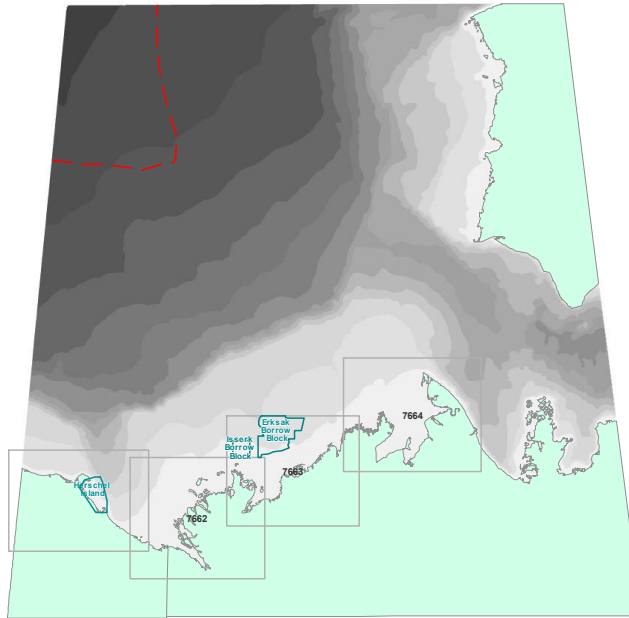


Review of Beaufort Sea Bathymetry and Granular Resource Studies



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March 2008

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Introduction

The search for new sources of oil and gas beneath the Canadian Beaufort Sea in the 1970's and 80's lead to the construction of 37 bottom-founded exploration structures that utilized about 40 million cubic meters of granular (mostly sand and gravel) material as base or core fill. As part of the Northern Oil and Gas Action Program (NOGAP), a considerable body of information on potential seabed granular resource that might be required for subsequent exploration and production structures was obtained prior to the mid-1990's.

With the environmental review of the proposed Mackenzie Gas Project nearing completion, a renewal of exploration activities in the Beaufort Sea is anticipated. The most recent call for bids for exploration rights included three areas, one of which produced a record high bid. It is, therefore, considered prudent to review and upgrade the available reference information, specifically regional bathymetry, and granular resource information for the three main areas of known resources.

Objective

The objective of this project is to review and upgrade selected information on the regional bathymetry of the Canadian Beaufort Sea and three known granular resource study areas.

Summary

- A total of 24 granular resource reports were examined for the potential to extract pertinent high level granular resource information for inclusion in the Beaufort Sea Granular Resource Inventory.
- The availability, processing and presentation of bathymetric data, for both the greater Beaufort Sea area, and the nearshore regions, was also examined and evaluated.
- Data from three granular resource study areas were evaluated, restructured and reprocessed for inclusion in the BSGRI. The study areas include Herschel Island, and the Isserk and Erksak Borrow blocks.
- The approach taken considered how similar types of information may be extracted from reports of other granular resource study areas with reasonable effort.
- This review presents several options and recommendations for the extraction, processing and inclusion of data from other granular resource studies including representations in the current MapGuide system, as well as in Google Earth.

Review of Granular Resource Data

- Data contained in twenty-four reports, and associated scanned map sheets, were reviewed for possible inclusion in the BSGRi. Among all reports reviewed, those considered for additional inclusion in the BSGRi are limited to the Yukon Shelf, Issigak, Banks Island and King Point granular resource study areas.
- All reports vary in terms of the time and author of study, and the data and methodologies used for the analysis and interpretation of granular resource potential of the respective areas.
- Due to the legacy nature of these reports and primary input data (some dating back to the 1980's), complete conversion and inclusion of all primary input data into the BSGRi would be an enormous undertaking.
- However, pertinent 'high level' information, such as the identification of key granular resource areas, and some granular resource surface maps (e.g. isopach maps to particular granular materials, surficial sediment maps), can be extracted from these reports with moderate effort.
- The approach taken in this review focused primarily on maps and associated data tables pertaining to identified granular resource areas to which are regarded the most directly relevant for inclusion in the BSGRi.
- Data extracted can be included in the BSGRi for use in conventional GIS (e.g. ArcView), within the existing Web-based platform (MapGuide), and may also distributed through alternative Open Source (CGDI) and new 3-D interfaces such as Google Earth.
- This review examined how granular resource information may be included in the BSGRi by examining the requirements for (re-)structuring and processing of these data for the identified BSGRi interfaces and other distributed platforms.
- The three study areas for which digital data is readily available include Herschel Island, and the Isserk and Erksak Borrow Blocks. These data were re-processed and re-structured and implemented in the BSGRi.
- Several other study areas for which additional data may be added to the BSGRi were evaluated and summarized below.

Implementation in the BSGRi

The results of this review are presented along with the attached PowerPoint presentation (Appendix A) that contains a number of screen captures of the data views in the BSGRi.

Bathymetry

- The IBCAO Bathymetric data was remodelled into a raster format (Figure 1). This presents a consistent presentation of the major marine physiographic regions for the greater Beaufort Sea.
- Four CHS digital CHS Charts are available as indicated in Figure 1. The CHS have recently changed their licensing and distribution services for this data, and further effort is required to determine how to access and licence the use of these charts for the nearshore regions of the Beaufort Sea.

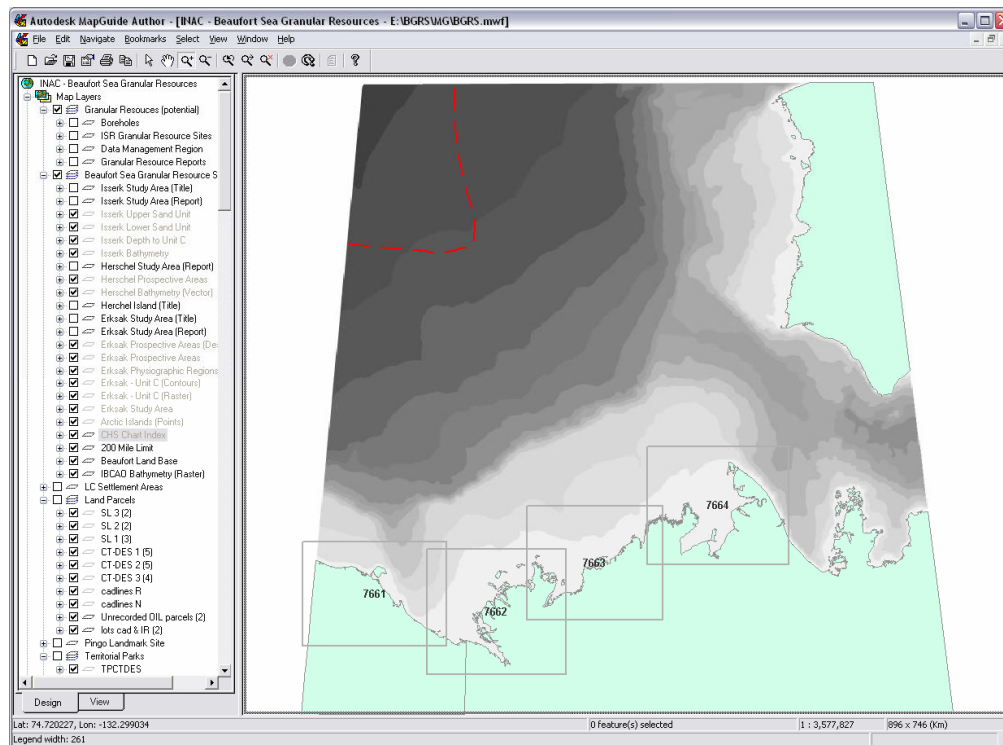


Figure 1. Regional IBCAO bathymetry and index of available CHS charts for the Beaufort Sea

Granular Resource Study Areas

- The boundaries for the study areas contain direct links to the on-line reports as an embedded URL. In the current implementation, selecting the study areas provides a direct link to the on-line .pdf report. Modifications to the on-line query code will be required to link to multiple reports in the ASTIS database.
- The three granular resource study areas show a combination of local bathymetric contours (derived directly from supporting geophysical surveys), isopach maps to pertinent granular resource materials, and identified granular resource deposits (Figures 2, 3, 4 and 5).

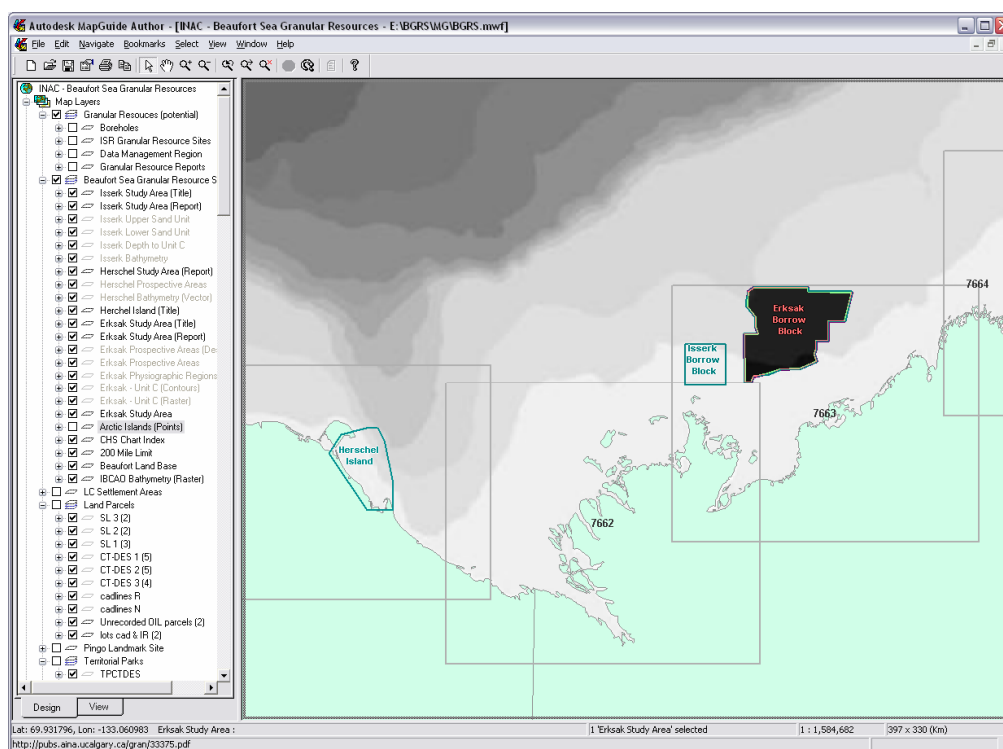


Figure 2. Location of three granular resource study areas included the BSGRI.

- This information can be shown along with boreholes, oil and gas wells, petroleum titles, environmental sensitivity information, and other reference layers included in the larger ISR MapGuide database.
- The same data can be shown through both the current MapGuide interface as well as in Google Earth (Figures 5 and 6). In some cases, it is beneficial to have some vector/contour data shown in a raster format, as is shown for the 'Depth to Unit C' isopach map for the Erksak Borrow Block. Key attributes for identified proven, probable and prospective areas can be quickly viewed through both display options.

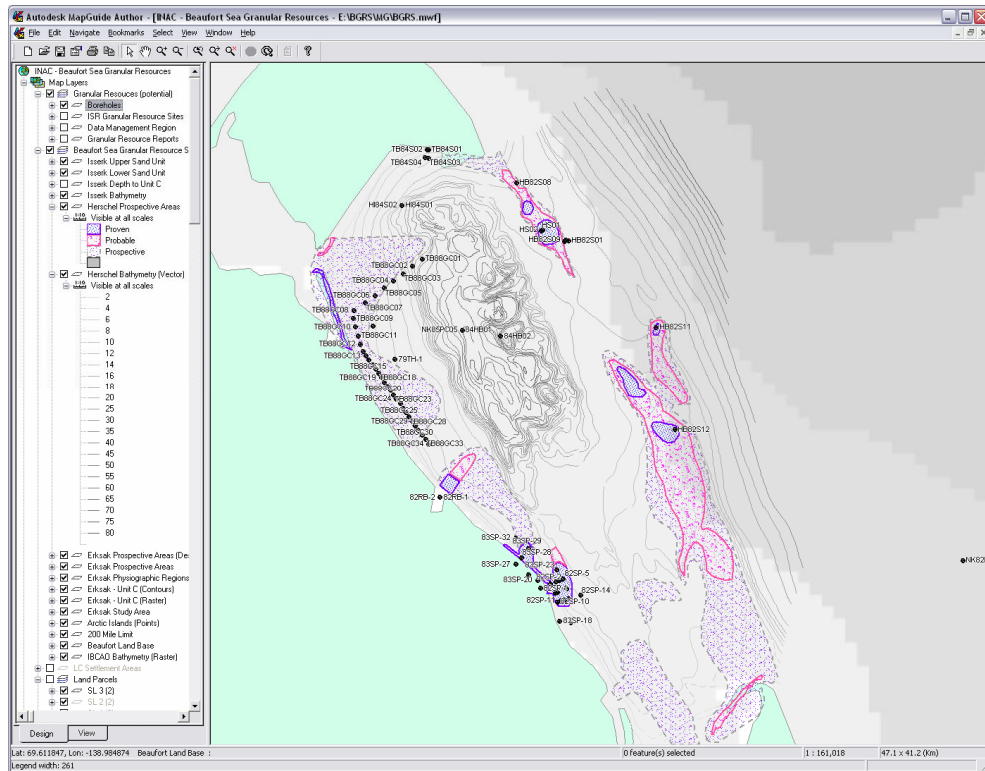


Figure 3. BSGRi showing data for the Herschel Island area.

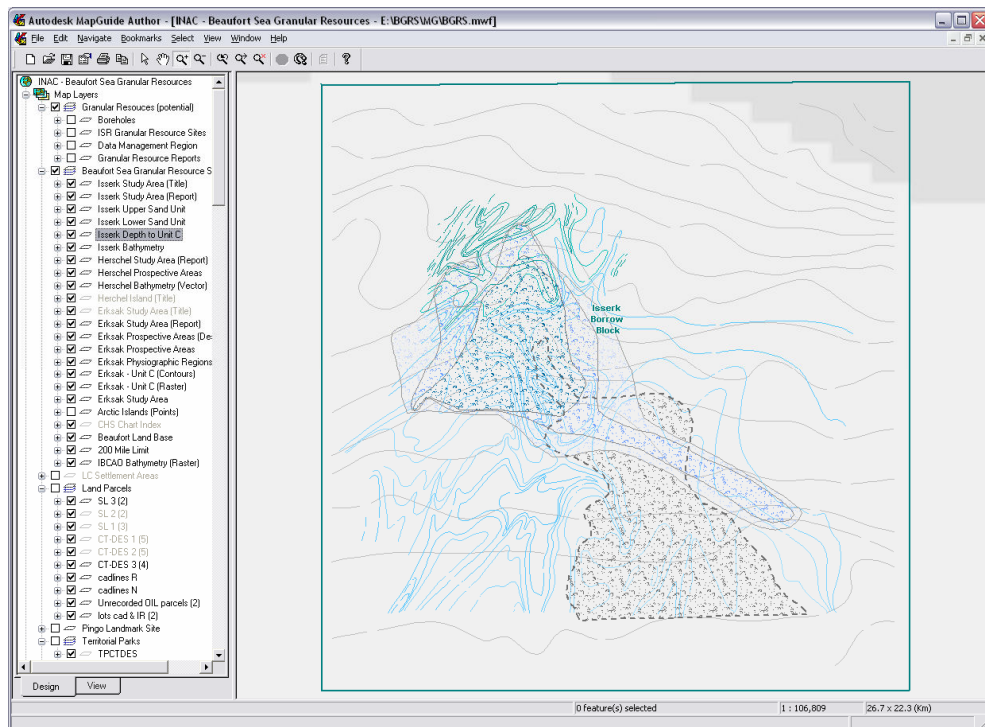


Figure 4. BSGRi showing data for the Isserk Borrow Block.

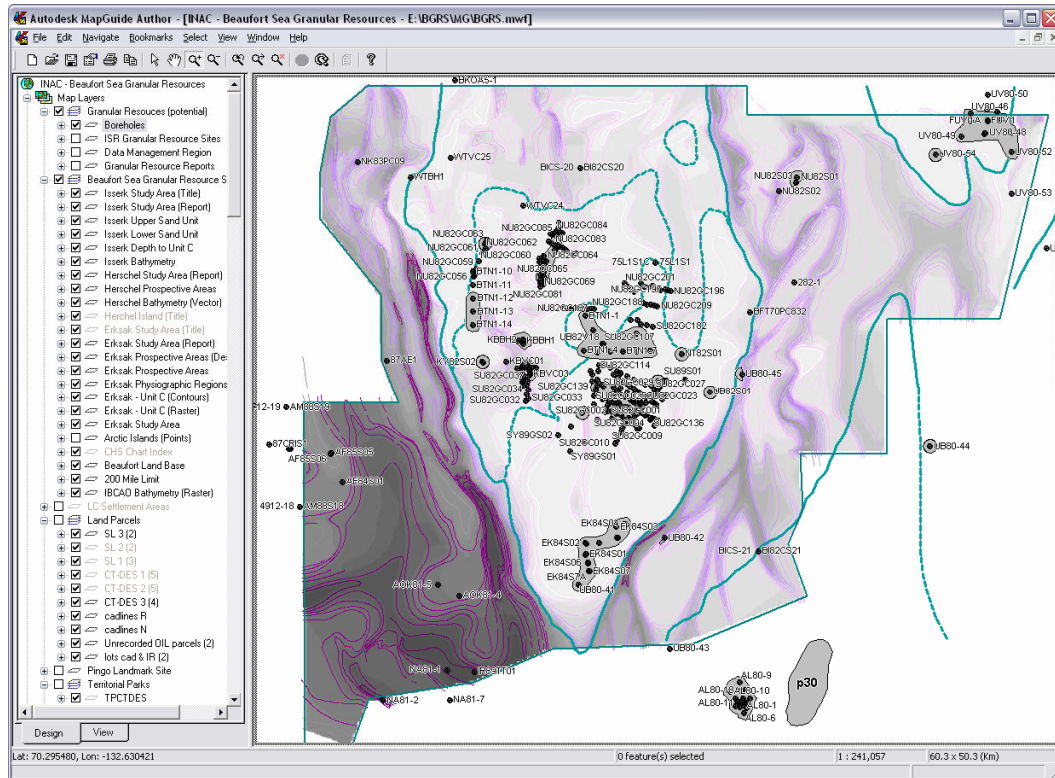


Figure 5. BSGri showing data for the Erksak Borrow Block.

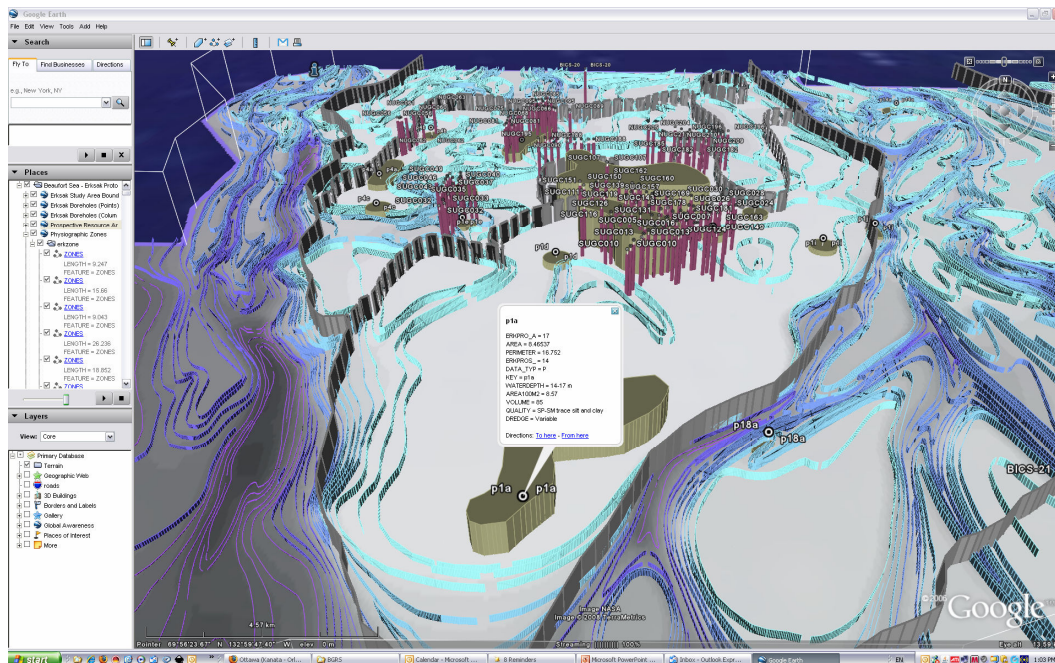


Figure 6. BSGri showing data for the Erksak Borrow Block in Google Earth.

Review and Evaluation of Additional Study Areas

- Whereas digital data for the Herschel Island, Isserk and Erksak borrow blocks was readily available for inclusion in the BSGRi, data for other granular resource study areas is not readily available. It has been determined from a review of existing reports that the approach requiring the least amount of effort for capture and entering in the BSGRi will involve digitizing data from the existing reports.
- The level of effort required in extracting and (re-)processing data from the existing reports is expected to be variable depending on the availability and quality of original maps and figures.
- The granular resource study areas for which data may be considered are summarized as follows:

Study Area (Report No.)	Description of maps and data that may be included in the BSGRi
Yukon Shelf (33378)	<p>Data from Figures 4, 5, 6, 9 and 10 contain pertinent information similar to the type of information implemented for the three current study areas. It is recommended that the following maps/figures be considered for conversion and implemented in the BSGRi (with level of effort indicated – low, moderate, high):</p> <p>Figure 4 – Bathymetry – (high) Figure 5 – Physiographic Regions – (low) Figure 6 – Bottom Sediment Types – (low-moderate effort) Figure 9 – Surficial Seismo-Stratigraphy – (moderate) Figure 10 – Granular Resources – (moderate-high)</p> <p>In all cases, access to digital version of original full-scale figures will mitigate against misinterpretation and georeferencing of data.</p>
Issigak Borrow Block (33380 and 35311)	<p>Report # 33380 contains scaled-down replicated of maps and data included in report # 35311. It is recommended that the maps in report 35311 be used, and that the following be considered for conversion and inclusion in the BSGRi:</p> <p>Figure 2.4 – Detailed Bathymetry – (moderate) Figure 3.4 – Physiographic Regions – (low – however, regions are not clearly delineated) Figure 4.8 – Surficial Sediment (from side-scan sonar interpretation) – (moderate-high) Figure 4.9 – Granular Resource Zones (proven, probable, prospective areas delineated) – (low to moderate) Figure 5.1 – Borrow Thickness Isopach – (low-moderate)</p>
Banks Island (33383 and 35163)	Limited data as compared to other study areas. Granular resource sites identified in Figure 2 and described in Table 2 can be captured and entered in the BSGRi.
King Point (20733a/b)	Existing digital version of maps and data in this report are of poor quality. Bathymetry map shows no projection information (which is required for digital conversion). Most other maps are black-out due to scanning errors. Original report is required for further evaluation.

Conclusions and Recommendations

1. High level, pertinent granular resource data and information can be captured and implemented in the BSGRi with moderate effort. The type of data included for the three study areas included in this review (Herschel Island, and Isserk and Erksak Borrow Blocks) included bathymetric and isopach maps, physiographic regions, and identified granular resource areas/deposits. Summary table information associated with granular resource areas can also be directly linked in the map interface.
2. Similar data is available and can be extracted from existing reports for the following additional study areas:
 - Yukon Shelf
 - Issigak Burrow Bock
 - Banks Island (to a lesser extent)
3. In technical interface terms, BSGRi data can be implemented in both MapGuide and Google Earth, as well as be made available in conventional GIS formats (ArcView).
4. This review makes the following recommendations:
 - Conduct further detailed review of the technical interface functionality in both the MapGuide and Google Earth interfaces. A comparative analysis of performance, visualization, data access and use by various clients of the BSGRi will be beneficial.
 - Further investigation is required to gain access to and implement the available CHS charts identified.
 - It is recommended that work proceed on capturing and entering the data for the three additional study areas identified above.

APPENDIX A

POWERPOINT PRESENTATON



Beaufort Sea Granular Resources Inventory (BSGRi): Web GIS Implementation

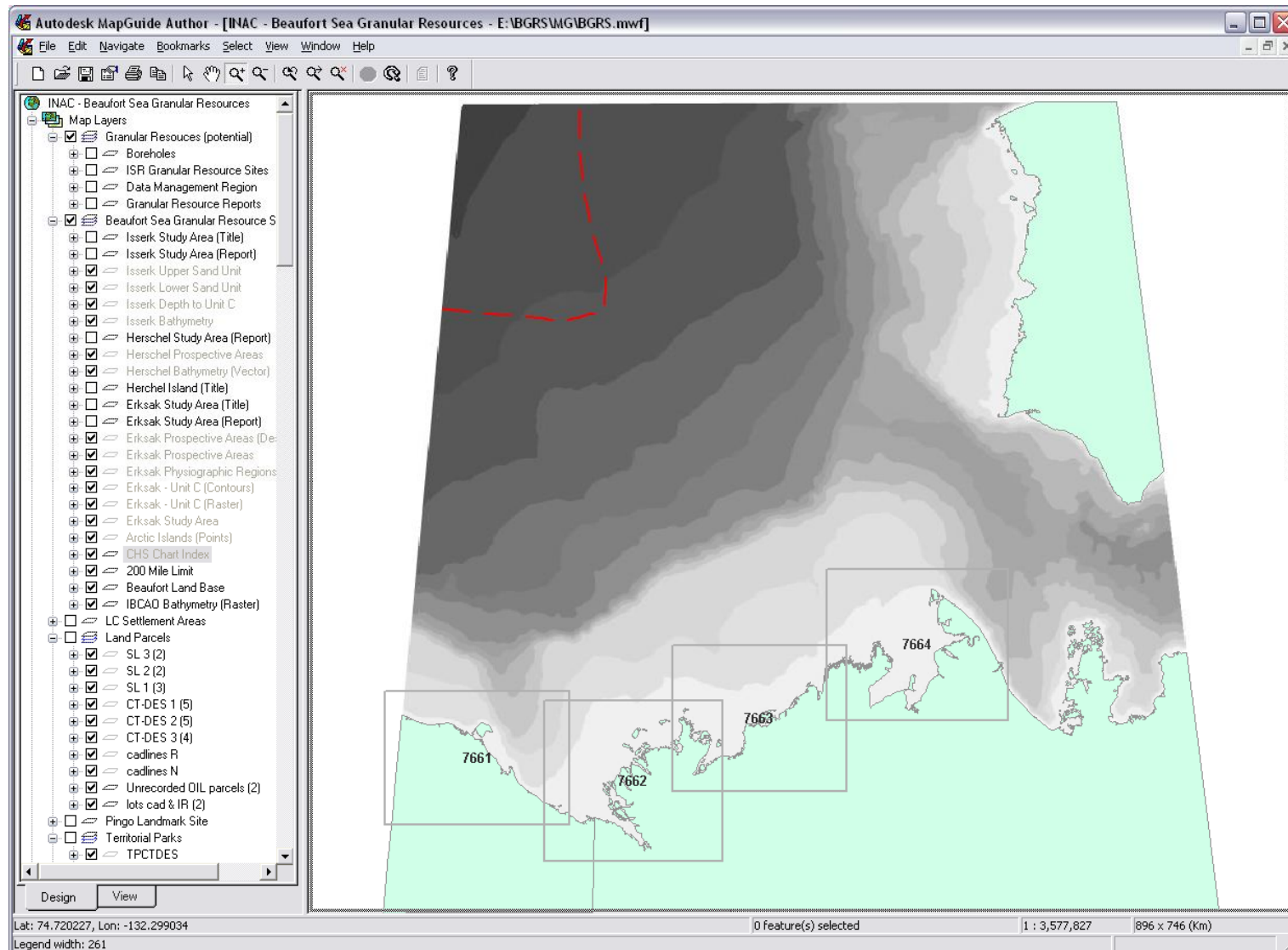
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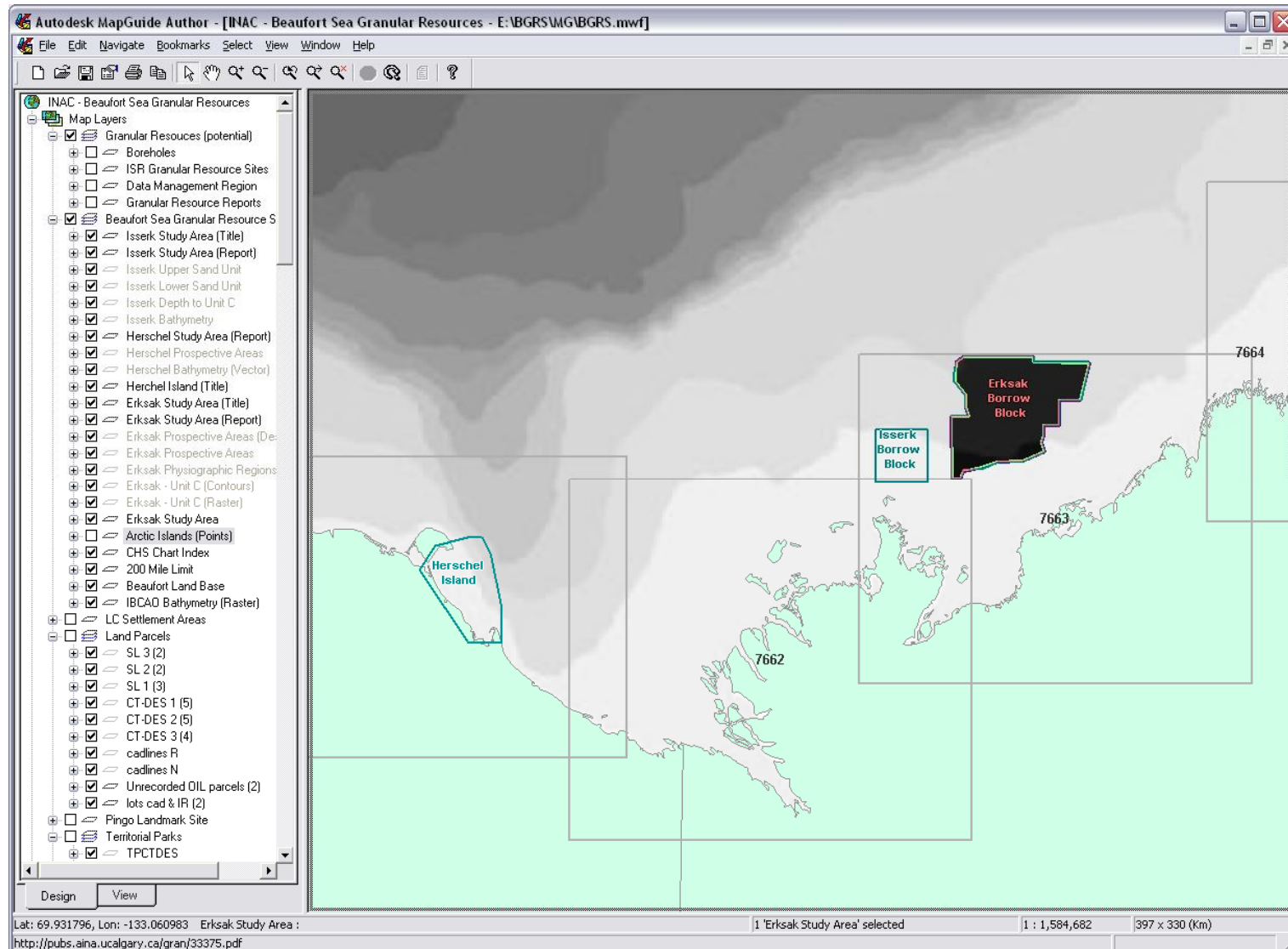
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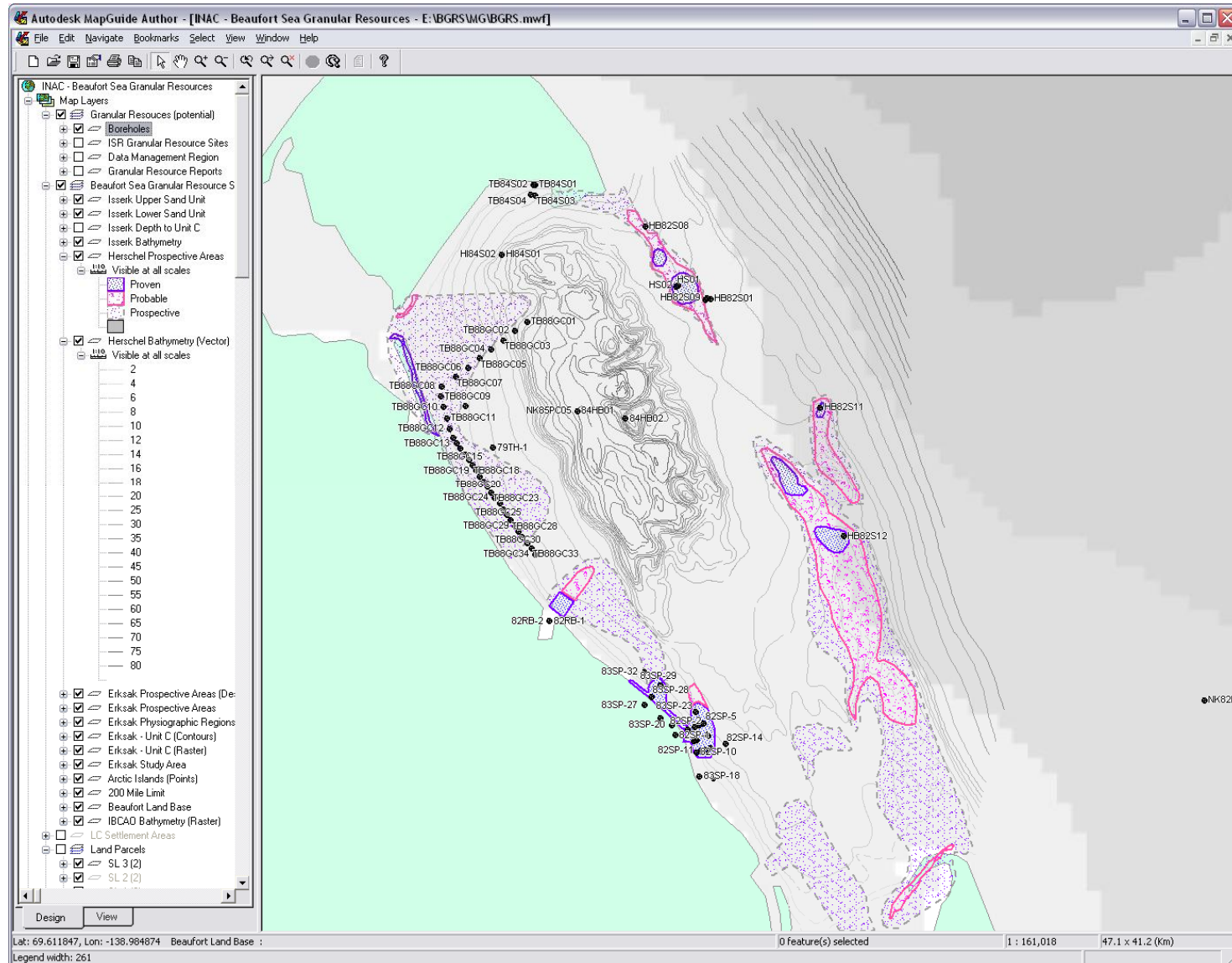
IBCAO Bathymetry and CHS Chart Index



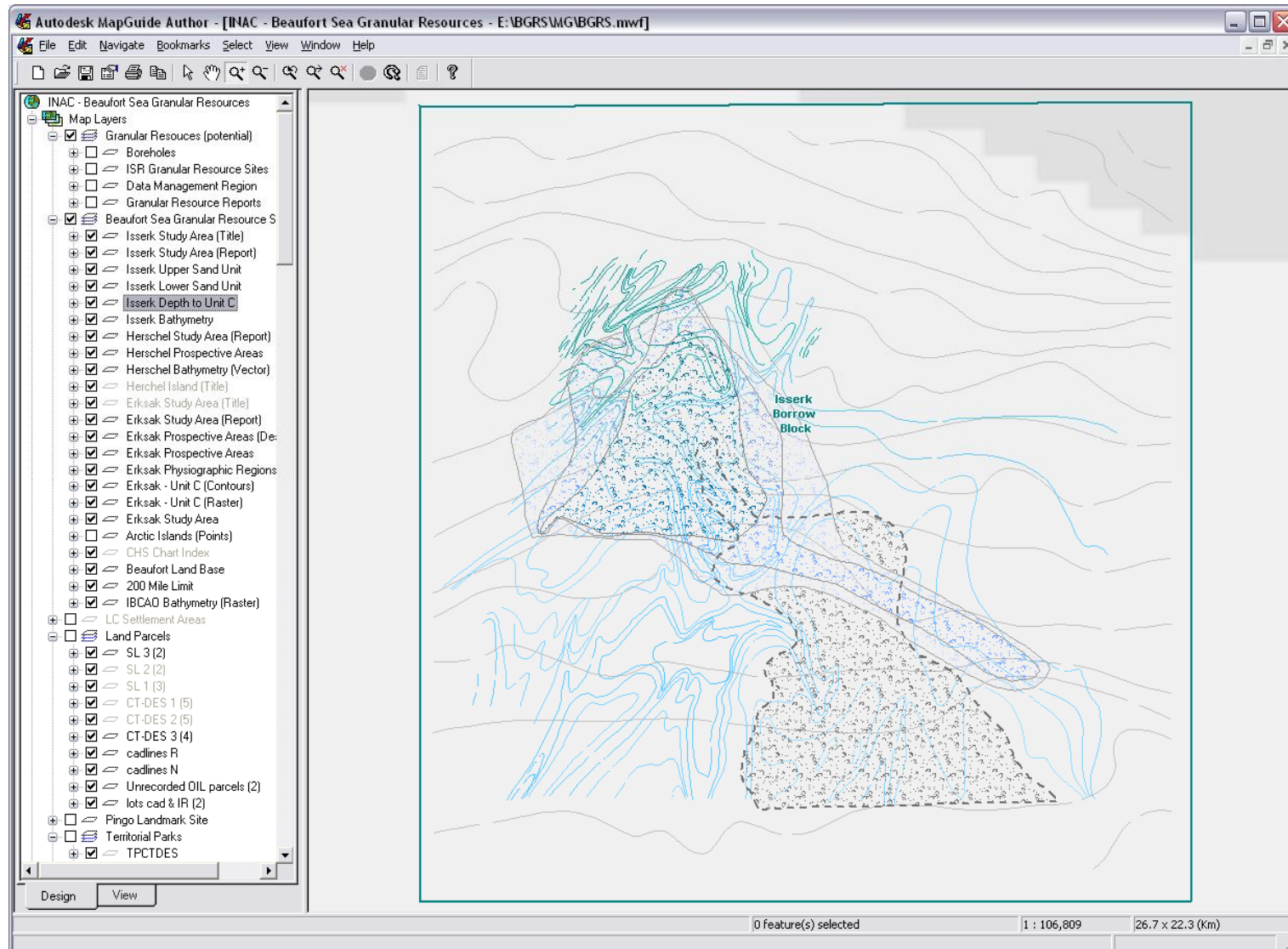
Study Area Locations



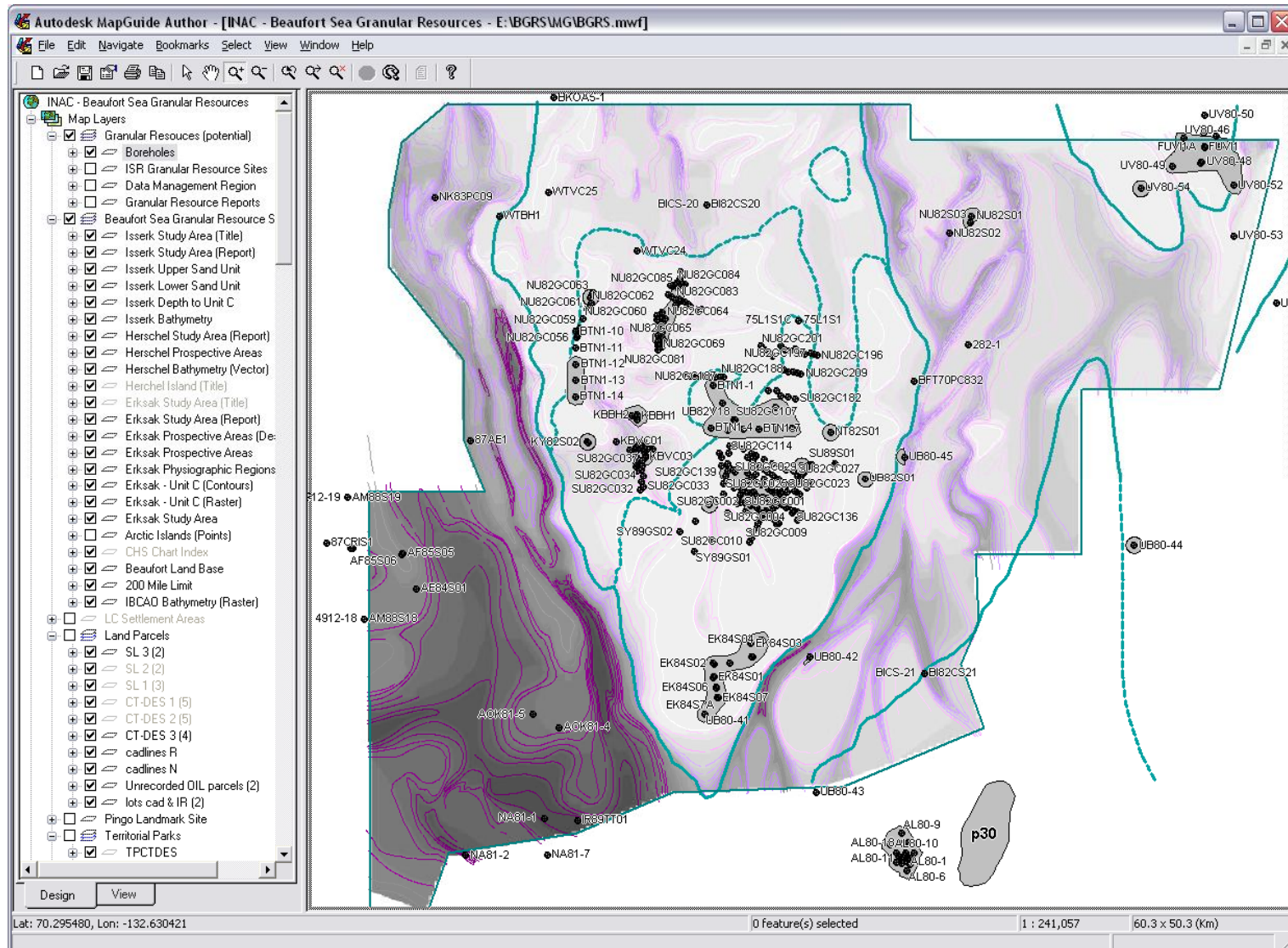
Herschel Island – Granular Resources



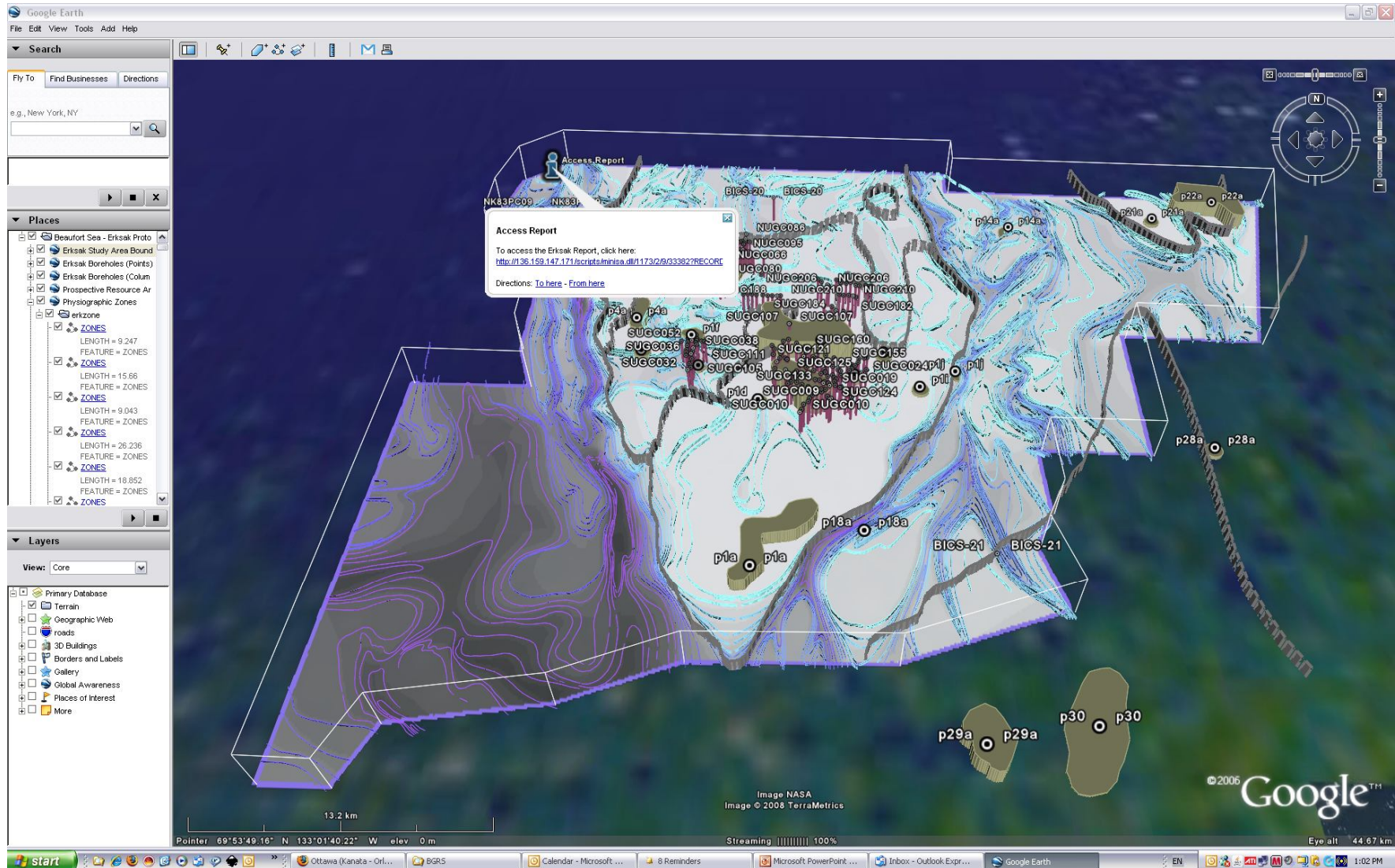
Isserk Borrow Block – Granular Resources



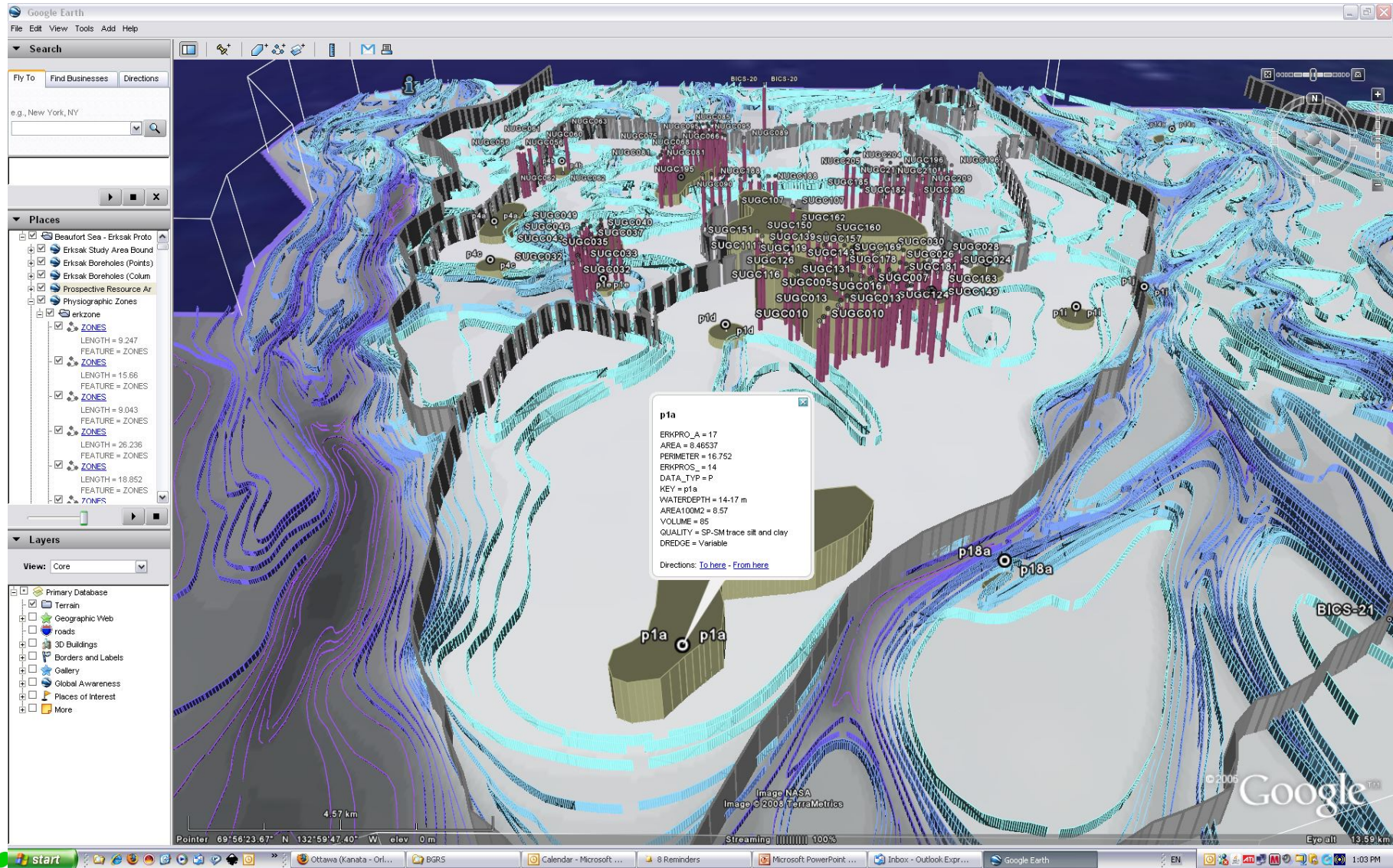
Erksak Borrow Block – Granular Resources



Erksak Data in Google Earth – Reports



Erksak Data in Google Earth – Prospects





Beaufort Sea Granular Resources Mapping System (BGRS): Review of Granular Resource Studies