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1.0 BACKGROUND

Understanding and managing the marine environment is essential for its sustainable use and development. Canadians tend to see their country as just those bits that stick out of the water, and while their knowledge of terrestrial habitats and atmospheric phenomena is growing exponentially, we still probably know more about the surface of the moon than we do about our oceans. The marine environment, not space, is our next frontier. Better understanding and management of our ocean resources will require a quantum leap in our ability to collect and process data about this environment. While the social and economic contributions of the ocean sector to modern life are both very significant, it is not at all trite to say that the health of the oceans is directly related to the very sustainability of human life on planet Earth. Information Seaway is a significant new initiative that will contribute significantly to informed decisions in this sector.

The world’s oceans constitute a vast, remote, complex and harsh environment. The data sets that describe this environment can be very large. Describing this environment can generate huge volumes of data, combining aspects that vary both spatially and temporally. The ocean is a dynamic, 3-D environment in which phenomena in the water column (e.g. thermal gradients; variations in currents, temperature and salinity; as well as size and movement of fish stocks) are important elements of the overall domain. Ocean data sets are typically collected and used by different groups for different purposes. For example, data sets for hydrography, oceanography, navigation, fishing, offshore hydrocarbon exploration and development, transportation, or maritime security tend to have differing data structures, application environments and policies for distribution and use. While some data sets are relatively static (e.g. bathymetry, bottom type), others are dynamic (e.g. waves, surface currents, vessel location) and are often required in ‘real time’ to be of value.

In today’s world, biologists, resource managers and policy makers cannot begin to accomplish their dream of integrated ocean management unless and until they have the necessary data and information. New policies and the implementation of additional technical framework elements are both necessary to enable simple access by all stakeholders to the data and information they need to function safely, efficiently and profitably.

The acquisition of ocean-related data represents a significant investment of time effort and money. However, these data sets represent little value to the end user. Data only has real value when it tangibly benefits the mariner. Typically, it must be refined into information and knowledge before it can have practical application. The requirement to turn data into application-specific information products and then deliver and present these products to the stakeholder in an efficient and effective manner provides commercial opportunity for the private sector in the way of R&D and product and service development and commercialization.

© Canadian Centre for Marine Communications (CCMC)
CCMC with the assistance of Industry Canada (Energy and Marine Branch) the National Research Council-IRAP and the Government of Newfoundland and Labrador (Department of Innovation, Trade and Rural Development) is currently undertaking a feasibility study as an initial step toward implementation of an Information Seaway demonstration project for Placentia Bay, Newfoundland. This report builds on the results of a stakeholder workshop held March 3 – 4, 2004 in St. John’s to define user desires, requirements and perceptions of the Placentia Bay Information Seaway pilot project. Input acquired through the workshop will serve to define the Terms of Reference of the project that will be detailed in the subsequent feasibility study.
2.0 PROJECT PERSPECTIVE

CCMC and its members have been the driving force behind developing an Information Seaway pilot project for Placentia Bay. Initially referred to as the Placentia Bay Marine Electronic Highway (MEH), the project has broadened to support the coming together as a single initiative of three concepts - ocean mapping, integrated ocean management, and spatial data infrastructure. The basic premise of Information Seaway is to create and support an infrastructure and culture to enable the broad marine sector to use and benefit from information technology with the same ubiquity as business and industry on land. Such a facility would enhance marine safety and environmental protection as well as enhance the efficiency and commercial viability of marine-related industry and activity.

2.1 Placentia Bay, Newfoundland – a Logical Study Location

Located on the south coast of Newfoundland, Placentia Bay (Figure 1) is fringed by a host of small communities, all of which rely to some extent on the adjoining waters for their livelihood. The bay is considered an environmentally sensitive area, hosting an abundant and diverse marine ecosystem.

As early as 1991 Placentia Bay was identified as the most likely site in Canada for a major marine disaster. The Brander-Smith Report (1990) determined:

"the risk of spills is highest in Eastern Canada, particularly in Newfoundland. Placentia Bay is considered by many to be the most likely place in Canada for a major spill."

At the time this conclusion was based on the movement of oil tankers associated with the Come by Chance oil refinery combined with the extreme weather conditions typical of the area.

In their traverse through Placentia Bay; oil tankers, container ships, bulk carriers and ferries navigate through the

Figure I: Placentia Bay
bay's 365 islands and reefs. Vessel traffic of note in Placentia Bay includes foreign oil tankers discharging at the Come-by-Chance oil refinery as well as loading from both Come-by-Chance and the Whiffin Head transshipment facility; domestic shuttle tankers discharging oil at the transshipment facility and tugs associated with the two facilities. There is also seasonal Marine Atlantic ferry service from Argentia to North Sydney, Nova Scotia and bulk shipment of sulphur waste from the Come-by-Chance refinery. In addition to current activity, INCO has announced Argentia as the site for a smelter to be constructed in support of its Voiseys Bay nickel deposit in northern Labrador. The project will result in the delivery of heavy industry construction materials and industrial equipment throughout the 3-4 year development timeframe followed by the regular shipment of raw ore to Argentia and the transfer to foreign markets of refined product.

There are other factors supporting the choice of Placentia Bay as well. Placentia Bay has significant potential for tourism primarily driven by natural rather than manmade attractions. Perhaps the greatest attraction is the population and diversity of marine bird species that are present in Placentia Bay. Placentia Bay also has a rich culture and history. It was the seat of the French power in Newfoundland in the late 17th century and today the area is home to much of the Irish culture for which Newfoundland is well known.

All of this activity shares the bay with an active fishing industry involving fishing activity in the bay as well as the transit of vessels to offshore fishing grounds.

2.2 Why Now?

New technological advances in our ability to collect data and process ocean information products have resulted in very rapid growth in the volume of data about this environment. To address the ever-increasing supply of and demand for ocean data and information, the development and implementation of an Information Seaway for Canada has been advocated. The Information Seaway will provide the foundation for integrated marine management. It will facilitate access to coastal and marine environmental, transportation and resource data and information by a broad range of users.

The concept of an Information Seaway is not new. The Canadian Hydrographic Service (CHS) in support of the Department of Fisheries and Oceans (DFO) proposed an Inland Waters Coastal and Ocean Information Network (ICOIN) in 1989. As part of a Canadian effort to develop a Canadian Geospatial Data Infrastructure (CGDI) through a national program called GeoConnections, CCMC and DFO subsequently coined the term Marine Geospatial Data Infrastructure' (MGDI). Since then, Technopole Maritime du Quebec (TMQ) has begun a process to develop an Integrated Marine Information Infrastructure (IMII) for the lower St. Lawrence seaway. More recently, the BC Ministry of Sustainable Resource Management (BC SRM) has initiated the development of the Cooperative Ocean Information Network - Pacific (COINPacific). From an international perspective, the Malacca Straits Marine Electronic Highway (MEH) project is focused primarily on providing enhanced
information to the mariner operating in a congested seaway. In each case, the objective of establishing a technical and policy framework that will enable simple third party access to widely distributed data and information is the same.

Currently, there are four Information Seaway-type projects proposed for across the country. Through separate entities from a focus, funding and operational perspective, CCMC is working with the respective parties to help weave a common strand through each to ensure that at the end of the day we end up with a truly national initiative.

The four projects are:

- **Placentia Bay Information Seaway Pilot (CCMC)** - primary focus on resource management, environmental protection and safety of life.
- **Integrated Marine Information Infrastructure - Showcase St. Lawrence (Technopole Maritime du Quebec (TMQ))** - primarily focuses on marine transportation management processes and vessel traffic movement on the Lower St. Lawrence.
- **Pacific Coast Demonstration Project (Ocean Innovative Systems, Inc (OISI))** - conceptual stage, however it is envisioned the project will be located in the central coast region and assume an oil and gas exploration/development and coastal and ocean use (environmental, recreational and aboriginal) focus.
- **Arctic Region Information Seaway Pilot (CCMC – to be confirmed)**
  Conceptual stage however anticipated to focus in particular on ice monitoring and movement as it relates to climate change, marine transportation and resource management.
3.0 THE INFORMATION SEAWAY

The vision of Information Seaway can be encapsulated as...

“Simple access by all stakeholders to data and information that support effective management and sustainable development of coastal and marine areas”.

Information Seaway is the ‘information infrastructure’ that will facilitate simple third party access to marine environmental and operational data and information in real time or near real time. This infrastructure will embody tools to record, save, manage, model, analyse and access data, and present the results as textual and graphical information to a broad base of expert and non-expert users. It must be based on standards and wide area networking, be affordable and be invisible to the user.

To initiate a full-blown Information Seaway initiative requires significant financial and technical commitment. Given the level of investment required it is prudent to assess the concept from a financial and technical perspective with attention paid to the ‘expectations’ of the various stakeholders. The Feasibility Study, which represents the next stage of the project should prove an effective tool in a decision making process as well as provide potential investors, public and private with hard data on which to weigh their decision.

The Marine and Ocean Technology Roadmap, a broad-reaching document developed by a committee comprised of representatives from industry with support and participation from NRC, Industry Canada, DFO, NRCAN, DND, Transport Canada, Environment Canada and the Canadian Space Agency makes the following statement:

“The vision for ocean science and services in Canada is to develop, over the next several years, the necessary knowledge base for our oceans that will contribute to confident decision-making. This knowledge base should mirror, in size and extent, the database we have at our disposal for making such decisions on land.”1
A conceptual illustration of what a realized Information Seaway might encompass is presented below (Figure 2).

The Information Seaway can be defined as the people, processes and technologies that collectively enable access to data and information that is the basis for a dynamic, multi-source understanding of the oceans. It is comprised of the following major components:

- **Data**.... The data can be categorized as that which describes the ocean floor and sub-floor, the water column, the sea surface, the land-sea interface and the marine atmospheric environment. The cost and value of this data must be assessed in terms of the resources, including human effort, ship’s time and satellite resources required to collect it.

- **Processes**.... Whereas collecting ocean data represents a significant investment, in and of itself the data represents little value to the end user outside of the scientific community. The processes that add value to the data are a significant component of the Information Seaway. This includes the cost and resources for assembly, storage, management and value added processing of the data into
application-specific information products. Process also includes policies on IP, licensing, security/entitlement, data sharing, etc.

• **Information Products**.... Data only has real value when it is a form that tangibly benefits the ocean's community of interest. Whether it is a seafloor habitat map or a marine weather forecast the information products derived from the data present the real value. Delivery and presentation of these products to the end user in an efficient and effective manner provides commercial opportunity for the private sector in terms of R&D and commercialization.

• **Infrastructure**.... This encompasses facilities and enabling technologies necessary to disseminate, present and act upon marine information products. As well, it includes the public information infrastructure required to gather, store and manage the tremendous volumes of data that will potentially be made available through the Information Seaway.

• **Users**.... In order to be successful, infrastructure must serve the needs of a large user community. The marine community is a diverse group that includes mariners, scientists, policy makers, environmentalists and enforcement agencies. The implementation, adoption and ultimate success of the Information Seaway will depend on its ability to serve the information needs of this diverse user community and to offer each individual a value proposition. (One of the interesting things about information infrastructure is the potential role of the 'users'. For all other infrastructures a fundamental requirement is to 'remove' the users from the infrastructure (e.g. users typically do not provide anything to the telecom infrastructure). In the case of information infrastructure, however, there is a potential role for users to provide data and receive information.)
4.0 WORKSHOP METHODOLOGY

The Placentia Bay Information Seaway Pilot Project – Stakeholder Workshop was held in St. John’s, Newfoundland March 3 – 4, 2004. Hosted by CCMC, the workshop brought together a broad cross section of stakeholders from public, private and academic circles. A list of workshop participants is provided in Appendix I.

The objectives of the workshop were to:

- Share with the user community the background and vision of the Information Seaway concept and specifically the Placentia Bay Information Seaway Pilot Project.

- Gain a better understanding of ongoing information access/management activities, etc. of each segment in relation to Placentia Bay.

- Draw from stakeholders their data and information needs, wants and perceptions

- Solicit feedback on how to proceed with the development and implementation of Placentia Bay Information Seaway Pilot Project.

- Identify existing information and data sets that may be relevant to the project.

- Provide insight into stakeholder perceptions of the status of existing data and information accessibility as well as current information gaps and future requirements

As a result of the workshop, a broad cross-section of the marine community has had the opportunity to participate in the development of the Information Seaway vision for Placentia Bay and will undoubtedly prove to be valuable contributors as the project advances into the implementation stage.

This report represents the initial step in a more complete and on-going analysis of the technical and business issues surrounding establishing and operating a sustainable information infrastructure that can serve the information requirements of a broad range of marine users. Future work will focus on a more detailed market analysis that will help to refine the technical infrastructure and data/information products, as well as beginning to develop the business case for Information Seaway as a sustainable information infrastructure.

The Workshop was carried out in three sessions. Session I provided a general overview of the Information Seaway concept. Session II focused solely on seabed mapping, a
specific component of the Information Seaway proposed as the foundation data set for the overall initiative. Session III dealt with building the Information Seaway and the data management, integration and dissemination issues surrounding it. To help maximize the effectiveness of the workshop, attendees were divided into five breakout groups to address a series of prepared questions posed to draw out participant input to the feasibility study design. The workshop agenda and breakout group questions are included in Appendix II and III respectively.

A synthesis of input to the study derived through the breakout sessions forms the basis of this report. This input will help define the strategic direction for the follow-on feasibility study.
5. OCEAN SECTOR SEGMENTATION

Placentia Bay stakeholders span the full gamut of the oceans sector. We believe that the following segmentation of the sector provides a fair representation of the ocean community. One notable omission is non-renewable resources, primarily offshore oil and gas in the context of Newfoundland and Labrador. This is a conscious omission in that, strictly speaking, offshore production and exploration operate entirely outside of Placentia Bay. Oil trans-shipment, storage, and the North Atlantic refinery in Come-by-Chance are included as noted in other segments.

5.1 Marine Transportation

Moving people and goods using the world’s waterways is one of mankind’s oldest activities. Marine transportation, including ports/harbour operations and various support services, is presently one of the world’s largest industries. Economics and competition from other modes of transportation are creating a trend towards larger, faster vessels. This, in turn, places increasing demands on operational safety and environmental protection, and requires that marine transportation must be managed in an integrated manner from planning through to delivery of goods to their final destination.

Vessel routing, electronic charts and chart systems, aids to navigation (including GPS), at-sea communication services, real-time access to environmental data and forecasts, port facilities (including links to other transportation modes), and emergency response infrastructure are some of the information dependent components of the marine transportation segment.

Marine transportation is of prime importance in the Placentia Bay context. Each year there are hundreds of transits of Placentia Bay by oil and bulk cargo vessels as well as passenger ferries. Based on marine pilot assignments by the Atlantic Pilotage Authority, there were

Figure 3: Shuttle Tanker MV Kometik (courtesy of Canship Ugland.)
approximately 2500 vessels transits during the period of 2000-2002, peaking at nearly 1200 vessels in 2002. About half of these vessels are currently oil tankers destined for the Come by Chance oil refinery and the Whiffen Head Trans-shipment facility (Figure 3).

5.2 Ocean Science

Reducing the uncertainty in understanding and monitoring the state of the oceans can assist in preventing both social and economic impacts and devising adaptive strategies to cope with the impacts of climate change. Increases in sea level and changes in the intensity and pattern of storms related to global warming will increase the risk and pattern of coastal erosion and flooding, and adversely impact the operations of ships and other structures at sea.

Changes in ocean circulation, sea level and the pattern of weather systems are some of the areas requiring scientific investigation and technological innovation. Enhancing ocean observation capabilities, refining ocean components of coupled ocean / atmosphere circulation models, strengthening regional climate models and developing better operational ocean forecast methods are challenges to be addressed in understanding the impact of the world’s oceans on climate, and vice versa.

5.3 Commercial Fishery

The oceans are an important source of protein for the world’s expanding population. The commercial fishery has an undeniable and irreplaceable influence, not only on the economic future of Placentia Bay, the province and the Atlantic region but also on its history and its culture. Because of the significant decline in ground fish stocks in the North Atlantic over the past decade, the profile of the commercial fishery has changed dramatically. There is now much greater emphasis on higher-value shellfish species, particularly shrimp and crab.

The exploitation of living marine resources is placing stresses on biodiversity and habitat. The effort must be managed in order to ensure its availability for generations to come. There has been considerable collaboration between fish harvesters and government in defining and acquiring the information necessary to set the direction for a new more efficient fishery with optimum effort and reduced by-catch. Measuring and understanding the environmental parameters, the size and characteristics of the biomass and the interactions between natural and human activities, allocating resources and monitoring harvesting activities and capacities are challenges facing fishers and resource managers alike.
5.4 Aquaculture

For centuries Newfoundland and Labrador has been a world player in international seafood markets. However, worldwide demand and the corresponding increase in catch effort have seriously depleted much of the wild stocks that have been traditionally exploited for food. The aquaculture industry in Newfoundland and Labrador while still very much in its developmental stages is perhaps the fastest growing segment of the marine sector. In Newfoundland it is considered to be one of the main tenets of rural economic renewal. Placentia Bay has about six approved aquaculture sites, two of which produce cod and the remainder of which produce blue mussels.

The United Nations Food and Agriculture Organization (FAO) reports that nearly 20% of the world's wild stocks are over exploited while approximately an additional 50% are fully exploited. Simply put, production from the world's wild fisheries has peaked and is arguably in decline. As world demand increases, traditional fishery cannot and will not meet this demand. Aquaculture currently produces about one third of the world's supply of seafood and in the next 25 years is expected to surpass one half of the global supply.

In the North Atlantic context aquaculture consists primarily of pelagic species such as salmon trout, shellfish, and aquatic plants, primarily used in the extraction of pharmaceuticals and nutraceuticals. A basic premise of the value of aquaculture is that as an offset to wild species harvesting and as a source of the global supply of protein it is a cheaper and less environmentally impacting than other conventional sources of protein produced for human consumption.

The realities of the supply and demand in the world seafood market has placed the aquaculture industry on the fast track. If we relate the evolution of aquaculture to agriculture as a primary supplier to the human food chain, the challenge facing the industry is to accomplish in a matter of decades what was accomplished in agriculture over several hundred years during the last millennium. While a daunting challenge, this is achievable, albeit through considerable innovation in the application of technology and ocean information.

5.5 Ocean and Coastal Management

The sustainable use of our ocean and coastal resources requires an understanding of the interdependencies of a set of natural and human interactions. These interactions are complex and not easy for regulators and stakeholders to understand or incorporate into existing regulatory frameworks. The diversity of conflicts, some terrestrial and some marine, compounds the issue.

An integrated approach to management attempts to harmonize economic, social and environmental objectives, similar to the land use management frameworks in urban areas. Data and information is key to integrated planning and to build the necessary consensus on sustainability of coastal environments. Increases in sea level and changes in the intensity and pattern of storms related to global warming are likely to increase the risk and pattern of coastal flooding. As such, integrated scientific (prognostic and
predictive) and socio-economic models will be needed as a basis for planning future coastal zone developments.

The typical stakeholder in this segment is the “Ocean Resource Manager”, for whom the principle of integrated ocean management is the most favourable end goal. In the Placentia Bay context, environmental protection would be a key component of integrated ocean management. As an example, there is currently a consideration by the International Maritime Organization (IMO) to have Placentia Bay and approaches declared a PSSA (particularly sensitive sea area).

5.6 Emergency Preparedness and Management

The ambient climate in and around Placentia Bay can regularly serve up the worst that nature has to offer. Heavy precipitation, icing, gale to hurricane force winds, waves, storm surges and flooding are among the extreme events that can result in injury or death and significant damage to property in Placentia Bay’s coastal and marine environments. Furthermore, damage to ships at sea (particularly those transporting bulk hydrocarbons), drill rigs or production facilities can result in significant and widespread detrimental impacts on the environment. Preventive measures and timely response is critical to mitigating such impacts.

Various technologies such as meteorological and oceanographic buoys and satellite remote sensing can provide early signals and improve emergency response and lessen the impact of such events through rapid identification of potentially impacted areas and preparation of appropriate planning, protection and response measures. High resolution, seamless coastal mapping, advanced drift prediction models and decision support systems are all key components required to effectively anticipate, respond to and manage coastal and ocean emergencies.

5.7 Coastal Communities

For the purposes of the Placentia Bay feasibility study this segment includes the collection of communities and industrial facilities bordering the perimeter of Placentia Bay. While arguably sparse by standards of other significant Canadian waterways such as the St. Lawrence Seaway, Great Lakes and the southern British Columbia coast, Placentia Bay’s population base and its industrial infrastructure is nevertheless quite significant in the local and regional context.

Twenty-six incorporated and another forty unincorporated communities border Placentia Bay. All to some extent owe their existence and their future sustainability to the ocean and in particular the bay. While there is some diversity from the service sector in the larger communities such as Marystown and Placentia, the economic and cultural bond to Placentia Bay for all communities is critical and undeniable. The interface between these communities, the breakwaters, boat basins, public and private wharves and waterfront properties and the bay is, of course of particular interest.
North Atlantic Refining operates Newfoundland and Labrador’s only oil refinery at Come by Chance at the head of Placentia Bay. A well established facility, in operation for over thirty years, the refinery benefits from a year round ice free port and closer proximity to the oil fields of the North Sea, West Africa and the Persian Gulf than any other refinery in North America.

The Newfoundland Transshipment Limited, Whiffen Head oil-handling facility is also located at the head of Placentia Bay near the Come by Chance refinery (Figure 4). Shuttle tankers, specially designed for the harsh environment of the Grand Banks, deliver crude oil from the Hibernia and Terra Nova oil fields for storage and subsequent reshipment to markets and processing facilities elsewhere. The transshipment facility has a storage capacity of three million barrels and is poised for additional activity as future oil projects such as White Rose and Hebron begin production.

The Marystown shipyard and the affiliate Cow Head offshore fabrication facility, operated by Kiewit Offshore Services are located in Marystown, the largest population centre in Placentia Bay. Together they constitute the largest shipbuilding and repair facility in Newfoundland and Labrador. The shipyard has the capacity to build ships ranging from large fishing vessels and specialized vessels that support the offshore oil and gas sector. The Cow Head facility has carried out commissioning, repair and decommissioning of a number of offshore drill rigs and has built a number of components for the Hibernia and upcoming White Rose production projects.

Other industrial facilities include three large fish processing facilities located in Marystown, Burin and Arnold’s Cove as well as approximately six smaller seasonal processing plants and the now decommissioned US Naval Base at Argentia. While currently largely underutilized, the Argentia facilities represent an important asset to Placentia Bay. Nickel giant INCO, owners of the Voiseys Bay nickel mine, have committed to constructing a pilot nickel processing facility on the Argentia site.
5.8 Maritime Security and Sovereignity

Canada is a maritime nation that owes much of its security and prosperity to its use of the oceans for commerce and national security. Canada spends in excess of $2.2 billion annually on Maritime Command operations by the Department of National Defence alone. In addition to this, DFO spends several million each year on maritime surveillance related to management and control of offshore fishing activity.

The United Nations Convention on the Law of the Sea (UNCLOS) creates a framework of international agreements that are designed to protect ocean access, maintain the environmental quality of the oceans and guard against inappropriate exploitation of marine resources. As Canada implements its new Oceans Act, pressure will increase to declare an Exclusive Economic Zone under UNCLOS. Declaration and implementation of sovereign rights over this territory is spurred not only by the need to exploit economic opportunities, but also by the need to manage and protect marine resources for future generations.

Conservation and protection of Canada’s EEZ, and those of other countries, will depend in large part on the use of geomatics tools and technologies to map and monitor this vast area. Space-borne, airborne, land based and ship based sensors, many of them new, will be required to feed an advanced, multi-jurisdictional information management and decision support system.

5.9 Tourism, Recreation and Cultural Resources

The tourism and recreation segment, in particular adventure tourism and eco-tourism represents a segment that is rapidly growing, not only in volume but in the diversity of the product that is available.

Clean water, healthy coastal habitats, bountiful living resources (fish, coral reefs, wetlands, etc.) and a safe, secure and enjoyable environment are all fundamental to coastal tourism. Security from risks associated with natural hazards such as wind, waves and strong currents created by storms is required if coastal tourism is to be sustainable over the long term. Geomatics tools and technologies can contribute to the sustainable development of coastal tourism by assisting with proper siting of coastal and marine infrastructure and public access, habitat management and coastal monitoring (waves, currents, erosion, algal blooms, etc.).

Nearly fifty species of marine birds including twenty-three species of breeding seabirds can be found in Placentia. It contains a number of ecological reserves, the most prominent of which is the Cape St. Mary’s Seabird Ecological Reserve. Internationally recognized and considered one of the great wildlife spectacles on earth, the reserve attracts tourists from around the globe. As well, Placentia Bay is said to contain 365 islands in addition to its diverse coastline. This geography lends well to marine recreation activities such as yachting and ocean kayaking.
Historically, the community of Placentia was the French capital of Newfoundland during the seventeenth and early eighteenth centuries as the British and French battled for control of the then colony. Castle Hill, the remains of a French Fortress dating from the late seventeenth century is a National Historic Site.

In more recent times, the waters off the tiny community of Ship Harbour became the site for what is often referred to as the “first summit meeting” (Figure 5). In 1941, US President Roosevelt and British Prime Minister Winston Churchill met there to lay out the Atlantic Charter, a document that laid out the vision for the world, post World War II. A monument marks the location of the meeting.
6.0 THE INFORMATION SEAWAY – ISSUES AND REQUIREMENTS

The first step in the feasibility study is an assessment of the issues and more particularly the information requirements as seen through the eyes of the Placentia Bay stakeholders.

Seabed data is the cornerstone of the Information Seaway and will be the default foundation layer over which all other information products will be referenced and overlaid. Collection is, of course a key aspect of seabed data. While all segments of the ocean sector will rely to some extent on it, some will be in the position to collect and contribute seabed data as well. This is a key premise that must be exploited if maximum benefit is to be gained from the Information Seaway. Obviously, segments such as Ocean Science and Management will be the primary agents for data collection but other segments such as the fishery and maritime security and sovereignty gather seabed data for their own operational needs, data that can supplement that gathered through primary means.

Meteorological and Oceanographic information, directly or indirectly impacts most of the ocean sector. Therefore issues associated with them tend to be identified with many segments of the sector.

A key premise of the Information Seaway is that data should be collected once, maintained close to the source and be available for use by many. Data management is therefore an issue that will inevitably arise in an operational environment where there are varied interests, some public, some private, are contributing and drawing upon a pool of data. Issues around ownership, possession, rights and access to data will ultimately need resolution.

The following is a commentary on the responses gathered from the five working groups in response to the two questions posed during Session I of the workshop. The intent is not to repeat the universal issues noted above, rather to highlight issues and requirements that are unique or of particular interest to a segment.

6.1 Marine Transportation

It was generally agreed by all participants at the workshop that transportation represents a major consideration within the management framework of Placentia Bay. Oil tankers, container ships, bulk carriers, tugs, transiting and active fishing vessels, pleasure craft as well as the occasional oil rig making its way into Marystown for refit all operate within the confines of the Bay. Scheduled traffic is typically restricted to a defined corridor or Traffic Separation Scheme (TSS) as defined by Marine
Communication and Traffic Services (MCTS) of Canadian Coast Guard (CCG) however vessels outside of oil tankers, bulk carriers etc. can move freely within the Bay, sometimes in a manner hazardous to scheduled traffic. CCG currently maintains an Automatic Identification System (AIS) within Placentia Bay. AIS transponders transmit information about vessel size, speed and heading in real time with the aim to improve safety at sea and reduce the likelihood of collisions between vessels. The AIS system is recognized as a critical component of the Information Seaway – the logistics of such will be explored in the follow-up feasibility study.

The marine transportation sector requires two types of information – strategic information about the overall environment and what to expect ahead of the ship (hours), and tactical (real time) information about the environment immediately surrounding the ship, this is important to both the mariner and the maritime manager. To a large extent, ship navigation entails extended periods of monotony, broken by moments when decisions must be made quickly. Ships masters spend a significant amount of time focused on contingency planning, however, when things are happening fast, it is critical for the master and crew to have good information at their fingertips.

Charts are widely used by all mariners. Within the TSS bathymetric information shown on existing charts is adequate for routine transit however the “comfort factor” diminishes significantly outside the routine such as in the case of contingency situations. Similarly, for fishing and pleasure vessels navigating the coastline and islands of the Bay more accurate data is a real requirement. Workshop participants expressed an awareness of the wealth of data that can be generated by modern multibeam survey systems. In an ideal world, users would like to have full bottom coverage with multibeam data, and tools that could be used to generate multiple outputs from the multibeam source data. It was generally agreed that 100% multibeam sonar coverage to the coastline represents the optimum solution with suggestion that in a perfect world the data should extend up to 12 miles beyond the mouth of the Bay.

Weather (particularly wind and air temperature) and oceanographic data (tide, currents, waves and, to a lesser extent, sea surface temperature) are all important tactical data for the mariner. Ice cover and icebergs information are additional data sets that though rare for Placentia Bay are of critical importance. The possibility of conditions resulting in extreme weather effects such as storm tide surges and extreme icing are important to transiting vessels. These data are required both as forecasts and in real time or near real time. Real-time data buoys were suggested as the best solution.

It was suggested during the workshop that there exists a lot of data in government (DFO, etc.) archives that is lying dormant either because few people know it is there or because it is not in an appropriate format to be widely used. It was felt that a complete inventory of existing data was necessary to get a better handle on what presently exists.

6.2 Ocean Science

Canada’s Oceans Act is based on the principles of sustainable development, integrated management and precautionary approach. Management and use of ocean areas and resources is fundamentally different than for land areas. As ‘commons’ that are owned
by all of the people of Canada, marine areas/resources must be managed by consensus. To manage effectively we must understand the whole ecosystem. This can only be done through data that is comprehensive, conclusive, irrefutable and visual. Within this discussion arose aspects of the public/private relationship with regard to who should pay for data collection and whether such should be made available for public good.

There was consensus among workshop participants that those with a focus is the marine environment must recognize that their data collection activities should be done with an eye to other potential uses for the data and should therefore be collected to a consistent standard. The data should then be stored and made accessible to others. It was recognized that appropriate standards and protocols are required to ensure compatibility between independent data sets.

There was general agreement that detailed multibeam data is the single largest data gap for Placentia Bay. Recent developments in multibeam technology mean that we can now do for the oceans what satellite remote sensing has done for the land. A multibeam “foundation layer” could serve as a reference point or “horizontal integrator” for all other scientific/management data.

It was noted that we are still on the learning curve in our understanding of the interaction of the ocean and our ability to predict the cause and effects of ocean related events whether they be changes in biomass population or extreme tidal surges. Ongoing data requirements include real-time and recorded data such as wind and air temperature and oceanographic data such as tides, currents, waves, sea surface temperature, salinity and water column characterization data.

### 6.3 Commercial Fishery

The size of our oceans, the dynamics of ocean phenomena, trans-boundary impacts and the simple fact that the resources are not easily seen or touched make geospatial science and geomatic technologies essential drivers to support better decision making by both regulators and fishers.

In the absence of data, the state of any given fish stock and its relationship to its habitat is to a large extent a mystery. Habitat can, in this instance be defined as a combination of environmental parameters (nutrients, temperature, salinity, current field, wave activity, bottom substrate, etc.) that are ideal for supporting a particular species. It was generally acknowledged during the workshop that our knowledge of these parameters within Placentia Bay is inadequate and even when information exists it is inaccessible for any number of reasons to potential users. Ongoing data acquisition and dissemination of the information to fishers in real or near-real time is desirable.

Knowledge of habitat represents an important fishery management tool. However it can also dramatically influence the efficiency of fishers from an economic, environmental and human perspective impact. There was general agreement at the workshop that a logical value-added product of seabed data would be habitat or ecosystem delineation showing surface geology and sediment characteristics backed up by ground-truth data.
The value of habitat maps has been demonstrated through other Canadian and international projects and represents a logical component of Information Seaway.

Efficiency within the fishery could be further advanced through implementation of a “smart fishing” pilot project within the Information Seaway Pilot Project development initiative. The “smart fishing” concept utilizes wireless technology to minimize the level of effort required by fishers to report and document catch and dramatically minimizes the catch monitoring logistics of fisheries managers. In addition fishers have the ability to download fishery management and tactical fishery information. CCMC is presently developing such an initiative in Placentia Bay, known as FISHnet. The goal is to improve the profitability and sustainability of the fishery through improved access to information provided by a fisheries management information system.

The very nature of fishing lends itself to conflict with co-users of the Placentia Bay. Fishers go where the fish are and this can result in conflict. Workshop participants acknowledged that fishing vessels operating in the path of tankers has been an ongoing management issue within the bay. The situation remains manageable however a more effective means of monitoring and controlling it as a component of risk management would be a step forward.

It was raised at several points of the workshop that industrial activity and its impact on the fishery deserve consideration under Information Seaway. The point was reinforced by reference to the now infamous Long Harbour “Red Herring” crisis in 1969 when elemental phosphorus was released into Placentia Bay and resulted in the largest and most prolonged acute pollution episode to date in Atlantic Canada. With the current industrial activity around the Bay and with the likely addition of a smelter to process Voiseys Bay nickel it would be logical and prudent to develop mechanisms for more effective assessment and monitoring of industrial impact. The requirement for ongoing, real-time water quality monitoring to assess nutrient and pollution distribution was specifically proposed.

The fishery within Placentia Bay is generally undertaken by vessels of less than 35 ft. that due to their small sizes, are most susceptible to weather. Better forecasting and in-situ recording of meteorological and oceanographic conditions utilizing moored buoys is required. This information should be made available to fishers in real time in order to assist the fisher in the decision making process.

6.4 Aquaculture

The dependencies between physical, biological and socio-economic elements of the ocean environment are complex, often subtle and not at all well understood. This is especially true for aquaculture where slight changes in water chemistry can dramatically adverse effects on the farmed fish and conversely the intensive activity surrounding a fish farm can potentially impact the surrounding environment. Escaped fish are a noted issue of uncertainty and concern as they may have an adverse impact on natural stocks in the region. Better monitoring is required from both perspectives.
The half dozen approved aquaculture sites in Placentia Bay are located primarily on the western side of the bay somewhat removed from the primary commercial/industrial activity. To help increase aquaculture development activity in this area more extensive information on suitable locations should be made available to applicants. Such information should include oceanographic/water column information, physiography, surficial geology, and the support infrastructure such as site communications. In addition, the relevant data to assess co-usage and the potential impact of users on each other is required. In addition a better understanding of extreme weather influence on potential sites would be helpful for both the decision making process and for advancement of cage design.

Regulatory and management issues were also raised at the workshop. It was suggested that accurate and current (up to date) information with regard to specific facilities combined with the baseline and monitoring data requirements suggested above accessible through the Information Seaway, would assist in taking a more holistic management approach in this area.

6.5 Ocean and Coastal Management

There is a need for better data and information about the entire Placentia Bay ecosystem (above and below water) if we are to effectively manage it in a sustainable manner. Good quality multibeam data was generally accepted as the foundation for all activities however alone it is not sufficient if managers as to understand processes; this will require time series data acquired through oceanographic and coastal monitoring and recording stations. This information is necessary in defining sensitive marine areas and marine protected areas (MPA). It was brought to the attention of workshop attendees that the International Maritime Organization (IMO) is presently considering having Placentia Bay designated an international Particularly Sensitive Sea Area (PSSA), one of only three in the world.

For effective management the integration and sharing of relevant data and the ability to manipulate this data for a particular purpose was recognized as a significant advantage of the Information Seaway. Continuing with this theme, it was suggested that those who operate in the marine environment recognize that their data collection activities should be done with an eye to other potential uses for the data. There was significant discussion though no resolution with regard to data ownership, liability and management of the data.

Queries were raised with regard to the possibility of utilizing air and satellite borne sensors to acquire synoptic data about ocean surface phenomena. These rapid acquisition technologies could offer the regular repeat coverage for monitoring of time variant processes. Airborne Lidar (Light Detection and Ranging) was suggested as a possible tool to improve bathymetric data gathering in shallow water.

The necessity for seamless integration of terrestrial and marine data sets was seen as a very important aspect in assessing environmental impact from a development perspective as well as for emergency response.
6.6 Emergency Preparedness and Disaster Response

The ability to effectively respond to an emergency situation is highly dependent on availability and access to relevant decision-making information. As an example, first response to an oil spill is to a large extent determined by assessment of present wind, wave and current information. Similarly, when it comes to life at sea minutes are critical. The ability to accurately predict the drift of a life raft can make the difference between rescue and recovery.

Shoreline sensitivity and the protection of MPA’s that can be catastrophically affected by a spill (e.g. seabird nesting area) are critical considerations. Immediate access to information that, in the case of an emergency, can help define first response action and thereby help minimize damage extent was a common issue to the breakout groups. The ability to quickly access a combination of data sets to evaluate beach composition and the inter-tidal zone characteristics could prove determining factors in first response.

A first consideration in emergency preparedness is avoidance. Management of vessel and industrial activity with a consideration toward the “what if” scenario can help avoid emergencies. Through knowledge of, and access to information concerning bathymetry, coastal morphology and prevailing oceanographic and climatological conditions can be utilized to define shipping corridors and to assess the suitability of potential industrial sites. Placentia Bay is quite exposed to storm forces. Real time information and access to oceanographic/sea-state and weather conditions such as can be provided by fixed buoys was endorsed. Such information can help predict localized dangerous situations such as freezing spray or rapidly building seas that can be dangerous especially to smaller vessels. There was suggestion that better use of satellite data could also play a role here and that this should be further investigated.

It was noted that organizations charged with managing and responding to emergency situations need a clear delineation between the roles and responsibilities of each to help minimize confusion and expedite response to an emergency situation.

6.7 Coastal Communities

Balancing economic development and environmental protection in the coastal zone requires up-to-date information about terrestrial and marine environments. The concept of ‘integrated management’ that is being applied to coastal areas relies on ready access to up-to-date information from all available sources to help decision makers employ appropriate planning decisions in order to avoid or resolve potential conflicts. Examples of such put forward included “how does one rationalize the cost of a municipal waste disposal system for a coastal community against revenues from potential aquaculture or recreational sites nearby?” Or, “what information is needed to resolve conflicting activities such as aquaculture and lobster fishing at the same locale?” These questions such as these need to be considered on more than an ad hoc basis since they go right to
the heart of the traditional rights and practices of coastal people and the sustainable economic development of coastal communities.

Also raised as important to coastal industry and communities is a knowledge of industrial impact on the surrounding environment. For example one needs to have access to background levels of pollutants as a result of past industrial activity in order to assess the impact of current industry. The former phosphorous plant at Long Harbour was put forward as the obvious example. However the same requirements exist in the case of smaller, less intrusive operations such as local fish plants. It was indicated that some baseline data does exist for Placentia Bay however it needs to be compiled.

There was general consent at the workshop that good data/information is a first step toward good governance. The knowledge of the physical scientist needs to be considered in combination with that of the social scientist and the socio economic realities in order to positively impact quality of life in coastal communities.

There needs to be better access to information concerning coastal infrastructure such as wharves, haul-out/repair facilities, and fixed aids to navigation as well as clarification of roles and responsibilities of community councils, provincial and federal government managers and regulators. As well, there needs to be better planning for communities and their infrastructure in case of extreme weather events such as storm surges. ‘What if’ planning is required.

There was specific reference to Information Seaway and the positive impression it would have on Placentia Bay as a “smart” region, which could potentially make the area attractive to new industrial, economic and tourism activity.

### 6.8 Maritime Security and Sovereignty

In the post 9-11 view of security and sovereignty there are on the surface at least, relatively few issues that directly affect Placentia Bay. Because of its sparse population and industry base and its relatively remote location on an island isolated from mainland North America, Placentia Bay is an unlikely location for a hostile invasion or a major attack on infrastructure.

As a safeguard against an attack on North America launched from the ocean, vessel reporting and tracking requirements have increased significantly since the terrorist attacks on the United States. Depending the class of vessel and the origin of the voyage, ships may have to begin reporting up to 96 hours before entering a Canadian or US port. Placentia Bay and its approaches lie very close to the main shipping lanes between Europe and the Middle East and Eastern North America. Avoiding comment on the likelihood or the feasibility of a sea borne attack on North America, if such an attack were to occur, the attacking force would likely sail across the mouth of Placentia Bay, conceivably using the lower bay as refuge or a staging area. In this scenario, Placentia Bay becomes a valuable monitoring post for ships of interest.

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The integration of data will be an important issue for the security and sovereignty segment. Information necessary to track, investigate and take action against a potential threat will in practice rarely come from a single source. Rather it will be a “fused” information picture created from satellite and aerial surveillance, vessel tracking and human input. This fused common operating picture or COP would then be available to multiple agencies to enable a coordinated response effort.

Placentia Bay does present some indirect concern from the point of view of maritime security. Tremendous amounts of crude oil and refined petroleum products enter and exit the bay daily on route to and from the Come by Chance and Whiffen Head facilities. These ships travel well known and well marked shipping lanes within the bay and could conceivably be easy targets for an attack with the intent of releasing large amounts of pollutants into the bay. This environmental terrorism has the potential to create havoc and cause significant environmental damage to the bay. A potential tool in combating this scenario lies in repetitive mapping of the seabed in areas of particular risk such as the shipping lanes and approaches to the oil facilities. Quite simply, a baseline survey is conducted and serves as the benchmark. Subsequently, whether through ships of convenience or in response to a threat, an area is re-surveyed and the results compared to the baseline data. Anomalies can then be assessed and investigated if deemed to be a potential threat.

### 6.9 Tourism and Recreation

Integrated physical, geological, biological, social, economic, political and cultural information in order to accommodate a broad range of stakeholder needs and expectations and the ability to ‘one-stop-shop’ when looking for information was seen as important from a tourism, recreation and historic resources perspective. The availability of information can help attract tourists and visiting researchers as well as manage those resources for future generations. It was raised that there needs to be a better understanding of the areas eco/adventure tourism potential and better promotion of such.

Readily available information concerning bio-diversity such as ecosystems, habitat, local species populations, endangered species as well as the location and sensitivity of historic resources is important from both an impact assessment perspective as well as from a site attraction perspective. Often people visit an area as a result of a keen interest in a specific topic. There is an opportunity to utilize “individuals of opportunity” with regard to recording whale and turtle sightings, unusual flora and fauna etc. to help build the Placentia Bay data base however an appropriate mechanism (set of protocols) is required to log this information.

Tourism can have a positive economic and social impact on Placentia Bay however it can also result in co-usage issues. For example, with visiting pleasure boats utilizing “fishing” wharves and traffic management issues with small vessels straying into shipping corridors. Also weather can change quickly in Placentia Bay and accurate
forecasting and timely dissemination of localized weather information is critical to small boats from a safety perspective.

Information on coastal infrastructure such as public wharves, accommodations, road access, communications options, marine service centres etc. is also a requirement.
7.0 SEABED DATA REQUIREMENTS

It is rapidly becoming accepted in the ocean science community and reconfirmed by the majority workshop attendees that multibeam bathymetric data represents the logical foundation data set for the Information Seaway. With the exception of sediment transport and coastal processes associated with wave and current action, bathymetric data is for the most part static; meaning that a digital, high-resolution data set collected today to modern hydrographic standards will remain current and technologically compatible well into the foreseeable future. Furthermore, it is geo-spatial or a “blanket” of information on which other data sets can be geo-referenced and layered or to which specific data points can be stacked.

As the common reference, the seabed can effectively serve not just the ‘water layer’ but also the atmosphere above it and the geology below it. It is also the underwater extension of the surrounding land in what should ultimately become a seamless data set, a concept only made possible over the past decade through quantum advances in positioning and underwater survey technology.

Recognizing the immediate importance of modern bathymetric information to the Information Seaway initiative a workshop session was specifically dedicated to the topic with relevant presentations by CCMC, CHS-Atlantic and GSC-Atlantic (see Appendix II). In attempting to garner the views and perceptions of the workshop participants with regard to seafloor mapping requirements for Placentia Bay a series of three questions were posed to participants during the subsequent breakout session.

The questions were:

- From you perspective what geographic areas within Placentia Bay and approaches would most benefit from new/advanced seafloor information?
- What types of seabed information do you see as important from a Placentia Bay perspective?
- How should this information be presented to best serve your needs?

The general consensus from the five breakout groups was that optimally all of Placentia Bay should be resurveyed with multibeam sonar to acquire consistent, 100% ‘foundation layer’ coverage. The optimal scenario would see the multibeam data extend to the shoreline in a format appropriate for seamless integration with the coastal topography. The data would also extend southward to the 12 nautical mile territorial limit.

As per a lead-in presentation by CHS, bathymetric charts built on a variety of data sets currently exist for the entire of the Bay however the level of resolution is variable with 100% multibeam coverage existing for only about 10% of the Bay. (Figure 7)
Both CHS and GSC indicated that some resurveying of the multibeam data set off Argentia Harbour may be required to bring the data to an appropriate resolution standard.

There was some discussion surrounding the existing shipping lanes defined in Placentia Bay. Although adequate for the defined purpose (i.e. safe water depth for deep draft commercial vessels) it was felt from the perspective of utilizing the existing data for applications beyond general bathymetry the data is inadequate given that it was acquired using single beam sounder at variable line spacing. A scenario raised was that although the existing surveys may be adequate for routine situations what’s the comfort factor if a vessel were to drift or be required to seek anchor refuge among the many island of the bay. There are currently five alternated anchorage sites located in the area of Merasheen, Long, Red and Woody Island(s). It was proposed that if resources permit data should be acquired in the area of these anchorage sites.

Money – that unfortunate point where desires and reality collide. There was general acceptance at the workshop that the ultimate goal should remain 100% multi-beam coverage. However, it was also recognized that as a starting point the cost would be prohibitive; better to try and build project momentum by focusing in those areas where one could expect best value from a project profile perspective. Following that mindset, there was a reasonable level of consensus that surveying, at least initially should be limited to waters deeper that 50m to help maximize coverage. Primary focus should be placed on the eastern side and north end of the Bay where the majority of commercial activity is occurring, working south and westward as resources permit. As a minimum, effort should be made to tie together the existing data set off Argentia to that in the north in the Come-by-Chance area (see Figure 7).

From a near-shore perspective, i.e. 0 – 50 metres there was a reasonable level of agreement that priority be placed at the key industrial areas including the Voiseys Bay smelter site/Argentia, Come-by-Chance refinery, Whiffen Head Transshipment Terminal and at Mortier Bay. Beyond accurate bathymetric information these ‘site-specific’ surveys can form the foundation of baseline environmental monitoring from which to assess risk and ‘change-over-time’ brought on by major industrial activity (e.g. baseline geochemical levels). It was suggested that airborne Lidar be investigated as a survey tool for shallow waters.
In addressing what types of seabed information should be deemed important from the perspective of Placentia Bay, the five break-out groups were fairly consistent in their feedback. Beyond the obvious response of continuous, digitally stackable bathymetric data there was significant interest in seafloor classification i.e. identification and delineation of the composition of the seafloor. This was deemed important from a couple of perspectives. Benthic habitat mapping has proven highly effective for the fishing industry from both an economic and environmental perspective. Knowledge of seafloor composition is also important to risk assessment in the case of an oil spill. Knowing the environmental sensitivity of an area including how the seafloor will respond to oil (e.g. will it be absorbed or sit on the seabed) is important to directing emergency response efforts. A coastline sensitivity index was proposed as the logical extension to this requirement – further indication of the requirement for a seamless data set.

The ability to monitor change over time was also considered important whether that be from a natural sediment transport perspective or as part ongoing monitoring of industrial activity and impact including dumping sites for industrial and fish plant waste. Identifying seafloor and navigational hazards such as cables, wrecks, munitions dumping sites etc. was also deemed important from a seabed perspective.

The requirement for geotechnical information, especially in the area of geohazards was also raised. For example, the detection of shallow gas pockets and knowledge of sediment stability is important from the perspective of siting bottom infrastructure such as cables, pipelines and pier footings.

In attempting to define how information should best be presented to suit user needs one point became quite clear; people are not interested in data, they are interested in information presented in an intuitive format whether that be as a map, an image etc. There needs to be a value-added component inherent in the presented information.

To the extent of available resources the ‘foundation’ data layer should be established for the entire of the Bay with additional information populating areas of particular interest. Priority should be placed on addressing the information needs of sites deemed for near term development or utilization.

Consistent with the vision of the Information Seaway, there is a necessity to be able to digitally “overlay” additional information with relative ease through a web or portal based access point. In developing the data presentation and access framework dedicated effort should be placed on breaking down existing data/information ‘silos’ and ensuring that users of the Information Seaway are able to access multipoint, multi-source data.

There was consistent feedback from the breakout groups that information presented must be easily accessed and presentation must be simple and intuitive. Especially in the early stages of implementation while attempting to ramp up project profile it was suggested that consideration be given to making the presentation “eye grabbing” or “sexy” in order to increase profile to potential users, funding providers as well as the general public, possibly schools through schools and community organizations.
8.0 BUILDING THE INFORMATION SEAWAY

If the vision of an Information Seaway is to be realized, it will require considerable investment; both directly on the part of the major stakeholders and by governments and agencies on behalf of the general public. The first question that must be asked when considering investing in any project is “what’s the return”? Those who are approached or expected to buy in as early investors and adopters of what is in effect a new approach to operating in the ocean sector must be able to rationalize the investment. In the case of commercial interests, whether in transportation, oil and gas or in the fishery, the correct answer is easy. The Information Seaway must translate to an improved bottom line. In the case of those who are poised to be or already are delivering services and technology to the sector will see the obvious benefit of increased market demand for their products and services. Scientific and regulatory agencies will benefit through timely collection and dissemination of information and information products.

The question and response become even more pertinent when a return on the investment is neither direct nor immediately obvious. While perhaps not as tangible as the direct economic benefit to stakeholders, the environment, more specifically the coastal zone habitat and marine wildlife, is poised to see tremendous benefits from the broad scale adoption of the Information Seaway.

Models for financing of public use infrastructure point to the inevitability of up front financing that is heavily weighted towards the public sector. Only with time do we see the widespread adoption necessary for the business case to become obvious. It is only at this stage that private investment can be attracted.

As an example, oil fouled seabirds have been a serious environmental concern for decades. One area where this is recognized as being a particular concern is along the coastline and the approaches to Placentia Bay. Here the abundance of seabirds and the proximity to primary trans-Atlantic shipping route have contributed to an alarmingly high incidence of fouled seabirds. Analysis of specimens indicates the likely source of the oil to be bilge water from transiting ships rather than from vessels engaged in trade in the area.

At the October 2002 meeting of the Newfoundland and Labrador region of the Canadian Marine Advisory Council (CMAC), there was considerable discussion on means of protecting against ships pumping their bilges while transiting the south coast of Newfoundland. Alternatively, there must be a reliable, accepted means of gathering evidence in the event that prosecution is necessary. Surveillance is the obvious answer. Traditional surveillance, whether by radar or by aircraft is not effective in all cases because of the vast areas and sparse population in the area. A more effective approach may be to track vessels throughout an entire voyage rather than as they transit the coastal area in question. An electronic file containing all pertinent vessel information as well as a track of voyages would be an invaluable tool for investigators.
8.1 The Foundation

The final session of the Information Seaway workshop, addressed the implementation as well as long-term economic and social benefits of the Information Seaway. One participant commented, ...things are being done now with little or no information, what difference will the Information Seaway make? This is a valid comment from the perspective of a user and one that illustrates the evolutionary rather than the revolutionary nature. It is said that the best infrastructure is that which is transparent to the user. Perhaps the best example of this is the public telephone network. A vast majority of users see only the telephone itself and are aware only of the end-to-end connectivity. The worldwide infrastructure is transparent or at least invisible to the user. This model does and must continue to apply to the Information Seaway.

In reality, many of the essential components of the Information Seaway exist and have existed for sometime. Perhaps the best example of this is the long time existence of navigation charts. The following illustration (Figure 8) shows the existence of navigation charts for Halifax Harbour for nearly 150 years. While the look and format has obviously changed the basic information contained has remained essentially constant.

Seabed data will form the foundation layer for the Information Seaway. Whether collected through single and more recently multi-beam sonar or through the leaded line soundings of past centuries, information derived from seabed data affects all segments of the ocean sector. In the particular case of Placentia Bay, it is estimated that multi-beam sonar data exists for 10% of the bay, high-resolution single beam data exists for 50% and low-resolution data exists for the remainder. An important attribute of Placentia Bay is of
course the shoreline. There have been organized human settlements bordering Placentia Bay for more than three centuries. All owe their existence to the sea so the shoreline is an important boundary between man and the environment. Consequently, much is known and recorded about the shoreline. In addition to the physical shoreline contour, compiled shoreline data includes man made structures such as public wharves and breakwaters, sewerage outflows and the mouths of rivers. This information is supplemented by aerial photography of the landmass surrounding the bay. The compiled data that is currently available is by no means complete but does form a solid basis on which to build. As a side note, much of the available data on Placentia Bay has been compiled into a “community based coastal resource inventory”, a publicly available database.

Because of its considerable historic military and shipping importance, Placentia Bay already contains much of the infrastructure that will form the basis of the Information Seaway. The development of an oil refinery at Come by Chance at the head of the bay served as the impetus for much of the infrastructure development more than three decades ago. In particular, the Coast Guard Vessel Traffic Management System is of primary interest for the Information Seaway. The system provides excellent radar surveillance of the Bay and approaches, in particular the traffic lanes and the head of the bay, north of Argentia. As well, the Bay has an excellent radio communications infrastructure. While this has traditionally been used for voice communications in support of vessel traffic management and normal marine operations, Coast Guard has embarked on a national program to add AIS or Automatic Identification System infrastructure, using the public marine radio channels as the communications medium. A traffic management and data communications system, AIS will enable identification and tracking of ships within and approaching the bay and has the capability to allow ships to exchange data with shore and with each other. While the primary mandate of these facilities will continue to be safety of life and traffic management, they can serve as a valuable means of collecting data, and in the case of AIS, a means of delivery.

In addition to the Coast Guard and the physical infrastructure it provides, there is considerable institutional infrastructure in Placentia Bay to be directed towards the Information Seaway. Some examples; The Placentia Bay traffic committee was established many years ago to manage issues affecting shared usage of the Bay by the fishery and other commercial interests. The East Coast Response Corporation, cooperatively funded by oil and gas industry stakeholders has the mandate to be the first response and coordinating body in the event of an oil spill in the bay. Finally, the Atlantic Pilot Authority maintains a pilot service that is mandatory for certain vessels including oil tankers. All are expected to be institutional cornerstones in the support and delivery of Information Seaway services.

8.2 Benefits

The last issue to be addressed in the workshop and important aspect of the Placentia Bay feasibility study was the stake-holder’s vision of the long-term socio-economic benefits of an Information Seaway for Canada. The range of well-supported responses suggests that there is tremendous potential for support from all across the ocean sector. These responses will form the basis for future work in the feasibility study.
At the foundation layers formed by the data and the technology, the Information Seaway will serve as a catalyst for development of new technology as well as new data gathering, processing and management techniques. Adoption and implementation of these technologies in Canada will give the industry the credentials to successfully export Canadian technology and services internationally.

Direct economic benefits will ultimately be realized by the oceans sector as well. These benefits will be seen across the sector. For example, the marine transportation segment and those that rely on it for their supply chain and their distribution will see direct cost efficiencies from more direct route planning, optimum load management and through more efficient port operations. Renewable resources, in particular the commercial fishery in the Placentia Bay context will see tremendous benefit. In the case of fishing, this will be seen not just in an improved bottom line but in the principle of smart fishing, and inherent in that, fishing with minimal by-catch and with minimal resulting habitat damage.

The Information Seaway will give Canada the opportunity to have a coordinated approach to infrastructure development. This will result in better, more efficient use of the public purse and government resources through economies of scale and less duplication of infrastructure and services. The other considerable benefit resulting from a coordinated effort is the opportunity to standardize infrastructure. The long-term benefits of this will be seen as the varied components of the Information Seaway grow and are eventually integrated into a cohesive national information network.

Planning and sustainable development of the ocean resources are a clear priority. The Information Seaway will provide the knowledge and the tools to support conscious and effective decision-making. Development of ocean resources requires investment from both public and private stakeholders. Most importantly, the information and knowledge that can be made available to investors will allow smart investment decisions to be made. In addition to sound investment, the Information Seaway will be crucial in supporting other aspects of development and management of resources. For example, information is critical in site selection, planning and design for developments ranging from aquaculture sites to wharves and infrastructure. Another example would be the benefit to the ocean manager in the definition and enforcement of management and regulatory zones.

Finally there are other less tangible benefits resulting from the Information Seaway. For example, the oceans and those that rely on it often go largely unnoticed except in times of emergency or disaster, whether that be a hurricane, a major accident or an oil spill. If there is one common benefit at least perceived by all, it will likely be improved public safety, health and quality of life. Finally, a largely undefined but nonetheless valid benefit, particularly to the general public is simply, a better understanding of the oceans. The extent to which the general public gain an appreciation of the ocean and its issues in the same manner as is seen for example in the urban environment will be a measure of success for the Information Seaway.
APPENDICES
Appendix I

Workshop Attendees
# Placentia Bay Information Seaway Feasibility Study

**Workshop Attendees**  March 3 – 4, 2004

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<th>Name</th>
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<td>Dick Pickrill</td>
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<td>Ron Newhook</td>
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<td>Randy Gillespie</td>
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<td>Clayton Burry</td>
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Appendix II

Workshop Agenda
Information Seaway – Placentia Bay Feasibility Study Stakeholder Workshop

……a CCMC Initiative

Workshop – March 3 & 4, 2004

Location – Marine Institute, Memorial University of Newfoundland
Ridge Road, St. John’s
Industry Seminar Room (main entrance, downstairs and to the left)

Wednesday, March 3rd/04

Session 1

8:30am Coffee and registration

9:00am Welcome and Introduction

09:30 – 10:15 Presentation 1 – Information Seaway; Overview and Stakeholder Perspective
Neil Cater CCMC

10:15 – 10:45 Coffee (informal seafloor mapping demo. – Ewan Cumming, Fugro Jacques Geosurveys Inc.)

10:45 – 11:45 Break-out session 1

11:45 – 12:30 Rapporteur reports

12:30 – 13:30 Lunch (provided)

Session 2

13:30 – 14:00 Presentation 2 – Capability and Capacity in Ocean Mapping; the Canadian perspective
Bill Carter CCMC
14:00 – 15:00 Presentation 3 – Seabed Mapping for Placentia Bay: Planning and Priorities
   Dick Pickrill    Geological Survey of Canada – Atlantic
   Gerard Costello    Canadian Hydrographic Service
   John Shaw    Geological Survey of Canada – Atlantic

15:00 – 15:45 Coffee and Break-out session 2
15:45 – 16:30 Rapporteur reports

Thursday, March 4\textsuperscript{th}/04

08:30 – 09:00 Coffee

Session 3

09:00 – 09:30 Presentation 4 – Information Infrastructure Concept and Components
   Randy Gillespie    CCMC/Canadian GeoProject Centre

09:30 – 10:15 Presentation 5 – Building the Information Seaway
   Neil Cater    CCMC

10:15 – 10:30 Coffee
10:30 – 11:15 Break-out session 3
11:15 – 12:00 Rapporteur reports
12:00 – 12:30 Wrap-up
Appendix III

Breakout Group Questions
Placentia Bay Information Seaway Initiative –

Feasibility Study Workshop
March 3 – 4, 2004

Presentation 1. Information Seaway; Overview and Stakeholder Perspective (Cater)

Session 1 Questions

1. Within the context of Information Seaway as just presented, what do you perceive as the important and/or desirable decision-making information?

2. What are the current shortfalls/gaps in information you perceive as important for decision-making and why do you feel these limitations exist?

Presentation 2. Capability and Capacity in Ocean Mapping; the Canadian Perspective (Carter)

Presentation 3. Seabed Mapping for Placentia Bay: Planning and Priorities (Pickrill/Shaw/Costello)

Session 2 Questions

1. What types of seabed information do you see as important from a Placentia Bay perspective?
2. From your perspective what geographic areas within Placentia Bay and approaches would most benefit from new/enhanced seafloor information?

3. How should this information best be presented to suit your needs?

Presentation 4. Information Infrastructure Concept and Components (Gillespie)

Presentation 5. Building the Information Seaway (Cater)

Session 3 Questions

1. From your perspective, what elements of the information Seaway already exist for Placentia Bay?

2. What do you perceive as the long term economic and social benefits to Canada of Information Seaway?