# 47th Meeting of the US-Canada Hydrographic Commission

## Canada's National Report

May 2024

Canada

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## Executive Summary

This report to USCHC47 provides a summary of Canadian activities since the previous USCHC meeting with a lens on digital transformation in preparation for S-100



Canada

# 1. Hydrographic Office

## 1.1 Role of the Canadian Hydrographic Service

The Canadian Hydrographic Service (CHS) is part of the Department of Fisheries and Oceans Canada (DFO) and is primarily responsible for hydrographic activities in Canadian waters. The responsibilities of the CHS include: ensuring Canada's sovereignty by determining maritime zones and boundaries; monitoring tides, currents, and water levels to predict climate change, natural hazards, and ensure safety; creating nautical charts which guide mariners with details like shorelines, depths, and navigation aids; and surveying and recording ocean, lake, and river details for safe navigation. The CHS maximizes opportunities with Canadian Coast Guard (CCG) ships to conduct regular field surveys, especially in higher risk and priority areas, to maintain crucial hydrographic and oceanographic data. By doing so, the CHS ensures safe navigation and contributes to the well-being of mariners and the environment.

## 1.2 Organization of the Canadian Hydrographic Service

The CHS is made up of five regional offices, covering Canada's vast land and marine territory: National Capital Region (Headquarters); Pacific; Ontario, Prairie and Arctic; Quebec; and Atlantic (Figure 1).

Please note the following new appointments:

(1) Manon Larocque has been appointed as the Director General of the Canadian Hydrographic Service, replacing Dr. Geneviève Béchard;
(2) Mariah McCooey has been appointed as Regional Director of CHS Pacific Region, replacing Mark Leblanc;
(3) Lynn Patterson has been appointed as Regional Director of CHS Atlantic Region, replacing York Friesen; and
(4) Sonja Bhatia has been appointed as the Senior Advisor and IHO Liaison, replacing Doug Brunt.

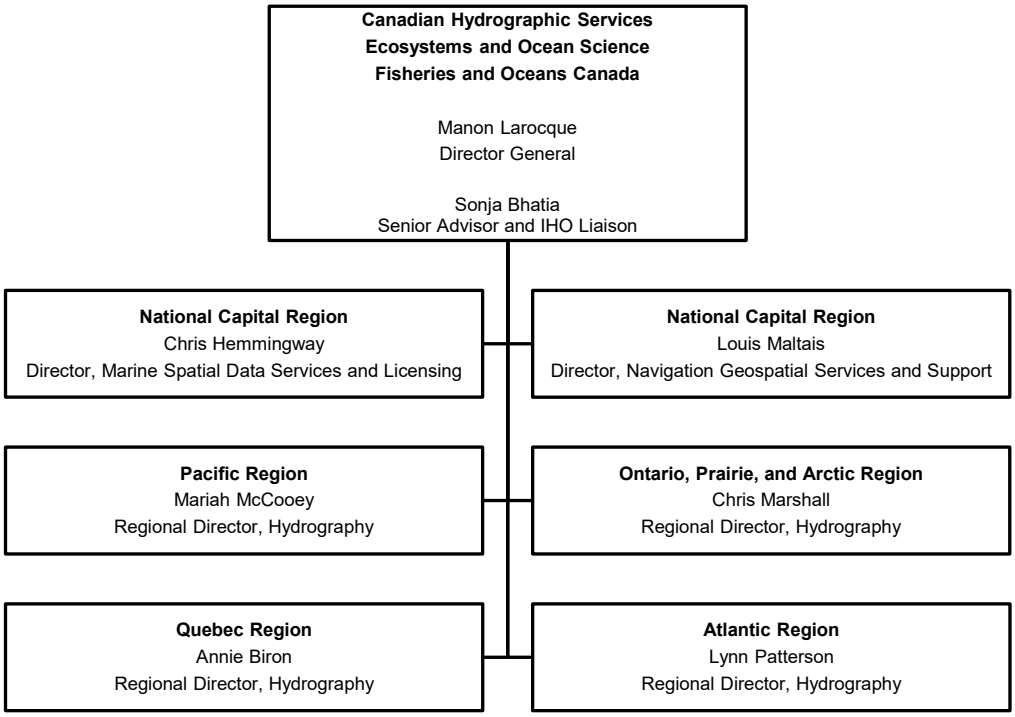


*Figure 1. Organizational Structure of the Canadian Hydrographic Service*

### 1.3 CHS Digital Transformation

Like many hydrographic offices around the world, the CHS is undergoing a digital transformation. This transformation touches all aspects of our organization, from our workforce and workplace to our data management (Figure 2).

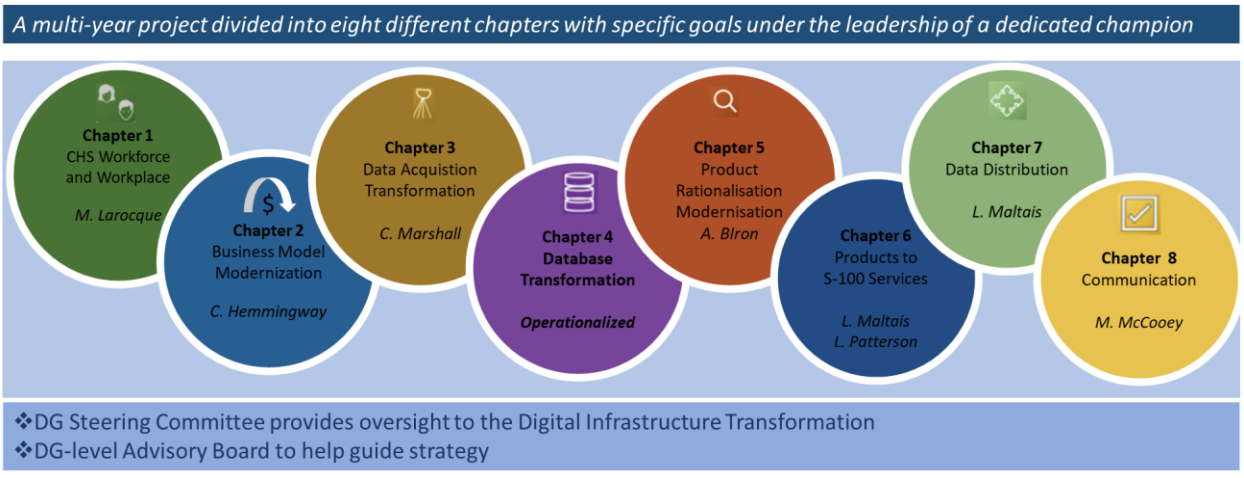


*Figure 2. Organization of CHS Digital Transformation*

### 1.4 Ocean Protection Plan II

In the summer of 2022, the Canadian Government announced a renewal of the Ocean Protection Plan (OPP). Under the renewed program, the CHS will receive an investment of $84 million over a period of 9 years to deliver on two key initiatives:

**(1) Advancing Arctic surveying and charting:** continue to survey and chart to increase coverage and fill gaps; leverage innovation including: increased use of automated data processing, space-based remote sensing applications, uncrewed and autonomous surface and subsurface systems.

Progress to date:

- 48.6% of the proposed primary and secondary low impact shipping corridors (LISC), or 255,313.8km², have now been surveyed. This includes 3.9% modern bathymetric coverage added in 2023. This was done with a mix of CCG Icebreakers, contracted surveys, and a dedicated vessel charter.
- 15% of the 500 Electronic Navigational Charts (ENC) required to cover the proposed primary and secondary LISC have now been achieved (including 25 Electronic Navigational Charts released last year and 52 this year). This equals 30% of the ENCs targeted by the OPPII 5-year goal. These new ENCs create the digital foundation upon which future S-100 services will be built.

**(2) Community Based Hydrographic Data Collection and Use**: to empower Indigenous and coastal communities to collect and use hydrographic data, builds on some of the recent pilot projects and initiatives by the CHS to expand the organization's use of crowd sourced bathymetry.

Progress to date:

- Significant initiatives have been developed with 4 communities and 6 collaboration agreements have been established.

## 2. Survey

The CHS performs surveys to collect and provide hydrographic information and products to support safe, efficient, and sustainable marine navigation in Canadian waters. Some select surveys of interest in 2023 included:

- Bathymetric survey operations conducted throughout the interconnecting waterways of Detroit, St. Clair and St. Mary's Rivers in support of CCG waterways maintenance/dredging operations and incident response (Figure 3 a, b);
- Victoria Channel on the approaches to the Port of Thunder Bay due to feedback from the Great Lakes Pilotage Authority that there was increased liner traffic at key locations along the Great Lakes (Figure 3 c).
- CHS Surveys around Vancouver Island (Figure 4)

The CHS also performed surveys in a number of areas including:

- In the Pacific Region, Boundary Bay, Sand Heads, Georgia Strait, Bute Inlet, Rennell Sound, Hippa Island, Portland Canal, Cartwright Sound, Swiftsure Bank, Amphitrite Bank, Earls Bay, Hotham Sound, Harmony Islands, Saltery Bay, Blubber Bay, Discovery Passage, Kliktsoatil Harbour, Cann Inlet, Long Inlet, Trounce Inlet, Kagan Bay, Rennel Reef, Kinkdakun Rock. Skidegate Channel, Long Inlet, Buck Channel, Kitasu Bay, Pulteney Point, Plumper Islands, Carrie Bay, Port Mellon, Halibut Bight, Rooney Bay, and Skidegate Inlet;
- In the Atlantic Region, Eastern Shore Islands, Port Joli, and the Port of Halifax;
- In Ontario and Prairie, Nipigon Strait and Lake Superior.
- In Quebec Region, North Shore & Gaspésie Peninsula, Cacouna-Bic.
- Arctic Survey work will be reported at ARHC14 in September 2024.

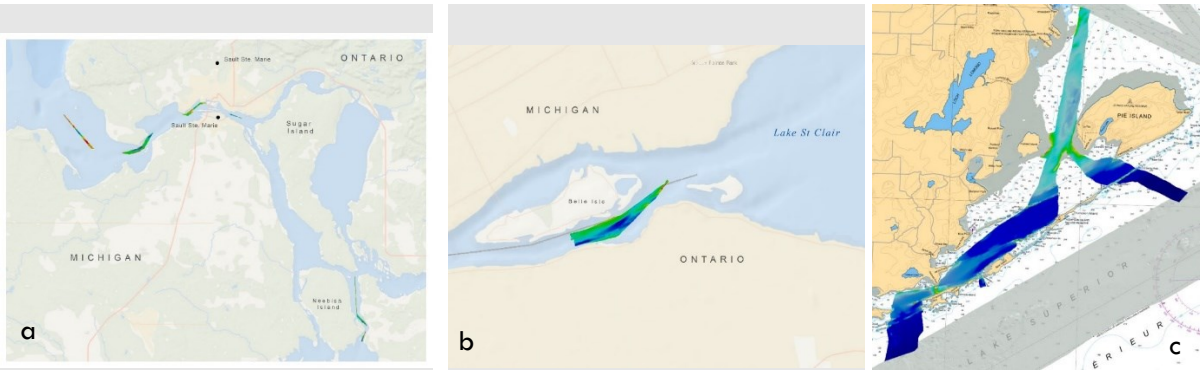


*Figure 3. Surveys in the Great Lakes (a) Sault Ste. Marie Area, (b) Detroit River, (c) Victoria Channel*

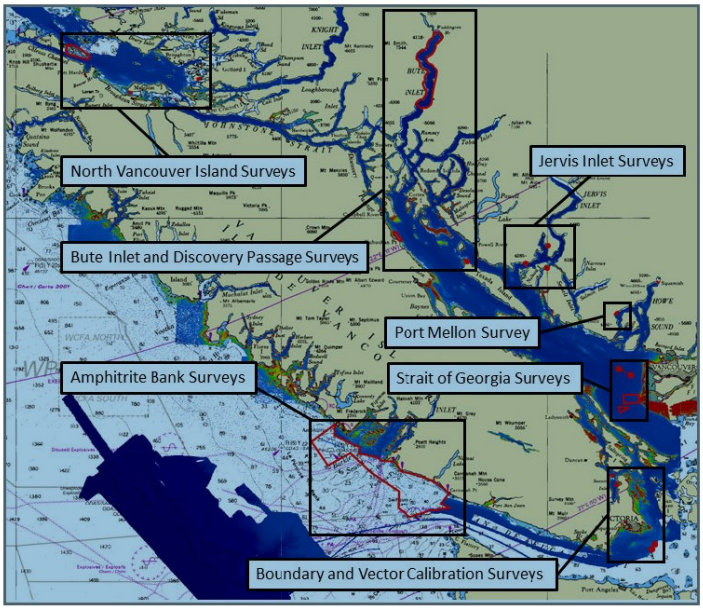


*Figure 4. Surveys around Vancouver Island*

# New Charts and updates

## 3.1 New Releases

Between April 1st, 2023 to April 15th, 2024, the CHS released 509 new ENC's, and 129 new edition ENC's, 9 new paper charts, 10 new edition paper charts and 1 Paper Chart 2.0 (elaborated on later in the report).

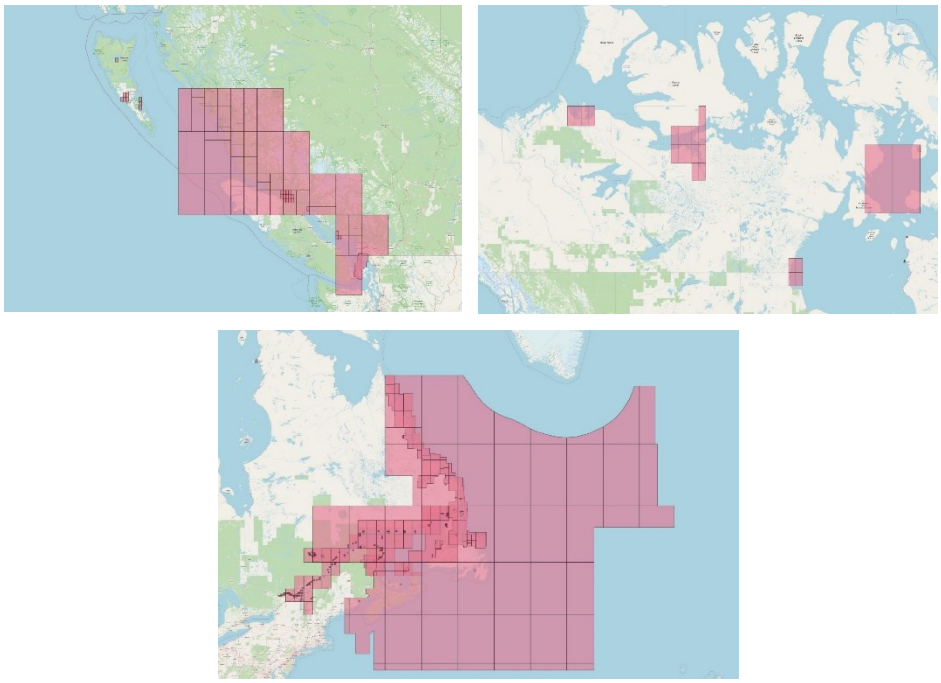

*Figure 5. New ENC's released since April 1, 2023.*

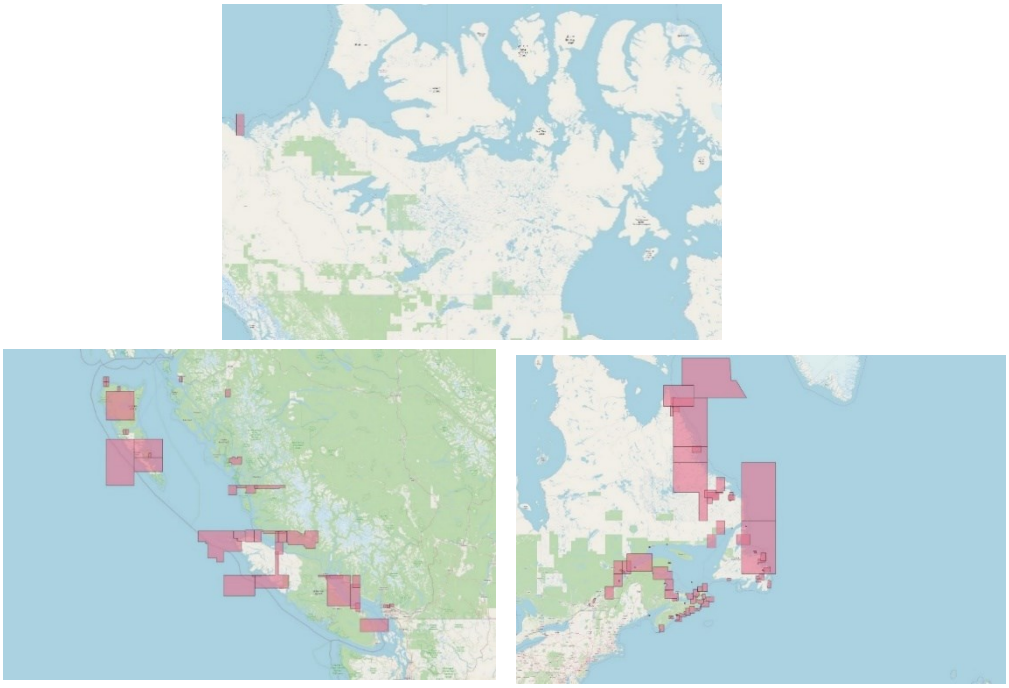

*Figure 6. New Edition ENC's released since April 1, 2023.*

*Figure 7. New Chart's released since April 1, 2023.*

*Figure 8. New Edition Charts released since April 1, 2023.*

### 3.2 Portfolio Modernization

In preparation for moving to S-101 ENCs, the CHS is modernizing its portfolio, and has begun retiring charts available in old formats in order to offer the most up-to-date formats. The CHS has completed the first two of three phases of cancellation of BSB raster charts in areas where sufficient ENC coverage exists. As of April 2024, 276 of the 810 BSB's have been canceled. The CHS will continue to link BSB cancellation to ENC generation on the grid. This approach ensures data being moved to the grid have been looked at, vetted and validated. Once those ENC's on the grid are known to maintain the same coverage as their BSB counterpart, the CHS will safely cancel the BSB. In addition, some regions have fully converted to the S-100 cell-based diagram (3 usages – port, transit, and overview).

### 3.3 Database Modernization

The CHS uses CARIS HPD, which is now compliant with S-100 standards. For the next few years, S-57 data will be mapped to S-101 products. The CHS has started to prepare source data for the S-101 mapping, and testing of the latest official version S-101 mapping will begin this summer.

### 3.4 Gridding

The CHS has established grids that are located south of the 68th parallel. In addition, in the lower Arctic, the CHS has established grids, which will include portions of the Eastern Arctic (Figure 9). In the High Arctic a rectilinear grid is being considered based on the recommendations of an external consultant. Due to the scarcity of charting in this area, there is

an opportunity for a common rectilinear grid. The Arctic Regional Hydrographic Commission Chair recently reported this to the Worldwide ENC Database Working Group and have asked Canada to consider moving forward with a partner to pilot such a grid to assess the feasibility of developing a common grid in the High Arctic.

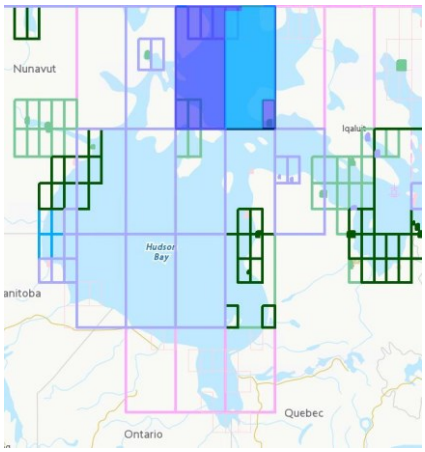


*Figure 9. Gridded ENC (dark green) and potential for gridding (light green) in Hudson and James Bay*

# 4 New publications & updates

## 4.1 International Hydrographic Review

The CHS recently released/collaborated on a number of articles posted in the International Hydrographic Review. These include:

- Canada's Answer to Marine Spatial Data Infrastructure (Nov 2023)
- They Hydrographic Geospatial Products and Services Committee (HGPSC) – Using technology to facilitate international collaboration on USA-Canada transboundary charting discussions (Nov 2023)

# 5 Maritime Safety Information (MSI)

## 5.1 Marine Communications and Traffic Services

Information on marine communications and traffic services (MCTS) in Canada is available at: https://www.ccg-gcc.gc.ca/mcts-sctm/index-eng.html

## 5.2 Navigational Warnings (NAVWARNs)

Canadian Coast Guard continues to operate the Navigational Warnings web site and subscription service which replaced the domestic Notice to Shipping (NOTSHIP) services. For further information please visit: http://nis.ccg-gcc.gc.ca/

### 5.3 Progress on S-124

Canadian Coast Guard (CCG) has created an S-124 export from its NAVWARN Issuing System (NIS) and created a technical service compatible with SECOM to test dissemination of these. Moreover, trials have been done with Australian Maritime Safety Administration (AMSA) to access the service and these showed the service was viewable. The phase trials are under way with CCG having under contract IIC Technology to create a tool to connect and ingest the data made available via the service. These tests are still underway (March 2024).

## 6 C-55

Canada is in the process of updating its C-55 information, including MSI and in collaboration with the US is streamlining its approach to reporting C-55 information.

## 7 Capacity Building

7.1 In 2022, the CHS embarked on the Community Hydrography project, a transformative initiative designed to enhance the collection and use of bathymetric data by coastal and Indigenous communities. Three communities were granted funding dedicated to data acquisition and application, enabling them to effectively pursue their individual objectives. The designated communities include:

- Community-based bathymetric and hydrographic data collection in the Qikiqtani region of Nunavut (Kinngait).
- Bathymetry and hydrographic data collection in support of Ecosystem Knowledge of Areas of Importance to Miawpukek First Nations.
- Community-driven bathymetric mapping in Tuktoyaktuk. To learn more about community hydrography at the Canadian Hydrographic Service, please click here.

## 8 Oceanographic Activities

### 8.1 CHS Bathymetric Gap Analysis update since USCHC 46

In order to align with the US methodology to provide a regional status, the CHS developed a bathymetric gap analysis using a series of spatial analytical tools performed on all of the Canadian bathymetric data holdings to derive data classifications to present an understanding of the extent of bathymetric coverage in Canadian waters. With the methodology recently updated, the following results have been obtained (based on April 2022 data):

- Methodology has been updated to apply a 100m x 100m grid which is consistent with the Seabed 2030 assessment method.

- Result of updated analysis show 86.4% of the 100m grid cells in Canadian waters are void of soundings.
- For the Great Lakes (Excluding St. Lawrence River), 75.46% of the grid are void of soundings. **This considers Canadian waters only**. *Note* this metric is reflective of the legacy data not yet loaded into the database

*Table 1. Results of Phase 1 version 2 – Data Driven method*

| Canada | | | |
|---|---|---|---|
| **Classification Name** | **Number of cells** | **Square kilometre** | **Percentage** |
| GAP - Void of Soundings | 508,028,872.00 | 5,080,288.72 | 86.41% |
| Minimal Coverage | 7,870,459.00 | 78,704.59 | 1.34% |
| Moderate Coverage | 1,437,563.00 | 14,375.63 | 0.24% |
| Full Bottom Coverage | 70,587,963.00 | 705,879.63 | 12.01% |

### 8.2 Binational International Great Lakes Datum (IGLD)

The binational IGLD Update project is currently underway. It is being managed by the Co-ordinating Committee on Great Lakes Basic Hydraulic and Hydrologic Data and its various sub-committees. While several components of the IGLD Update are ongoing, some key items are worth noting. They are as follows:

- 2024 is Canada's final year of seasonal gauging to support IGLD 2020 Update. Plan is to deploy and recover 7 seasonal gauges in Lake Ontario and the St. Lawrence River and obtain data from 5 gauges operated by other agencies along the St. Lawrence River.
- The 2023 IGLD Canadian seasonal gauging was successful: 11 seasonal gauges deployed and recovered.
- The 2022 Global Navigation Satellite System (GNSS) survey data is in final stages of processing.
- The 2018 to 2022 seasonal gauge data is being archived and will be available online. In addition, all the benchmark information for each of the archived station data is also updated in the database.
- A Low Water Datum Fact Sheet has been published (available here: *Low Water Datum – Great Lakes Coordinating Committee (greatlakescc.org)*)
- Work regarding the low water datum analysis continues; analysis to determine which time series and record length to use. This information will inform decisions needed for low water datum.
- The low water datum decisions will have an impact on charting products.
- A Standards Working Group has been formed to review operating, maintenance and leveling standards for water level data collection and document the standards. This group will also do some sensor comparisons and set out specifications for equipment.

- The provisional heights in the new reference frame, North American-Pacific Geopotential Datum of 2022 (NAPGD2022), will be available later in 2024, and the work on the hydraulic correctors is planned to be completed in 2024.

### 8.3 S-104 Water Levels and S-111 Surface Currents

Working with DFO and Environment and Climate Change Canada (ECCC) ocean modeling colleagues, the CHS has developed a multi-scale International Hydrographic Organization (IHO) standard S-100 file production approach to deliver S-111 and S-104 products at the following scales:

- In-transit (open ocean),
- Approach (shelf and coastal), and
- Nearshore, Port and waterway (high resolution)

Within this approach, lower resolution (down to 2.5 km scale) in-transit and approach scale S-100 products are derived from existing Regional Ice Ocean Prediction System (RIOPS) and Coastal Ice Ocean Prediction Systems (CIOPS-East, CIOPS-West) Nucleus for European Modeling of the Ocean (NEMO) models that were already fully developed within ECCC's 24/7 operational predication system environment. Medium to high resolution S-100 products are principally derived from six new NEMO-based Port and Waterway Ocean Prediction systems (POPS), relying on the existing ECCC CIOPS and high-resolution atmospheric model outputs for their boundary forcing, developed specifically to meet the dynamic electronic navigation (dE-nav) and enhanced oil spill response needs for these areas:

- Port of Metro Vancouver BC
- Fraser River BC
- The Kitimat Estuary BC
- The St. Lawrence River Estuary Que
- Port of Canso NS, and
- Port of Saint John NB

POPS employ several nested downscales, bringing spatial (grid) resolution down to 100, or even 20-30 meters in some cases. In addition, high resolution S-100 products for the upper St. Lawrence Estuary, between Quebec City and Montreal, are derived from an existing ECCC 2D high resolution Finite Element Operational Hydrodynamic Prediction System (OHPS) with resolution down to 7 meters in some areas.

POPS were developed though a multi-departmental cooperation, the Canadian Operational Network of Coupled Environmental Prediction Systems (CONCEPTS). CONCEPTS is a collaboration between DFO, ECCC, the Department of National Defense (DND), the Canadian Space Agency (CSA) and the National Research Council (NRC), https://science.gc.ca/site/science/en/concepts.

POPS presently represent the highest resolution, CONCEPTS supported, NEMO Prediction Systems. The pre-existence of the CONCEPTS collaboration, and its logical extension to

include consideration of dE-nav needs has been key for the parallel development of multiple new POPS solutions propagating forecast capability to small area, high resolution scales where required.

Standards, or 'fit for purpose' evaluation criteria, for model source data to feed dE-nav systems are not presently well defined or described. This suggests that for the immediate future many developing S-100 forecasting systems are likely to rely on pre-existing operational solutions initially created for other use, or to serve multiple purposes. Canada's new high-res POPS were developed with specific consideration of "fit for purpose" for both dynamic electronic navigational and oil spill response needs.

CONCEPTS prediction systems acceptance procedures for both new solutions, and solution updates, include several levels of internal evaluations and reviews considering aspects of both qualitative and quantitative model performance, run-time stability and efficiency, and consideration of solution 'fit for purpose'. POPS solutions also received an extensive Canadian Science Advisory Secretariat (CSAS) model review, including the first "fit for purpose" Canadian evaluation for E-nav services. This CSAS review included both external, expert-invited reviewers, and IHO Tides Water Levels and Currents Working Group observers.

# 9 Spatial Data Infrastructures

The CHS's Marine Spatial Data Infrastructure (MSDI) is currently in its sixth year and is in the process of planning for the next five years, working closely with Information Technology (IT) counterparts.

## 9.1 New Applications

The Canadian MSDI has facilitated the creation of over 40 applications including:

- Canada Marine Spatial Planning Atlas – Integrates data into a common platform, uses applications to perform geospatial analysis and develops map products to support the development of publicly available interactive maps and marine spatial plans
- Canadian Aquaculture Public Reporting Interface (CAPRI): Allows the general public to examine drug and pesticide data for reporting aquaculture sites
- Canadian Extreme Water Level Adaptation Tool (CAN-EWLAT): A science-based planning tool for climate change adaptation of coastal infrastructure related to future water-level extremes and changes in wave climate
- Whale Insight: An interactive map displaying visual and/or acoustic detections of North Atlantic right whale detections in eastern Canadian waters.

## 9.2 Open Data Contributions

All applications published through the MSDI adheres to the Government of Canada's Harmonized North American Profile (HNAP) – ISO 19115. Since its inception, the MSDI has contributed over 600 datasets to the Canadian Open Data Initiative. The MSDI has developed

an infrastructure that relies on stakeholder expertise and adheres to Government of Canada standards and security practices. The MSDI focuses on interoperability and data sharing.

### 9.3 CHS Non-Navigational (NONNA) Products

The CHS NON-Navigational or NONNA-10 (2020) and NONNA-100 (2018) Bathymetric Data products continue to be updated and available, since being released:

- ~5.9 million CHS NONNA Product Downloads
- Over 30,800 unique users
- 4.3/5 user rating
- ~ 5.3 million downloads are coming from the new Packages Layer
- Our users are global
- Most popular CHS NONNA 100 product is the cell (NONNA100_4900N12400W) covering Vancouver, British Columbia
- Most poplar CHS NONNA 10 product is the cell (NONNA10_4460N06360W) covering Halifax Harbour, Nova Scotia

## 10 Innovation

### 10.1 Paper Chart 2.0

The CHS is actively in the process of transitioning to a digital future centered on the S-100 standard. While this shift is underway, it is important to recognize the limitations of available resources. In response to this challenge and to prepare for the digital transformation, the CHS has developed an automated process known as Paper Chart 2.0 (PC2.0), which is designed to generate traditional paper chart products based on their Electronic Nautical Chart (ENC) portfolio. This automation will also allow the CHS to focus resources on increasing and improving their ENC portfolio.

PC 2.0 represents the CHS's initial foray into the automated generation of paper charts from ENC content. This product adheres to the S-4 standard and currently employs INT1 symbology. However, CHS has plans to transition to the S-101 ENC symbology in the future. This transition will harmonize the symbology used in both ENC and paper chart products, ensuring consistency and compatibility.

The first PC 2.0, 4654 Lark and York Harbours, was released as a pilot project on 22 December 2023. Additional PC 2.0 will be released over 2024/25, seeking input from mariners/navigators to continue improving the product.

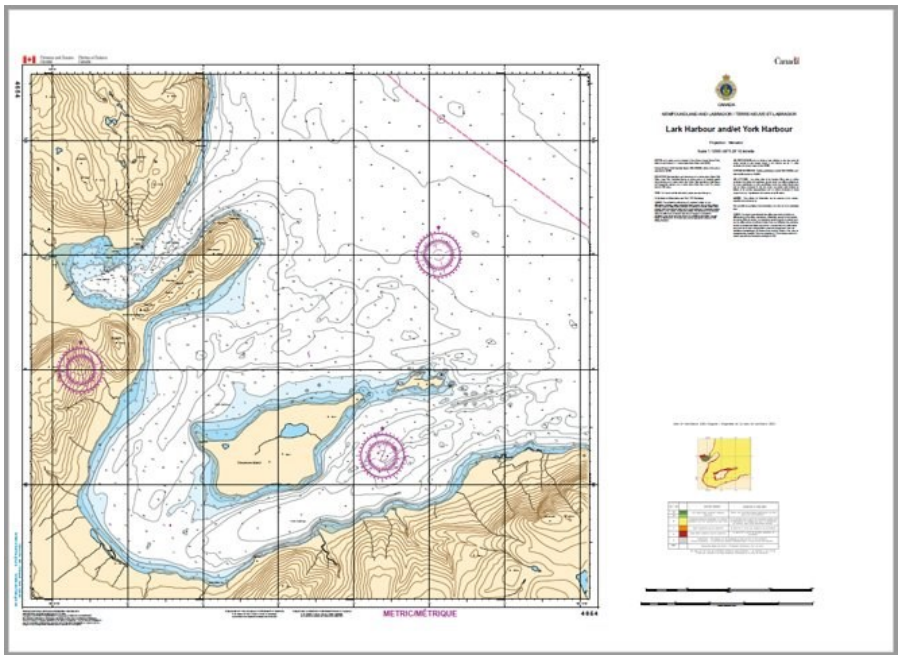


*Figure 10. First Paper Chart 2.0 in Lark and York Harbours*

The CHS's adoption of the innovative PC2.0 initiative underscores the organization's commitment to evolving with the digital landscape while addressing the finite nature of available resources. This strategic move not only empowers mariners with a reliable backup in the form of secure paper chart products but also demonstrates CHS's dedication to compliance with international standards, notably the S-100 framework.

### 10.2. CHS Digital Transformation

The CHS is continuing to make progress on digital transformation, and has operationalized Chapter 4, Database Transformation. Some results for other chapters are as follows:

- **Chapter 2** is entitled: *CHS Business Model Modernization: Streamlining and strengthening our business practices.* The CHS has focused efforts on several ongoing aspects of the business model over the last year, including reviewing its policies around custom data requests, modernizing its distribution and Value-Added Reseller programs and contracting out a pricing study. The latter item involved input from several jurisdictions with similar models to provide benchmarking of product availability and pricing in other countries, including S-100 services.

- **Chapter 3** is entitled: *Data Acquisition Transformation: Modernizing our data acquisition methods*. Connectivity for remote sonar operations and remote data processing beyond LTE Cellular coverage has been implemented aboard all survey-capable vessels within CCG's Central and Arctic Region Fleet using Starlink.  2023 Sea trials for remote

operations aboard CCGS Kelso in northern L. Superior were successful with sufficient bandwidth to effectively support remote access to sonar operations in frontier areas. An industry Request for Information served to inform on the specifications of technology currently available. This information has contributed to a renewed Request For Proposal for Uncrewed Surface Vessel services. An assessment of the viability of using Canadian Coast Guard-approved aerial drones at sea to support LiDAR bathymetric payloads was found not to be cost effective at this time. The project instead pivoted to data acquisition using Satellite Derived Bathymetry within the test area.

- **Chapter 6**: **Products to S-100 Services**
  At HSSC 16, the CHS will propose the St. Lawrence River as a designated Sea Trial Area for 2025. The primary objective of this trial is to evaluate the S-100 system's capabilities in ingesting and displaying a variety of datasets. These include S-101 Electronic Navigational Charts, S-102 High-Resolution Bathymetry, S-104 Water Levels, S-111 Surface Currents, S-124 Navigational Warnings, S-128 Catalog, and S-129 Under keel Clearance Management Data.

  The CHS has been holding technical information sessions with pilots' associations and other members of industry on S-111 surface currents and S-102 bathymetry. International observers have also been invited to attend. Sessions were well attended, with over 100 participants. Sessions are recorded and online for those who would like to view the content after the fact.

  In Quebec Region, the CHS is currently producing S-102 products in the St-Lawrence waterway (Montréal/Salt-au-Cochon corridor) with biweekly product releases. A second phase of this is proposed sea trial will include upstream sections of the St. Lawrence River to the west, from Kington to Montreal. This will offer an opportunity for technical collaboration between the US and Canada, as well as the St. Lawrence Seaway Management Corporations (US and Canada).

### 10.3 Collaboration with IHO Singapore Learning Lab

In conjunction with the IHO-Singapore Lab, the Nautical Information Provision Working Group (NIPWG) is directing a project to further develop and operationalize S-131. Canada continues to chair the Project Team and port testing will begin in the database later in 2024.

## 11 Other Activities

### 11.1 Collaboration between CHS and the US Office of Coast Survey

The monthly meetings between the office of Coast Survey and CHS Central have been ongoing, with discussions covering various topics such as data sharing, transboundary evaluation of product coverage, data acquisition locations, and IGLD. The Pacific and Atlantic regional offices have also conducted meetings with their Office of Coast Survey (OCS) counterparts to explore transboundary coverage between Canada and the United States, providing an opportunity for CHS and OCS staff to establish connections in those regions. Monthly meetings have now been

established for the office of Coast Survey and CHS Pacific as well. For more information, please refer to the HGPSC's report to USCHC47. These meetings have been beneficial in fostering collaboration and information exchange.

### 11.2 Ocean Decade – Undersea Features

Part of the Ocean Decade project's aim is to detect and study the more than 40 types of undersea features, each with its unique characteristics, to gain insight into new underwater ecosystems. As Seabed 2030 continues to update General Bathymetric Chart of the Oceans (GEBCO)'s global bathymetry grid, we anticipate that detecting submarine features using GIS, geomatics, and deep learning will become increasingly feasible. To facilitate this, all undersea features in the GEBCO database are publicly available to build a digital inventory of training bathymetric data that can be used to detect additional undersea features with deep learning analysis. Other methods of analysis, such as remote sensing and geological data, can complement these results. Since 2017, this project has been primarily developed by university and college students working for the CHS. Key outputs include a methodology for detecting undersea features that can be used and reused by other hydrographic offices and the larger science community, criteria for the application of deep learning, and the development of an S-100 specification for undersea features. Additionally, we will produce a database of unnamed undersea features.

### 11.3 Commission on the Limits of the Continental Shelf

On 19 December 2022, Canada submitted an addendum to its partial Submission to the Commission on the Limits of the Continental Shelf regarding its continental shelf in the Arctic Ocean. In accordance with the Rules of Procedure of the Commission (CLCS/40/Rev.1), a communication was circulated to all Member States of the United Nations, as well as States Parties to the Convention, to make public the executive summary of the addendum to the partial Submission, including all illustrative maps and coordinates contained therein. The Canadian Extended Continental Shelf Program is ramping up to carry out new data collection and analyses over the next four years (2024-2028). A full revised Arctic Ocean submission is planned to be filed with the Commission in 2030.

### 11.4 CHS Workforce of the Future

Building on our Hydrographer of the Future International Workshop held in spring, 2022, the CHS brought the conversation back to staff and held a series of regional consultation sessions on the CHS Workforce of the Future. Based on the input received, the results of the international workshop, and an internal culture review conducted in 2022-23, the CHS is now developing a skills matrix to identify opportunities for training and recruitment to help shape our current workforce to meet our future needs.

### 11.5 Empowering Women in Hydrography

Canada was proud to play a leadership role in the initial pilot project of Empowering Women in Hydrography which sought to promote greater gender diversity and to provide women with more international technical expert and leadership roles, among other things. In the three years of the project, kickoff VTC meetings were held, internship opportunities at the IHO and the IBSC were filled, and other opportunities offered via IHO member states, including the US were completed.

The initial pilot is now complete, but the project has been extended another three years. Canada is actively seeking ways to continue to support the project. In addition, the International Hydrographic Organization has received support from other member states.

# Annex A - Status on Implementation of the S-100 Roadmap (Canada)

2024

Please note the current status of the eight prioritized S-100 product specifications noted in the S-100 timeline.[2] This summary is generated for general awareness and to share expectations among member states.

This summary is provided focusing on Region A as defined by the International Hydrographic Organization. Additional products and services are provided outside the continental United States and Alaska and Hawaii where the US has a Primary Chart Authority responsibility.[3]

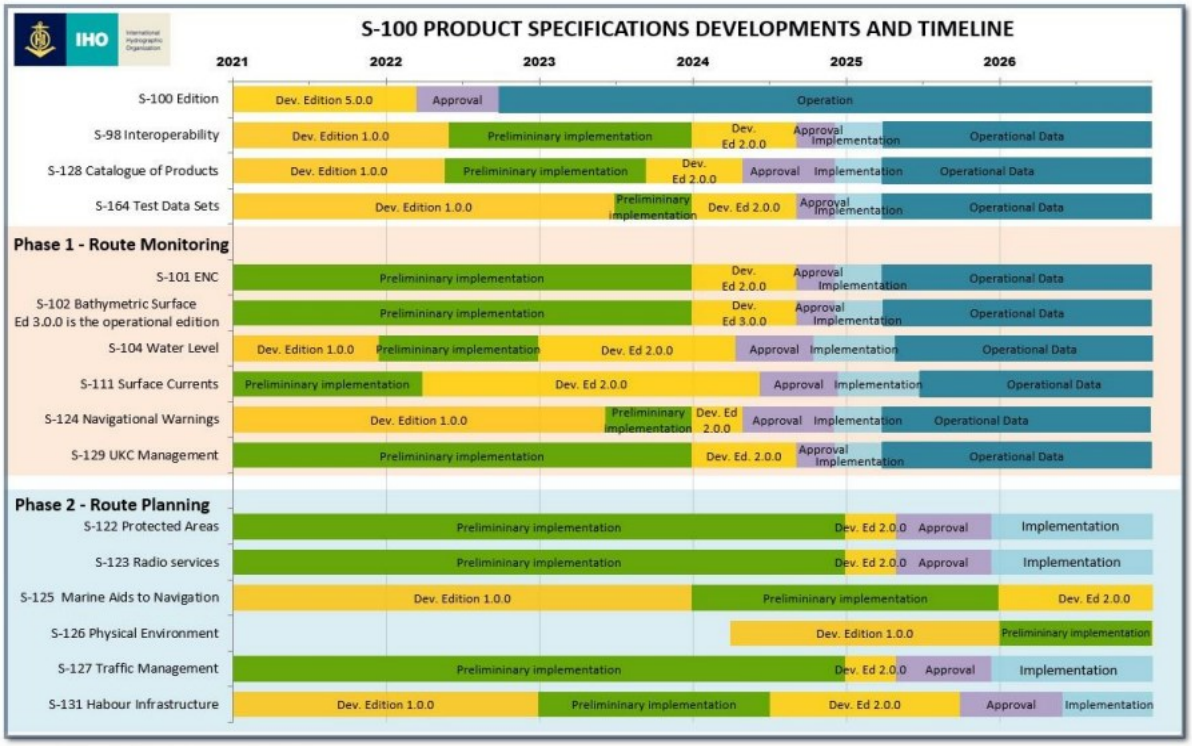


*Figure 1. Timeline for S-100 Implementation (updated July, 2023)*

[2] Roadmap For the S-100 Implementation Decade (2020-2030) Version 1 Rev 1. https://iho.int/uploads/user/About%20IHO/Council/S-100_ImplementationStrategy/S100_Roadmap_Decade_v1Rev1_EN_16Nov2020.pdf

Table 1. Product Specification – Responsible Authority

| | | Product Specification | Key Governmental Authority |
|---|---|---|---|
| | **S-98** | **Interoperability** | **Multi-Agency** |
| | **S-128** | **Catalogue of Products** | **CHS** |
| | | | |
| Route Monitoring Mode | S-101 | Electronic Navigational Chart | Canadian Hydrographic Service (CHS) |
| | S-102 | Bathymetric Surface | CHS |
| | S-104 | Water Level Information | CHS |
| | S-111 | Surface Currents | CHS |
| | S-124 | Navigational Warnings | Canadian Coast Guard (CCG) |
| | S-129 | Under Keel Clearance Management | CCG |
| | | | |
| Route Planning Mode | S-122 | Marine Protected Areas | To be determined |
| | S-123 | Radio Services | CCG |
| | S-125 | Marine Aids to Navigation | CCG |
| | S-126 | Physical Environment | CHS |
| | S-127 | Traffic Management | Transport Canada - CHS - CCG |
| | S-131 | Harbour Infrastructure | CHS facilitator to help ports generate S-131 |

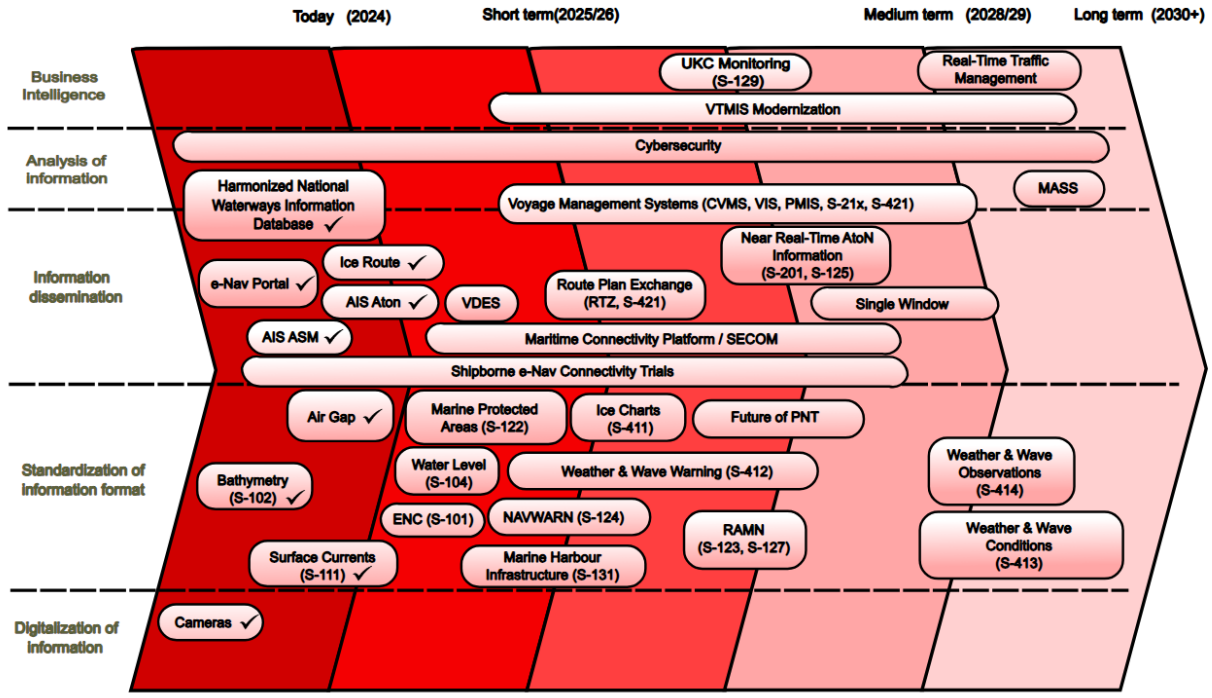


*Figure 2. Canadian S-100 Implementation Timelines*

## S-98 Interoperability

- PRIMAR is Canada's official distributor of S-100 products
- Canada has proposed an International S-100 Trial Area for 2025 in the St. Lawrence River for all S-100 route monitoring layers

## S-128 Catalogue of Products

The CHS is leading the development of an all-of-government catalogue, which will be ready in the fall of 2024.

*further information:*
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## S-101 Electronic Navigational Chart

- Edition 1.1.0 (April 2023) (English)

- IHO Roadmap Operational Data Target: early 2025
- CHS is working toward being ready to release a complete suite of S-101 ENCs in 2026, in accordance with the IMO timelines recently put forward by the Maritime Safety Committee's adoption of updated ECDIS performance standards to address S-100. Specific data preparation within the production database has begun. This will put CHS in a position to accurately generate both S-57 and S-101 (CHS Internal Pre-Conversion Readiness Checks and Guidance-Based on IHO S-65 Annex B)

  *further information:*
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**S-102 Bathymetric Surface (High Resolution Bathymetry)**

- S-102 Edition 2.2.0 (April 2023) (English)
- IHO Roadmap Operational Data Target: early 2025
- S-102 (v. 2.1) is already operational in key areas in Canada
- S-102 will be one of the first standards tested in Canada's proposed International S-100 Trial Area.

  *further information:*
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**S-104 Water Level Information**

- Web-based display of water levels via the Integrated Water Level System (IWLS)
- IHO Roadmap Operational Data Target: Late 2024
- Add functionality for export to cloud in late 2024.

  *Further information:*
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  Hydrographic Geospatial Services and Support
  Canadian Hydrographic Service
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**S-111 Surface Currents**

- S-111 Edition 1.2.0 (April 2023)
- IHO Roadmap Operational Data Target: late 2024
- Already operational; just awaiting formal specification. Already in production mode.

*Further information:*
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**S-124 Navigational Warnings**

- S-124 Edition 1.0.0 (May 2023)
- Edition 2.0.0. will likely be approved in 2025
- IHO Roadmap Operational Data Target: The HSSC report to IRCC13 had the operational target date of 2026
- Responsibility for S-124 Navigational Warnings lies with Canadian Coast Guard (CCG)
- S-124 is currently in trial mode, very close to production
- CCG has created an S-124 export from its NAVWARN Issuing System (NIS) and created a technical service compatible with SECOM to test dissemination of these. Moreover, trials have been done with Australian Maritime Safety Administration (AMSA) to access the service and these showed the service was viewable. The phase trials are under way with CCG having under contract IIC Technology to create a tool to connect and ingest the data made available via the service. These tests are still underway (March 2024).

*Further information*:
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**S-129 Under Keel Clearance**

- S-129 Edition 1.0.0 (June 2019)
- IHO Roadmap Operational Data Target: early 2025
- Internal study completed to look at Canadian practices vs World practices,
- CCG is preparing internally before going to industry

*Further information:*
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**S-122 Marine Protected Areas**

- S-122 Edition 1.0.0 (January 2019)
- IHO Roadmap Operational Data Target: not specified
- Marine Protected Areas in Canada are a multi-agency-multi-jurisdictional responsibility. S-122 is not part of the initial S-98 interoperability phase and is not ready for testing and implementation. The specification needs to be updated.
- Complex governance around MPA's creates challenges around accountability for S-122 in Canada

**S-123 Radio Services**

- S-123 Edition 1.0.0 (January 2019)
- IHO Roadmap Operational Data Target: not specified
- Task force being established toward v. 1.1
- Under development in Canada: CCG issued a recent contract to enable Geoserver on e-nav portal, client feedback on portrayal and use that will inform future S-123 production

*Further information:*
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**S-125 Marine Aids to Navigation**

- Edition 0.3
- Not listed in the IHO Standards and Specifications
- In development (medium term)
- CCG has modernised a list of lights and what goes on S-101 vs S-125 to avoiding duplication

*Further information:*
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**S-126 Physical Environment (Sailing Directions)**

- Edition 0.0
- IHO Nautical Information Provision Working Group is currently developing product specs
- Tasks frozen by HSSC June 2023
- CHS is converting Sailing Directions text to database objects

*Further information:*
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Canadian Hydrographic Service
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**S-127 Traffic Management**

- Edition 1.0.0
- Shared Responsibility in Canada between Transport Canada, CCG, and CHS
- CCG recently issued a contract to enable Geoserver on e-nav portal and client feedback on portrayal and use (will inform future S-123 production)

*Further information:*
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**S-131 Harbour Infrastructure**

- Edition 1.0.0
- Responsibility with Harbours and CHS
- Coverage only in Harbour areas
- Testing with Canadian Ports (Vancouver, Montreal, Nanaimo, and considering a small East Coast port)
- Work on infrastructure ongoing,

- Project under IHO Innovation LAB funded by CHS for the last two years; IHO seeking funding for 2024-25seeki funding for 2024-2025

*Further information:*
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## PHASE 2 PRODUCT DEVELOPMENT

### S-411 Ice Information

- S-411 Edition 1.1.0 (June 2014)
- IHO Roadmap Finalized Standard Target: 2026
- NOAA Fisheries, Oceans Canada and ECCCC are working to update standards to edition 5.0 or higher, Target 2026.
- Close to datamart publication in the Great Lakes

*Further information*:
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### S-412 Marine Weather Warnings

- S-412 Edition 1.0.0
- IHO Roadmap Finalized Standard Target: 2025
- Under development, WMO ET-MS to stand up an S-412 WG.
- ECCC and NOAA collaborating

*Further information*:
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### S-413 Wave and Weather Conditions

- S-413 Edition 1.0.0
- IHO Roadmap Finalized Standard:  2026
- Under development, WMO ET-MS to stand up an S-413 WG

- ECCC and NOAA collaborating

  *Further information*:
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**S-414 Wave and Weather Observations**

- S-414 Edition 1.0.0
- IHO Roadmap Finalized Standard Target: 2027
- Under development, WMO ET-MS to stand up an S-414 WG.

  *Further information*:
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**Changes to Coverage Since March 2023**

Primar is Canada's primary ENC distributor. For all available products please see: PRIMAR Portal - Map (ecc.no).

**Changes since last year (March 2023)**

- IHO Council has updated several planning documents related to S-100 implementation.
- Several Product Specifications have been updated (indicated above)
- Canada has continued to phase out raster navigational products
- Canada's first automatically generated paper chart was produced off the Coast of Newfoundland (4654 Lark and York Harbours)
- Canada is working on test datasets for S-101, but we are still waiting on the final version of the standard

# Annex B – New Arctic Coverage

The following represents coverage of new surveys obtained in 2023-2024 fiscal year. This is only a selection of coverage, as the CHS continues work on processing data.

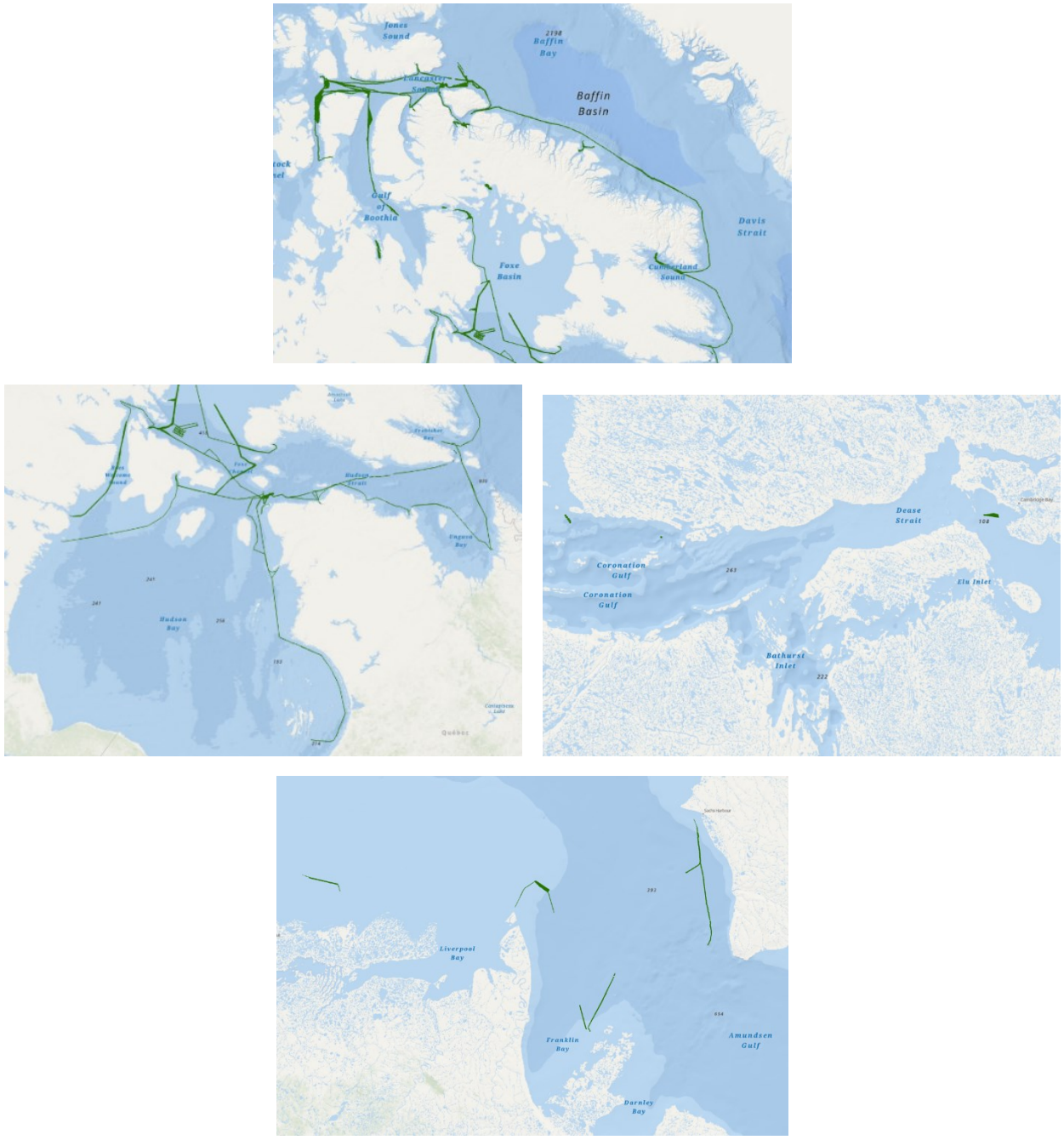


*Figure 1: New Surveys Arctic Region*

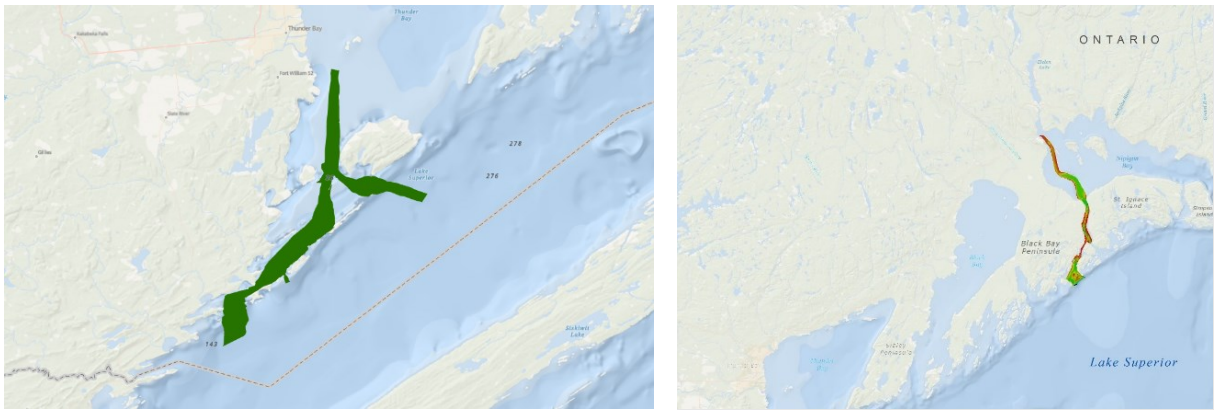


*Figure 2: New Survey near Thunder Bay*


*Figure 3: New Survey in Welland Canal*

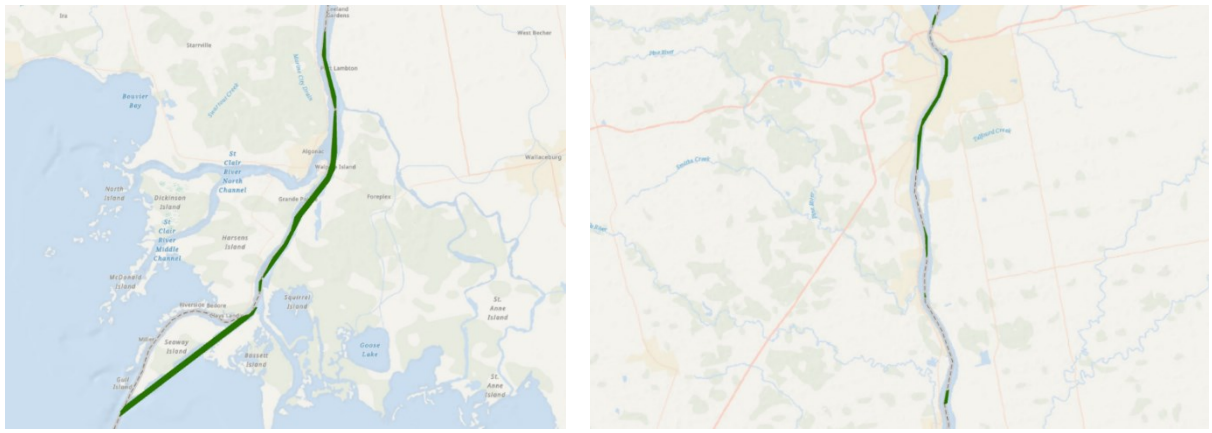

*Figure 4: New Surveys in St. Clair River*

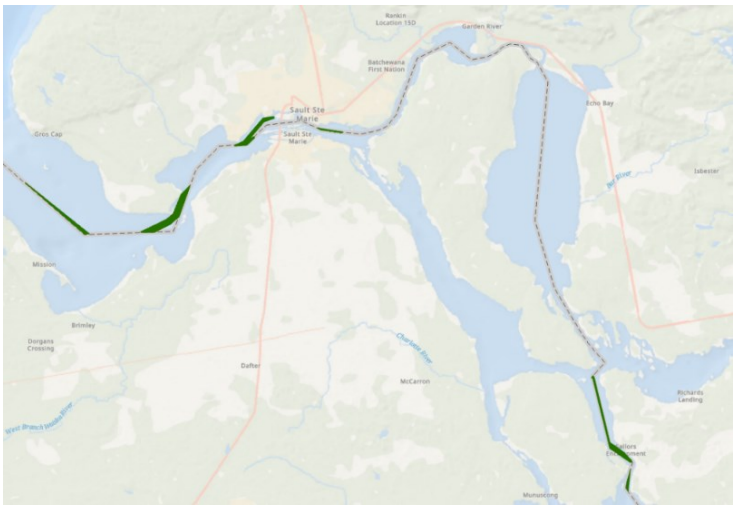


*Figure 5: New Survey in St Marys River and Munuscong Channel*

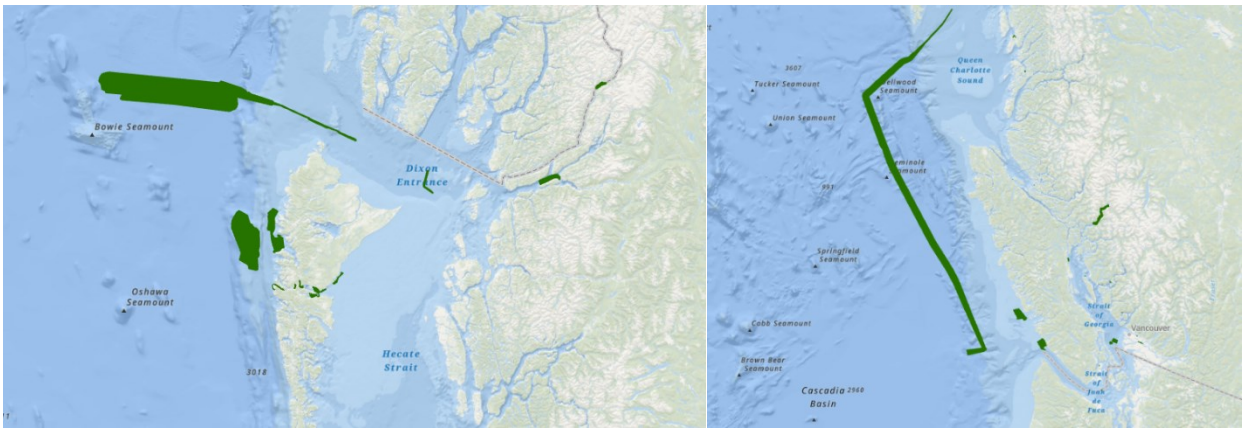


*Figure 6: New Surveys Pacific Region*

The following represents a selection of planned surveys for the upcoming 2024-2025 season.

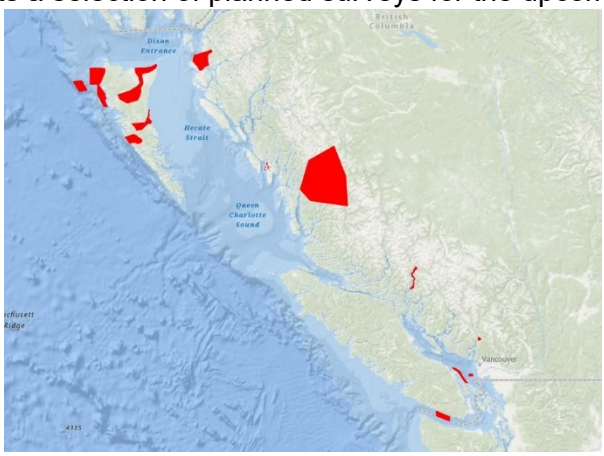


*Figure 7: Planned Surveys Pacific Region*

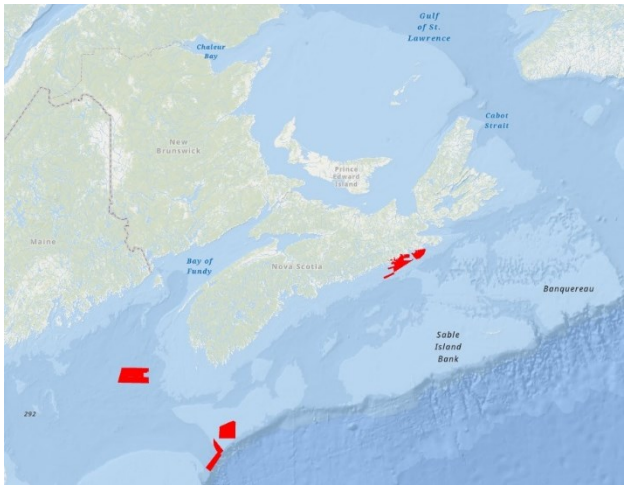


*Figure 8: Planned Surveys Atlantic Dartmouth Region*


*Figure 9: Planned Surveys Atlantic Newfoundland Region*


*Figure 10: Planned Surveys Quebec Region*


*Figure 11: Planned Surveys Ontario and Prairie Region*


*Figure 12: Planned Surveys Arctic Region*

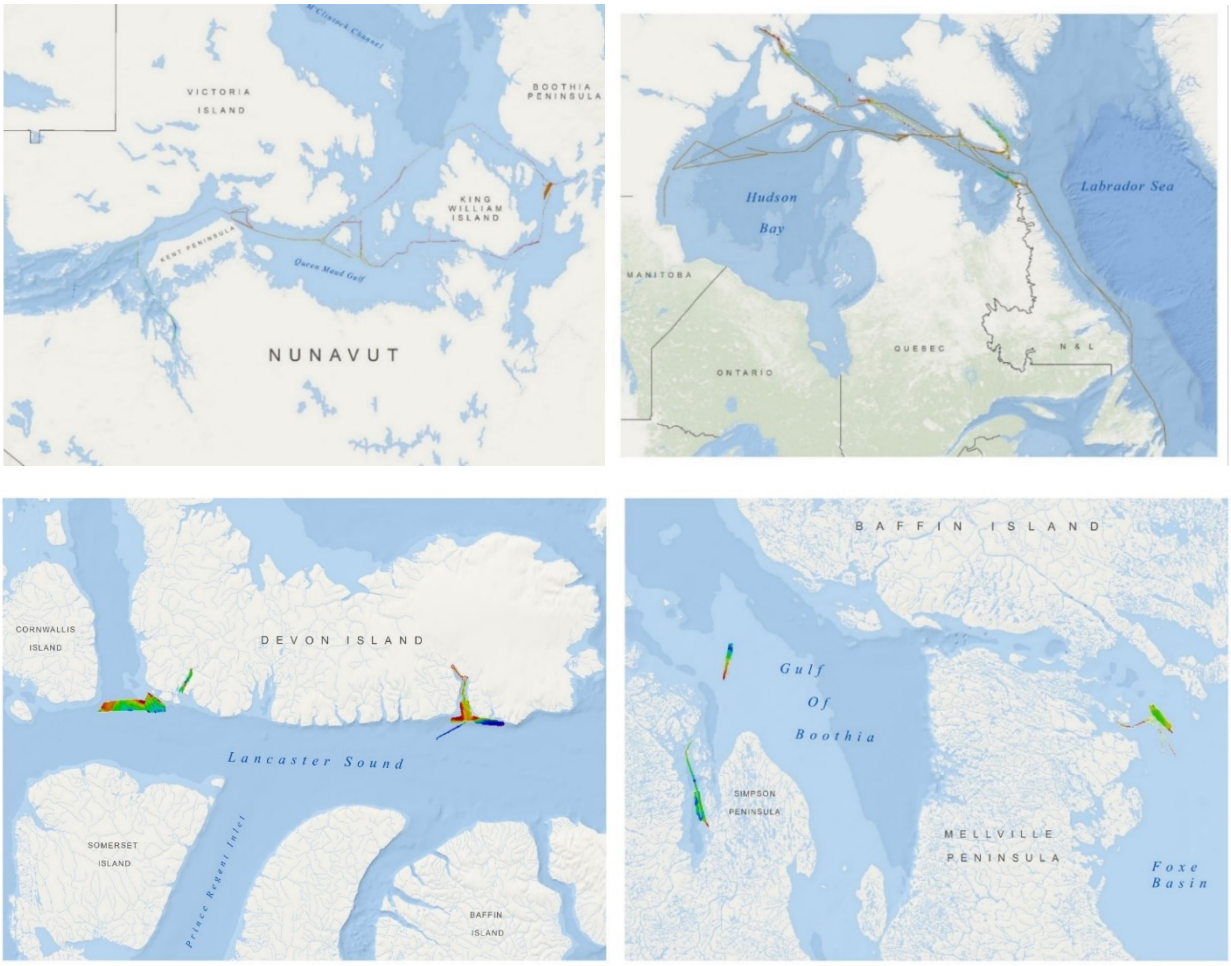


*Figure 13: New Surveys Arctic Region*


*Figure 14: New Survey Nipigon Bay*