

029 Surficial Geology Surveys
on the Scotian Shelf:
Compilation of Maps
from Government,
Industry, University and
Foreign Sources

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SURFICIAL GEOLOGY SURVEYS ON THE SCOTIAN SHELF:
COMPILATION OF MAPS FROM
GOVERNMENT, INDUSTRY, UNIVERSITY, AND FOREIGN SOURCES

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SUMMARY

An index has been compiled of more than 200 surficial geology surveys that have been conducted on the Scotian Shelf. The co-ordinates for about 7,000 sample stations and 70,000 line kilometres of shallow seismic profiles have been plotted on four separate basemaps for the Scotian Shelf. Sources for the compilation include the Government of Canada, the oil and gas industry, various universities, and foreign agencies. Only 36 of the surveys are not in the public domain.

For each survey, an index sheet was used to summarize parameters such as the cruise number, survey period, vessel, chief scientist, number of survey lines, total line kilometres, government agencies and contractors who performed the survey, and the availability of initial cruise reports. Details on geophysical, sampling, and navigation equipment were also obtained. A page-sized track plot, and co-ordinates for samples and seismic lines, were included with most cruise summaries.

Page-sized reductions of 20 map enclosures show the position of samples and seismic profiles on the Scotian Shelf.

Four, additional, page-sized reductions of map enclosures summarize the sea-bottom conditions on the Scotian Shelf in terms of sediment instability. These maps are based on a comparison between sea-bed composition, sea-bed gradients, and the known occurrences of bedforms such as sand ribbons, megaripples, sand waves, and sand ridges.

RESUME

Un index de plus de 200 levés géologiques de surface qui ont été effectués sur la plate-forme de Scotian a été compilé. Les coordonnées d'environ 7000 stations d'échantillonnage et de 70 000 kilomètres de profils linéaires sismiques réalisés à faible profondeur ont été reportées sur quatre différentes cartes de base de la plate-forme de Scotian. Les sources de compilation sont le Gouvernement du Canada, l'industrie pétrolière et gazière, diverses universités et des organismes étrangers. Trente-six levés seulement ne s'appliquent pas au domaine public.

Pour chaque levé, une carte-index a été employée pour résumer les paramètres tels que le numéro de la route de navigation, l'époque du levé, le navire, le chercheur dirigeant le levé, le nombre de lignes de levé, le parcours total en kilomètres, les organismes gouvernementaux et entrepreneurs ayant réalisé le travail de levé, et la disponibilité des rapports initiaux sur les routes de navigation. Des détails sur le matériel d'exploration géophysique, d'échantillonnage et de navigation ont aussi été donnés. Un tracé des cheminements à la grandeur d'une page et les coordonnées des points d'échantillonnage et des lignes sismiques ont été inclus dans la plupart des résumés de routes de navigation.

Vingt cartes schématiques réduites à la grandeur d'une page indiquent la position des points d'échantillonnage et des profils sismiques sur la plate-forme de Scotian.

Quatre cartes schématiques supplémentaires de la même grandeur décrivent sommairement l'état du fond marin de la plate-forme de Scotian du point de vue de l'instabilité des sédiments. Dans ces cartes, sont comparés la composition du fond marin, les gradients du fond, et les cas connus de présence de formes topographiques du fond telles que les rubans de sable, mégarides, ondes et crêtes de sable.

INTRODUCTION

In January 1984, Earth & Ocean Research Ltd. of Dartmouth, Nova Scotia, was hired by the Environmental Studies Revolving Funds, COGLA, to compile a comprehensive index of surficial geology surveys conducted on the Scotian Shelf. An extensive data base was developed from surveys by government agencies and industry, from university research projects and theses, and from foreign sources. The compilation represents about 90% of the surficial geology work that has been performed to date on the Scotian Shelf.

The purpose of the compilation was to identify and prepare an index of surficial geology surveys, which in turn could be used as background information for sediment transport studies. This data base has applications that extend well beyond its intended use in sediment transport studies. A variety of persons involved in areas as diverse as resource management, engineering planning, and scientific research on the Scotian Shelf, may also derive benefits from this compilation.

This work differs from previous compilations in two important ways. First, it provides co-ordinates for industry samples and shallow seismic profiles on the Scotian Shelf that were previously confidential. About 20,000 km of shallow seismic profiles and 1,000 samples have been indexed and mapped from various sources in industry. Although sample analyses and geologic interpretations for these data have not been released, this compilation clearly indicates what is available, and whom to contact if more information is required. Secondly, other compilations of Scotian Shelf surveys such as Meagher and Hill (1981), Plasse (1983b), Evans Computer Applications (1983), Ruffman (1983), to name a few, are either specific to the data base of one company, or a mixture of indexing and mapping of actual geologic data. In contrast, this compilation has a broader data base that includes contributions from eight companies, as well as data from the public domain, and the focus is on providing sample and seismic line locations, not geologic results.

Summaries were prepared for each cruise, indicating both general and detailed survey information. The general survey information included items such as cruise numbers, survey period, chief scientist, and COGLA reference numbers. The detailed information specified the types of geophysical, sampling, and navigation equipment that was used on each survey. The navigation data included both listings of sample co-ordinates, co-ordinates for the start and end of each line, and a page-sized track plot for each survey.

Twenty-four maps were compiled that show the locations of samples and seismic lines for all of the surficial geology surveys on the Scotian Shelf, and for reference purposes, these maps are reduced to page-size in this report. Because the maps form an important part of the final product, the selection of scales, projections, and general contents of each type of map are described briefly.

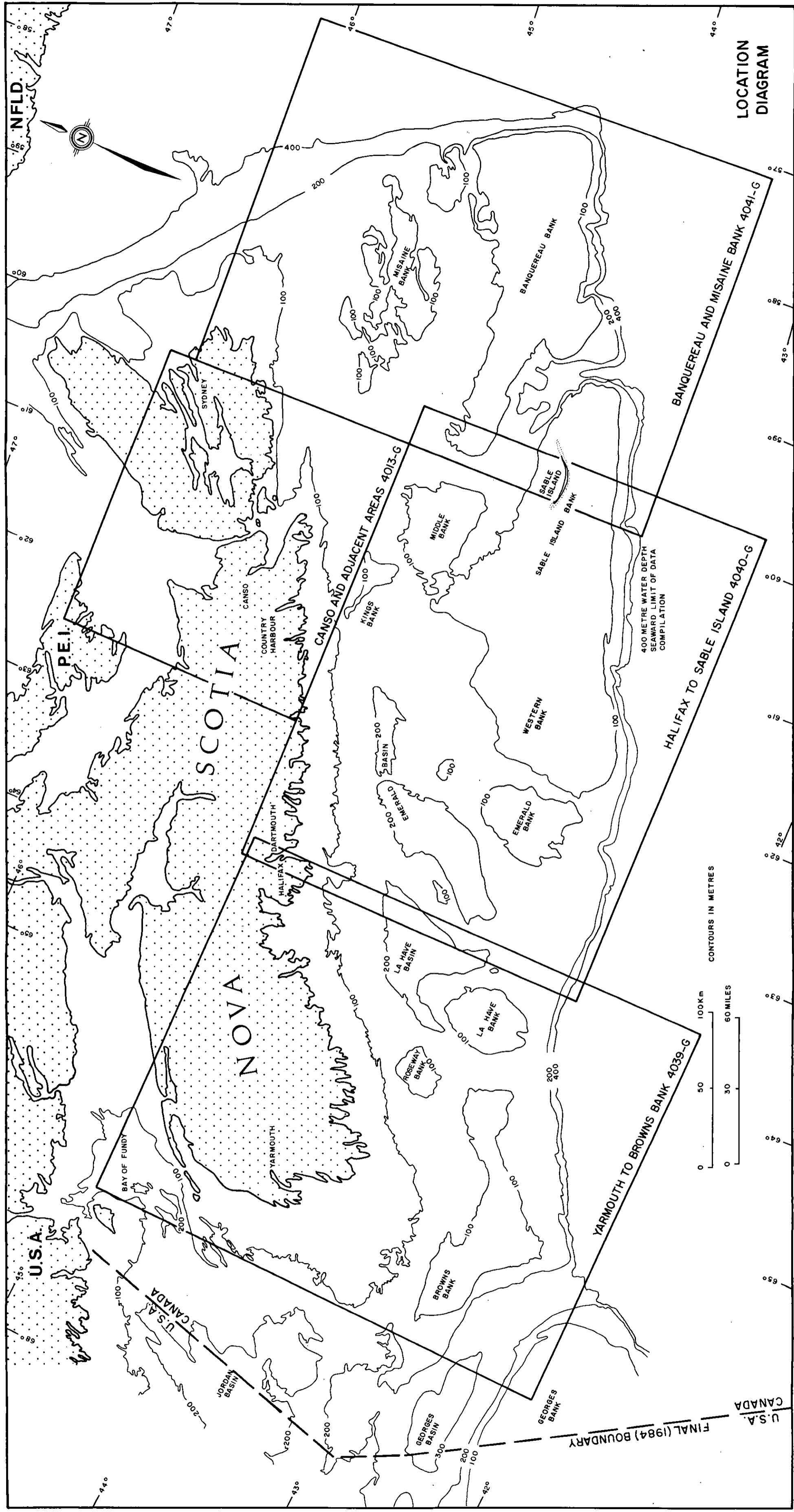
Figure 1 indicates the position of the four base maps used in this compilation, which coincide with four published maps of the surficial geology of the Scotian Shelf; Halifax to Sable Island (King 1970), Yarmouth to Brown's Bank (Drapeau and King 1971), Banquereau and Misaine Bank (MacLean and King 1971), and Canso and Adjacent Areas (MacLean et al. 1977). The basemaps used in this study are identical to those used for the government maps, i.e., a scale of 1:300,000 at reference latitude 48°N, using a Mercator projection. With minor exception for some deep water sites, only sample and seismic lines that occurred in the water depth range of 50-400 m were indexed.

One advantage to using this scale and projection, is that the map enclosures can be overlain on the published maps, facilitating a correlation between interpreted geologic data and original survey track lines and sample locations. Also, many of the survey track plots prior to 1975 were hand-drawn at a scale of 1:300,000 on a Mercator projection and, for practical reasons, it was more efficient to transfer this information directly to the final maps by using overlays than it was to change scales and projections.

The complete compilation of maps and cruise summaries for the Scotian Shelf is contained in a full edition, the limited distribution of which is provided in Appendix A. The full edition consists of four separate volumes; a descriptive report, complete lists of detailed cruise summaries for all geophysical surveys, and 24 map enclosures. Copies of the limited edition may be obtained from:

Earth & Ocean Research
22 Waddell Ave.
Dartmouth, Nova Scotia, B3B 1K3
(902) 465-3974
Cost: \$500. (Cdn.)

Figure 1. Location of base maps used in this compilation.



LOCATION
DIAGRAM

FIGURE 1

HYDROGRAPHIC AND OCEANOGRAPHIC SURVEYS

The systematic mapping of bathymetric and geoscientific data over Canada's eastern continental shelves began in the early 1960s (MacNab 1983). The first bathymetric surveys on the Scotian Shelf took place in 1961 and 1963 from the MV Kapusksing. Since that time a variety of reconnaissance and detailed survey work has been conducted on the Scotian Shelf.

A knowledge of the sea-bed topography is fundamental to most surficial geology surveys, especially those that deal with the process of sediment transport. Because bathymetric information is such an important aspect of the surficial geology of continental shelves, it was decided that the preparation of a series of index maps showing the location of existing charts and field sheets on the Scotian Shelf was within the scope of this study.

This section outlines the hydrographic data base that is available for the Scotian Shelf, including government and industry sources. The indexed data include bathymetric charts, Canadian Hydrographic Service (CHS) field sheets, government tidal reference stations, and government and industry current meter locations, the positions of which have been plotted on four maps (see map reductions 1 to 4). The compilation does not include a review of special CHS surveys on the Scotian Shelf, such as the aerial hydrography work performed around Sable Island by Hunter and Associates (1982), or special bathymetry projects for industry such as Ruffman (1985).

CANADIAN HYDROGRAPHIC SERVICE DATA

The CHS data for the Scotian Shelf can be broken down into four categories:

- CHS field sheets that show tidally corrected, digitized water depths;
- published 'Fisheries' charts;
- published natural resource charts; and
- published offshore navigational charts.

Field Sheets

Positions of CHS field sheets on the Scotian Shelf can be obtained from three separate index maps available from the Canadian Hydrographic Service Data Centre at the Bedford Institute of Oceanography (BIO):

- Field Sheet Index #2, Gulf of Maine to Strait of Belle Isle. Natural Resource Series Field Sheets (primarily earlier, offshore surveys conducted from the CHS survey ship MV Kapuskasing, the MV Acadia, and CSS Baffin);
- Field Sheet Index #2B, Gulf of Maine to Strait of Belle Isle. Natural Resource Series Field Sheets (primarily later, offshore surveys conducted from the CSS Baffin); and
- Field Sheet Index #3, Nova Scotia and Bay of Fundy (both inshore and offshore field sheets).

Most of the offshore field sheets are at a scale of 1:75,000 or 1:100,000 with a line spacing of 3 to 4 km and depths in fathoms, whereas the inshore sheets, as well as harbour and wharf survey data, are at progressively smaller scales with closer line spacing.

The locations of offshore field sheets are given on four maps (see map reductions 1 to 4). The positions of inshore sheets were not mapped because they occur in water depths less than 50 m, the minimum water depth for this study.

Published Charts

The standard bathymetric chart for the Scotian Shelf is Natural Resource Map 801 (CHS 1969), which, at a scale of 1:1,000,000, is a Lambert conformal conic projection and is contoured in metres. This chart is in colour and was re-printed in 1975.

In addition to Map 801, CHS has published several other charts for the Scotian Shelf. The first is a series that is referred to as the 'fisheries charts.' Two of these charts are Mercator projections at a scale of 1:300,000, with another Mercator projection having a scale of 1:350,000. The three charts are identified as follows:

- L-8008 Banquereau and Misaine Bank, 1973 - 1:300,000 Mercator, in fathoms (CHS 1973);

- L/C 8007 Sable Island Bank, 1978 - 1:300,000 Mercator, in fathoms (CHS 1978); and
- L/C 4013 Nova Scotia Shore Areas, 1980 - 1:350,000 Mercator, in fathoms (CHS 1980).

Another series, known as the Natural Resource Bathymetry Maps or 'A' series, has also been initiated that will eventually show detailed bathymetry and potential field data, as well as some surficial geology. However, only one map has been published (sheet 15130A, 1973), mainly because the existing data base has insufficient line density for detailed contouring of bathymetric data.

Related Oceanographic Data

Locations for tidal reference stations were obtained from the Tidal Section of the Canadian Hydrographic Service, and are listed in Table 1.

The positions of government current meter locations on the Scotian Shelf (Table 2) were obtained from the Department of Fisheries and Oceans, and from BIO cruise reports. Known current meter locations are plotted on four maps (see map reductions 1 to 4).

OIL AND GAS INDUSTRY DATA

In industry, bathymetric data on the Scotian Shelf come mainly from the oil companies, and the data base encompasses a wide variety of surveys, including engineering projects such as well-site surveys, pipeline routes, deep seismic exploration surveys, and rig moves. Most of these data are proprietary; however, under certain circumstances access to them may be granted for the purpose of scientific research.

Well-site surveys are an important data base for detailed bathymetric maps as well as other types of surficial geology data. The typical well-site survey on the Scotian Shelf measures about 5 X 5 km, with a minimum line spacing of about 200 m. Bathymetric maps are often contoured at a 2-m interval. The pipeline route work is more of a reconnaissance nature and provides long, continuous profiles but little in the way of contoured bathymetric maps. In some cases, for example, Cordsen et al. (1979), detailed

TABLE 1

Government tidal reference stations, Scotian Shelf

STATION NO.	GEOGRAPHIC AREA	LAT. (N)	LONG. (W)	DATE
550	SABLE ISLAND	43° 58'	59° 48'	JULY, 1963
40551	SABLE ISLAND BANK	44 02	59 36	JUNE, 1981
40555	BANQUEREAU BANK	44 35	57 41	JUNE, 1975
50003	FUNDY (OFFSHORE 6)	42 28	67 43	JUNE, 1976
50005	FUNDY (OFFSHORE 22B)	42 03	65 38	SEPT, 1976
50006	FUNDY (OFFSHORE 22A)	42 07	65 30	SEPT, 1976
50007	FUNDY (OFFSHORE 21)	42 37	64 22	SEPT, 1976
50008	FUNDY (OFFSHORE 1)	42 49	63 13	SEPT, 1976
50450	LA HAVE BANK	42 54	64 14	SEPT, 1974
50550	SABLE ISLAND BANK	43 50	59 57	JULY, 1974

NOTE: - If more than one occupation of a station has occurred, the dates listed are for a representative station.

- Information on tidal data from the above stations may be obtained from:

Mr. D. Mitchell
 Marine Environmental Data Services Branch
 Dept. of Fisheries and Oceans
 200 Kent St.
 Ottawa, Ontario K1A 0E6

TABLE 2

Government current meter and conductivity,
temperature, depth (CTD) stations
on the Scotian Shelf

CRUISE NO.	AREA	SCIENTIST
A. Data in the BIO computerized data base		
67004	ST. MARGARETS BAY	TRITES
68018	STRAIT OF CANSO	PILOTE
68031	ST. MARGARETS BAY	TRITES
69033	CAPE SABLE AREA	FOOTE
69057	SCOTIAN SHELF	DOBSON
70030	CHEBUCTO BAY	NEU
75900	ST. MARGARETS BAY	LAWRENCE
76020	SCOTIAN SHELF	SMITH
76030	SCOTIAN SHELF	OAKEY
76033	SCOTIAN SHELF	SMITH
76038	SCOTIAN SHELF	SMITH
77003	SCOTIAN SHELF	SMITH
77003	SCOTIAN SHELF	SMITH
78031	CAPE SABLE	SMITH
79007	CAPE SABLE	SMITH
79027	CAPE SABLE	SMITH
79031	EMERALD BASIN	OAKEY
80006	CAPE SABLE	SMITH
80022	CAPE SABLE	SMITH
81004	CAPE SABLE	SMITH
81040	CAPE SABLE	SMITH
81042	CAPE SABLE	SMITH
82005	CAPE SABLE	SMITH
82035	CAPE SABLE	SMITH
81043	SCOTIAN SHELF	ELLIOT
82900	BEDFORD BASIN	HORNE
82999	SABLE ISLAND	HEFFLER *
0	ST. MARGARETS BAY	TRITES
0	SCOTIAN SHELF	DOBBS
0	SCOTIAN SHELF	VARIOUS
0	HALIFAX HARBOUR	NOT GIVEN
0	BEDFORD BASIN	REINIGER
B. Additional surveys from BIO cruise reports but apparently not in the BIO computerized data base		
67003	SCOTIAN SHELF	DOBSON
67023	SCOTIAN SHELF	FOOTE

TABLE 2 (cont.)

CRUISE NO.	AREA	SCIENTIST
68025	SCOTIAN SHELF	FOOTE
68057	SCOTIAN SHELF	FOOTE
68065	SCOTIAN SHELF	FOOTE
68073	SCOTIAN SHELF	DOBSON
69006	SCOTIAN SHELF	DOBSON
69036	STRAIT OF CANSO	LAWURENCE
69046	SCOTIAN SHELF/SLOPE	FOOTE
75020	LAURENTIAN FAN	REINGER
75033	SCOTIAN SHELF	REINGER
81016	SCOTIAN SHELF	SCOTT **
82037	SCOTIAN SHELF	MCKEOWN ***
83027	SCOTIAN SHELF	HUNTLEY **

* Atlantic Geoscience Centre, BIO

** Dalhousie University

*** Metrology, BIO

Source: Atlantic Oceanographic Laboratory, BIO

bathymetric work has been carried out without the usual complement of seismic profiling equipment, and these types of surveys were indexed as well.

Again it is not the purpose of this compilation to provide a detailed discussion of the available reports on industry bathymetric surveys that are related to sediment transport. For example, the work that has been carried out on behalf of Mobil Oil Canada Ltd. in conjunction with the Venture Development Project (e.g., Plasse (1983a) and Ruffman (1985)), and in the 1970s as part of a series of sand wave studies (Evans-Hamilton 1972a, 1972b, 1975a, 1976), are not discussed in this section, even though the results have some bearing on the process of sediment transport on the Scotian Shelf. Samples and surveys lines from surveys such as the Evans and Hamilton work have, however, been mapped in this compilation (see map reductions 13 to 20).

In terms of current meter locations, Table 3 provides a list of well locations and other descriptive material for data that have been collected on the Scotian Shelf by industry.

TABLE 3
Industry current meter data on the Scotian Shelf

Well-head name	Client	Lat. (N)	Long. (W)	Depth (metres)	Time	Start time Date	Run time (End time)	Sample interval (min)
ALDER SITE	SHELL	42°39.84'	62°00.30'	208	18:28:30	15/07/80	4858 CYCLES	10
ALDER SITE	SHELL	42 39.84	62 00.30	700	18:28:00	15/07/80	4858 CYCLES	10
ALDER SITE	SHELL	42 39.84	62 00.30	1465	18:29:00	15/07/80	4858 CYCLES	10
ASPEN SITE	SHELL	42 43.26	61 54.48	208	24:00:00	15/07/80	4850 CYCLES	10
BLUENOSE G47A	MOBIL	44 06.96	59 21.73	23	16:00:00	15/02/83	3529 CYCLES	40
BLUENOSE G47A	MOBIL	44 06.96	59 21.73	48	16:20:00	15/02/83	7055 CYCLES	20
BLUENOSE G47A	MOBIL	44 06.72	59 21.36	20	19:20:00	06/04/83	5019 CYCLES	40
BLUENOSE G47A	MOBIL	44 06.72	59 21.36	43	14:00:00	06/06/83	9732 CYCLES	20
BLUENOSE G47A	MOBIL	44 06.72	59 21.36	61	14:00:00	06/06/83	9799 CYCLES	20
BLUENOSE G47A	MOBIL	44 06.72	59 21.36	20	21:40:00	15/06/83	2032 CYCLES	40
BLUENOSE G47A	MOBIL	44 06.72	59 21.36	47	21:30:00	15/06/83	8206 CYCLES	20
BLUENOSE G47A	MOBIL	44 06.72	59 21.36	62	21:30:00	15/06/83	8206 CYCLES	20
GLENELG SITE	SHELL	43 37.65	60 10.36	7	22:32:00	11/03/83	4136 CYCLES	20
GLENELG SITE	SHELL	43 37.65	60 10.36	7	22:24:00	11/03/83	4136 CYCLES	20
GLENELG SITE	SHELL	43 39.00	60 06.42	66	08:53:00	08/03/83	4136 CYCLES	20
SHUBENACADIE H-100	SHELL	42 52.95	61 32.18	10	19:45:00	19/11/82	00:15:00	10
SHUBENACADIE H-100	SHELL	42 52.95	61 32.18	570	19:50:00	19/11/82	18:30:00	10 (?)
SHUBENACADIE H-100	SHELL	42 52.95	61 32.18	1120	19:40:00	19/11/82	18:30:00	10 (?)
GLOOSCAP C-63	HUSKY/BOW VAL.	43 12.16	62 09.95	20	N/A	06/08/83	N/A	N/A
GLOOSCAP C-63	HUSKY/BOW VAL.	43 12.16	62 09.95	50	N/A	06/08/83	N/A	N/A
GLOOSCAP C-63	HUSKY/BOW VAL.	43 12.16	62 09.95	80	N/A	06/08/83	N/A	N/A
GLOOSCAP C-63	HUSKY/BOW VAL.	43 12.16	62 09.95	20	N/A	04/09/83	N/A	N/A
GLOOSCAP C-63	HUSKY/BOW VAL.	43 12.16	62 09.95	50	N/A	04/09/83	N/A	N/A
GLOOSCAP C-63	HUSKY/BOW VAL.	43 12.16	62 09.95	80	N/A	04/09/83	N/A	N/A

Source: Data provided by Doug Gregory, Department of Fisheries and Oceans, Bedford Institute of Oceanography (DFO indicates that all wells drilled after 1977 on the Scotian Shelf have current meter data).

SURFICIAL GEOLOGY SURVEYS

GOVERNMENT, UNIVERSITY, AND FOREIGN SOURCES

This section provides background information on the indexing that has been performed for government, university, and foreign surveys. The data referred to here are given in the full edition (see footnote page 4).

Government Data

Cruise summaries. Each government survey has been identified by a cruise number, the first two digits of which provide the year of the survey, and last three digits of which give the cruise number for that year. For example, cruise no. 83006 was performed in 1983 and was the 6th government cruise in that year. The cruise summaries were listed in reverse chronological order, and were divided into five-year groups. The first cruise listed is always the most recent cruise that has been indexed.

The cruise summaries are composed of two parts: an index, which provides a written description of survey parameters, and a page-sized track plot, which gives some idea of the location and coverage of the survey.

The written index provides both general information about the survey, such as the cruise number, the date of the survey, the vessel, chief scientist, responsible agency, the number of survey lines, overall length of the survey, and general locality on the Scotian Shelf. Such information is of practical importance in locating archived or confidential data.

At a more detailed level, surveys are indexed according to three more categories; namely, geophysical equipment, sampling equipment, and navigation equipment. The geophysical equipment includes a wide variety of gear that has been used to survey the surficial geology of the sea bed. Echo sounders, side-scan sonar, microprofilers, deep tow systems (boomers and sparkers), and surface tow systems are all examples of seismic equipment that are documented in this compilation. Seismic refraction surveys, although less frequent than other methods for characterizing the upper part of the sea bed, appear in sufficient number to warrant a separate category in the index, as do special acoustic devices, and the use of magnetic tape recorders for data play-back purposes.

The sampling equipment indexed includes types of underwater cameras (still photography and television), grabs, gravity and piston cores, vibrocores, box cores, boreholes, current meters, and miscellaneous items that may pertain to sediment transport or surficial geology.

The navigation equipment is described in a section providing information on the positioning system used, the navigation fix intervals, and the type and availability of navigation data; for example, page-sized track plots, map-sized enclosures with scales and projections, and whether or not lists of sample survey line co-ordinates are available. In cases where sample locations were given in original cruise reports, a copy of the original list is given. In other cases, co-ordinates may represent hand- or computer-digitized locations that were obtained from original maps.

In general, the quality of government cruise summaries is largely a function of the availability of background information that could be obtained from original cruise reports and original maps. About 70 to 80% of the cruise summaries contain a page-sized track plot that indicates the locality and layout of survey grids. The quality of the reproduction of these track plots varies, depending upon the clarity of the original diagram, as well as upon the capability of the photocopying machine that was available at the site where the indexing was performed. In general, the page-sized track plots provide at least a good starting point for where to look on the map-sized enclosures if additional information is required.

Map enclosures. This section describes the methods used to compile maps of government surveys (see map reductions 5 to 12).

As indicated earlier, the four base maps for this study were derived from earlier published maps of the Scotian Shelf by King (1970), MacLean and King (1971), Drapeau and King (1971), and MacLean et al. (1977). All of the base maps were constructed at a scale of 1:300,000 Mercator projection at reference latitude 48°N. This choice of scale and projection was based on the fact that nearly all of the published fisheries charts, published surficial geology maps, as well as hand-drawn track plots of seismic lines and sample locations are at a scale of 1:300,000. The maps produced in this compilation, including industry maps, sediment instability maps, and current meter locations, can be compared directly to published fisheries charts and surficial geology maps using transparent overlays. The scale of

1:300,000 also simplifies the process of checking plotted data against original maps, most of which were also generated at this scale. The disadvantages of using this scale and projection are that they resulted in crowding of industry seismic lines in the vicinity of Sable Island, where much work has been done in and around the Venture Gas Field. In addition, industry maps are typically based on a Universal Transverse Mercator (UTM) projection, and direct comparisons between industry and government maps may not always be possible.

The government data were taken from numerous sources (Table 4), some of which are described here. Some of the sample locations and seismic lines were provided by the Data Section at the Atlantic Geoscience Centre (AGC) of the Bedford Institute of Oceanography (BIO) in the form of computer-drafted maps at the final scale and projection. Scientists at AGC assisted in the collection of old maps and data listings for inclusion in this compilation. In addition, a good deal of information was derived from cruise reports held at BIO.

Sample locations were mapped using a variety of techniques, including direct transfer of information from existing maps, as in the case of AGC Data Section material and track plots of old surveys plotted on fisheries charts. Other track plots were mapped using a semi-automated map digitizer at the Tidal Section of the Canadian Hydrographic Service, or by photographic reduction or enlargement, the latter of which may have introduced minor distortions because of differences in map projections. Whenever possible, original sample locations in latitudes and longitudes were typed directly into the computer.

Government sample maps and reference numbers. The combination of reference numbers and map symbols was used to avoid overcrowding on maps and to reduce the time and expense of drafting sample locations. In a compilation of this magnitude, the use of reference numbers in the place of actual sample numbers is inevitable. Thus, a government sample number, such as 65008 KC 457G, was reduced to 77, to save both space and drafting time. In addition to these considerations, another aspect in favour of reference numbers is the duplication of sample numbers from different investigations. It is not uncommon to have several identification numbers for the same sample. For example, a government sample from the AGC data base may also appear in King and Drapeau (1971) and Williamson (1983). The problem is that neither of these authors indicate the actual government number for any of their thesis samples. Thus, the use of reference numbers avoids the problem of having to map a single sample

TABLE 4

Government cruises indexed in the compilation

CRUISE	YEAR	VESSEL	CHIEF SCIENTIST	RESPONSIBLE AGENCY	SEISMIC PROFILES	SIDESCAN SONAR	BOTTOM SAMPLES	BOTTOM PHOTOS	CURRENT METRES	SPECIAL PARAMETERS
84005	1984	DAWSON	AMOS	AGC (BIO)	YES	YES	-	-	-	-
84003	1984	DAWSON	BIDGOOD	NSRF	YES	YES	YES	-	-	-
84002	1984	DAWSON	FOWLER	AGC (BIO)	-	-	YES	-	-	DRILL
83039	1983	DAWSON	MANCHESTER	AGC (BIO)	YES	-	(?)	-	-	-
83037B	1983	DAWSON	SCHWINGHAMMER	MEL (BIO)	-	-	YES	-	-	-
83031	1983	DAWSON	BIDGOOD	NSRF	YES	YES	-	-	-	-
83027	1983	DAWSON	HUNTLEY	DAHOUSIE	-	-	YES	-	(YES)	INSTRUMENT PACKAGE
83026	1983	DAWSON	AMOS	AGC (BIO)	YES	YES	YES	-	-	-
83019	1983	HUDSON	FADER	AGC (BIO)	YES	YES	YES	YES	YES	SEABED II
83012	1983	DAWSON	BIDGOOD	NSRF	YES	YES	YES	-	-	-
83010	1983	DAWSON	CHRIS	DALHOUSIE	-	-	YES	-	-	INSTRUMENT PACKAGE
82040	1982	DAWSON	AMOS	AGC (BIO)	YES	YES	(?)	-	-	-
82039	1982	BAFFIN	AMOS	AGC (BIO)	YES	YES	-	-	-	-
82037	1982	DAWSON	MCKEOWN	METROLOGY (BIO)	-	-	YES	-	YES	-
82014	1982	HUDSON	MANCHESTER	AGC (BIO)	YES	(YES)	-	-	-	SEA MARC 1
82006	1982	DAWSON	POCKLINGTON	CHEM. OC. (BIO)	-	-	YES	-	-	-
82005	1982	DAWSON	SMITH	COAST. OC. (BIO)	-	-	YES	YES	-	-
82004	1982	DAWSON	BIDGOOD	NSRF	YES	YES	-	-	-	-
82003	1982	DAWSON	SCOTT	DALHOUSIE	YES	YES	YES	-	-	-
81050	1981	PANDORA II	PIPER	AGC (BIO)	YES	YES	-	-	-	PICES IV SUBMERSIBLE
81049	1981	PANDORA II	HARGRAVES	MEL (BIO)	-	-	YES	-	-	PICES IV SUBMERSIBLE
81044	1981	DAWSON	PIPER	AGC (BIO)	YES	YES	YES	-	-	-
81026	1981	DAWSON	FOURNIER	DALHOUSIE	-	-	YES	-	-	-
81025	1981	DAWSON (?)	SUNDBY	U. DU QUEBEC	-	-	YES	-	-	-
81016	1981	DAWSON (?)	SCOTT	DALHOUSIE	YES	YES	YES	YES	YES	-
81013	1981	DAWSON	HARGRAVES	MEL (BIO)	-	-	YES	-	-	SEDIMENT TRAPS
81006	1981	DAWSON	BIDGOOD	NSRF	YES	YES	YES	YES	-	-

TABLE 4 (cont.)

CRUISE	YEAR	VESSEL	CHIEF SCIENTIST	RESPONSIBLE AGENCY	SEISMIC PROFILES	SIDESCAN SONAR	BOTTOM SAMPLES	BOTTOM PHOTOS	CURRENT METRES	SPECIAL PARAMETERS
80040	1980	PANDORA II	MEDIOLI	DALHOUSIE	-	-	-	-	-	-
80020	1980	DAWSON	FOURNIER	DALHOUSIE	-	-	YES	-	-	EPI-BENTHIC SLED
80010	1980	HUDSON	FADER	ACC (BIO)	YES	YES	YES	YES	-	-
80005	1980	DAWSON	FOURNIER	DALHOUSIE	-	-	-	-	-	SEDIMENT TRAPS
80004	1980	DAWSON	BIDGOOD	NSRF	YES	YES	YES	-	-	-
80M29	1980	CAPE ISL.	BIDGOOD	NSRF	YES	-	YES	-	-	-
P80	1980	PANDORA II	WILLIAMSON	DALHOUSIE	-	-	YES	-	-	-
79031	1979	DAWSON	OAKY	OC. CIRC. (BIO)	-	-	-	YES	-	WAVE RIDER BUOYS
79022	1979	DAWSON	SMITH	COAST. OC. (BIO)	-	-	YES	-	-	-
79015	1979	BAFFIN	HENDERSON	DFO (BIO)	YES	-	-	-	-	-
79011	1979	HUDSON	MCKEOWN	METROLOGY (BIO)	YES	YES	YES	YES	-	ELECT. DRILL
79003	1979	DAWSON	HARGRAVES	MEL (BIO)	-	-	-	-	-	-
79002	1979	DAWSON	BIDGOOD	NSRF	YES	YES	YES	YES	-	-
78033	1978	MAXWELL	BURKE	CHS (BIO)	-	YES	-	-	-	-
78026	1978	HUDSON	LEVY	CHEM. OC. (BIO)	-	-	YES	-	-	-
78024	1978	DAWSON	FOURNIER	DALHOUSIE	-	-	YES	-	-	-
78020	1978	DAWSON	KEEN	ACC (BIO)	YES	-	(?)	-	-	-
78014	1978	DAWSON	FOURNIER	DALHOUSIE	-	-	YES	-	-	-
78008	1978	HUDSON	MCKEOWN	METROLOGY (BIO)	YES	YES	YES	-	-	MUN PENETROMETER
78007	1978	DAWSON	FOURNIER	MEL (BIO)	-	-	YES	YES	-	-
78005	1978	DAWSON	BIDGOOD	NSRF	YES	-	YES	YES	-	-
77022	1977	DAWSON	SYNDY	U DU QUEBED	-	-	YES	-	-	-
77020	1977	DAWSON	FOURNEIR	DALHOUSIE	-	-	YES	-	-	-
77018	1977	HUDSON	BROOKE	METROLOGY (BIO)	-	YES	YES	-	-	-
77013	1977	DAWSON	FOURNIER	DALHOUSIE	-	-	YES	-	-	-
77011	1977	DAWSON	KING	ACC (BIO)	YES	YES	YES	YES	-	ELECT. DRILL
77005	1977	HUDSON	MCKEOWN	METROLOGY (BIO)	YES	-	YES	-	-	ELECT. DRILL
77002	1977	DAWSON	BIDGOOD	NSRF	YES	YES	YES	YES	-	SUSPENDED SEDIMENTS

TABLE 4 (cont.)

CRUISE YEAR	VESSEL	CHIEF SCIENTIST	RESPONSIBLE AGENCY	SEISMIC PROFILES	SIDESCAN SONAR	BOTTOM SAMPLES	BOTTOM PHOTOS	CURRENT METRES	SPECIAL PARAMETERS
76055	1976 HILLSBOROUGH	DEWOLFE	CHS (BIO)	-	-	-	-	-	TIDAL GAUGES
76033	1976 DAWSON	SMITH	COAST. OC. (BIO)	-	-	-	-	YES	-
76024	1976 DAWSON	DEWOLFE	CHS (BIO)	-	-	-	-	-	TIDAL GAUGES
76017	1976 DAWSON	FOURNIER	DALHOUSIE	-	-	YES	-	-	-
76016	1976 HUDSON	KING	AGC (BIO)	YES	YES	YES	YES	-	ELECT. DRILL
76013	1976 HUDSON	MCKEOWN	METROLOGY (BIO)	-	YES	YES	-	-	-
76005	1976 DAWSON	SMITH	COAST. OC. (BIO)	-	-	YES	-	-	-
76004	1976 DAWSON	BIDGOOD	NSRF	YES	YES	YES	-	-	-
75033	1975 DAWSON	REINIGER	OC. CIRC. (BIO)	-	-	-	-	YES	-
75030	1975 MAXWELL	DRESSERAULT	METROLOGY (BIO)	-	YES	-	-	-	-
75020	1975 DAWSON	REINGER	OC. CIRC. (BIO)	-	-	YES	-	YES	-
75009	1975 HUDSON	KING	AGC (BIO)	YES	YES	YES	YES	-	ELECT. DRILL
75007	1975 HUDSON	KING	AGC (BIO)	YES	YES	YES	-	-	-
75M29	1979 KAPUSKASING	BIDGOOD	NSRF	YES	-	-	-	-	-
75.5.3	1975 KAPUSKASING	BIDGOOD	NSRF/GEOMARINE	YES	-	YES	YES	-	-
74032	1974 DAWSON	SUNDBY	CHEM. OC. (BIO)	-	-	YES	-	-	-
74021	1974 HUDSON	PIPER	DALHOUSIE	-	-	YES	-	-	-
74017	1974 DAWSON	FOURNIER	DALHOUSIE	-	-	YES	-	-	-
74013	1974 DAWSON	SCHAEFER	AGC (BIO)	-	-	YES	-	-	-
74007	1974 SACKVILLE	BIDGOOD	NSRF	YES	YES	-	-	-	-
74004	1974 DAWSON	BEMERS	CHEM. OC. (BIO)	-	-	YES	-	-	-
73036	1973 MAXWELL	THORBURN	MEL (BIO)	-	YES	-	YES	-	CINE SEA VEHICLE
73032	1973 SACKVILLE	HAWORTH	AGC (BIO)	-	-	YES	-	-	-
73030	1973 DAWSON	GORDON	MEL (BIO)	-	-	YES	-	-	-
73029	1973 SACKVILLE	KING	AGC (BIO)	(?)	-	YES	-	-	-
73024	1973 DAWSON	GORDON	MEL (BIO)	-	-	YES	-	-	-
73023	1973 BLUETHROAT	DESSUREAULT	METROLOGY	-	-	YES	YES	-	CINE SEA VEHICLE
73022	1973 VILMA-L	BUCKLEY	AGC (BIO)	YES	-	YES	YES	-	U.W. T.V., SHEAR V.

TABLE 4 (cont.)

CRUISE YEAR	VESSEL	CHIEF SCIENTIST	RESPONSIBLE AGENCY	SEISMIC PROFILES	SIDESCAN SONAR	BOTTOM SAMPLES	BOTTOM PHOTOS	CURRENT METRES	SPECIAL PARAMETERS
73009	1973 SACKVILLE	BIDGOOD	NSRF	YES	YES	-	-	-	-
73007	1973 DAWSON	DESSUREAULT	MEL (BIO)	YES	-	YES	-	-	ELECT. DRILL
73006	1973 HUDSON	MACLEAN	AGC (BIO)	-	YES	YES	YES	-	ELECT. DRILL
73003	1973 DAWSON	FADER	AGC (BIO)	YES	-	YES	YES	-	-
72021	1972 HUDSON	KEEN	AGC (BIO)	YES	-	YES	-	-	-
72019	1972 DAWSON	BUCKLEY	AGC (BIO)	-	-	YES	-	-	-
72011	1972 BLJETHROAT	WHITWAY	METROLOGY (BIO)	-	YES	YES	-	-	ELECT. DRILL
72010	1972 SACKVILLE	BIDGOOD	NSRF	YES	YES	-	-	-	-
72009	1972 DAWSON	KING	AGC (BIO)	-	-	YES	-	-	-
71036	1971 DAWSON	MASON	METROLOGY (BIO)	-	-	YES	-	-	-
71034	1971 DAWSON	BUCKLEY	AGC (BIO)	-	-	YES	-	-	ELECT. DRILL
71014	1971 HUDSON	KING	AGC (BIO)	YES	-	YES	-	-	-
71013	1971 SACKVILLE	BIDGOOD	NSRF	YES	-	-	-	-	-
71006	1971 SACKVILLE	MASON	AOL (BIO)	-	YES	-	-	-	-
70016	1970 DAWSON	BUCKLEY	AGC (BIO)	-	-	YES	-	-	-
70014	1970 SACKVILLE	PRITCHARD	COAST. OC. (BIO)	-	-	YES	-	-	-
70010	1970 DAWSON	DOBSON	COAST. OC. (BIO)	-	-	YES	-	-	-
69046	1969 DAWSON	FOOTE	APPL. OC. (BIO)	-	-	-	-	YES	-
69043	1969 LADY MOOD	LAWRENCE	APPL. OC. (BIO)	-	-	YES	-	-	-
69036	1969 FAIRROSE	LAWRENCE	APPL. OC. (BIO)	-	-	YES	-	-	-
69016	1969 KAPUSKASING	KING	AGC (BIO)	YES	-	YES	-	-	-
69006	1969 DAWSON	DOBSON	APPL. OC. (BIO)	-	-	-	-	YES	-
68073	1968 DAWSON	DOBSON	APPL. OC. (BIO)	-	-	-	-	YES	-
68065	1968 DAWSON	DOBSON	APPL. OC. (BIO)	-	-	-	-	YES	-
68063	1968 DAWSON	SRIVASTAVA	APPL. OC. (BIO)	-	-	-	-	YES	-
68058	1968 HUDSON	ROSS	AGC (BIO)	-	-	-	-	-	DETAILED HYDROG.
68057	1968 DAWSON	FOOTE	APPL. OC. (BIO)	YES	-	YES	-	-	ELECT. DRILL
68056	1968 DAWSON	SRIVASTAVA	AGC (BIO)	-	-	-	-	YES	-
68025	1968 DAWSON	FOOTE	APPL. OC. (BIO)	-	-	-	-	-	DETAILED HYDRO.
68014	1968 KAPUSKASING	MACLEAN	AGC (BIO)	-	-	YES	-	YES	-
68004	1968 MAXWELL	BIDGOOD	NSRF	YES	-	YES	YES	-	-

TABLE 4 (cont..)

CRUISE	YEAR	VESSEL	CHIEF SCIENTIST	RESPONSIBLE AGENCY	SEISMIC PROFILES	SIDESCAN SONAR	BOTTOM SAMPLES	BOTTOM PHOTOS	CURRENT METRES	SPECIAL PARAMETERS
67036	1967	LABRADOR	BARRET	AGC (BIO)	YES	-	-	YES	-	-
67035	1967	MAXWELL	HOFFMAN	DALHOUSIE	YES	-	-	-	-	-
67027	1967	HUDSON	KING	AGC (BIO)	YES	YES	-	-	-	-
67023	1967	THETA	FOOTE	APPL., OC. (BIO)	-	-	-	YES	-	-
67012	1967	HUDSON	TRITES	APPL., OC. (BIO)	-	-	YES	-	-	-
67009	1967	KAPUSKASING	KING	AGC (BIO)	YES	YES	YES	-	-	-
67003	1967	EE PRINCE	DOBSON	APPL., OC. (BIO)	-	-	-	YES	-	-
66031	1966	MAXWELL	DOUGLAS	CHS (BIO)	-	-	-	-	-	DETAILED HYDROG.
66026	1966	HUDSON	MARLOWE	GSC (BIO)	YES	-	YES	-	-	-
66004	1966	KAPUSKASING	KING	GSC (BIO)	YES	-	YES	-	-	-
65035	1965	KAPUSKASING	KING	GSC (BIO)	YES	-	-	YES	-	-
65034	1965	HUDSON	LONCAREVIC	GSC (BIO)	-	-	YES	YES	-	MICRO MOHOLE DRILL
65011	1965	SACKVILLE	STANLEY	DALHOUSIE	YES	-	YES	YES	-	SUSPENDED SEDIMENTS
65008	1965	KAPUSKASING	KING	GSC (BIO)	-	-	YES	-	-	-
65007	1965	KAPUSKASING	MARLOWE	GSC (BIO)	-	-	YES	-	-	-
65005	1965	SACKVILLE	STANLEY	DALHOUSIE	-	-	YES	YES	-	-
64030	1964	HUDSON	BOYD	DALHOUSIE	-	-	YES	-	-	-
64022	1964	BLUETHROAT	LONCAREVIC	GSC (BIO)	YES	-	-	-	-	-
64018	1964	BAFFIN	LONCAREVIC	GSC (BIO)	YES	-	-	-	-	-
64017	1964	THETA	KEEN	DALHOUSIE	-	-	YES	-	-	-
64013	1964	HUDSON	PELLETIER	GSC (BIO)	YES	-	-	-	-	-
64010	1964	THETA	KEEN	DALHOUSIE	YES	-	-	-	-	-
64005	1964	KAPUSKASING	SWIFT	DALHOUSIE	-	-	YES	-	-	-
64005A	1964	KAPUSKASING	BARRETT	GSC (BIO)	-	-	YES	-	-	-
S80	1964	SACKVILLE	BLANCHARD	GSC (BIO)	-	-	YES	YES	-	-
S74	1963	SACKVILLE	KEEN	DALHOUSIE	-	-	YES	-	-	-
S70	1963	SACKVILLE	KEEN	DALHOUSIE	-	-	(?)	-	-	-
S67	1962	SACKVILLE	PEER	AOG	(?)	-	(?)	-	-	-
S66	1962	SACKVILLE	MILLS	DALHOUSIE	-	-	(?)	-	-	-
S65	1962	SACKVILLE	KEEN	DALHOUSIE	YES	-	-	-	-	-

several times on the same map, and ensures that all samples are plotted.

Two types of reference numbers are used in this study. Numeric reference numbers describe all samples that are either already in the AGC computerized data base, or samples that will probably soon be entered in the data base. Each of the four maps for government samples (see map reductions 5 to 8) has a unique set of government sample reference numbers, along with detailed sample identifications, with references to the chief scientist, vessel, and so on.

It is important to bear in mind that each of these four maps has its own set of government reference numbers, and that a "349" on one map will, in all likelihood, be a different sample than a "349" on another map. This aspect of the manner in which the BIO computer-assigned reference numbers for this compilation study is unfortunate.

Another set of reference numbers describes government and university samples that are outside of the realm of AGC, such as thesis and research samples. Each survey is indicated by an alphabetical reference number prefixed by a specific letter. For example, the C series refers to Cok's (1970) thesis samples, and J refers to James' (1966) thesis samples.

Unlike the numeric series of government reference numbers, the alphabetic series apply to all the maps, and the co-ordinates are identical to those listed in the original sources. Because most of the government samples were plotted first, only those thesis samples that are not already plotted as government samples appear on the maps. For example, sample J4 from James (1966) is not in the AGC data base, and it is plotted separately on map reduction 6.

Maps of government seismic surveys. Map reductions 9 to 12 indicate the position of government survey lines along which either seismic profiles or side-scan sonar lines, or both, were carried out. Survey lines are identified according to cruise number as well as the government convention for navigation fixes in terms of Julian Day and Greenwich Mean Time (GMT). For example, a line labelled as 86006 would indicate cruise number 6 of 1986, and a day-and-time fix number such as 1591155 would indicate Julian Day 159 (8 June 1986) at 1155h. Although the government fix time interval is typically 5 min, it is not practical to map navigation fixes over such short distances. Fix intervals in this compilation correspond to time periods that measure several hours to avoid over-crowding.

In terms of map legends, a separate set of symbols is used to differentiate between seismic profiles and side-scan sonar lines. A solid line indicates seismic profiles, and a wide hash mark is used for side-scan sonar. With this choice of symbols, it is possible to indicate the simultaneous operation of both seismic profilers and side-scan sonar. Similarly, a different symbol is used for various types of cores, boreholes, camera stations, and other sample equipment.

University Data

Nearly all of the university research has been carried out in conjunction with government cruises to maximize the efficient use of government research vessels. All of the background information for university projects can be obtained from the cruise summaries (see footnote page 4). The theses of most significance in terms of samples are Pezzetta (1962), James (1966), Yorath (1967), Cok (1970), Drapeau (1971), Vaughn (1982), Williamson (1983), Hill (1983) (mainly for the Scotian slope), and Hoogendoorn (1985).

Foreign Data

All the foreign data for this compilation were obtained from the National Geophysical Data Centre (NGDC) located in Boulder, Colorado, USA. The National Oceanographic Data Centre in Washington, D.C., was also contacted but there was no information in their data base for the Scotian Shelf that applied to surficial geology. The data that were obtained from NGDC included a page-sized track plot of approximate ship tracks without reference to specific cruises or type of seismic profiling performed, such as deep seismic or side-scan (Figure 2); a page-sized location diagram of sample locations (Figure 3); and computer printouts indicating both general information on cruises that were conducted on the Scotian Shelf and, in some cases, specific information on sample types and locations. Only the latter have been plotted in this compilation. A great deal more information would be required before seismic lines could be plotted with any degree of accuracy on the 1:300,000 maps, as well as more information on the type of data collected. For time and budgetary considerations, only samples with specific location co-ordinates (a total of 413) were plotted on the maps.

To summarize, the sample locations and seismic lines for government, university, and foreign surveys were all plotted on the same maps, using a unique set of reference

numbers to assist identification, to reduce the time and expense of final drafting, and to avoid overcrowding. Seismic lines are differentiated in terms of profiles and side-scan sonar, and the breakdown to grabs and cores on final maps is explicit. Detailed cruise summaries provide both general and specific descriptions of survey parameters, as well as a page-sized track plot for the purpose of location. For more information, contact the individuals listed in Appendix B.

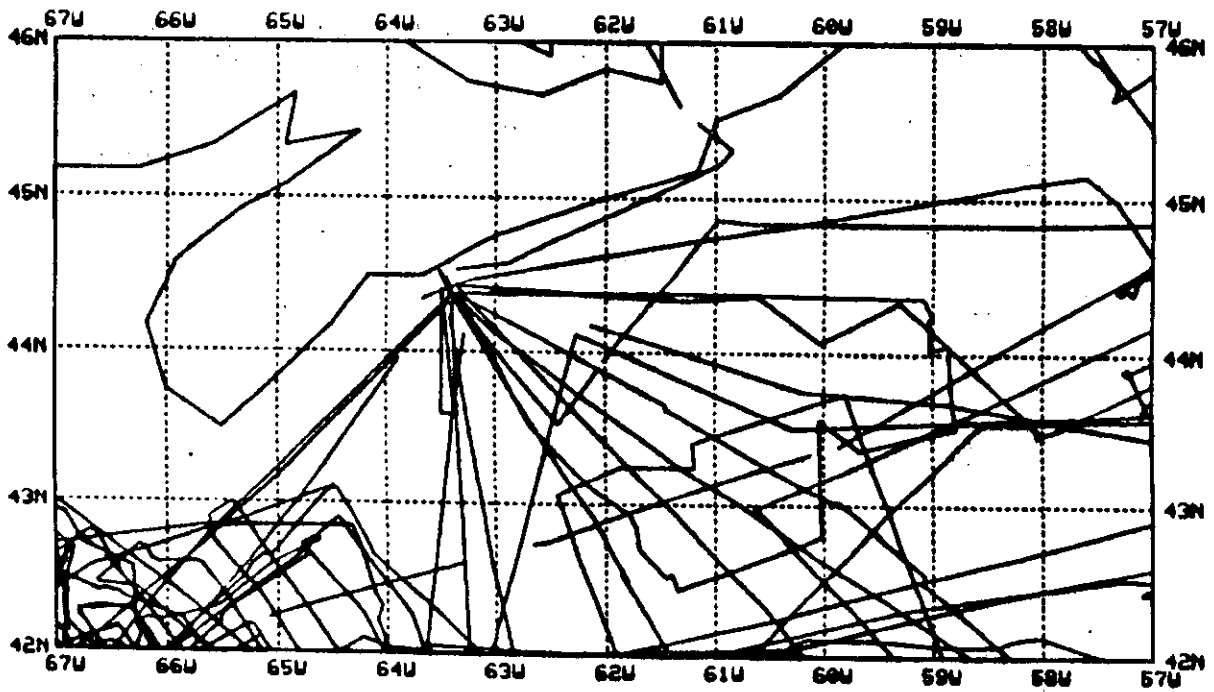


Figure 2. Track plot of foreign seismic lines off Nova Scotia (key 232F, Mercator projection)

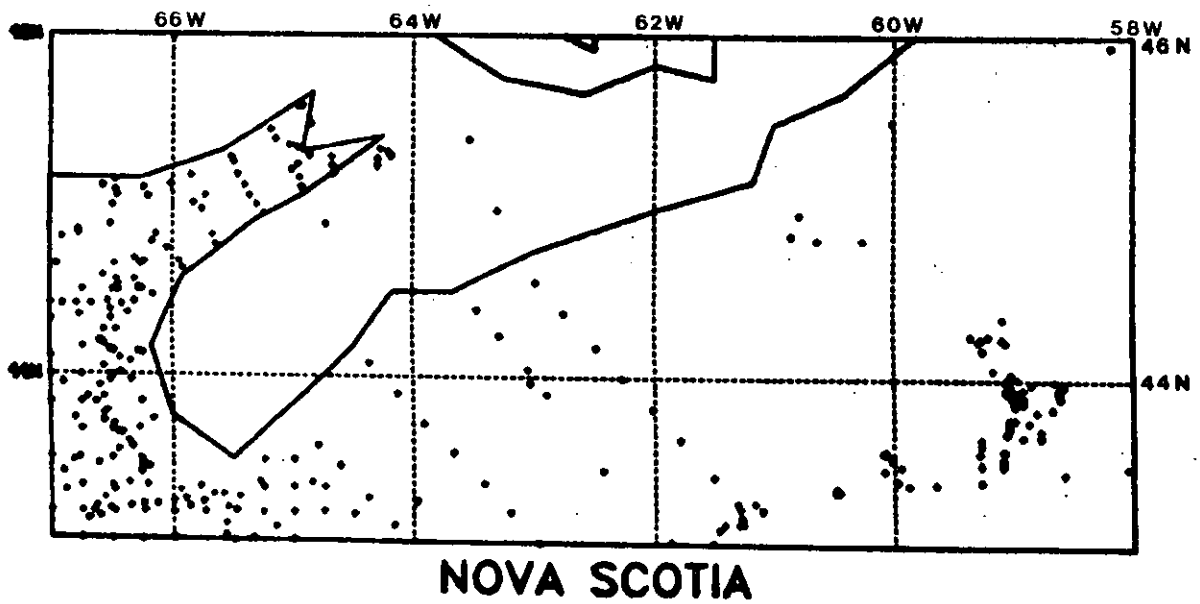


Figure 3. Sample locations off Nova Scotia, from foreign sources.

OIL AND GAS INDUSTRY SOURCES

The indexing and compilation of industry data was very similar to that described in the previous section for government surveys. However, the categories "Chief Scientist" and "Responsible Agencies" have been replaced with "Client," "Prime Contractor," and "Sub-contractor," and COGLA reference numbers have been included (see Appendix C). Industry's cruise summaries also contain start- and end-of-line co-ordinates for seismic profiles and side-scan lines, whereas this information does not apply to government surveys because the latter are based on day and time fixes instead of line numbers to identify track lines. Other considerations such as the indexing of geophysical, sampling, and navigation equipment, and the use of page-sized track plots, remain the same (see Appendix C). Indexing and mapping techniques are also the same and will not be reiterated here.

The method used for labelling ships' tracks on industry maps was slightly different than that used for government surveys. Government cruises are usually regional in nature, and are characterized by irregularly shaped track lines that measure tens to hundreds of km in overall length. Industry surveys are usually site-specific, i.e., limited to an area that measures about 5 x 5 km. Thus, the method of using solid lines for seismic profiles and cross-hatched lines for side-scan sonar lines was generally not suitable for industry surveys because it results in over-crowding. To get around this labelling problem, the designations "PR" and "SS" was used on all industry maps to indicate seismic profiles and side-scan sonar lines, respectively. Similarly, when a large number of samples occur in a given area, that number and a letter such as "G" for grab, "C" for core, and "CA" for underwater camera was used to indicate sampling activity.

The industry cruise summaries were broken down by company, and were listed in reverse chronological order. Thus, the first cruise summary for each company is the most recent survey to be indexed in this compilation. Final maps of the industry sample locations are presented as map reductions 13 to 16, and of the seismic surveys as map reductions 17 to 20.

At the time this index was being compiled, another compilation exercise on shallow boreholes on the Scotian Shelf was being carried out by Geomarine Associates Ltd. on behalf of the Atlantic Geoscience Centre at BIO (Ruffman

1984). Rather than duplicate that effort, it was decided that no indexing of borehole information would be conducted in the compilation.

In summary, the methods for indexing and compiling industry surveys were similar to those used for government surveys, with minor modifications being required because of the site-specific nature of industry work compared to the regional or reconnaissance nature of government surveys. Otherwise the basic concept of providing a cruise summary, page-sized track plot, and regional map worked quite well for industry data. Table 5 lists all the industry surveys for which summaries were compiled.

TABLE 5

Industry surveys indexed in this compilation

Company	Year	Survey
Chevron Standard Ltd.	1978	Acadia K-62 well-site survey
Husky Oil Operations Ltd.	1983	Chebucto K-90 well-site survey
	1983	Glooscap C-63 well-site survey
	1983	Evangeline (South Sable) well-site survey
Imperial Oil Limited	1975	1975 seismic program, Scotian Shelf survey
Mobil Oil Canada Ltd.	1984	West Venture C-62 drilling mud monitoring
	1983	Venture pipeline route, shallow geophysical survey
	1983	Venture Development Project - geotechnical study, soil and foundation study
	1983	Olympia A-12, Venture B-43 and Venture D-23 sediment/benthos survey #2
	1982	Arcadia J-16 well-site survey
	1982	West Olympia well-site survey
	1982	1982 Venture pipeline route, shallow geophysical survey
	1982	1982 Venture production platform, shallow geophysical survey
	1982	Mariner D-25 well-site survey

Table 5 (cont.)

Company	Year	Survey
Mobil Oil Canada Ltd. (cont.)	1982	Olympia A-12, Venture B-43 and Venture D-23 sediment/benthos survey #1
	1981	Well-head search, Sable Island
	1980	Venture D-42/G12 well-site survey
	1980	Bluenose G-47 well-site survey
	1980	Thebaud K-93 well-site survey
	1980	Venture NW (originally called 'Olympia') well-site survey
	1979	Sable Island East Bar bathymetry survey
	1979	Venture B-13 corridor survey
	1977	1977 Sable Island Bank surveys and tie lines (Venture A, Migrant A, Thebaud, Cohasset A, Cohasset C, and Penobscot
	1977	Migrant O-20 well-site survey
	1973	Banquereau site surveys and tie lines
	1973	Adventure well-site survey
	1973	Gaultois well-site survey
	1973	Tie lines Adventure - Gaultois
1973	Tie lines Sable Island Bank wells	
Nova Scotia Research Foundation Corp.	1984	Cruise 84003, CSS Dawson
	1983	Cruise 83031, CSS Dawson
	1983	Cruise 83012, CSS Dawson

Table 5 (cont.)

Company	Year	Survey
Nova Scotia Res- search Foundation Corp. (cont.)	1982	Cruise 82004, CSS Dawson
	1981	Cruise 81006, CSS Dawson
	1980	Cruise 80004, CSS Dawson
	1980	Cruise 80M29, Cape Islander
	1979	Cruise 79002, CSS Dawson
	1978	Cruise 78005, CSS Dawson
	1977	Cruise 77002, CSS Dawson
	1976	Cruise 76004, CSS Dawson
	1975	Cruise 75.7.3, M/V KAPUSKASING
	1975	Cruise 75M20, M/V KAPUSKASING
	1974	Cruise 74007, M/V SACKVILLE
	1973	Cruise 73009, M/V SACKVILLE
	1972	Cruise 72010, M/V SACKVILLE
	1971	Cruise 71013, M/V SACKVILLE
	1968	Cruise 68004, M/V MAXWELL
Petro-Canada Exploration Inc.	1983	Albatross G-02 well-site survey
	1983	Dover A-43 well-site survey
	1983	Bonnet F-24 well-site survey
	1983	St. Paul well-site survey
	1981	Banquereau Site D well-site survey
	1981	Banquereau Site C well-site survey

Table 5 (cont.)

Petro-Canada Exploration Inc. (cont.)	1981	Banquereau Site B well-site survey
	1981	Banquereau Site A well-site survey
Sable Gas Systems	1984	1984 Venture pipeline route survey (with Atlantic Geo- science Centre, BIO)
	1983	1983 Venture pipeline route survey off Country Harbor, Nova Scotia
Shell Canada Res- ources Ltd.	1983	Des Barres well-site survey
	1983	Kegeshook well-site survey
	1983	Alma well-site survey
	1982	Glenelg well-site survey
	1983	South Des Barres well-site survey
	1983	Uniacke well-site survey
	1982	Shubenacadie well-site survey
	1981	N. Cheyenne-1 and S. Cheyenne-2 well-site surveys
	1981	Shawnee-1 and Shawnee-2 well- site surveys
	1981	S. Onondoga well-site survey
	1981	Saog well-site survey
	1981	Aspen well-site survey
	1980	Alder well-site survey
	1971	1971 Marine hydrocarbon survey
1970	1970 Marine hydrocarbon survey	
1966	1966 Geophysical progress report	

SEDIMENT INSTABILITY MAPS

The maps in this section present an indirect and preliminary view of the degree and form of sediment instability on the Scotian Shelf.

Sediment instability refers to all forms of movement of sediment that occurs at the boundary between the sea floor and sea water. It is commonly defined by such measures as rate, volume, and direction of movement, depth of active layer, periodicity of movement, and net and gross accumulation or removal of material. Quantification of these parameters requires detailed, site-specific, time series studies of the sediment dynamics and hydrodynamics of the boundary layer. Although studies of this nature are now underway, to date no studies combining these elements have been performed within the study area and quantitative information on sediment movement is nonexistent. However, other characteristics of the Scotian Shelf have been documented that either result from, or are conducive to, certain modes of sediment transport; for example, surficial cover, water depth, topography, sea-floor slope, bedform features, and oceanic, storm, and tidal currents. The integration of such measurements permits inferences to be drawn on aspects of sediment transport.

Bathymetry and surficial sediment cover are the two most thoroughly researched aspects of the study area. These have been combined by King and co-workers to produce the maps (see map reductions 21 to 24) used in the present study. These maps show, in general, a close association between the texture of surficial sediments and sea-floor topography, with coarse-grained material predominant on local highs and finer-grained material settled into the intervening lows.

The genetic and stratigraphic relationships between the various lithofacies have been described by Drapeau and King (1971), Fader et al. (1977), King (1970), King and MacLean (1976), King et al. (1972), and MacLean et al. (1977). Their descriptions indicate a Pleistocene substrate that has undergone and is, at present, undergoing modification in response to the hydrodynamic conditions of the Holocene transgression. These sedimentary regimes have resulted in the formation of five lithostratigraphic units.

The Sable Island Sand and Gravel and the La Have Clay are developing in response to the Holocene hydrodynamic conditions and the sediment textures and their distribution reflect the present physical oceanographic conditions.

The Scotian Drift and Emerald Silt, however, were developed in proglacial or subglacial conditions and the Sambro Sand was formed as a sublittoral reworking of these prior to the Holocene transgression. Where these units occur, therefore, they are relict and their grain-sizes do not represent the physical oceanographic conditions of today.

This being the case, some deductions regarding sediment movement can be made on the basis of the present distribution and texture of the Sable Sand and Gravel and La Have Clay but none for the other units. These deductions are somewhat improved by incorporating conclusions on sediment movement derived from the examination of bedform features and of oceanographic data. Bedform features have been described by the authors already noted and by others, in particular Amos and King (1984), Evans-Hamilton Inc. (1972a, 1975b, 1976), Stanley and Silverberg (1969), and Stanley et al. (1973).

Sea-floor slopes also affect sediment instability and have been studied by Jacques/McClelland Geosciences Inc. (1982). In this report, the author has followed their practice and has outlined areas that exceed 3 of slope and areas that exceed 6 of slope. These areas virtually all lie within the Sambro Sand or Emerald Silt units.

In summarizing the sediment dynamics of the study area from the data available, the descriptions here and in the maps (see map reductions 21 to 24) assume a general uniformity of sediment instability over entire lithostratigraphic units, that varies only with changes in bottom slope. Such a condition is unlikely to be the case in detail, but is a reasonable starting assumption on which to plan future work.

The Sable Island Sand and Gravel Formation contains a sandy and a gravelly facies that grade into one another. They are exposed in the shallow areas of the shelf, above about 115 m water depth. The sediments lie in a high- to very-high-energy environment that is dominated by storm-generated currents. Material is transported primarily as a bedload component. The volume of material transported and the bedforms constructed are primarily functions of the sand component available. Ripple marks, megaripples, sand waves and sand ridges are common on the Sable Sand facies indicating much sediment motion. There is a net loss of material off the highs and into the lows, with spill-over observed into The Gully and over the upper Scotian Slope.

The gravel facies of the formation is demarcated by the 50% gravel line. Its occurrence is determined either by the greater exposure to storm currents or by the initial abundance of gravel in the source material. The occurrence of the gravel facies indicates a high-energy environment but the movement of a low volume of sediment because of a lack of source material. Bedform features are restricted to sand ripples and sand ribbons. Megaripples, sand waves, and sand ridges do not occur.

The La Have Clay is at present being formed from the winnowing of the more heterogenous units; namely, Emerald Silt, Scotian Drift, Sambro Sand, and Sable Island Sand and Gravel. It is restricted to the sheltered bathymetric lows where it blankets the underlying strata. It is transported in suspension and deposited under quiescent conditions. The movement of post-depositional sediment is restricted to its disturbance by gas or water seeps (pockmarks), and, on steep slopes, by possible slumping or sliding. Flute marks, caused by increases in intensity of local bottom currents, are also possible.

Although the three remaining units (Emerald Silt, Sambro Sand, and Scotian Drift) are relict and therefore not suitable as indicators of present sediment dynamics, some deductions may be made from the bathymetry and topography in which the units are located. (It should be remembered that reworking of these relict units changes the reworked fraction to either Sable Island Sand and Gravel or La Have Clay, depending largely on the texture of the resultant fraction.)

All the relict units now occur in deeper water than the Sable Island Sand and Gravel, and they are thus further removed from the energy of the storm-generated currents that dominate the Scotian Shelf. The proportion of bedload to suspension load generally decreases with depth and is greater for Sambro Sand and Scotian Shelf Drift than for the finer-grained Emerald Silt. Bedforms such as sand ripples, megaripples, and sand waves are most common in areas of Sambro Sand and of steeper slopes. The Sambro Sand or Emerald Silt also occur on most of the steeper slopes which are prone to mass wastage processes such as soil creep, slumping, and sliding. Within the basins, gas or water escaping from within the Emerald Silt may cause pockmarks to form on the sediment surface.

General information on sediment instability on the Scotian Shelf may be inferred indirectly, and these inferences are useful both for planning future studies and for preliminary assessment of the sea floor for engineering

purposes. However, there are no truly quantitative data on sediment dynamics on the Scotian Shelf and, because offshore construction is expected to increase, studies of sediment dynamics should receive high priority.

CONCLUSIONS

The amount of survey data that required indexing in this project was considerably larger than expected, and the data base is still growing. Already there are new surveys to add, and some old ones that were missed. As the numerous gas shows and discoveries on the Scotian Shelf continue to fuel exploration and development projects in the oil and gas industry, there will undoubtedly be many more well-site surveys, pipeline route surveys, and platform surveys during the next two decades, and presumably a requirement for the proper indexing and analysis of such data.

The oil and gas exploration in the area also seems to have rekindled a lot of scientific and applied research, particularly on the subject of sediment transport. It is hoped that this compilation will benefit those persons involved in future resource management, engineering planning, and scientific research, and will also serve as an example of data indexing methods to those involved in future data compilations on the Scotian Shelf and in other parts of Canada.

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- Canadian Hydrographic Service. 1973. Chart L-8008 - Canada, Atlantic Ocean, Fisheries Chart, Banquereau Bank and Misaine Bank. Scale 1:300,000 Mercator projection at 48°N.
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APPENDIX A

LIMITED DISTRIBUTION LIST FOR
FULL EDITION OF COMPILATION

REPOSITORIES OF THE FULL EDITION
OF THIS COMPILATION

Library
Atlantic Geoscience Centre
Bedford Institute of Oceanography
Dartmouth, Nova Scotia

Library
Department of Geological Sciences
Queen's University
Kingston, Ontario

Library
Pacific Geoscience Centre
Institute of Oceans Sciences
Sidney, British Columbia

Mobil Oil Canada Limited
1809 Barrington St.
Halifax, Nova Scotia

Canada Oil and Gas Lands
Administration
2000 Barrington Street
Halifax, Nova Scotia

Canada/Newfoundland Offshore
Petroleum Board
140 Water Street
St. John's, Newfoundland

Shell Canada Resources Limited
45 Alderney Drive
Queen Square
Dartmouth, Nova Scotia

Ocean Engineering Information
Centre
Memorial University
St. John's, Newfoundland

Library
Institute of Sedimentary Petroleum
Geology
303-33rd Street N.W.
Calgary, Alberta

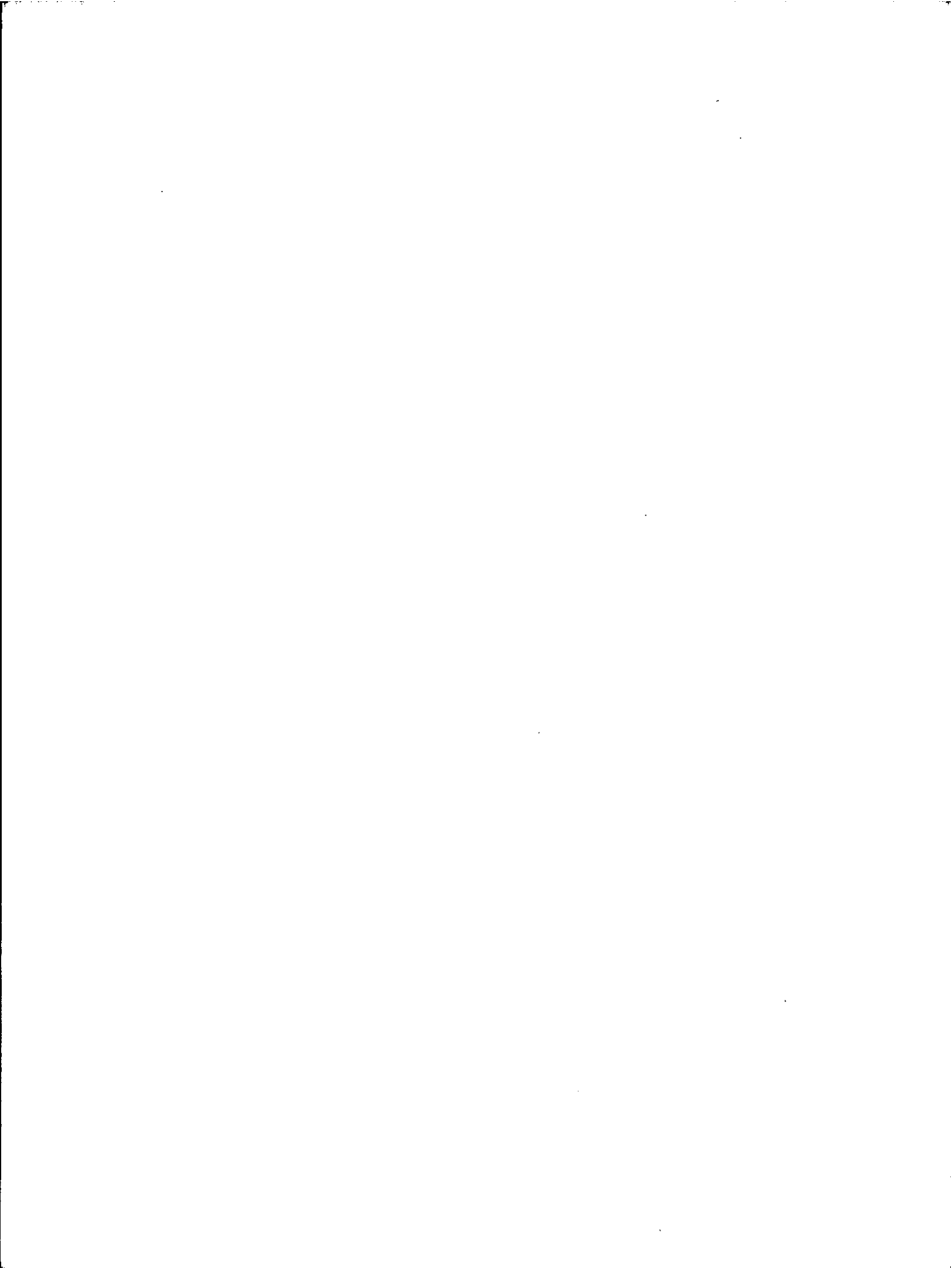
Library (GSC open File)
Geological Survey of Canada
601 Booth Street
Ottawa, Ontario

Library
Government of Nova Scotia
1690 Hollis Street
Halifax, Nova Scotia

Librarian
MacDonald Science Library
Dalhousie University
Halifax, Nova Scotia

APPENDIX B

CONTACTS FOR FUTURE INFORMATION



APPENDIX B

For further
information on

Contact

Published CHS Charts
and Field Sheets

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Appendix B (cont.)

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Computer-Drawn Plots
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Surveys

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or
Mr. Brian MacLean
Regional Reconnaissance
Atlantic Geoscience Centre

APPENDIX C

CRUISE SUMMARY INDEX SHEETS

SURVEY I.D.: 84005
 YEAR: 1984
 VESSEL: DAWSON
 CHIEF SCIENTIST: C. AMOS
 RESPONSIBLE AGENCIES: ATLANTIC GEOSCIENCE CENTRE; QUEENS UNIV.; DALHOUSIE UNIV.;
 SURVEY PERIOD: MARCH 8-16
 LOCALITY: SABLE ISLAND BANK AND BANQUEREAU BANK

SURVEY LINE DATA - TOTAL NO. LINES:
 TOTAL LINE KM: 362 KM

GEOPHYSICAL EQUIPMENT

ECHO SOUNDER:
 SIDESCAN SONAR: KLEIN K-MAPS 100KHZ 3-CHANNEL
 MICROPROFILER:
 DEEPTOW PROFILING SYSTEM: HUNTEC DTS (BOOMER) WITH INTERNAL AND EXTERNAL
 HYDROPHONES
 SURFACE TOW PROFILING SYSTEM
 SOUND SOURCE: BOLT 40 CU. IN. AIRGUN
 RECEIVER: NSFR TAPERED STREAMER 20 FT. LENGTH
 SEISMIC REFRACTION
 SOUND SOURCE:
 RECEIVER:
 OTHER ACOUSTIC DEVICES
 SOUND SOURCE:
 RECEIVER:
 MAGNETIC TAPE RECORDINGS: HP 3968A 8 TRACK RECORDER FOR HUNTEC AND SIDESCAN DATA

SAMPLING EQUIPMENT

PHOTOGRAPHY: BRUTIV UNDERWATER TOWED VEHICLE; CONTINUOUS VIDEO RECORDING; STEREO
 PHOTOGRAPHS EVERY 10 SEC. WITH 2 EGERTON CAMERAS (STILL PHOTOGRAPHY)
 BOTTOM SAMPLES
 GRABS:
 CORES:
 BOX CORES:
 VIBRACORES:
 BOREHOLE: NOROCO AUGER DRILL
 OTHER:

NAVIGATION

POSITIONING SYSTEM: INTEGRATED ARGO/SATNAV; CUBIC WESTERN DATA DM54; BACK UP
 FROM MAGNAVOX 1107 SATNAV; INTERNAV LC404 (LORAN C); MOTOROLA MINIRANGER;
 POSITIONING PROVIDED BY MCELHANNEY ENGINEERING SERVICES LTD.
 FIX INTERVAL: 100 M
 AVAILABLE NAV. DATA: FIX POINT SUMMARY TABLE IN CRUISE REPORT; PAGE SIZE TRACK
 IN PREPARATION

INITIAL REPORTS: CRUISE REPORT IN BIO LIBRARY

COMMENTS: GEOPHYSICAL/GEOLOGICAL CRUISE WITH SEISMIC PROFILES; SIDESCAN SONAR;
 BOTTOM PHOTOGRAPHY AND MINOR BOTTOM SAMPLING

Example of a government cruise summary

THEBAUD K-93
8626-M3-6E

SURVEY I.D.: THEBAUD K-93
COGLA REFERENCE NO.: 8626-M3-6E
CLIENT: MOBIL OIL CANADA LTD.
PRIME CONTRACTOR: MCELHANNY SERVICES LTD.
SUB-CONTRACTOR: GEOMARINE ASSOCIATES LTD.
YEAR: 1988
SURVEY PERIOD: AUGUST 12 TO 24
VESSEL: POLARIS V
LOCALITY: SABLE ISLAND BANK; SCOTIAN SHELF

SURVEY LINE DATA - TOTAL NO. LINES:
TOTAL LINE KM:

GEOPHYSICAL EQUIPMENT

ECHO SOUNDER: ATLAS-DESO 10
SIDESCAN SONAR: ORE; 100KHZ
MICROPROFILER: ORE 1036 MICROPROFILER
DEEPTOW PROFILING SYSTEM:
SURFACE TOW PROFILING SYSTEM
SOUND SOURCE: EG&G 16/24 KJOULE SPARKER
RECEIVER: DFS IV RECORDER; 24 CHANNEL TELEDYNE STREAMER
SEISMIC REFRACTION
SOUND SOURCE:
RECEIVER:
OTHER ACOUSTIC DEVICES
SOUND SOURCE:
RECEIVER:
MAGNETIC TAPE RECORDINGS:

SAMPLING EQUIPMENT

PHOTOGRAPHY: OLYMPUS OM-1; 5 STATIONS - 82 USEABLE FRAMES
BOTTOM SAMPLES
GRABS: SHIPEK GRABS - 8 SAMPLES
CORES:
BOX CORES:
VIBRACORES:
BOREHOLE:
OTHER:

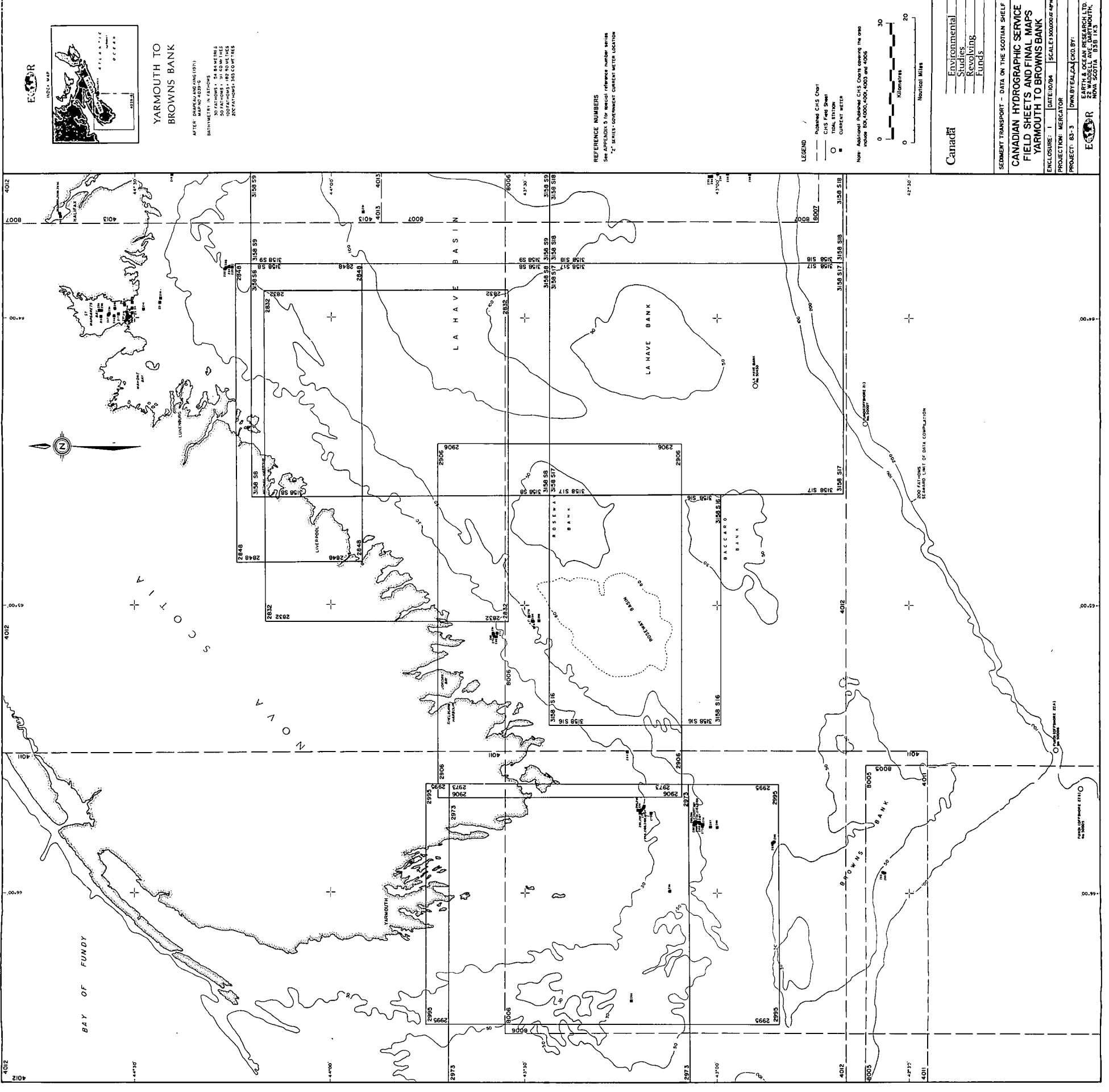
NAVIGATION

POSITIONING SYSTEM:ARGO/SAT NAV
FIX INTERVAL: 16.67 M
AVAILABLE NAV. DATA: PAGE SIZE TRACK; MAP ENCLOSURES; LIST OF SAMPLE LOCATIONS

INITIAL REPORTS: WELLSITE SURVEY REPORT

COMMENTS: WELLSITE SURVEY - GEOPHYSICAL/ENGINEERING HAZARDS

Example of an industry cruise summary



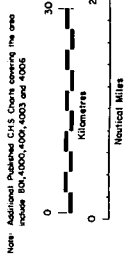
**YARMOUTH TO
BROWNS BANK**

MAP NO. 4225-5
 AFTER: CHAMBERLAND AND OTHERS (1971)
 BATHYMETRY IN METERS
 20 METERS - 1:10,000
 100 METERS - 1:20,000
 200 METERS - 1:40,000
 400 METERS - 1:80,000

REFERENCE NUMBERS
 See APPENDIX 5 for British reference number series
 * - SERIES-GOVERNMENT CURRENT METERS LOCATION

LEGEND

- Bathymetric Chart
- CHS Field Sheet
- TOTAL STATION
- CURRENT METERS

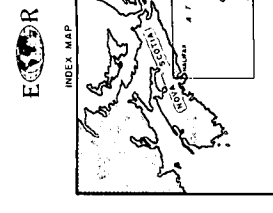
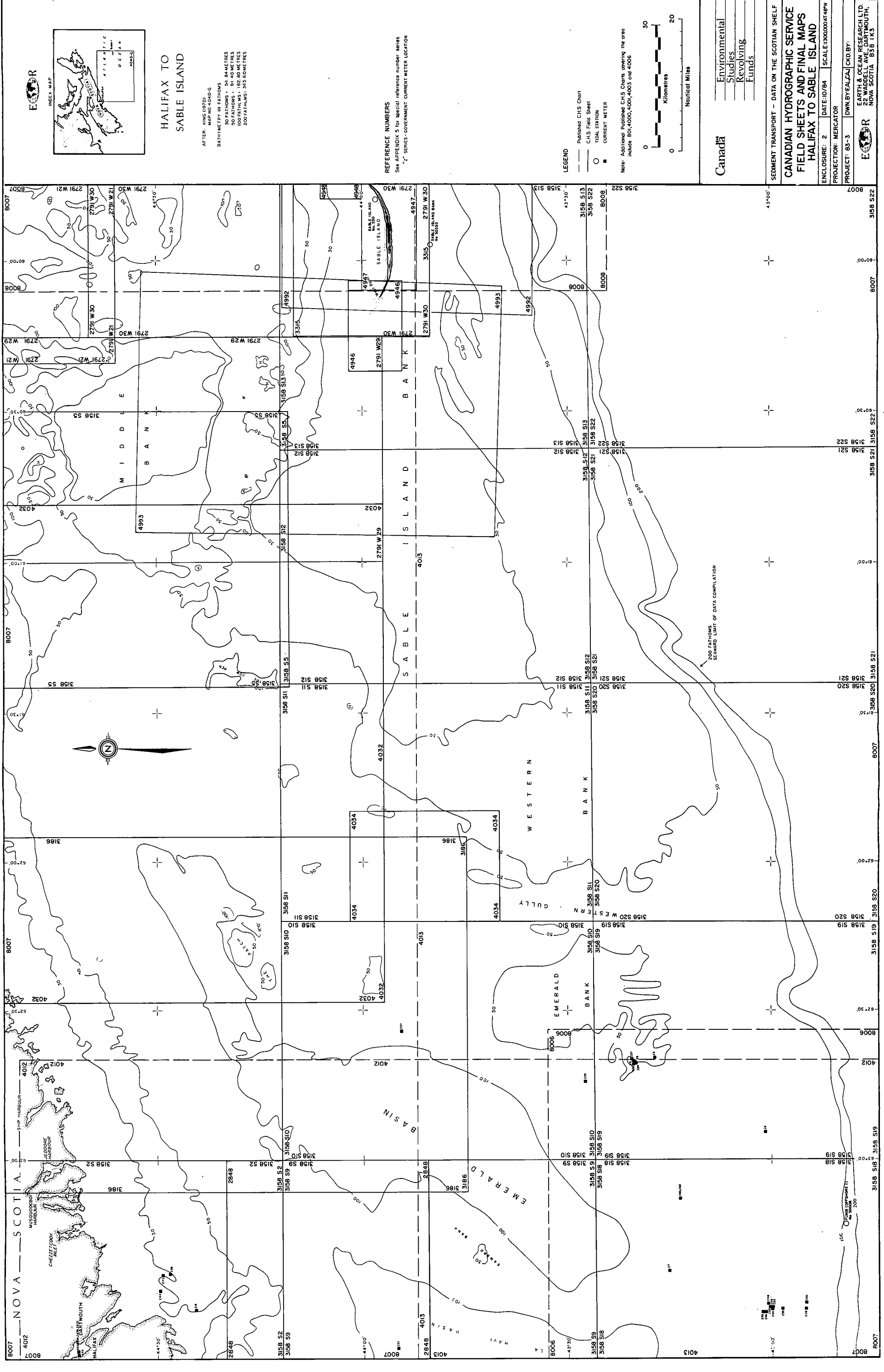


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SEDIMENT TRANSPORT - DATA ON THE SCOTIAN SHELF
 CANADIAN HYDROGRAPHIC SERVICE
 FIELD SHEETS AND FINAL MAPS
 YARMOUTH TO BROWNS BANK

ENCLOSURE: 1 DATE: 10/94 SCALE: 300000/475
 PROJECT: 83-3 PROJECT MANAGER: JMW/BTEALZ/EOJ/SY
 EASTMAN OCEAN RESEARCH LTD.
 22 WADDELL AVE. YARMOUTH, NS
 NOVA SCOTIA B5P 1Y3



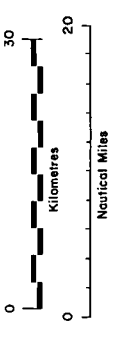
HALIFAX TO SABLE ISLAND

AFTER: KING (1970)
MAP NO. 4000-G
BATHYMETRY IN FATHOMS
30 FATHOMS - 54 METRES
50 FATHOMS - 91 METRES
100 FATHOMS - 183 METRES
200 FATHOMS - 365.8 METRES

REFERENCE NUMBERS
See APPENDIX 5 for special reference number series
"Z" SERIES - GOVERNMENT CURRENT METER LOCATION

LEGEND
Published CHS Chart
CHS Field Sheet
TIDAL STATION
CURRENT METER

Note: Additional Published CHS Charts covering the area include 801, 4000, 4001, 4003 and 4006

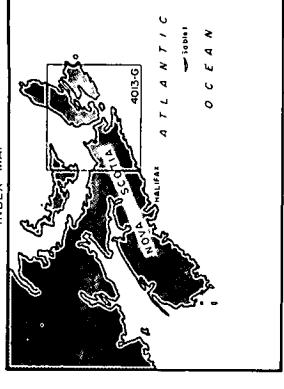


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SEDIMENT TRANSPORT - DATA ON THE SCOTIAN SHELF
CANADIAN HYDROGRAPHIC SERVICE
FIELD SHEETS AND FINAL MAPS
HALIFAX TO SABLE ISLAND
ENCLOSURE: 2 DATE: 10/84 SCALE: 1:300000 AT 48°N
PROJECTION: MERCATOR
PROJECT: 83-3 DWN BY: EALCAJ CKD BY:
EARTH & OCEAN RESEARCH LTD.
WAGBELL AVE. DARTMOUTH,
NOVA SCOTIA B5B 1K5



INDEX MAP



CANSO BANK AND ADJACENT AREAS

AFTER: MACLEAN, PATER AND KING (1977).
 MAP NO 4015-G
 BATHYMETRY IN FATHOMS
 30 FATHOMS = 54.84 METRES
 50 FATHOMS = 91.40 METRES
 100 FATHOMS = 182.80 METRES
 200 FATHOMS = 365.60 METRES

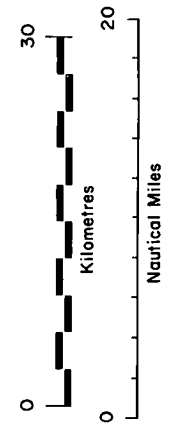
REFERENCE NUMBERS

See APPENDIX 5 for special reference number series
 "Z" SERIES - GOVERNMENT CURRENT METER LOCATION

LEGEND

- Published C.H.S. Chart
- C.H.S. Field Sheet
- CURRENT METER

Note: Additional Published C.H.S. Charts covering the area include 801,4000,4001,4003,4006 and 4013



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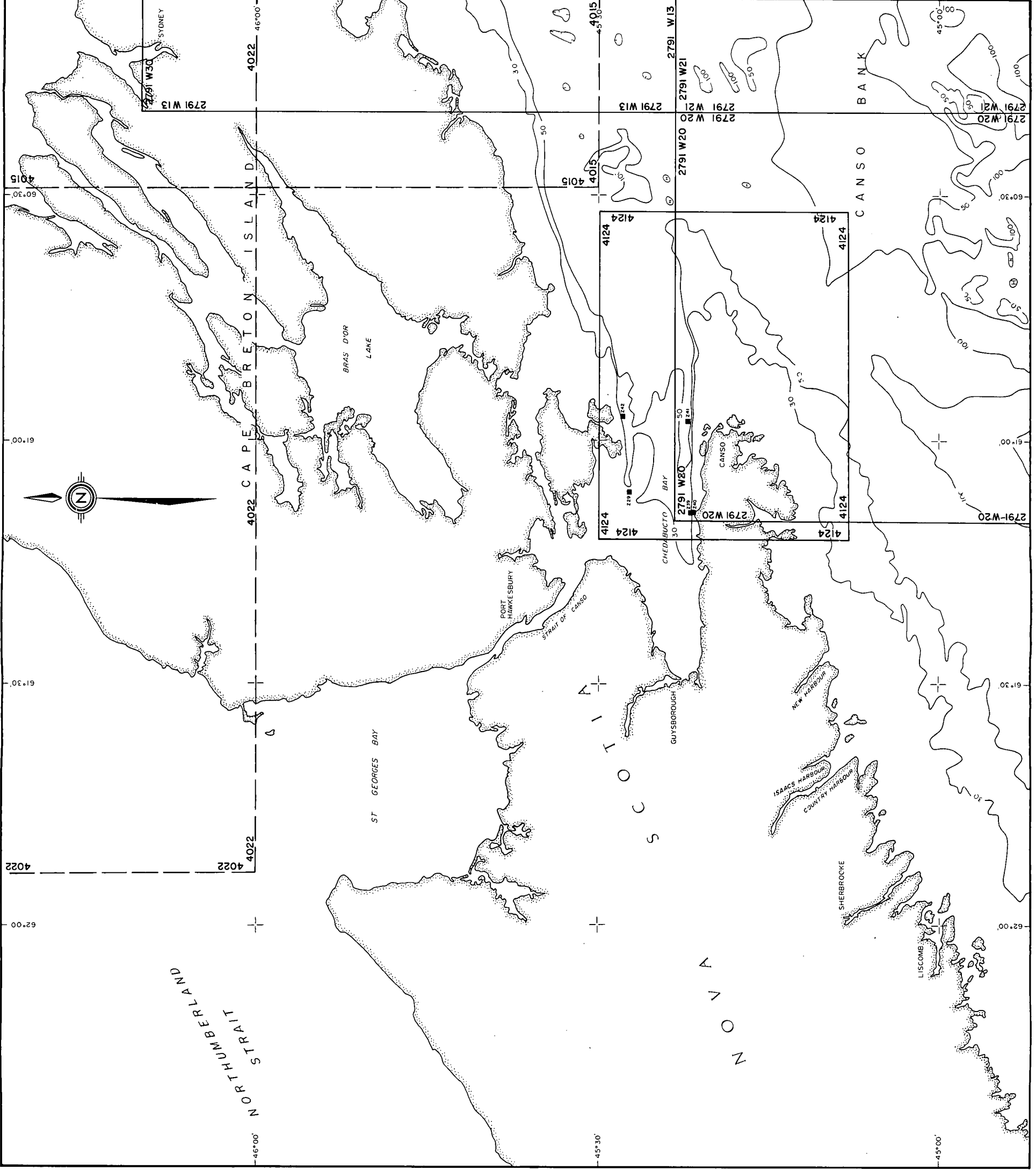
SEDIMENT TRANSPORT - DATA ON THE SCOTIAN SHELF

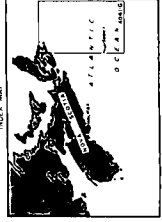
CANADIAN HYDROGRAPHIC SERVICE FIELD SHEETS AND FINAL MAPS CANSO BANK AND ADJACENT AREAS

ENCLOSURE: 3 DATE: 10/84 SCALE: 300,000 AT 48°N
 PROJECTION: MERCATOR
 PROJECT: 83-3 DWN BY: EAL, CAJ CKD BY:



EARTH & OCEAN RESEARCH LTD.
 22 WADDELL AVE., DARTMOUTH,
 NOVA SCOTIA B3B 1K3



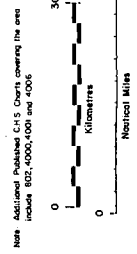


BANQUEREAU AND MISAINÉ BANK

AT 1:100 000 SCALE (1:500 000)
BY THE METRE IN FATHOMS
50 FATHOMS = 91.44 METRES
100 FATHOMS = 182.88 METRES
200 FATHOMS = 365.76 METRES

REFERENCE NUMBERS
See APPENDIX for special reference number series
1. SHEET IDENTIFICATION (CURRENT SHEET LOCATION)

LEGEND
--- Bathymetric Chart
--- CUS (Contour Interval)
○ TOTAL STATION
● CURRENT METER

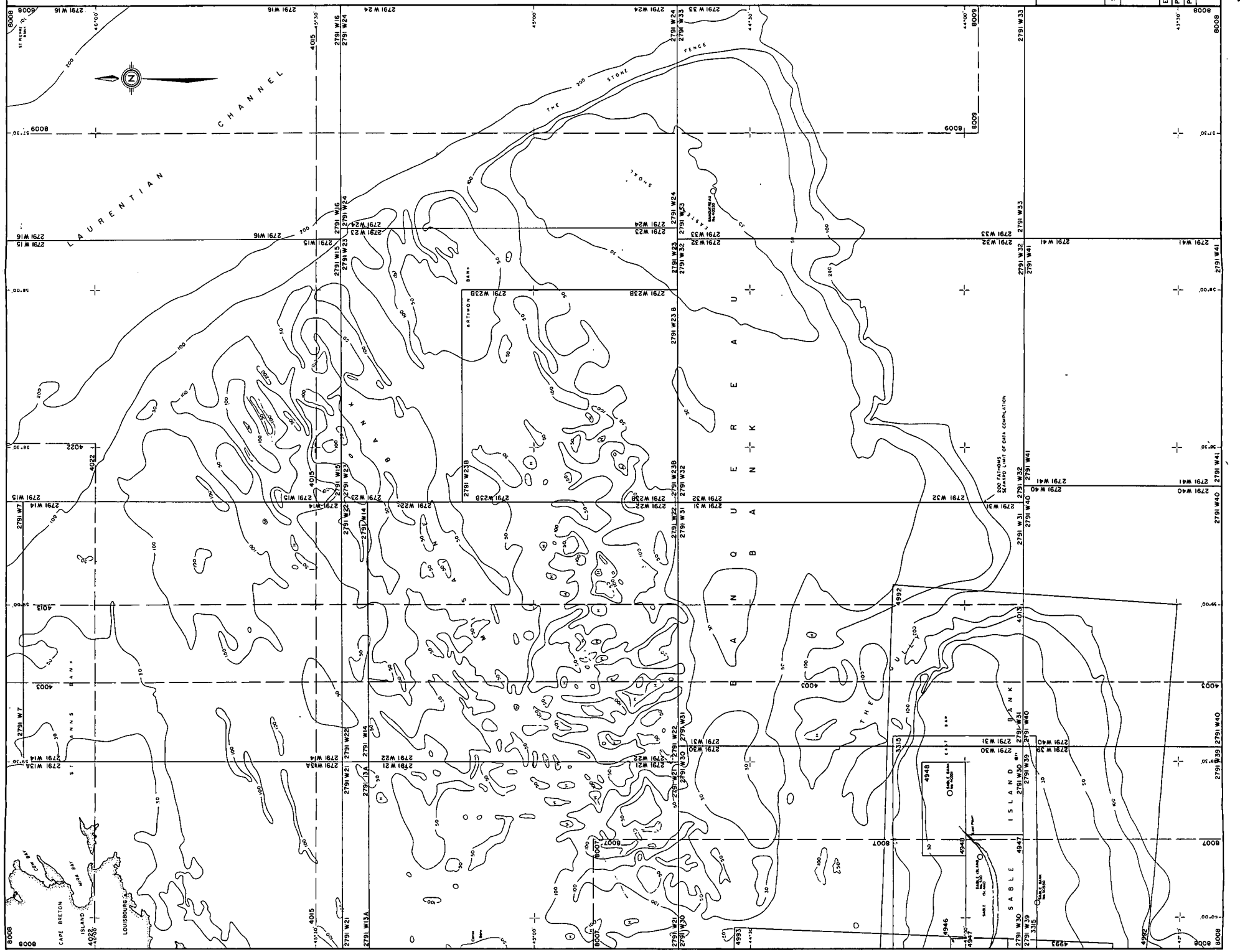


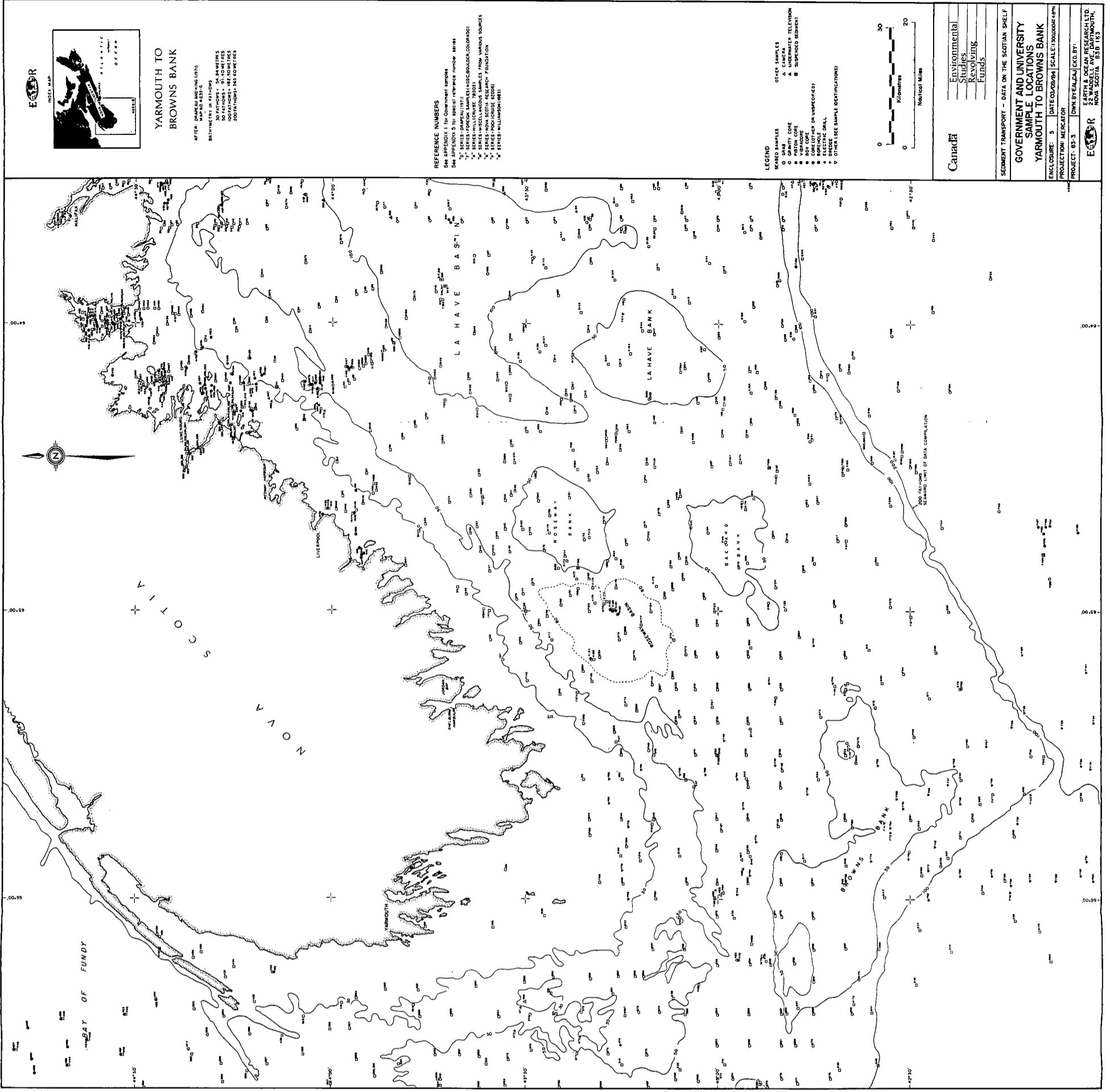
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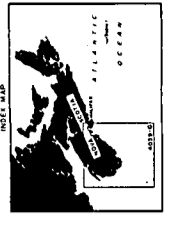
SEDIMENT TRANSPORT - DATA ON THE SCOTIAN SHELF
CANADIAN HYDROGRAPHIC SERVICE
FIELD SHEETS AND FINAL MAPS
BANQUEREAU AND MISAINÉ BANK

ENCLOSURE: 4 DATE: 10/84 SCALE: 1:500 000
PROJECTION: MERCATOR
PROJECT: 83-3 DRAWN BY: JAL/CLD BY:
ES&R OCEAN RESEARCH LTD.
22 WATSON ROAD
NOVA SCOTIA B1B 1K3





EGOR

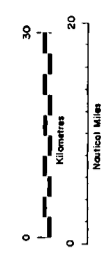


**YARMOUTH TO
BROWNS BANK**

APPROX. BATHYMETRIC MAP (1970)
MAP NO. 831-5
SCALE: 1:50,000
VERTICAL SCALE: 1:100,000
HORIZONTAL SCALE: 1:50,000

REFERENCE NUMBERS
See Appendix 1 for Government symbols
See Appendix 2 for special reference number series
1. SERIES - HULL (1963)
2. SERIES - POLAR (1963)
3. SERIES - POLAR (1963)
4. SERIES - POLAR (1963)
5. SERIES - POLAR (1963)
6. SERIES - POLAR (1963)
7. SERIES - POLAR (1963)
8. SERIES - POLAR (1963)
9. SERIES - POLAR (1963)
10. SERIES - POLAR (1963)

LEGEND
SOUND SAMPLES
O SHALLOWS
A UNDERWATER TELEVISION
B SUSPENDED SEDIMENT
C PISTON CORE
D BOX CORE
E CORE (OTHER OR UNSPECIFIED)
F ELECTRIC MULL
G OTHER (SEE SAMPLE DESCRIPTIONS)
OTHER SAMPLES
H OTHER (SEE SAMPLE DESCRIPTIONS)



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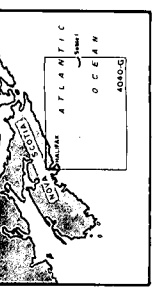
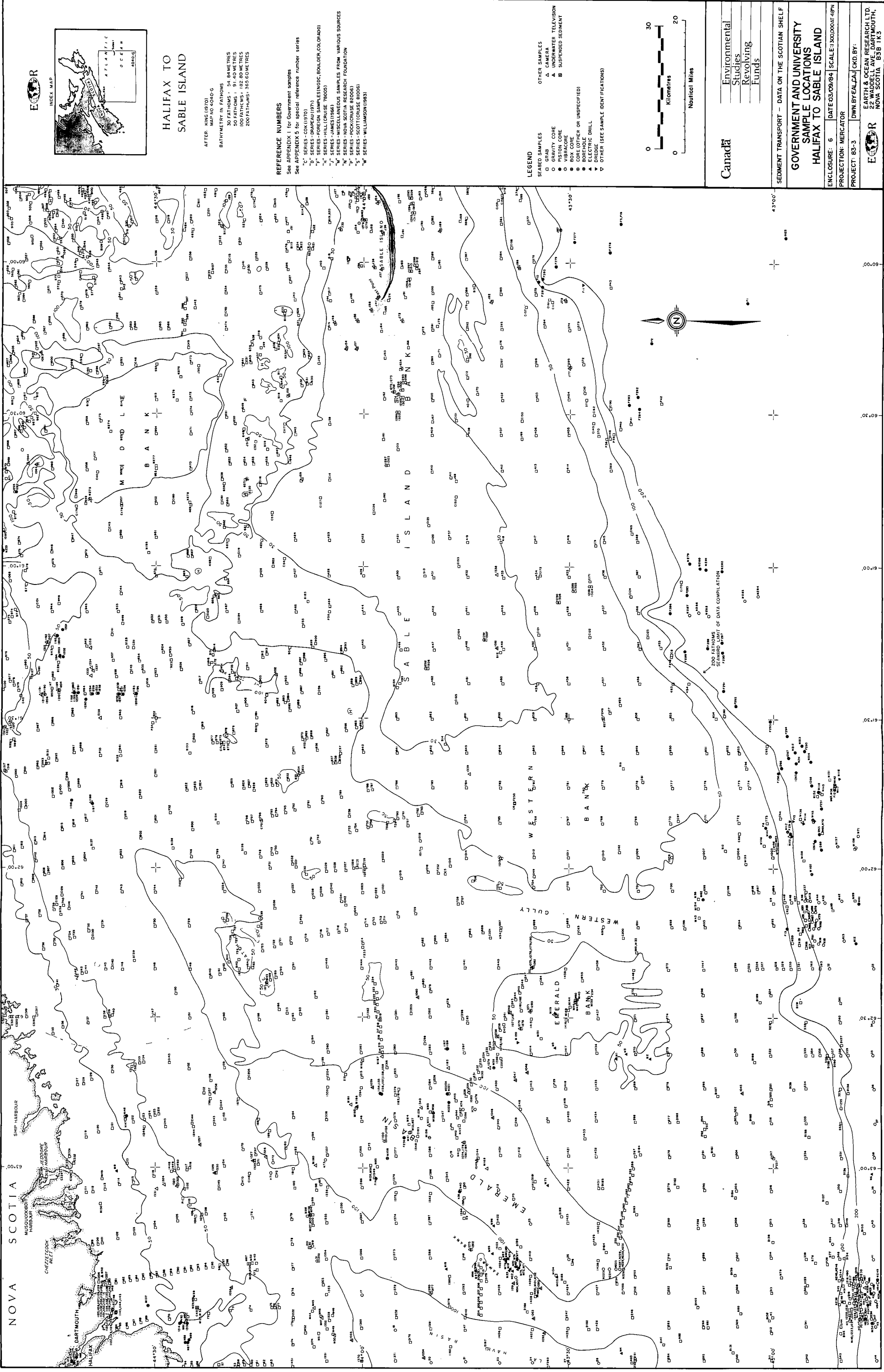
SEDIMENT TRANSPORT - DATA ON THE SCOTIAN SHELF

GOVERNMENT AND UNIVERSITY
SAMPLE LOCATIONS
YARMOUTH TO BROWNS BANK

ENCLOSURE: 5 | DATE: 02/08/94 | SCALE: 1:50,000 (1970)

PROJECT: 83-3 | DOWN BY: EALZ/COG BY: EALZ/COG

EGOR EASTMAN RESEARCH LTD. 22 WADDELL AVE. DARTMOUTH, NOVA SCOTIA B3B 1K3



HALIFAX TO SABLE ISLAND

AFTER KING (1970)
 MAP NO 6040-G
 BATHYMETRY IN FATHOMS
 50 FATHOMS - 91.40 METRES
 100 FATHOMS - 182.80 METRES
 200 FATHOMS - 365.60 METRES

REFERENCE NUMBERS

See APPENDIX I for Government samples
 See APPENDIX 5 for special reference number series

- "C" SERIES - COX (1970)
- "D" SERIES - FOREIGN SAMPLES (INGOC, BOULDER, COLORADO)
- "F" SERIES - BRADY (1971)
- "H" SERIES - HULL (CRUISE 78005)
- "J" SERIES - JAMES (1966)
- "M" SERIES - MISCELLANEOUS SAMPLES FROM VARIOUS SOURCES
- "N" SERIES - NOVA SCOTIA RESEARCH FOUNDATION
- "S" SERIES - SCOTT (CRUISE 8005)
- "W" SERIES - WILLIAMSON (1983)

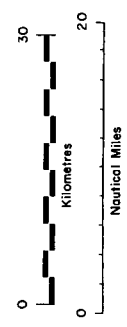
LEGEND

SEARED SAMPLES

- GRAB
- GRAVITY CORE
- VIBRACORE
- CORE (OTHER OR UNSPECIFIED)
- BOREHOLE
- ▲ ELECTRIC DRILL
- ▼ DREDGE
- ▽ OTHER (SEE SAMPLE IDENTIFICATIONS)

OTHER SAMPLES

- ▲ CAMERA
- ▲ UNDERWATER TELEVISION
- SUSPENDED SEDIMENT

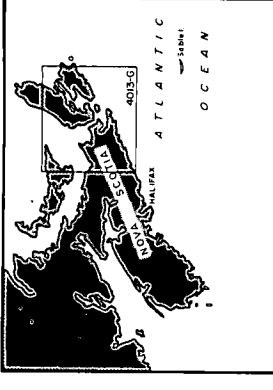


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SEDIMENT TRANSPORT - DATA ON THE SCOTIAN SHELF
**GOVERNMENT AND UNIVERSITY
 SAMPLE LOCATIONS
 HALIFAX TO SABLE ISLAND**
 ENCLOSURE: 6 | DATE: 03/09/84 | SCALE: 1:300,000 (48N)
 PROJECTION: MERCATOR
 PROJECT: 83-3 | DWN BY: EALJ | CKD BY:
 EARTH & OCEAN RESEARCH LTD.
 22 WADDELL AVE. DARTMOUTH,
 NOVA SCOTIA B5B 1K3



INDEX MAP



CANSO BANK AND ADJACENT AREAS

AFTER: MacLEAN, FADER AND KING (1977).
 MAP NO. 4013-G

BATHYMETRY IN FATHOMS
 30 FATHOMS = 54.84 METRES
 50 FATHOMS = 91.40 METRES
 100 FATHOMS = 182.80 METRES
 200 FATHOMS = 365.60 METRES

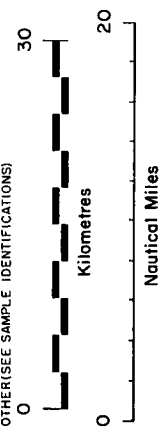
REFERENCE NUMBERS

SEE APPENDIX 1 for Government samples
 SEE APPENDIX 5 for special reference number series

"C" SERIES - COK (1970)
 "J" SERIES - JAMES (1966)
 "M" SERIES - MISCELLANEOUS SAMPLES FROM VARIOUS SOURCES
 "N" SERIES - NOVA SCOTIA RESEARCH FOUNDATION
 "S" SERIES - SCOTTI CRUISE (81006)
 "W" SERIES - WILLIAMSON (1983)

LEGEND

- SEABED SAMPLES**
- GRAB
 - GRAVITY CORE
 - PISTON CORE
 - ⊙ VIBRACORE
 - ⊗ BOX CORE
 - ⊕ CORE (OTHER OR UNSPECIFIED)
 - ⊖ BOREHOLE
 - ▲ ELECTRIC DRILL
 - ▼ DREDGE
 - ▽ OTHER (SEE SAMPLE IDENTIFICATIONS)
- OTHER SAMPLES**
- △ CAMERA
 - ▲ UNDERWATER TELEVISION
 - ⊗ SUSPENDED SEDIMENT



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SEDIMENT TRANSPORT - DATA ON THE SCOTIAN SHELF

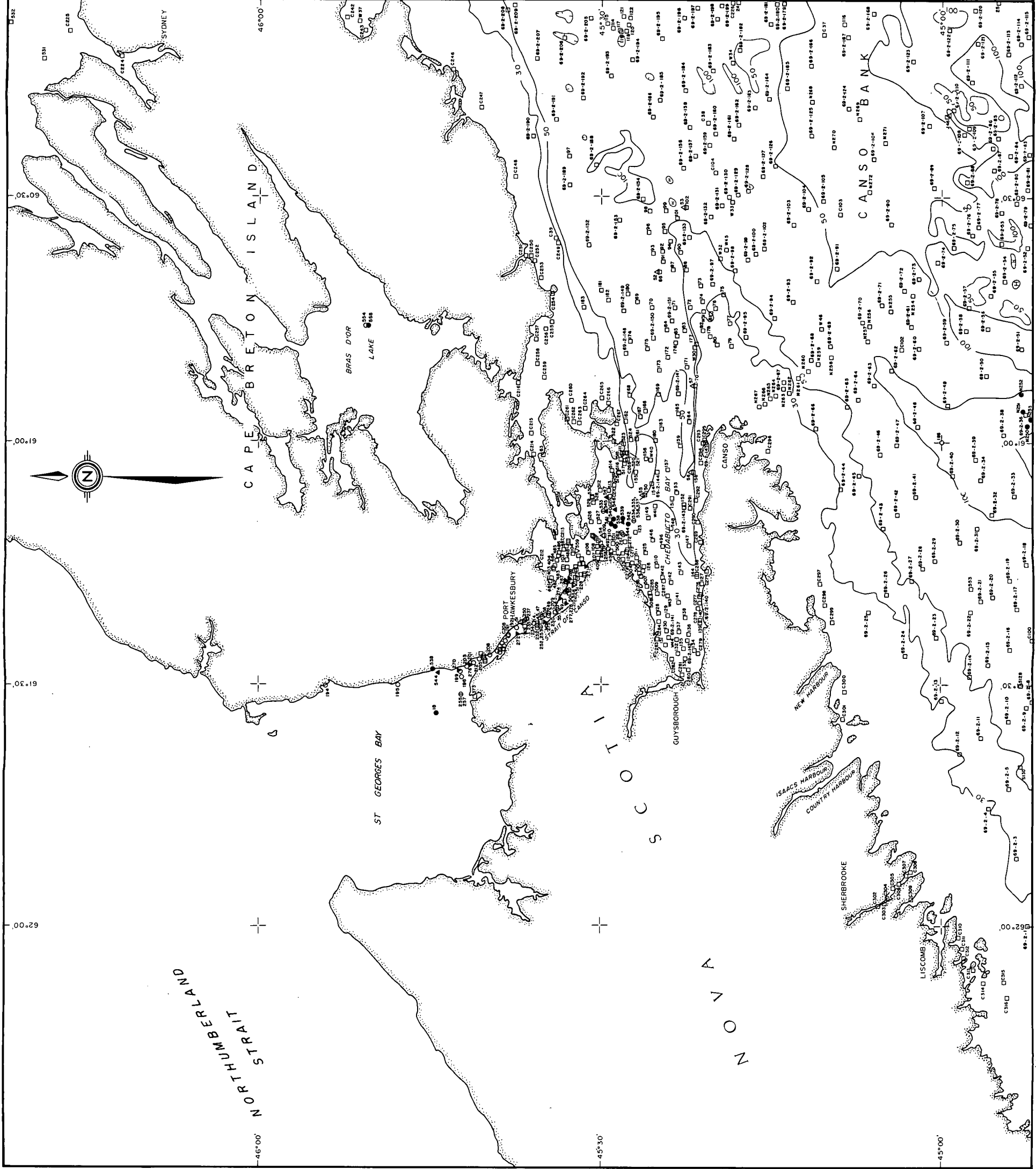
GOVERNMENT AND UNIVERSITY
 SAMPLE LOCATIONS

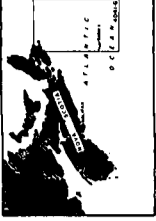
CANSO BANK AND ADJACENT AREAS

ENCLOSURE: 7 DATE 03/09/84 SCALE: 1:300,000 AT 48°N
 PROJECTION: MERCATOR
 PROJECT: 83-3 DWN BY: EAL/CAJ CKD BY:



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 22 WADDELL AVE. DARTMOUTH,
 NOVA SCOTIA B5B 1K3





BANQUEREAU AND MISAINÉ BANK

DATE: 1983-08-04
SCALE: 1:50,000
PROJECT: E3-3
DRAWN BY: JAL/CDJ

REFERENCE NUMBERS
See Appendix 1 for Government numbers
See Appendix 5 for special reference number series
* SERIES - CORE (1980)
* SERIES - MISCELLANEOUS (1980-1982)
* SERIES - MISCELLANEOUS (1983-1984)
* SERIES - MISCELLANEOUS (1985-1986)
* SERIES - MISCELLANEOUS (1987-1988)
* SERIES - MISCELLANEOUS (1989-1990)
* SERIES - MISCELLANEOUS (1991-1992)

LEGEND
SEATED SAMPLES
O SAND
O GRAVEL
O SANDY SILT
O SILTY SAND
O SILTY CLAY
O CLAY
O SILTY CLAY (UNSPECIFIED)
O SANDY SILT (UNSPECIFIED)
O SILTY SAND (UNSPECIFIED)
O SILTY CLAY (UNSPECIFIED)
O CLAY (UNSPECIFIED)
O OTHER (SEE SAMPLE IDENTIFICATION)



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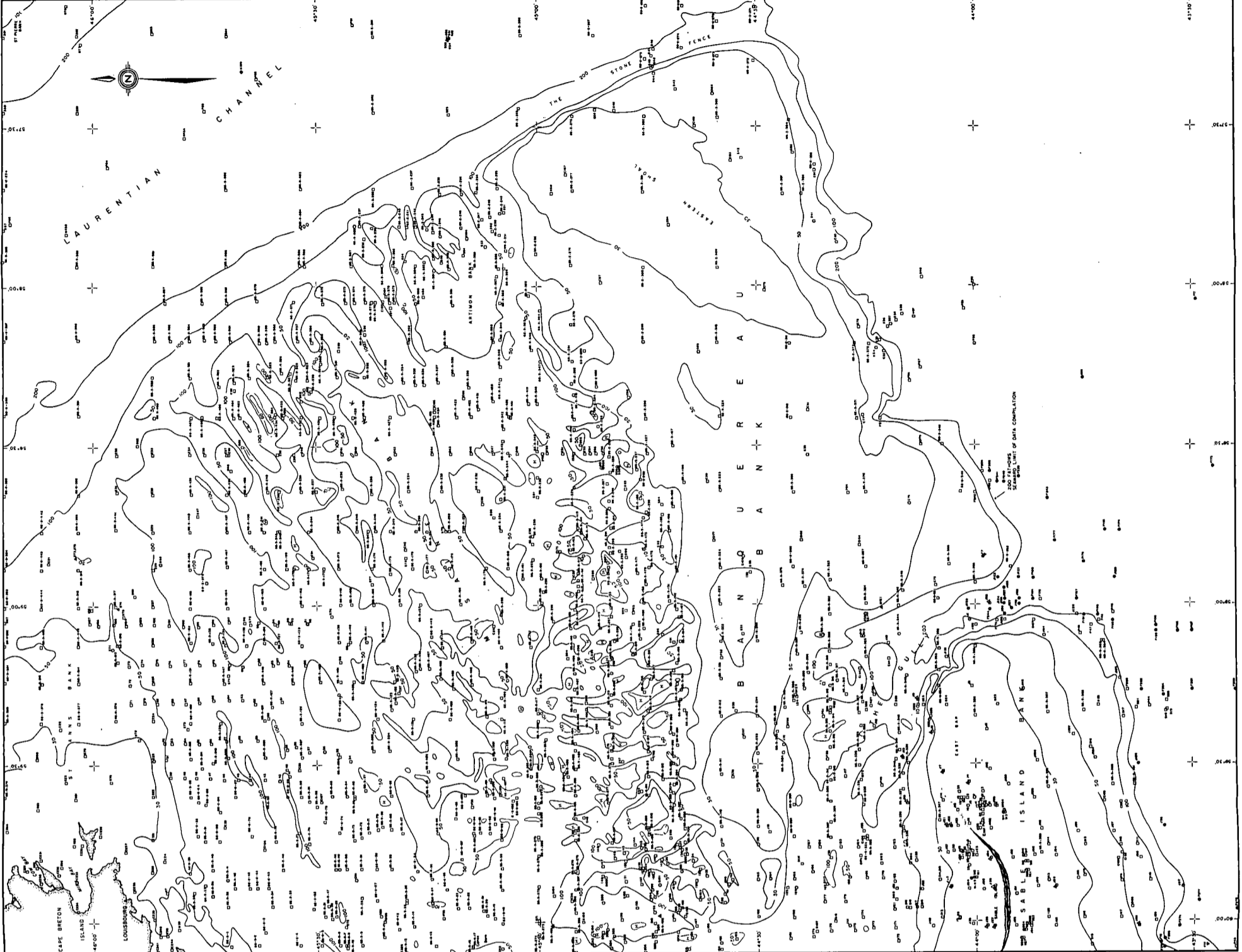
SEIZURE TRANSPORT - DATA ON THE SCOTTIAN SHELF

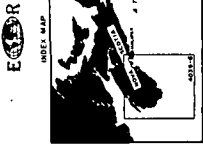
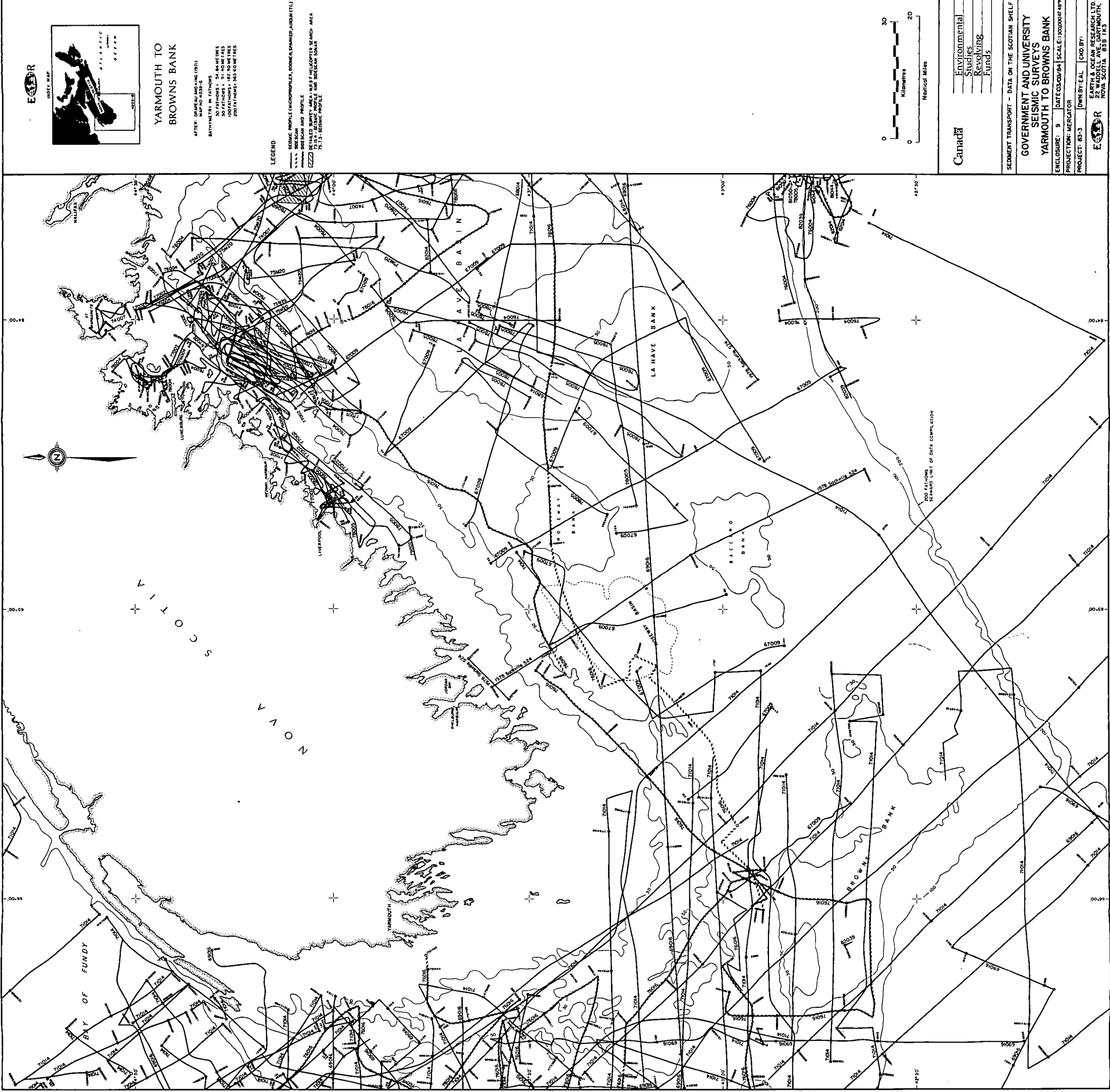
GOVERNMENT AND UNIVERSITY SAMPLE LOCATIONS BANQUEREAU AND MISAINÉ BANK

ENCLOSURE: B DATE: 1983-08-04 SCALE: 1:50,000

PROJECT: E3-3 DRAWN BY: JAL/CDJ

ECOR EARTH & OCEAN RESEARCH LTD. 1000 AVENUE WINDERMERE, NEW SCOTIA, B3B 1Y3

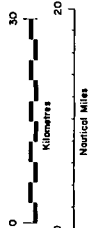




**YARMOUTH TO
BROWNS BANK**

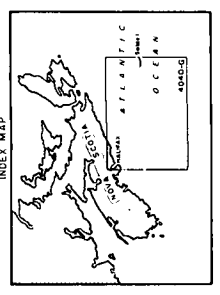
DATE: 1977
 AFTER: 1:50000 (1977)
 BATHYMETRY IN FATHOMS
 50 FATHOMS - 54 METRES
 100 FATHOMS - 113 METRES
 200 FATHOMS - 183 METRES
 300 FATHOMS - 274 METRES

LEGEND
 DEPTH CONTOUR (METRES, FATHOMS, UNITS)
 SURVEY LINE
 BREAK AND PROFILE
 BATHYMETRIC DATA
 1:50000 BATHYMETRIC DATA
 1:50000 BATHYMETRIC DATA
 1:50000 BATHYMETRIC DATA



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SEDIMENT TRANSPORT - DATA ON THE SCOTIAN SHELF
 GOVERNMENT AND UNIVERSITY
 SEISMIC SURVEYS
 YARMOUTH TO BROWNS BANK
 ENCLOSURE: 9 DATE: 03/09/84 SCALE: 1:500000
 PROJECTION: MERCATOR
 PROJECT: 85-3
 DRAWN BY: EAL
 CHECK BY: EOR
 EARTH & OCEAN RESEARCH LTD.
 1000 UNIVERSITY AVENUE
 YARMOUTH, N.S. B1B 1A1



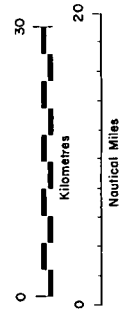
HALIFAX TO SABLE ISLAND

AFTER KING (1970)
 MAPIC 4600-G
 BATHYMETRY IN FATHOMS
 30 FATHOMS - 54 BATHYMETRES
 50 FATHOMS - 91 40 METRES
 100 FATHOMS - 182 80 METRES
 200 FATHOMS - 365 60 METRES

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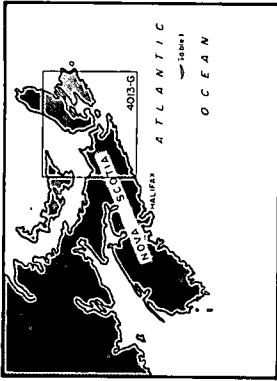
SEDIMENT TRANSPORT - DATA ON THE SCOTIAN SHELF
**GOVERNMENT AND UNIVERSITY
 SEISMIC SURVEYS
 HALIFAX TO SABLE ISLAND**
 ENCLOSURE: 10 DATE: 03/09/84 SCALE: 1:500,000 @ 49N
 PROJECTION: MERCATOR
 PROJECT: 83-3 DWN BY: EAL CRD BY:
 EOR
 EARTH & OCEAN RESEARCH LTD.
 22 WADDELL AVE., DARTMOUTH,
 NOVA SCOTIA B3B 1K3

- LEGEND**
- SEISMIC PROFILE (MICROPROFILE, BOOMER, SPARKER, ARGON ET C)
 - - - SIDESCAN AND PROFILE
 - SEISMIC REFRACTION
 - SEISMIC REFRACTION AND PROFILE
 - 2 SEISMIC REFRACTION SITE - N.R.S.F. QUEST 1980
 - ▨ DETAILED SURVEY AREA - N.R.S.F. HELICOPTER SEARCH AREA
73.5.4 - SEISMIC PROFILE AND SIDESCAN SONAR
73.7.3 - SEISMIC PROFILE
 - ▨ DETAILED SURVEY AREA
75007 - SEISMIC PROFILE AND SIDESCAN SONAR





INDEX MAP

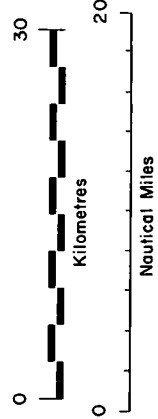


CANSO BANK AND ADJACENT AREAS

AFTER: MACLEAN, FADER AND KING (1977).
MAP NO 4013-G
BATHYMETRY IN FATHOMS
30 FATHOMS : 54.84 METRES
50 FATHOMS : 91.40 METRES
100 FATHOMS : 182.80 METRES
200 FATHOMS : 365.60 METRES

LEGEND

- SEISMIC PROFILE (MICROPROFILER, BOOMER, SPARKER, AIRGUN ETC.)
- - - SIDESCAN
- - - SIDESCAN AND PROFILE
- SEISMIC REFRACTION



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SEDIMENT TRANSPORT - DATA ON THE SCOTIAN SHELF

GOVERNMENT AND UNIVERSITY SEISMIC SURVEYS

CANSO BANK AND ADJACENT AREAS

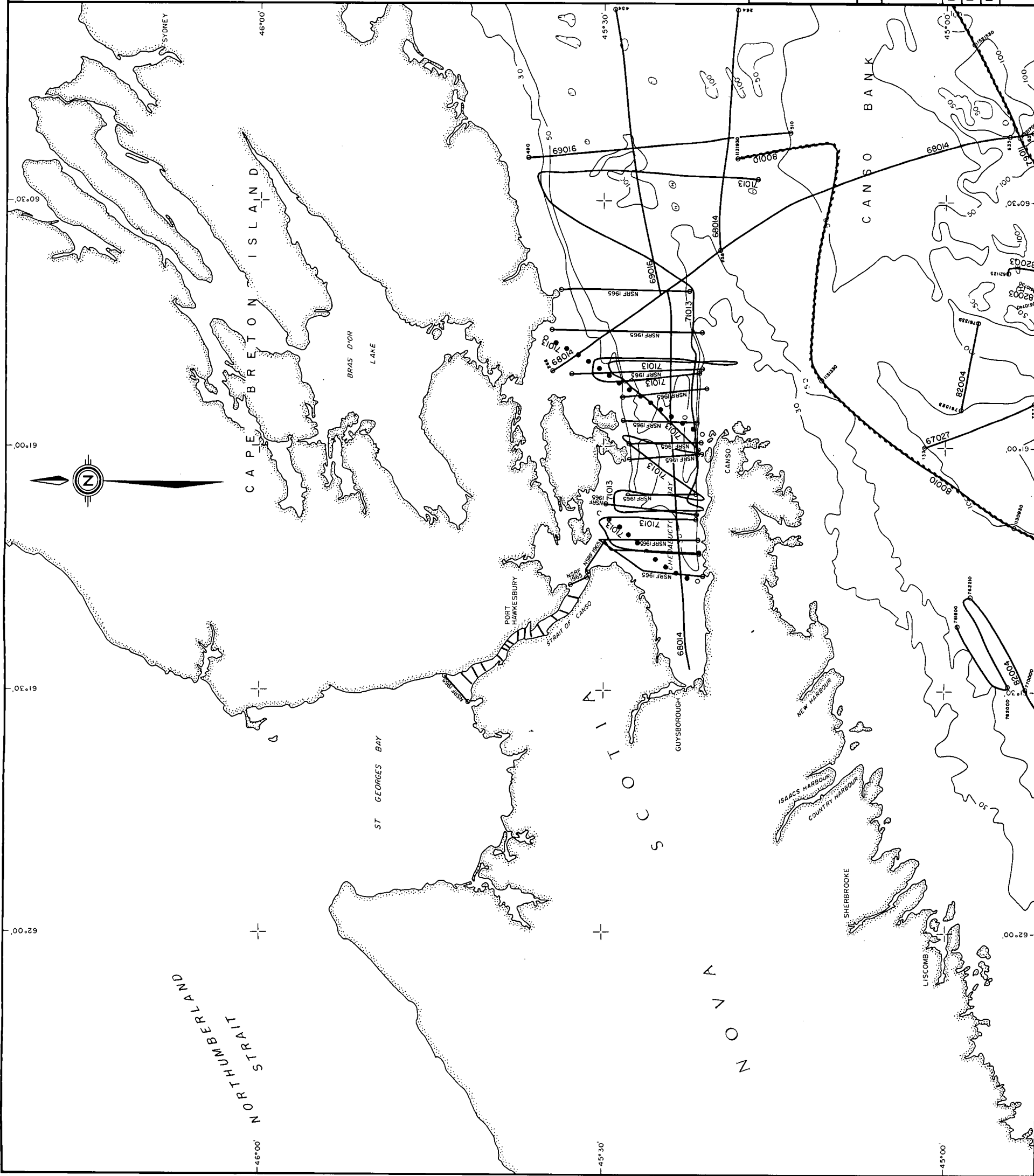
ENCLOSURE: 11 DATE: 03/09/84 SCALE: 1:300,000 AT 48°N

PROJECTION: MERCATOR

PROJECT: 83-3 DWN BY: EAL CKD BY:



EARTH & OCEAN RESEARCH LTD.
22 WADDELL AVE., DARTMOUTH,
NOVA SCOTIA B5B 1K3



E.S.R.

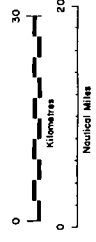


BANQUEREAU AND MISAINÉ BANK

AFTER: MASON AND HODGKIN (1971)
MAP NO. 2046
SYMBOLS IN PARENTHESES
IN METRES
SYMBOLS IN BRACKETS
IN METRES
SYMBOLS IN SQUARES
IN METRES

LEGEND

SEISMIC PROFILE (UNCONTOURED, NUMBER, NUMBER, NUMBER, NUMBER ETC.)
SEISMIC SECTION AND PROFILE



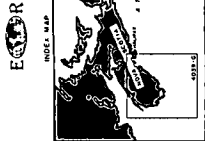
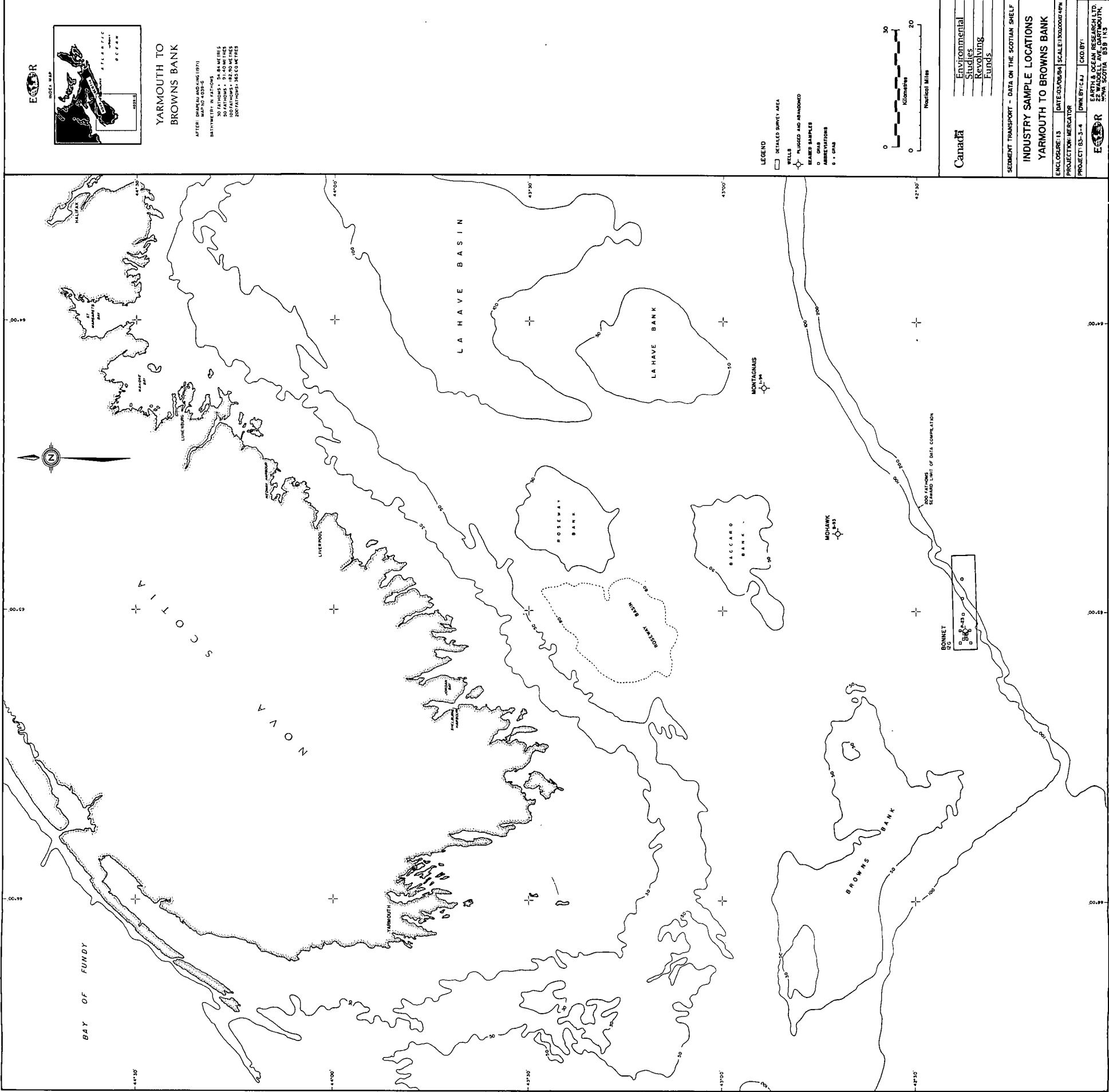
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SEDIMENT TRANSPORT - DATA ON THE SCOTIAN SHELF
GOVERNMENT AND UNIVERSITY
SEISMIC SURVEYS
BANQUEREAU AND MISAINÉ BANK

ENCLOSURE 12 DATE 03/09/84 SCALE 1:500000
PROJECT: BB-3 DRAWN BY: JAL CAD BY: JAL
E.S.R. RESEARCH LTD.
55 WILSON AVENUE
NOVA SCOTIA B3B 1Y3



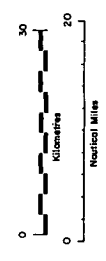


**YARMOUTH TO
BROWNS BANK**

APRIL 1997
 AFTER: GRAPHER AND KING (1977)
 BATHYMETRY: 1:50,000
 50 FATHOMS - 54.84 METRES
 100 FATHOMS - 182.88 METRES
 200 FATHOMS - 365.76 METRES

LEGEND

- DETAILED SURVEY AREA
- OMS
- OMS
- PLUMED AND ANTIPOD
- PLUMED SAMPLES
- OMS
- ABBREVIATIONS
- OMS



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SEDIMENT TRANSPORT - DATA ON THE SCOTIAN SHELF

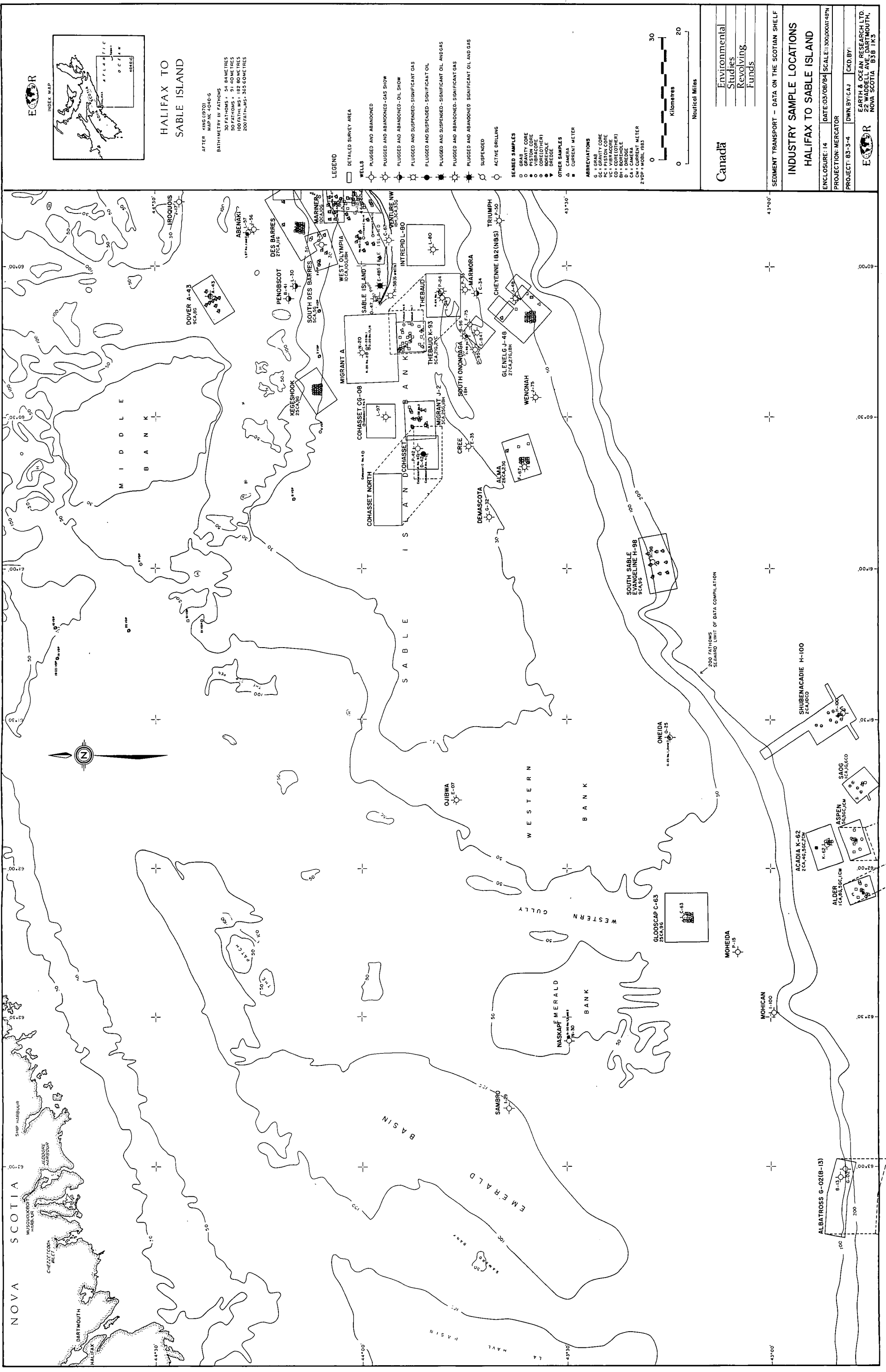
INDUSTRY SAMPLE LOCATIONS

YARMOUTH TO BROWNS BANK

ENCLOSURE 13 | DATE: 02/08/98 | SCALE: 1:50,000 (APP)

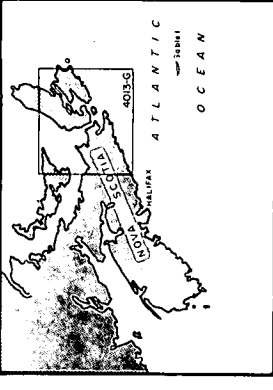
PROJECTION: MERCATOR | DRAWN BY: C.J.A. | CHECKED BY: C.J.A.

PROJECT: 85-3-4 | EARTH & OCEAN RESEARCH LTD. | 1000 UNIVERSITY AVENUE | YARMOUTH, NS B1S 1L3





INDEX MAP



CANSO BANK AND ADJACENT AREAS

AFTER: MacLEAN, FADER AND KING (1977).
MAP NO. 4013-G

BATHYMETRY IN FATHOMS

- 30 FATHOMS = 54.84 METRES
- 50 FATHOMS = 91.40 METRES
- 100 FATHOMS = 182.80 METRES
- 200 FATHOMS = 365.60 METRES

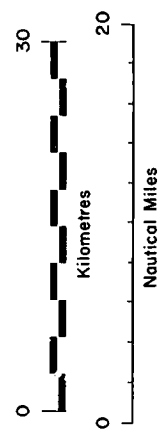
LEGEND

SEABED SAMPLES

- GRAB
- VIBRACORE

ABBREVIATIONS

2 VDP MOBIL 1983



Canada

- Environmental Studies
- Revolving Funds

SEDIMENT TRANSPORT - DATA ON THE SCOTIAN SHELF

INDUSTRY SAMPLE LOCATIONS

CANSO BANK AND ADJACENT AREAS

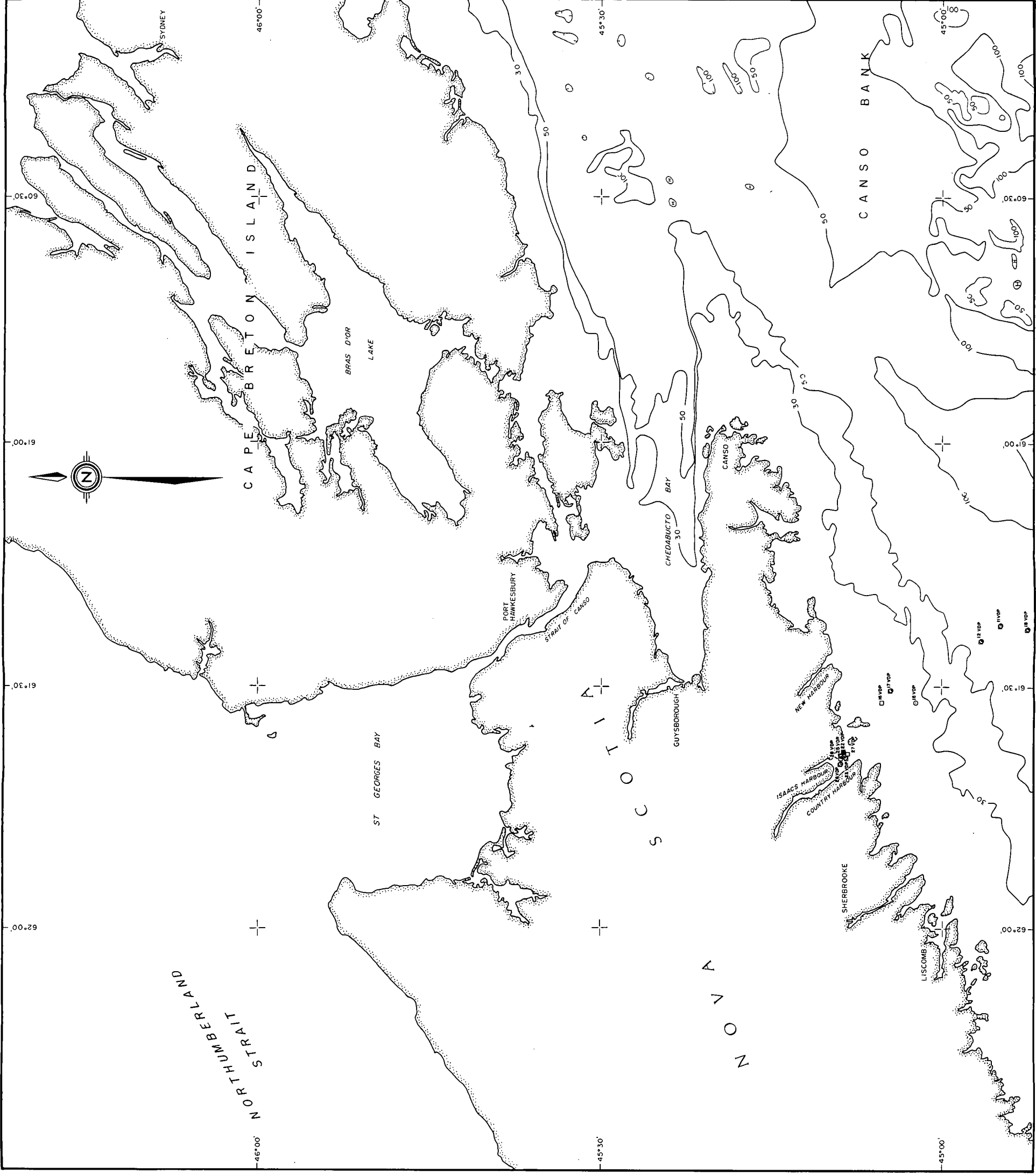
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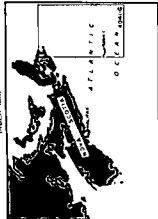
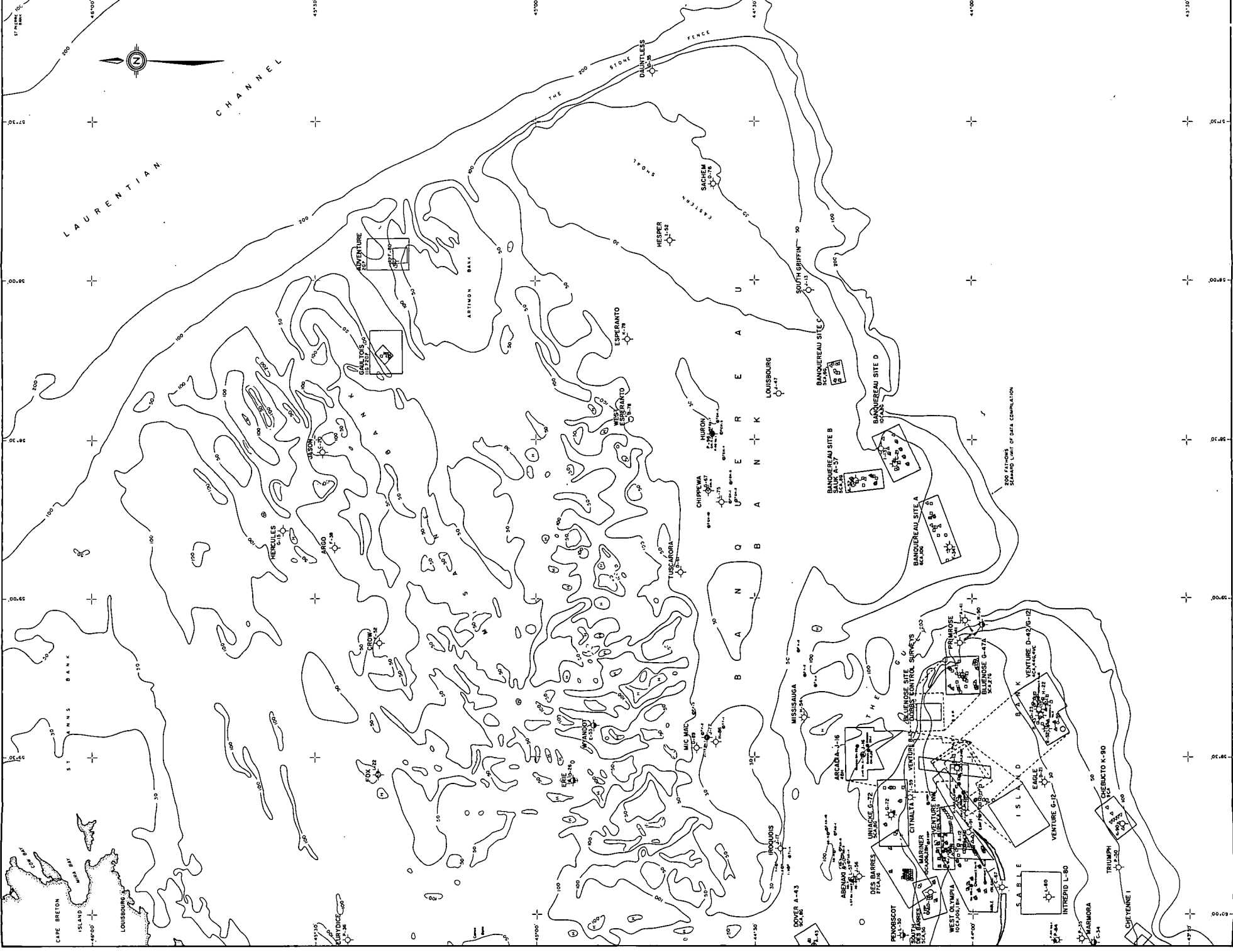
PROJECTION: MERCATOR

PROJECT: 83-3-4 DWN BY: CAJ CKD BY:



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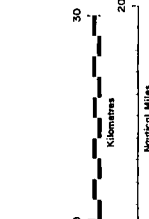


BANQUEREAU AND MISAINÉ BANK

ALTER: MSLAN AND KING (1971)
MAP NO 5041 G

BATHYMETRY - IN FATHOMS
50 FATHOMS - 180 METRES
100 FATHOMS - 370 METRES
200 FATHOMS - 730 METRES
300 FATHOMS - 1100 METRES

- LEGEND**
- DETAILED SURVEY AREA
 - WELLS
 - PLUGGED AND ABANDONED
 - PLUGGED AND ABANDONED - GAS SHOW
 - PLUGGED AND ABANDONED - OIL SHOW
 - PLUGGED AND SUSPENDED - SIGNIFICANT GAS
 - PLUGGED AND SUSPENDED - SIGNIFICANT OIL
 - PLUGGED AND SUSPENDED - SIGNIFICANT GAS AND OIL
 - PLUGGED AND ABANDONED - SIGNIFICANT GAS AND OIL
 - SUSPENDED
 - ACTIVE DRILLING
- SEISMIC SAMPLES**
- GRAVITY CORE
 - HYDROLOGICAL
 - DIAPHRAGM
 - DIAPHRAGM (1)
 - DIAPHRAGM (2)
 - DIAPHRAGM (3)
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 - DIAPHRAGM (100)



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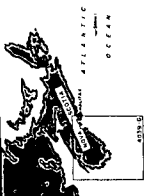
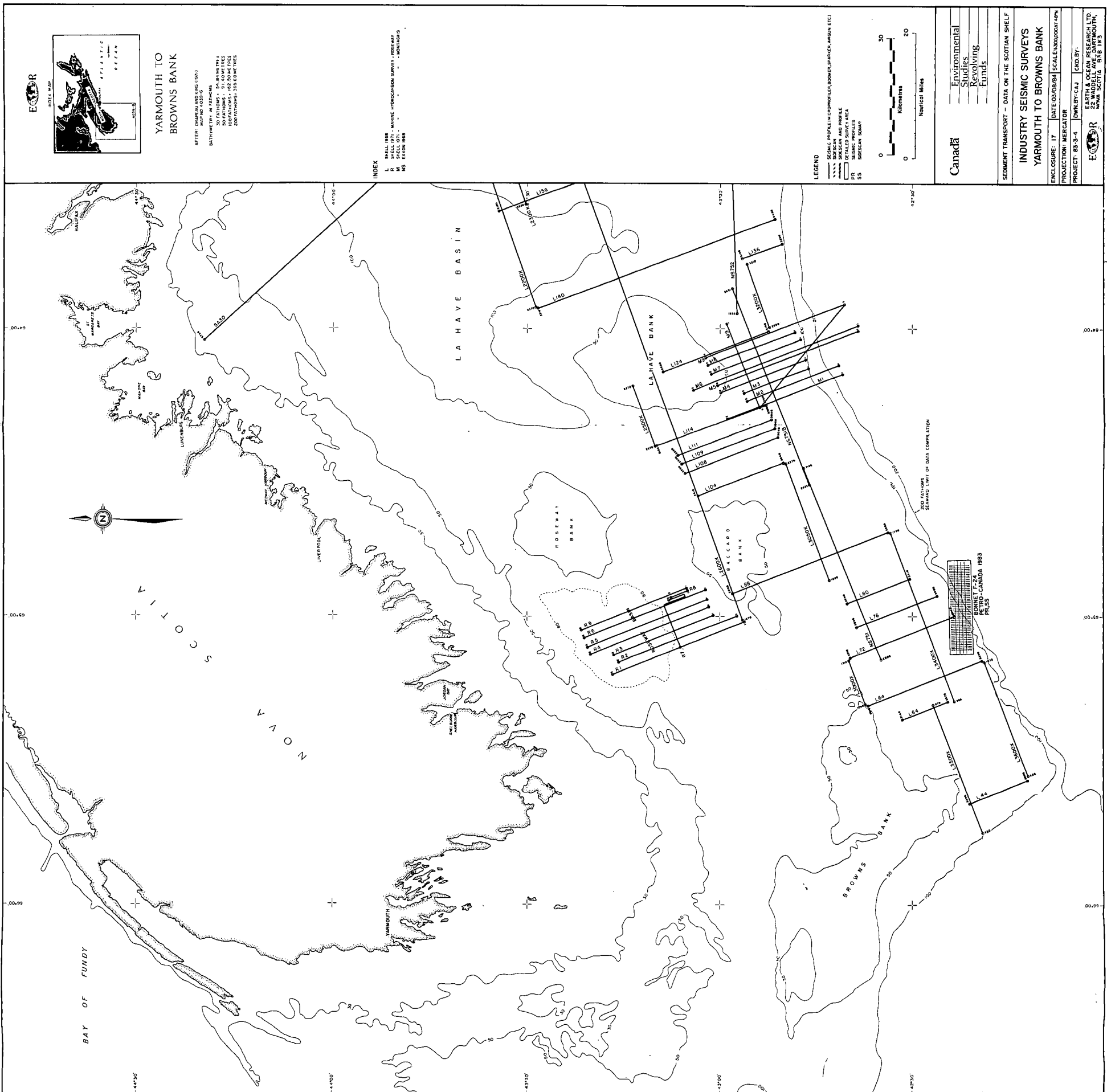
INDUSTRY SAMPLE LOCATIONS
BANQUEREAU AND MISAINÉ BANK

ENCLOSURE 16 DATE: 03/08/84 SCALE: 1:50,000 (4:1)

PROJECT: 83-3-4 DRAWN BY: CAJ CRO BY: J

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SEDIMENT TRANSPORT - DATA ON THE SCOTIAN SHELF



YARMOUTH TO BROWNS BANK

AFTER CHANGING (1997)
 MAPPING (1995)

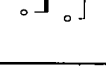
BATHYMETRY IN METERS
 50 METERS - 10 METERS
 100 METERS - 20 METERS
 200 METERS - 30 METERS

INDEX

- L SHELL FEE
- M SHELL FEE
- N SHELL FEE
- MS SHELL FEE

LEGEND

- SEISMIC PROFILE (INCLINOMETER, BENTONITE, JARVIS, JARVIS ETC)
- SEISMIC AND PROFILE
- SEISMIC SURVEY LINE
- SEISMIC SURVEY AREA
- SEISMIC SURVEY
- SEISMIC SURVEY

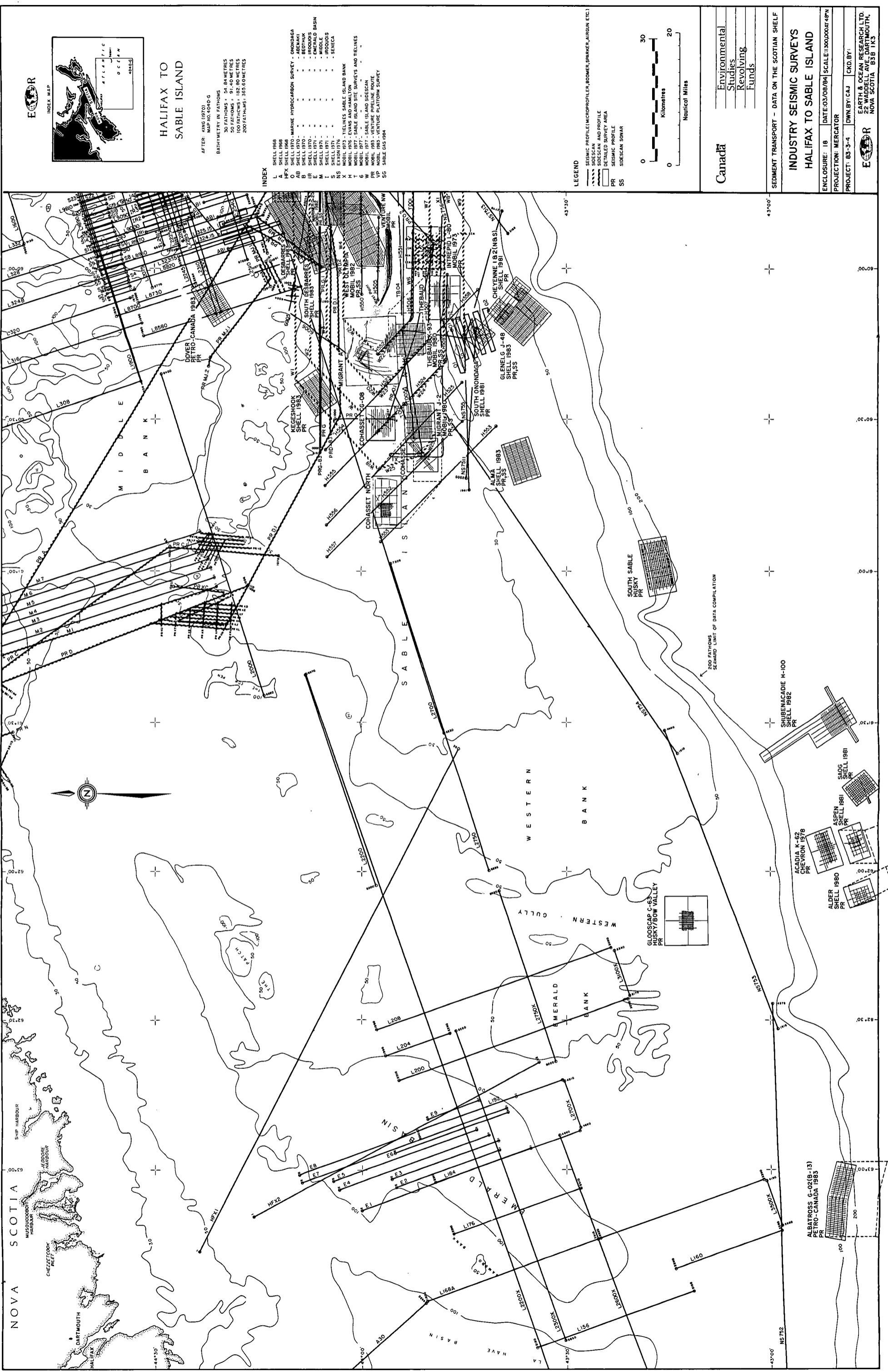


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SEDMENT TRANSPORT - DATA ON THE SCOTIAN SHELF

INDUSTRY SEISMIC SURVEYS
YARMOUTH TO BROWNS BANK

ENCLOSURE 17 DATE 02/09/98 SCALE 1:500000 49N
 PROJECT MERCATOR DMR/PC/CAJ CND BY:
 EARTH & OCEAN RESEARCH LTD.
 200 W. SCOTIA ST. S.W.
 VICTORIA, B.C. V8W 2G5



EARTH OCEAN RESEARCH
INDEX MAP

HALIFAX TO SABLE ISLAND

AFTER: MINE (1973)
MAP (1974) G

BATHYMETRY IN FATHOMS
30 FATHOMS: 54 METRES
50 FATHOMS: 91.40 METRES
100 FATHOMS: 182.80 METRES
200 FATHOMS: 365.60 METRES

- INDEX**
- L SHELL 1968
 - A SHELL 1969
 - FP SHELL 1969
 - O SHELL 1970
 - AB SHELL 1970
 - B SHELL 1970
 - IR SHELL 1970
 - M SHELL 1971
 - T SHELL 1971
 - S SHELL 1971
 - X SHELL 1971
 - NS MOBI 1973 - TIELINES SABLE ISLAND BANK
 - H MOBI 1976 - EVANS AND HAMILTON
 - T MOBI 1977 - SABLE ISLAND SITE SURVEYS AND TIELINES
 - W MOBI 1977 - SABLE ISLAND SAGESCAN
 - MOBI 1983 - VENTURE PIPELINE ROUTE
 - UP MOBI 1983 - VENTURE PLATFORM SURVEY
 - SG SABLE 045 1984

- ONONDAGA
- ABENAKI
- BEDFORD
- IRROQUOIS BASIN
- MIDDLE
- IRROQUOIS
- SENECA

- SEISMIC PROFILE (MICROPROFILE, BOOMER, SPARKER, AIRGUN ETC.)
- SAGESCAN AND PROFILE
- SAGESCAN
- DETAILED SURVEY AREA
- PR SEISMIC PROFILE
- SS SAGESCAN SONAR

0 30
0 20
Kilometres
Nautical Miles

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SEDIMENT TRANSPORT - DATA ON THE SCOTIAN SHELF

INDUSTRY SEISMIC SURVEYS
HALIFAX TO SABLE ISLAND

ENCLOSURE: 18 DATE: 03/08/84 SCALE: 1:500,000 @ 49°N
PROJECTION: MERCATOR
PROJECT: B3-3-4 DWN BY: CAJ CKD BY:

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INDEX MAP



CANSO BANK AND ADJACENT AREAS

AFTER: McLEAN, FADER AND KING (1977).
MAP NO. 4013-G

BATHYMETRY IN FATHOMS

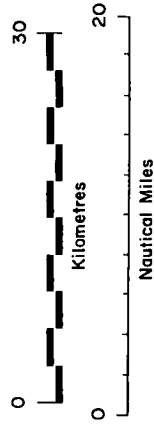
- 30 FATHOMS = 54.84 METRES
- 50 FATHOMS = 91.40 METRES
- 100 FATHOMS = 182.80 METRES
- 200 FATHOMS = 365.60 METRES

INDEX

- L SHELL 1968
- M SHELL 1971 - MARINE HYDROCARBON SURVEY - MIDDLE
- PR MOBIL 1983
- SG SABLE GAS 1984

LEGEND

- SEISMIC PROFILE (MICROPROFILE, BOOMER, SPARKER, AIRGUN ETC.)
- SIDESCAN
- SIDESCAN AND PROFILE
- DETAILED SURVEY AREA



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SEDIMENT TRANSPORT - DATA ON THE SCOTIAN SHELF

INDUSTRY SEISMIC SURVEYS CANSO BANK AND ADJACENT AREAS

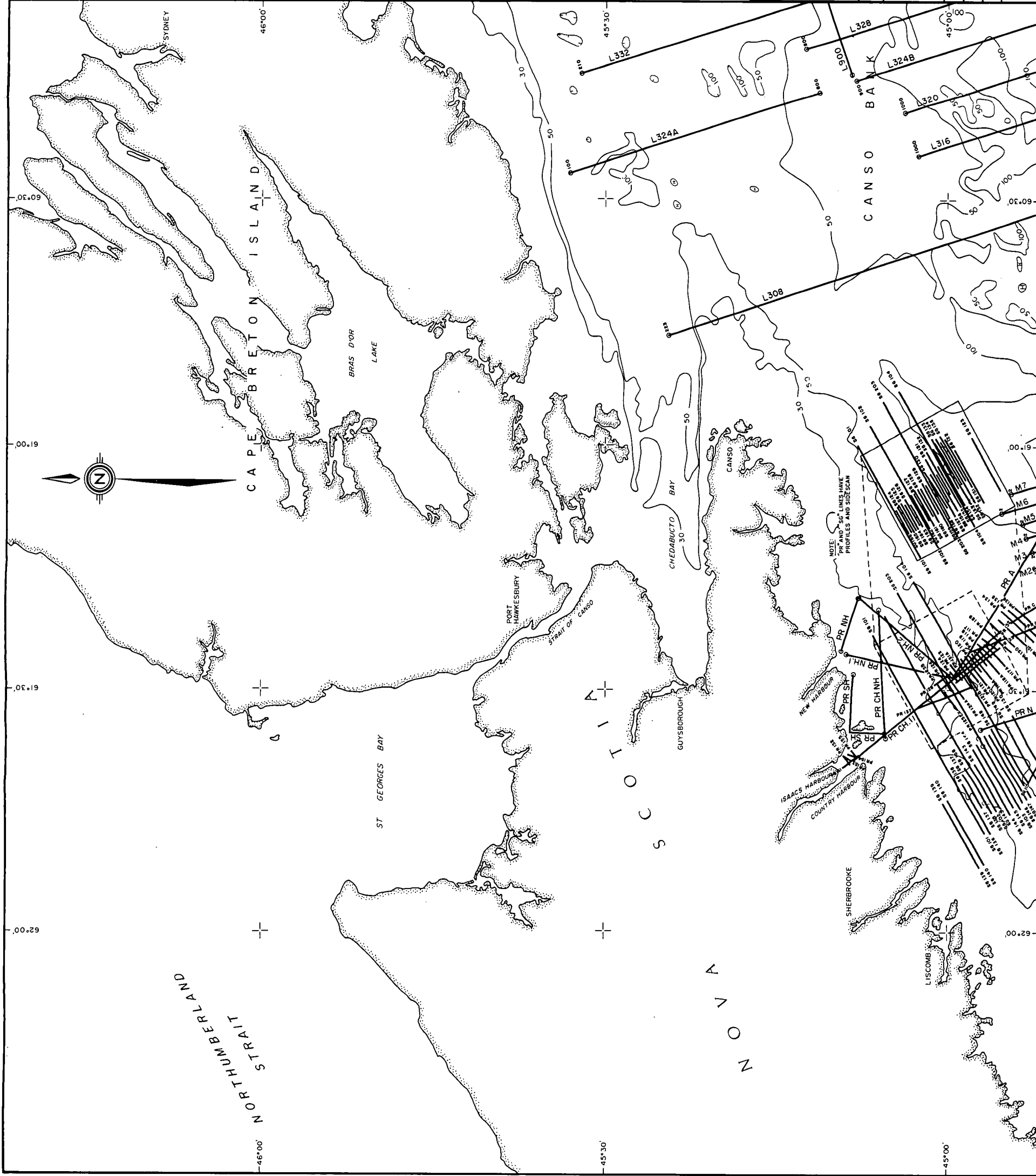
ENCLOSURE: 19 DATE: 03/08/84 SCALE: 1:300,000 AT 48°N

PROJECTION: MERCATOR

PROJECT: 83-3-4 DWN BY: CAJ CKD BY:



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YARMOUTH TO BROWNS BANK

LEGEND

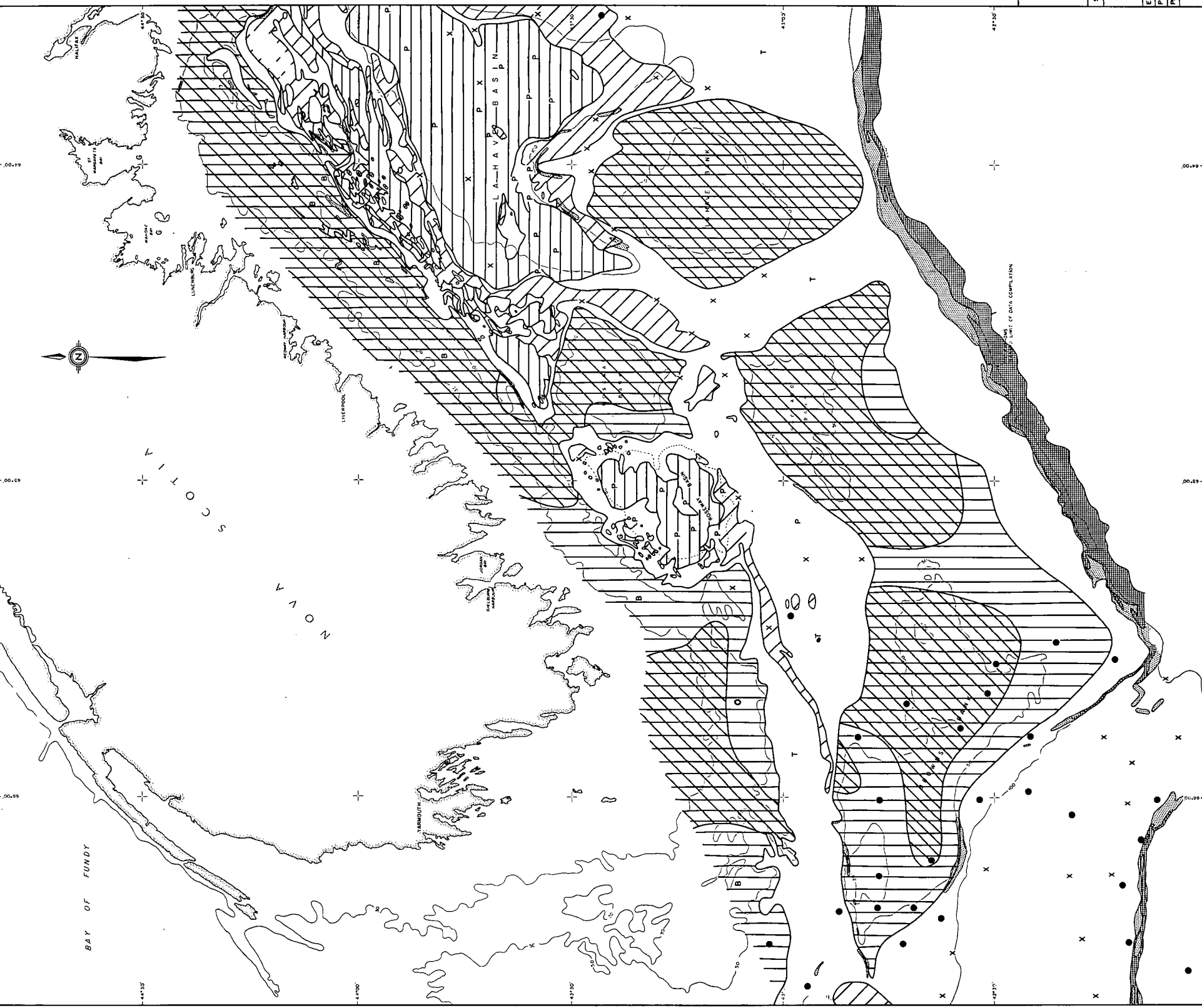
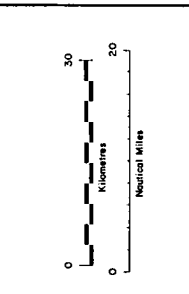
- ▨ High energy beach with 50% gravel
- ▨ High energy beach with 25% gravel
- ▨ High energy beach with 10% gravel
- ▨ High energy beach with 5% gravel
- ▨ High energy beach with 0% gravel
- ▨ High energy beach with 10% sand
- ▨ High energy beach with 20% sand
- ▨ High energy beach with 30% sand
- ▨ High energy beach with 40% sand
- ▨ High energy beach with 50% sand
- ▨ High energy beach with 60% sand
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- ▨ High energy beach with 300% sand
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- ▨ High energy beach with 690% sand
- ▨ High energy beach with 700% sand
- ▨ High energy beach with 710% sand
- ▨ High energy beach with 720% sand
- ▨ High energy beach with 730% sand
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- ▨ High energy beach with 770% sand
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- ▨ High energy beach with 970% sand
- ▨ High energy beach with 980% sand
- ▨ High energy beach with 990% sand
- ▨ High energy beach with 1000% sand

SEDEMENT TRANSPORT - DATA ON THE SCOTIAN SHELF

SEDIMENT TRANSPORT - DATA ON THE SCOTIAN SHELF

SEDIMENT TRANSPORT - DATA ON THE SCOTIAN SHELF

SEDIMENT TRANSPORT - DATA ON THE SCOTIAN SHELF



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SEDIMENT TRANSPORT - DATA ON THE SCOTIAN SHELF

SEDIMENT INSTABILITY MAP

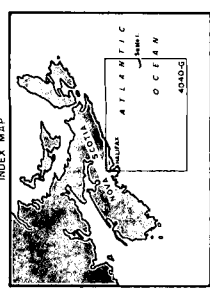
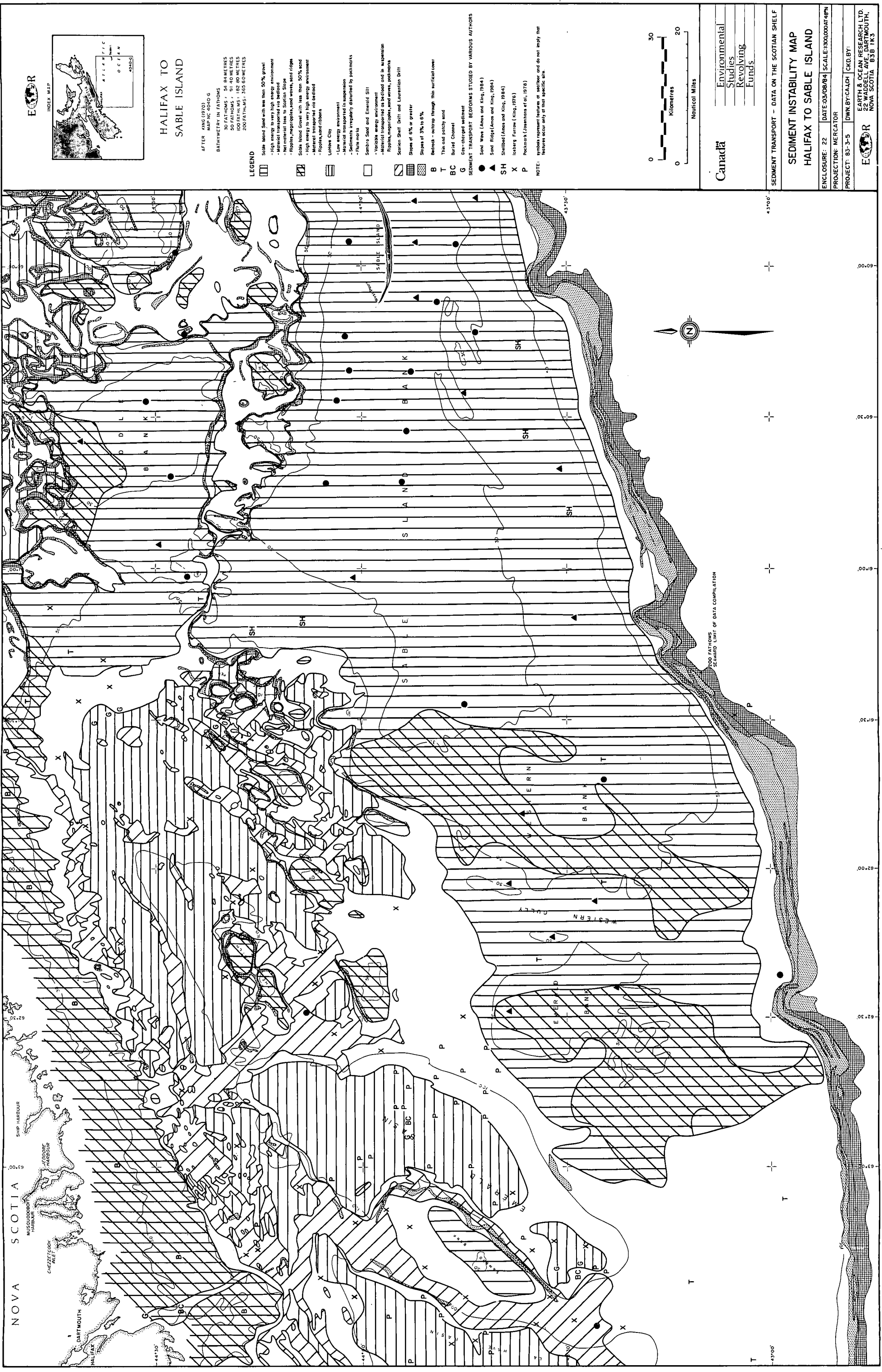
YARMOUTH TO BROWNS BANK

ENCLOSURE: 21 DATE: 03/08/04 SCALE: 300000:1

PROJECTION: MERCATOR

PROJECT: 83-2-5 DRAWN BY: G. CALVERT

NOVA SCOTIA B1B 1-3



HALIFAX TO SABLE ISLAND

AFTER KING (1970)
BATHYMETRY: 200 FATHOMS - 30 METRES
300 FATHOMS - 51.8 METRES
400 FATHOMS - 73.1 METRES
500 FATHOMS - 91.4 METRES
600 FATHOMS - 110.3 METRES
700 FATHOMS - 128.0 METRES
800 FATHOMS - 146.3 METRES
900 FATHOMS - 164.6 METRES
1000 FATHOMS - 182.9 METRES

- LEGEND**
- Scale below 500m with less than 50% gravel
 - High energy to very high energy environment
 - Material transported in suspension
 - Material transported in suspension
 - Material transported in suspension
 - Rippled, irregular, sand waves, sand ridges
 - Sable Island (with less than 50% sand)
 - High energy to very high energy environment
 - Material transported via bedload
 - Rippled, sand ribbons
 - Lutetia City
 - Low energy environment
 - Material transported in suspension
 - Sediments irregularly disturbed by pockmarks
 - Flute marks
 - Sandbars and Emerald Silt
 - Highly energy environment
 - Material transported on bedload and in suspension
 - Rippled, irregular, sand waves, pockmarks
 - Sooten Shell Drift and Lutetian Drift
 - Slopes of 3% to 6%
 - Slopes of 6% or greater
 - Thin and sticky mud
 - Barred Channel
 - Gas-charged sediment

SEDIMENT TRANSPORT BEDFORMS STUDIED BY VARIOUS AUTHORS

- Sand Wave (Aron and King, 1984)
- ▲ Sand Ridge (Aron and King, 1984)
- SH Shellbed (Aron and King, 1984)
- X Isberg Furrow (King, 1976)
- P Pockmark (Johannes et al., 1978)

NOTE: Symbols represent features of seafloor and do not imply that features occur only at their specific site.

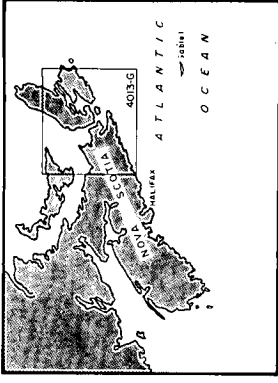
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SEDIMENT TRANSPORT - DATA ON THE SCOTIAN SHELF
**SEDIMENT INSTABILITY MAP
HALIFAX TO SABLE ISLAND**

ENCLOSURE: 22 | DATE: 03/08/84 | SCALE: 1:300,000 AT 48°N
PROJECTION: MERCATOR | DWN BY: CAJCH | CKD BY:
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INDEX MAP



CANSO BANK AND ADJACENT AREAS

AFTER: M. J. LEAN, FADDER AND KING (1977).
MAP NO. 4013-G

BATHYMETRY IN FATHOMS
30 FATHOMS : 54.84 METRES
50 FATHOMS : 91.43 METRES
100 FATHOMS : 182.86 METRES
200 FATHOMS : 365.60 METRES

LEGEND

- Sable Island Sand with less than 50% gravel
- High energy to very high energy environment
- Material transported via bedload
- Net material loss to Scotian Shelf
- Ripples, megaripples, sand waves, sand ridges
- Sable Island Gravel with less than 50% sand
- High energy to very high energy environment
- Material transported via bedload
- Ripples, sand ribbons

- Lachave Clay
- Low energy environment
- Material transported in suspension
- Sediments irregularly disturbed by pockmarks
- Flute marks

- Sambre Sand and Emerald Silt
- Variable energy environment
- Material transported as bedload and in suspension
- Ripples, megaripples, sand waves, pockmarks

- Scotian Shelf Drift and Laurentian Drift
- Slopes of 6% or greater
- Slopes of 3% to 6%

- Bedrock - outcrop through thin surficial cover
- Buried Channel
- Gas-charged sediment

SEDIMENT TRANSPORT BEDFORMS STUDIED BY VARIOUS AUTHORS

- Sand Wave (Amos and King, 1984)
- Iceberg Furrow (King, 1976)

NOTE: symbols represent features at specific sites and do not imply that features occur only at that specific site

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SEDIMENT TRANSPORT - DATA ON THE SCOTIAN SHELF

SEDIMENT INSTABILITY MAP CANSO BANK AND ADJACENT AREAS

ENCLOSURE: 23 DATE: 03/08/84 SCALE: 1:300,000 AT 48°N
PROJECTION: MERCATOR
PROJECT: 83-3-5 DWN BY: CAJ/CH CKD BY:

EOR
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NOVA SCOTIA B3B 1K3

