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**SPATIALLY ENABLED DATABASE
OF ARTIFICIAL ISLANDS IN THE
CANADIAN BEAUFORT SEA**



KLOHN CRIPPEN



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December 15, 2000

Indian and Northern Affairs Canada
Les Terrasses de la Chaudiere
Ottawa, Ontario
K1A 0H4

Mr. Bob Gowan, P.Geol.

Dear Mr. Gowan:

Contract # 99-0378

Spatially Enabled Database of Artificial Islands in the Canadian Beaufort Sea

We are pleased to submit ten bound copies and one unbound copy of our report on the creation of spatially enabled databases for Artificial Islands in the Canadian Beaufort Sea using ArcView and Earth Science Publisher programs. Two CD-ROM discs are enclosed with each copy of the report that contain the database files and the four converted reports from previous phases of the Project.

If you have any questions on the report, please call.

Yours truly,

KLOHN CRIPPEN CONSULTANTS LTD.

Brian T. Rogers, P.Eng.
Manager, Alberta

BTR/sh
Enclosure

PA 2695.07
001215R-Database REPORT.DOC



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**SPATIALLY ENABLED DATABASE
OF ARTIFICIAL ISLANDS IN THE
CANADIAN BEAUFORT SEA**

EXECUTIVE SUMMARY

Approximately 40 million cubic metres of granular material have been dredged within the Canadian Beaufort continental shelf to create artificial islands or subsea berms for caisson retained islands and drilling barges. These islands were constructed to provide temporary drilling structures for hydrocarbon exploration. After completing drilling and removing the equipment and consumables, these islands were abandoned to natural erosion, or partially scalped and reused at other exploration sites.

A series of reports by Klohn Crippen Consultants Ltd. and Canadian Seabed Research Ltd. for the Department of Indian and Northern Affairs, Canada, have documented the available sources of good quality granular material located in the Canadian Beaufort Sea that could potentially be used in future developments.

The information contained in these reports has been converted into database format for review and presentation on a PC. The user has the option of reading the reports using a standard Internet browser or accessing the artificial island data in a spatially enabled database format using the programs *ArcView 3.2* by ESRI or *Earth Science Publisher* by Pole Star Geomatics Inc.

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1. INTRODUCTION

In Northern Canada, including offshore areas adjacent to the Northwest Territories, Nunavut and Yukon, management of most natural resources is the responsibility of the Department of Indian Affairs and Northern Development (DIAND). In the offshore areas, approximately 40 million cubic metres of granular material have been dredged within the Canadian Beaufort continental shelf since the early 1970's to create at least 37 artificial islands or subsea berms for caisson retained islands and drilling barges. These islands were constructed to provide temporary drilling structures for hydrocarbon exploration. Upon completion of exploratory drilling and after removal of equipment and consumables, these islands have generally been abandoned to natural erosion, or partially scalped and reused at alternate exploration sites.

The remains of the islands represent stockpiles of "processed" borrow material that are typically of higher quality than their source deposits due to winnowing of fines on placement and subsequent erosion. They may also provide the foundations or cores of future, more permanent production islands, thereby reducing construction costs. However, others have been concerned that some of these structures may be hazards to navigation or may have adverse impacts on the marine environment. Some parties have previously proposed the establishment of guidelines requiring removal of major portions of abandoned islands. In addition to the environmental concerns that might result from "disposal" of the islands as suggested above, the scattering of these relatively high quality materials would result in the loss of a scarce and valuable granular resource.

It is from this context that a review and synthesis of available information on the construction materials contained in the islands and an assessment of their granular resource potential was initiated in 1992 as part of the Northern Oil and Gas Action Program. Additional information was obtained as part of Panel on Energy Research and Development (PERD) Offshore Geotechnics research studies to determine island erosion

dynamics and potential changes in the resource potential of the islands over time. The Geological Survey of Canada (GSC) also supported this work from the perspective of using island erosion information for estimating regional marine sediment transport rates and directions.

A total of four reports on Beaufort artificial islands, listed below, were prepared for DIAND under these projects:

1. Granular Resource Potential of Beaufort Artificial Islands, March 1994; revised March 1995.
2. Sediment Transport at Artificial Island Sites, Canadian Beaufort Sea (Phase 1 and Phase 2), December 1994.
3. Granular Borrow and Fill Quality at Selected Locations in the Canadian Beaufort Sea, June 1997.
4. CPT Data, Artificial Islands Canadian Beaufort Sea, March 1999.

Another aspect of the previous data compilations was to ensure that information that had been extremely costly to obtain was preserved for potential use in the event that future development proceeded. This included data contributed by oil and gas companies who had abandoned or suspended their interests in this region. Without this "data rescue" effort, much information would otherwise have been lost or destroyed.

There is currently a renewed interest in the hydrocarbon resources of the Beaufort - Mackenzie Region and in information needed to plan future exploration and development activities. As a result of land claims agreements and other legislative changes since the last exploration boom, the number of parties involved in the review, assessment and approval of activities has also increased. Since part of DIAND's continuing role as a resource manager in the North includes provision of information and advice, it is important that the information can easily be distributed to, and understood by, participating stakeholders.

The purpose of this project was to assemble the artificial island data contained in the four hard-copy reports into a digital format suitable for presentation on a PC. The user would have the option of reading the reports using a standard Internet browser or accessing the artificial island data in a spatially enabled database format using the programs *ArcView 3.2* by ESRI or *Earth Science Publisher* by Pole Star Geomatics Inc.

This report is accompanied by two compact discs. Each disc contains one type of spatially enabled database and the reports in HTML format. Further information on the production of the databases, the datasets included, and any special operating instructions are included in the following sections.

2. SUMMARIES OF EXISTING REPORTS

2.1 Granular Resource Potential of Beaufort Artificial Islands

This study documented 37 islands in the Canadian Beaufort Shelf, which we believe represented the total number of offshore islands constructed in the area. A tabular listing of the as-built quantities required for each island, the borrow source and a description of the fill material is included in Table 1. The location of these islands is shown in Figure 1.

Table 1 As-Built Quantities of Beaufort Artificial Islands

No	Island Name	Island Type	Fill Quantity (m ³)	Borrow Site	Primary Fill Material	Secondary Fill Material
1	Immerk B-48	Sacrificial Beach Island	180 000	Local	Sand	gravel
2	Adgo F-28	Sandbag Retained Island	46 000	Local, Immerk area	Silt	gravel cap
3	Pullen E-17	Gravel Fill Island	65 000	Onshore, Yaya Lakes	Gravel	
4	Unark L-24	Gravel Fill Island	44 000	Onshore, Yaya Lakes	gravel	
5	Pelly B-35	Barge Cored Island	35 000	Local, Yaya Lakes	silt	gravel cap
6	Netserk B-44	Sandbag Retained Island	306 000	Pelly Island	sand	
7	Adgo P-25	Sandbag Retained Island	27 000	Local	silt	gravel cap
8	Adgo C-15	Gravel Fill Island	70 000	Onshore, Yaya Lakes	gravel	
9	Netserk F-40	Sandbag Retained Island	291 000	Pelly Pit, Garry Harbour and Spit	sand	
10	Sarpik B-35	Gravel Fill Island	118 000	Onshore, Adgo C-15 area	gravel	
11	Ikkatok J-17	Sandbag Retained Island	38 000	Local	sand	
12	Kugmallit H-59	Sandbag Retained Island	236 000	Tufts Point	sand	
13	Adgo J-27	Sandbag Retained Island	69 000	Local, Netserk B-44 area	silt	gravel cap
14	Amak L-30	Sacrificial Beach Island	1 150 000	Local	sand	
15	Kannerk G-42	Sacrificial Beach Island	1 150 000	Local	sand	

No	Island Name	Island Type	Fill Quantity (m ³)	Borrow Site	Primary Fill Material	Secondary Fill Material
16	Isserk E-27	Sacrificial Beach Island	1 908 000	Local, Tufts Point	sand	
17	Issungnak O-61	Sacrificial Beach Island	4 100 000	Local, Tufts Point	sand	
18	Issungnak 2-O-61	Sacrificial Beach Island	4 900 000	Issungnak 0-61	sand	
19	Alerk P-23	Sacrificial Beach Island	2 670 000	Local	sand	
20	North Protection Island	Sacrificial Beach Island	2 000 000	Local	sand	
21	West Atkinson L-17	Sacrificial Beach Island	1 000 000	Local	sand	
22	Tarsiut N-44	Caisson Retained Island	1 800 000	Ukalerk, Issigak, Isserk, Herschel	sand	gravel
23	Uviluk P-66	Single Steel Drilling Caisson	1 900 000	Local, Ukalerk, Isserk, Kadluk, Issigak	sand	gravel cap
24	Itiyok I-27	Sacrificial Beach Island	1 943 000	Local, Ukalerk	sand	
25	Nerlerk B-67	Single Steel Drilling Caisson	4 000 000	Ukalerk, Local	sand	
26	Kogyuk N-67	Single Steel Drilling Caisson	1 450 000	Ukalerk, Uviluk P-66, Banks Island, Rufus	sand	gravel cap
27	Kadluk O-07	Caisson Retained Island	450 000	Ukalerk	sand	
28	Amerk Q-09	Caisson Retained Island	1 700 000	Ukalerk	sand	
29	Adgo H-29	Sandbag Retained Island	75 000	Adgo J-27, Sarpik B-35, Kadluk O-07	sand	gravel cap
30	Nipterk L-19	Sacrificial Beach Island	1 500 000	Issigak, Ukalerk	gravel	sand
31	Tarsiut P-45	Molikpaq	350 000	Ukalerk, Tarsiut N-44, Kogyuk N-67	sand	gravel
32	Minuk I-53	Sacrificial Beach Island	2 000 000	Ukalerk, Issigak, Isserk, Kadluk O-07	gravel	sand
33	Amauligak I-65	Molikpaq	1 410 000	Ukalerk, Kogyuk N-67, Amerk O-09, Issigak	sand	gravel toe
34	Arnak K-06	Sacrificial Beach Island	700 000	Local	sand	
35	Kaubvik I-43	Caisson Retained Island	565 000	Ukalerk, Isserk, Issigak	sand	gravel toe
36	Amauligak F-24	Molikpaq	2 000 000	Ukalerk, Amauligak I-65, Minuk I-53	sand	gravel toe
37	Isserk I-15	Molikpaq	72 000	Amauligak I-65	sand	

The project identified that approximately four (4) million cubic metres of a mixture of sand and gravel are available as a resource in three of the abandoned offshore islands, Tarsiut N-44, Nipterk I-19 and Minuk I-53. Seven (7) million cubic metres of Ukalerk type sand are available in eight (8) of the abandoned berms that were used for the CRI, Molikpaq and SSDC deployments. An additional 200,000 m³ of gravel is present in four older gravel filled islands constructed in the 1970's. This material represents a delineated source of high quality sand and gravel that can be readily used for future construction activities related to exploration or development in the Canadian Beaufort Shelf.

Fourteen (14) million cubic metres of finer gradation sandfill remain in place in sandbag retained and sacrificial beach abandoned islands. This material was typically obtained from local borrow sources, and is not likely to be transported for use in construction of islands at new exploration sites. However, the sandfill does represent a valuable base resource for potential development at each of the individual exploration sites.

The study was reported in two volumes dated March 1995. Volume 1 was the main report summarizing all aspects of the project. The FoxPro2/QUIKMap/InFocus disks that contained the granular resource database were included in Appendix I of this volume. Hard copy information for each island was presented in Volume 2, including a summary of information entered into the database, schematic cross-sections of the islands and plan-view drawings of the various surveys undertaken for each island.

2.2 Sediment Transport at Artificial Island Sites

As a participant in the original database work of the artificial islands in the Beaufort Sea, Canadian Seabed Research Limited was contracted to analyse the hydrographic and geophysical survey data collected at 13 of the artificial island sites listed in Table 2. This work was then extended to allow further analysis of the survey data to review the way the islands have changed since abandonment.

Table 2 Artificial Island Sites Analysed by Canadian Seabed Research

Island	Physiographic Province	Water Depth (m)	Island Design	Date Constructed	Date Abandoned	Sidescan Surveys Following Abandonment	Bathymetric Surveys After Abandonment	Bathymetric Surveys at, or Prior to Completion
Netserk F-40	Kringulik Plateau	7.0	SBR	1975	1976	1990	1981/90	
Kugmallit H-59	Kugmallit Channel	5.3	SBR	1976	1977	1990	1982/90	
Arnak L-30	Akpak Plateau	8.5	SB	1976	1977	1989/90	1982/84/89/90	
Kannerk G-42	Kaglulik Plain	8.5	SB	1976	1977	1990	1982/90	
Isserk E-27	Akpak Plateau	13.0	SB	1977	1978	1990	1982/90	
Issungak 2-0-61	Akpak Plateau	19.0	SB	1978/79	1981	1989/90	1981/89/90	
Alerk P-23	Tingmiark Plain	11.6	SB	1980/81	1982	1990	1982	1981
West Atkinson L-17	Hutchison Bay	6.0	SB	1981/82	1982	1990	1990	1982
Itiyok I-27	Akpak Plateau	15.0	SB	1981/82	1983	1989/90	1984/89/90	1982
Nipterk L-19	Ikit Plateau	11.7	SB/S&G	1983/84	1985	1990	1990	1984
Minuk I-53	Kringulik Plateau	14.7	SB/S&G	1982-85	1986	1990	1987/90	1985
Arnak K-06	Kugmallit Plateau	7.2	SB	1985	1986	1990	1990	1985
Kaubvik I-43	Ikit Trough	17.9	CRI	1983-86	1987	1989/90	1989/90	1986

Island Design Identification

SBR - Sand Bag Retained

SB - Sacrificial Beach

S&G - Sand and Gravel

CRI - Caisson Retained Island

The final report addresses and documents the following key questions of relevance to the long-term fate of these thirteen islands as an aggregate resource:

- 1) In what ways are the islands changing with time after abandonment?
- 2) What seafloor processes are active at the island sites?
- 3) Does the location, water depth, construction material or design influence the behaviour of the islands after abandonment?
- 4) What are the direction and magnitude of sediment transport on the islands?
- 5) Which area of the islands are undergoing sediment erosion and where has this sediment accumulated?
- 6) How do these processes impact the aggregate resource potential of the islands?

The results of the study were presented in a single hard copy volume dated December 1994. No electronic version of the report was prepared in 1994.

2.3 Granular Borrow and Fill Quality at Selected Locations in the Canadian Beaufort Sea

The two main borrow pits that were used for the majority of the construction of the coarser fill islands were named Issigak and Ukalerk (or Erksak). The gradation of the material at Issigak contained cobble, gravel and sand size material, which was substantially coarser than that material at Ukalerk, which contained medium to fine sand with a D_{50} of about 0.3 mm. Significant resources remain within both pits, however actual material quality and accessibility is not as well delineated as the fill already placed in the abandoned islands. Typically, the fill material also becomes coarser in the abandoned islands, as finer material is lost during the dredging process.

This study was completed to provide background information on the seabed borrow locations which were the original source of the coarser fill material and to document the material gradation records from eleven of the abandoned islands in which the coarser fill material was placed. For the purposes of this report, the eleven selected abandoned islands have been divided into two categories, those consisting of fill almost entirely from the Ukalerk pit, and those consisting of both fill from the Ukalerk sand pit and the coarser cobbles, gravel and sand fill from the Issigak pit.

Based on the most recent available bathymetry, it is estimated that about seven (7) million cubic metres of sandfill with a D_{50} in the range of 0.3 mm - 0.4 mm is available from the abandoned islands at Amauligak I65 and F24, Amerk P-09, Kadluk O-07, Kogyuk N-67, Tarsiut P-45 and Uviluk P-66. All these islands were originally

constructed for the SSDC, the CRI or the Molikpaq, so fill is now at a depth of about 8 metres to 10 metres from mean sea level.

An estimated four (4) million cubic metres of the mixed sand and gravel fill material with a D_{50} in the range of 0.3 mm to 3 mm is available from Kaubvik I-43, Minuk I-53, Nipterk L-19 and Tarsiut N-44. These islands provide a valuable source of coarse-grained fill material that can be used in future construction. Consideration will need to be given to the best way to utilize the resource, as there are some constraints due to the fact that the island crests are typically closer to mean sea level and they may contain remnant drilling debris, piles, rock filled gabions, or other contaminants. Some ongoing loss to these old island resource sites is expected due to sediment transport mechanisms. However, these losses will be small on an annual basis once the island surfaces have eroded to about 4 metres to 5 metres below mean sea level.

The results from the study were presented in a single hard copy volume dated June 1997, and as an electronic database on CD Rom. The new database included the previously developed electronic database converted into Microsoft Access format, and renamed the "Beaufil" database program. Beaufil is a CD-ROM based menu-driven database application of the available Beaufort Sea artificial island data.

2.4 CPT Data for Artificial Islands

Information on the in situ density of the fill was monitored by deploying the cone penetration test (CPT). This report was completed to provide a summary of the available CPT data for the key abandoned islands with delineated sand and gravel borrow material, and also documented CPT data from some additional sites in the Canadian Beaufort Sea, namely the Nerlerk B-67 berm, the Isserk I-15 Molikpaq deployment site, and at trial berm sites that used Isserk and Ukalerk borrow material. In total, the report documented

422 cone penetration tests completed at nine island sites and three trial berm sites and are listed in Table 3.

Table 3 Selected Beaufort Sea Artificial Islands and Available CPT Data

Island Name	Island Type	Latitude	Longitude	Water Depth (m)	Number of CPT tests	Construction Date
Sand Islands						
Uviluk P-66	Single Steel Drilling Caisson	70.263444	132.313280	29.7	16	1981-82
Kogyuk N-67	Single Steel Drilling Caisson	70.113722	133.328220	28.1	55	1982-83
Kadluk O-07	CRI	69.780083	136.021250	14.0	0	1983
Amerk O-09	CRI	69.982333	133.514778	27.0	3	1983-84
Tarsiut P-45	Molikpaq	69.915444	136.418000	25.5	66	1984
Amauligak I-65	Molikpaq	70.077694	133.804556	31.0	44	1985
Amauligak F-24	Molikpaq	70.054833	133.630250	32.0	127	1985-87
Sand and Gravel Islands						
Tarsiut N-44	Caisson Retained Island	69.896139	136.193470	21.0	27	1981-82
Nipterk L-19	Sacrificial Beach Island	69.810583	135.298194	11.7	0	1983-84
Minuk I-53	Sacrificial Beach Island	69.709639	136.458860	15.3	0	1982-85
Kaubvik I-43	CRI	69.875833	135.422028	17.9	0	1983-86
Additional CPT Data Sources						
Isserk Trial Berm	Trial Berm			22.0	8	1982
Ukalerk Trial Berm	Trial Berm				16	1982
Nerlerk B-67		70.433444	133.324556	45.1	43	1982-83
Isserk I-15	Molikpaq	69.912361	134.299222	11.8	17	1989

As part of this project, the electronic CPT data was transferred from the original HP format, to a PC based ASCII format. The data from each CPT profile were imported into Microsoft Excel spreadsheets to provide an easily accessible storage of the data. This data was then incorporated into an updated version of the "Beaufil" database.

The study was presented in a single hard copy volume, dated March 1999, which contained a CD Rom with the updated "Beaufil" database.

3. REPORT CONVERSION

To allow distribution of the reports on media such as compact disc or by use of the Internet, the first deliverable for this project was to convert the four reports, including all the Figures and Drawings, into a format that can be read by a standard Internet web browser, such as Microsoft Internet Explorer.

The four reports were converted into HTML (hypertext markup language) using Microsoft Word 2000 and have been optimized for viewing with Microsoft Internet Explorer Version 5.5. The files were hot-linked and bookmarked to facilitate faster data access. Typically, the documents have only slight modifications from the original hard-copy versions and have only been changed where necessary to suit the new presentation environment. It should be noted that in optimizing for Microsoft Internet Explorer, the files may not view properly in other internet browsers, such as Netscape.

Existing figures in digital format, typically AutoCAD, were used when available. Some scanning of Figures was required to complete the database. The standard graphic file format adopted was the Windows bitmap (*.bmp). This uncompressed file format was chosen because it can be viewed on virtually any computer setup without the need for installing any additional software. If Microsoft Internet Explorer Version 5.5 is used, the images can be viewed from within the application and no additional viewers are required.

However for other internet browsers or image viewing only, a fast image viewer such as "ACDSee32" by ACD Systems Ltd. is highly recommended. A trial version of ACDSee32 Version 2.42 is included on the discs in the following directory: \\Beaufort Sea Islands\Reports\BMP Viewer\acdc323224.exe. The software can be installed from the executable file and should be setup as the default graphic viewer. All graphic editing and conversion was performed using Paint Shop Pro Version 6.02 by Jasc Software Inc.

For the report containing CPT plots, Microsoft Excel 2000 was used to process and convert the CPT data into HTML format. 413 CPT datasets are included in the database. This report has been modified slightly from the original document and now includes the UTM coordinates of the CPT locations (where available).

The reports can be accessed through an introductory screen, which is opened by clicking on the file "*Introduction.htm*" in the *\\Beaufort Sea Islands* directory on the CD. The reports and associated figures have been organized on the CD in the *\\Beaufort Sea Islands\Reports* directory.

4. SPATIALLY ENABLED DATABASES

4.1 General

To create the databases, a master table of general information on the 37 islands was created from the previous databases. This was then combined with all the Figures, Drawings and CPT data from the four reports, which were then sorted by island.

Two versions of the artificial island spatially enabled database have been provided. The ArcView database was produced using ArcView Version 3.2 and requires a licensed version of ArcView to be installed on the user's system. The Earth Science Publisher database is provided with its own viewing software.

Installation instructions for the software packages are provided in Appendix I. Basic operational instructions for the two databases are provided in the following sections.

4.2 Arcview Database

The default view on starting the database is the "Beaufort Sea Overview". In the main window, the 37 island locations are shown in their geographic locations. On the left hand side of the screen is the Table of Contents for the view. From the Table of Contents, datasets can be selected or deselected (checked) and highlighted to become the "current dataset". The following groups of island datasets can be selected:

- All Island Locations
- High Quality Fill Island Locations
- Islands with CPT Data
- Islands with Sediment Transport Data
- Borrow Area Locations

Highlighting the groups of dataset above results in data being displayed or new views being activated. For example, using the "hotlink" tool: if "All Island Locations" is

highlighted, then clicking on an island will bring up a new view for that island showing plans and sections etc. However, if "Island Description and Quantities" is highlighted, then clicking on an island will bring up a datasheet for the island.

For more details on the functions and use of the ArcView tools, such as zoom and information, the user is directed to the ArcView manual and tutorials.

The ArcView project makes extensive use of the default Internet browser installed on the user's system. For the database to fully function as originally configured, the Internet browser must be Microsoft Internet Explorer located in C:\Program Files\Internet Explorer\. If this is not the case, then an internal script must be modified within the project file. Instructions are included in Appendix I

For reference, the ArcView database CD has the following structure:

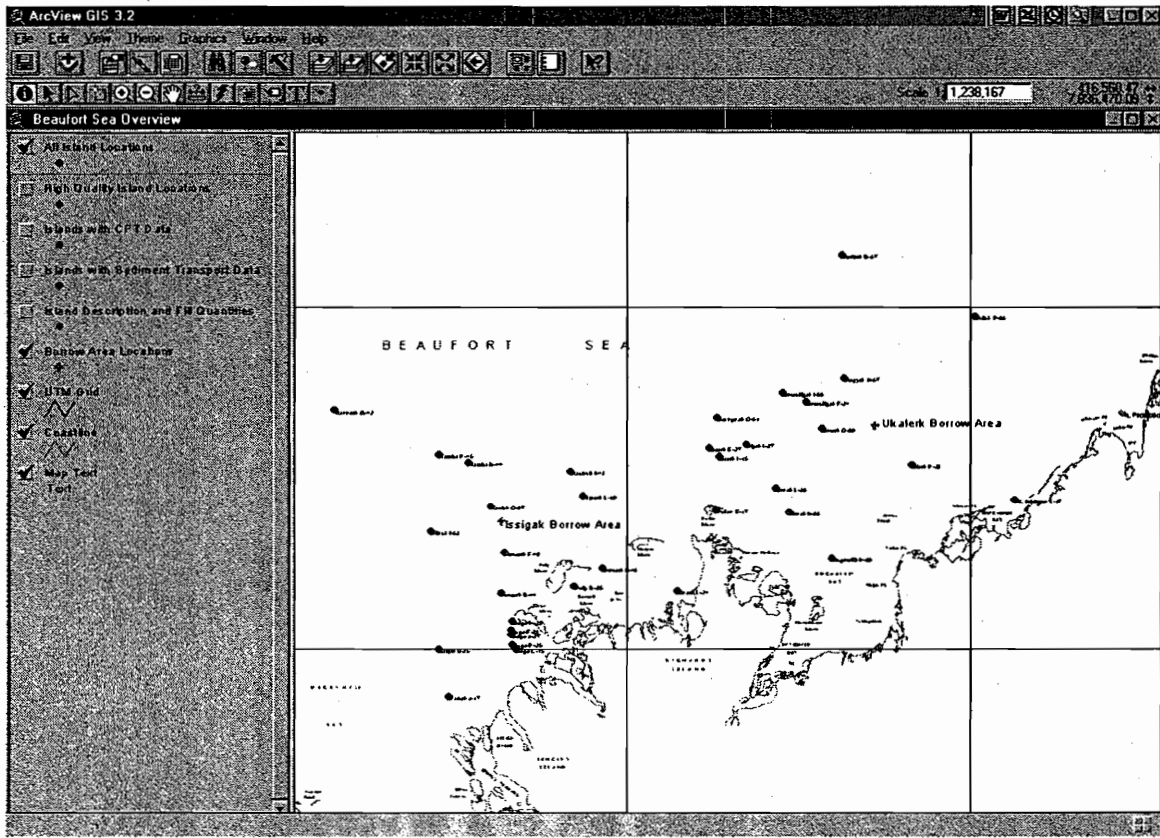
\\Beaufort Sea Islands\Arcview - contains the ArcView project files, shape files and tables.

\\Beaufort Sea Islands\Borrow Areas - contains the figures relating to the borrow areas.

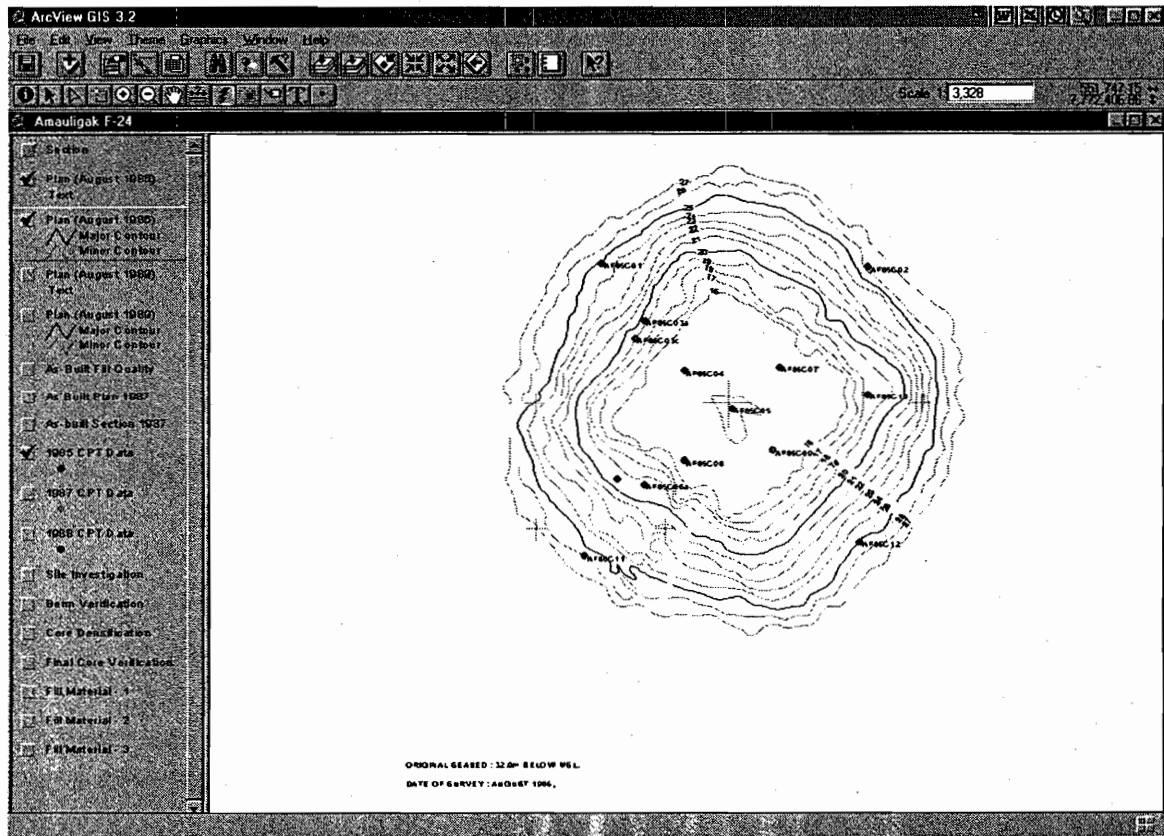
\\Beaufort Sea Islands\Island Data - contains 39 subdirectories containing data for individual islands or trial berm locations. For each island there is a summary datasheet exported from the original database, CPT data, and any applicable drawings related to that location.

\\Beaufort Sea Islands\Reports - contains the four reports in HTML format with associated figures.

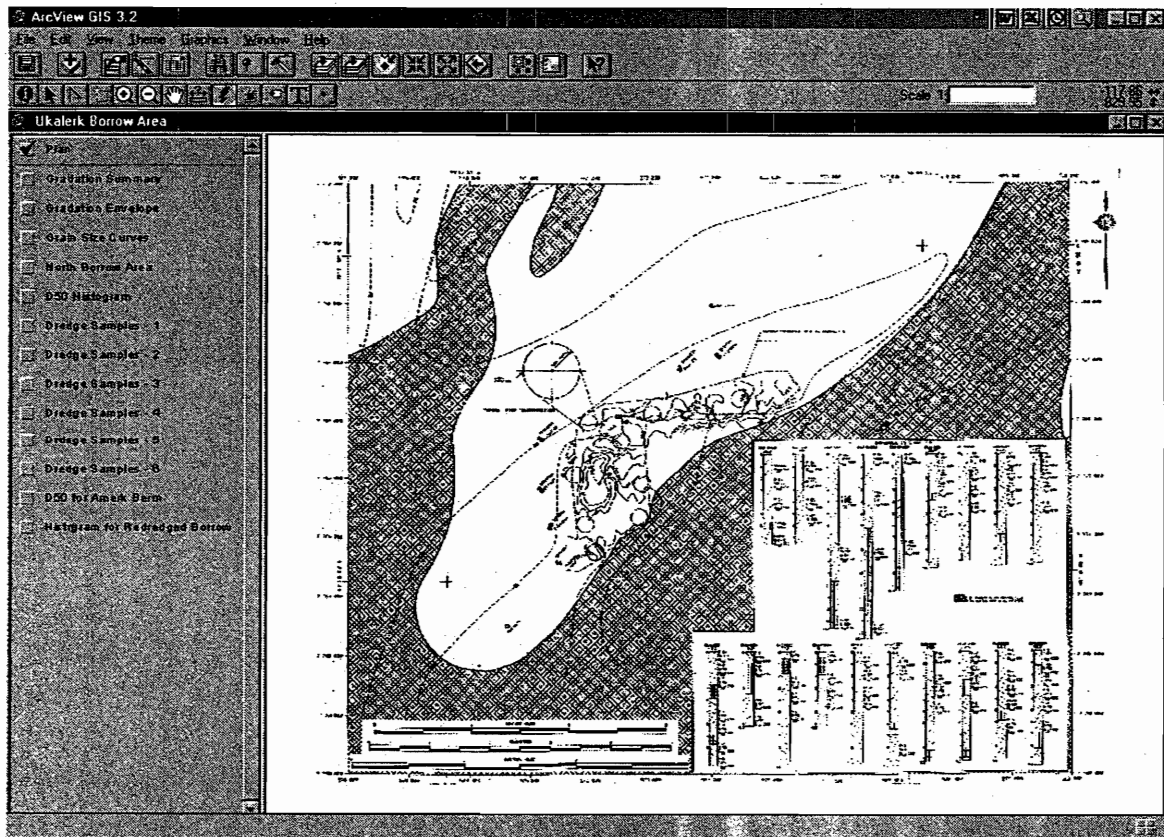
To illustrate the operation of the database, a number of screenshots are provided from the program on the following pages:



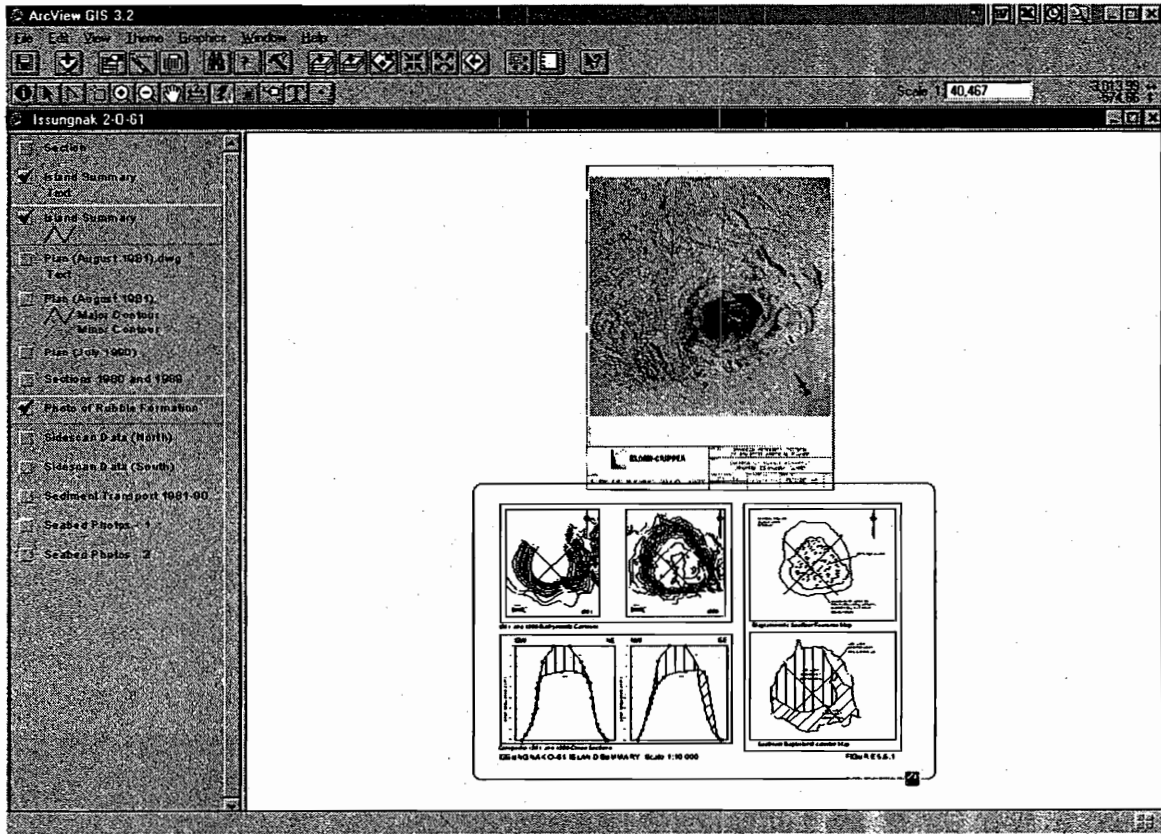
Beaufort Sea Overview screen showing all 37 island locations.



Typical Island View providing survey plan data, sections, CPT data and other miscellaneous data relating to the island.



Borrow Area Data



Summary drawings and photographs

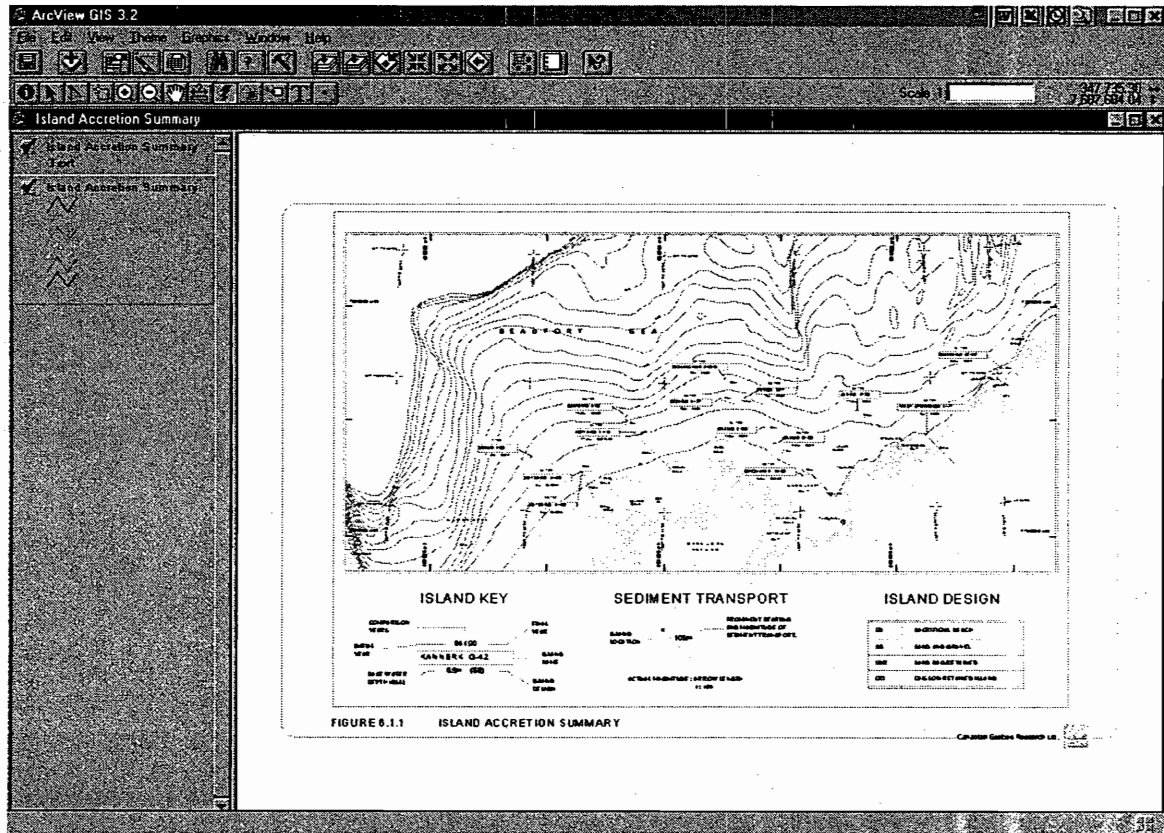


Figure from Canadian Seabed Research Report "Sediment Transport at Artificial Island Sites, Canadian Beaufort Sea (Phase 1 and Phase 2)", December 1994.

4.3 Earth Science Publisher Database

After starting the ESP application, the file "*Islands.esp*" should be selected from the *\\Beaufort Sea Islands* directory. This will open the default map view showing the coastline and the island locations. Other views available include: an Introduction view containing the introductory text and a Table view containing the island data.

In the map view, there is a basic division of the islands based on the type of CPT data available. When you left-click on an island location, basic island information is provided. When you right-click on an island, a menu reading "Datasheet", "Construction Details" and "Ice Conditions" appears. "Datasheet" is an HTML datasheet view of the island data. Included on the datasheet are links to the associated island bitmap images. The "Construction details" and "Ice Conditions" tabs each bring up a smaller subset of the information on the datasheet in a tabular view. Note that the views have been formatted to look best when expanded to the full width of the screen.

For reference, the Earth Science Publisher database CD has the following structure:

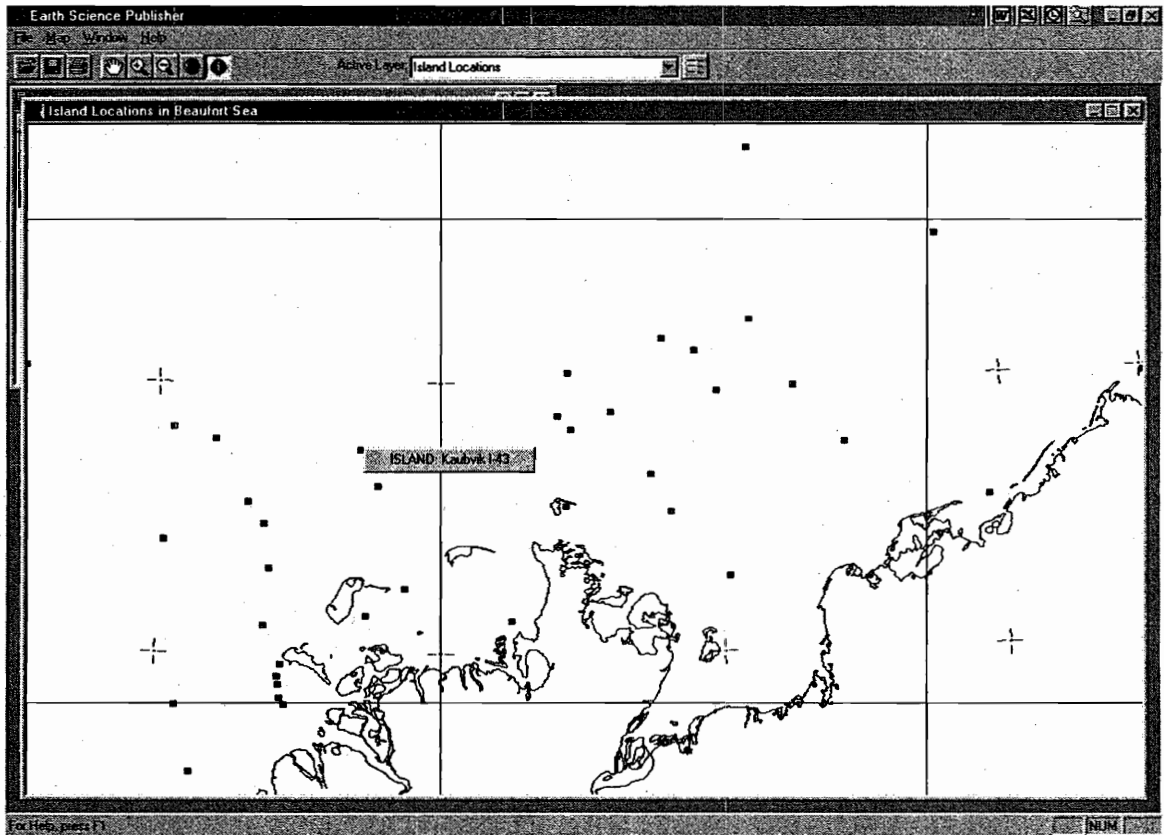
\\Beaufort Sea Islands - contains the ESP project file, and all the island data files.

\\Beaufort Sea Islands\ESP Viewer - contains the viewing software.

\\Beaufort Sea Islands\Island Data - contains the CPT data for applicable islands.

\\Beaufort Sea Islands\Reports - contains the four reports in HTML format with associated figures. The file "*Introduction.htm*", which can be used to access the four reports, is located in the *\\Beaufort Sea Islands* directory.

To illustrate the operation of the database, a number of screenshots are provided from the program on the following pages:

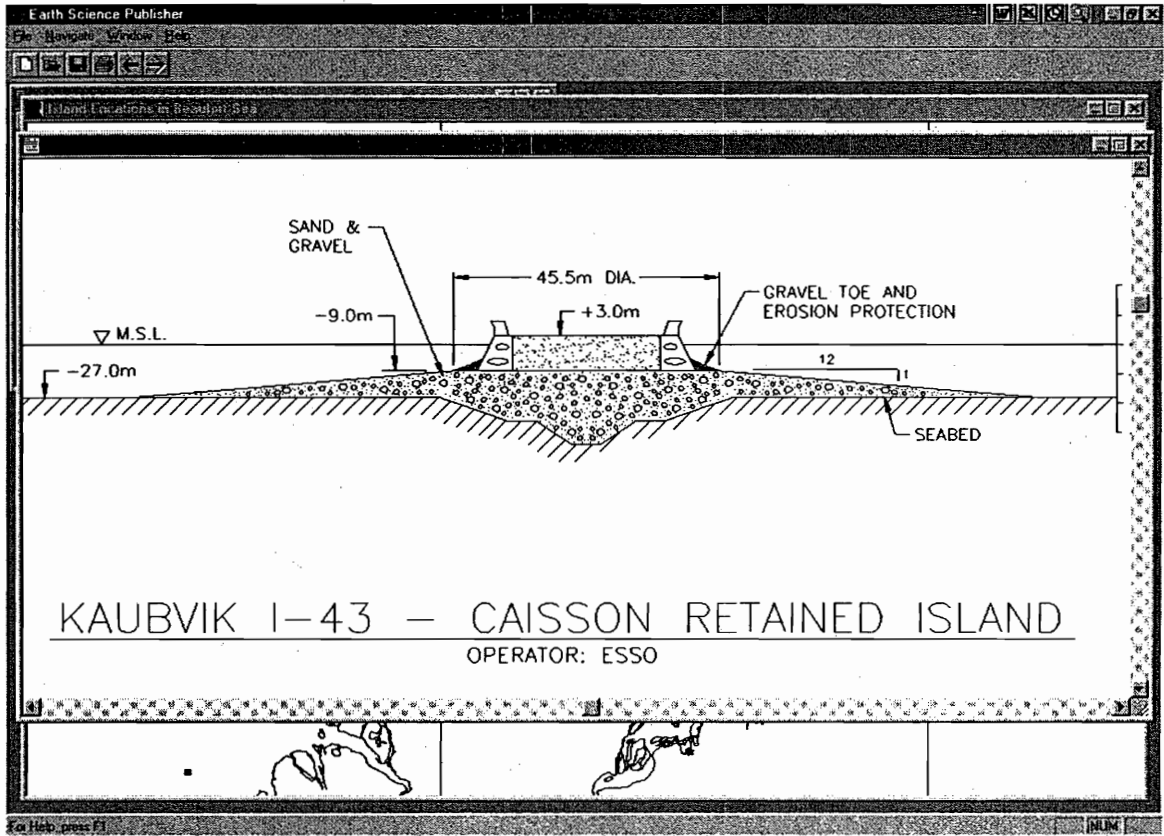


Initial view showing island locations in the Beaufort Sea.

The screenshot shows a software window titled "Earth Science Publisher" with a sub-window titled "Island Locations in Beaufort Sea". The main content area displays a datasheet for "Kaubvik I-43". Below the datasheet is a map of the Beaufort Sea region with a grid overlay. A small black square on the map indicates the location of Kaubvik I-43.

Island Name	Kaubvik I-43			
Operator	Esso			
Water Depth	17.9 m			
	UTM N	7751919	Latitude	69.875833
	UTM E	483776	Longitude	135.422028
Island Type	CRI			
Construction Method	Glory hole excavated prior to berm construction. Trailing suction hopper dredge used, sand bottom dumped on site.			
Borrow Area	Ukalerk, Isserk, Issgak			
Fill Material	sand gravel toe			
D50	0.075 to 75 mm			
Fines Content	n/a			

Island datasheet accessed by right-clicking on island location.



Typical island image

ISLAND	OPERATOR	MD NORTH	MN EAST	LATDEC	LONGDEC	WATERDEP
1 Inuvik E-48	Esso	7723210	492972	69.6189	135.1807	3
2 Adigo F-28	Esso	7705112	466536	69.4546	135.8543	2.1
3 Pullen E-17	Esso	7740302	525907	69.7711	134.328	1.5
4 Unak L-24	Sun	7716497	514941	69.5583	134.6166	1.3
5 Peely B-35	Sun	7717762	484774	69.5697	135.3908	2
6 Netserk B-44	Esso	7715886	463632	69.5508	135.9327	4.5999
7 Adigo P-25	Esso	7700778	466961	69.4158	135.8416	1.5
8 Adigo C-15	Esso	7693396	467902	69.4036	135.8175	1.5
9 Netserk F-40	Esso	7727631	464854	69.6563	135.9058	7
10 Sarpik B-35	Esso	7699621	445579	69.4019	135.3861	4.2999
11 Ikaitok J-17	Esso	7685723	448527	69.2779	136.3036	1.5
12 Kugnellik H-59	Esso	7726225	559655	69.6391	133.4636	5.2999
13 Adigo J-27	Esso	7703675	466787	69.4417	135.8474	1.8
14 Arnak L-30	Esso	7747019	543381	69.829	133.8725	8.5
15 Kannek G-42	Esso	7769814	415533	70.0233	131.2155	8.5
16 Isserk E-27	Esso	7758902	524131	69.9388	134.3696	13
17 Issungnak O-61	Esso	7767726	526213	70.0168	134.3133	19
18 Issungnak 20-61	Esso	7767705	526151	70.0166	134.3134	19
19 Alek P-23	Esso	7754063	582939	69.8824	132.8394	11.6
20 N. Protection Island	Dome	7768878	643959	69.9527	131.2351	4.5999
21 W. Atkinson L-17	Esso	7743427	612790	69.776	132.0756	6
22 Tarsut N-44	Gulf	7754563	454218	69.8961	136.1934	21
23 Uvik P-66	Dome	7797312	601236	70.2634	132.3132	29.6999
24 Ityok I-27	Esso	7759760	534880	69.9444	134.0886	15
25 Nerlerk B-67	Dome	7814900	562620	70.4334	133.3245	45.1

Tabular data form

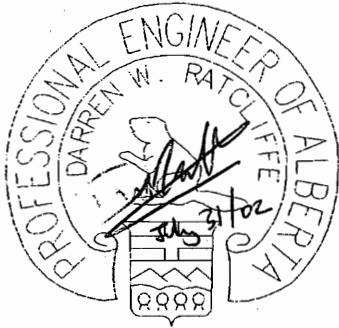
5. **CLOSURE**

This report summarizes the work undertaken to convert the four existing hard-copy reports of Beaufort Sea artificial island data into spatially enabled databases. CD-ROM discs are enclosed with the report that contain the databases..

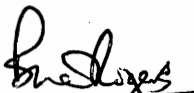
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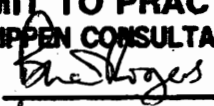
Respectfully Submitted,

KLOHN CRIPPEN CONSULTANTS LTD.



Darren Ratcliffe, P.Eng.
Senior Geotechnical Engineer


Brian Rogers, P.Eng.
Manager, Alberta

PERMIT TO PRACTICE KLOHN CRIPPEN CONSULTANTS LTD.
Signature <u></u>
Date <u>July 31, 2002</u>
PERMIT NUMBER: P 433 The Association of Professional Engineers, Geologists and Geophysicists of Alberta

APPENDIX I

Software Instructions

Two versions of the artificial island database have been provided. The ArcView database was produced using ArcView Version 3.2 and requires a licensed version of ArcView to be installed on the user's system. The Earth Science Publisher database is provided with its own viewing software (located in the \\Beaufort Sea Islands\ESP Viewer directory and can be installed by executing the "setup.exe" program).

After starting the ArcView application, a project should be selected from the \\Beaufort Sea Islands\Arcview directory. Three projects are available:

Arc_islands_C.apr
Arc_islands_D.apr
Arc_islands_E.apr

The project should be selected based on the physical location of the data file directories (the last letter of the filename denotes the drive letter, usually the CD-ROM drive). For example, if the project is opened from the CD, which is in the D: drive, the file to select is "Arc_islands_D.apr".

For the database to fully function as originally configured, the Internet browser must be Microsoft Internet Explorer located in C:\Program Files\Internet Explorer\. If this is not the case, then an internal script must be modified within the project file. This can be accomplished as follows:

1. Copy the appropriate ArcView project file to a directory on the user's hard drive (select the project with the drive letter which corresponds to the CD drive letter; e.g. If the CD drive is D:, copy *Arc_islands_D.apr*).
2. Remove the "read-only" attribute from the file (use the "Properties" menu in Explorer)
3. Start the ArcView application and select the project file that was just copied to the users hard drive.
4. Close the "Beaufort Sea Overview" view.

5. Select "Scripts" from the menu on the left hand side of the screen.

6. Click on "Link.HTML" and click on the open button.

7. About midway through the script is a line:

```
System.Execute("c:\Program Files\Internet Explorer\iexplore.exe" ++theVal)
```

Edit the path and the executable name for the default Internet browser on the users system (consult the Network Administrator if advice is required).

8. After the changes have been made, select "Script" from the top menu and click on "compile".

9. Close the Script box, and select "Views" from the menu on the left hand side of the screen.

Double-click on the "Beaufort Sea Overview" view, and then "Save" the project.