
		NH-DES	1.0	
		NH-OSP	1.0	
		RI-DADP	1.0	
		RI-EDC	10.0	
		VT-ANR	3.0	
		VT-AOT	2.0	
		VT-OGIS	2.0	
	PC ERDAS Satellite Imaging	NH-CSRC	2.0	
	PC ORACLE	MA-BBP	1.0	
	Quatro Pro	VT-ANR	2.0	
	Surfer contour/3D modelling	CT-NRC	1.0	
		NH-CSRC	1.0	
		RI-EDC	1.0	
	Trimble global postioning	CT-NRC	2.0	
		RI-EDC	2.0	
		US-EPAI	2.0	
		VT-ANR	3.0	
	Workstation ARC/INFO GIS	CT-NRC	4.0	
		MA-USGS	1.0	
		ME-DEP	1.0	
		ME-GS	1.0	
		ME-OGIS	3.0	
		NH-DES	1.0	
		RI-DADP	1.0	
		US-EPAI	8.0	
		VT-OGIS	1.0	

**TABLE C-5**

**Planned GIS Resources by Resource**

Table C-5:Planned GIS Resources by Resource

Resource Type	Resource	Organization Reference	How Many?	Total Annually Cost or Total
Expenditures	Data development and maintenance	ME-DEP		400,000.00 Annual
		RI-DADP		25,000.00 Total
	General operations	RI-DADP		2,000.00 Annual
	Hardware	ME-DEP		36,000.00 Total
		ME-OGIS		22,000.00 Total
		RI-DADP		5,000.00 Annual
	Personnel	VT-ANR		30,000.00 Total
	Software	RI-DADP		65,000.00 Annual
		RI-DADP		5,000.00 Annual
		VT-ANR		5,000.00 Total
	System Maintenance	RI-DADP		6,500.00 Annual
	User support and training	ME-DEP		10,000.00 Annual
		RI-DADP		3,000.00 Annual
Hardware	386 chip PC	ME-BOH	1.0	
	486 chip PC	CT-NRC	1.0	
	Avion workstation	CT-NRC	2.0	
	D size color electrostatic plottr	RI-ERIC	1.0	
	D size digitizer	CT-NRC	2.0	
	D size pen plotter	ME-BOH	1.0	
	E size digitizer	ME-BOH	1.0	
		ME-DEP	1.0	
		VT-OGIS	1.0	
	E size pen plotter	CT-NRC	1.0	
		VT-OGIS	1.0	
	Graphic terminal	ME-BOH	1.0	
	IBM workstation	ME-DEP	2.0	
	SUN workstation	CT-NRC	1.0	
		RI-ERIC	1.0	
Personnel	Trimble high-res GPS	ME-BOH	2.0	
	Trimble low-res GPS	RI-ERIC	1.0	
	Database Administrator	VT-OGIS	2.0	
	Geologist technician	ME-BOPC	1.0	
	GIS program manager	RI-ERIC	1.0	
		VT-OGIS	1.0	
	GIS project manager	VT-OGIS	1.5	
	GIS technical specialist	MA-USGS	1.0	
		ME-DEP	2.0	
		VT-OGIS	3.0	
Software	System manager	VT-OGIS	1.0	
	ARC/INFO's TIN model	RI-EDC	2.0	
	AutoCAD drafting	US-EPAI	1.0	
	Grafpoint software	NH-DES	1.0	
	PC ARC/INFO GIS	CT-NRC	1.0	
	Trimble global postioning	ME-BOH	1.0	
		RI-ERIC	1.0	
	Workstation ARC/INFO GIS	CT-NRC	4.0	
		RI-EDC	2.0	
		RI-ERIC	1.0	

**TABLE C-6**

**Needed GIS Resources by Resource**

Table C-6:Needed GIS Resources by Resource

Resource Type	Resource	Organization Reference	How Many?	Total Cost	Annually or Total
Expenditures	Data development and maintenance	MA-EOEAD		200,000.00	Annual
		ME-OGIS		100,000.00	Annual
		VT-ANR		25,000.00	Total
		VT-OGIS		250,000.00	Annual
	General operations	VT-ANR		5,000.00	Total
		VT-OGIS		60,000.00	Annual
		MA-DFA	2.0		
	Hardware	MA-EOEAD		25,000.00	Annual
		ME-OGIS		200,000.00	Total
		NH-CSRC		25,000.00	Total
		NH-OSP		12,000.00	Total
		US-EPAI		500,000.00	Total
		VT-ANR		100,000.00	Total
		VT-OGIS		40,000.00	Annual
		VT-OGIS		20,000.00	Annual
		MA-DFA	2.0		
		ME-OGIS		90,000.00	Annual
	Marketing and public relations Personnel	US-EPAI		60,000.00	Annual
		VT-ANR		40,000.00	Total
		VT-OGIS		300,000.00	Annual
		VT-OGIS		20,000.00	Annual
		MA-DFA	2.0		
	Research and development Software	NH-CSRC		10,000.00	Total
		US-EPAI		100,000.00	Total
	System Maintenance	VT-ANR		30,000.00	Total
		VT-OGIS		20,000.00	Annual
		MA-EOEAD		50,000.00	Annual
		US-EPAI		100,000.00	Annual
		VT-ANR		2,500.00	Total
	User support and training	VT-OGIS		30,000.00	Annual
		VT-ANR		5,000.00	Total
	Hardware	VT-OGIS		30,000.00	Annual
		US-EPAI	1.0		
	386 chip PC	VT-ANR	1.0		
		VT-OGIS	3.0		
	486 chip PC	CT-NRC	3.0		
	Avilion workstation	RI-EDC	5.0		
	D size color electrostatic plotr	ME-GS	1.0		
	D size digitizer	ME-BOPC	1.0		
	D size pen plotter	MA-BBP	1.0		
		ME-BOPC	1.0		
	E size b/w electrostatic plotter	VT-OGIS	1.0		
	E size color electrostatic plotr	ME-DEP	1.0		
		ME-OGIS	1.0		
		NH-CSRC	1.0		
		VT-ANR	1.0		
		VT-OGIS	1.0		
	E size digitizer	RI-DEMGW	1.0		
		RI-ERIC	1.0		
		RI-NBP	1.0		
		VT-ANR	1.0		
	Global Positioning System	MA-BBP	1.0		
		ME-GS	2.0		
		ME-OGIS	2.0		
		NH-CSRC	1.0		
	GPS Pathfinder	NH-DES	3.0		
	Graphic terminal	ME-BOPC	1.0		
		MA-EOEAD	30.0		
		ME-DEP	3.0		
		ME-OGIS	1.0		
		NH-OSP	1.0		
	Miscellaneous workstation	RI-EDC	1.0		
		MA-MBP	1.0		
		NH-OSP	1.0		
		RI-NBP	1.0		
	PC Server	VT-ANR	1.0		
	Screen dump plotter	ME-GS	1.0		
		RI-EDC	1.0		
		VT-ANR	1.0		
		VT-OGIS	1.0		
	Slide Matrix	RI-EDC	1.0		

Resource Type	Resource	Organization Reference	How Many?	Total Annually Cost or Total
Personnel	SUN workstation	NH-CSRC	1.0	
		VT-OGIS	1.0	
	Trimble high-res GPS	ME-DEP	6.0	
	Trimble low-res GPS	RI-NBP	1.0	
		VT-ANR	3.0	
	Unspecified scanner	ME-DEP	1.0	
		NH-CSRC	1.0	
		VT-ANR	1.0	
	Cartographer/Database Administrator	MA-EOEAD	1.0	
	Database Administrator	CT-NRC	1.0	
		ME-BOPC	1.0	
		US-EPAI	1.0	
		VT-OGIS	2.0	
	GIS program manager	MA-USGS	1.0	
		NH-CSRC		30,000.00 Annual
		VT-AOT	1.0	
		VT-OGIS	1.0	
	GIS project manager	MA-MBP	1.0	
		VT-AOT	1.0	
		VT-OGIS	2.0	
	GIS technical specialist	CT-NRC	1.0	
		MA-DFA	2.0	
		MA-EOEAD	2.0	
		MA-MBP	1.0	
		ME-BOH	1.0	
		ME-BOPC	1.0	
		ME-DEP	3.0	
		ME-GS	1.0	
		ME-OGIS	2.0	
		RI-NBP	1.0	
Software		VT-ANR	0.5	
		VT-AOT	1.0	
		VT-OGIS	6.0	
	Programmer/Analyst	MA-EOEAD	3.0	
	System manager	ME-DEP	1.0	
		RI-EDC	1.0	
		VT-OGIS	1.0	
	ARC/INFO GRID module	MA-EOEAD	1.0	
		NH-CSRC	1.0	
	ARC/INFO's TIN model	VT-OGIS	1.0	
	ARC/VIEW end user interface	MA-BBP	1.0	
		MA-EOEAD	10.0	
		VT-OGIS	1.0	
	Contouring software	ME-BOH	1.0	
	ERDAS Satellite Imaging	MA-EOEAD	2.0	
	FoxPro Database Management Sys	VT-ANR	1.0	
		VT-OGIS	3.0	
	Mainframe ARC/INFO GIS	MA-DFA	2.0	
		RI-NBP	1.0	
		VT-ANR	1.0	
	Oracle Database Management Sys	ME-OGIS	1.0	
		US-EPAI	1.0	
		VT-OGIS	1.0	
	PC ARC/INFO GIS	CT-NRC	1.0	
		RI-OEC	1.0	
		VT-ANR	1.0	
		VT-OGIS	3.0	
	Quattro Pro	VT-ANR	1.0	
	Satellite image processing	ME-OGIS	1.0	
	Trimble global positioning	MA-BBP	1.0	
		MA-MWRA	1.0	
		ME-DEP	1.0	
		NH-DES	3.0	
		RI-NBP	1.0	
	Workstation ARC/INFO GIS	MA-BBP	1.0	
		MA-DFA	1.0	
		MA-EOEAD	2.0	
		ME-BOPC	1.0	
		NH-CSRC	1.0	
		NH-OSP	1.0	
		RI-EDC	5.0	
		VT-OGIS	4.0	

## **APPENDIX D**

### **Data Summaries**

**Table D-1 Existing Data in use by Organization**

**Table D-2 Planned Data in use by Organization**

**Table D-3 Needed Data in use by Organization**

**Table D-4 Existing Data in use by Data Type**

**Table D-5 Planned Data in use by Data Type**

**Table D-6 Needed Data in use by Data Type**



**TABLE D-1**

**Existing Data by Organization**

Table D-1: Existing GIS Data by Organization

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Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Title Unit	Data Extent	Additional Comments
CT-NRC	Air	Aeroradioactivity	1:250,000			State	Digitized from 2 different source maps with different measuring units. Maps were generalized to create common units of gamma radiation.
		Emissions source	POINT			State	All Air Compliance Unit regulated stationary sources. Includes facility name, permitted and actual emissions. Not up to date.
		Radon	1:24,000			State	Radon sampling sites. Includes indoor air as well water samples.
	Background	7.5' quad boundaries				State	Mathematically generated from lat/long of quad corners using ARC/INFO generate and project commands.
		Land base map	1:100,000			Long Island Sound	Base map of Long Island Sound produced from 1:100,000 scale USGS DLGs. Includes from Eastern L.I. west of Block Island, south shore of L.I. to several quads inland in CT.
	Earth	Bedrock geology	1:125,000			10% of state	1985 statewide bedrock geology map available. To be to be completed as part of radon investigations.
			1:24,000			10% of state	Includes geologic units and fault lines. Strike and dip data maintained in separate coverage.
		Coastal zones	1:24,000			State	Represents the area originally identified by DEP as the coastal management area.
		Elevation - DEM	1:24,000			State	Available in gridded format with 30 meter horizontal resolution and 7 or 15 meter vertical resolution.
		Geologic terrains	1:250,000			State	Includes terrain unit data.
		Hydrography (detailed)	1:100,000			State	Source is USGS DLG.
			1:24,000			State	From USGS DLG. In ARC/INFO format. Attributes include DLG codes plus water body IDs.
		Hydrography (subset)	1:24,000			State	From Hydrography (detailed). Simple version.
		Hypsography (elevation contours)	1:24,000			2% of state (Bound Brook, Ellington)	Completed on pilot basis for Bound Brook and Ellington quads only. No active program to expand this theme.
		Quaternary geology	1:80,000			State	A coverage of major quaternary geologic units of LIS. Produced from seismic data collected and interpreted over a 10 year period.
		Soils	1:250,000			State	U.S. Soil Conservation Service data set in CT GIS.
		Stratified drift	1:125,000			State	Includes most coarse grained aquifer areas of significance with greater than 10' saturated thickness.
		Surficial geology	1:125,000			State	Digital file to be supplied by USGS in Spring 1991.
			1:24,000			75% of state	Includes stack unit data and water features greater than 5 acres from hydro DLGs. Many have not yet been edited. To be completed by April, 1992.
	Haz	Ash disposal sites	1:24,000			State	Includes approximately 40 sites being considered as potential disposal sites for ash residue. Special project database.
		Landfills	1:24,000			State	Includes existing and know historical sites. Need to add attribute data.
		Polluted wells	1:48,000			State	Includes approx. 800 wells (community, domestic, etc) that have been polluted from a variety of sources. Attributes (type of pollution) not yet added.
		Pollutions sources	1:50,000			State	Leachate and waste sources. Information is of marginal quality.
		Underground storage tanks	POINT			State	Data supplied by tank owner at time of registration. Quality of data is low. All tanks with lat/long reported have been converted. To be replaced by 1:24,000 dig data.
	Ir	Power generating facilities	1:24,000			State	Locations of fossil fuel, nuclear and hydro electric

Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Title Unit	Data Extent	Additional Comments
							generating stations. Attribute data in Water-Use Information System.
		Roads	1:100,000			State	DLG major highways.
		Roads and trails	1:24,000			State	Source is USGS DLG. In ARC/INFO format.
		Sewage treatment plants	1:24,000			State	Facilities with sanitary wastewater permits.
		Sewer service areas	1:24,000			State	Areas served by public and private sewer systems.
		Water service areas	1:24,000			State	Digitizing complete. Areas in Upper CT and S. Central PWSMA have gone thru extensive review & update. Includes service area boundaries. Attributes in Water-Use Information System.
Land Use	Farmland		1:24,000			80% of state	Property boundaries of 100+ farms for which CT Dept of Agriculture has purchased development rights. Additional properties will be digitized in Spring 1991.
	Golf courses		1:24,000			State	Boundaries of golf courses and attribute information on ownership. Boundaries digitized by WRD from 1:24,000 topographic maps.
	Land use		1:24,000			3% of state (4 quads at level 3 detail)	4 quads completed at level 3 detail. Also avail. 1:24,000, 1970 DOT coarse polygon data (updates made to urban quads) and 1970 1:250,000 USGS level 2 data.
	Municipally owned lands		1:24,000			15% of state	Includes all municipally owned lands and privately owned open space. Attributes not yet added. No formal program to complete.
	State owned lands		1:24,000			State	Includes DEP and other state agency holdings. DEP data fair, others less reliable. Attributes not yet added.
	Zoning					50% of state	Being digitized from town source maps. Scales and quality vary.
Pol Bound	County boundaries		1:250,000			State	Includes county name.
	Regional Planning Commission		1:250,000			State	Includes regional planning association name.
	Town boundaries		1:24,000			State	From USGS DLG. ARC/INFO format w/ town tax code. Shoreline represents a generalization from hydrography data.
			1:250,000			State	Includes town name, 1980, 82, 84, 86 census estimates.
Sample	Precipitation monitoring						Maintained by the hydrology program.
	Water quality monitoring network		1:24,000			State	Location and characterization of USGS/DEP ambient monitoring network.
Water	Aquifer protection areas		1:24,000			10% of state	CT water companies required to conduct level B & level A mapping in format for digitizing. Production digitizing to begin summer 1991.
	Aquifers		1:125,000			State	40+/- potential high yield aquifers. Includes 7Q10 and estimated yields.
	Drainage basins		1:24,000			State	Major regional, subregional and local. All digitizing complete. 80% need to be adjusted to match hydrography.
			1:250,000			State	Includes 4 digit basin ID and basin name.
	Public water supply		1:250,000			State	Derived from towns. Includes public water supply planning area name.
	Reservoirs		1:24,000			State	Water bodies used for potable water supply. Boundaries from DLG hydrography data.
	Streams		1:250,000			State	
	Water diversions		1:24,000			25% of state	Locations of registered water diversions greater than 50,000 gpd.
	Water quality classifications		1:24,000			20% of state	Farmington river basin completed. Most coordinate data is derived from existing GIS data layers.
	Water supply watersheds		1:24,000			State	Boundaries of existing and potential water supply reservoir watersheds. Taken from digital basin boundaries.
	Wells (community)		1:24,000			State	Includes all community water supply wells. Attributes in Water-Use Information System.
	Wetlands		1:24,000			State	Originally digitized from 1:24,000 scale maps. Appended to

Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
	Wildlife	Rare and endangered species	1:24,000			80% of state	a single coverage. Not to be used for detailed analyses. No active program to expand inventory.
		Shellfish areas	1:24,000			20% of state	Site locations "masked" to prevent unauthorized access. Data is from DEP/TNC Natural Diversity Database.
							Includes hard, soft clam area, oyster beds, lease areas state town jurisdiction and closure areas along the western CT shoreline.

MASSACHUSETTS  
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Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
MA-BBP	Earth	Bathymetry	POINT			Buzzards Bay	Data from National Ocean Service
	Haz	Marine fisheries sanitary survey					Mass. Division Marine Fisheries sanitary survey (shoreline)
		NPDES outfalls	POINT	unknown		Buzzards Bay	Data layer mostly developed from coordinates in EPA NPDES files. Believe that have locations for all active permits.
	Infra	"Segments" data	1:25,000	NMA		Buzzards Bay	Boundaries of approx. 100 sub areas of the Bay, defined on the basis of physical oceanographic and on the basis of geography.
		Combined Sewer Overflows		unknown		New Bedford Harbor	CSOs in New Bedford Harbor
	Sample	Water quality	POINT	unknown		Buzzards Bay	Water quality sampling data. Units are 100 sub areas in the Bay.
	Water	Drainage basins	1:25,000	unknown		Buzzards Bay drainage basin	Revised major basin based on new USGS groundwater data; developed subbasin boundaries too.
	Wildlife	Eelgrass beds	1:25,000	very poor		Buzzards Bay	Data compilation used best available inexpensive data source (i.e. not interpreted from satellite data). Digit. method. & software very poor. Data adequate for approx locations
		Shellfish areas	1:25,000	NMA		Buzzards Bay	Mass. Division Marine Fisheries shellfish management areas. This data set is volatile and only current as of date listed
MA-DFA	Infra	Rights of Way	1:25,000	+- 100 ft.		Part of Plymouth/Barnstable counties	Rights-of-way spray/no spray zones - Barnstable (Old Colony RR).
MA-EOEA	Earth	Bathymetry					
		Coastal zones	1:25,000				
		Tidal flats					
MA-EOEAD	Sample	Sediment Chemistry					
	Background	7.5' quad boundaries	1:25,000		STATE	state	
		Census tracts	1:100,000			2 halves of state	1990 census
			1:250,000			3 250k quads	1980 census
		State plane grid (10000 ft)	1:25,000		STATE	state	
	Earth	Bathymetry	1:25,000		QUAD7.5	selected quads	Source is USGS quads.
		Elevation - DEM	1:25,000			189 25k quads	
			1:250,000			28 unique grid	30 ft contours
			1:250,000	NMA		state	Source is USGS.
		Hydrography	1:100,000			5 panels	
		Hypsography (elevation contours)	1:25,000			189 25k quads	
		Surficial geology	1:125,000			3 250K quads	
			1:250,000			3 panels, statewide	USGS recompiled from 1:25,000 manuscripts of Byron Stone.
	Infra	Aqueducts	1:100,000		STATE	state	
		Pipelines	1:100,000		"	state	

Organization Data Reference	Type	Data Layer	Source Scale	Data Accuracy	Title Unit	Data Extent	Additional Comments
		Railroads	1:100,000		STATE	state	
		Roads	1:100,000			189 25k quads	
			1:100,000		STATE	state	
	Land Use	Areas of critical env. concern	1:25,000		STATE	state	
		Land use	1:25,000		TOWN	351 towns	
		Protected areas	1:25,000		GRPCNTY	6 panels	
		TIGER data	1:100,000		COUNTY	14 counties	
			1:100,000		TOWN	351 towns	
	Pol Bound	County boundaries	1:25,000		STATE	state	
		Regional Planning Commission	1:25,000		STATE	state	
		Senate districts	1:25,000		STATE	state	
		Town boundaries	1:25,000		STATE	state	
		Zip code boundaries	1:2,000,000		STATE	state	
	Water	Aquifers	1:48,000		BASIN	25 panels	
		Drainage basins	1:25,000		STATE	state	
		Drainage sub-basins	1:25,000		GRPBASIN	4 panels	
		Ponds	1:100,000		GRPBASIN	5 panels	
		Sole source aquifers	1:25,000		STATE	state	
		Streams	1:100,000		GRPBASIN	5 panels	
		Supply wells	1:25,000		STATE	state	
		Wellhead protection areas	1:25,000		STATE	state	
		Wetlands	1:100,000		STATE	state	
MA-MBP	Land Use	Land use	1:25,000				MassGIS data in which statistics by drainage basing have been aggregated in INFO.
	Water	Drainage basins	1:25,000			Cape Cod Bay watershed	Data in draft stages. Added Cape Cod watershed boundary.
MA-MWRA	Earth	Bathymetry		NMA	HARBOR	Boston Harbor	
		Bedrock geology	1:25,000	NMA		Four quadrangle area	Bedrock contacts and fault lines for a 4-quad area in the area of the Wachusett Reservoir.
		Elevation - DEM	1:250,000	NMA		State	
		Hydrography	1:100,000	NMA	BASIN	State	MassGIS hydrography data: streams and ponds
		Soils	1:25,000	NMA		Four quadrangle area	Soil units as defined by the U.S. Soil Conservation Service. Covers a 4-quad area around the Wachusett Reservoir.
		Surficial geology	1:25,000	NMA		Four quadrangle area	Areas of surficial materials, including: sands & gravel, eskers, knobs & kettles, drumlins, alluvium, fill, wetlands, water bodies. Covers 4-quad area in Wachusett Reservoir.
	Haz	Landfills					
		Underground storage tanks				Watersheds	
	Infra	Roads	1:100,000	NMA	QUAD7.5	State	USGS DLG data processed by MassGIS
		Sewer					
		Sewer service areas					
		Water					
		Water service areas			STATE	MWRA Service Area	
	Land Use	Land use	1:25,000		TOWN		UMass/MassGIS land use datalayer
		Publically owned lands	1:25,000		BASIN		MassGIS Open Space layer

Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	File Unit	Data Extent	Additional Comments
MA-USGS		Zoning					
		Pol Bound					
		County boundaries	1:25,000	NMA	STATE	State	MassGIS datalayer
		State boundaries	1:25,000	NMA	STATE	State	Massachusetts only
		TIGER (reprocessed)	1:100,000	NMA		Service area	
		Town boundaries	1:25,000	NMA	STATE	State	MassGIS datalayer
	Sample	Stream gaging	POINT		STATE	Service area watershed	
	Water	Aquifers			BASIN		MassGIS datalayer
		Drainage basins					
		Reservoirs					
		River basins					MassGIS datalayer?
		Water supply watersheds					
		Wellhead protection areas					
		Wells (community)	POINT		STATE	State	MassGIS datalayer
		Wells (Ind, Ag, Commer)					
		Wells (non-community)					
		Wells (private)					
	Air	Pesticides	1:250,000	NMAS		National	Will be used for NAWQA.
	Earth	Hydrography	1:24,000	NMAS		Cape-wide	From DLG data.
		Hypsography (elevation contours)	1:250,000			Cape Cod	Bedrock contours
	Infra	Sewer	1:100,000	NMAS		Cape-wide	Needs updating - used 1:100,000 DLG roads and coded them.
		Sewer service areas	1:100,000	NMAS		Cape-wide	Needs updating - used 1:100,000 DLG roads and coded them.
	Land Use	Population or pop density				Nation	Census centroids.
		Protected areas	1:24,000			Cape-wide	Open space includes municipal and town owned and private owned.
	Sample	Stream gaging		NMAS		State	Up-to-date and well attributed.
		SWUDS		NMAS		State	Q
		Water quality		NMAS		State	Some areas better sampled than others.
	Water	Monitoring wells		NMAS		State	
		Reservoirs	1:250,000			Nation	Well attributed.
		Sole source aquifers	1:24,000				Received from MassGIS.
		Supply wells		NMAS		State	
		Wellhead protection areas	1:24,000				Received from MassGIS. Includes Well ZOCS - Zone II's - approved. Also have Cape Cod Commission Zone II areas.
		Wells (community)	1:24,000			Southeast Mass.	Received from MassGIS. Includes well ZOCS - Zone II's - approved. Also have Cape Cod Commission Zone II areas.
		Wells (private)	1:24,000			Eastham	

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Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	File Unit	Data Extent	Additional Comments
ME-BOH	Earth	Hypsography (elevation contours)			QUAD15		Data reside at OGIS.
	Infra	Roads					Data reside at OGIS.
	P	nd County boundaries			.5		Data reside at OGIS.

Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
ME-BOPC	Water	State boundaries			QUAD7.5		Data reside at OGIS.
		Town boundaries			QUAD7.5		Data reside at OGIS.
		Surface water (ponds,streams)			QUAD7.5		Data reside at OGIS.
		Bedrock geology					See ME-OGIS for scale, extent, etc. Data reside at OGIS.
		Hydrography					See ME-OGIS for scale, extent, etc. Data reside at OGIS.
	Earth	Soils					See ME-OGIS for scale, extent, etc. Data reside at OGIS.
		Surficial geology					See ME-OGIS for scale, extent, etc. Data reside at OGIS.
		Roads					See ME-OGIS for scale, extent, etc.
		County boundaries					See ME-OGIS for scale, extent, etc. Data reside at OGIS.
		State boundaries					See ME-OGIS for scale, extent, etc. Data reside at OGIS.
ME-DEP	Water	Town boundaries					See ME-OGIS for scale, extent, etc. Data reside at OGIS.
		Aquifers					See ME-OGIS for scale, extent, etc. Data reside at OGIS.
		Floodplains					See ME-OGIS for scale, extent, etc. Data reside at OGIS.
		Surface water (ponds,streams)					See ME-OGIS for scale, extent, etc. Data reside at OGIS.
		Wetlands					See ME-OGIS for scale, extent, etc. Data reside at OGIS.
	Earth	Elevation - DEM	1:24,000			Fore River watershed - in progress	
		Soils	1:24,000			Fore River watershed - in progress	
		Landfills	POINT			Fore River watershed	
		Underground storage tanks	POINT			Fore River watershed	
		Buildings	1:2,400			Camp Ellis	
ME-GS	Infra	Sewer service areas	POINT	95%		Portland, South Portland, Westbrook	
		Floodplains	1:2,400			Camp Ellis	
		Wetlands	1:24,000			York - in progress	
		Rare and endangered species	POINT			Casco Bay watershed	Taken from National Heritage database.
		Wildlife habitats	POINT			Casco Bay watershed	Taken from National Heritage database
	Air	Pesticides	1:24,000	12m	QUAD7.5	Few quads, Presque Isle area	Cooperative with EPA.
		Bathymetry	1:250,000	125m	QUAD250	One quad	
		Bedrock geology	1:24,000	12m	QUAD7.5	Few quads completed	
			1:62,500	32m	QUAD15	Few quads completed	
		Coastal zones	1:62,500	32m	QUAD15	Several quads	Ongoing automation program
	Earth	Earthquake epicenters	POINT	10,000m	REGION	Regional	Point locations updated regularly.
		Photo-lineament	1:100,000	50m	QUAD100	Lincoln, Lewiston	
		Sand dunes	1:4,800	5m	TOWN	Sand beaches	
		Landfills	1:24,000	12m	QUAD7.5	10% of state	Located on sand and gravel aquifer maps.
		Sand/salt piles	1:24,000	12m	QUAD7.5	10% of state	Located on sand and gravel aquifer maps.
	Sample Water	Marine sediment sampling	1:24,000	12m	QUAD7.5	5% of coast	Ongoing data acquisition and automation.
		Aquifers	1:24,000	12m	QUAD7.5	10% of state	Sand & gravel, ongoing data acquisitions and automation.
		Drainage basins	1:24,000	12m	QUAD7.5	State	Cooperative w/ USGS.
		River basins	1:500,000	250m	STATE	State	USGS data.

Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Title Unit	Data Extent	Additional Comments
ME-OGIS	Earth	Snow survey results		50m	STATE	State	From snow survey stations.
		Wells (community)	POINT	100m	TOWN	10% of state	Drillers have been required for 5+years to provide MGS with locations + pertinent data for wells drilled (no water usage or pop served). Data acquired since '90; accurately mapped.
		Wells (Ind, Ag, Commer)	POINT	100m	TOWN	10% of state	Drillers have been required for 5+years to provide MGS with locations + pertinent data for wells drilled (no water usage or pop served). Data acquired since '90; accurately mapped.
		Wells (non-community)	POINT	100m	TOWN	10% of state	Drillers have been required for 5+years to provide MGS with locations + pertinent data for wells drilled (no water usage or pop served). Data acquired since '90; accurately mapped.
		Wells (private)	POINT	100m	TOWN	10% of state	Drillers have been required for 5+years to provide MGS with locations + pertinent data for wells drilled (no water usage or pop served). Data acquired since '90; accurately mapped.
	Infra	Areas of high elevation	1:100,000			State	Areas with elevations above 2,700 feet.
		Bedrock geology	1:500,000			State	
		Elevation - DEM	1:24,000				
		Hydrography	1:100,000			State	Lakes, ponds, coastline, intermittent and perennial rivers and streams, and canals.
			1:24,000		QUAD7.5	30-50% of state	Both single and double line coverages available for rivers and streams. Another coverage for lakes and ponds.
		Metamorphic geology	1:1,000,000			State	
		Soils	1:24,000			Approximately 10% of state	Including enhanced drainage features.
		Surficial geology	1:250,000		QUAD250	State	
		Pipelines	1:100,000		QUAD100	State	
			1:24,000		QUAD7.5	30-50% of state	
		Railroads	1:100,000		QUAD100	State	
			1:24,000		QUAD7.5	30-50% of state	
		Roads	1:100,000		QUAD100	State	
			1:24,000		QUAD7.5	30-50% of state	
		Trails	1:100,000		QUAD100	State	
			1:24,000		QUAD7.5	30-50% of state	
		Transmission lines	1:100,000		QUAD100	State	
			1:24,000		QUAD7.5	30-50% of state	
	Land Use	Privately owned land	1:100,000		QUAD100	State	Major private land ownerships.
		Publically owned lands	1:100,000		QUAD100	State	State and federal lands in conservation and parks. Indian lands.
	Pol Bound	County boundaries	1:100,000		QUAD100	State	
			1:24,000		QUAD7.5	30-50% of state	
		Political boundaries	1:500,000				From USGS.
		State boundaries	1:100,000		QUAD100	State	
			1:24,000		QUAD7.5	35-50% of state	
		Town boundaries	1:100,000		QUAD100	State	
			1:24,000		QUAD7.5	30-50% of state	
		Aquifers	1:50,000		QUAD50	State	Aquifer boundaries from Maine Geological Surver sand and gravel aquifer and significant aquifer maps.
		Water supply watersheds	1:24,000		QUAD7.5	State	Watersheds of streams, rivers, ponds and lakes in Maine.
		Wetlands	1:100,000		QUAD100	State	From USGS DLG files



Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
			1:250,000		QUAD250	State	Areas of wet soils as shown on Maine Geological Survey surficial maps.
<b>NEW HAMPSHIRE</b> =====							
Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
NH-CSRC	Air	Forest cover; forest type	1:24,000		QUAD7.5	Coos County	Ongoing project in Coos County - due to be completed in Oct. 1992.
	Earth	Pesticides	1:24,000	NMAS	QUAD7.5	State	
		Bathymetry	1:24,000	?		Bathymetry for 2 waterbodies in NH	Bathymetry for Squam Lake and Great Bay. Exists in both point and contour line format. Contours were created using ARC/INFO TIN.
		Bedrock geology	1:250,000		STATE	State	
		Elevation - DEM	1:24,000	NMAS	QUAD7.5		
		Hydrography	1:24,000	NMAS	QUAD7.5	60% of state	Balance of State due by summer, 1992. This data is from the DLG files.
		Slope	1:24,000		QUAD7.5	Same extent as DEM data	Slope can be generated from DEM data.
		Soils	1:24,000	NMAS	QUAD7.5		
						Carroll, Grafton, Rock	
		Surficial geology	1:24,000	NMAS	QUAD7.5	6 quads	
	Infra	Roads	1:100,000	NMAS	QUAD7.5	State	USGS DLG 1:100,000 scale data.
			1:24,000	NMAS	QUAD7.5	60% of state	Roads from DLG data. Due for completion by summer, 1992.
		Sewer service areas	1:125,000		STATE	State	
		Water service areas	1:125,000		STATE	State	
	Land Use	Land cover	1:24,000		QUAD7.5	Coos County	Initial efforts are in Coos County. This data being interpreted from LANDSAT TM imagery.
		Land use	1:24,000	NMAS	QUAD7.5	very partial coverage	1955, 1974 and 1985 photography interpreted to support specific projects.
		Publically owned lands	1:24,000	NMAS	QUAD7.5	partial coverage of Coos County	Ongoing project. Initial efforts focusing on Coos County.
	Pol Bound	Census tracts	1:100,000	NMAS	QUAD7.5	Raw TIGER for entire State.	Raw TIGER data is available for the entire State, however only portions have been processed for specific projects.
		County boundaries	1:24,000	NMAS	QUAD7.5	60% of state	This data is from the DLG files.
		Political districts	1:24,000	NMAS	QUAD7.5	60% of state	
		State boundaries	1:24,000	NMAS	QUAD7.5	60% of state	This data is from the DLG files.
	Water	Aquifers	1:24,000	NMAS	QUAD7.5	Nashua, Lamprey, Exeter	Contocook in progress.
		Drainage basins	1:24,000	NMAS	QUAD7.5	State	
		Wells (community)	1:24,000	NMAS	QUAD7.5	50% of state	
		Wells (non-community)	1:24,000	NMAS	QUAD7.5	50% of state	
		Wetlands	1:24,000	NMAS	QUAD7.5	24 quadrangles	Wetlands Thematic Mapper data was ordered for Merrimack Watershed and automated in 1988. Entire state is due for completion by December, 1992.
NH-DES	Air	Pesticides	1:24,000	?	QUAD7.5	State	Parcel boundaries defining land to which pesticides have been applied from 1965 to 1988. Polygons contain applicator number which links to master table with more information.
	Haz	Landfills	1:24,000	+/- 200 ft.	?	90% of State	
		Pollutions sources	1:24,000	+/- 200 ft.	?	90% of State	Potential sources of contamination

Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
NH-OSP	Infra	Underground storage tanks	1:24,000	+/- 200 ft.	?	90% of State	
		Sewer service areas	1:125,000	?	?	State	Areas served by municipal sewer systems.
		Water service areas	1:125,000		?	State	Areas served by municipal water supply.
	Sample Water		1:24,000	?	?	Very limited	Areas served by public water supply.
		Stream gaging			STATE	State	Locations of stream gaging stations from USGS WRD.
		Aquifers	1:24,000	?	QUAD7.5	27 quadrangles	The aquifers are currently being mapped by the USGS and automated by CSRC for NHDES. Polygons are not coded, only arcs are coded for known, inferred, and concealed boundaries
		Dams	1:24,000	+/- 100 ft.	STATE	State	
		Drainage basins	1:24,000	?	BASIN	100% of State	Datalayer of 110 recognized watersheds in NH. Boundaries were compiled and digitized by DES WRD, and are based on boundaries originally delineated at 1:250,000 by US SCS.
		Public water supply	1:24,000	?	QUAD7.5	More than half of State	Field-checked well locations with extensive list of attributes. Points compiled onto quads and digitized. Initial statewide coverage expected to be completed in 1993.
	Air	Forest cover; forest type			COUNTY	State	There are two point coverages. One has 16,000 points which come from photo-interpretation of ground plots. The other has about 1,000 field-checked points with more attributes.
	Earth	Bedrock geology	1:250,000		STATE	100% of State	Polygons are coded to designate the type of geologic unit by age, formation name, and lithology. Arcs are coded to distinguish between normal geologic contacts and faults.
		Elevation - DEM	1:24,000	NMAS	QUAD7.5	15 quadrangles	This is USGS DEM point data at 30 meter intervals. The data is available for much of the State, however only 15 quadrangles have been acquired so far.
		Soils	1:24,000		QUAD7.5	About 2/5 of the State	This is a digital version of the county-based soil surveys prepared by the US SCS. All field work is about to be completed except for White Mtn. Nat'l Forest.
	Infra	Surficial geology	1:24,000		QUAD7.5	6 quadrangles	This datalayer consists of 3 different coverages: surficial material units, surficial exposures, and drumlins. Only a small portion of the state has been mapped.
		Pipelines	1:24,000	NMAS	QUAD7.5	41 quads	Data is USGS DLG 1:24,000/1:25,000 scale data. NH DOT and USGS are working to create statewide coverage. USGS is automating - about half of state is available for automation
		Railroads	1:24,000	NMAS	QUAD7.5	41 quads	Data is USGS DLG 1:24,000/1:25,000 scale data. NH DOT and USGS are working to create statewide coverage. USGS is automating - about half of state is available for automation
	Land Use	Roads	1:24,000	NMAS	QUAD7.5	41 quads	Data from USGS DLG 1:24,000/1:25,000 scale data. NH DOT and USGS are working to get statewide coverage. USGS is automating - about half of state is available for automation.
		Archaeological sites	1:24,000			Very limited	Discussions underway to automate archaeological areas. Some initial automations has been done in upper Merrimack River corridor.
		Land use	1:24,000	?	QUAD7.5	7 full quads, 24 partial quads	Land use change datalayer based on 1:20,000 photography from 1955 and 1974 and 1:40,000 1982 photo. Ten classes of land uses photo-interpreted and compiled onto orthophotoquads.
	Pol Bound	Political districts	1:24,000	NMAS	QUAD7.5	41 quads	Data from USGS DLG 1:24,000/1:25,000 scale data. USGS is automating data as it becomes available. About half the state is available currently.
	Water	Coastal wetlands	1:24,000	?	QUAD7.5	About 4 quads on coast	Coastal wetlands data based on delineations performed by consultants as part of New Hampshire Coastal Program. Codes are for: uplands, undesignated, or classified wetlands
		Wetlands	1:24,000	30m pixel sz	QUAD7.5	24 quadrangles	Wetlands Thematic Mapper data was ordered for Merrimack Watershed and automated in 1988. Entire state is due for completion by December, 1992.
	Wildlife	Rare and endangered species	1:24,000		QUAD7.5	State	Contains locational information regarding the distribution of rare or declining native plant and animals and exemplary natural communities. Locations have been buffered.

RHODE ISLAND  
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Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
RI-DEMGW	Haz	Above ground storage tanks	1:24,000		QUAD7.5	state	Last updated in July, 1991. Part of Facility Inventory coverage.
		Dry cleaning facilities	1:24,000		QUAD7.5	state	Last updated in April, 1991. Part of Facility Inventory coverage.
		Landfills	1:24,000		QUAD7.5	state	Last updated in June, 1991. Part of Facility Inventory coverage.
		Leaking USTs	1:24,000		QUAD7.5	state	Last updated in Dec., 1990. Part of Facility Inventory coverage.
		Misc. hazardous waste site	1:24,000		QUAD7.5	state	Includes spills and defense department sites. Spills and leaks last updated in Dec., 1990. Military facilities last updated in June, 1991.
		Sand/salt piles	1:24,000		QUAD7.5	state	State facilities last updated in Sept., 1988. Other facilities in Sept., 1987.
		Surface impoundments	1:24,000		QUAD7.5	state	Last updated in Feb., 1991. Part of Facility Inventory coverage.
		Undergrnd injection control site	1:24,000		QUAD7.5	state	Last updated in Jan., 1991. Part of Facility Inventory coverage.
		Underground storage tanks	1:24,000		QUAD7.5	state (except Block Island)	Last updated in 1990. Part of Facility Inventory coverage.
	Water	Groundwater classifications	1:24,000				Exists but is in draft form until state regulations implementing groundwater classifications have been formally adopted (early in 1992).
RI-EDC	Air	Aeroradioactivity	1:250,000	NMAS	STATE	State	Digitized from USGS aerorad maps.
		Forest cover; forest type	1:24,000	NMAS	QUAD7.5	State	This data can be derived from the Land Use/Land Cover datalayer.
	Earth	Bathymetry	POINT			Narragansett Bay	NOAA data for Narragansett Bay
		Bedrock geology	1:125,000	NMAS	?	State	Digitized from USGS Bedrock Geology map.
		Elevation - DEM	1:24,000	NMAS	QUAD7.5	5 partial quads	5 partial quads exist. 29 out of 37 quads are available in RI.
		Hydrography	1:24,000	NMAS	QUAD7.5	State	Digitized from USGS topo maps.
		Slope	1:24,000		QUAD7.5		Slope can be derived from DEM data.
		Soils	1:15,840		QUAD7.5	State	US SCS compiled soils onto mylars for automation. Both SCS and RIGIS own these data. Classified by 112 soil types in RI.
		Surficial geology	1:24,000	NMAS	?	State	Glacial deposits are coded for till, outwash, mixed, and bedrock classes. Digitized from USGS groundwater maps.
	Infra	Buildings			?	University of Rhode Island campus	
		Electric	1:24,000	NMAS		State	Major above-ground electrical transmission line right-of-ways for RI.
		Gas	1:24,000	NMAS		State	Major gas utility pipelines right-of-ways.
		Roads	1:24,000	NMAS	QUAD7.5	State	Roads digitized from USGS 7.5 minute quads. Coded for road, county, and functional classes. Annotation for major road names present.
		Sewer		NMAS	QUAD7.5	State	Public sewer system collection lines and treatment facilities.
	Land Use	Archaeological sites	1:24,000	NMAS	STATE	State	Known sites of archaeological significance (RESTRICTED ACCESS).
		Historic sites	1:24,000	NMAS	STATE	State	Above ground structures and districts listed with the National and State Historic Registers as of spring 1989.
		Land use	1:24,000	NMAS	QUAD7.5	State	Land use and land cover for RI with 34 Anderson Level II and III classes. Minimum mapping unit - 1/2 acre.

Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Title Unit	Data Extent	Additional Comments
		Publically owned lands	1:24,000	NMAS		State	Federal, state, and municipal owned recreation, conservation, and open space lands.
		Recreation facilities				Some towns	
	Pol Bound	Census tracts	1:100,000	NMAS		Partial coverage	Census tracts from TIGER data.
		State boundaries	1:24,000	NMAS	STATE	State	Rhode Island boundary
		TIGER (reprocessed)	1:100,000	NMAS		partial coverage	
		Town boundaries	1:24,000	NMAS	STATE	State	Political boundaries digitized from USGS topos, coded for FIPS and DOP town ID.
	Sample	Marine sediment sampling	POINT			Narragansett Bay	
		Soil boring sampling	1:15,840	NMAS	QUAD7.5	State	This data can be derived from the SCS Soil Survey data by linking this data to soil polygons.
	Water	Buffered wellhead prot areas	1:24,000		?	State	Current datalayer consists of 1000 ft buffer around wells (Interim WHPA). This is being updated to reflect applications of groundwater models.
		Floodplains	?				Data from FEMA flood hazard areas.
		Groundwater recharge areas	1:24,000	NMAS	STATE	State	Critical portions of areas recharging DEM GWD defined groundwater reservoirs.
		Groundwater reservoirs	1:24,000	NMAS	STATE	State	Two coverages of groundwater reservoirs as defined by: 1) The RI Water Resources Board 2) RIWRB map modified by DEM GWD
		Major drainage basins	1:24,000	NMAS		State	Major drainage basins for the state.
		Sole source aquifers	1:24,000			State	Digitized from DEM/USGS groundwater maps.
		Sub-drainage basins	1:24,000	NMAS	?	State	Sub-drainage basins within the Major drainage basins.
		Water supply watersheds	1:24,000	NMAS		State	
		Wells (community)	1:24,000	NMAS	?	State	Point locations of public wells that supply at least 15 service connections used by year-round residents or that regularly supply at least 25 year-round residents.
		Wells (non-community)	1:24,000	NMAS	QUAD7.5	1 town	
		Wetlands	1:24,000	NMAS	QUAD7.5	State	16-class wetlands data set based on the Cowardin, et al. classification system with 1/4 acre minimum mapping unit.
	Wildlife	Rare and endangered species	1:24,000	NMAS	STATE	State	Approximate locations of rare and endangered biotic species and communities. Locational coordinates only, no species names given (RESTRICTED ACCESS).
RI-NBP	Background	7.5' quad boundaries					Map neat lines for the USGS 7.5 min quad series covering RI. Generated from NAD 27 quad corner coordinates.
		Geodetic survey benchmarks	POINT			state	Point locations of National Geodetic Survey benchmakrs in Rhode Island in UTM and Lat-Long coordinates.
		Geographic names					Geographic names included on the USGS 7.5' topographic map series for RI.
	Haz	Oil spill sites					Aerial survey data from the World Prodigy oil spill, June, 1980. Extent of oil skick in Narragansett Bay.
	Infra	Dredged channels					Dredged channels in Narragansett Bay.
	Water	Coastal water use					Defined by State CRMC.
		Drainage basins	1:24,000	140ft		Narragansett Bay	Includes areas in Massachusetts + Rhode Island.
	Wildlife	Wildlife habitats	1:4,800				Accuracy = line reproduction during automation. Generated from geology type and benthic types, also included in database.
RI-OEC	Earth	Elevation - DEM					RIGIS data
		Hydrography					RIGIS data
		Soils					RIGIS soils
	Haz	CERCLIS sites					RIGIS data

Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Title Unit	Data Extent	Additional Comments
		Landfills					RIGIS data
		Spill sites					RIGIS data
		Underground storage tanks					RIGIS data
	Infra	Roads					RIGIS data
		Sewer					RIGIS data
		Water					RIGIS data
	Land Use	Land cover					RIGIS data, same as land use coverage.
		Land use					RIGIS data
		Protected areas					RIGIS data
		Publically owned lands					RIGIS data
	Pol Bound	State boundaries					RIGIS data
		Town boundaries					RIGIS data
	Water	Reservoirs					RIGIS data
		River basins					RIGIS data
		Water supply watersheds					RIGIS data
		Wetlands					RIGIS data

UNITED STATES - FEDERAL  
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Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Title Unit	Data Extent	Additional Comments
US-EPA1	Air	Pesticides	1:24,000	questionable	?	16 quads in New Hampshire	Pesticide application areas. No attributes exist.
	Backgroun	7.5' quad boundaries	1:24,000	excellent		CT	From CT. Includes name, number.
			1:24,000	good		NH, 16 quads	From UNH. Includes name.
			1:24,000	good		RI	From URI. Includes name.
			1:24,000	good		VT	From VT/ANR. Includes quad name.
	Earth	Bedrock geology	1:250,000	accurate		MA	From EPA/USGS. Includes geol type.
			1:250,000	Generalized	?	Mass.	Fractured bedrock datalayer - attributes include fracture type.
		Bedrock outcrops	1:62,500	poor		ME 2 quads	From ME USGS.
		Earthquake epicenters	POINT	good		Region I, II & Eastern Canada	From NYGS. Includes magnitude, locality, etc.
		Elevation - DEM	1:24,000	good		CT	From USGS. Includes elevation.
		Generalized bedrock	1:1,000,000	fair		Region I	From State of NH.
			1:150,000	poor		CT	From CDM. Includes bedrock type.
		Glacial deposits	1:24,000	draft		RI 12 quads	From URI. Includes deposit code.
		Hydrography	1:100,000	good		Region I	From USGS/EPA. Includes watertype.
			1:2,000,000	good		Region I	From USGS/EPA. Includes description.
			1:24,000	good		CT, 30 quads	From USGS/CT DEP. Includes water type.
			1:24,000	good		ME, 2 quads	From EPA.
			1:24,000	good		RI	From URI.
		Hypsography (elevation contours)	1:2,000,000	fair		Region I	From EPA/USGS. Includes contours, elevation points.
			1:24,000	good		ME, 2 quads	From EPA. Includes elevation.

Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
Haz		Mineral resources	1:24,000	good		VT 31 quads	From VT/ANR. Includes rocktype, age, owner, position.
		Soils	1:24,000	good		24 quads in Vermont	From VT-OGIS. Includes soil type.
			1:24,000	good		ME, 2 quads	From SCS, EPA. Includes soil type.
		Stratified drift	1:125,000	Generalized	?	Connecticut	Datalayer of Specialized Saturated Thickness.
		Surficial geology	1:24,000	good		ME 2 quads	From ME USGS/EPA. Includes type of surficial material.
		Hazardous waste sites	?			VT, 31 quads	From VT/ANR. Includes site, name, type.
		Landfills	POINT	fair		Conn.	From EPA. Includes EPA id.
			POINT	fair		CT	From CT DEP.
			POINT	fair		RI	From EPA. Includes EPA id.
			POINT	fair		States of CT, RI	From EPA data system. Includes EPA ID number.
		NPDES outfalls	POINT	good		Blackstone Basin	From GPS. Includes GPS/Loc. Acc. related.
			POINT	good		NH, 16 quads	From WGP, RI. Includes many.
		Pollutions sources	?	poor		VT, 31 quads	From VT/ANR. Includes site type.
		RCRA facilities		Fair	?	EPA Region I	RCRA generator sites coded with address.
		RCRA generators		Fair	?	EPA Region I	Locations of RCRA generators coded with address and EPA ID.
		RCRA storage facilities		Fair	?	EPA Region I	Locations of RCRA storage facilities coded with address, EPA ID, and NPL.
		RCRA treatment, storage, disposal		Varied	STATE	EPA Region I	RCRA treatment, storage, and disposal facilities in EPA Region I. Sources of the data are various.
		Underground storage tanks		Fair	?	Connecticut	Underground storage tanks which were located by address-matching. Name of the site and address are included as attributes.
Infra		Railroads	1:100,000	good		Region I	From USGS/EPA. Includes number of tracks, type.
			1:25,000	good		MA, 4 quads	From USGS.
		Roads	1:100,000	good		Region I	From USGS/EPA. Includes number, type, description.
			1:2,000,000	good		Region I	From USGS/EPA. Includes number, type, description.
			1:24,000	good		ME, 2 quads	From USGS/EPA.
			1:24,000	good		RI	From URI.
		Farmland	1:24,000	fair		ME, 2 quads	From EPA. Includes code for cleared.
		Land use		?	?	Most of Rhode Island	Two coverages of land use/land cover data, one with 8 classes and the other with 20 classes. Data from imagery with 30 meter resolution?
			1:24,000	Good	?	2 quads in Connecticut?	Land use datalayer coded by land use category.
		Land use/land/cover	1:24,000	good		State of MA	From McConnell aerial photos. Includes landuse codes.
Pol Bound			30M	unknown		24 quads in NH	From UNH. Includes landuse code. Landsat Thematic Mapper.
		Open space	1:24,000	unknown		State of RI	From RIGIS. Includes type.
		Protected areas	1:25,000	accurate		MA	From MAGIS. Includes state program.
			1:62,500	poor		NH	From UNH. Includes responsible party.
		State owned lands	1:24,000	unknown		State of CT	From CT-DEP. Includes type, name, acres.
		County boundaries	1:2,000,000	good		Region I	From USGS/EPA. Includes fips, county, state.
		Indian reservations	1:24,000	poor		CT, Mashantucket Pequot	From EPA.
			1:24,000	good		MA, Wampanoag	From Rizzo Assoc.
			1:24,000	poor		ME, Houlton Malisett	From EPA.
			1:24,000	poor		ME,	From EPA.

Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
						Passamoquoddy/Town	
		Population	1:24,000	poor		ME, Passamoquoddy/PP	From EPA.
				good		Region I	From U.S. Census. Includes pop 90, town, density.
			POINT			Region I	From MARF U.S. Census. Includes population 70 through 85, fips.
		Postal carrier routes					
		State boundaries	1:2,000,000	good		Region I	From USGS/EPA. Includes fips, county, state.
		Town boundaries	1:125,000	good		NH	From UNH. Includes name, fips, rpa.
			1:24,000	good		16 quads NH	From UNH. Includes name.
			1:24,000	good		CT	From CT DEP. Includes name, county.
			1:24,000	good		ME, 2 quads	From USGS/EPA.
			1:24,000	good		RI	From URI. Includes name, fips, county.
			1:24,000	good		VT, 31	From EPA.
			1:25,000	good		MA	From MAGIS. Includes name, fips, county.
			1:250,000	poor		VT 31 Q	From VT/ANR. Includes townname.
		Zip code centroids	POINT	poor		Region I	From GDT/EPA HQ. Includes zip.
Sample		Ozone monitoring stations	POINT	fair		Region I & II	From Airs. Includes id, 1987, 1988 data.
		Precipitation monitoring	POINT	good		CT	From CT DEP. Includes name, number, status.
Water		Aquifers	1:24,000	good		2 quads, ME	From ME USGS. Includes <, > 50 gpm.
			1:24,000	good		Plymouth, MA	From EPA.
			1:24,000	good		State of RI	From RIGIS. Includes name.
			1:48,000	accurate		MA	From MA EDOEA. Includes type, yield.
			1:62,500	fair		2 quads Maine	From ME USGS.
		Coastline	1:25,000	Fair	?	Mass, Bay and Portland, ME	NOAA coastline for Mass. Bay area and Portland, ME area.
		Dams	1:2,000,000	good		Region I	From USGS/EPA. Includes name.
			1:24,000	good		RI 12 quads	From URI.
			1:24,000	draft		VT 31 quads	From VT/ANR. Includes dam name, town.
		Hydrologic Unit Codes	1:2,000,000		?	EPA Region I	Hydrologic Unit Code boundaries coded with HUC ID number.
		Monitoring wells	POINT	good		NH, 16 quads	From WGP, RI. Includes many.
			POINT	good		RI 2 quads	From EPA.
		Public water supply	1:24,000	Good	?	Connecticut	Surface water supplies in Connecticut.
			POINT	good		NH, 16 quads	Location of intakes. Source WGP, RI. Includes many attributes.
		River basins	1:100,000	Generally?	?	Mass.	Major basins and subbasins for Massachusetts coded with basin names.
			1:125,000		?	Connecticut	Major basins and subbasins for Connecticut coded with basin number.
			1:125,000	Fair	?	New Hampshire	Major basins for New Hampshire coded with basin names.
			1:24,000	Poor	?	Lake Champlain, VT	Major basins and subbasins in the Lake Champlain area coded with basin name and basin number?
			1:24,000	Good	?	Rhode Island	Major basins and subbasins for Rhode Island coded with basin code number.
		Supply wells	POINT	good		NH, 16 quads	From WGP, RI.
			POINT	good		States of RI, NH	GPS collected. Includes PWSID number.
		Water supply watersheds	1:24,000	Good	?	New Hampshire	Watersheds for New Hampshire coded with Hydrologic Unit.

Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
			1:24,000	unknown		State of CT	From CT-DEP. Includes name, utility name.
		Wells (community)	POINT	good		CT	From CT DEP. Includes name, supply code, aquifer.
			POINT	excellent		MA	From MAGIS. Includes pwsid, usgs id, name.
			POINT	good		NH 16 quads	From WGP, R1.
		Wells (non-community)	POINT	good		NH, 16 quads	From WGP, R1.
		Wells (private)	POINT	good		ME, 2 quads	From EPA Region I. Includes nitrate concentration.
		Wetlands	1:24,000	Good	?	Rhode Island	Wetlands which were mapped and digitized by IEP.
			1:24,000	good		VT, 18 quads	From VT/ANR.
Wildlife	Rare and endangered species		?			VT, 31 quads	From VT/ANR. Includes Nat'l Her. Code.

VERMONT  
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Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
VT-ANR	Earth	Bedrock geology	1:24,000			limited	
		Hydrography	1:100,000			State	USGS-DLG
			1:20,000			Limited areas	UVM
			1:5,000			Limited areas	UVM
		Soils	1:20,000		COUNTY	7 Counties	UVM
	Infra	Roads	1:100,000			State	USGS-DLG
	Land Use	Population or pop density					Default census data
	Pol Bound	County boundaries	1:24,000			State	EPA Region I - enhanced here
		State boundaries	1:24,000			State	EPA Region I - enhanced here
		Town boundaries	1:24,000			State	EPA Region I - enhanced here
	Water	Drainage basins	1:24,000			Limited	
		Reservoirs	1:24,000			State	
		River basins	1:100,000			State	
		Surface water (ponds, streams)	1:100,000			State	USGS-DLG
			1:20,000			Limited areas	
			1:5,000			Limited areas	
		Surface water classifications	1:100,000			Winooski River basin only	
		Wellhead protection areas	1:24,000			State	
		Wells (community)					
		Wetlands	1:80,000			70% of state	National Wetlands Complexes only
	Wildlife	Rare and endangered species	1:24,000			State	
		Wildlife habitats	1:24,000			30% of state	
VT-OGIS	Background	7.5' quad boundaries	?		STATE	State	
		DLG tile boundaries	?		STATE	State	
		Orthophoto boundaries	1:5,000		STATE	State	
	Earth	Elevation - DEM	1:5,000		VT-OP4	Chittenden county except along borders	
		Hydrography	1:100,000		VT-DLG	State	
			1:20,000		' '6	Chittenden,	Single line surface waters (no lake or po undaries),



Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
						Franklin, Grand Isle	from 1:20,000 orthophotos.
			1:5,000		VT-OP12	Addison, Orange, Rutland, Windham	
		Hypsography (elevation contours)	1:5,000		VT-OP4	Chittenden County except along boundar	
		Lakes	1:100,000		STATE	State	
		Soils	1:20,000		VT-OP16	Addison, Orage, Rutland, Windham cty	
Haz		Hazardous waste sites	1:25,000		STATE	State	
		Pollutions sources	1:63,360		STATE	State	
Infra		Railroads	1:100,000		VT-DLG	State	
		Roads	1:100,000		VT-DLG	State	
		Transmission lines	1:100,000		VT-DLG	State	
		Transportation	1:20,000		VT-OP16	Chittenden, Franklin, Grand Isle	
Land Use		Managed areas	?		STATE	State	
Pol Bound		County boundaries	1:250,000		STATE	State	
		Regional environmental districts	1:250,000		STATE	State	
		Regional Planning Commission	1:250,000		STATE	State	
		Town boundaries	1:24,000		STATE	Addison, Orange, Rutland, Windham	
			1:250,000		STATE	State	
			1:62,500		STATE	State	
Water		Buffered wellhead prot areas	1:25,000		STATE	State	
		Lake/pond drainage basins	1:25,000		STATE	State	Pre-release of lakes and ponds drainage basins.
		River drainage basins	?		STATE	State	
		Water supply watersheds	1:25,000		STATE	State	
		Wellhead protection areas	1:25,000		STATE	State	
		Wells (community)	1:25,000		STATE	State	For delineated wellhead protection areas
		Wetlands	1:24,000		VT-DLG	QUAD16 files 11-15,21,23,24,31-33	
Wildlife		Endangered invertebrate species	1:25,000		STATE	State	Subset of endangered species coverage.
		Endangered natural communities	1:25,000		STATE	State	Subset of endangered species coverage.
		Endangered plant species	1:25,000		STATE	State	Subset of endangered species coverage.
		Endangered vertebrate species	1:25,000		STATE	State	Subset of endangered species coverage.
		Rare and endangered species	1:25,000		STATE	State	

**TABLE D-2**

**Planned Data by Organization**

Table D-2:Planned GIS Data by Organization

CONNECTICUT  
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Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
CT-NRC	Earth	Hydrography (network)	1:24,000		QUAD7.5		Derived from hydrography (subset) coverage, specifically for network applications.
		Soils	1:15,840			None completed	18 quads in eastern CT are digitized and being reviewed by SCS. Digitizing by SCS, DEP and contractors. Limited program; will take many years at present rate.
	Haz	CERCLIS sites	1:24,000				CERCLIS sites: NPL, Non-NPL. Digital database must be created from Hazard. Materials Management files, but locational info must have QA/QC.
		RCRA facilities	1:24,000				RCRA facilities, TSD, generator. Digital database must be created from Hazard. Materials Management files, but locational info must have QA/QC.
		SARA sites	1:24,000				Digital database must be created from Hazard. Materials Management and Air files, but locational info must have QA/QC.
		Spill sites	1:24,000				State database, federal database. Digital database must be created from Hazard. Materials Management files, but locational info must have QA/QC.
		Underground storage tanks	1:24,000				Digital database must be created from Hazard. Materials Management files, but locational information must have QA/QC.
	Land Use	Land use		30 meters		State	TM multi temporal stellite imagery. LU data cover the entire state and are currently in ERDAS format to be converted to ARC/INFO summer of 91.
	Pol Bound	County boundaries	1:24,000				
		Regional Planning Commission	1:24,000				
		Town boundaries	1:24,000				
	Sample	Marine sediment sampling	1:80,000				Being produced with University of New Haven.
	Water	NPDES sites	1:24,000				Digital database must be created from Water Compliance files but locational information must have QA/QC.
		Public water supply	1:24,000				

MASSACHUSETTS  
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Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
MA-BBP	Sample	Water quality	POINT	unknown		Buzzards Bay	Water quality sampling data
MA-MBP	Earth	Bathymetry				MA & Cape Cod Bays, Merrimack Embayment	In conjunction with EPA Region 1, MWRA, EOE, and Mass. Division of Marine Fisheries.
		Coastal segmentation				From NH border to Provincetown	
	Haz	NPDES outfalls				Selected embayments only	MiniBays will collect data.
	Infra	Combined Sewer Overflows				Selected embayments only	MiniBays will collect data.
		Stormdrains				Selected embayments only	MiniBays will collect data.
	Sample	Marine sediment sampling					
	Water	Drainage sub-basins				Selected embayments only	
		Water quality and circulation				Mass and Cape Cod Bays	In development.

Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Title Unit	Data Extent	Additional Comments
MA-MWRA	Wildlife	Living resources				Selected embayments only	MiniBays will collect data (shellfish, etc).
	Land Use	Population or pop density					
<b>MAINE</b> =====							
Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Title Unit	Data Extent	Additional Comments
ME-BOH	Earth	Hypsography (elevation contours)			QUAD7.5		Currently being digitized and will be made available when completed.
ME-BOPC	Water	Wells (community)	POINT	GPS			
		Wells (non-community)	POINT	GPS			
	Land Use	Farmland			QUAD7.5	4 quads in Ardoostook County	Part of pilot farmland mapping project.
ME-DEP	Water	Wellhead protection areas					Planned by Department of Human Services - Drinking Water Control.
	Wildlife	Rare and endangered species					Planned by the Maine State Planning Office.
	Air	Ozone study					
	Haz	Underground storage tanks	POINT			Fore River watershed	
	Land Use	Land cover	1:24,000			Fore River watershed	
		Land use	1:24,000			Fore River watershed	
ME-GS		Zoning	1:2,400			Fore River watershed, Harspswell	
	Sample	Marine sediment sampling					
	Wildlife	Rare and endangered species	POINT			Casco Bay watershed	Taken from National Heritage database.
		Wildlife habitats				Casco Bay watershed	Taken from National Heritage database
	Earth	Bathymetry	1:250,000	123m	QUAD7.5		
		Bedrock geology	1:24,000	12m	QUAD7.5		
			1:62,500	32M	QUAD7.5		
		Coastal zones	1:62,500	32m	QUAD7.5		Ongoing automation project.
		Earthquake epicenters	POINT	10,000m	REGION	Regional	
		Hydrography	1:24,000	12m	QUAD7.5		Cooperative program with several agencies.
	Haz	Landfills	1:24,000	12m	QUAD7.5		To be located on sand and gravel aquifer maps.
		Sand/salt piles	1:24,000	12m	QUAD7.5		To be located on sand and gravel aquifer maps.
	Infra	Roads	1:24,000	12m	QUAD7.5		Cooperative with several agencies.
	Pol Bound	Town boundaries	1:24,000	12m	QUAD7.5		Cooperative program with several agencies.
	Sample	Marine sediment sampling	1:24,000	12m	QUAD7.5		Ongoing data acquisition and automation.
	Water	Aquifers	1:24,000	12m	QUAD7.5		Sand & gravel, ongoing data acquisition and automation.
		Wells (community)	POINT	100m	TOWN		Drillers have been required for 5+years to provide MGS with locations + pertinent data for wells drilled (no water usage or pop served). Data acquired since '90; accurately mapped.
		Wells (Ind, Ag, Commer)	POINT	100m	TOWN		Drillers have been required for 5+years to provide MGS with locations + pertinent data for wells drilled (no water usage or pop served). Data acquired since '90; accurately mapped.
		Wells (non-community)	POINT	100m	TOWN		Drillers have been required for 5+years to provide MGS with locations + pertinent data for wells drilled (no water usage or pop served). Data acquired since '90; accurately mapped.
		Wells (private)	POINT	100m	TOWN		Drillers have been required for 5+years to provide MGS with locations + pertinent data for wells drilled (no water usage or pop served). Data acquired since '90; accurately mapped.

Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
ME-OGIS	Miscellan	Miscellaneous comment					or pop served). Data acquired since '90; accurately mapped. No current funding for major layers; individual agency projects will contribute to database.

NEW HAMPSHIRE  
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Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
NH-CSRC	Air	Forest cover; forest type	1:24,000		QUAD7.5	Coos County	Ongoing project in Coos County - due to be completed in Oct. 1991
	Earth	Hydrography	1:24,000	NMAS	QUAD7.5	40% of State	The remaining 40% of State due to be complete by summer, 1992. This data is from the DLG files.
		Soils	1:24,000	NMAS	QUAD7.5	Hillsborough, Coos, Cheshire Counties	These counties are in progress.
	Infra	Roads	1:24,000	NMAS	QUAD7.5	40% of state	Remaining 40% of state due for completion by summer, 1992. Data are from the DLG files.
	Land Use	Land cover	1:24,000		QUAD7.5		
		Publically owned lands	1:24,000	NMAS	QUAD7.5		Ongoing project. Initial efforts focusing on Coos County.
	Pol Bound	County boundaries	1:24,000	NMAS	QUAD7.5	40% of state	Remaining 40% of state due for completion by summer, 1992. This data are from the DLG files.
		Political districts	1:24,000	NMAS	QUAD7.5	40% of state	The remaining 40% of state due for completion by summer, 1992.
		State boundaries	1:24,000	NMAS	QUAD7.5	40% of state	Remaining 40% of state due for completion by summer, 1992. This data is from the DLG files.
	Water	Wetlands	1:24,000	NMAS	QUAD7.5	State	Based on LANDSAT Thematic Mapper. Due for completion by December, 1992.
NH-DES	Haz	Pollutions sources	1:24,000	+/- 100 ft.	QUAD7.5	None	NH DES is helping to fund Regional Planning Agencies (RPAs) to locate and map point/non-point pollution sources. Much of water pollution sources mapped but need updating.
NH-OSP	Land Use	Historic sites	1:24,000			None	Discussions underway to develop pilot project to automate existing historic inventories maintained by Historic Resources.
		Land cover	1:24,000		QUAD7.5	None	Imagery is available, and classification taking place on an as needed basis. Currently, 20 classes of land cover have been classified for three towns in Carroll and Grafton Co.
		Publically owned lands	1:24,000		QUAD7.5	None	Sources of this data will be: USGS DLG data (24K scale), parcel boundaries, and current mapping of LCIP parcels being undertaken by the Society of Protection of NH Forests.
		Recreation facilities	1:24,000			None	During fall of 1991, recreation areas in Coos County will be located and digitized as part of Northern Forest Lands Project. OSP will be starting statewide public access to waters
	Wildlife	Wildlife habitats	1:24,000		QUAD7.5	None	This datalayer will be derived from the LANDSAT imagery already obtained by the State. Future plans are to link data to the Fish&Game's computerized Fish&Wildlife Info. Sys

RHODE ISLAND  
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Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
RI-EDC	Water	Wellhead protection areas	1:24,000	NMAS			Ongoing project to apply groundwater models to determine actual WHPAs to wells. These are then being digitized for inclusion in RIGIS.

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VERMONT  
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Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Title Unit	Data Extent	Additional Comments
VT-ANR	Infra	Roads	1:5,000			State	Orthophoto - from OGIS
	Land Use	Publically owned lands					
		Recreation facilities	1:24,000			State	Part of SCORP effort (due 1993)
		Pol Bound TIGER (reprocessed)					

**TABLE D-3**

**Needed Data by Organization**

Table D-3: Needed GIS Data by Organization

CONNECTICUT  
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Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
CT-NRC	Haz	Pesticide areas					
	Water	Wetlands					Existing coverage does not meet regulatory criteria.

MASSACHUSETTS  
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Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
MA-BBP	Earth	Hydrography	1:25,000			Buzzards Bay watershed	Need 1:25,000 scale DLG hydrography.
	Land Use	Land use	1:25,000			Buzzards Bay watershed	Need updated land use - current MassGIS data layer is too old (1985).
	Sample	Marine sediment sampling	POINT			Buzzards Bay	Would like to add station locations where data on sediments have been collected.
		Water quality	POINT			Buzzards Bay	Water quality sampling data
	Wildlife	Shellfish areas				Buzzards Bay	Need shellfish habitat data (at 1:25,000 scale or larger; preferably 1:5,000 scale to go with the existing shellfish management areas data layer).
MA-DFA	Earth	Soils				State	
	Land Use	Land use	1:25,000			State	Need updated land use - current MassGIS land use is too old (1985).
MA-EOEA	Sample	Sediment Chemistry					
MA-EOEAD	Earth	Soils					
MA-MBP	Background	Land base map	1:5,000				
	Haz	Non-point pollution sources					Data that will allow estimates of nonpoint source input including actual area (acres) of impervious surfaces.
		Sewage disposal type					
	Land Use	Land use					Need update.
		Population or pop density					
	Sample	Marine sediment sampling					From USGS.
	Water	Coastal features					For oil spill and emergency response. Including marsh, dune, armored shoreline, piers, marinas, bird nesting areas, fish spawning areas.
		Coastline	1:5,000				
		Dams					
		Floodplains				Coast and rivers	
		NPDES sites					Accurate for entire coastline.
		Offshore base map				State	Comparable to land base info: including bathymetry, navigational hazards, sediment type, waste disposal, level of high and low tide.
		Saltwater intrusion				Estuaries	
		Volume of water flow				Rivers	
		Wetlands	1:5,000				
	Wildlife	Anadromous fish runs					Including locations of dams.
		Living resources					Living resources of the marine environment.
		Shellfish areas					



Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
MA-MWRA	Earth	Bathymetry	1:25,000			Gulf of Maine	Need bathymetry data for Gulf of Maine. Currently only have data for Massachusetts Bay.
		Elevation - DEM				MWRA Service Area	Need 30-meter DEM data for entire MWRA service area - only select quads currently exist.
	Infra	Roads				MWRA Service Area	Need larger-scale roads coverage than the 1:100,000 scale which exists. Also, would like it to be annotated with road names.
	Land Use	Land use				MWRA Service Area	Need updated land use.

MAINE  
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Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
ME-BOH	Haz	CERCLIS sites					Overlays to be used for wellhead protection and risk assessment to identify water sources considered to be at risk.
		Landfills					
		RCRA facilities					
		Sand/salt piles					
		Sewage lagoons					
		Spill sites					Contracts are planned to fund the location of point source contaminants and to build the appropriate database for each.
		Underground storage tanks					
	Water	Drainage basins					
		Reservoirs					
		River basins					
ME-BOPC	Air	Pesticides					No available funding for mapping use data.
	Haz	Spill sites					Would be desirable to locate pesticide spill areas.
	Infra	Railroads					
		Rights of Way					Would like to locate those private domestic wells w/ residue levels on GIS.
	Land Use	Golf courses					
	Water	Wells (private)					
ME-DEP	Earth	Elevation - DEM	POINT	1:24,000		All but North Central Maine Fore River watershed	Focus on all layers at 1:24,000 for urban and coastal Maine. Much of the data (e.g., wetlands and soils) need to be recompiled before digitizing.
	Haz	Underground storage tanks					
ME-OGIS	Earth	Bathymetry	POINT	1:24,000			Focus on all layers at 1:24,000 for urban and coastal Maine. Much of the data (e.g., wetlands and soils) need to be recompiled before digitizing.
		Elevation - DEM	POINT	1:24,000			Focus on all layers at 1:24,000 for urban and coastal Maine. Much of the data (e.g., wetlands and soils) need to be recompiled before digitizing.
		Soils					Focus on all layers at 1:24,000 for urban and coastal Maine. Much of the data (e.g., wetlands and soils) need to be recompiled before digitizing.
	Land Use	Land use/land/cover		1:24,000			Focus on all layers at 1:24,000 for urban and coastal Maine. Much of the data (e.g., wetlands and soils) need to be recompiled before digitizing.
	Water	Wetlands		1:24,000			Focus on all layers at 1:24,000 for urban and coastal Maine. Much of the data (e.g., wetlands and soils) need to be recompiled before digitizing.

Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
							recompiled before digitizing.

**NEW HAMPSHIRE**  
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Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
NH-CSRC	Air	Forest cover; forest type	1:24,000		QUAD7.5	State	Current project in Coos County is developing this data, however future funding to increase coverage does not exist Statewide coverage needed, however not all quads are available.
	Earth	Elevation - DEM	1:24,000	NMAS	QUAD7.5	State	
	Land Use	Land cover	1:24,000		QUAD7.5	State	
		Land use	1:24,000	NMAS	QUAD7.5		
	Water	Aquifers	1:24,000	NMAS	QUAD7.5	State	
NH-DES	Infra	Sewer service areas	1:24,000		?	None	This layer will contain the extent of areas served by public sewer as well as the collection system and treatment facilities. Data on population served, etc. will be included.
	Water	Aquifers	1:24,000		QUAD7.5	State	Completed statewide aquifer data layer.
		Wetlands	1:24,000	?	?	None	Wetlands mapping has been completed for entire State by the US Fish and Wildlife Service. It is being considered for automation.
NH-OSP	Land Use	Zoning			QUAD7.5	None	Regional Planning Agencies may contribute zoning districts.

**RHODE ISLAND**  
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Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
RI-EDC	Background	Orthophoto images				State	Would like orthophoto images as background to ARC/INFO data.
	Land Use	Land use	1:24,000			State	Would like updated land use - current land use is from 1988 aerial photos.
	Pol Bound	TIGER (reprocessed)				State	Would like complete address-matched roads for the state.
RI-NBP	Earth	Bathymetry					Updates beyond the first base line data will be needed. Updates beyond the first base line data will be needed. Updates beyond the first base line data will ne needed. Need updated land use for Non-point source program.
	Sample	Marine sediment sampling					
	Wildlife	Marine Finfish					
		Marine Invertebrates					
		Marine macrophytes					
RI-OEC	Land Use	Land use	1:24,000			State	

**UNITED STATES - FEDERAL**  
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**VERMONT**  
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Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
VT-ANR	Air	Air quality					Priority 27, status 0 on Needs Analysis Summary Table. Priority 27, status 1 on Needs Analysis Summary Table.
		Forest cover; forest type					
	Background	USGS reference marks					
	Earth	Hydrography					
		Surficial geology					

Organization Reference	Data Type	Data Layer	Source Scale	Data Accuracy	Tile Unit	Data Extent	Additional Comments
	Haz	Landfills					
		Underground storage tanks	1:5,000			State	Using GPS; conversion to GIS not funded.
	Infra	Drainage					NPDES, CSO's
		Roads					Priority 27, status 1 on Needs Analysis Summary Table.
	Land Use	Archaeological sites					
		Historic sites					
		Land cover					
		Land use					
		Protected areas					
		State owned lands					Priority 27, status 1 on Needs Analysis Summary Table.
	Pol Bound	Census tracts					
		Zip code boundaries					
	Sample	Stream gaging					
	Water	Aquifers					
		Floodplains					
		Groundwater classifications					
		Surface water classifications				Other than Winooski River basin	
		Water supply watersheds					
		Wells (private)					

**TABLE D-4**

**Existing Data by Data Type**

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Table D-4: Existing GIS Data by Data Layer

	Data Layer	Org Reference	Source Scale	Data Accuracy	Tile Unit	Data Extent
Air	Aeroradioactivity	CT-NRC	1:250,000			State
		RI-EDC	1:250,000	NMAS	STATE	State
	Emissions source	CT-NRC	POINT			State
	Forest cover; forest type	NH-CSRC	1:24,000		QUAD7.5	Coos County
		NH-OSP			COUNTY	State
		RI-EDC	1:24,000	NMAS	QUAD7.5	State
	Pesticides	MA-USGS	1:250,000	NMAS		National
		ME-GS	1:24,000	12m	QUAD7.5	Few quads, Presque Isle area
		NH-CSRC	1:24,000	NMAS	QUAD7.5	State
		NH-DES	1:24,000	?	QUAD7.5	State
		US-EPAI	1:24,000	questionable	?	16 quads in New Hampshire
	Radon	CT-NRC	1:24,000			State
	Background 7.5' quad boundaries	CT-NRC				State
		MA-EOEAD	1:25,000		STATE	state
		RI-NBP				
		US-EPAI	1:24,000	good		NH, 16 quads
		US-EPAI	1:24,000	excellent		CT
		US-EPAI	1:24,000	good		VT
		US-EPAI	1:24,000	good		RI
		VT-OGIS	?		STATE	State
Earth	Census tracts	MA-EOEAD	1:100,000			2 halves of state
		MA-EOEAD	1:250,000			3 250k quads
	DLG tile boundaries	VT-OGIS	?		STATE	State
	Geodetic survey benchmarks	RI-NBP	POINT			state
	Geographic names	RI-NBP				
	Land base map	CT-NRC	1:100,000			Long Island Sound
	Orthophoto boundaries	VT-OGIS	1:5,000		STATE	State
	State plane grid (10000 ft)	MA-EOEAD	1:25,000		STATE	state
	Areas of high elevation	ME-OGIS	1:100,000			State
	Bathymetry	MA-BBP	POINT			Buzzards Bay
		MA-EOEA				
		MA-EOEAD	1:25,000		QUAD7.5	selected quads
		MA-MWRA		NMA	HARBOR	Boston Harbor
		ME-GS	1:250,000	125m	QUAD250	One quad
		NH-CSRC	1:24,000	?		Bathymetry for 2 waterbodies in NH
		RI-EDC	POINT			Narragansett Bay
	Bedrock geology	CT-NRC	1:24,000			10% of state
		CT-NRC	1:125,000			10% of state
		MA-MWRA	1:25,000	NMA		Four quadrangle area
		ME-BOPC				
		ME-GS	1:62,500	32m	QUAD15	Few quads completed
		ME-GS	1:24,000	12m	QUAD7.5	Few quads completed
		ME-OGIS	1:500,000			State
		NH-CSRC	1:250,000		STATE	State
		NH-OSP	1:250,000		STATE	100% of State
		RI-EDC	1:125,000	NMAS	?	State
		US-EPAI	1:250,000	Generalized	?	Mass.
		US-EPAI	1:250,000	accurate		MA
		VT-ANR	1:24,000			limited
	Bedrock outcrops	US-EPAI	1:62,500	poor		ME 2 quads
	Coastal zones	CT-NRC	1:24,000			State
		MA-EOEA	1:25,000			
		ME-GS	1:62,500	32m	QUAD15	Several quads
	Earthquake epicenters	ME-GS	POINT	10,000m	REGION	Regional
		US-EPAI	POINT	good		Region I, II & Eastern Canada
	Elevation - DEM	CT-NRC	1:24,000			State
		MA-EOEAD	1:250,000	NMA		state
		MA-EOEAD	1:25,000			189 25k quads
		MA-EOEAD	1:250,000			28 unique grid
		MA-MWRA	1:250,000	NMA		State
		ME-DEP	1:24,000			Fore River watershed - in progress
		ME-OGIS	1:24,000			
		NH-CSRC	1:24,000	NMAS	QUAD7.5	
		NH-OSP	1:24,000	NMAS	QUAD7.5	15 quadrangles
		RI-EDC	1:24,000	NMAS	QUAD7.5	5 partial quads
		RI-OEC				
		US-EPAI	1:24,000	good		CT
		VT-OGIS	1:5,000		VT-OP4	Chittenden county except along borders
	Generalized bedrock	US-EPAI	1:150,000	poor		CT
		US-EPAI	1:1,000,000	fair		Region I
	Geologic terrains	CT-NRC	1:250,000			State

Data Type	Data Layer	Org Reference	Source Scale	Data Accuracy	Title Unit	Data Extent
	Glacial deposits	US-EPAI	1:24,000	draft		RI 12 quads
	Hydrography	MA-EOEAD	1:100,000			5 panels
		MA-MWRA	1:100,000	NMA	BASIN	State
		MA-USGS	1:24,000	NMAS		Cape-wide
		ME-BOPC				
		ME-OGIS	1:100,000			State
		ME-OGIS	1:24,000		QUAD7.5	30-50% of state
		NH-CSRC	1:24,000	NMAS	QUAD7.5	60% of state
		RI-EDC	1:24,000	NMAS	QUAD7.5	State
		RI-OEC				
		US-EPAI	1:24,000	good		CT, 30 quads
		US-EPAI	1:24,000	good		ME, 2 quads
		US-EPAI	1:24,000	good		RI
		US-EPAI	1:100,000	good		Region I
		US-EPAI	1:2,000,000	good		Region I
		VT-ANR	1:100,000			State
		VT-ANR	1:20,000			Limited areas
		VT-ANR	1:5,000			Limited areas
		VT-OGIS	1:20,000		VT-OP16	Chittenden, Franklin, Grand Isle
		VT-OGIS	1:100,000		VT-DLG	State
		VT-OGIS	1:5,000		VT-OP12	Addison, Orange, Rutland, Windham
	Hydrography (detailed)	CT-NRC	1:100,000			State
		CT-NRC	1:24,000			State
	Hydrography (subset)	CT-NRC	1:24,000			State
	Hypsography (elevation contours)	CT-NRC	1:24,000			2% of state (Bound Brook, Ellington)
		MA-EOEAD	1:25,000			189 25k quads
		MA-USGS	1:250,000			Cape Cod
		ME-BOH			QUAD15	
		US-EPAI	1:2,000,000	fair		Region I
		US-EPAI	1:24,000	good		ME, 2 quads
		VT-OGIS	1:5,000		VT-OP4	Chittenden County except along boundary
	Lakes	VT-OGIS	1:100,000		STATE	State
	Metamorphic geology	ME-OGIS	1:1,000,000			State
	Mineral resources	US-EPAI	1:24,000	good		VT 31 quads
	Photo-lineament	ME-GS	1:100,000	50m	QUAD100	Lincoln, Lewiston
	Quaternary geology	CT-NRC	1:80,000			State
	Sand dunes	ME-GS	1:4,800	5m	TOWN	Sand beaches
	Slope	NH-CSRC	1:24,000		QUAD7.5	Same extent as DEM data
		RI-EDC	1:24,000		QUAD7.5	
	Soils	CT-NRC	1:250,000			State
		MA-MWRA	1:25,000	NMA		Four quadrangle area
		ME-BOPC				
		ME-DEP	1:24,000			Fore River watershed - in progress
		ME-OGIS	1:24,000			Approximately 10% of state
		NH-CSRC	1:24,000	NMAS	QUAD7.5	Carroll, Grafton, Rockingham, Strafford Co.
		NH-OSP	1:24,000		QUAD7.5	About 2/5 of the State
		RI-EDC	1:15,840		QUAD7.5	State
		RI-OEC				
		US-EPAI	1:24,000	good		24 quads in Vermont
		US-EPAI	1:24,000	good		ME, 2 quads
		VT-ANR	1:20,000		COUNTY	7 Counties
		VT-OGIS	1:20,000		VT-OP16	Addison, Orange, Rutland, Windham ctys
	Stratified drift	CT-NRC	1:125,000			State
		US-EPAI	1:125,000	Generalized	?	Connecticut
	Surficial geology	CT-NRC	1:125,000			State
		CT-NRC	1:24,000			75% of state
		MA-EOEAD	1:125,000			3 250K quads
		MA-EOEAD	1:250,000			3 panels, statewide
		MA-MWRA	1:25,000	NMA		Four quadrangle area
		ME-BOPC				
		ME-OGIS	1:250,000		QUAD250	State
		NH-CSRC	1:24,000	NMAS	QUAD7.5	6 quads
		NH-OSP	1:24,000		QUAD7.5	6 quadrangles
		RI-EDC	1:24,000	NMAS	?	State
		US-EPAI	1:24,000	good		ME 2 quads
		MA-EOEA				
Haz	Tidal flats	RI-DEMGW	1:24,000		QUAD7.5	state
	Above ground storage tanks	CT-NRC	1:24,000			State
	Ash disposal sites	RI-OEC				
	CERCLIS sites	RI-DEMGW	1:24,000		QUAD7.5	state
	Dry cleaning facilities	US-EPAI	?			VT, 31 quads
	Hazardous waste sites	VT-OGIS	1:25,000		STATE	State
	Landfills	CT-NRC	1:24,000			State

Data Type	Data Layer	Org Reference	Source Scale	Data Accuracy	Tile Unit	Data Extent
		MA-MWRA				
		ME-DEP	POINT			Fore River watershed
		ME-GS	1:24,000	12m	QUAD7.5	10% of state
		NH-DES	1:24,000	+- 200 ft.	?	90% of State
		RI-DEMGW	1:24,000		QUAD7.5	state
		RI-OEC				
		US-EPA1	POINT	fair		CT
		US-EPA1	POINT	fair		Conn.
		US-EPA1	POINT	fair		RI
		US-EPA1	POINT	fair		States of CT, RI
	Leaking USTs	RI-DEMGW	1:24,000		QUAD7.5	state
	Marine fisheries sanitary survey	MA-BBP				
	Misc. hazardous waste site	RI-DEMGW	1:24,000		QUAD7.5	state
	NPDES outfalls	MA-BBP	POINT	unknown		Buzzards Bay
		US-EPA1	POINT	good		NH, 16 quads
		US-EPA1	POINT	good		Blackstone Basin
	Oil spill sites	RI-NBP				
	Polluted wells	CT-NRC	1:48,000			State
	Pollutions sources	CT-NRC	1:50,000			State
		NH-DES	1:24,000	+- 200 ft.	?	90% of State
		US-EPA1	?	poor		VT, 31 quads
		VT-OGIS	1:63,360		STATE	State
	RCRA facilities	US-EPA1		Fair	?	EPA Region I
	RCRA generators	US-EPA1		Fair	?	EPA Region I
	RCRA storage facailities	US-EPA1		Fair	?	EPA Region I
	RCRA treatment,storage,disposal	US-EPA1		Varied	STATE	EPA Region I
	Sand/salt piles	ME-GS	1:24,000	12m	QUAD7.5	10% of state
		RI-DEMGW	1:24,000		QUAD7.5	state
	Spill sites	RI-OEC				
	Surface impoundments	RI-DEMGW	1:24,000		QUAD7.5	state
	Undergrnd injection control site	RI-DEMGW	1:24,000		QUAD7.5	state
	Underground storage tanks	CT-NRC	POINT			State
		MA-MWRA				Watersheds
		ME-DEP	POINT			Fore River watershed
		NH-DES	1:24,000	+- 200 ft.	?	90% of State
		RI-DEMGW	1:24,000		QUAD7.5	state (except Block Island)
		RI-OEC				
		US-EPA1		Fair	?	Connecticut
Infra	"Segments" data	MA-BBP	1:25,000	NMA		Buzzards Bay
	Aqueducts	MA-EOEAD	1:100,000		STATE	state
	Buildings	ME-DEP	1:2,400			Camp Ellis
		RI-EDC			?	University of Rhode Island campus
	Combined Sewer Overflows	MA-BBP		unknown		New Bedford Harbor
	Dredged channels	RI-NBP				
	Electric	RI-EDC	1:24,000	NMAS		State
	Gas	RI-EDC	1:24,000	NMAS		State
	Pipelines	MA-EOEAD	1:100,000		STATE	state
		ME-OGIS	1:100,000		QUAD100	State
		ME-OGIS	1:24,000		QUAD7.5	30-50% of state
		NH-OSP	1:24,000	NMAS	QUAD7.5	41 quads
	Power generating facilities	CT-NRC	1:24,000			State
	Railroads	MA-EOEAD	1:100,000		STATE	state
		ME-OGIS	1:100,000		QUAD100	State
		ME-OGIS	1:24,000		QUAD7.5	30-50% of state
		NH-OSP	1:24,000	NMAS	QUAD7.5	41 quads
		US-EPA1	1:100,000	good		Region I
		US-EPA1	1:25,000	good		MA, 4 quads
		VT-OGIS	1:100,000		VT-DLG	State
	Rights of Way	MA-DFA	1:25,000	+- 100 ft.		Part of Plymouth/Barnstable counties
	Roads	CT-NRC	1:100,000			State
		MA-EOEAD	1:100,000			189 25k quads
		MA-EOEAD	1:100,000		STATE	state
		MA-MWRA	1:100,000	NMA	QUAD7.5	State
		ME-BOH				
		ME-BOPC				
		ME-OGIS	1:24,000		QUAD7.5	30-50% of state
		ME-OGIS	1:100,000		QUAD100	State
		NH-CSRC	1:100,000	NMAS	QUAD7.5	State
		NH-CSRC	1:24,000	NMAS	QUAD7.5	60% of state
		NH-OSP	1:24,000	NMAS	QUAD7.5	41 quads
		RI-EDC	1:24,000	NMAS	QUAD7.5	State
		RI-OEC				
		US-EPA1	1:2,000,000	good		Region I

Data Type	Data Layer	Org Reference	Source Scale	Data Accuracy	Tile Unit	Data Extent
Land Use	Roads and trails	US-EPAI	1:24,000	good	VT-DLG	RI
		US-EPAI	1:24,000	good		ME, 2 quads
		US-EPAI	1:100,000	good		Region I
		VT-ANR	1:100,000			State
		VT-OGIS	1:100,000			State
		CT-NRC	1:24,000			State
		CT-NRC	1:24,000			State
		MA-MWRA				
		MA-USGS	1:100,000	NMAS		Cape-wide
		RI-EDC		NMAS		State
	Sewer service areas	RI-OEC			QUAD7.5	
		CT-NRC	1:24,000			State
		MA-MWRA				
		MA-USGS	1:100,000	NMAS		Cape-wide
		ME-DEP	POINT	95%		Portland, South Portland, Westbrook
	Trails	NH-CSRC	1:125,000		STATE	State
		NH-DES	1:125,000	?	?	State
		ME-OGIS	1:100,000		QUAD100	State
		ME-OGIS	1:24,000		QUAD7.5	30-50% of state
	Transmission lines	ME-OGIS	1:100,000		QUAD100	State
		ME-OGIS	1:24,000		QUAD7.5	30-50% of state
		VT-OGIS	1:100,000		VT-DLG	State
	Transportation	VT-OGIS	1:20,000		VT-OP16	Chittenden, Franklin, Grand Isle
		MA-MWRA				
	Water service areas	RI-OEC				
		CT-NRC	1:24,000			State
		MA-MWRA			STATE	MWRA Service Area
		NH-CSRC	1:125,000		STATE	State
		NH-DES	1:125,000		?	State
		NH-DES	1:24,000	?	?	Very limited
		NH-OSP	1:24,000			Very limited
		RI-EDC	1:24,000	NMAS	STATE	State
		MA-EOEAD	1:25,000		STATE	state
		CT-NRC	1:24,000			80% of state
Land Use	Archaeological sites	US-EPAI	1:24,000	fair		ME, 2 quads
		CT-NRC	1:24,000			State
		RI-EDC	1:24,000	NMAS	STATE	State
		MA-EOEAD	1:25,000		STATE	state
		CT-NRC	1:24,000			80% of state
		US-EPAI	1:24,000			ME, 2 quads
		CT-NRC	1:24,000			State
		RI-EDC	1:24,000	NMAS	STATE	State
		NH-CSRC	1:24,000		QUAD7.5	Coos County
		RI-OEC				
	Land use	CT-NRC	1:24,000			3% of state (4 quads at level 3 detail)
		MA-EOEAD	1:25,000		TOWN	351 towns
		MA-MBP	1:25,000			
		MA-MWRA	1:25,000		TOWN	
		NH-CSRC	1:24,000	NMAS	QUAD7.5	very partial coverage
		NH-OSP	1:24,000	?	QUAD7.5	7 full quads, 24 partial quads
		RI-EDC	1:24,000	NMAS	QUAD7.5	State
		RI-OEC				
		US-EPAI		?	?	Most of Rhode Island
		US-EPAI	1:24,000	Good	?	2 quads in Connecticut?
	Land use/land/cover	US-EPAI	30M	unknown		24 quads in NH
		US-EPAI	1:24,000	good		State of MA
		VT-OGIS	?		STATE	State
		CT-NRC	1:24,000			15% of state
		US-EPAI	1:24,000	unknown		State of RI
	Managed areas	MA-USGS				Nation
		VT-ANR				
		ME-OGIS	1:100,000		QUAD100	State
		MA-EOEAD	1:25,000		GRPCNTY	6 panels
		MA-USGS	1:24,000			Cape-wide
	Publically owned lands	RI-OEC				
		US-EPAI	1:62,500	poor		NH
		US-EPAI	1:25,000	accurate		MA
		MA-MWRA	1:25,000		BASIN	
		ME-OGIS	1:100,000		QUAD100	State
Land Use	Privately owned land	NH-CSRC	1:24,000	NMAS	QUAD7.5	partial coverage of Coos County
		RI-EDC	1:24,000	NMAS		State
		RI-OEC				
		RI-EDC				Some towns
		CT-NRC	1:24,000			State
	State owned lands	US-EPAI	1:24,000	unknown		State of CT
		MA-EOEAD	1:100,000		TOWN	351 towns
		MA-EOEAD	1:100,000		COUNTY	14 counties
		CT-NRC				50% of state
	Zoning					



Data Type	Data Layer	Org Reference	Source Scale	Data Accuracy	Tile Unit	Data Extent
Pol Bound	Census tracts	MA-MWRA				
		NH-CSRC	1:100,000	NMAS	QUAD7.5	Raw TIGER for entire State.
		RI-EDC	1:100,000	NMAS		Partial coverage
	County boundaries	CT-NRC	1:250,000			State
		MA-EOEAD	1:25,000		STATE	state
		MA-MWRA	1:25,000	NMA	STATE	State
		ME-BOH			QUAD7.5	
		ME-BOPC				
		ME-OGIS	1:100,000		QUAD100	State
		ME-OGIS	1:24,000		QUAD7.5	30-50% of state
		NH-CSRC	1:24,000	NMAS	QUAD7.5	60% of state
		US-EPAI	1:2,000,000	good		Region I
		VT-ANR	1:24,000			State
		VT-OGIS	1:250,000		STATE	State
	Indian reservations	US-EPAI	1:24,000	poor		ME, Houlton Malisett
		US-EPAI	1:24,000	poor		CT, Mashantucket Pequot
		US-EPAI	1:24,000	poor		ME, Passamoquoddy/PP
		US-EPAI	1:24,000	poor		ME, Passamodquoddy/Town
		US-EPAI	1:24,000	good		MA, Wampanoag
	Political boundaries	ME-OGIS	1:500,000			
	Political districts	NH-CSRC	1:24,000	NMAS	QUAD7.5	60% of state
		NH-OSP	1:24,000	NMAS	QUAD7.5	41 quads
	Population	US-EPAI	POINT			Region I
		US-EPAI		good		Region I
	Postal carrier routes	US-EPAI				
	Regional environmental districts	VT-OGIS	1:250,000		STATE	State
	Regional Planning Commission	CT-NRC	1:250,000			State
		MA-EOEAD	1:25,000		STATE	state
		VT-OGIS	1:250,000		STATE	State
	Senate districts	MA-EOEAD	1:25,000		STATE	state
	State boundaries	MA-MWRA	1:25,000	NMA	STATE	State
		ME-BOH			QUAD7.5	
		ME-BOPC				
		ME-OGIS	1:100,000		QUAD100	State
		ME-OGIS	1:24,000		QUAD7.5	35-50% of state
		NH-CSRC	1:24,000	NMAS	QUAD7.5	60% of state
		RI-EDC	1:24,000	NMAS	STATE	State
		RI-OEC				
		US-EPAI	1:2,000,000	good		Region I
		VT-ANR	1:24,000			State
	TIGER (reprocessed)	MA-MWRA	1:100,000	NMA		Service area
		RI-EDC	1:100,000	NMAS		partial coverage
	Town boundaries	CT-NRC	1:24,000			State
		CT-NRC	1:250,000			State
		MA-EOEAD	1:25,000		STATE	state
		MA-MWRA	1:25,000	NMA	STATE	State
		ME-BOH			QUAD7.5	
		ME-BOPC				
		ME-OGIS	1:24,000		QUAD7.5	30-50% of state
		ME-OGIS	1:100,000		QUAD100	State
		RI-EDC	1:24,000	NMAS	STATE	State
		RI-OEC				
		US-EPAI	1:24,000	good		VT, 31
		US-EPAI	1:250,000	poor		VT 31 q
		US-EPAI	1:125,000	good		NH
		US-EPAI	1:25,000	good		MA
		US-EPAI	1:24,000	good		ME, 2 quads
		US-EPAI	1:24,000	good		16 quads NH
		US-EPAI	1:24,000	good		CT
		US-EPAI	1:24,000	good		RI
		VT-ANR	1:24,000			State
		VT-OGIS	1:250,000		STATE	State
		VT-OGIS	1:62,500		STATE	State
		VT-OGIS	1:24,000		STATE	Addison, Orange, Rutland, Windham
	Zip code boundaries	MA-EOEAD	1:2,000,000		STATE	state
	Zip code centroids	US-EPAI	POINT	poor		Region I
	Marine sediment sampling	ME-GS	1:24,000	12m	QUAD7.5	5% of coast
		RI-EDC	POINT			Narragansett Bay
	Ozone monitoring stations	US-EPAI	POINT	fair		Region I & II
	Precipitation monitoring	CT-NRC				
		US-EPAI	POINT	good		CT
	Sediment Chemistry	MA-EOEA				
	Soil boring sampling	RI-EDC	1:15,840	NMAS	QUAD7.5	State

Data Type	Data Layer	Org Reference	Source Scale	Data Accuracy	Tile Unit	Data Extent
Water	Stream gaging	MA-MWRA	POINT		STATE	Service area watershed
		MA-USGS		NMAS		State
		NH-DES			STATE	State
	SWUDS	MA-USGS		NMAS		State
	Water quality	MA-BBP	POINT	unknown		Buzzards Bay
		MA-USGS		NMAS		State
	Water quality monitoring network	CT-NRC	1:24,000			State
	Aquifer protection areas	CT-NRC	1:24,000			10% of state
	Aquifers	CT-NRC	1:125,000			State
		MA-EOEAD	1:48,000		BASIN	25 panels
		MA-MWRA			BASIN	
		ME-BOPC				
		ME-GS	1:24,000	12m	QUAD7.5	10% of state
		ME-OGIS	1:50,000		QUAD50	State
		NH-CSRC	1:24,000	NMAS	QUAD7.5	Nashua, Lamprey, Exeter
		NH-DES	1:24,000	?	QUAD7.5	27 quadrangles
		US-EPAI	1:62,500	fair		2 quads Maine
		US-EPAI	1:24,000	good		2 quads, ME
		US-EPAI	1:24,000	good		Plymouth, MA
		US-EPAI	1:48,000	accurate		MA
		US-EPAI	1:24,000	good		State of RI
	Buffered wellhead prot areas	RI-EDC	1:24,000		?	State
		VT-OGIS	1:25,000		STATE	State
	Coastal water use	RI-NBP				
	Coastal wetlands	NH-OSP	1:24,000	?	QUAD7.5	About 4 quads on coast
	Coastline	US-EPAI	1:25,000	Fair	?	Mass. Bay and Portland, ME
	Dams	NH-DES	1:24,000	+- 100 ft.	STATE	State
		US-EPAI	1:2,000,000	good		Region I
		US-EPAI	1:24,000	good		RI 12 quads
		US-EPAI	1:24,000	draft		VT 31 quads
	Drainage basins	CT-NRC	1:250,000			State
		CT-NRC	1:24,000			State
		MA-BBP	1:25,000	unknown		Buzzards Bay drainage basin
		MA-EOEAD	1:25,000		STATE	state
		MA-MBP	1:25,000			Cape Code Bay watershed
		MA-MWRA				
		ME-GS	1:24,000	12m	QUAD7.5	State
		NH-CSRC	1:24,000	NMAS	QUAD7.5	State
		NH-DES	1:24,000	?	BASIN	100% of State
		RI-NBP	1:24,000	140ft		Narragansett Bay
		VT-ANR	1:24,000			Limited
	Drainage sub-basins	MA-EOEAD	1:25,000		GRPBASIN	4 panels
	Floodplains	ME-BOPC				
		ME-DEP	1:2,400			Camp Ellis
		RI-EDC	?			
	Groundwater classifications	RI-DEMGW	1:24,000			
	Groundwater recharge areas	RI-EDC	1:24,000	NMAS	STATE	State
	Groundwater reservoirs	RI-EDC	1:24,000	NMAS	STATE	State
	Hydrologic Unit Codes	US-EPAI	1:2,000,000		?	EPA Region I
	Lake/pond drainage basins	VT-OGIS	1:25,000		STATE	State
	Major drainage basins	RI-EDC	1:24,000	NMAS		State
	Monitoring wells	MA-USGS		NMAS		State
		US-EPAI	POINT	good		RI 2 quads
		US-EPAI	POINT	good		NH, 16 quads
	Ponds	MA-EOEAD	1:100,000		GRPBASIN	5 panels
	Public water supply	CT-NRC	1:250,000			State
		NH-DES	1:24,000	?	QUAD7.5	More than half of State
		US-EPAI	1:24,000	Good	?	Connecticut
		US-EPAI	POINT	good		NH, 16 quads
	Reservoirs	CT-NRC	1:24,000			State
		MA-MWRA				
		MA-USGS	1:250,000			Nation
		RI-OEC				
	River basins	VT-ANR	1:24,000			State
		MA-MWRA				
		ME-GS	1:500,000	250m	STATE	State
		RI-OEC				
		US-EPAI	1:125,000		?	Connecticut
		US-EPAI	1:125,000	Fair	?	New Hampshire
		US-EPAI	1:100,000	Generally?	?	Mass.
		US-EPAI	1:24,000	Good	?	Rhode Island
		US-EPAI	1:24,000	Poor	?	Lake Champlain, VT
		VT-ANR	1:100,000			State

Data Type	Data Layer	Org Reference	Source Scale	Data Accuracy	Tile Unit	Data Extent
	River drainage basins	VT-OGIS	?		STATE	State
	Snow survey results	ME-GS		50m	STATE	State
	Sole source aquifers	MA-EOEAD	1:25,000		STATE	state
		MA-USGS	1:24,000			
		RI-EDC	1:24,000			State
	Streams	CT-NRC	1:250,000			State
		MA-EOEAD	1:100,000		GRPBASIN	5 panels
	Sub-drainage basins	RI-EDC	1:24,000	NMAS	?	State
	Supply wells	MA-EOEAD	1:25,000		STATE	state
		MA-USGS		NMAS		State
		US-EPAI	POINT	good		NH, 16 quads
		US-EPAI	POINT	good		States of RI, NH
	Surface water (ponds,streams)	ME-BOH			QUAD7.5	
		ME-BOPC				
		VT-ANR	1:100,000			State
		VT-ANR	1:20,000			Limited areas
		VT-ANR	1:5,000			Limited areas
	Surface water classifications	VT-ANR	1:100,000			Winooski River basin only
	Water diversions	CT-NRC	1:24,000			25% of state
	Water quality classifications	CT-NRC	1:24,000			20% of state
	Water supply watersheds	CT-NRC	1:24,000			State
		MA-MWRA				
		ME-OGIS	1:24,000		QUAD7.5	State
		RI-EDC	1:24,000	NMAS		State
		RI-OEC				
		US-EPAI	1:24,000	Good	?	New Hampshire
		US-EPAI	1:24,000	unknown		State of CT
		VT-OGIS	1:25,000		STATE	State
	Wellhead protection areas	MA-EOEAD	1:25,000		STATE	state
		MA-MWRA				
		MA-USGS	1:24,000			
		VT-ANR	1:24,000			State
		VT-OGIS	1:25,000		STATE	State
	Wells (community)	CT-NRC	1:24,000			State
		MA-MWRA	POINT		STATE	State
		MA-USGS	1:24,000			Southeast Mass.
		ME-GS	POINT	100m	TOWN	10% of state
		NH-CSRC	1:24,000	NMAS	QUAD7.5	50% of state
		RI-EDC	1:24,000	NMAS	?	State
		US-EPAI	POINT	good		NH 16 quads
		US-EPAI	POINT	good		CT
		US-EPAI	POINT	excellent		MA
		VT-ANR				
		VT-OGIS	1:25,000		STATE	State
	Wells (Ind, Ag, Commer)	MA-MWRA				
		ME-GS	POINT	100m	TOWN	10% of state
	Wells (non-community)	MA-MWRA				
		ME-GS	POINT	100m	TOWN	10% of state
		NH-CSRC	1:24,000	NMAS	QUAD7.5	50% of state
		RI-EDC	1:24,000	NMAS	QUAD7.5	1 town
		US-EPAI	POINT	good		NH, 16 quads
	Wells (private)	MA-MWRA				
		MA-USGS	1:24,000			Eastham
		ME-GS	POINT	100m	TOWN	10% of state
		US-EPAI	POINT	good		ME, 2 quads
	Wetlands	CT-NRC	1:24,000			State
		MA-EOEAD	1:100,000		STATE	state
		ME-BOPC				
		ME-DEP	1:24,000			York - in progress
		ME-OGIS	1:100,000		QUAD100	State
		ME-OGIS	1:250,000		QUAD250	State
		NH-CSRC	1:24,000	NMAS	QUAD7.5	24 quadrangles
		NH-OSP	1:24,000	30m pixel sz	QUAD7.5	24 quadrangles
		RI-EDC	1:24,000	NMAS	QUAD7.5	State
		RI-OEC				
		US-EPAI	1:24,000	good		VT, 18 quads
		US-EPAI	1:24,000	Good	?	Rhode Island
		VT-ANR	1:80,000			70% of state
		VT-OGIS	1:24,000		VT-DLG	QUAD16 tiles 11-15,21,23,24,31-33
Wildlife	Eelgrass beds	MA-8BP	1:25,000	very poor		Buzzards Bay
	Endangered invertebrate species	VT-OGIS	1:25,000		STATE	State
	Endangered natural communities	VT-OGIS	1:25,000		STATE	State
	Endangered plant species	VT-OGIS	1:25,000		STATE	State

Data Type	Data Layer	Org Reference	Source Scale	Data Accuracy	Title Unit	Data Extent
	Endangered vertebrate species	VT-OGIS	1:25,000		STATE	State
	Rare and endangered species	CT-NRC	1:24,000			80% of state
		ME-DEP	POINT			Casco Bay watershed
		NH-OSP	1:24,000		QUAD7.5	State
		RI-EDC	1:24,000	NMAS	STATE	State
		US-EPAI	?			VT, 31 quads
		VT-ANR	1:24,000			State
		VT-OGIS	1:25,000		STATE	State
	Shellfish areas	CT-NRC	1:24,000			20% of state
		MA-BBP	1:25,000	NMA		Buzzards Bay
	Wildlife habitats	ME-DEP	POINT			Casco Bay watershed
		RI-NBP	1:4,800			
		VT-ANR	1:24,000			30% of state

**TABLE D-5**

**Planned Data by Data Type**

Table D-5:Planned GIS Data by Data Layer

	Data Layer	Org Reference	Source Scale	Data Accuracy	Title Unit	Data Extent
Air	Forest cover; forest type	NH-CSRC	1:24,000		QUAD7.5	Coos County
	Ozone study	ME-DEP				
Earth	Bathymetry	MA-MBP				MA & Cape Cod Bays, Merrimack Embayment
	Bedrock geology	ME-GS	1:250,000	123m	QUAD7.5	
		ME-GS	1:62,500	32m	QUAD7.5	
		ME-GS	1:24,000	12m	QUAD7.5	
	Coastal segmentation	MA-MBP				From NH border to Provincetown
	Coastal zones	ME-GS	1:62,500	32m	QUAD7.5	
	Earthquake epicenters	ME-GS	POINT	10,000m	REGION	Regional
	Hydrography	ME-GS	1:24,000	12m	QUAD7.5	
		NH-CSRC	1:24,000	NMAS	QUAD7.5	40% of State
	Hydrography (network)	CT-NRC	1:24,000		QUAD7.5	
	Hypsography (elevation contours)	ME-BOH			QUAD7.5	
	Soils	CT-NRC	1:15,840			None completed
		NH-CSRC	1:24,000	NMAS	QUAD7.5	Hillsborough, Coos, Cheshire Counties
Haz	CERCLIS sites	CT-NRC	1:24,000			
	Landfills	ME-GS	1:24,000	12m	QUAD7.5	
	NPDES outfalls	MA-MBP				Selected embayments only
	Pollutions sources	NH-DES	1:24,000	+ - 100 ft.	QUAD7.5	None
	RCRA facilities	CT-NRC	1:24,000			
	Sand/salt piles	ME-GS	1:24,000	12m	QUAD7.5	
	SARA sites	CT-NRC	1:24,000			
	Spill sites	CT-NRC	1:24,000			
	Underground storage tanks	CT-NRC	1:24,000			
		ME-DEP	POINT			Fore River watershed
Infra	Combined Sewer Overflows	MA-MBP				Selected embayments only
	Roads	ME-GS	1:24,000	12m	QUAD7.5	
		NH-CSRC	1:24,000	NMAS	QUAD7.5	40% of state
		VT-ANR	1:5,000			State
	Stormdrains	MA-MBP				Selected embayments only
Use	Farmland	ME-BOPC			QUAD7.5	4 quads in Aroostook County
	Historic sites	NH-OSP	1:24,000			None
	Land cover	ME-DEP	1:24,000			Fore River watershed
		NH-CSRC	1:24,000		QUAD7.5	
		NH-OSP	1:24,000		QUAD7.5	None
	Land use	CT-NRC		30 meters		State
		ME-DEP	1:24,000			Fore River watershed
	Population or pop density	MA-MWRA				
	Publically owned lands	NH-CSRC	1:24,000	NMAS	QUAD7.5	
		NH-OSP	1:24,000		QUAD7.5	None
		VT-ANR				
	Recreation facilities	NH-OSP	1:24,000			None
		VT-ANR	1:24,000			State
	Zoning	ME-DEP	1:2,400			Fore River watershed, Harpswell
Miscellan	Miscellaneous comment	ME-OGIS				
Pol Bound	County boundaries	CT-NRC	1:24,000			
		NH-CSRC	1:24,000	NMAS	QUAD7.5	40% of state
	Political districts	NH-CSRC	1:24,000	NMAS	QUAD7.5	40% of state
	Regional Planning Commission	CT-NRC	1:24,000			
	State boundaries	NH-CSRC	1:24,000	NMAS	QUAD7.5	40% of state
	TIGER (reprocessed)	VT-ANR				
	Town boundaries	CT-NRC	1:24,000			
		ME-GS	1:24,000	12m	QUAD7.5	
Sample	Marine sediment sampling	CT-NRC	1:80,000			
		MA-MBP				
		ME-DEP				
		ME-GS	1:24,000	12m	QUAD7.5	
Water	Water quality	MA-BBP	POINT	unknown		Buzzards Bay
	Aquifers	ME-GS	1:24,000	12m	QUAD7.5	
	Drainage sub-basins	MA-MBP				Selected embayments only
	NPDES sites	CT-NRC	1:24,000			
	Public water supply	CT-NRC	1:24,000			
	Water quality and circulation	MA-MBP				Mass and Cape Cod Bays
	Wellhead protection areas	ME-BOPC				
		RI-EDC	1:24,000	NMAS		
	Wells (community)	ME-BOH	POINT	GPS		
		ME-GS	POINT	100m	TOWN	
	Wells (Ind, Ag, Commer)	ME-GS	POINT	100m	TOWN	
	Wells (non-community)	ME-BOH	POINT	GPS		
		ME-GS	POINT	100m	TOWN	
	Wells (private)	ME-GS	POINT	100m	TOWN	

Data Type	Data Layer	Org Reference	Source Scale	Data Accuracy	Tile Unit	Data Extent
Wildlife	Wetlands	NH-CSRC	1:24,000	NMAS	QUAD7.5	State
	Living resources	MA-MBP				Selected embayments only
	Rare and endangered species	ME-BOPC				
		ME-DEP	POINT			Casco Bay watershed
	Wildlife habitats	ME-DEP				Casco Bay watershed
		NH-OSP	1:24,000		QUAD7.5	None

**TABLE D-6**

**Needed Data by Data Type**



Table D-6: Needed GIS Data by Data Layer

	Data Layer	Org Reference	Source Scale	Data Accuracy	Tile Unit	Data Extent
Air	Air quality	VT-ANR				
	Forest cover; forest type	NH-CSRC VT-ANR	1:24,000		QUAD7.5	State
Background	Pesticides	ME-BOPC				
	Land base map	MA-MBP	1:5,000			
	Orthophoto images	RI-EDC				State
	USGS reference marks	VT-ANR				
Earth	Bathymetry	MA-MWRA ME-OGIS RI-NBP	POINT	1:24,000		Gulf of Maine
	Elevation - DEM	MA-MWRA ME-DEP ME-OGIS	POINT	1:24,000		MWRA Service Area All but North Central Maine
	Hydrography	NH-CSRC MA-BBP VT-ANR	1:24,000 1:25,000	NHAS	QUAD7.5	State Buzzards Bay watershed
	Soils	MA-DFA MA-EOEAD ME-OGIS				State
Haz	Surficial geology	VT-ANR				
	CERCLIS sites	ME-BOH				
	Landfills	ME-BOH VT-ANR				
	Non-point pollution sources	MA-MBP				
	Pesticide areas	CT-NRC				
	RCRA facilities	ME-BOH				
	Sand/salt piles	ME-BOH				
	Sewage disposal type	MA-MBP				
	Sewage lagoons	ME-BOH				
	Spill sites	ME-BOH ME-BOPC				
	Underground storage tanks	ME-BOH ME-DEP VT-ANR	POINT 1:5,000			Fore River watershed State
Infra	Drainage	VT-ANR				
	Railroads	ME-BOPC				
	Rights of Way	ME-BOPC				
	Roads	MA-MWRA VT-ANR				MWRA Service Area
Land Use	Sewer service areas	NH-DES	1:24,000		?	None
	Archaeological sites	VT-ANR				
	Golf courses	ME-BOPC				
	Historic sites	VT-ANR				
	Land cover	NH-CSRC VT-ANR	1:24,000		QUAD7.5	State
	Land use	MA-BBP MA-DFA MA-MBP MA-MWRA NH-CSRC RI-EDC RI-OEC VT-ANR	1:25,000 1:25,000  1:25,000 1:24,000 1:24,000 1:24,000	NHAS	QUAD7.5	Buzzards Bay watershed State MWRA Service Area State State
	Land use/land/cover	ME-OGIS		1:24,000		
	Population or pop density	MA-MBP				
	Protected areas	VT-ANR				
	State owned lands	VT-ANR				
	Zoning	NH-OSP			QUAD7.5	None
Pol Bound	Census tracts	VT-ANR				
	TIGER (reprocessed)	RI-EDC				State
	Zip code boundaries	VT-ANR				
Sample	Marine sediment sampling	MA-BBP MA-MBP RI-NBP	POINT			Buzzards Bay
	Sediment Chemistry	MA-EOEA				
	Stream gaging	VT-ANR				
Water	Water quality	MA-BBP	POINT		QUAD7.5	Buzzards Bay
	Aquifers	NH-CSRC NH-DES VT-ANR	1:24,000 1:24,000	NHAS	QUAD7.5 QUAD7.5	State State
	Coastal features	MA-MBP				

Data Type	Data Layer	Org Reference	Source Scale	Data Accuracy	Tile Unit	Data Extent
	Coastline	MA-MBP	1:5,000			
	Dams	MA-MBP				
	Drainage basins	ME-BOH				
	Floodplains	MA-MBP				Coast and rivers
		VT-ANR				
	Groundwater classifications	VT-ANR				
	NPDES sites	MA-MBP				
	Offshore base map	MA-MBP				State
	Reservoirs	ME-BOH				
	River basins	ME-BOH				
	Saltwater intrusion	MA-MBP				Estuaries
	Surface water classifications	VT-ANR				Other than Winooski River basin
	Volume of water flow	MA-MBP				Rivers
	Water supply watersheds	ME-BOH				
		VT-ANR				
	Wellhead protection areas	ME-BOH				
	Wells (private)	ME-BOPC				
		VT-ANR				
	Wetlands	CT-NRC				
		MA-MBP	1:5,000			
		ME-OGIS		1:24,000		
		NH-DES	1:24,000	?	?	None
Wildlife	Anadromous fish runs	MA-MBP				
	Living resources	MA-MBP				
	Marine Finfish	RI-NBP				
	Marine Invertebrates	RI-NBP				
	Marine macrophytes	RI-NBP				
	Shellfish areas	MA-BBP				Buzzards Bay
		MA-MBP				

## **APPENDIX E**

### **Application Summaries**

**Table E-1 Existing Applications by Organization**

**Table E-2 Planned Applications by Organization**

**Table E-3 Needed Applications by Organization**

**Table E-4 Existing Applications by Application**

**Table E-5 Planned Applications by Application**

**Table E-6 Needed Applications by Application**

**TABLE E-1**

**Existing Applications by Organization**

Table E-1: Existing GIS Applications by Organization

CONNECTICUT  
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Organization Reference	Application Type	Application	End User	Additional Comments
CT-NRC	Miscellaneous	Data storage and transfer	Govt agencies, business, individuals	Data distribution.
		Map products	DEP	Only provide mapping production internally.
		Radon	DEP, health dept, towns	
	Water Management	Aquifer mapping	DEP, water companies, towns	Part of state groundwater protection program.
		Marine studies	USGS, DEP, UConn, Univ. New Haven, SCS	Long Island Sound Resources Center in cooperation with many groups.
		Non-point source pollution	DEP, EPA, towns, businesses	Uses land use data from Long Island Sound Study.
		Watershed/wellhead protection	DEP, water companies, towns	Part of state groundwater protection program.

MASSACHUSETTS  
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Organization Reference	Application Type	Application	End User	Additional Comments
MA-BBP	Miscellaneous	Land use planning	Buzz. Bay Program office	Spent a lot of time developing land use acreage statistics by watershed and sub-watershed.
		Map products	Many users	Requesters for maps other than program office: towns, SCS, university extension, private non-profit, state agencies, RPAs
	Water Management	Marine studies	Buzz. Bay Program office	We've linked ARC/INFO monitoring stations coverage to ORACLE database of monitoring data via RDBI-O. Focus is using spatial criteria to select data for analysis.
		Watershed/wellhead protection	private non-profit	Used TIN to create educational poster illustrating watershed concept.
MA-DFA	Miscellaneous	Agricultural studies	DFA, EOE, Farming community	
		Land use planning	DFA, Farmers	
	Water Management	Non-point source pollution	DFA	Pesticide regulation
MA-EOEAD	Water Management	Watershed/wellhead protection	DFA, EOE, Farmers	Regulation of pesticide application within Zone II areas.
		Air pollution pesticide studies	DPH, DFA, DEP tech serv branch	Spraying, monitoring stations.
	Miscellaneous	Acid Rain	UMASS/ARM (acid rain monitoring)	
		Address to coordinate matching		Based on TIGER file.
		Demographics		TIGER file from US Census for studies.
		Epidemiologic studies	DPH	Eastern equine encephalitis.
	Waste Management	Map products	public + private	
		Hazardous waste	DEP/DUSC (div of waste site cleanup)	21 sites being mapped.
		Municipal solid waste management	DEP/DSW	Location of solid waste landfills.
	Water Management	Aquifer mapping	DEP/DWS (div of water supply)	
		Marine studies	CZM (coastal zone management)	Mapping of water quality monitoring points; marinas, shellfish areas.
		Non-point source pollution		Numerous projects based on landuse class, agricultural chemicals, road salt, etc.
		Watershed/wellhead protection		Zones of contribution to public water supply wells.
		Wetland studies	DEP/DWM (div of wetlands & waterways)	Wetlands conservation program mapping from CIR photos for restrictions.
MA-MBP	Miscellaneous	Map products	CZM, EPA, RPAs, MiniBays	Used by program for public outreach; will be distributed to wider audience in the future.

Organization Reference	Application Type	Application	End User	Additional Comments
MA-MMRA	Water Management	Aquifer mapping	CZM, MBP	To show contribution of watersheds to bays on MA coast.
		Non-point source pollution		Developed with guidance of MassGIS. Consists of aggregation of land use statistics in INFO from MassGIS land use data.
	Miscellaneous	Data storage and transfer		
		Demographics		
		Epidemiologic studies		Giardia tracking
		Forestry planning		MDC lands
		Global warming/climate change		
		Land use planning		
		Map products		
		Risk assessments		
	Waste Management	Fate/transport/dispersion model	Harbor studies	
		Waste facility siting	Sewerage Division	
MA-USGS	Water Management	Aquifer mapping		
		Marine studies		
	Miscellaneous	Non-point source pollution	Waterworks Division	
		Water pollution control		
		Water supply and demand		
		Watershed/wellhead protection		
		Basin delineation	State, USGS	
		Map products	Cape Cod	Project for wellhead protection includes map products. MAEDA will also be using GIS for all mapping requirements. This will be extensive.
	Water Management	Aquifer mapping	State, USGS	Modeling on Cape Cod has and is being done extensively for water quality and quantity.
		Watershed/wellhead protection	Cape Cod, USGS	Modeling on Cape Cod has and is being done extensively for water quality and quantity.
MAINE =====		Wetland studies	State	
	ME-BOH	Demographics		
		Epidemiologic studies		
		Socio-economic factors		
	ME-BOPC	Aquifer mapping		Held by ME-OGIS
	ME-DEP	Map products	Anyone who requests maps	
		Oil spill preparedness	State of Maine	
		Wildlife management	State of Maine	To be incorporated with oil spill preparedness.
		Stormwater management	Casco Bay National Estuary Program	
ME-GS	Miscellaneous	Water pollution control	Casco Bay National Estuary Program	
		Wetland studies	Town of York	Cooperative project with Tom Burns, York and DEP.
		Community growth mgmt planning	Municipalities	All MGS digital data is used in this application

Organization Reference	Application Type	Application	End User	Additional Comments
ME-OGIS	Waste Management Water Management	Land use planning	State planning agencies, municipalities	All MGS digital data is used in this application.
		Map products	State & federal agencies, public	To the best of MGS ability, map products are now generated through GIS.
		Waste facility siting	ME Low Level Radioactive Waste Auth.	Uses MGS digital maps.
		Aquifer mapping	State agencies, municipalities	
	Miscellaneous	Groundwater resrc characterizatr	State agencies, municipalities	Characterize quality, quantity, availability of groundwater resources.
		Marine studies	MGS, Federal agencies	Mapping sea floor sediments, access sub-sea sand supplies.
		Marine Oil Spill Response	DEP, Marine Resources...	Additional users include Inland Fisheries and Wildlife, Conservation, Coast Guard, NOAA.
		Northern Forest Lands Study	Conservation, State Planning...	Additional users include Inland Fisheries and Wildlife and National Forest Service.

NEW HAMPSHIRE  
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Organization Reference	Application Type	Application	End User	Additional Comments
NH-CSRC	Air Pollution	Air pollution pesticide studies	NH Dept. of Agriculture	
	Miscellaneous	Data storage and transfer	Multiple users	Data is routinely transferred to state agencies, federal agencies, regional planning commissions, private consultants etc
		Forestry planning	NH Dept of Resources and Economic Devt	
		Land use planning	OSP, and US Forest Service	
		Map products	Multiple users	
NH-DES	Water Management	Socio-economic factors	US Forest Service	A study of socio-economic factors constitutes one aspect of the Northern Forest Lands study.
		Aquifer mapping	Municipalities	
	Water Management	Wetland studies	Municipalities	Ongoing statewide wetlands mapping project using LANDSAT TM Results will become inputs to variety of projects, and be dissem. to municip. so prime wetlands designator work begin
		Non-point source pollution	DES	Wellhead Protection Program
NH-OSP		Watershed/wellhead protection	DES	Wellhead Protection Program
	Air Pollution	Air pol. fate/transport analysis	OSP	By combining TIGER data which includes census tracts & block and air pollution sources, an air pollution model is used to simulate fallout of chemicals to determine no. people affect
	Miscellaneous	Land use planning	OSP, municipalities	Many land use planning applications.

RHODE ISLAND  
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Organization Reference	Application Type	Application	End User	Additional Comments
RI-DADP	Miscellaneous	Community growth mgmt planning	RI cities and towns	Provided RIGIS data of maps.
		Land use planning	RI DEM, State planning	Greenspace Management Plan, in progress.
RI-DENGW	Water Management	Aquifer mapping	DEM GW	
		Facility inventory		
		Groundwater class mapping		
RI-ERIC	Miscellaneous	Wellhead protection	DEM GW	
		Land use planning	Division of Planning	Statewide Open Space Program, land acquisitions, protection of specific features and green belts, Greenspace 2000 Project.

Organization Reference	Application Type	Application	End User	Additional Comments
RI-NBP	Waste Management	Oil spill preparedness	Groundwater Division	Site specific small projects for Emergency Response remediation sites.
		Wildlife management	Natural Heritage Program	Protection, evaluation of habitat for rare & endangered state and federal species.
		Hazardous waste	Hazardous Materials Division	CERCLIS & RCRA inventory, prep, site eval. to EPA for rankings and field investigations, facility inventory
		Waste facility siting	Hazardous Materials Division	Maintain Facility Inventory - Solid Waste Mgmt. Corp. has multiple applications used for siting projects.
	Water Management	Waste permit/license/registratn	Hazardous Materials Inventory	Facility Inventory
		Aquifer mapping	Groundwater Division	
		Inland water quality	Water Resources Division	Surface water quality
		Marine studies	Water Resources Division	Surface water quality, shellfish closure map, shellfish growing areas sampling.
		Non-point source pollution	Office of Environmental Coordination	OEC assessment for report to Congress "The state of the State's waters" also assessing NPS pollutant potential to drinking water supplies.
		Water pollution control	Water Resources Division	OLD RIPDES site inventory, awaiting EPA update of info., other uses planned.
		Water supply and demand	Groundwater Div., Air & Haz. Mater. Div	Project from EPA and RI DOH wells siting inventory.
		Watershed/wellhead protection	Groundwater Div., and OEC	Multiple applications for GW div. OEC defined watersheds & subbasins for production with drinking water supply watersheds.
	Miscellaneous	Wetland studies	Wetlands Division	Regulatory guidance, assist in site evaluations.
		Community growth mgmt planning	Municipal planners, state planning divs	
		Land use planning	Project staff, state planning divisions	
		Map products	Municipal & state agencies, public	
RI-OEC	Water Management	Marine studies	Project staff, public education	
		Non-point source pollution	Proj staff, pub educ, state planning div	
		Stormwater management	state reg agencies, public education	Also used by regional waste treatment organizations and project staff.
		Water pollution control	Muni, state reg agencies, pub education	
		Non-point source pollution	DEM NPS Program, Muni & State Agencies	
		Stormwater management	DEM NPS Program, Muni & State Agencies	
		Water pollution control	DEM NPS Program, Muni & State Agencies	

UNITED STATES - FEDERAL  
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Organization Reference	Application Type	Application	End User	Additional Comments
US-EPAI	Air Pollution	Air pollution emissions tracking	Air and Environ Services Divisions	SARA Title III, Ambient Air and Emissions Programs interested in emissions.
	Miscellaneous	Chemical spill preparedness	Enforcement and Preparedness Section	Identify priority Local Emergency Planning Commissions for each state.
		Multi-media initiatives	Various programs	Geographically targeted enforcement activities.
	Waste Management	Industrial waste management	RCRA and Superfund Programs	Site remediation project.
		Waste facility prioritization	RCRA and Superfund Programs	Prioritize sites for remediation.
	Water Management	Stormwater management	Non-point source Program, Merrimack Init	
		Watershed/wellhead protection	Various programs	Multi-media geographic initiatives, vulnerability assessments, wellhead delineation.
		Wetland studies	Wetlands Protection	Advanced identification of wetlands using Lands data.



Organization Reference	Application Type	Application	End User	Additional Comments		
VERMONT =====						
Organization Reference	Application Type	Application	End User	Additional Comments		
VT-ANR	Air Pollution	Air pollution emissions tracking		Preliminary version; un-verified		
	Miscellaneous	Data storage and transfer				
		Map products				
		Wildlife management				
		Waste Management	Hazardous waste			
	Water Management	Water permit/license/registratn				
		Watershed/wellhead protection				
		Wetland studies				
	VT-OGIS	Miscellaneous	Community growth mgmt planning		Town government	VT OGIS fills role as data distributor and archive.
			Data storage and transfer			
Wildlife management			State game authorities			
Waste Management		Municipal solid waste management	Several regional waste authorities			
Water Management		Stormwater management	City government			
		Watershed/wellhead protection	State & local government			

**TABLE E-2**

**Planned Applications by Organization**

Table E-2:Planned GIS Applications by Organization

CONNECTICUT  
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Organization Reference	Application Type	Application	End User	Additional Comments
CT-NRC	Air Pollution	Air pol. fate/transport analysis	DEP, EPA	Ozone studies/ models with NY, NJ.
		Air quality studies	DEP, EPA	Ozone studies/ models with NY, NJ.
	Miscellaneous	Risk assessments	DEP, EPA, towns, applicators	Pesticides/EPA ground water protection program.
	Waste Management	Hazardous waste	DEP, EPA	Part of EPA/LT core grant GIS add-on.
		Waste facility siting	DEP, EPA	Part of EPA/LT core grant add-on.
		Waste generation studys/analysis	DEP,EPA	Part of EPS/LT core grant GIS add-on.
		Waste permit/license/registratn	DEP, EPA	Part of EPA/LT core grant add-on.
	Water Management	Wetland studies	DEP, towns	Awaiting UNIX ARC/INFO - application/database defined, parts in place.

MASSACHUSETTS  
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Organization Reference	Application Type	Application	End User	Additional Comments
MA-BBP	Miscellaneous	Oil spill preparedness		Have plans to develop a series of maps to support oil spill response. Maps would show sensitive resources.
	Water Management	Marine studies	Buzz. Bay Program office	
MA-EOEAD	Water Management	Water pollution control		3056 reporting.
MA-MBP	Water Management	Marine studies	CZM, MBP Office, MWRA, communities	Show location and results of offshore (bay) circulation studies.
		Water pollution control	CZM, MBP office, MWRA, communities	Show location of NPDES discharges, shellfish areas, nonpoint source (through landuse).
		Wetland studies		Through grants program, analyze wetland acreage around a bay
MA-MWRA	Waste Management	Waste facility siting	Sewerage Division	
MA-USGS	Water Management	Inland water quality	State, USGS	Applications at a local and national scale are being programmed and tested.
		Non-point source pollution	State, USGS	Applications at a local and national scale are being programmed and tested.
		Stormwater management	State, USGS	Buzzard Bay potential.
		Water facility siting	State, USGS	Applications at a local and national scale are being programmed and tested.
		Water pollution control	State, USGS	
		Water supply and demand	State, USGS	A statistical package thru AMC has been put together.
		Watershed/wellhead protection	Cape Cod, USGS	Modeling on Cape Cod has and is being done extensively for water quality and quantity.
		Wetland studies	State	

MAINE  
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Organization Reference	Application Type	Application	End User	Additional Comments
ME-BOPC	Water Management	Water pollution pesticide study	State, municipal	Evaluate vulnerability of gw to pesticide contamination. Need current farmland and crop maps.
		Watershed/wellhead protection		Planned by Department of Human Services - Drinking Water Division.

Organization Reference	Application Type	Application	End User	Additional Comments
ME-DEP	Air Pollution	Air pollution emissions tracking	AIR Bureau	The facility and mobil emissions are currently stored in the EPA AIRS computer system and are spatially referenced.
		Ozone study	AIR Bureau	This study is just beginning.
	Miscellaneous	Oil spill preparedness	State of Maine	Focused on marine oil spill.
		Wildlife management	State of Maine	To be incorporated with oil spill preparedness.
	Water Management	Marine studies	Casco Bay National Estuary Program	
		Stormwater management	Casco Bay National Estuary Program	
ME-GS		Water pollution control	Casco Bay National Estuary Program	
	Miscellaneous	Oil spill preparedness	Maine DEP	Provide various data for multi-agency effort.
	Water Management	Aquifer mapping	State agencies, municipalities	
		Groundwater resrc characterizatr	State agencies, municipalities	Characterize quality, quantity, availability of groundwater resources.

**NEW HAMPSHIRE**  
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Organization Reference	Application Type	Application	End User	Additional Comments
NH-OSP	Miscellaneous	Community growth mgmt planning	Municipal planners	
	Water Management	Watershed planning	Community/watershed groups	

**RHODE ISLAND**  
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Organization Reference	Application Type	Application	End User	Additional Comments
RI-ERIC	Air Pollution	Air pollution pesticide studies	Division of Agriculture	Awaiting hardware delivery, project with EPA, coordinate with Groundwater and Air & Hazardous Divisions, Water Resources.
	Miscellaneous	Agricultural studies	Division of Agriculture	Awaiting hardware delivery, project with EPA, coordinate with Groundwater, Air & Hazardous Divisions, Water Resources
RI-NBP	Miscellaneous	Community growth mgmt planning	Municipal planners, state planning divs	
		Land use planning	Project staff, state planning divisions	

**UNITED STATES - FEDERAL**  
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Organization Reference	Application Type	Application	End User	Additional Comments
US-EPAI	Waste Management	Municipal solid waste management	Superfund Program	
	Water Management	Non-point source pollution	Non-point Source Program	

**VERMONT**  
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Organization Reference	Application Type	Application	End User	Additional Comments
VT-ANR	Miscellaneous	Data storage and transfer		
VT-OGIS	Miscellaneous	Forestry planning	State	Northern Forest Lands Council
		Socio-economic factors	Legislation	Reappointment
		Transportation	Municipality & state government	Road mapping and planning
	Water Management	Hazardous waste	State authority	Low level radioactive waste

Organization Reference	Application Type	Application	End User	Additional Comments
	Water Management	Wetland studies	State & local government	

**TABLE E-3**

**Needed Applications by Organization**

Table E-3: Needed GIS Applications by Organization

CONNECTICUT  
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Organization Reference	Application Type	Application	End User	Additional Comments
CT-NRC	Air Pollution	Air pollution emissions tracking	DEP	Basic data inventory needed.
		SARA Title III	DEP, EPA, towns	
	Miscellaneous	Address to coordinate matching	DEP	Needed for many applications.
		Forestry planning	DEP	
		Land use planning	DEP, OPM, towns	Some will be done as part of CT.
		Oil spill preparedness		
	Waste Management	Recycling and waste minimization	DEP, recycling regions	
	Water Management	Water facility siting	DEP, business	
		Water permit/license/registratn	DEP, business	
		Water pollution control	DEP, businesses	GIS to support water quality models
		Water supply and demand	DEP, water companies	Regional water supply planning program existed & used ARC/INFO, currently inactive.

MASSACHUSETTS  
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Organization Reference	Application Type	Application	End User	Additional Comments
MA-BBP	Water Management	Non-point source pollution		Non-point source analysis, particularly of storm drains needed, although not all necessary data available.
MA-MBP	Water Management	Non-point source pollution		
MA-MWRA	Miscellaneous	Address to coordinate matching		
		Demographics		
	Water Management	Stormwater management		

MAINE  
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Organization Reference	Application Type	Application	End User	Additional Comments
ME-BOH	Miscellaneous	Community growth mgmt planning		
		Land use planning		
		Oil spill preparedness		
		Radon		
		Risk assessments		
	Waste Management	Hazardous waste		
		Industrial waste management		
		Municipal solid waste management		
		Recycling and waste minimization		
		Waste facility siting		
		Waste generation studys/analysis		
	Water Management	Aquifer mapping		
		Water pollution control		

Organization Reference	Application Type	Application	End User	Additional Comments
ME-BOPC	Water Management	Watershed/wellhead protection Water pollution control		Would like to use GIS in vulnerability assessment and permitting for pesticides prone to leaching to groundwater, and for siting of pesticide storage and mix/load areas.
ME-DEP	Water Management	Stormwater management Water pollution control Wetland studies	Casco Bay National Estuary Program Casco Bay National Estuary Program National Estuary Program	Wetlands for Casco Bay watershed.
ME-GS	Water Management	Water supply and demand Wetland studies		Has been discussed as necessary for several years. Has been discussed as necessary for several years.
ME-OGIS	Water Management	Groundwater management	DOT, DOC, DEP, MGS, DOA, SPO	Groundwater management has been identified by the GIS Steering Committee as a priority application. No state funds are currently available.

NEW HAMPSHIRE  
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Organization Reference	Application Type	Application	End User	Additional Comments
NH-CSRC	Miscellaneous	Epidemiologic studies	NH Div. of Public Health Services	A commitment has been made to fund a project related to cancer incidence, but no specifics have been finalized.
		Transportation	NH Dept. of Transportation	Preliminary discussions are focusing on a corridor study of Route 16.
NH-DES	Water Management	Watershed/wellhead protection	DES	Prioritize watershed control program activities based on non-point sources of pollution.

RHODE ISLAND  
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Organization Reference	Application Type	Application	End User	Additional Comments
RI-ERIC	Miscellaneous	Address to coordinate matching	Regulatory Divisions	Primarily for complaints and remediation, but perhaps for facility identification, permit applications, and in conjunction with census info. - for risk assessment.
		Forestry planning Wildlife management	Division of Fish & Wildlife	Need updated vegetation & wetlands info for general and species specific management models; determine land ownership abutting management areas for future acquisition.
	Water Management	Inland water quality Marine studies Non-point source pollution	WRD, and GW & ISDS Divisions Water Resources Division Office of Environmental Coordination	Information on sewer areas vs. ISDS and soil type for groundwater & surface water pollution potential. Surface water quality, shellfish closure map, shellfish growing areas sampling. Wetland delineations and NPS for wetlands Div. permit review and enforcement. Also, GIS watershed analysis to develop/refine phosphorous loading model for local planners.
		Stormwater management Water pollution control	WRD and OEC Water Resources Division	Need update of RIPDES site inventory - awaiting EPA update of information.
RI-NBP	Miscellaneous	Wetland studies Community growth mgmt planning Land use planning	Wetlands Division Municipal planners, state planning divs Project staff, state planning divisions	Permit application review, complaints, enforcement tracking.

UNITED STATES - FEDERAL  
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Organization Reference	Application Type	Application	End User	Additional Comments
US-EPA1	Air Pollution	Air quality studies	Air Division	Mobile source emissions tracking.
	Miscellaneous	On-line data catalog	Various programs and states	On-line data catalog with interface.
	Water Management	Wetlands permit tracking	Wetlands Protection Section	

VERMONT  
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Organization Reference	Application Type	Application	End User	Additional Comments
VT-ANR	Air Pollution	Air pol. permit/licence/registr		
		Air pollution facility siting		
		Air quality studies		
	Miscellaneous	Acid Rain		
		Demographics		
		Forestry planning		
		Land use planning		
		Socio-economic factors		
	Waste Management	Industrial waste management		
		Municipal solid waste management		
		Waste permit/license/registratn		
	Water Management	Aquifer mapping		
		Non-point source pollution		
		Water pollution control		
VT-OGIS	Air Pollution	Air pol. fate/transport analysis		
		Air pol. permit/licence/registr		Proposals made, some funded.
		Air pollution emissions tracking		
		Air pollution facility siting	State environmental quality authorities	Proposals made, some funded.
		Air pollution pesticide studies		
	Waste Management	Air quality studies		
		Industrial waste management		
		Recycling and waste minimization		
		Waste generation studys/analysis		
		Waste Hauling		

**TABLE E-4**

**Existing Applications by Application**

Table E-4: Existing GIS Applications by Application

Application	Organization Reference	End User
Air Pollution	Air pol. fate/transport analysis NH-OSP	OSP
	Air pollution emissions tracking US-EPAI	Air and Environ Services Divisions
	VT-ANR	
	Air pollution pesticide studies MA-EOEAD	DPH, DFA, DEP tech serv branch
	NH-CSRC	NH Dept. of Agriculture
Miscellaneous	Acid Rain MA-EOEAD	UMASS/ARM (acid rain monitoring)
	Address to coordinate matching MA-EOEAD	
	Agricultural studies MA-DFA	DFA, EOE, Farming community
	Basin delineation MA-USGS	State, USGS
	Chemical spill preparedness US-EPAI	Enforcement and Preparedness Section
	Community growth mgmt planning ME-GS	Municipalities
	RI-DADP	RI cities and towns
	RI-NBP	Municipal planners, state planning divs
	VT-OGIS	Town government
	Data storage and transfer CT-NRC	Govt agencies, business, individuals
	MA-MWRA	
	NH-CSRC	Multiple users
	VT-ANR	
	VT-OGIS	
	Demographics MA-EOEAD	
	MA-MWRA	
	MA-MWRA	
	ME-BOH	
	Epidemiologic studies MA-EOEAD	DPH
	MA-MWRA	
	ME-BOH	
	Forestry planning MA-MWRA	
	NH-CSRC	NH Dept of Resources and Economic Devt
	Global warming/climate change MA-MWRA	
	Land use planning MA-BBP	Buzz. Bay Program office
	MA-DFA	DFA, Farmers
	MA-MWRA	
	ME-GS	State planning agencies, municipalities
	NH-CSRC	OSP, and US Forest Service
	NH-OSP	OSP, municipalities
	RI-DADP	RI DEM, State planning
	RI-ERIC	Division of Planning
	RI-NBP	Project staff, state planning divisions
	Map products CT-NRC	DEP
	MA-BBP	Many users
	MA-EOEAD	public + private
	MA-MBP	CZM, EPA, RPAs, MiniBays
	MA-MWRA	
	MA-USGS	Cape Cod
	ME-DEP	Anyone who requests maps
	ME-GS	State & federal agencies, public
	NH-CSRC	Multiple users
	RI-NBP	Municipal & state agencies, public
	VT-ANR	
	Marine Oil Spill Response ME-OGIS	DEP, Marine Resources...
	Multi-media initiatives US-EPAI	Various programs
	Northern Forest Lands Study ME-OGIS	Conservation, State Planning...
	Oil spill preparedness ME-DEP	State of Maine
	RI-ERIC	Groundwater Division
	Radon CT-NRC	DEP, health dept, towns
	Risk assessments MA-MWRA	
	Socio-economic factors ME-BOH	
	NH-CSRC	US Forest Service
	Wildlife management ME-DEP	State of Maine
	RI-ERIC	Natural Heritage Program
	VT-ANR	
	VT-OGIS	State game authorities
Waste Management	Fate/transport/dispersion model MA-MWRA	Harbor studies
	Hazardous waste MA-EOEAD	DEP/DUSC (div of waste site cleanup)
	RI-ERIC	Hazardous Materials Division
	VT-ANR	
	Industrial waste management US-EPAI	RCRA and Superfund Programs
	Municipal solid waste management MA-EOEAD	DEP/DSW
	VT-OGIS	Several regional waste authorities
	Waste facility prioritization US-EPAI	RCRA and Superfund Programs
	Waste facility siting MA-MWRA	Sewerage Division

Application Type	Application	Organization Reference	End User
Water Management	Waste permit/license/registratn Aquifer mapping	ME-GS	ME Low Level Radioactive Waste Auth.
		RI-ERIC	Hazardous Materials Division
		RI-ERIC	Hazardous Materials Inventory
		CT-NRC	DEP, water companies, towns
		MA-EOEAD	DEP/DWS (div of water supply)
		MA-MBP	
		MA-MWRA	
		MA-USGS	State, USGS
		ME-BOPC	
		ME-GS	State agencies, municipalities
	Facility inventory Groundwater class mapping Groundwater resrc characterizatn Inland water quality Marine studies	NH-CSRC	Municipalities
		RI-DEMGW	DEM GW
		RI-ERIC	Groundwater Division
		RI-DEMGW	
		RI-DEMGW	
		ME-GS	State agencies, municipalities
		RI-ERIC	Water Resources Division
		CT-NRC	USGS, DEP, UConn, Univ. New Haven, SCS
		MA-BBP	Buzz. Bay Program office
		MA-EOEAD	CZM (coastal zone management)
	Non-point source pollution	MA-MWRA	
		ME-GS	MGS, Federal agencies
		RI-ERIC	Water Resources Division
		RI-NBP	Project staff, public education
		CT-NRC	DEP, EPA, towns, businesses
		MA-DFA	DFA
		MA-EOEAD	
		MA-MBP	CZM, MBP
		MA-MWRA	
		NH-DES	DES
	Stormwater management	RI-ERIC	Office of Environmental Coordination
		RI-NBP	Proj staff, pub educ, state planning div
		RI-OEC	DEM NPS Program, Muni & State Agencies
		ME-DEP	Casco Bay National Estuary Program
		RI-NBP	state reg agencies, public education
		RI-OEC	DEM NPS Program, Muni & State Agencies
		US-EPAI	Non-point source Program, Merrimack Init
		VT-OGIS	City government
	Water permit/license/registratn Water pollution control	VT-ANR	
		MA-MWRA	
		ME-DEP	Casco Bay National Estuary Program
		RI-ERIC	Water Resources Division
		RI-NBP	Muni, state reg agencies, pub education
		RI-OEC	DEM NPS Program, Muni & State Agencies
	Water supply and demand	MA-MWRA	Waterworks Division
		RI-ERIC	Groundwater Div., Air & Haz. Mater. Div
		CT-NRC	DEP, water companies, towns
		MA-BBP	private non-profit
		MA-DFA	DFA, EOEAD, Farmers
		MA-EOEAD	
		MA-MWRA	
		MA-USGS	Cape Cod, USGS
		NH-DES	DES
		RI-ERIC	Groundwater Div., and OEC
	Watershed/wellhead protection	US-EPAI	Various programs
		VT-ANR	
		VT-OGIS	State & local government
		RI-DEMGW	DEM GW
		MA-EOEAD	DEP/DWM (div of wetlands & waterways)
		MA-USGS	State
		ME-DEP	Town of York
		NH-CSRC	Municipalities
		RI-ERIC	Wetlands Division
		US-EPAI	Wetlands Protection Section
	Wellhead protection Wetland studies	VT-ANR	

**TABLE E-5**

**Planned Applications by Application**

**Table E-5:Planned GIS Applications by Application**

Application	Application	Organization Reference	End User
Air Pollution	Air pol. fate/transport analysis	CT-NRC	DEP, EPA
	Air pollution emissions tracking	ME-DEP	AIR Bureau
	Air pollution pesticide studies	RI-ERIC	Division of Agriculture
	Air quality studies	CT-NRC	DEP, EPA
Miscellaneous	Ozone study	ME-DEP	AIR Bureau
	Agricultural studies	RI-ERIC	Division of Agriculture
	Community growth mgmt planning	NH-OSP	Municipal planners
		RI-NBP	Municipal planners, state planning divs
	Data storage and transfer	VT-ANR	
	Forestry planning	VT-OGIS	State
	Land use planning	RI-NBP	Project staff, state planning divisions
	Oil spill preparedness	MA-BBP	
		ME-DEP	State of Maine
		ME-GS	Maine DEP
Waste Management	Risk assessments	CT-NRC	DEP, EPA, towns, applicators
	Socio-economic factors	VT-OGIS	Legislation
	Transportation	VT-OGIS	Municipality & state government
	Wildlife management	ME-DEP	State of Maine
	Hazardous waste	CT-NRC	DEP, EPA
		VT-OGIS	State authority
	Municipal solid waste management	US-EPAI	Superfund Program
	Waste facility siting	CT-NRC	DEP, EPA
		MA-MWRA	Sewerage Division
	Waste generation studys/analysis	CT-NRC	DEP,EPA
Water Management	Waste permit/license/registratn	CT-NRC	DEP, EPA
	Aquifer mapping	ME-GS	State agencies, municipalities
	Groundwater resrc characterizatr	ME-GS	State agencies, municipalities
	Inland water quality	MA-USGS	State, USGS
	Marine studies	MA-BBP	Buzz. Bay Program office
		MA-MBP	CZM, MBP Office, MWRA, communities
		ME-DEP	Casco Bay National Estuary Program
	Non-point source pollution	MA-USGS	State, USGS
		US-EPAI	Non-point Source Program
	Stormwater management	MA-USGS	State, USGS
		ME-DEP	Casco Bay National Estuary Program
	Water facility siting	MA-USGS	State, USGS
	Water pollution control	MA-EOEAD	
		MA-MBP	CZM, MBP office, MWRA, communities
		MA-USGS	State, USGS
		ME-DEP	Casco Bay National Estuary Program
	Water pollution pesticide study	ME-BOPC	State, municipal
	Water supply and demand	MA-USGS	State, USGS
	Watershed planning	NH-OSP	Community/watershed groups
	Watershed/wellhead protection	MA-USGS	Cape Cod, USGS
		ME-BOPC	
Wetland studies		CT-NRC	DEP, towns
		MA-MBP	
		MA-USGS	State
		VT-OGIS	State & local government

**TABLE E-6**

**Needed Applications by Application**

Table E-6: Needed GIS Applications by Application

Application	Organization Reference	User
<b>Air Pollution</b>		
Air pol. fate/transport analysis	VT-OGIS	
Air pol. permit/licence/registr	VT-ANR	
	VT-OGIS	
Air pollution emissions tracking	CT-NRC	DEP
	VT-OGIS	
Air pollution facility siting	VT-ANR	
	VT-OGIS	State environmental quality authorities
Air pollution pesticide studies	VT-OGIS	
Air quality studies	US-EPAI	Air Division
	VT-ANR	
	VT-OGIS	
<b>Miscellaneous</b>		
SARA Title III	CT-NRC	DEP, EPA, towns
Acid Rain	VT-ANR	
Address to coordinate matching	CT-NRC	DEP
	MA-MWRA	
	RI-ERIC	Regulatory Divisions
Community growth mgmt planning	ME-BOH	
	RI-NBP	Municipal planners, state planning divs
Demographics	MA-MWRA	
	VT-ANR	
Epidemiologic studies	NH-CSRC	NH Div. of Public Health Services
Forestry planning	CT-NRC	DEP
	RI-ERIC	
	VT-ANR	
Land use planning	CT-NRC	DEP, OPM, towns
	ME-BOH	
	RI-NBP	Project staff, state planning divisions
	VT-ANR	
Oil spill preparedness	CT-NRC	
	ME-BOH	
On-line data catalog	US-EPAI	Various programs and states
Radon	ME-BOH	
Risk assessments	ME-BOH	
Socio-economic factors	VT-ANR	
Transportation	NH-CSRC	NH Dept. of Transportation
Wildlife management	RI-ERIC	Division of Fish & Wildlife
<b>Waste Management</b>		
Hazardous waste	ME-BOH	
Industrial waste management	ME-BOH	
	VT-ANR	
	VT-OGIS	
Municipal solid waste management	ME-BOH	
	VT-ANR	
Recycling and waste minimization	CT-NRC	DEP, recycling regions
	ME-BOH	
	VT-OGIS	
Waste facility siting	ME-BOH	
Waste generation studys/analysis	ME-BOH	
	VT-OGIS	
Waste Hauling	VT-OGIS	
Waste permit/license/registratn	VT-ANR	
<b>Water Management</b>		
Aquifer mapping	ME-BOH	
	VT-ANR	
Groundwater management	ME-OGIS	DOT, DOC, DEP, MGS, DOA, SPO
Inland water quality	RI-ERIC	WRD, and GW & ISDS Divisions
Marine studies	RI-ERIC	Water Resources Division
Non-point source pollution	MA-BBP	
	MA-MBP	
	RI-ERIC	Office of Environmental Coordination
	VT-ANR	
Stormwater management	MA-MWRA	
	ME-DEP	Casco Bay National Estuary Program
	RI-ERIC	WRD and OEC
Water facility siting	CT-NRC	DEP, business
Water permit/license/registratn	CT-NRC	DEP, business
Water pollution control	CT-NRC	DEP, businesses
	ME-BOH	
	ME-BOPC	
	ME-DEP	Casco Bay National Estuary Program
	RI-ERIC	Water Resources Division
	VT-ANR	
Water supply and demand	CT-NRC	DEP, water companies



Application Type	Application	Organization Reference	End User
	Watershed/wellhead protection	ME-GS ME-BOH NH-DES	DES
	Wetland studies	ME-DEP ME-GS	National Estuary Program
	Wetlands permit tracking	RI-ERIC US-EPAI	Wetlands Division Wetlands Protection Section