Appendix B

Integrated Ocean Information Management System

There are a number of federal, provincial, First Nations and NGO organizations collecting and using marine data in BC marine waters. However, it often proves difficult for one organization to access or integrate data from another organization. Canada and British Columbia governments did recognize the need to cooperatively develop *an integrated oceans information management system*[1] through the Federal/Provincial MOU[2] on the implementation of Canada's Ocean Strategy on the Pacific Coast of Canada. Consistent with this MOU, the two governments under the auspices of the Canada/BC Oceans Coordinating Committee initiated work that provided direction for the development of a 5 year implementation plan for an integrated ocean information management system. The first phase of this plan commissioned three background assessment reviews:

1. Assessment of Current Barriers to Interagency Data Integration
2. Assessment of Agency Current Information and Identification of Future Needs
3. Overview Assessment of Agency Information Systems

The project was managed by the Oceans, Habitat and Enhancement Branch, DFO and GeoBC, Integrated Land Management Bureau. The three background review projects were completed in January, 2008. After a short hiatus work on the project has been re-activated. Given the hiatus, a review of the work to date was undertaken and confirmed that the analysis and recommendations of the three background assessment reviews are still relevant and applicable today. The current effort is focused on developing a Business Case for the integrated Ocean Information Management System. If the Business Case is positive the next stage of work is to confirm business and technical requirements for the system. This will complete Phase 1 of the effort and provide the definition of a Phase 2 approach – this may involve as originally envisioned development of *a 5 year implementation plan for an ocean information management system,* or some other approach consistent with the Business Case and confirmed business and technical requirements.

The results of the three completed background reports for Phase 1 of the implementation plan are summarized below.

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[1] An ocean information management system includes the following components: standards, policy, agreements, processes, inventory, protocols and infrastructure. It is expected that this system would *enhance* rather than replace existing agency systems used to manage ocean related information.

[2] Section 2.1 of the MOU states that the Parties agree to develop subsidiary MOU or agreements on the following: c) *the cooperative development of an integrated ocean information management system to support science based decision-making and sustainable development. Development of this subsidiary memorandum of understanding or agreement will be led by the Department of Fisheries and Oceans and the Ministry of Sustainable Resource Management (now Integrated Land Management Bureau). It will address information requirements, information standards, warehousing and access to information by government and non-government users*;

Phase 1-Project 1: Assessment of Current Barriers to Interagency Data Integration

Even when the data required for EBM have been collected it is not always the case that it gets used for that purpose. Reasons for this might include: information users may not be aware of the information; it could be in a format or at a scale that is not appropriate or easily used; or it could be unavailable because of confidentiality or costs associated with procuring it.

A recent review of current barriers to inter-agency data integration classified these barriers to data sharing into 12 categories (Table 1; extracted with some elaboration directly from the document). This report[3] (Hofmeyr *et al*. 2007) thoroughly reviews these barriers. The details are not expanded on here but the issues are indicated for the data/knowledge categories in the following table. The report highlights the problems of data redundancy between agencies, often with some sites holding outdated information with incomplete metadata.

Table 1: Categories of issues surrounding barriers to data sharing

Issue	Description
1. Base Mapping	Currently there is no common base map that is suitable for many of the users; thus integration of ocean information maintained on different base maps involves significant technical, human and financial effort. Currently, TRIM and CHS shorelines are both commonly used by agencies and this creates situations where resource and other themes created against one shoreline must be adjusted to fit the other shoreline for analysis. Issues such as what coastlines to include (mean high water, mean-low water etc.), where large estuaries switch from river bank to coastline and how to include man-made features such as causeways and marine terminals all need to be resolved in a way that satisfies users of the data. A working group from both government, First Nations, NGOs and industry should be formed to determine what the core data of the base map set should include and the appropriate scale of mapping. A minimum set of data would include the coastline and bathymetry. A mechanism for including updates from future survey data should be incorporated into the system.
2. Cost Recovery	Cost-recovery policies are limiting inter-agency sharing of data because overall cost may not be affordable by the requesting internal and/or external agency. It was recognised that there are significant benefits to having all agencies working with the same base map information (coastline, bathymetry, ortho-photography).
3. Discovery Documentation	It is difficult to discover what other agencies are holding with respect to 'ocean information' – (who, what where, how?). Existing information portals such as those operated by GeoConnections, DFO and ILMB with associated data catalogues and internet mapping web sites are incomplete and do not always provide a current source for the data. A one-stop data portal is still needed which makes data easy to find for other users, along with the appropriate metadata and information on how to access the data. Once established this data portal needs to be brought to the attention of all users; in the interim, the links to existing data portals should be cross linked and made easier to find.
4. Resources	Limited human and financial resources available to prepare and provide information to other agencies in a timely manner. This requires identification of the key areas where additional resources are needed and allocation of funds to remedy the situation. Co-operation between agencies would help in streamlining this process.

[3] H. Hofmeyr, D.E. Howes and P. Wainwright. 2007. Assessment of Current Barriers to Inter-agency Data Integration. Unpublished report for Integrated Land Management Bureau and Department of Fisheries and Oceans by Synetric Consulting Group, 42 p.

Issue	Description
5. Restricted Use	Data collected in partnership with external agencies may have conditions (e.g. no sharing with other parties, industry permission required) restricting access and use of the data. This information may be highly sensitive (e.g. on First Nations traditional uses or oil industry seismic exploration) or it might simply be easier or less costly for the agency to agree to restrict use and access to the data (e.g. commercial fisheries activity).
6. Information Management	Data sharing barriers tend to be more frequent and severe for those agencies (or business units) where the integration of information management into corporate and operational business polices and procedures are poorly developed. In these instances information is exchanged via informal personal networks and there is fear that this information may be lost on the retirement of key individuals. It was recommended that all agencies adopt and incorporate information management as part of their corporate mission, implement an information management strategy, develop goals and policies and institute best practices throughout their organizations.
7. Standards / Procedures	The lack of information management standards/procedures and their implementation can be costly to other users (agencies) as well as increasing the risk that data may be inappropriately used. It was recommended that agencies be aware that data collected should strive to: meet external user needs; conform to accepted standards; be adequately documented; utilize technology standards that facilitate data sharing.
8. Privacy	Freedom of Information and Privacy regulations are limiting the ability to share certain data sets. Some agencies have developed policies that allow the release of aggregated or summary information in specific cases; others lack these policies and need to develop them. It was recommended that agencies should strive to develop methodologies that provide *the maximum level of detail* while still respecting the requirements of FOIP regulations. Policies and guidelines should be in place to provide staff with direction in the release and distribution of sensitive data.
9. Potential User Misuse	Some data custodians consider that their data requires interpretation by experts and therefore they choose to limit distribution of the data in order to prevent potential misuse by clients. While data distributors have no control over the eventual use of the data they provide, the creation of comprehensive metadata with each dataset can at least ensure that data users know how the data should be used.
10. Pre-publication	Some agencies are unwilling to share data until the data and/or results have been published in the scientific literature. This barrier applies to data collected and managed by scientists (whose mandate is research and development). It was recommended that agencies adopt clear and consistent policy regarding the length of time scientists have to analyze and publish data prior to their release. This should also speak to the types of data that should and should not be withheld.
11. Legacy Systems	Certain data is stored and managed in multiple and complex data formats that are outdated (legacy systems) and extracting data requires a high level of intervention by the data custodian that affects timely data delivery. These legacy datasets need to be clearly identified and efforts made to convert them to modern software/data structures.
12. Data Sharing Agreements	Data sharing agreements were identified as an impediment (not a barrier) to data sharing in that they caused delays in accessing data, created an administrative burden or increased costs and affected project work.

Phase 1-Project 2: Assessment of Agency Current Information and Identification of Future Needs

The purpose of this study was to undertake an assessment and analysis of current federal and provincial 'oceans information' holdings and future information requirements to identify and recommend solutions to information gaps/issues for improved delivery of the appropriate ('right') information in support of the MOU Business Activities. The review[4] was based on user community input. A rating system was developed to objectively assess ocean information sources in terms of completeness, being up-to-date, quality, accessibility and suitability. Key findings of the report included:

1. Establishment of a system for setting priorities for issues that impact the utility of ocean information for integrated use. The report recommends a multi-agency committee. This would be supplemented by "champions" in both federal and provincial governments.
2. A multi-agency agreement on a list of core or critical information sources for integrated Oceans Strategy Business Uses.
3. A multi-year action plan to improve the quality, accessibility and suitability of information for Oceans Strategy Business Uses.
4. A system to monitor how well the plan is being implemented.

The report also identified a series of key issues including:

1. A need to create or improve the linkages between data generators, data custodians and data stewards at both governance and operational levels.
2. A need to improve the utility of information for integrated use by ensuring completeness, filling gaps, updating, streamlining, documentation, improving consistency, improving scale, improving ease of use, and filling in missing attributes.
3. Improve access to spatial "grey" data.
4. Address emerging issues and missing data needs such as climate change, ecosystem based management, First Nations information, local area knowledge, habitat.

Phase 1-Project 3: Overview Assessment of Agency Information Systems

The purpose of this study[5] was to develop and evaluate concepts for systems and infrastructure for inter-agency data sharing between the Province of BC and the Government of Canada in the Pacific Region. The report details an overview of agency information systems, a set of evaluated options for integrated systems, and recommendations for an Integrated Ocean Information Management System (IOIMS).

A service oriented architecture (SOA) is favoured due to the distributed nature of the operational systems, both across geographies and across jurisdictions. Accordingly, the project team defined four options for an integrated system based on SOA with varying

[4] Wainwright, P., B. Emmett, G. Lemieux and R.C. Bocking. 2007. Assessment of Current Information to Support the Oceans Strategy. Unpublished report *Prepared for:* Integrated Land Management Bureau Ministry of Agriculture & Lands Victoria, BC and Department of Fisheries and Oceans Vancouver, BC. September 2007. 50 p.

[5] Kyle, Martin. Sierra Systems Group Inc., 2009. Agency Information Systems – Recommendations and Final Report. Unpublished report *Prepared for:* Integrated Land Management Bureau, Ministry of Agriculture & Lands Victoria, BC and Department of Fisheries and Oceans Vancouver, BC. January 2008. 85 p.

degrees of data warehouse consolidation among the constituent agencies and governments.

The first option relied on a centralized data warehouse shared between the federal and provincial government. The second option relied on a decentralized model where each federal department managed its own set of web services and each provincial agency managed its own set of web services. The third option relied on centralization of distinct data warehouse environments at both the federal and provincial government levels. Finally, the fourth option relied on a centralized data warehouse environment at the provincial government level and decentralization of warehouse environments into the individual federal departments.

After evaluation of the alternatives and consultation with stakeholders, the project team recommended the development of an Integrated Ocean Information Management System based on service oriented architecture modeled to accommodate a centralized data warehousing environment at the provincial level and decentralized warehouses at the federal level (i.e. the fourth option - Hybrid B; colloquially know as "Close-to-Quo").

Current Activities

After a short hiatus work on the project has been re-activated. The purposes of the current activities are to: i) confirm that the work done to date is still applicable; ii) undertake a Business Case for an integrated Ocean Information Management System, and given the Business Case is positive; to iii) develop a Phase 2 approach that is consistent with confirmed business and technical requirements. This will complete Phase 1 of the effort and provide the definition of a Phase 2 approach – this may involve as originally envisioned development of *a 5 year implementation plan for an ocean information management system,* or some other approach consistent with the Business Case and confirmed business and technical requirements. This would also confirm the scope of the target system and determine if it will conform to a Service Oriented Approach, or something that starts to move in that direction such as an organized suite of web-services