

**FIVE YEAR PROGRAM PLAN  
FOR  
PHYSICAL RESOURCES INVENTORY  
1977 - 1982**



**State of Maine  
DEPARTMENT OF CONSERVATION  
Bureau of Geology**

December 1976

"The Land and Water Resources Council strongly endorses the Bureau of Geology's Five Year Program Plan as an efficient and effective means of providing necessary physical resource data to land management decision makers on a timely basis.

"The Council urges the Governor to endorse this approach to program planning and to support the Bureau of Geology's Five Year Program Plan."

-MAINE LAND & WATER RESOURCES COUNCIL  
Resolution of October 19, 1976



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FOR  
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Bureau of Geology

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STATE OF MAINE

James B. Longley, Governor

DEPARTMENT OF CONSERVATION

Richard E. Barringer, Commissioner

BUREAU OF GEOLOGY

Robert G. Doyle, State Geologist

ADVISORY COMMITTEE FOR PROGRAM PLANNING

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Professor Donaldson Koons, Colby College

Mr. John R. Rand, Brunswick, Maine

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## I. INTRODUCTION

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The accelerating rate and changing nature of development activity in Maine in the last few years have presented decision-makers with problems of land and water use management that demand geologic information and assistance for their solution.

Critical problems requiring specific geologic input to their solution have been identified:

1. The need to devise management policies that will insure the protection of the fresh water supplies from pollution and over-use. Whenever the land surface is altered, there is danger that the physical systems that contain our water sources can be seriously harmed. Only with geologic knowledge of what these systems are and how they operate can we develop suitable water management plans to preserve the resource.
2. Increased development of our shorelines requires that we evaluate the effects of such activities on one of the most fragile of our resources. It is important to make informed decisions that will allow us to continue use of the shoreline without causing irreversible harm to it. Geologic investigations into natural shoreline processes will provide the information upon which guidelines for proper beach and estuary management can be developed and implemented.
3. A very serious concern is to insure a continuing availability of mineral resources (mostly sand, gravel, clay, lime, and bedrock) in sufficient quantity at a low enough cost to support the construction necessary for a healthy economy. These so-called industrial minerals are in limited supply and occur irregularly throughout the State. Without careful management, such resources can be prematurely exhausted or excluded from use by poor land planning. Geologic mapping will locate and define the quantitative and qualitative information on mineral deposits, thus allowing for balanced exploitation and conservation of these resources. An equally pressing need is to acquire and interpret basic geologic data for making informed judgments on the seismic susceptibility and bearing strength of the subsurface in relation to major energy facilities construction.



There is an immediate and pressing need to provide information and technical assistance to private and public decision-makers for solutions to the problems described above. Given the present level of Bureau activity, however, it will take 15 to 20 years to complete the required data acquisition program. In the meantime, many critical land management decisions will be made with very little knowledge of the environment that is being affected.

The acceleration of the Bureau's physical resources inventory program will make the needed information available for the decision makers before, rather than after, critical land management decisions are made.

An accelerated physical resource inventory acquisition program will require an increase in funding and staff. Outside funding will contribute at least one-half of this increase. Upon completion of the five year program, budget and staff levels will be reduced by fifty percent, close to it's present level.

The Program Plan Summary and Budget in the next section shows the actual General Fund budget request, outside funding sources and necessary expenditures for Fiscal Years 1978 and 1979. The funding and expenditure figures for the last three years are projected estimates.

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## II PROGRAM PLAN SUMMARY AND BUDGET

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The Bureau of Geology physical resource inventory program was begun three years ago as a data acquisition project to help planning agencies develop land use management plans for various regions of the State. Work was concentrated in the coastal zone and in two urban centers, Portland and Augusta. The State Planning Office, regional planning agencies, and other resources agencies, including the Corps of Engineers have, during the last three years, contracted with the Bureau for over \$175,000 to conduct specific data acquisition studies.

The proposed plan covers a five fiscal year period from July 1977 to June 1982. It is a state-wide data acquisition program designed to produce high quality physical resource data at low cost, on a fixed schedule. Resource data will be refined into the Bureau's Physical Resources Map Series. This basic product will be supplemented by detailed studies in critical problem areas throughout the State. The intensity of mapping and data acquisition, the parts of the State to be investigated during any mapping season and the types of product derived can be changed year to year. Shifts in emphasis and priority, resulting from current needs, will be subject to annual review.

OBJECTIVES There are two objectives of the Bureau's Program Plan:

To prepare and make available, in useful form, a physical resource data base that can be used by private and public agencies to make more intelligent land management decisions; and

To provide technical assistance to decision makers concerning the geologic implications of specific resource management policies.

ORGANIZATION The Bureau presently functions with an informal organization of data gathering divisions, supported by an administrative section and cartographic services. Under the five year program, there will be three specific data gathering programs: Hydrogeology, Marine Geology and Physical Geology.

Administrative support will consist of the State Geologist, a clerical and fiscal section, and a four-person cartographic section. Each of the three programs will have a professional Geologist for budget control and program performance. The directors will also be responsible for editing maps and reports dealing with their part of the program.



The State Geologist will have overall responsibility for program performance and for any changes in program and budget allocations, as circumstances demand. He will also develop contracts with outside funding sources, and assist the supervisors in the preparation of grant proposals.

COST The average annual cost of the Five Year Program Plan will be \$386,170, an increase of \$169,170 over the present Bureau budget. The present Bureau budget is \$217,000, including \$126,400 from the General Fund, and the balance from outside funding sources.

Implementation of the Five Year Plan will require an average annual General Fund appropriation of \$223,175, an increase of some \$73,334 annually. The balance will be derived from outside funding sources. State appropriations will be used primarily to bring the base level staffing in the Bureau up to a required operational minimum. The total program budget and funding sources are shown on page 7 (Tables I and II). These tables are accompanied by a third table (page 8) which shows the distribution of General Fund appropriations.

PRODUCTS Five products, in the form of maps, reports, and technical bulletins will result from the physical inventory program.

1. Physical Resource Inventory Maps (PM)
2. Physical Resource Inventory Reports (RR)
3. Specific Study Bulletins (SB)
4. Education Booklets (EB)
5. Technical Assistance Reports

The basic product of the Five Year Plan is a series of physical inventory maps covering the entire State. The Bureau program will produce inventory maps for each type of information - hydrogeology, marine, and physical geology. Additional maps and reports of regional or specific topic needs will be produced to supplement the basic format.

PROGRAM REVIEW COMMITTEE Five highly qualified geologists have been asked by the Commissioner of the Department of Conservation to serve on an informal committee to review the Bureau's work program. The Committee's initial task has been to participate with the State Geologist in the development of the Five Year Program Plan. Upon implementation of the program in 1977, the Committee will conduct periodic reviews of the program and the schedule of completion, and evaluate the quality of the product.

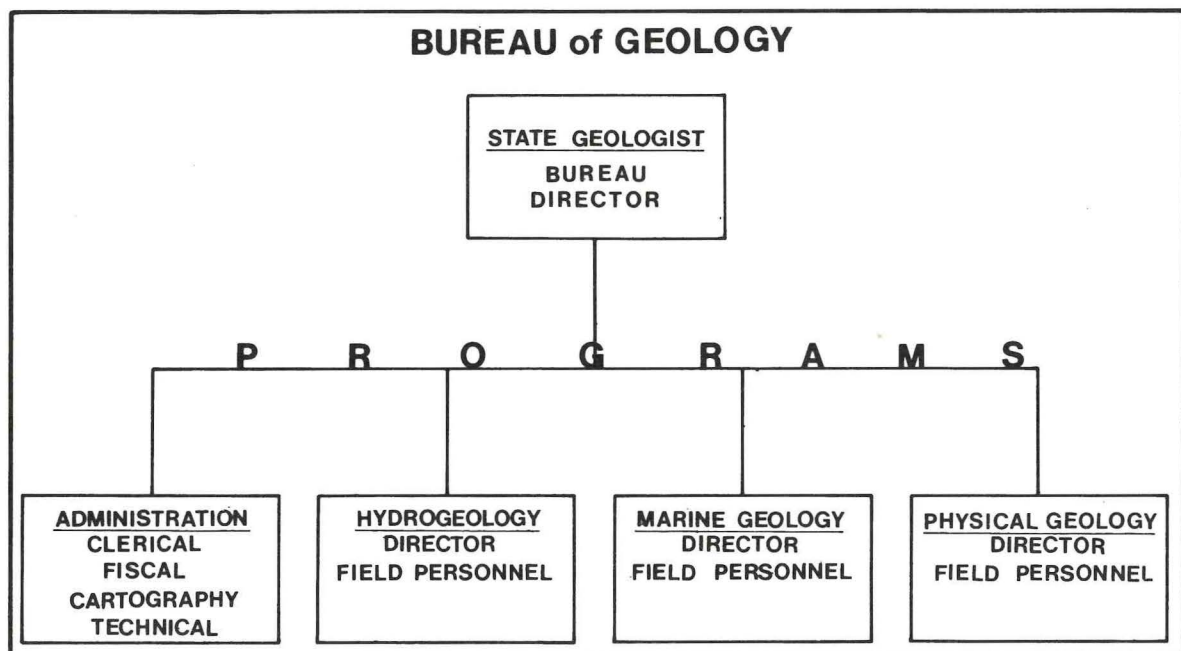


The Five Year Plan includes a series of time lines for completion of work products which will provide the Committee with clearly defineable benchmarks of work product completion that can be matched against actual performance. It is proposed that the Committee meet at least twice a year to conduct a work product evaluation, and assist the State Geologist in the management of the Program Plan.

USERS GROUP In order to assure better coordination with other agency activities and responsiveness to user requirements, the Bureau will establish a Users Group which will meet at least annually to review progress and specifications of the Program Plan.

The Users Group will represent such agencies as the Department of Environmental Protection, Department of Transportation, Department of Marine Resources, State Planning Office, Soil and Water Conservation Commission, Regional Planning Commissions, University of Maine at Orono, and the Soil Conservation Service, and may report to the Land and Water Resources Council on the Bureau's progress toward Plan objectives and on any problems encountered in that regard.

In particular, the Users Group will see to it that: (1) coordination is achieved with other agencies to minimize duplication of effort and to maximize overall work product; (2) review and recommend shifts in geographic priorities to reflect changing conditions and work program requirements; and (3) assure that data generated by the work program is organized, stored, and presented in such fashion as to maximize its usefulness to land management decision makers.



ADMINISTRATION AND PROGRAM STAFF BUDGET. The full time administrative and program staff requirements for the Bureau Program Plan during the five year period are listed below. These positions are included in the General Fund appropriation request for personal services. The fiscal breakdown below is only for the first year of the Program Plan.

#### Administration and Management Staff

*State Geologist	(1) (Salary & Retirement)	\$21,809
*Fiscal Person	(1)	9,445
*Clerk Steno III	(1)	8,165
Clerk II	(1)	6,654
*Cartographers	(3)	32,918
***Mapping Supervisor	(1)	<u>12,144</u>
Sub-Total		\$91,135

#### Division Program Staff

##### Hydrogeology

Director	(1)	\$17,518
Geology Technician	( $\frac{1}{2}$ )	4,641
Geology Technician	(1)	9,748

##### Marine Geology

Director	(1)	\$17,518
Geology Technician	(1)	9,282

##### Physical Geology

Director**	(1)	\$20,262
Geology Technician	( $\frac{1}{2}$ )	<u>4,641</u>

Sub-Total		\$83,610
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Total Positions	(14)	
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Total Cost (Fiscal Year 1978 only)		\$174,745
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\* Present General Fund Position (Clerk Steno III is presently a II).

\*\* The Physical Geology Director acts as Assistant State Geologist as required.

\*\*\* Mapping Supervisor is presently a Cartographer.

Table I  
PROGRAM BUDGET SUMMARY

Program Segment	1977-78	1978-79	1979-80	1980-81	1981-82	Total
Administration	\$124,496	\$109,544	\$105,400	\$ 99,900	\$ 99,900	\$539,240
Hydrogeology	113,783	102,837	103,300	103,300	93,200	516,420
Marine	126,893	74,943	56,136	51,900	53,900	363,772
Physical Geology	107,630	108,536	100,550	97,550	97,050	511,316
Total	\$472,802	\$395,860	\$365,386	\$352,650	\$344,050	\$1,930,748

Table II  
BREAKDOWN OF FUNDING SOURCES

Funding Source	Present Year	1977-78	1978-79	1979-80	1980-81	1981-82	Total
General Fund	\$126,400	\$247,241	\$247,335	\$217,890	\$202,200	\$201,200	\$1,115,866
Mining Bureau	22,000	22,590	18,210	22,000	22,000	22,000	106,800
Planning Agencies	61,000	34,964	33,261	32,050	27,740	28,690	156,705
Other Agencies	7,600	168,007	97,054	93,446	100,710	92,160	551,377
Total	\$217,000	\$472,802	\$395,860	\$365,386	\$352,650	\$344,050	\$1,930,748



Table III

## GENERAL FUND APPROPRIATION REQUEST - 1977-82

PROGRAMS	Year- 1	2	3	4	5
HYDROGEOLOGY					
Well Inventory					
Personal Services	12,447	12,923	12,945	12,945	12,945
All Other	737	2,237	1,000	1,000	1,000
Capital					
Observation Wells					
Personal Services	3,577	3,766	8,000	8,000	8,000
All Other	325	2,007	3,000	3,000	3,000
Capital			500	500	500
Aquifer Investigations					
Personal Services	29,699	30,336	9,795	9,795	9,795
All Other	1,308	2,090	1,000	1,000	1,000
Capital					
MARINE GEOLOGY					
Beach Inventory					
Personal Services	16,397	17,111	14,050		
All Other	1,500	1,000	1,200		
Capital					
Estuarine Inventory					
Personal Services	16,396	17,112	11,040	16,100	16,100
All Other	1,000	3,800	2,000	2,000	1,000
Capital					
PHYSICAL GEOLOGY					
Surficial Geology					
Personal Services	17,962	17,962	13,030	13,030	13,030
All Other	1,000	1,000	4,500	4,500	4,500
Capital			700	700	700
Bedrock Inventory					
Personal Services	14,680	16,086	14,530	14,530	14,530
All Other	1,000	1,250	4,500	4,500	4,500
Capital			700	700	700
Engineering Geology					
Personal Services	8,841	8,841	8,000	8,000	8,000
All Other	776	200	2,000	2,000	2,000
Capital					
ADMINISTRATION *					
Personal Services	91,135	94,888	95,900	95,900	95,900
All Other	19,921	14,656	9,500	4,000	4,000
Capital	8,540				
TOTAL	247,241	247,335	217,890	202,200	201,200

\* This figure includes \$45,062 for cartographic and technical support.

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### III HYDROGEOLOGY PROGRAM

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This program is designed to provide technical information required for the beneficial use and maintenance of Maine's ground water resources.

#### PROJECTS

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- A. Ground Water Inventory. Inventory and analysis of water well, bore hole, and other available subsurface data pertaining to ground water resources.
- B. Observation Well Network. Installation and monitoring of wells to detect physical and chemical changes in ground water aquifers.
- C. Aquifer Investigations. Investigation into the physical and quantitative characteristics of three types of aquifer situations:
  - 1. Gravel Aquifers
  - 2. Bedrock Aquifers
  - 3. Salt Water Intrusion of Coastal Aquifers

PROGRAM BUDGET	YEAR - 1	2	3	4	5
Groundwater Inventory	\$17,924	\$18,400	\$18,400	\$18,400	\$22,700
Observation Well Network	16,602	16,543	16,600	16,600	16,600
Aquifer Investigations	<u>79,257</u>	<u>67,894</u>	<u>68,300</u>	<u>68,300</u>	<u>53,900</u>
Program Totals	\$113,783	\$102,837	\$103,300	\$103,300	\$ 93,200
Total Program Cost, 1977-82					\$516,420

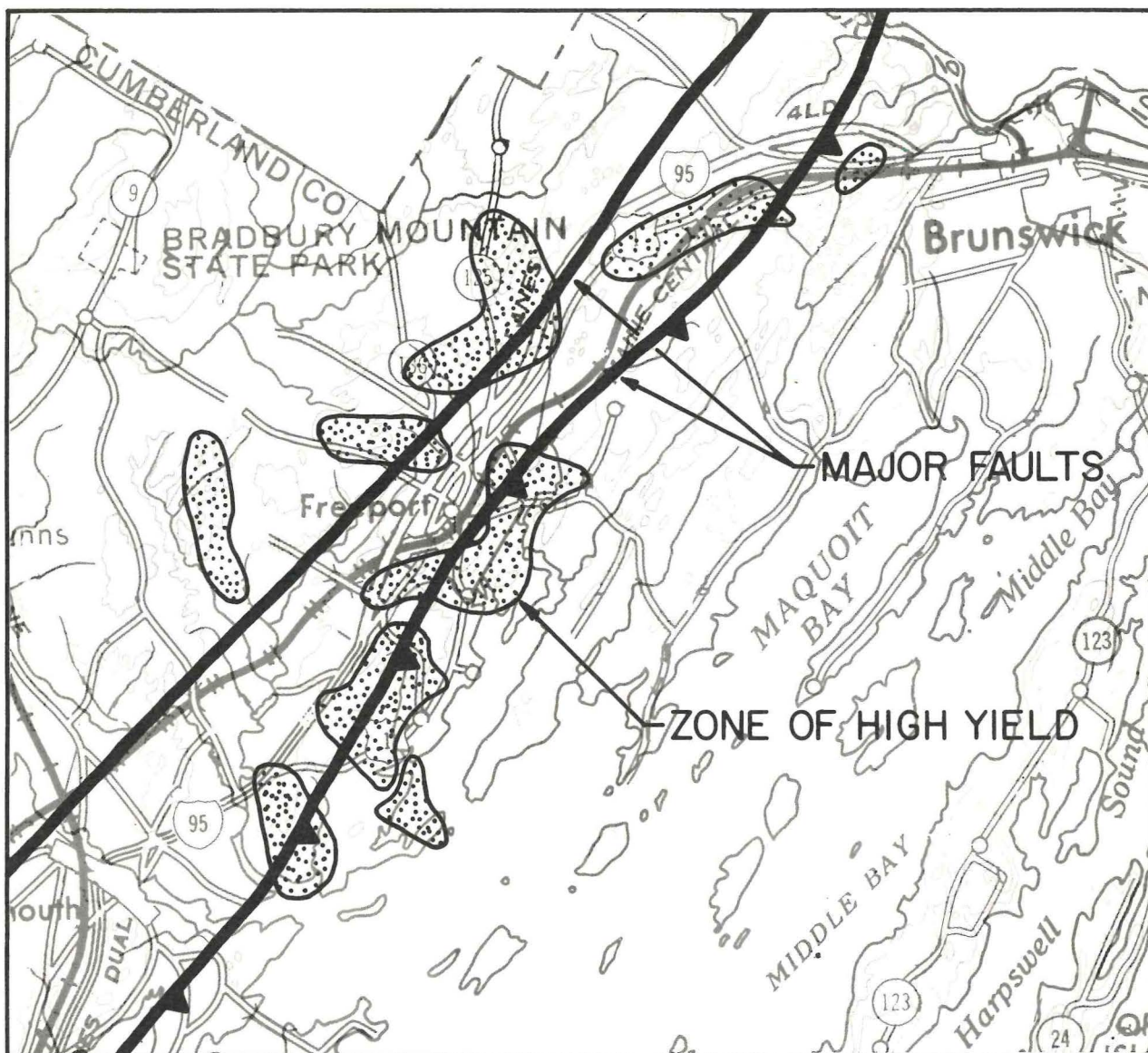


Figure 1

This figure shows how geologic investigations will be used to locate high yield bedrock aquifers where a predictable source of water can benefit well drillers and consumers. Zones of high yield bedrock wells associated with major bedrock faults in the area of Freeport are optimal sites for drilling commercial and municipal wells. Additional, but as yet untapped, high yield zones will occur along the trace of these faults.



## HYDROGEOLOGY PROGRAM DESCRIPTIONS

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- A. Ground Water Inventory Project. An inventory and analysis of water well, bore hole, and other available subsurface data that pertain to ground water resources.

Water well records are obtained on a voluntary basis from well drilling firms, the Department of Transportation, the Maine Turnpike Authority, and other public agencies. Water well and test hole locations are plotted by staff assistants working in the field.

Analysis of well and test hole data is reduced and compiled on water resource maps at scales consistent with available data and user requirements. Reconnaissance level maps are at the scale of 1:125,000, detailed work is done at the scale of 1:62,500, or in some cases 1:48,000.

There are five distinct kinds of information which can be derived from analysis of field data: Bedrock Well Yield, Bedrock Well Depth, Overburden Thickness, Topography of the Bedrock Surface, and the Potentiometric Surface. Maps showing each of these features will be separately produced. This program will also develop maps showing the location and potential yield of gravel aquifers. Project work will be conducted in cooperation with the U.S.G.S., Water Resources Division where practical.

### Breakdown of Project Cost (per year average)

Personal Services	\$15,675
All Other	3,490
Capital	<hr/>
Annual Project Cost	\$19,165
Total Project Cost, 1977-82	\$95,824

- B. Observation Well Network Project. This project will require installation and monitoring of wells to detect physical and chemical changes in ground water aquifers. A network of observation wells is required in areas where expected changes in ground water level and/or quality will adversely affect water supplies. There are four such areas in Maine: (1) southern Maine coast, (2) central Maine coast, (3) central Maine urban centers, and (4) northeastern Maine.

In southern Maine, observation wells will be installed in high yield gravel aquifers that are to be utilized in the near future. Observation wells in the central Maine coast area will monitor salt water encroachment in bedrock aquifers. Ground water use patterns in the central Maine urban centers will be measured from observation wells in both bedrock aquifer zones and gravel aquifers. Observation of water level and quality changes will be conducted in northeastern Maine to detect excessive aquifer drawdown and contamination. Observation well networks will be installed, maintained, and monitored in cooperation with the U.S.G.S., Water Resources Division.

Breakdown of Project Cost (per year average)

Personal Services	\$ 3,749
All Other	7,240
Capital	<u>5,600</u>
Annual Project Cost	\$16,589
Total Project Cost, 1977-82	\$82,945

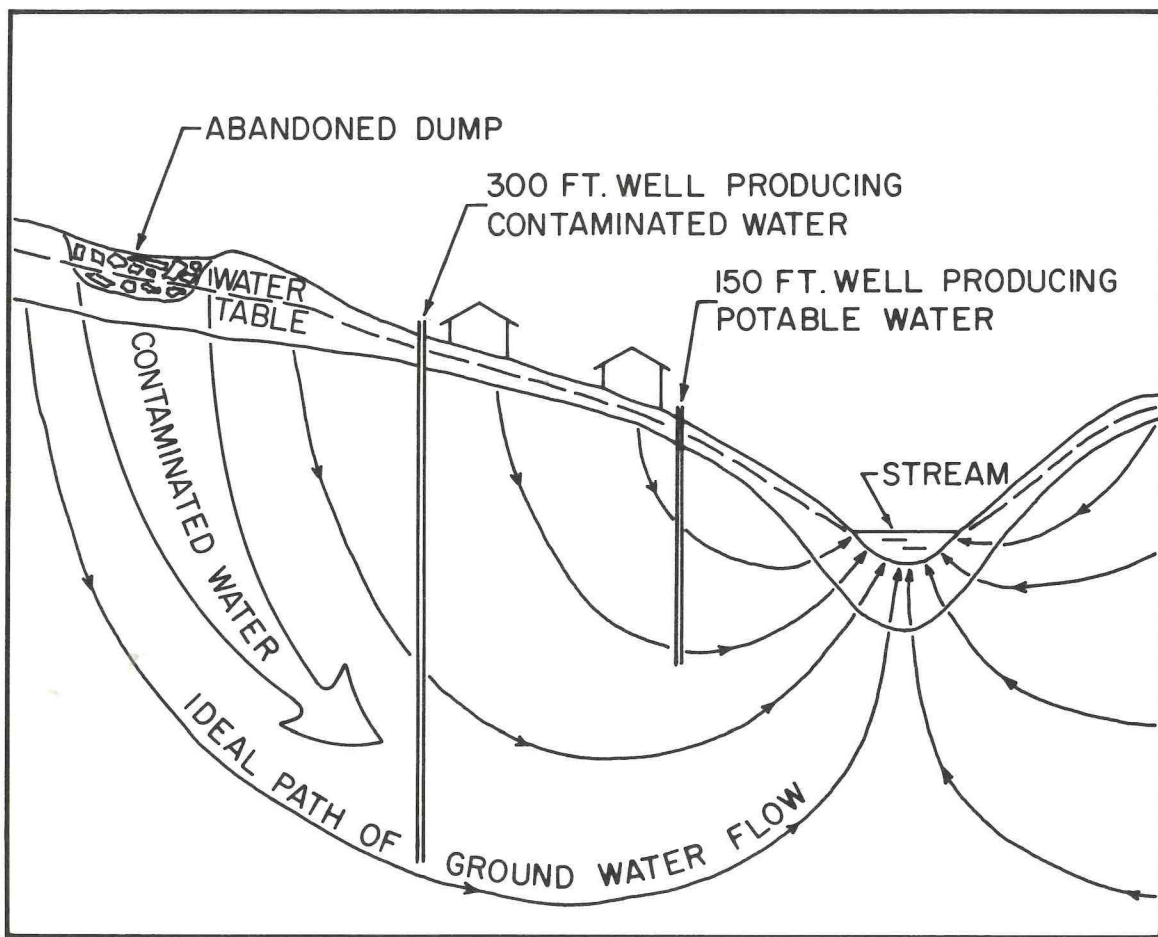


Figure 2

Knowledge of subsurface geologic features is necessary to plan and manage future municipal and private developments in order to protect aquifer areas and surface water bodies. This figure shows how water supplies can be affected by ignorance of local ground water flow characteristics.

C. Aquifer Investigations Project. Three types of aquifers are included; gravel, bedrock, and coastal. Coastal aquifers, although essentially bedrock, are considered separately because they are subject to salt-water intrusion.

1. Gravel Aquifer - Field mapping, flow measurements, and data analysis are necessary to provide quantitative information about gravel aquifers as a water supply source. Gravel aquifers in Maine are distinct from bedrock aquifers in three respects; they generally yield more water, are of similar geologic origin, and are easily contaminated by surface activities. Detailed hydrogeologic investigation is required to locate sources and measure ground water quantity and quality characteristics.

Glacial deposits which are of potential value as gravel aquifers can be located by field mapping of surficial deposits. Hydrologic studies of these potential aquifers will then determine their actual value as useable ground water sources. Previous reconnaissance field mapping has identified three areas where such aquifers exist. These areas are: southern Maine, central Maine, and northeastern Maine. Hydrologic investigations will be conducted in these areas in cooperation with the U.S.G.S., Water Resources Division.

Gravel Aquifer Budget (per year average)

Personal Services	\$ 10,397
All Other	15,954
Capital	<u>2,400</u>
Annual Project Cost	\$ 28,751
Total Project Cost, 1977-82	\$143,757



2. Bedrock Aquifers - Bedrock aquifers occur in all parts of the State and are the most common source of potable water for family homes. Use of this resource is expanding rapidly in the more heavily developed regions of the State. Acquisition of detailed bedrock geologic information and studies of the hydrologic regions in central and northern Maine will be the first priority of this program element.
- a. Adequate supplies of bedrock ground water for domestic, industrial, and commercial use are required in central Maine urban centers. Reconnaissance investigations indicate that within the bedrock aquifer as a whole, there are zones of anomalously high yield, which may produce the large volumes of water required for municipal and industrial consumption. More geologic work is needed to predict the location and yield of high yield zones in the bedrock.
  - b. Use of ground water for irrigation and domestic consumption in northeastern Maine may be altering ground water conditions in that area. Water table levels apparently are being lowered, causing some wells to go dry. Extensive application of agricultural chemicals may be affecting water quality. Basic hydrologic information, including precipitation, runoff, evapotranspiration, irrigation use, discharge points, and water quality is needed to predict and prevent deleterious changes in ground water quantity and quality.

Bedrock Aquifer Budget (per year average)

Personal Services	\$ 10,508
All Other	9,854
Capital	<u>2,520</u>
Annual Project Cost	\$ 22,882
Total Project Cost, 1977-82	\$114,412



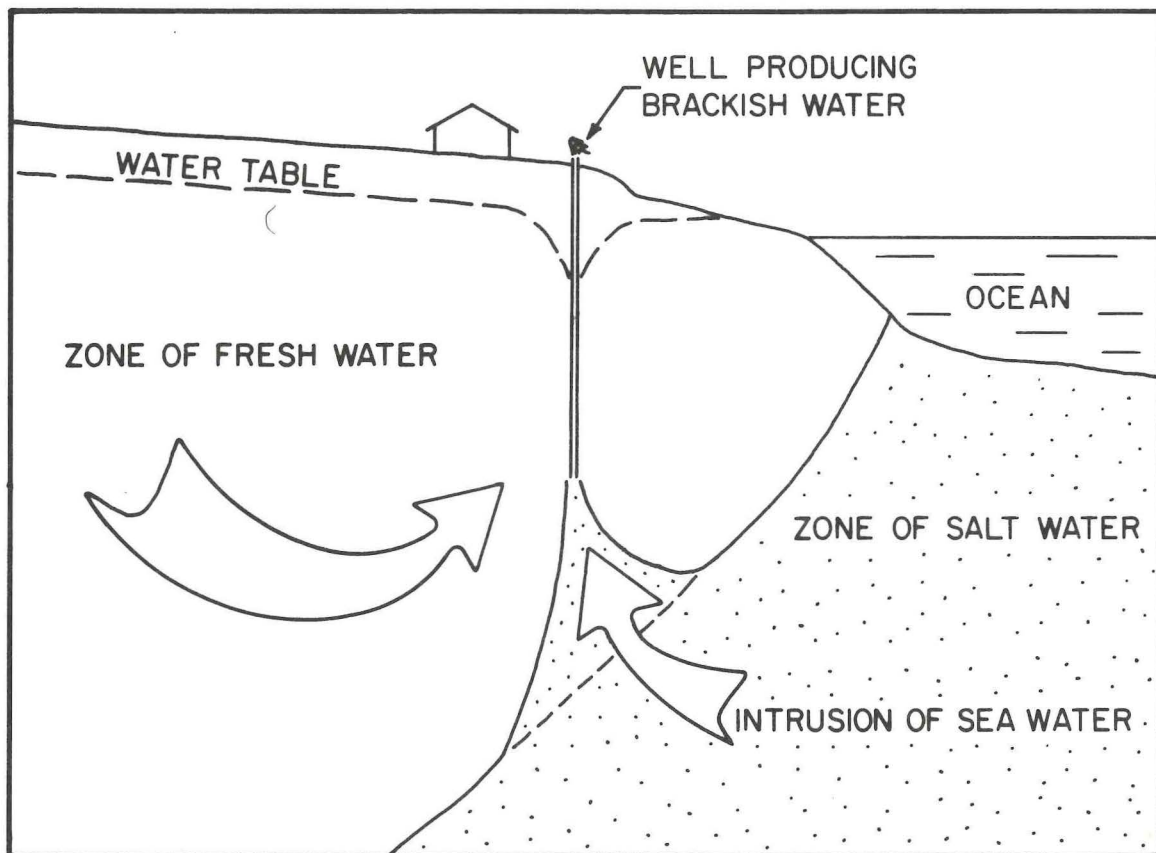


Figure 3

This figure demonstrates how sea water may be drawn into a coastal well that is too near the coast, too deep, or is being pumped at too great a rate for a sustained period of time. Detailed, three-dimensional geologic information, which implementation of the Coastal Aquifer Project will produce, is the only way to control this problem.

3. Coastal Aquifers - This project is designed to measure the degree of sea water contamination in wells drilled into near-shore fresh water aquifers. This problem is occurring now in the central coast area. The potential for significant sea water intrusion is high because of the increasing number of wells being drilled very close to the sea coast. Narrow rocky peninsulas being developed for seasonal and year-round homes appear especially vulnerable.

The problem is currently under study at High Head in Harpswell, Maine. Research started in 1974 and has grown in scope to become, in 1976, a cooperative venture between the Bureau and the U.S.G.S., Water Resources Division.

The purpose of the High Head investigation, and other proposed studies, is to acquire sufficient quantitative information to predict and prevent salt water intrusion of Maine's coastal bedrock aquifers. The project involves monitoring of ground water levels and salinity variations as well as detailed bedrock and structure mapping, and aquifer testing.

Coastal Aquifer Budget (per year average)

Personal Services	\$ 8,402
All Other	4,974
Capital	<u>2,520</u>
Annual Project Cost	\$15,896
Total Project Cost, 1977-82	\$79,482

HYDROGEOLOGY PROGRAM BUDGET

		PROGRAM DETAILS					
PROGRAM		1977-78	1978-79	1979-80	1980-81	1981-82	
Ground Water Inventory Program	Personal Services	\$ 14,687	\$ 15,163	\$ 15,163	\$ 15,163	\$ 18,200	
	All Other	3,237	3,237	3,237	3,237	4,500	
	Capital						
	Total	<u>17,924</u>	<u>18,400</u>	<u>18,400</u>	<u>18,400</u>	<u>22,700</u>	
Observation Well Inventory Program	Personal Services	3,577	3,766	3,800	3,800	3,800	
	All Other	7,425	7,177	7,200	7,200	7,200	
	Capital	5,600	5,600	5,600	5,600	5,600	
	Total	<u>16,602</u>	<u>16,543</u>	<u>16,600</u>	<u>16,600</u>	<u>16,600</u>	
Aquifer Investigation Program	Bedrock	Personal Services	10,698	11,042	11,100	11,100	8,600
		All Other	10,736	10,736	10,800	10,800	6,200
		Capital	2,800	2,800	2,800	2,800	1,400
		Total	<u>24,234</u>	<u>24,578</u>	<u>24,700</u>	<u>24,700</u>	<u>16,200</u>
	Gravel	Personal Services	10,418	10,367	10,400	10,400	10,400
		All Other	15,886	15,886	16,000	16,000	16,000
		Capital	12,000				
		Total	<u>38,304</u>	<u>26,253</u>	<u>26,400</u>	<u>26,400</u>	<u>26,400</u>
	Coastal	Personal Services	8,583	8,927	9,000	9,000	6,500
		All Other	5,336	5,336	5,400	5,400	3,400
		Capital	2,800	2,800	2,800	2,800	1,400
		Total	<u>16,719</u>	<u>17,063</u>	<u>17,200</u>	<u>17,200</u>	<u>11,300</u>
Annual Total		\$113,783	\$102,837	\$103,300	\$103,300	\$ 93,200	

BUDGET SUMMARY

Personal Services	\$ 47,963	\$ 49,265	\$ 49,463	\$ 49,463	\$ 47,500
All Other	42,620	42,372	42,637	42,637	37,300
Capital	<u>23,200</u>	<u>11,200</u>	<u>11,200</u>	<u>11,200</u>	<u>8,400</u>
Total	\$113,783	\$102,837	\$103,300	\$103,300	\$ 93,200
Total Program Cost, 1977-82					\$516,420

## HYDROGEOLOGY PRODUCT SCHEDULE

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### A. Ground Water Inventory

1. Fiscal Year 1977-78
  1. (PM) Bedrock Aquifer Maps of Northeast Maine 5 maps
  2. (PM) Gravel Aquifer Maps of Northeast Maine 2 maps
  3. (SB) High Yield Bedrock Wells, York to Waldo Co. (bulletin)
2. Fiscal Year 1978-79
  1. (PM) Gravel Aquifer Maps of Central Coast 2 maps
  2. (PM) Gravel Aquifer Maps of Urban Centers Preliminary
3. Fiscal Year 1979-80
  1. (PM) Gravel Aquifer Maps of Southern Coast 2 maps
  2. (PM) Gravel Aquifer Maps of Urban Centers 2 maps
4. Fiscal Year 1980-81
  1. (PM) Bedrock Aquifer Maps of Urban Centers 5 maps
  2. (PM) Bedrock Aquifer Maps of Eastern Coast 5 maps
5. Fiscal Year 1981-82
  1. (PM) Bedrock Aquifer Maps of Southern Coast 5 maps
  2. (PM) Bedrock Aquifer Maps of Central Coast 5 maps
  3. (PM) Bedrock Aquifer Maps of Eastern Coast 5 maps
  4. (PM) Gravel Aquifer Maps of Eastern Coast 2 maps
  5. (PM) Gravel Aquifer Maps of Eastern Maine 2 maps

### B. Observation Well Inventory

Summary report of data from observation wells each fiscal year.

### C. Aquifer Investigations

1. Fiscal Year 1977-78
  1. (RR) Bedrock Aquifer Map of Central Coast (progress report)
  2. (RR) Bedrock Aquifer Map of Urban Centers (progress report)
  3. (RR) Bedrock Aquifer Map of Aroostook County (progress report)
  4. (RR) Gravel Aquifer Map and Report of Northeastern Maine (progress report)
2. Fiscal Year 1978-79
  1. (RR) Bedrock Aquifer Map of Urban Centers (progress report)
  2. (RR) Bedrock Aquifer Map of Central Coast (progress report)
  3. (RR) Bedrock Aquifer Map of Aroostook County (progress report)
  4. (RR) Gravel Aquifer Map and Report of Northeastern Maine (final report)
  5. (SB) Ground Water Conditions at High Head, Harpswell, Maine (Bulletin)



3. Fiscal Year 1979-80
  1. (RR) Bedrock Aquifer Map of Urban Centers (progress report)
  2. (RR) Bedrock Aquifer Map of Central Coast (progress report)
  3. (RR) Bedrock Aquifer Map of Aroostook County (progress report)
  4. (RR) Gravel Aquifer Map and Report of Southern Coast
4. Fiscal Year 1980-81
  1. (RR) Bedrock Aquifer Map of Urban Centers (progress report)
  2. (RR) Bedrock Aquifer Map of Central Coast (progress report)
  3. (RR) Bedrock Aquifer Map of Aroostook County (progress report)
  4. (RR) Gravel Aquifer Map and Report of Urban Centers (progress report)
5. Fiscal Year 1981-82
  1. (RR) Bedrock Aquifer Map and Report of Urban Center (final report)
  2. (RR) Bedrock Aquifer Map and Report of Central Coast (final report)
  3. (RR) Bedrock Aquifer Map and Report of Aroostook County (final report)
  4. (SB) Bedrock Aquifers in Crystalline Rocks (Bulletin)
  5. (RR) Gravel Aquifer Map and Report of Urban Centers (final report)

# HYDROGEOLOGY PROJECTS

## TASK SCHEDULE

PROJECTS	1977 - 1978	1978 - 1979	1979 - 1980	1980 - 1981	1981 - 1982
Ground Water Inventory Project	Inventory gravel wells in Northeast Maine A,1,1(PM)*	Inventory gravel wells in Central Coast A,2,1(PM)	Inventory gravel wells in Southern Coast A,3,1(PM)	Inventory bedrock wells in Eastern Coast A,4,1(PM)	Inventory gravel wells in Eastern Coast A,5,1(PM)
	Inventory bedrock wells in Northeast Maine A,1,2(PM)	Inventory gravel wells in Urban Centers, A,3,2(PM)		Inventory bedrock wells in Urban Centers A,4,2(PM)	Inventory bedrock wells in Southern Coast A,5,2(PM)
	High yield bedrock wells, York to Waldo Co., Maine A,1,3(SB)				Inventory bedrock wells in Central Coast A,5,3(PM)
					Inventory gravel wells in Eastern Maine A,5,4(PM)
Observation Well Inventory Project	Install wells in Southern Coast		Install wells in Urban Centers		B(annual data rpts)
		Install wells in Central Coast		Install wells in Northeastern Maine	
Aquifer Investigations Project	Bedrock	Investigation of crystalline aquifers in Urban Centers C,5,1 (RR)			
		Investigation of crystalline and sedimentary aquifers in Aroostook County C,5,3 (RR)			
					Bedrock Aquifers in Crystalline Rocks of Maine C,5,4(SB)
	Gravel	Investigation in Northeastern Maine C, 2, 4 (RR)	Investigation in Southern Coast C, 3, 4 (RR)	Investigation in Urban Centers C, 5, 5 (RR)	
	Coastal	Investigation of aquifers subject to salt-water intrusion in Central Coast C, 5, 2 (RR)			
		Ground Water Conditions at High Head, Harpswell, Maine C, 2, 5 (SB)			

\* Symbol designates product completion, see page 19.



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#### IV MARINE GEOLOGY PROGRAM

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This program is designed to provide State basic coastal beach and estuarine inventory data; to solve critical problems of beach erosion and estuarine water quality maintenance; and to develop basic physical data on coastal areas to measure the effects of recreational and commercial development.

#### PROJECTS

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- A. Shoreline Management. An inventory of physical resources relating to beaches and dune systems to assist in solving critical problems of beach erosion (3 years only).
- B. Estuarine Investigations. To acquire estuarine data, develop maps of estuarine environments and conduct long term monitoring of the hydrographic-sedimentation processes in 25 Maine estuaries.

PROGRAM BUDGET	YEAR-	1	2	3	4	5
Shoreline Management		\$33,397	\$30,611	\$13,421		
Estuarine Investigations		<u>93,496</u>	<u>44,332</u>	<u>42,715</u>	<u>\$51,900</u>	<u>\$53,900</u>
Program Totals		\$126,893	\$74,943	\$56,136	\$51,900	\$53,900
Total Program Cost, 1977-82						\$363,772



## MARINE GEOLOGY PROGRAM DESCRIPTIONS

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- A. Shoreline Management Project. It is necessary to study beach system evolution and maintenance for the major beach types found along the coast of Maine in order to determine where incompatible development and use practices will shorten the life of these important environments. Several tasks comprise the shoreline management project:
- a. To define beach and dune processes for the major sand beaches of Maine where maintenance is presently in force.
  - b. To define the response of the Maine barrier beach systems to the present rapid rise in sea-level - a response which is believed to be one of rapid natural erosion of Maine beaches.
  - c. To inventory past and present development activities which accelerate the destruction of beach systems.
  - d. To inventory present shoreline protection structures and determine which of those structures effectively protect private and public property and yet produce minimum harm to beach health.
  - e. To increase public awareness of the wise use of the beach-dune environment, it is desirable to prepare for public distribution an educational booklet about natural beach processes, beach maintenance, and effects of misuse on beach health.

### Breakdown of Project Cost (per year average)

Program Duration: 3 Years (fiscal years 1977-1980)

Personal Services	\$17,576
All Other	3,733
Capital	<u>4,500</u>
Annual Project Cost	\$25,809
Total Project Cost, 1977-80	\$77,429

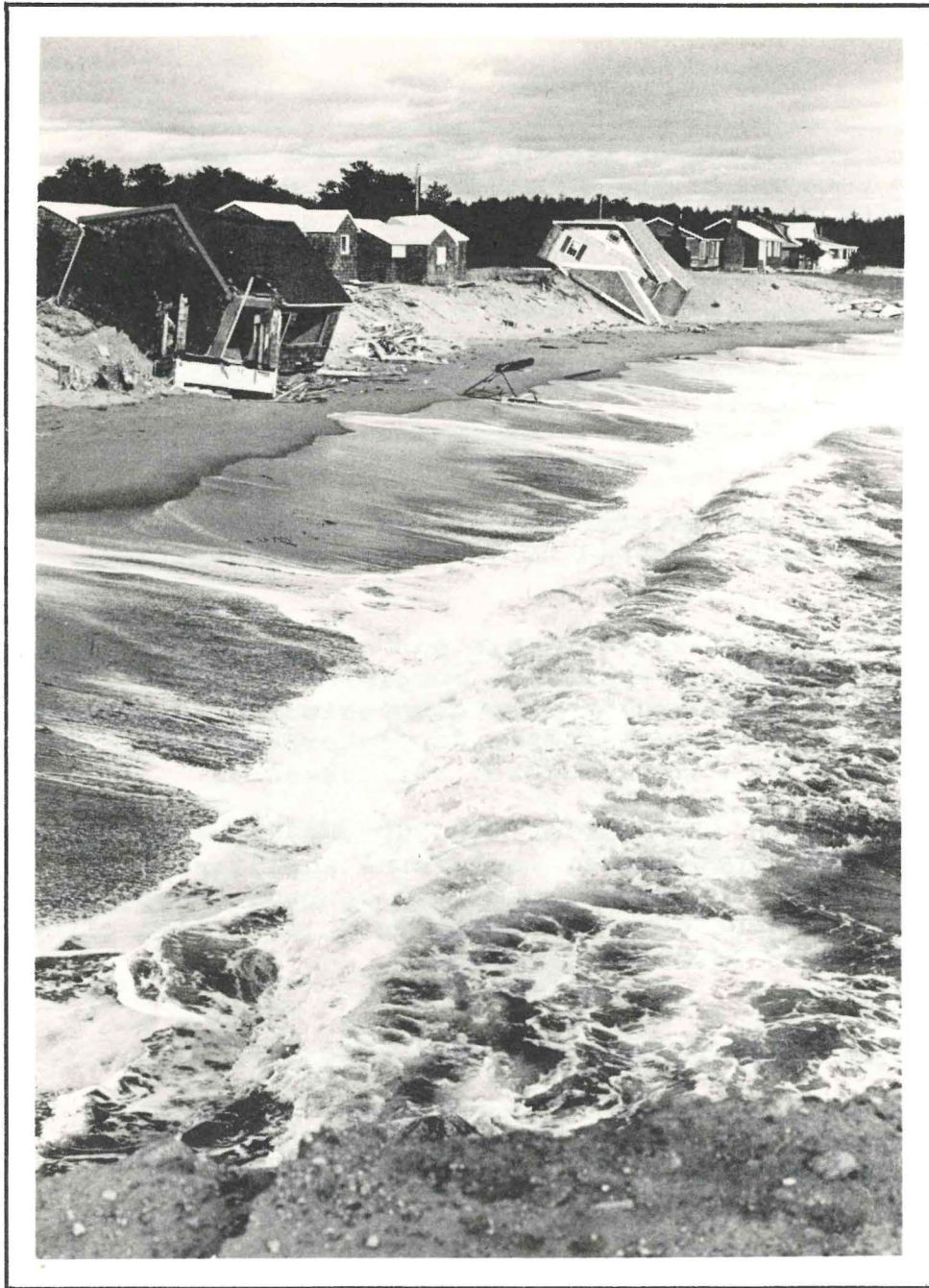


Figure 4

Wave destruction of cottages at Popham Beach, 1976. Shoreline erosion studies will define future trends and rates of beach erosion and aid in the prevention of property losses while recommending management techniques to prolong recreational beaches as tourist attractions.

- B. Estuarine Embayments Project. Projected demands and utilization of estuaries as navigational, recreational, economic and energy supporting systems will, almost of necessity, conflict with the present use of these areas, especially those of very high biological productivity. Detailed geological, hydrologic, and biological inventory base data will promote the informed allocation of demand-use priorities for our estuaries.

The tasks to be conducted in the estuarine program include:

1. Collection and integration of all existing physical resource data gathered to date from all available sources.
2. Seasonal-annual hydrographic and sedimentation surveys of five estuarine-embayment complexes. Twenty-five estuaries, representing the five estuarine environment complexes, have been chosen for interpretation. Flushing rates will be calculated for all estuaries.
3. Detailed maps (1:4,000 or 1:8,000 scale) of estuarine morphology, location of commercial shellfish beds, grass flats, and worm flats will be constructed relating these and other natural resources to estuarine circulation patterns and flushing rates.

Breakdown of Project Cost (per year average)

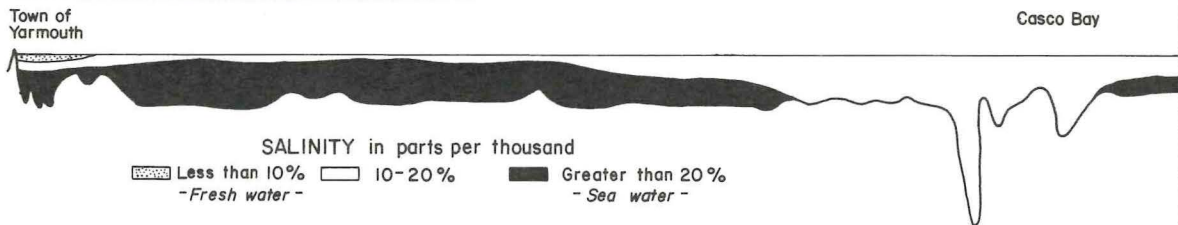
Program Duration: 5 years (fiscal years 1977-1982)

Personal Services	\$ 35,445
All Other	8,374
Capital	<u>13,450</u>
Annual Project Cost	\$ 57,269
Total Project Cost, 1977-82	\$286,343



# HYDROGRAPHIC SURVEY of ROYAL RIVER ESTUARY YARMOUTH, MAINE JUNE-1969

## SALINITY PROFILE at LOW WATER SLACK



## SEDIMENTATION PATTERNS

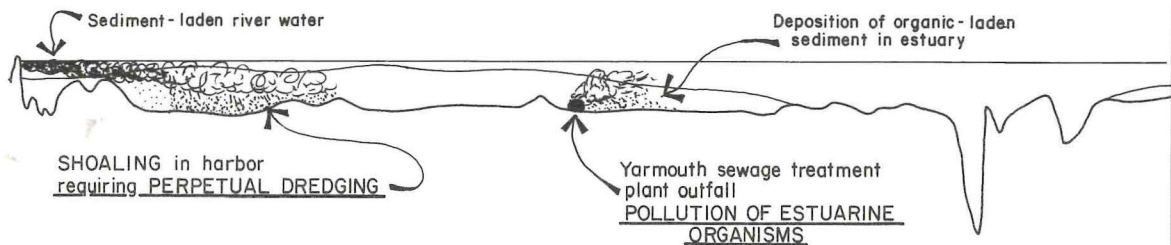


Figure 5

This figure demonstrates the relationship of sediment deposition problems to salinity distributions within an estuary. Hydrographic inventory surveys of Maine estuaries will aid in preventing improper use of the State's estuarine resources which result in increased costs to the public from such impacts as maintenance dredging, loss of commercial shellfish resources, and loss of commercial finfish nursery grounds.



# MARINE GEOLOGY PROGRAM BUDGET

## PROGRAM DETAILS

PROGRAM		1977-78	1978-79	1979-80	1980-81	1981-82
Shoreline Management	Personal Services	\$16,397	\$24,111	\$12,221		
	All Other	3,500	6,500	1,200		
	Capital	13,500				
	Total	\$33,397	\$30,611	\$13,421		
Estuarine Inventory	Personal Services	\$18,246	\$34,962	\$35,215	\$44,400	\$44,400
	All Other	8,000	9,370	7,500	7,500	9,500
	Capital	67,250				
	Total	\$93,496	\$44,332	\$42,715	\$51,900	\$53,900
Annual Total		\$126,893	\$74,943	\$56,136	\$51,900	\$53,900

## BUDGET SUMMARY

Personal Services	\$34,643	\$59,073	\$47,436	\$44,400	\$44,400
All Other	11,500	15,870	8,700	7,500	9,500
Capital	80,750				
Total	\$126,893	\$74,943	\$56,136	\$51,900	\$53,900
Total Program Cost, 1977-82					\$363,772

## MARINE GEOLOGY PRODUCT SCHEDULE

### A. Shoreline Management Project

1. Fiscal Year 1977-1978
  1. (SB) "Natural Processes Affecting Maine Coastal Beach Systems"
2. Fiscal Year 1978-1979
  1. (SB) "Shoreline Erosion Protection Methods Applicable to the Maine Coast"
3. Fiscal Year 1979-1980
  1. (SB) "Maine Beach Systems Response to Present Sea-Level Rise and Past Development Practices"
  2. (PR) "Erosion-Accretion Rates of the Major Recreational Coastal Beaches of Maine"
  3. (EB) "Maine Shoreline Processes, Stability, and Maintenance", Educational Booklet

### B. Estuarine Inventory Project

1. Fiscal Year 1977-1978
  1. Summary Report of Estuarine Inventory Program Each Fiscal Year
2. Fiscal Year 1978-1979
  1. (PM) "Inventory Map of the Major Southwestern Maine Estuaries"
3. Fiscal Year 1979-1980
  1. (PM) "Inventory Maps of the Major Mid-Coast Maine Estuaries"
  2. (PR) "Physical Processes Maintaining Maine Estuaries, Area I - Southwestern Coast"
4. Fiscal Year 1980-1981
  1. (PM) "Inventory Maps of the Major Down East Maine Estuaries"
  2. (PR) "Physical Processes Maintaining Maine Estuaries, Area II - Mid-Coast", Map and Report
5. Fiscal Year 1981-1982
  1. (PR) "Physical Processes Maintaining Maine Estuaries, Area III - Down East Coast", Map and Report
  2. (EB) "Maine Estuaries", Educational Booklet
  3. (SB) "Maine Estuarine Physical Resources and Their Management Implications"

## MARINE GEOLOGY PROJECTS

## TASK SCHEDULE

PROJECTS	1977 - 1978	1978 - 1979	1979 - 1980	1980 - 1981	1981 - 1982
Shoreline Management	Inventory Natural Beach Processes A, 1, 1 (SB)*				
	Inventory Shoreline Protection Structures and Methods A, 2, 1 (SB)				
	Inventory and Investigate Response of Maine Beaches to Rising Sea Level	A, 3, 1 (SB) A, 3, 2 (PR) A, 3, 3 (EB)			
Estuarine Inventory	Inventory Physical Resources of Southwestern Maine Estuaries B, 2, 1 (PM)				
	Inventory Physical Resources of Mid-Coast Maine Estuaries B, 3, 1 (PM) B, 3, 2 (PR)				
		Inventory Physical Resources of Downeast Maine Estuaries B, 4, 1 (PM) B, 4, 2 (PR)			
			Investigate Development and Management Activities on Maine Estuaries B, 5, 1 (PR) B, 5, 2 (EB) B, 5, 3 (SB)		

\* Symbol designates product completion, see page 29.

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## V PHYSICAL GEOLOGY PROGRAM

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This program is designed to acquire, with field mapping techniques, basic physical resource data on the surficial and bedrock materials in the State. It is divided into three program elements - Surficial Geology, Bedrock Geology, and Engineering Geology. Subject to review by the Land and Water Use Council, the three elements will require some flexibility on priorities, map scales, and the level of geologic mapping which in turn will be dictated by the requirements of funding sources, geologic complexity, the kinds and quantities of geologic materials, and the terrain in the area of investigation.

### PROJECTS

- A. Surficial Geology. This is a project of acquisition and presentation of data on the unconsolidated materials which lie above the bedrock. These materials represent over 90% of the surface in the State of Maine. Knowledge of their distribution and composition is critical to effective land and water use management of the physical environment.
- B. Bedrock Geology. This is a data acquisition project using field methods to determine the physical characteristics and distribution of the kinds of bedrock and their configuration.
- C. Engineering Geology. This is a task specific project designed to produce detailed information on the physical and engineering characteristics of the bedrock. The program will emphasize two types of investigation - mineral deposits and regional fracture systems.

<u>PROGRAM BUDGET</u>	YEAR-	1	2	3	4	5
Surficial Geology	\$60,750	\$60,250	\$57,750	\$56,750	\$56,750	
Bedrock Geology	18,880	20,286	21,300	21,300	21,300	
Engineering Geology	<u>28,000</u>	<u>28,000</u>	<u>21,500</u>	<u>19,500</u>	<u>19,000</u>	
Program Totals	\$107,630	\$108,536	\$100,550	\$97,550	\$97,050	
Total Program Cost, 1977-82					\$511,316	



## PHYSICAL GEOLOGY PROGRAM DESCRIPTIONS

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- A. Surficial Geology Project. Surficial materials are the unconsolidated materials lying above the bedrock. This project will produce maps and reports that portray the distribution, thickness, volume, and physical/chemical characteristics of these deposits. Information of this kind is already being used as the resource data base for a variety of land use management programs and decisions. Completion of this program will require expansion of surficial deposits mapping in greater detail and area of coverage.

Surficial mapping is generally done at three levels of intensity: Regional, Reconnaissance, and Detailed. Regional mapping involves heavy emphasis on air photo interpretation and field observation over a large geographic area; reconnaissance mapping includes field work along the entire passable road network, complemented by air photo interpretation; detailed mapping complements the reconnaissance level with detailed off-road pace and compass traverses or site specific data acquisition. The result may be three different types of physical inventory maps. Regional maps are at a scale of 1:125,000 to 1:62,500, reconnaissance maps at a scale of 1:62,500 to 1:24,000; and detailed maps at a scale of 1:24,000 and larger.

For the purposes of managing surficial field mapping schedules, the State is divided into ten project areas bounded by county lines, modified by special considerations, as (1) physiographic similarities; (2) terrain and accessibility; (3) geologic similarities; (4) abundance of surficial geologic data; (5) demography; and (6) the occurrence of substantial reserves of sand and gravel deposits. These project areas are shown on page 37.

### Breakdown of Project Cost (per year average)

Personal Services	\$ 35,250
All Other	22,500
Capital	<u>700</u>
Annual Project Cost	\$ 58,450
Total Project Cost, 1977-82	\$292,250

B. Basic Bedrock Inventory Project. This is a data acquisition project using field mapping methods to determine the physical characteristics, rock types and internal structures of the bedrock materials of the upper crust. Because of an earlier interest in metal deposit exploration, much of the bedrock mapping of the State has been completed. Three tasks are necessary in order to: (1) complete State-wide coverage of bedrock inventory, and (2) meet the need of detailed mapping for specific inventory purposes.

Task 1. Completion of bedrock inventory in north central Maine where data acquisition is incomplete. This region extends from Moosehead Lake to Ashland, and includes work in 7 quadrangles.

Task 2. Eastern Coast. Detailed mapping is required in 7 quadrangles where inventory data is incomplete.

Task 3. Central Coast. In order to complete the inventory of an area where recreational development is increasing rapidly, mapping is required in 9 quadrangles.

Breakdown of Project Costs (per year average)

Personal Services	\$ 16,413
All Other	4,200
Capital	<hr/>
Annual Project Cost	\$ 20,613
Total Project Cost, 1977-82	\$103,066

## COMMERCIAL GEOLOGIC ACTIVITIES

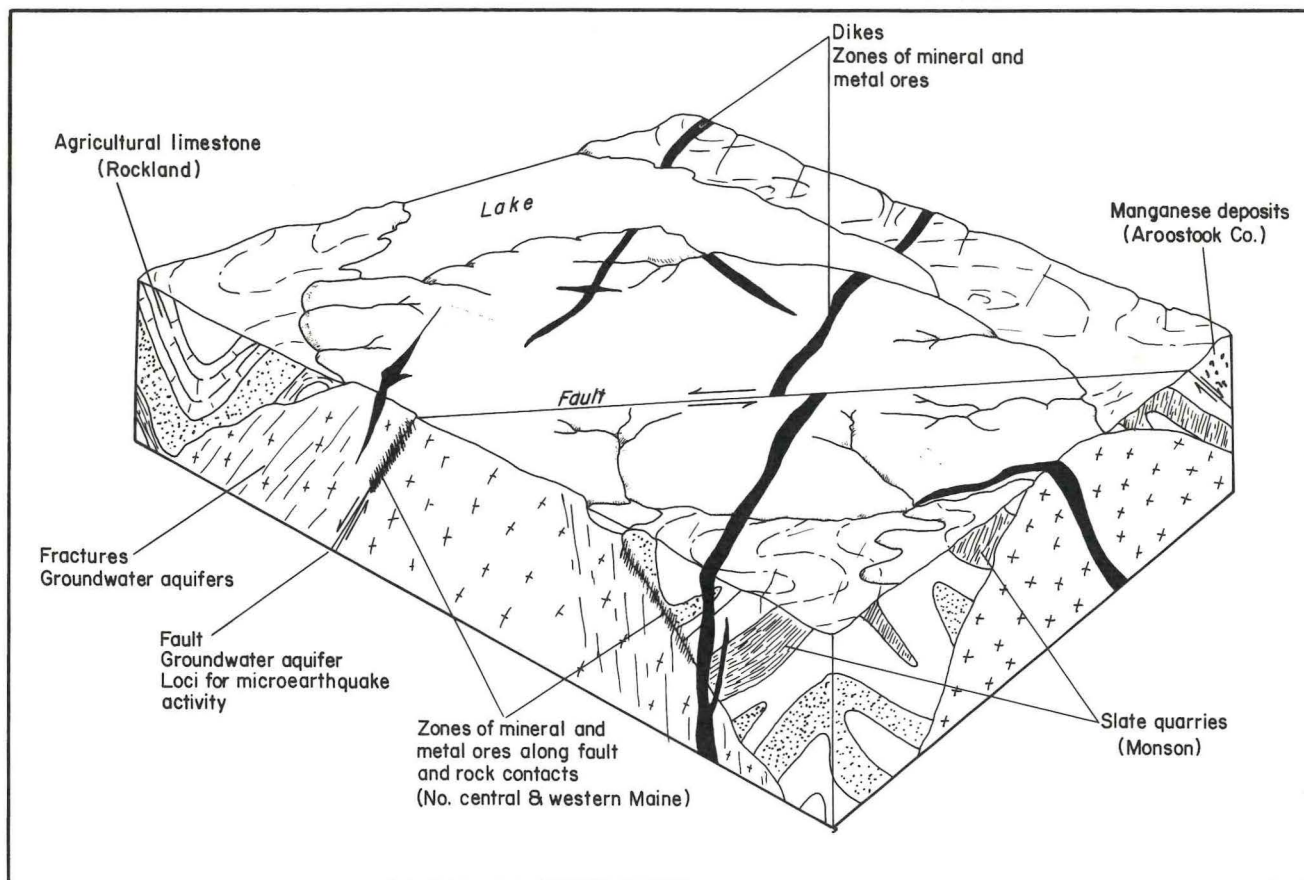


Figure 6

This figure shows the various kinds of commercial and municipal activities where geologic input is necessary. These include mineral developments (metals and non-metals), water supplies and seismic risk prediction. These activities are part of the bedrock and engineering geology program elements in the Five Year Plan.

- C. Engineering Geology. This project involves detailed geologic mapping of specific areas and types of bedrock to determine (1) the location and extent of economic mineral deposits, and (2) the distribution and character of major structural elements in the upper crust, particularly fault and fracture patterns. These investigations will be concentrated in coastal Maine, the major urban centers, and north central Maine.

Particular attention will be given to the location of agricultural lime deposits in northern Maine and the availability of bedrock quarry construction materials in central and coastal Maine. There is a scarcity of durable aggregate deposits in southern Maine; this program will assist the construction industry in locating and analyzing new deposits.

A knowledge of distribution, concentration and stability of the major fracture patterns is one of the basic concerns of industrial plant location. With the cooperation of the U.S. Geological Survey, a regional study of these structures will be undertaken, concentrated upon detailed structural mapping and rock mechanics.

Associated with bedrock shear zones and fracture patterns is the occurrence, intensity and magnitude of earth tremors in Maine. In cooperation with the Weston Observatory, seismograph stations will be located and monitored in the State. In addition, raw data gathered from intensity surveys, travel-time studies coordinated with quarry blasts and after shock studies will be submitted to Weston for interpretation and presentation to the public.

Breakdown of Project Costs (per year average)

Personal Services	\$ 23,004
All Other	195
Capital	<hr/>
Annual Project Cost	\$ 23,199
Total Project Cost, 1977-82	\$116,000



# PHYSICAL GEOLOGY PROGRAM BUDGET

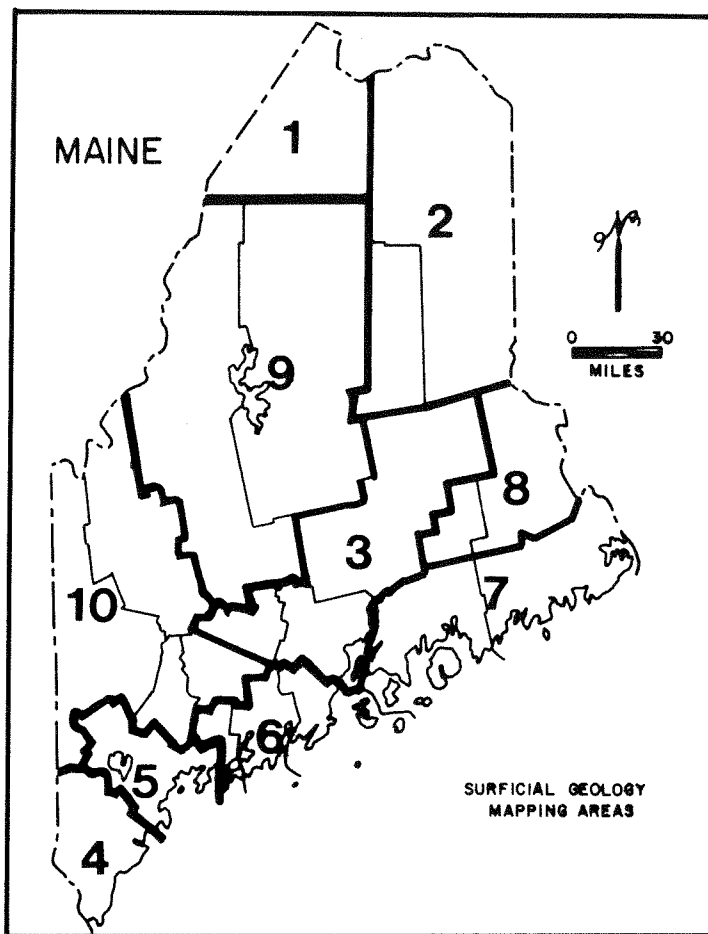
## PROGRAM DETAILS

PROJECT		1977-78	1978-79	1979-80	1980-81	1981-82
Surficial Geology	Personal Services	\$ 35,050	\$ 34,550	\$ 35,550	\$ 34,550	\$ 36,550
	All Other	25,000	25,000	21,500	21,500	19,500
	Capital	700	700	700	700	700
	Total	\$ 60,750	\$ 60,250	\$ 57,750	\$ 56,750	\$ 56,750
Bedrock Geology	Personal Services	\$ 14,680	\$ 16,086	\$ 17,100	\$ 17,100	\$ 17,100
	All Other	4,200	4,200	4,200	4,200	4,200
	Capital					
	Total	\$ 18,880	\$ 20,286	\$ 21,300	\$ 21,300	\$ 21,300
Engineering Geology	Personal Services	\$ 27,224	\$ 27,800	\$ 21,500	\$ 19,500	\$ 19,000
	All Other	776	200			
	Capital					
	Total	\$ 28,000	\$ 28,000	\$ 21,500	\$ 19,500	\$ 19,000
Annual Total		\$107,630	\$108,536	\$100,550	\$ 97,550	\$ 97,050

## BUDGET SUMMARY

Personal Services	\$ 76,954	\$ 78,436	\$ 74,150	\$ 71,150	\$ 72,650
All Other	29,976	29,400	25,700	25,700	23,700
Capital	700	700	700	700	700
Total	\$107,630	\$108,536	\$100,550	\$ 97,550	\$ 97,050
Total Program Cost, 1977-82					\$511,316

## PHYSICAL GEOLOGY PRODUCT SCHEDULE



### A. Surficial Geology Project

#### 1. Fiscal Year 1977-78

1. (PM) Surficial Maps, Area 1, 1 map (progress)
2. (PM) Surficial Maps, Area 2, 1 map (progress)
3. (PM) Surficial Maps, Area 3, 1 map
4. (PM) Surficial Maps, Area 8, 1 map (progress)
5. (PM) Surficial Maps, Area 10, 1 map (progress)
6. (PM) Surficial Maps, Area 4, 3 maps
7. (PM) Surficial Maps, Area 5, 3 maps
8. (PM) Surficial Maps, Area 6, 6 maps
9. (PM) Surficial Maps, Area 7, 5 maps
10. (SB) Ice Disintegration Characteristics in Northern Cumberland and York Counties 1 Bulletin

2. Fiscal Year 1978-79
  1. (PM) Surficial Maps, Area 1, 1 map
  2. (PM) Surficial Maps, Area 2, 1 map
  3. (PM) Surficial Maps, Area 8, 1 map
  4. (PM) Surficial Maps, Area 9, 1 map
  5. (PM) Surficial Maps, Area 10, 1 map
  6. (PM) Surficial Maps, Area 3, 1 map
  7. (PM) Surficial Maps, Area 4, 3 maps
  8. (PM) Surficial Maps, Area 5, 5 maps
  9. (PM) Surficial Maps, Area 6, 6 maps
  10. (PM) Surficial Maps, Area 7, 5 maps
  11. (SB) Pineo Ridge Ice Advance 1 Bulletin
3. Fiscal Year 1979-80
  1. (PM) Surficial Maps, Area 1, 5 maps
  2. (PM) Surficial Maps, Area 2, 10 maps
  3. (PM) Surficial Maps, Area 3, 10 maps
  4. (PM) Surficial Maps, Area 8, 6 maps
  5. (PM) Surficial Maps, Area 9, 8 maps
  6. (PM) Surficial Maps, Area 10, 6 maps
  7. (PM) Surficial Maps, Area 4, 8 maps
  8. (PM) Surficial Maps, Area 5, 6 maps
  9. (PM) Surficial Maps, Area 7, 5 maps
  10. (SB) Ice Streams and Calving Bays in Maine 1 Bulletin
4. Fiscal Year 1980-81
  1. (PM) Surficial Maps, Area 1, 5 maps
  2. (PM) Surficial Maps, Area 2, 15 maps
  3. (PM) Surficial Maps, Area 8, 7 maps
  4. (PM) Surficial Maps, Area 9, 8 maps
  5. (PM) Surficial Maps, Area 10, 7 maps
  6. (PM) Surficial Maps, Area 3, 5 maps
  7. (PM) Surficial Maps, Area 4, 4 maps
  8. (PM) Surficial Maps, Area 5, 4 maps
  9. (EB) Surficial Geology Map of Maine, 1 map
5. Fiscal Year 1981-82
  1. (PM) Surficial Maps, Area 1, 6 maps
  2. (PM) Surficial Maps, Area 9, 8 maps
  3. (PM) Surficial Maps, Area 2, 4 maps
  4. (PM) Surficial Maps, Area 3, 4 maps
  5. (PM) Surficial Maps, Area 4, 4 maps
  6. (PM) Surficial Maps, Area 5, 4 maps
  7. (PM) Surficial Maps, Area 10, 4 maps
  8. (SB) Movement and Disintegration of Wisconsin Ice in Northern Maine 1 Bulletin

B. Bedrock Geology Project

1. Fiscal Year 1977-78
  1. (PM) Calais Quadrangle
  2. (PM) Liberty Quadrangle
  3. (EB) Bedrock Geology of the State of Maine
  4. (EB) Two Lights State Park Geology Booklet
2. Fiscal Year 1978-79
  1. (PM) Big Lake/Wesley Area
  2. (PM) Wabassus Lake/Scraggly Lake Area
  3. (PM) Brooks Quadrangle
  4. (PM) Boothbay Quadrangle
  5. (PM) Moosehead Lake Region (3 maps)
3. Fiscal Year 1979-80
  1. (PM) Waite/Kellyland Area
  2. (PM) Danforth/Forest/Vanceboro Area
  3. (PM) Gardiner Quadrangle
  4. (PM) Caucomgomac - Katahdin Area
4. Fiscal Year 1980-81
  1. (PM) Springfield Quadrangle
  2. (PM) Washington County Regional Map and Report
  3. (PM) Waldoboro Area
  4. (PM) Casco Bay Area
  5. (PM) Burnham Area
  6. (RR) Moosehead - Katahdin Area
  7. (RR) Northern Aroostook Area
5. Fiscal Year 1981-82
  1. (PM) Amity Quadrangle
  2. (PM) Freeport Quadrangle
  3. (PM) Vassalboro Quadrangle
  4. (PM) Wiscasset Quadrangle
  5. (RR) Allagash River Area



C. Engineering Geology

1. Fiscal Year 1977-78
  1. (RR) York County Fracture Pattern Map
2. Fiscal Year 1978-79
  1. (RR) Cumberland and Androscoggin Counties Regional Rock Materials Report
  2. (RR) Sagadahoc and Lincoln County Structural Analysis
3. Fiscal Year 1979-80
  1. (PM) Bedrock Map of the Lewiston-Auburn Area
  2. (RR) Structure and Fracture Pattern Analysis of Kennebec, Waldo, and Hancock Counties
4. Fiscal Year 1980-81
  1. (SB) Regional Fracture Analysis of Lower Kennebec Valley
  2. (RR) Regional Rock Type and Structural Map of Somerset and Piscataquis Counties
  3. (RR) Structure and Fracture Pattern Analysis of Oxford and Franklin Counties
5. Fiscal Year 1981-82
  1. (SB) Regional Structure and Fracture Analysis, Kittery to Portland
  2. (RR) Geologic Investigations of Upper Penobscot County
  3. (RR) Report of Findings, Geology and Agricultural Limestone Deposits of Northern Aroostook County

# PHYSICAL GEOLOGY PROJECTS

## TASK SCHEDULE

PROJECTS	1977 - 1978	1978 - 1979	1979 - 1980	1980 - 1981	1981 - 1982
Surficial Geology	4 Regional Maps (PM) A1,1-5* 6 Reconnaissance Maps(PM) A1,6,7 11 Detailed Maps (PM) A1,8,9 1 Specific Study Bulletin A1,10	5 Regional Maps (PM) A2,1-5 9 Reconnaissance Maps(PM) A2,6-8 11 Detailed Maps (PM) A2,9,10 1 Specific Study Bulletin (SB) A2,11	45 Reconnaissance Maps (PM) A4,1-5 19 Detailed Maps (PM) A3,7-9 1 Specific Study Bulletin (SB) A3,10 1 Specific Study Bulletin (SB) A3,10	42 Reconnaissance Maps (PM) A4,1-5 13 Detailed Maps (PM) A4,6-8 1 Surficial State Map (EB) A4,9	14 Reconnaissance Maps (PM)A5,1,2 20 Detailed Maps (PM) A5,4-8 1 Specific Study Bulletin (SB) A5,9
Bedrock Geology	Eastern Maine Quadrangle Inventory Mapping Wesley - Danforth - Amity - Springfield Area (PM) B,1,1 (PM) B2,1&2 (PM) B,3,1&2 (PM) B,4,1 (PM) B,5,1 (RR) B,4,2				
	Central Coast Quadrangle Inventory Mapping Boothbay - Gardiner Area (PM) B,1,2 (PM) B,2,3&4 (PM) B,3,3 (PM) B4,3&4,5 (PM) B,5,2-3-4 (EB) B,1,3&4				
	Moosehead Lake - Katahdin Area Quadrangle Inventory Mapping (PM) B,2,5(3 maps)		(PM) B,3,4 (RR) B,4,6		
			Allagash River Basin Quadrangle Inventory Mapping (RR) B5,5		
Engineering Geology	Aroostook County Quadrangle Inventory Mapping			(RR) B,4,7	
	Rock Mechanics and Fracture Pattern Detail Mapping (RR) C1,1 (RR) C,2,1&2		(SB) C,5,1		
		Detailed Mapping Lewiston-Auburn, Upper Kennebec Valley Area (RR) C,3,1 (SB) C,4,1			
	Detailed Engineering Studies, Southern Penobscot and Kennebec Estuaries (RR) C,3,2				
			Structure and Fracture Mapping Western Maine (RR) C,4,3		
		Engineering Geology Mapping Northern Maine (RR) C,4,2			(RR) C,5,2
		Northern Maine Mineral Deposit Search			(RR) C,5,3

\* Symbol designates product completion, see page 37.

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## VI ADMINISTRATION

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The program administrative section provides management, fiscal and clerical support, as well as cartographic and technical support to the three major programs. The present general fund appropriation for administration and technical support is \$90,000\*. An average annual increase of \$15,100, per year for 1977-82, plus a single, first year \$8,540 capital item, is necessary to meet the additional work load.

The structure of the Bureau under the program plan places cartographic services, laboratory and technical support services with the administration section. The Bureau provides cartographic and technical services to other bureaus and departments of the State. Overall supervision of such activities is most effectively provided by the State Geologist and the administrative staff. The administration budget includes \$45,062 for cartographic and technical service; with \$60,097 for administration, fiscal and clerical costs.

### Administrative Staff (8)

State Geologist	(1)
Fiscal Person	(1)
Clerk Steno III	(1)
Clerk II	(1)
Cartographers	(4)

### A. Program Management

The State Geologist is responsible to the Commissioner of the Department of Conservation for management and scheduled completion of all elements of the program plan. He directs the work and schedules of the Program Division Directors and develops contracts with outside funding sources.

### B. Cartographic Services

The four person cartographic section will be responsible for drafting and printing of all Bureau maps, and maintaining an orderly file of all geologic maps and data files. This section will provide cartographic services to other Bureaus in the Department on a priority basis. A senior cartographer will supervise the section, reporting directly to the State Geologist.

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\* \$18,380 of which is salary for the present Assistant State Geologist. This person will be Director of the Physical Geology Program of the Five Year Program Plan; and that salary is included in the Physical Geology Program budget, 1977-82.

C. Fiscal/Clerical Services

The three person clerical/fiscal staff will conduct the general office work of the Bureau, and will provide fiscal and bookkeeping records in accordance with accepted State accounting methods.

Breakdown of Administration Budget (per year)

Personal Services	\$ 94,744
All Other	<u>10,415</u>
Annual Total	\$105,159
Capital Items (first year only)	13,445
Total Cost, 1977-82	\$539,240



