



Pêches et Océans
Canada

Fisheries and Oceans
Canada

Canadian Hydrographic Service (CHS) & Canadian Armed Forces -Royal Canadian Navy



Canadian National Report

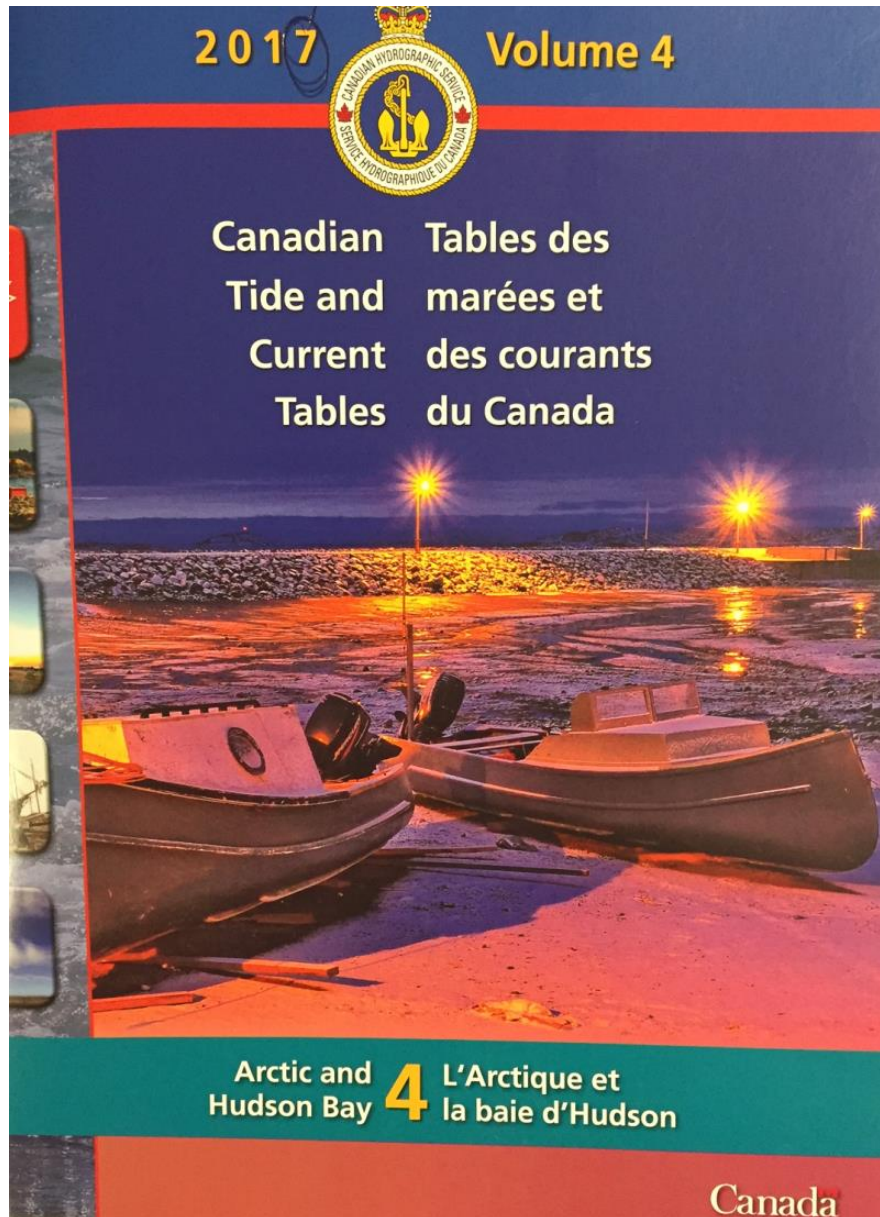
7th Arctic Regional Hydrographic Commission (ARHC7) Meeting

August 23, Ilulissat, Greenland

Denis Hains, Hydrographer General of Canada & Director General CHS

LCdr James Zuliani, Royal Canadian Navy

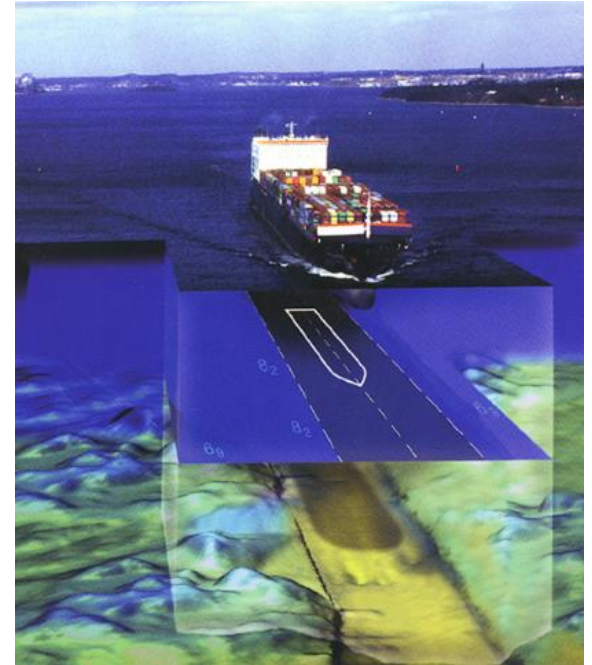
Canada 





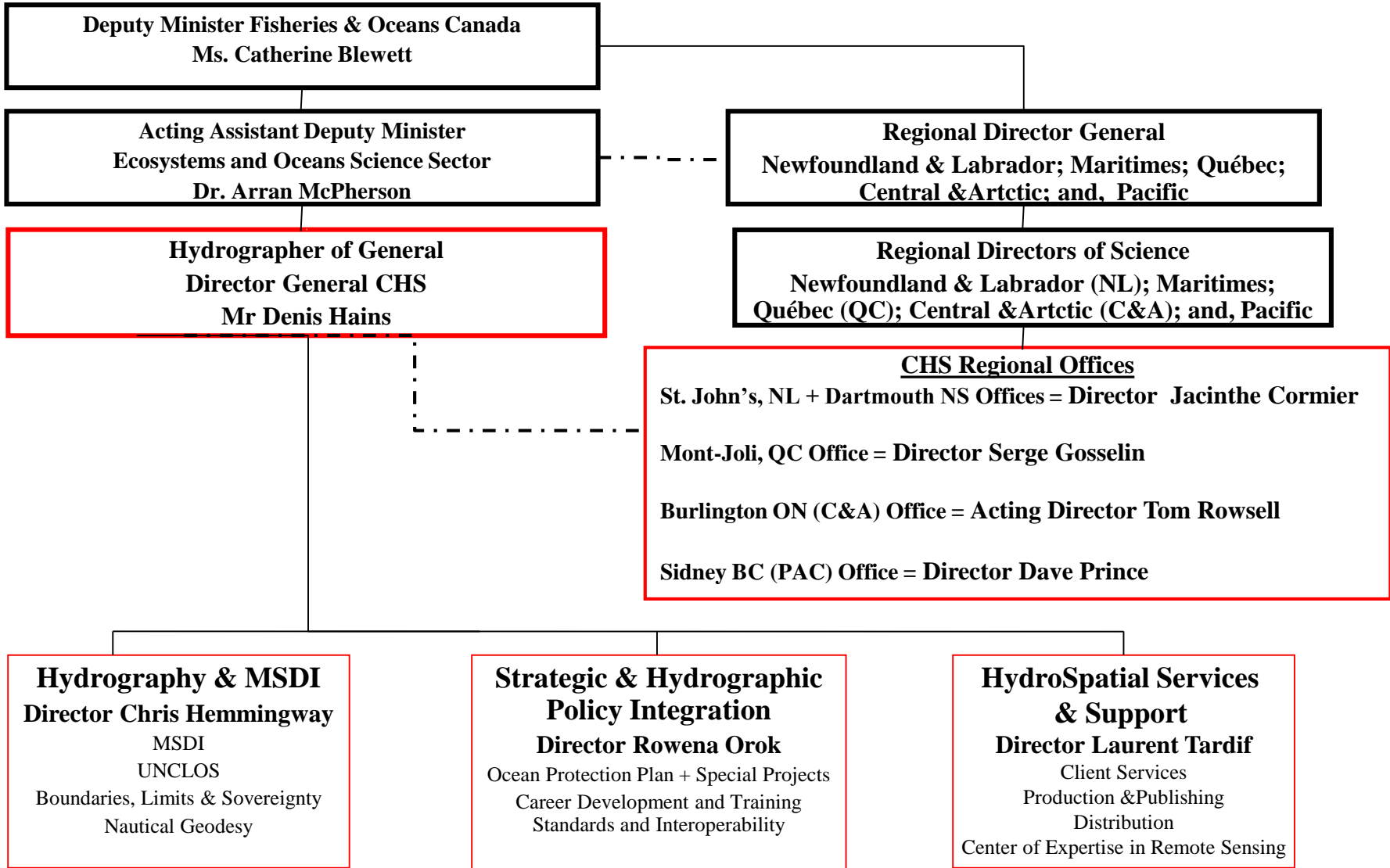
Overview

1. Canadian Hydrographic Service (CHS)
Organization Update
2. CHS Arctic Surveys & Production
3. Canada's Ocean Protection Plan (OPP)
4. Marine Spatial Data Infrastructure (MSDI)
5. Crowd-Source Bathymetry (CSB)
6. Satellite-Derived Bathymetry (SDB)
7. Canadian Ocean Mapping Research & Education Network (COMREN)
8. Canadian Armed Forces - Royal Canadian Navy update





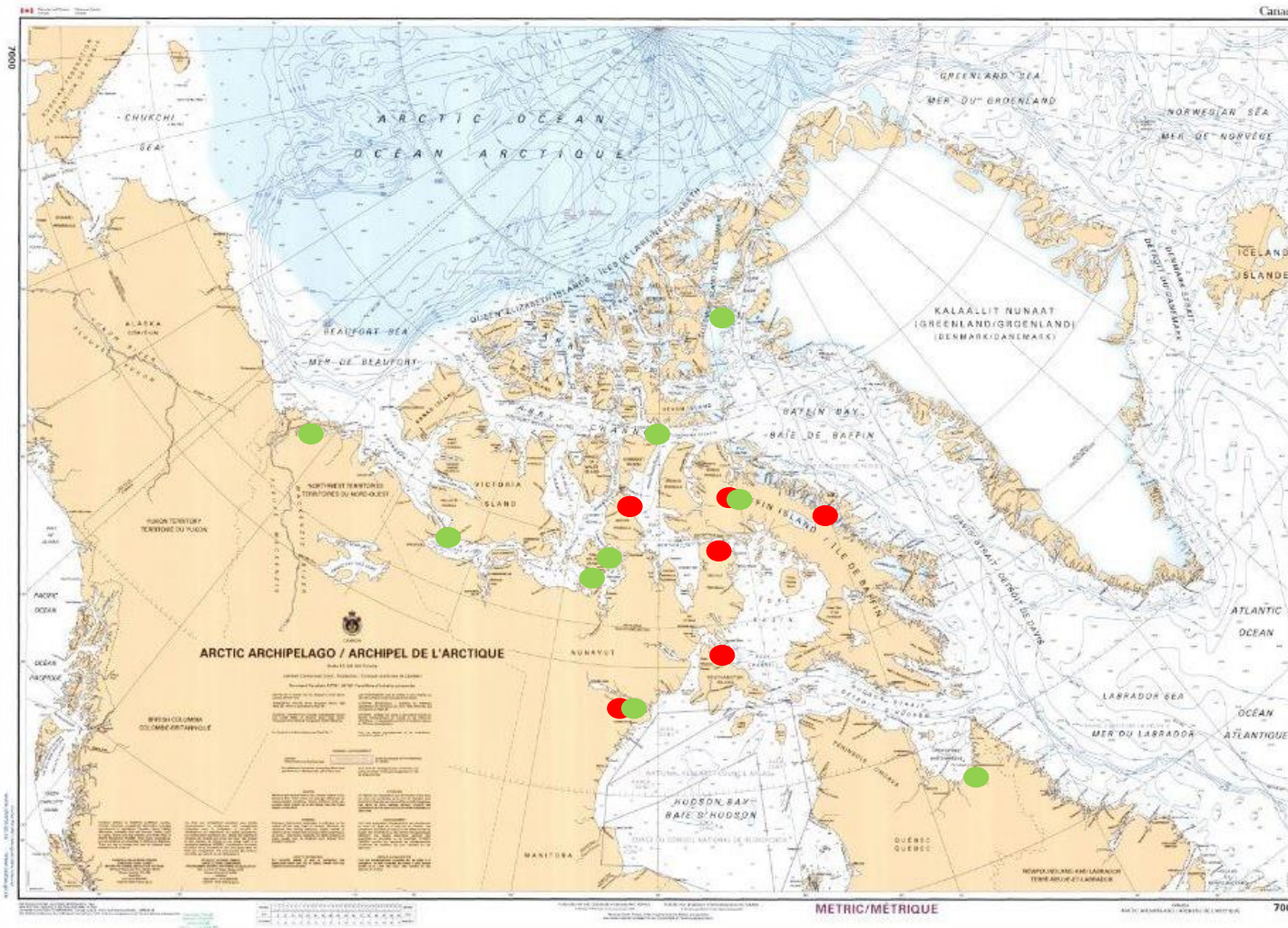
DFO Science - Canadian Hydrographic Service (CHS) *August 2017*



————— : Hierarchical reporting relationship
 - - - - - : Functional liaison or reporting relationship



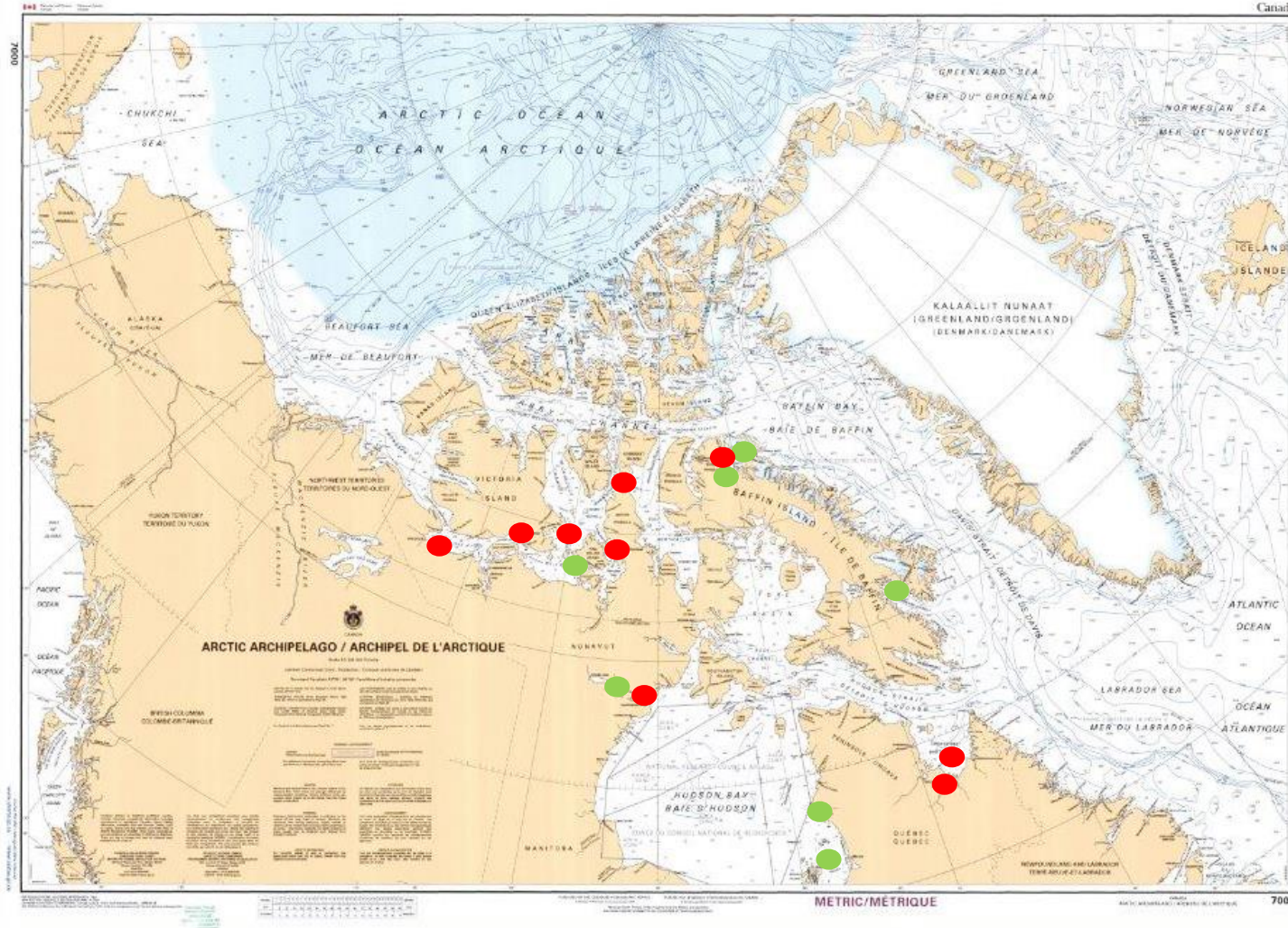
CHS 2016-17 Surveys & Production *August 2017*



- Surveys
- Charts



CHS 2017-18 Surveys & Production *August 2017*



- Surveys
- Charts



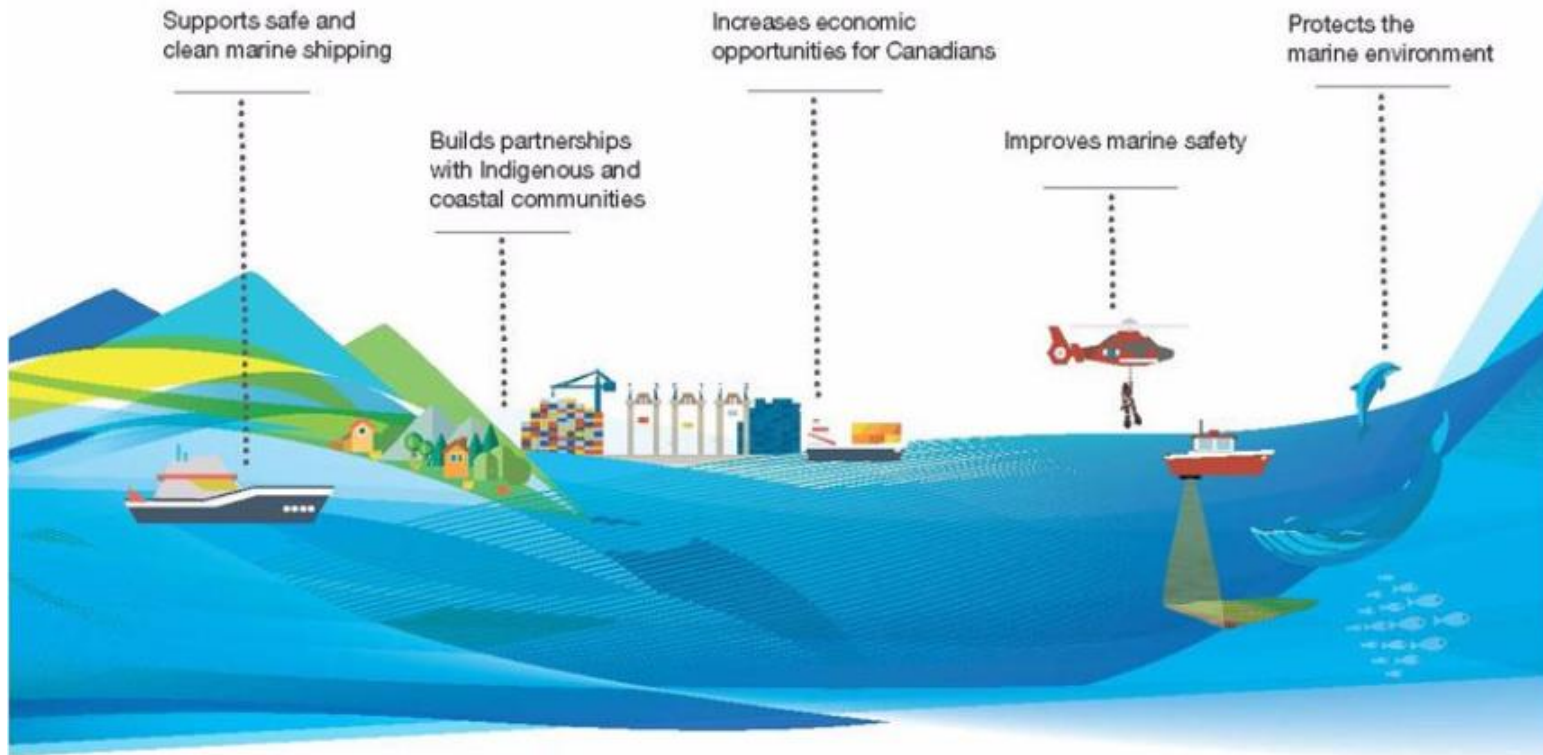
Electronic Navigation Chart (ENC) Production and Updates since ARHC6 *August 2017*

#	ENC #	Chart	Edition	Release Date	Last Notice	Product Title	Eqv PC Scale (1:n)
1	CA373463	7738	4	2017-08-01		Simpson Strait to/à Storis Passage	80000
2	CA273352	5505	7	2017-08-01		Bélanger Island à/to Cotter Island	250000
3	CA373462	7737	2	2017-07-28		Storis Passage to/à Requisite Channel	80000
4	CA373262	7784	7	2017-07-07	20151009	Victoria Strait	150000
5	CA373267	7783	7	2017-07-07		Queen Maud Gulf Eastern Portion	150000
6	CA473317	7736	6	2017-06-28		Simpson Strait	25000
7	CA273257	7575	6.002	2017-05-26	20170623	Prince Regent Inlet	300000
8	CA473451	5625	2	2017-05-19		Schooner Harbour to/a Baker Lake	40000
9	CA473379	5457	2.001	2017-05-12	20151204	Deception Bay	25000
10	CA573452	5625	2	2017-05-05		Ice Hunter Rock to/a Chesterfield Narrows	20000
11	CA573318	7736	5	2017-05-01		M'Clintock Bay	15000
12	CA573375	5471	2	2017-04-27		Inukjuak	12000
13	CA473448	5622	2	2017-03-07		Centre Island to/a Farther Hope Point	40000
14	CA473450	5624	2	2017-03-03		Terror Point to/a Schooner Harbour	40000
15	CA473449	5623	2	2017-03-03		Farther Hope Point to/a Terror Point	40000
16	CA473447	5621	2	2017-02-17		Rockhouse Island to/a Centre Island	40000
17	CA473483	7513	3	2017-02-16		Milne Inlet, Southern Portion	40000
18	CA373481	5626	1	2017-02-10		Baker Lake	80000
19	CA573453	5625	1	2017-02-10		Regina Narrows and/et Polaris Narrows	20000
20	CA573455	5626	1	2017-02-10		Baker Lake Harbour	15000
21	CA273357	7620	5.001	2017-02-07	20170310	Demarcation Bay to/à Liverpool Bay	500000
22	CA573465	7513	3	2017-01-30		Assomption Harbour	20000
23	CA373128	7935	7	2017-01-19		Crozier Strait and/et Pullen Strait	100000
24	CA273329	7573	4.002	2016-11-16	20161216	M'Clintock Channel, Larsen Sound and/et Franklin Strait	500000
25	CA573401	7212	2	2016-10-24	20160923	Pond Inlet	10000
26	CA373354	5505	6	2016-10-11		Umiujaq	60000



Canada's Ocean Protection Plan (OPP)

\$1.5 Billion **National Oceans Protection Plan**





Canada's Ocean Protection Plan (OPP) 2017-22

Modern Hydrography and Charting in Key Areas aims to:

1. Conduct highly intensive modern hydrographic and charting activities to provide ENCs for highly critical areas across the country, including Canada's 23 highest priority commercial ***Ports*** and waterways (13 in B.C., 7 in Quebec, and 3 in Atlantic).
2. Fill important gaps in high-resolution coastline and bathymetry in inter-tidal zones and ***Near-Shore*** areas to ensure the delivery of improved navigational charts and enhanced electronic navigational chart (ENC) in near-shore areas (e.g., Haida Gwaii), high risk coastal and inland water zones.
3. Undertake more extensive efforts to fill, at an accelerated pace, hydrographic data gaps in the ***Arctic***, through the provision of adequate navigational products and services.
4. Strengthen navigational safety and the prevention of marine incidents by delivering ***Dynamic*** hydrographic products and services (tide and water level, under-keel and overhead information) in key areas.
5. ***Marine Spatial Data Infrastructure (MSDI)*** in Regional (area) Response Planning.



Canada's Ocean Protection Plan (OPP)

Arctic Hydrography and Charting


- Accelerate the acquisition of modern hydrography in the **Arctic**:
 - Complete installation of multi-beam sonars on Canadian Coast Guard icebreakers.
 - Two icebreakers are equipped to collect modern hydrography during the 2017 Arctic navigation season;
 - By the 2019 season and thereafter, plans are underway to have five icebreakers fully equipped to collect modern hydrography in the Arctic;
 - Use of ships of opportunity e.g. HMCS *Kingston* from Royal Canadian Navy + RRS *Ernest Shackleton* as Crowd-Source Bathymetry Platforms.
- Installation of permanent and temporary tidal gauges (10);
- Paper chart and Electronic Navigation Chart (ENC) production.



Canada's Ocean Protection Plan (OPP)

Arctic Hydrography and Charting –Story Map


Canada's Oceans Protection Plan (OPP): Modern Hydrography & Charting in Key Areas


Francis- PPO 

DFO-Science CHS OPP Initiatives | Hydrography in Ports | Near Shore Bathymetry | **Arctic Hydrography & Charting** | Hydrographic Dynamic Products | MSDI & RRP

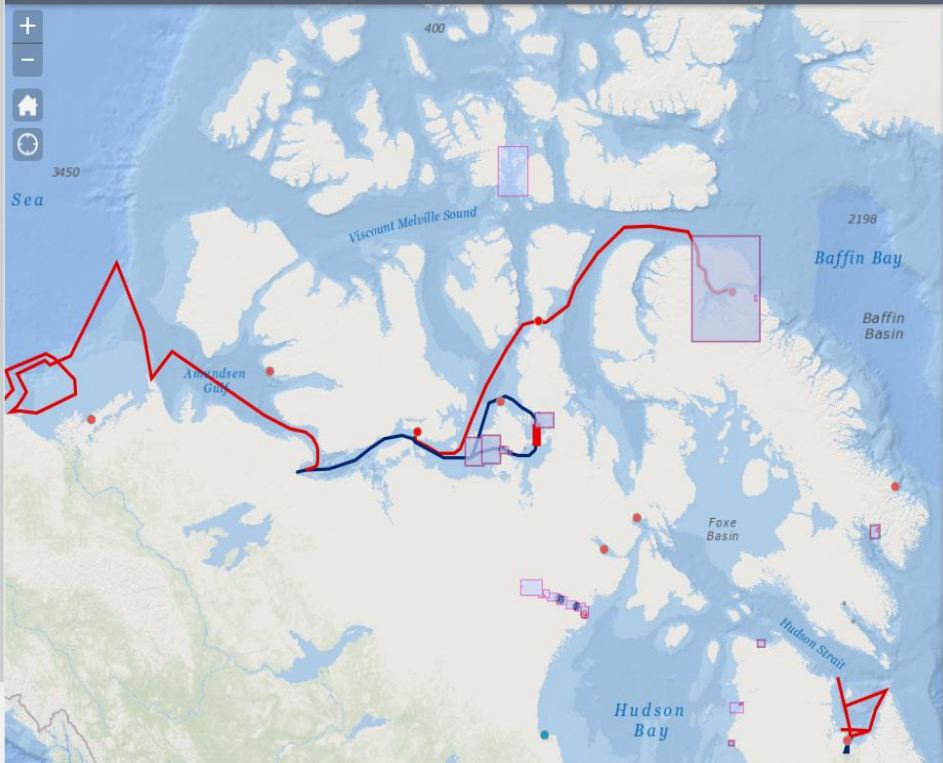
Esri World Geocoder

Last Updated: August 2, 2017

 Pêches et Océans Canada | Fisheries and Oceans Canada | **Canada**

 In an effort to accelerate the acquisition of modern hydrography in the Arctic, the Canadian Hydrographic Service is collaborating with the Canadian Coast Guard to install multi-beam sonars in icebreakers. Two icebreakers are equipped to collect modern hydrography during the 2017 Arctic navigation season. By the 2019 season and thereafter, plans are underway to have five icebreakers fully equipped to collect modern hydrography in the Arctic

Arctic WebApp



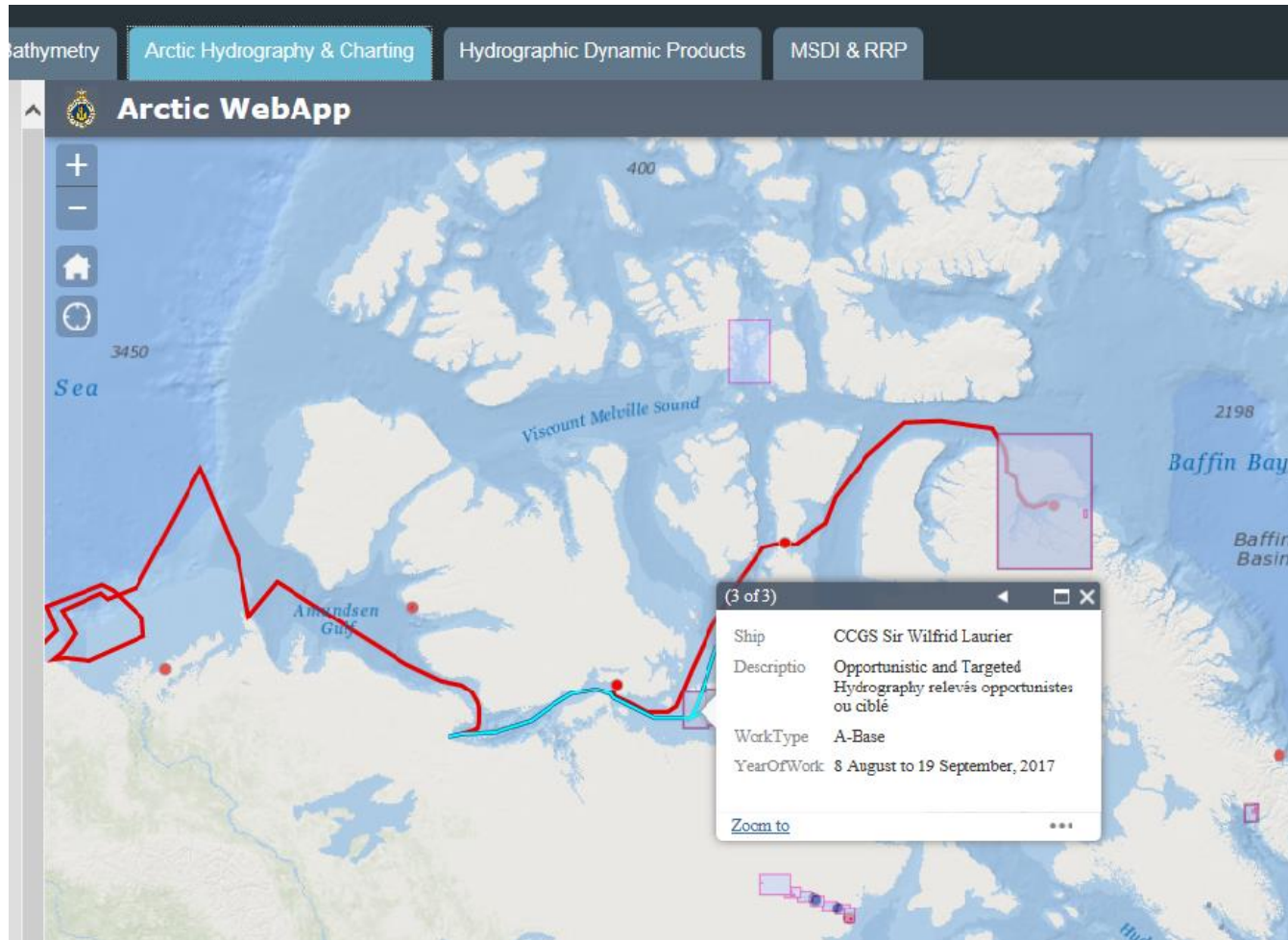
Layer List

- Operational layers
- Completed Survey ...
- Paper Chart Limits Production 2017-18 A-Based ...
- ENC Limits Production 2017-18 A-Based ...
- Tidal Gauges ...
- OPP Arctic Points ...
- Year One Plan / Plan de la première année ...



Canada's Ocean Protection Plan (OPP)

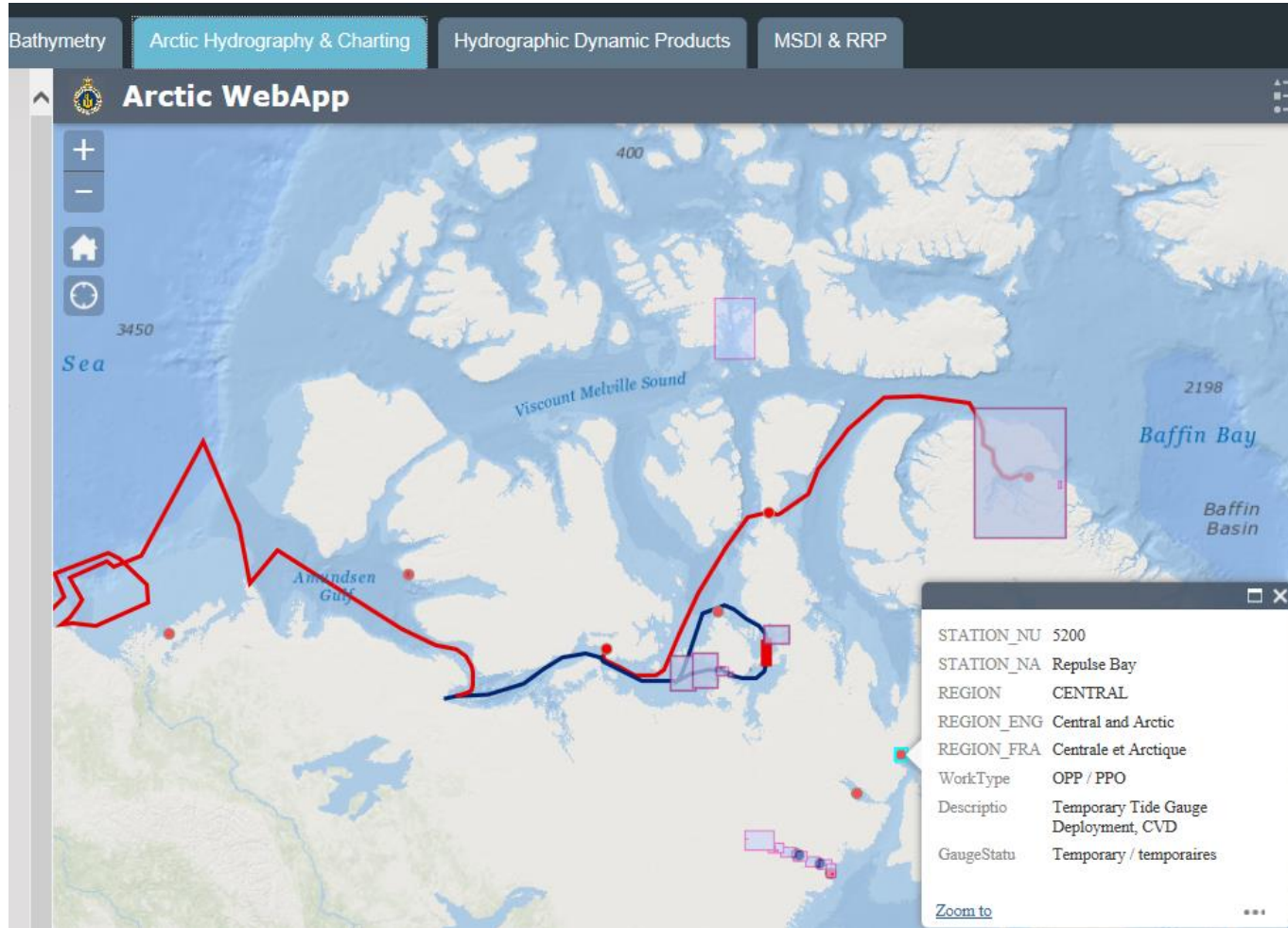
Arctic Hydrography and Charting – Hydrographic Surveys





Canada's Ocean Protection Plan (OPP)

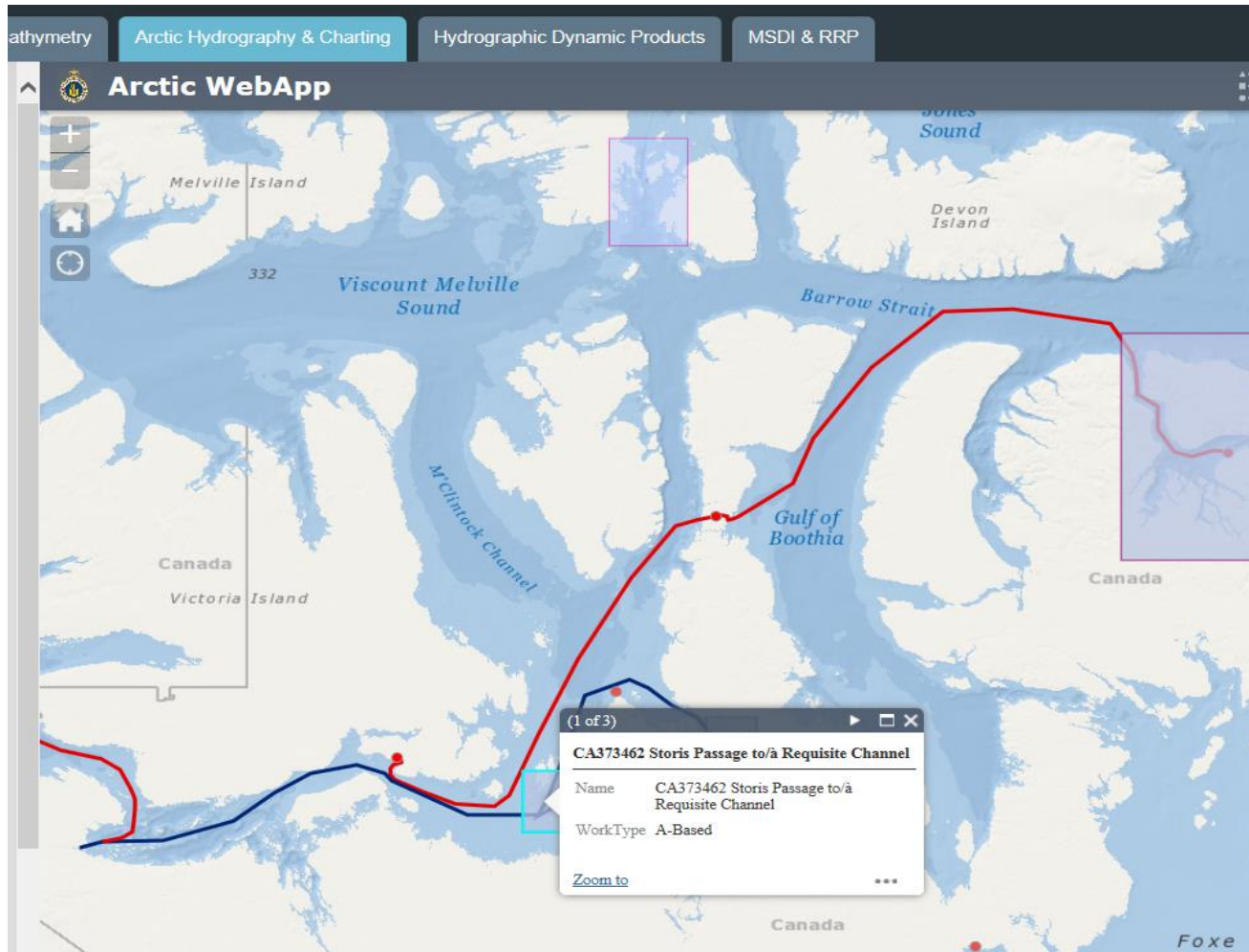
Arctic Hydrography and Charting – Tidal Gauges





Canada's Ocean Protection Plan (OPP)

Arctic Hydrography and Charting –ENC production





HYDRO"SPATIAL" DIRECTIONS...



UN-GGIM
UNITED NATIONS INITIATIVE ON
GLOBAL GEOSPATIAL
INFORMATION MANAGEMENT

Marine
Spatial
Data



Infrastructure



Crowd-Source Bathymetry (CSB) at CHS

CHS is committed to CSB:

Open, Targeted & Trusted Crowd-Source Bathymetry:

- CHS as Vice Chair of the IHO-CSB WG;
- Arctic - Crystal Cruises & *Crystal Serenity* Ship:
 - 2016 Anchorage to New York City via the Canadian North West Passage;
 - 2016 Royal Research Ship (RRS) *Ernest Shackleton* private Icebreaker escorted the *Crystal Serenity*;
 - The operators of the RRS *Shackleton* (Tactical Marine Solutions Ltd) provided 2016 Single Beam Bathymetric Data to UKHO and CHS for integration into Bathymetric Data Base;
 - 2017 via a collaborative agreement between the operator of the RSS *Shackleton*, the Marine Institute of Memorial University member of the Canadian Ocean Mapping Research & Education Network (COMREN) and CHS – a Portable MB will be installed of a launch to collect MB data;
 - World Ocean Council (WOC) recent involvement.





Satellite-Derived Bathymetry (SDB) at CHS

CHS has implemented a Centre of Expertise in Hydrographic Remote Sensing:

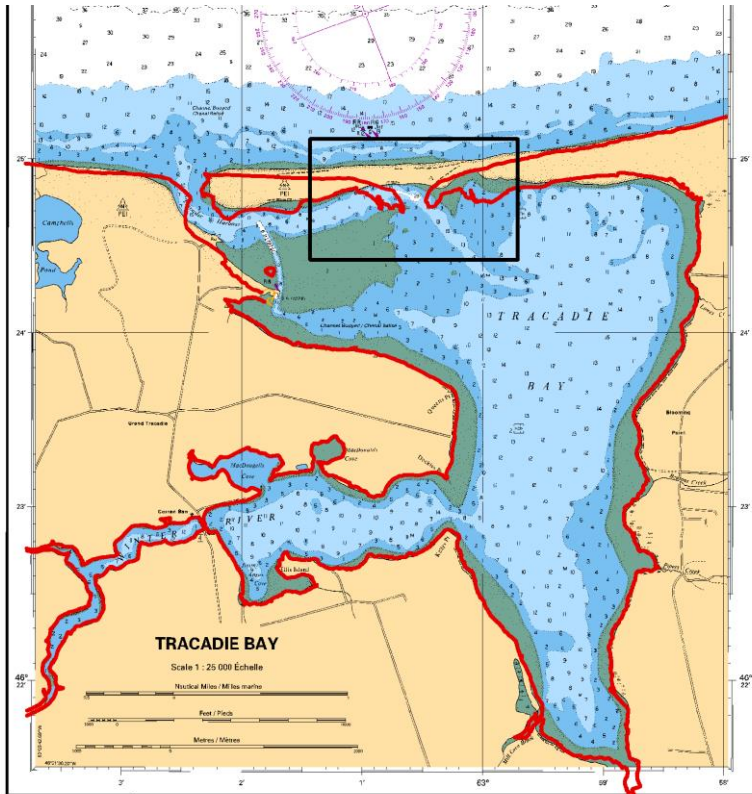
- **Current Project:** CHS has received Canadian Space Agency (CSA) Government Related Initiatives Program (**GRIP**) funding to investigate the potential of remote sensing to improve CHS' chart production process.
 - **Extraction of accurate shoreline and the intertidal zone**
 - New features (e.g. islands) could be used to calculate international limits.
 - Investigating use of optical and radar data.
 - **Satellite Derived Bathymetry (SDB)**
 - Mission planning.
 - Identification of risks to navigation (shoals, rocks, sandbars) in non-surveyed areas.
 - Significant potential for chart improvement within Arctic areas.
 - **Change detection**
 - Detecting areas of change/rate of change
 - **Data integration in CHS processes and database**
- **Future Project:** CHS also secured additional funding through CSA Data Utilization and Application Plan (**DUAP**) to further integrate GRIP objectives with RCM.
- CHS (Canada) with NOAA (USA) and SHOM (France) will host a SDB workshop in February 2018.



Shoreline Extraction for Chart Update

Example for Tracadie Bay, PEI (Chart 4425)

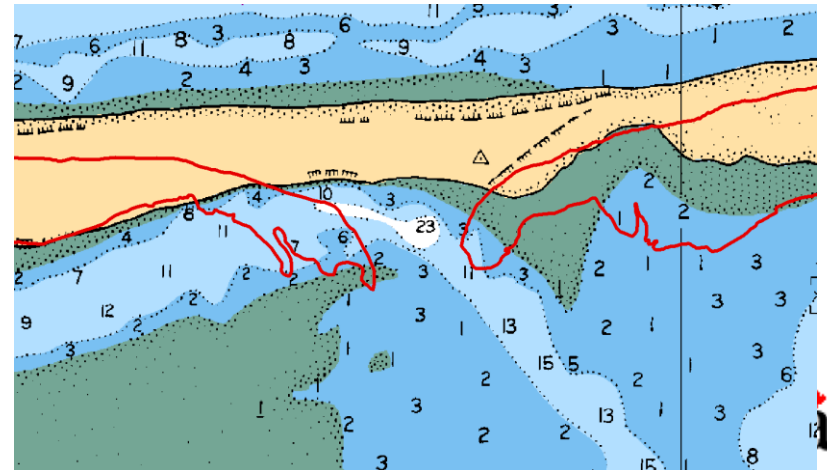
Current chart overlaid with extracted coastline



WorldView-2 image (2016-08-13) with extracted coastline. Arrow indicates new navigation channel.



Current chart with extracted coastline. Arrow indicates new navigation channel.



- Substantial change in coastline location over time.
- Remote sensing allows for regular monitoring of coastal changes, supporting chart improvement scheduling.



Canadian Ocean Mapping Research & Education Network (COMREN)

Independent Network – Academia Leadership

Membership:

- Memorial University - Marine Institute - St. John's NL - **Vice Chair** COMREN
- University of New Brunswick, Fredericton NB
- Nova Scotia Community College, Halifax, NS
- Centre Interdisciplinaire de Développement et de Cartographie des Océans (CIDCO), Rimouski, QC - **Chair** COMREN
- Université Laval, Québec QC
- Ottawa University, Ottawa ON
- York University, Toronto, ON
- British Columbia Institute of Technology (BCIT), Vancouver BC

Objectives:

- Design, develop and deliver Research & Education Programs in Canada and Internationally;
- Leverage on collaboration with Federal, Provincial and Territorial Government agencies – more specifically CHS;

New Project:

- Crowd-sourced bathymetry collection in Northern Communities





Canadian Armed Forces National Presentation

ARHC August 2017

CFINCOM- DGIPP

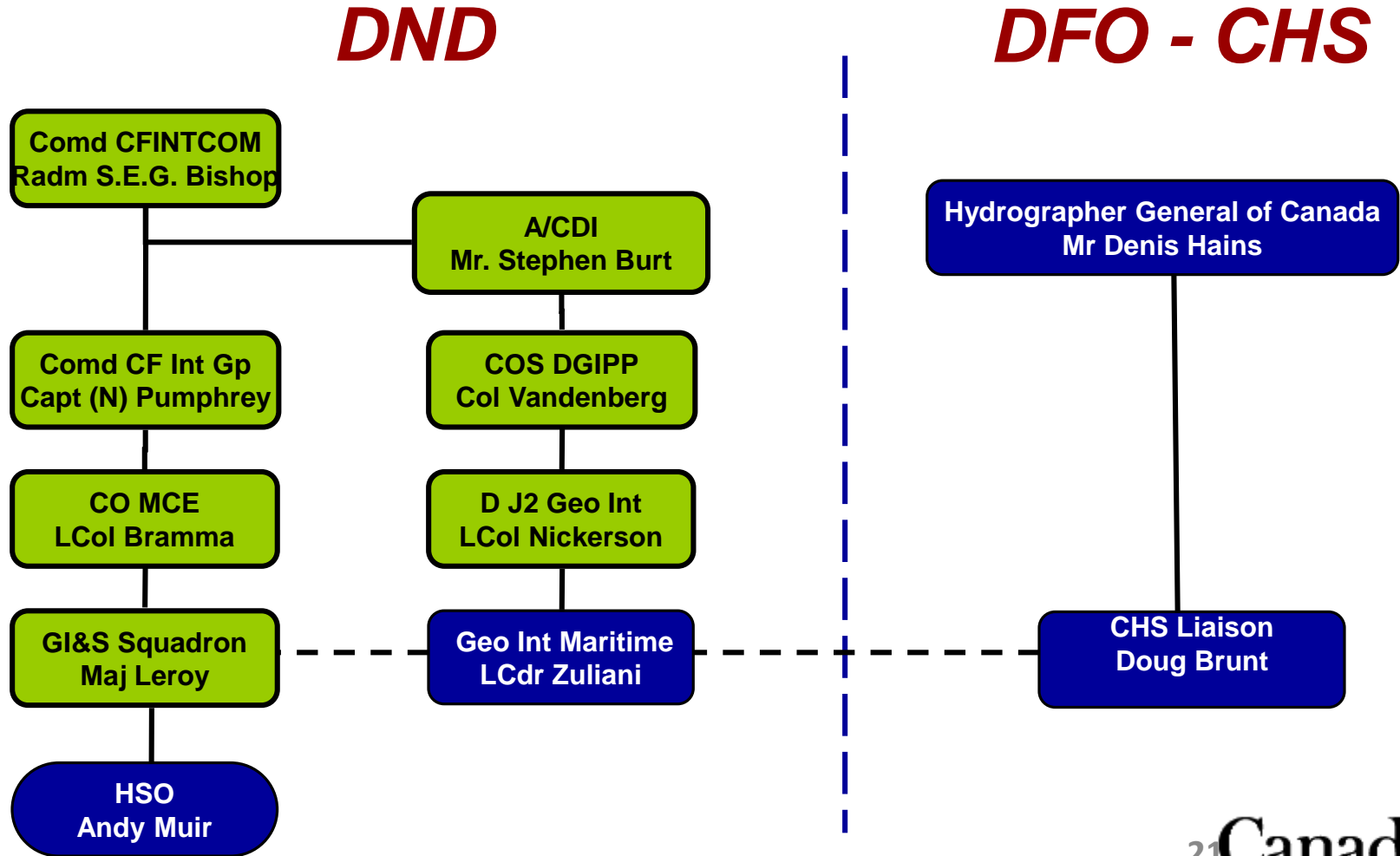
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Hydrographic Service Office

Mr. Andy Muir, Cdr (ret'd)
Super Intendant
Andy.Muir@forces.gc.ca



Canada's Maritime GEOINT Structure is split between the Civilian (Canadian Hydrographic Services-CHS) and the Military (Hydrographic Services Office-HSO). CHS provides the hydrographic data to the HSO which is responsible for adding additional military requirements and Chart distribution to the Military users.





POINTS OF CONTACT

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- RAdm S.E.M Bishop, Scott.Bishop2@forces.gc.ca

- **Commander CFINTGROUP**
- Capt(N) Ron Pumphery, ronald.pumphrey@forces.gc.ca

- **Chief of Staff Director Intelligence Policy and Partnerships**
- Col Eric Vandenberg, Eric.Vandenberg@forces.gc.ca

- **CO MCE**
- LCol Claire Brama , claire.bramma@forces.gc.ca

- **Superintendent of Hydrographic Service (HSO) office**
- Muir Andy Muir, mark.leblanc@forces.gc.ca

- **DGIPP GEOINT MARITIME**
- LCdr James Zuliani, James.Zuliani@forces.gc.ca



HSO Capabilities

The Canadian Maritime Digital Production Team is composed of eight staff (three senior and five geomatics technicians), located in Esquimalt, BC and Halifax NS. The Digital Production Team's main tasks include:

- Canadian Pacific and Atlantic AOR domestic AML production.
- NATO AML Co-Production.
- Hydrographic Field Sheets.
- Bathymetry processing and surface generation.
- Littoral Briefing Charts
- Submarine ENC's
- OPAREA Charts
- Paper Charts (3456)
- BSB Raster (3456)
- Digital Response Products (Custom Maps and Charts)
- GeoTIFF Charts (Can be loaded onto WECDIS)
- GeoPDF



2015-2016 HSO products

PRODUCTS	REMARKS	QUANTITY ISSUED 2015-16	
Custom Digital Products In Process or Completed	OPAREA CHARTS / PORT IMAGE MAPS (NEW PRODUCTS / REPRINTS)	53	570
Print-On-Demand (POD) Charts	CDN / NOAA / UKHO	12 768	
Safety of Navigation Notices	Originated by HSO for ship safety	880	
Additional Military Layers (AML)	For use by ships at sea in ECDIS	31	
NACPP AML*	For use by NATO Partners	42	
DNC QA**	QA of contractor deliverables	15	
SubENC	PRODUCTION TO BEGIN 2016-17	0	
Client Orders Processed	RCN / CDN COAST GUARD / RCMP	10 742	



RCN Presence in the Arctic



HARRY De WOLF Class

- 6 Ships in class
- 6440 tonnes
- LOA 104 meters
- Delivery to the RCN 2018
- Trials/deployment 2019

Roles

- Sovereignty
- Constabulary
- Fisheries
- Survey
- Support to Northern communities





FACT SHEET

HARRY DEWOLF-CLASS ARCTIC/OFFSHORE PATROL SHIP

The Arctic/Offshore Patrol Ship (AOPS) project will deliver six ice-capable ships, designated as the Harry DeWolf Class, after Canadian wartime naval hero Vice-Admiral Harry DeWolf. The AOPS will be capable of:

- armed sea-borne surveillance of Canada's waters, including the Arctic
- providing government situational awareness of activities and events in these regions
- cooperating with other partners in the Canadian Armed Forces and other government departments to assert and enforce Canadian sovereignty, when and where necessary.

Construction of the first AOPS will begin in September 2015, with HMCS *Harry DeWolf* scheduled for delivery in 2018.

AOPS SPECIFICATIONS:

Length:	103 metres
Beam:	19 metres
Complement:	65



Halifax-class Canadian Patrol Frigate
Displacement: 4,770 tonnes



Harry DeWolf-class Arctic/Offshore Patrol Ship
Displacement: 6,440 tonnes



Kingston-class Maritime Coastal Defence Vessel
Displacement: 970 tonnes

To scale

INTEGRATED BRIDGE NAVIGATION SYSTEM

Modern integrated bridge, from which control of navigation, machinery, and damage control systems can be performed.

MULTI-PURPOSE OPERATIONAL SPACE

Where operational planning and mission execution will be coordinated.

HELICOPTER CAPABILITY

Depending on the mission, the embarked helicopter could range from a small utility aircraft right up to the new CH-148 maritime helicopter.

BAE MK 38 GUN

Remote controlled 25 mm gun to support domestic constabulary role.

CARGO/PAYLOADS

Multiple payload options such as shipping containers, underwater survey equipment, or a landing craft. Ship has a 20-tonne crane to self-load/unload.

ENCLOSED FOCSLE/CABLE DECK

Protects foredeck machinery and workspace from harsh Arctic environment.

VEHICLE BAY

For rapid mobility over land or ice, the ship can carry vehicles such as pickup trucks, ATVs, and snowmobiles.

BOW THRUSTER

To enable manoeuvring or berthing without tug assistance.

DIESEL/ELECTRIC PROPULSION

Propulsion: Two 4.5 megawatt main propulsion engines, four 3.6 megawatt generators.

MULTI-ROLE RESCUE BOATS

Top speed of 35+ knots, 8.5 metres long. Will support rescues, personnel transfers, or boarding operations.

RETRACTABLE ACTIVE FIN STABILIZERS

Deployed to reduce ship roll for open ocean operations, retracted for operations in ice.



Harry DeWolf Class Arctic Offshore Patrol Vessel (AOPV) 430- 435





Thank you!

Merci!

**For further information & questions please contact:
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