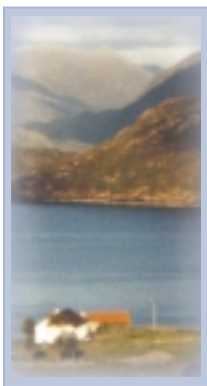




## Development of a Dissemination Strategy for Environmental Follow-up Results

Association québécoise pour  
l'évaluation d'impacts

2001



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## Acknowledgements

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## AQÉI Introduction

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The AQÉI is made up of almost 200 individuals and organizations working directly or indirectly in an area of environmental impact assessment. Its members come from various backgrounds: biologists, geographers, doctors, engineers, architects, economists, administrators, communicators, etc. and hold different positions within public and private organizations such as manager, administrator, advisor, consultant, researcher, student, etc. They share a common interest in the study, dissemination and promotion of impact assessment.

The AQÉI's primary concern is to promote the improvement of practices underlying impact assessment, public participation at all stages of the process, and consideration, by decision-makers, of study findings during resource and land use planning.

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## 1.0 Introduction

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An environmental assessment consists of forecasting the evolution of natural and human sites following the completion of a project or an activity. This process is based on a scientific approach, itself based on the observation and understanding of phenomena. As mentioned by Au (1996), “The environmental impact assessment (EIA) procedure cannot exist in our society without an environmental follow-up. The environmental follow-up makes it possible to systematically introduce a feedback loop in the EIA system, which makes it possible to draw on past experience and continually improve the process.”

In this context, the information gathered from ongoing projects and activities over the past several years is an invaluable source of knowledge, making it possible to:

- verify the accuracy of a project’s environmental assessment;
- assess the effectiveness of mitigation measures for adverse environmental effects<sup>1</sup>; and
- assess the effectiveness of improvement measures, if required.

The integration of lessons learned from environmental follow-up studies represents a gain for all stakeholders in this sector, as well as for society and the environment. It makes it possible to validate new approaches and new methods that have been effective in ensuring the best integration of projects into their environments, which should lead to economic gains as well as a better consideration of social concerns and increased protection of environmental resources. The knowledge and experience acquired in past follow-ups can be put to good use not only to improve impact-related assessments and forecasts, but also to develop mitigation measures and possibly revise the standards, directives or guidelines relating to environmental protection.

In Canada, environmental follow-up studies stemming from projects authorized under a regulatory process are not automatically made public and are disseminated to an even lesser degree. This information can sometimes be obtained under different access-to-information laws.

Various stakeholders have expressed their concerns over deficiencies in environmental follow-up.<sup>2</sup> These include the Association québécoise pour l’évaluation d’impacts (AQÉI) in 1999, the Comité d’examen de la procédure d’évaluation environnementale (Environmental Assessment Procedure Review Board) in 1988,<sup>3</sup> the Commission de l’aménagement et des équipements sur la procédure québécoise (Committee on Planning and Infrastructure, the Quebec Procedure) in 1992<sup>4</sup> and the Canadian Environmental Assessment Agency (the Agency) in 1996.<sup>5</sup>

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<sup>1</sup> Loi de mise en œuvre du processus fédéral d’évaluation environnementale [Sanctionnée le 23 juin 1992], Article 2 Définitions.

<sup>2</sup> AQÉI, 1999. Mémoire du comité de l’AQÉI sur le suivi environnemental.

<sup>3</sup> Québec, 1988. L’évaluation environnementale : une pratique à généraliser, une procédure à parfaire.

<sup>4</sup> Québec, 1992. La procédure d’évaluation des impacts sur l’environnement.

<sup>5</sup> Agence canadienne d’évaluation environnementale, 1996. L’évaluation environnementale dans un monde en évolution. Évaluer la pratique pour améliorer le rendement.



Also aware of the significant deficiencies in the area of dissemination of environmental follow-up lessons, AQÉI has been working towards improving this aspect of the environmental assessment in the past few years. The current research reflects this focus and is in keeping with this objective.

The development of a dissemination strategy for environmental follow-up study results requires a systematic, structured approach in order to ensure that it will meet the needs of a variety of users.

To this end, and following this introduction, the concept of environmental follow-up is explained in Chapter 2 of this report. Chapter 3 presents a brief description of the research project objectives, while Chapter 4 describes the methodology and results in detail. Chapter 5 outlines dissemination tools under consideration and Chapter 6 develops the implementation strategy for the dissemination tools.

Please note that a glossary of the primary technical terms used is presented in Appendix 9.

## 2.0 Environmental Follow-up

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### 2.1 Notion of Environmental Follow-up

Environmental follow-up is defined as a body of observation activities and measures for the purpose of determining the real impact of a project or activity (compared with impact forecasts performed at the time of the environmental impact assessment study). It must begin prior to construction, when it is necessary to set an environmental reference state for the environmental components that are subject of the follow-up.

In fact, the essence of an environmental follow-up is the verification of whether the predicted impact becomes a reality (depending on the forecasted importance and duration). If this is not the case, it must suggest ways to rectify the situation when the impact has been improperly assessed or identified. It must also make it possible to verify the effectiveness of the mitigation and improvement measures that are in place, and suggest any necessary modifications.

In its broadest sense, environmental follow-up is not restricted to studies required under environmental assessment procedures. It also encompasses reports and data stemming from measures, analyses, audits or inspections performed in order to monitor environmental change following a particular intervention.

### 2.2 Jurisdictions

Owing to the constitutionally-based division of jurisdiction in Canada between the federal and the provincial/territorial governments, the situation varies greatly from one province to another with respect to the design and implementation of follow-up programs.

At the federal level, according to section 38 of the *Canadian Environmental Assessment Act*, it is the obligation of the responsible authority to design or implement any follow-up programs it considers appropriate and to ensure their application. The responsible authority must also advise the public of any information on the project, specifically mitigation measures, as well as on the follow-up program and its results.

Section 7 of the Alberta *Environmental Protection and Enhancement Act* (Chapter E-13.3) stipulates that an environmental impact assessment must include, “(i) the plans that have been or will be developed to monitor environmental impacts that are predicted to occur and the plans that have been or will be developed to monitor proposed mitigation measures.”

In Manitoba, sections 10 and 11 of the *Environment Act* (Chapter E125), state that the “director,” appointed by the responsible minister, has the power to “(c) require the proponent to prepare and submit to the director an assessment report to include such studies, research, data gathering and analysis or monitoring...”

In Ontario, section 9(1)(b)(iii) of the *Environmental Assessment Act*, (R.S.O. 1990, Chapter E.18) grants the Minister the power to “[require] such research, investigations, studies and monitoring programs related to the undertaking, and reports thereof, as the Minister considers necessary...” Therefore, the Minister may make use of this section to require a follow-up program and follow-up studies.

In Quebec, the Regulation Respecting Environmental Impact Assessment and Review is silent with respect to the preparation of environmental follow-up and monitoring programs. It is therefore up to the environment minister to prescribe, when necessary, the requirements relative to environmental follow-up in an environmental directive as part of a decree or certificate of authorization for a given project, which is sent to a proponent or to the government.

In Nova Scotia, the *Environment Act* (S.N.S. 1994-95, Chapter 1) stipulates in section 19(1), “Where an environmental-assessment report is required, the Administrator shall prepare terms of reference for the preparation of the environmental-assessment report which shall include, but not be limited to, the following information:... (j) a program to monitor environmental effects produced by the undertaking during its construction, operation and abandonment stages.”

In Newfoundland, the *Act Respecting Environmental Assessment* (Chapter E-14.1) sets out in section 15(h) that an environmental assessment shall include, “a proposed program of study designed to monitor all substances and harmful effects that would be produced by the undertaking.”

In addition to the regulatory framework governing project implementation, the environmental follow-up can extend to different jurisdictions, bringing to light more scientific studies or basic or applied research on the environment. Numerous programs and studies are carried out in order to measure changes in the environment and its components, following the development of a research hypothesis. For example, there are endangered plant or animal population follow-up programs or follow-up studies on changes in biodiversity within fragile ecosystems that sometimes make reference to the impact human intervention has on the environment, without being directly related to the follow-up required of the proponent by regulatory agencies.

### 3.0 Study Objectives

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Generally speaking, it was noted that the information contained in various environmental follow-up studies is currently spread out among various stakeholders (proponents, consultants, departments, etc.). Moreover, in Quebec, the ministère de l'Environnement has conducted a study on environmental follow-up that outlined the gaps in the management of follow-up files at the Ministry and made recommendations in order to address these gaps (Government of Quebec, 2000). Among the weaknesses identified, the lack of accessibility to knowledge on environmental follow-up was most noticeable, and in the recommendations that arose from this, the Ministry suggested that clarification of the information be communicated and made accessible to the public in a general way.

For AQÉI, as for all stakeholders that were interviewed as part of this research, it is essential to promote dissemination of the results of environmental follow-up, and to make the results more easily accessible. This should be achieved by:

- identifying the type of information to be distributed;
- identifying the best method for promoting the dissemination of environmental follow-up study results in order to integrate this information into a process of continued improvement in environmental assessment; and
- developing a dissemination strategy that enables society at large to benefit from the lessons that arise from environmental follow-up activities.

Therefore, the objective of this report is to develop a strategy for the dissemination of environmental follow-up studies produced as part of the projects subject to environmental impact assessment.

This study should thus contribute to the practice and continued improvement of environmental assessment. The positive impact of this contribution will depend on the integration of the results and lessons from follow-up of projects already completed, in the development of guidelines for future projects in environmental assessment and in the follow-up programs that arise from it.

## 4.0 Method and Results

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This study was conducted in four phases.

First, Internet research was conducted to verify whether there are databases on the environmental follow-up of projects that were subject to environmental impact assessment. Second, potential environmental assessment study users were identified and interviewed to learn about their needs and expectations with respect to the dissemination of environmental follow-up. This phase also enabled the identification of certain limitations related to information-sharing.

In light of the short time-period that was allotted for the completion of the study, a sample of 19 individuals were selected and interviewed; in some cases, when it was difficult to meet with the individuals, they were contacted by telephone. The interviews were guided by an interview protocol. The three areas of focus during the interviews concerned user needs and expectations, the type of information to collect, and the limits related to the dissemination of data. The text used for the interview protocol can be found in Appendix 1. This text was also posted on the AQÉI Internet site in order to enable all members to participate in the study.

Based on the needs of the various users, a variety of scenarios for data dissemination were developed on a scale ranging from the simplest to the most complicated needs.

Finally, a phased implementation plan was developed to quickly meet the basic needs and then deal progressively with the other expectations brought forward by users.

### 4.1 Research on Data Banks Specializing in Environmental Follow-up

Research conducted on the Internet using several search engines, as well as specialized environment portals, did not reveal many resources specific to environmental follow-up dealing with projects authorized under a regulatory process that had been subject to impact assessment.

In fact, although there are a large number of sites dealing with the environment, and among them some that specialized in environmental follow-up, such as the United States Environmental Protection Agency's Environmental Monitoring and Assessment Program (EMAP), there was not one site, either in Canada or the United States, that included content on follow-up studies of regulated projects that had been subject to an impact assessment.

However, many organizations offer documents that relate to follow-up studies for on-line consultation. Most of these follow-up studies concern environmental quality follow-up and often deal with specific aspects such as water or air quality. In many cases, these are follow-up data on ecosystem quality or environmental indicators. The following sections present information on some of the most relevant sites.

#### **4.1.1 Environmental Monitoring and Assessment Program**

One of the most complete databases found on the Web that deals specifically with environmental follow-up in the general sense, is the United States Environmental Protection Agency's EMAP, <<http://www.epa.gov/emap/>>. Most of these reports are presented in summary form with a complete bibliographic note (Appendix 2). Some documents are also available in their full form, in portable document format (PDF). In addition, the site gives access to related resources (guides, directives, reports, etc.) dealing with environmental follow-up.

However, the data compiled in the database does not include results from project follow-up studies authorized under a regulatory process for impact assessment, but concern different studies and research dealing with environmental quality. Using these, it is possible to find results of long-term follow-up programs dealing with sediment quality in an estuary, for example.

In addition, this site's use of a search engine and a user-friendly interface makes it especially easy to search and access information. A search in the EMAP database can be done by author, keyword, publication type (article, report, book, etc.) and year.

#### **4.1.2 Canadian Environmental Assessment Agency**

The Agency's mission is to "provide Canadians with high-quality environmental assessments that contribute to informed decision making in support of sustainable development." (Canadian Environmental Assessment Agency, 2001).

Among its roles, the Agency "seeks to provide the public with a variety of opportunities to be informed at all stages of the comprehensive study, to offer ideas and information, to react to proposals in order to influence recommendations and decisions, and to be informed of all decisions". (Canadian Environmental Assessment Agency, 1997)

To do this, the Agency has made the Federal Environmental Assessment Index (FEAI), <[http://www.ceaa.gc.ca/0009/0004/0003/registry\\_e.htm](http://www.ceaa.gc.ca/0009/0004/0003/registry_e.htm)>, available to the public. This index contains all the impact assessments conducted under the *Canadian Environmental Assessment Act*. The results of a search of the data bank are presented in a record that includes some basic information related to federal environmental assessment. An example of a search result is presented in Appendix 3. For more information, however, the user must communicate with a responsible authority within the lead environmental assessment jurisdiction. No documents on environmental assessment or follow-up are available directly on this site, with the exception of the occasional comprehensive study report.

#### **4.1.3 Natural Resources Canada**

On its Web site, <<http://mend2000.nrcan.gc.ca/report-t.htm>>, Natural Resources Canada offers access to some research reports dealing mainly with environmental follow-up of mine tailings sites that generate acidic drainage water. These are research projects, not environmental follow-up programs, arising from the environmental assessments of projects.

#### *4.1.4 Ministère de l'Environnement du Québec*

The ministère de l'Environnement du Québec maintains a documentation centre that holds mainly environmental follow-up reports. However, the reports produced as part of regulatory requirements are not systematically filed with the documentation centre. It is possible to search the centre's catalogue by visiting <<http://www.biblinat.gouv.qc.ca:6611/cgi-gin/bestf?id=&act=9>>.

Note that the bibliographic entries, presented as records (Appendix 4), do not give on-line access to the documents, except in a few cases.

#### *4.1.5 Ministère des Ressources naturelles du Québec*

The ministère des Ressources naturelles du Québec gives access to a list of publications, some of which deal with environmental follow-up studies, on its Internet site, <<http://www.mrn.gouv.qc.ca/3/36/363/repertoire.asp>>. These studies are often undertaken as part of research projects and several deal with follow-up on the use of pesticides in forest environments. However, none of these studies are available to be read on-line.

#### *4.1.6 Hydro-Québec*

Hydro-Québec is a publicly-owned corporation whose main mission is to produce, transport and distribute electricity in Quebec. For almost 25 years, as part of its large hydroelectric developments, Hydro-Québec has implemented environmental follow-up programs and studies. The majority of these documents, including environmental follow-up studies, are stored in the documentation centre at its head office. In addition, Hydro-Québec enables Internet access to some of its synthesis reports on environmental follow-up, particularly for the Ste. Marguerite development, <[http://www.hydroquebec.com/sm3/documentation/pdf/sm3\\_bilan\\_99.pdf](http://www.hydroquebec.com/sm3/documentation/pdf/sm3_bilan_99.pdf)>, and information on the La Grande complex will soon be available.

#### *4.1.7 National Marine Fisheries Service*

Elsewhere on some Web sites, there are some databases available that contain raw data from scientific follow-up studies. This is particularly the case for the Baseline Environmental Monitoring Program for the Salmon River Basin, Idaho, U.S.A., <<http://www.bemdata.nwfsc.noaa.gov/baseline/intro.html>> (note: Web page no longer available). This project is directed by the National Marine Fisheries Service, Northwest Fisheries Science Center, Fish Ecology Division, for the United States Department of Energy and does not, per se, deal with environmental follow-up of the impact of a particular project.

However, other studies, such as the one dealing with the impact of dam and reservoir construction on the increase in predation rate on salmonids in the Columbia River basin, are available on-line in PDF, <<http://www.nwfsc.noaa.gov/pubs/white/Predation.PDF>>.

#### ***4.1.8 Ecological Monitoring and Assessment Network***

The Ecological Monitoring and Assessment Network (EMAN), sponsored by Environment Canada, is a monitoring and research network focused on long-term and multidisciplinary studies. The network strives to facilitate co-operation and a global approach to ecological studies and ecosystem understanding. The network is decentralized and acts as a co-ordinating body, facilitating communication among participants and providing strategic direction.

The network promotes the use of environmental indicators and the production of area-based assessments.

EMAN has a Web site <<http://eqb-dqe.cciw.ca/eman/emanhome.html>>; however, site updates are incomplete and only affect some of the Web pages. While there is access to various tools such as research guides and protocols, there are no environmental follow-up reports from projects subject to regulation.

#### ***4.1.9 Conclusion with respect to Internet sites***

Research did not reveal a Canadian or American site specifically dedicated to the dissemination of results of environmental follow-up studies arising from impact assessments of development projects. However, it can be concluded that there are many sites where it is possible to find information in the form of reports, overviews, studies or raw data on generic types of environmental follow-up.

### **4.2 User Categories and Needs Analysis**

To identify the needs of various users with respect to dissemination of the results of follow-up studies, several resource people were identified. In light of the time and resources available, the goal was not to conduct a systematic investigation of a statistically significant sample, but rather to develop an overview of the needs and expectations in this area. The following groups of potential users were identified:

- federal and provincial government agencies and management organizations;
- proponents and consultants;
- universities; and
- general public and environmental groups.

The complete list of all the individuals consulted as part of this research is presented in Appendix 5.

According to the categories of users interviewed, the reported needs dealt first of all with studies from federal and provincial levels. But for several users, mainly university researchers and consultants working on projects outside Canada, access to studies from outside Canada was of great importance. In fact, international information-sharing is becoming more and more important in this field, and Canada enjoys a high profile in the area of environmental assessment.



#### 4.2.1 Governmental departments and agencies

The expectations expressed by the responsible individuals at governmental and regulatory agencies were related first of all to internal file management needs. The information dealing with environmental follow-up that is stored at the managing organizations is of interest to many other users and is worth distributing.

The ministère de l'Environnement du Québec has developed a strategy for this purpose, the goal of which is to address the weaknesses identified in this area at the ministry, most notably the dispersion of information, lack of control over files, lack of clarity with respect to the responsibility of the various stakeholders, lack of resources, and limited information-sharing with other professionals, both internally and externally.

As part of its action plan (Government of Quebec, 2000), the Ministry also intends to establish an Internet site that will enable public access to information on development projects and follow-up reports.

According to the Agency, the *Canadian Environmental Assessment Act*, which is currently being revised, should make provisions for a public electronic registry of development projects that would enable them to be followed from beginning to end. Technically, environmental follow-up studies could be included in the registry if the new legal provisions allow for it.

The ministère des Transports du Québec has already tried to implement a data bank on environmental follow-up studies, but, after the restructuring and decentralization of operations at this Ministry, the project, although it had been quite far along, has stalled. However, a representative of the Ministry who was interviewed did say he supported a project that would make such studies accessible and would share experience in the area of environmental follow-up.

#### 4.2.2 Proponents and consultants

Proponents and consultants, whose responsibility it is to produce the environmental assessments and implement the follow-up programs, have different needs. In fact, too often, the professionals who work in private business do not have access to the results of environmental follow-up studies produced for other proponents or consulting firms. For these individuals, it seems that access to the data bank of environmental follow-up reports would enable information sharing with respect to past experience, and would improve their expertise and overall environmental performance.

Access to environmental follow-up reports produced by others and dealing with similar issues and with projects requiring authorization, may in fact turn out to be beneficial by making it possible to draw valuable lessons from previous experience (research methods, indicators of follow-up, mitigation methods, etc.).

Access to raw data (air or water quality measures, data on changes in animal populations, etc.), would allow the professionals responsible for conducting impact assessments and conducting follow-up studies to have access to relevant and up-to-date information for the purpose of carrying out their projects.

In addition, among the proponents contacted, reticence to encourage the large-scale and unrestricted dissemination of follow-up reports is not just a question of protecting the confidentiality of information. In their opinion, there is a risk that the data in these reports may be misinterpreted and used out of context. According to them, this risk arises from the fact that non-experts may draw biased conclusions from these documents and thus cause harm to proponents.

However, the general public expects greater availability of information of interest to them. One proponent suggested the idea of proceeding with restricted release of some documents to multipartite committees that might include proponent, representatives of the affected municipalities, citizens, employees of the various ministries involved, etc. This would permit a more complete analysis of the studies. According to this proponent, the need to limit dissemination of these documents comes in part from the fact that the regulatory authorities are not committed to verifying the reports submitted to them.

#### ***4.2.3 Universities***

There is a very great need for access to information for academics who either use or generate follow-up studies.

In their teaching duties, professors and researchers currently have access, through the network of university libraries or via the Internet, to many easily accessible impact assessment reports that are a very rich source of information on environmental assessment. These studies also give students access to a pool of concrete cases. On the other hand, professors currently find very few supportive teaching documents that present the final follow-up phase of the environmental assessment process. It is thus difficult to provide concrete illustrations for this phase of the process.

Other academics conduct research projects, the goal of which is to analyze the approaches, methods, processes and frequencies used in follow-up programs, for example. This type of work must be encouraged and disseminated. Among other things, this would enable the identification of weaknesses and suggestions for improvements in the procedures and practices currently being used in the area of impact assessment and environmental follow-up.

#### ***4.2.4 General public and environmental groups***

First and foremost, the general public wants to be informed of the effects of a development project on their living environment and especially on their health. In this respect, the reports of the Bureau d'audiences publiques sur l'environnement (BAPE) frequently reveal the concerns of citizens and environmental groups with respect to environmental follow-up data. BAPE has issued many recommendations that the ministère de l'Environnement encourage access to this information and take citizens' expectations into account in studies.

For several years, groups such as advisory or supervisory committees, have been established, and they have in some cases co-operated with proponents on project follow-up committees. These committees oversee the conduct of environmental follow-up programs.

Informing the communities affected by a project is one of the goals of these committees. In this light, dissemination of follow-up study results would supplement the work of these groups.

Access to studies conducted elsewhere would also enable the public and other groups to better focus their actions on real issues related to development projects, and to build a network of collaborators.

#### *4.2.5 Needs summary*

Almost all the users interviewed demonstrated a great deal of interest in better access to environmental follow-up studies. According to the individuals interviewed, access to this information should be decentralized and the data available at all times. In addition, the tool used for this purpose should be user-friendly.

For them, awareness of the existence of these studies is a priority. In fact, a directory that would compile the studies produced and make it possible to locate them would be a first step toward having access to these reports. This directory should include the basic document title, location of publication and eventually other information such as: the proponent's name, environmental factors under follow-up, mitigation measures, etc.

In light of the significant amount of information that may eventually be contained in it, such a directory should also be keyword searchable in order to facilitate searches by subject, region, project type, etc.

Several users also mentioned the importance of having quick access to an overview of the report contents (a briefing card and abstract) in order to select the most relevant documents.

With the development of new information and communications technologies (NICT), the potential for access to and transmission of data is practically unlimited. For most of the users interviewed, access, via the Internet, to the complete environmental follow-up reports seemed indispensable. This tool has become essential and very often replaces traditional dissemination networks such as libraries and documentation centres.

In addition to access to environmental follow-up reports, for some stakeholders such as consultants, it is important to be able to go back to the beginning of the follow-up studies and have access to the impact assessments and even to the guidelines of the regulatory organization. It is thus possible to follow the links between the project, the anticipated impact, the mitigation measures and the follow-up program and to appreciate their relevance, validity or effectiveness, in order to draw lessons that are applicable to other similar projects.

Follow-up studies conducted outside Canada, particularly in America, also present a great deal of interest, both for academics involved in research projects and for consultants working outside Canada. Thus, these stakeholders want access to studies conducted elsewhere. The Internet, in this case, is still the preferred tool for overcoming the obstacle of distance.

Finally, some individuals wish to go further, envisioning the development of a veritable environmental follow-up reference centre, including various complementary resources such as guides, discussion forums, a calendar of events and international meetings.

In light of the information gathered from various groups of users, it is clear that user needs with respect to dissemination of environmental follow-up results are relatively similar for the various categories of users. However, it is possible to prioritize the needs and summarize them from the simplest to the most complex:

- awareness of the existence of follow-up studies;
- ability to search by keywords;
- access to a summary of the study;
- access to the follow-up report in its entirety;
- access to related documents (impact assessments, guidelines, etc.);
- increased potential for access to studies conducted outside Canada; and
- access to a reference tool to identify resources in given specialities.

The following expectations must also be added to the needs with respect to the research tool:

- decentralized access;
- availability at all times; and
- ease of use (user-friendly).

## 5.0 Defining a Solution that Meets Requirements and Constraints on its Implementation

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Throughout Canada, environmental follow-up studies are conducted and sent to the regulatory organizations that require them. The research conducted at this stage has shown that it is difficult to discover the existence of these documents, and it is also equally difficult to access them.

During a seminar held in 1998, AQÉI suggested that dissemination of follow-up information could be done in various ways:

- hold workshops;
- make the information accessible via the Internet;
- present the results during seminars and in scientific publications;
- prepare synthesis reports by issue; and
- make reports accessible via ENVIRODOQ at Quebec's ministère de l'Environnement.

It seems that at this point these structures are inadequate and do not meet the intended goal. In fact, whether it is a library or a documentation centre, no institution of this type has the mandate to collect, index, file and give access to the results of all environmental follow-up studies. The study reports, when they are available, are spread out over many institutions and are not indexed in a common database.

In addition, dissemination activities that could be used, such as workshops or seminars, rely first and foremost on isolated initiatives that, although conducted on an occasional basis, are not at all permanent.

Frequently, for lack of other methods, stakeholders must resort to access to information laws to obtain certain data. This is a barrier to the dissemination of this information and thus to its use. In fact, recourse to this process may become necessary when proponents are reluctant to reveal information about their business and development projects, deemed to be of a sensitive nature.

In a country such as Canada, where a relatively small population is spread over a large territory, use of NICT has proven to be an inexpensive, effective and quick medium of access to documents produced almost everywhere, even outside the country. This study has also led to recognition that the Internet is very heavily used by the project's target clients and is the tool preferred by the majority of stakeholders.

For all these reasons, the solution chosen for dissemination of the results of follow-up studies will use the Internet. In addition, the ministère de l'Environnement du Québec (MENV) project, to make certain documents accessible via the Internet is also part of this push.

The following section first sketches a solution that would be the best response to all the expectations expressed by the majority of individuals interviewed. The second part of this section reviews the main limitations to the implementation of this tool.

A table summarizing the needs expressed by the various stakeholders has been prepared. This table, presented below, also illustrates the characteristics of the tool that enable it to meet each of the needs identified.

Need	Suggested Tool	Content
Awareness of the existence of follow-up studies	Bibliography of reports	<ul style="list-style-type: none"> <li>• Author, subject, date, study location, where document can be accessed</li> </ul>
Search and categorize content	Data bank of summary records	<ul style="list-style-type: none"> <li>• Information on the report categorized by keywords and information fields</li> <li>• Search the database using search field: project name, author's name, proponent's name, study location, year(s) of the study, follow-up indicators, elements involved, mitigation measures, etc.</li> </ul>
Brief overview of the study contents	Data bank of summary records	<ul style="list-style-type: none"> <li>• Brief description of the project, research hypothesis, follow-up study objectives, description of initial status, results, assessment of the effectiveness of the mitigation measures, etc.</li> </ul>
Access to complete study contents	Data bank with access to the full version of the reports	<ul style="list-style-type: none"> <li>• Complete text of follow-up study.</li> <li>• Maps, figures, illustrations, multimedia material, etc.</li> </ul>
Access to related documents.	Data bank with access to related documents	<ul style="list-style-type: none"> <li>• Complete documents, including: study guidelines, impact assessments, follow-up programs, etc.</li> <li>• Raw data</li> </ul>
Access to studies conducted outside Canada	Data bank of environmental follow-up reports published outside of Canada	<ul style="list-style-type: none"> <li>• Full text of environmental follow-up reports and other available documents related to the project.</li> <li>• Maps, figures, illustrations, multimedia material, etc.</li> </ul>
Existence of a reference tool	Portal specializing in environmental follow-up.	<ul style="list-style-type: none"> <li>• Access to a wide range of resources</li> <li>• Guides to the preparation of follow-up programs</li> <li>• Discussion forums</li> <li>• General information on follow-up</li> </ul>

## 5.1 Solution for Dissemination

For the past five years the Web has been growing rapidly, and the technology used for building Web sites has been especially well-documented and mastered. In addition, the Web meets the expectations for decentralized access, widespread availability and user-friendliness mentioned in section 4.3.5.

The ideal solution for meeting these needs is a dynamic hybrid architecture using Web and database technologies that enables progressive deployment of the tool with the following characteristics:

**a) Access to the list of reports**

This is a simple bibliographic list.

**b) Access to the report summary records**

An example of the typical information that should appear in these summary records is presented on the following page.

These information fields, which are actual follow-up report metadata, are sometimes mandatory and sometimes optional. In addition, for the purpose of harmonization, some information may be standardized in the form of keywords or pre-defined values (Appendix 6).

According to one of the stakeholders interviewed, the summary record could meet the expectations of a large number of users who do not need access to more detailed information. They could in fact be satisfied with more factual information to which the report summary would be attached.

**c) Access to report summaries**

Access to summaries of the follow-up reports gives the user a general idea of the document contents.

**d) Access to the full version of the reports**

Inserting hyperlinks in the record allows access to the full report for immediate on-line consultation. This access should apply not only to the text but to the maps, figures and illustrations.

**e) Access to related documents**

The practical nature of this data bank would also be reinforced by the addition of hyperlinks to environmental assessment reports, to other studies on the same project either in progress or completed, to raw follow-up data, or to any other document that could be of interest to users.

## Fictional Example of a Report Summary Record

Project identification	
File number	12345
Project name	Dredging the Saint-Janvier marina
Proponent	Saint-Janvier Tourism Association
About the document	
Author	Environmental Studies Consulting Inc.
Report title	Environmental follow-up of the Saint-Janvier marina dredging project
Publication date	25-11-2002
Publisher	Saint-Janvier Tourism Association
Report Type	Final report
Access to report	<input checked="" type="checkbox"/> On-line <input checked="" type="checkbox"/> Reference
Access to related documents	<input checked="" type="checkbox"/> Yes
Project date and location	
Year(s) of the follow-up program	2001-2002
Latitude/Longitude	56° 41' 00" / 131° 05' 00"
Ecozone	Canadian shield
Province	Quebec
Environment	Urban, aquatic
Drainage basin	Rivière à Pitre
Municipality	Saint-Janvier
Description	
Installation type	Port or marine infrastructure
Project	Dredging; decontamination
Follow-up components	Surface water quality, sediment quality, aquatic wildlife habitat, northern pike, aquatic vegetation
Mitigation measures	Sediment decontamination, coffer dam, spawning ground, northern pike
Summary	
The Saint-Janvier dredging project...	

### f) Access to studies conducted outside Canada

Over the longer term, documents produced outside Canada can be included in the tool. This option assumes that contact will have been made with foreign organizations.

### g) Existence of a reference tool

The final piece of the puzzle would be the creation of an Internet portal specializing in environmental follow-up, integrating the report data bank. This site may give access to references (guides, methods, etc.) as well as a format linking specialists with the public, a news bulletin board, or a resource directory. Links to other specialized Web sites would also enable users to expand their knowledge.



### **5.1.1 Solution architecture**

The architecture of the ideal dissemination solution is based on hybrid technology that combines a dynamic Web site and a database. As with all conventional database management systems, this solution has two components:

- a data storage component used to physically or virtually store (classify) data; and
- a user interface with access to the functional aspects of the storage component (simple searches, display of results, data entry or updating, complex analysis). It can also be designated as the access component. In this case, the user interface is the user's Web browser.

A detailed technical description of the solution architecture is presented in Appendix 7.

The main points to keep in mind during the development of this solution are addressed below.

#### **a) Location issues**

The geographic location, inherent in several follow-up studies, has proven to be complicated due to the many co-ordinate systems used to locate projects (latitude and longitude, UTM, MTM and others). In addition, the dimensions and varying forms of the study areas, depending upon whether the projects are specific or linear, for example, adds to the difficulty in taking this part of the information into account. Managing this aspect of project identification therefore requires the use of specialized technology distinct from the Web-database combination.

#### **b) Language**

If the contents of the reports are problematic in this respect, the multilingualism of the Web pages, whether static or dynamic (summary records), can be resolved, at least in part, fairly easily.

In fact, all of the site's static content can be produced in both of Canada's official languages. The site's structures and internal navigation mechanism can be built in such a way that the user can choose their desired language.

For the dynamic content stored in the database, a distinction must be made. In the case of standardized information, the corresponding English-French text will be stored in the related database tables. The dynamic mechanisms of the tool will use these tables to produce Web pages in the user's language of choice.

In the case of information in the text itself, the producer of a study can choose to offer this information in one or the other of the two languages.

### c) Search

To meet the dissemination goals, the tool must have maximum visibility in all portals and search engines.

A static Web site can be automatically indexed by the full contents of each HyperText Markup Language (HTML) page, or simply by the specialized HTML tags (<META> for metadata). It is very important to note that the large majority (if not all) of the indexers operate solely on pages in HTML or ASCII (text) format. Informed use of meta tags on the static pages of a site should allow good visibility in the main Web resource catalogues. In the case of dynamic pages (the invisible Web), various options must be developed. However, there are currently several initiatives designed to facilitate the dissemination of dynamic databases on the Web (Direct Search, Webdata.com, AlphaSearch, Lycos Invisible Web catalogue, INFOMINE Multiple Database Search).<sup>6</sup>

### d) Report contents

Environmental follow-up reports are produced in many diverse formats. Although we can consider that all the reports produced are done so electronically, the issue of formats becomes an important constraint, since potential users may not have, or be familiar with, all the tools and software used in their production. The issue of electronic formats also includes the idea of the software's life cycle, since new technologies rapidly make those that precede them obsolete.

In the case of more specialized content (maps and figures, plans, photographs, multimedia documents), the issue of report dissemination again brings up even more questions about the complexity of the tools and software used, the many proprietary formats and the often significant size of the files that result.

Appendix 8 presents three approaches that enable access to the contents of the reports and related documents.

### *5.1.2 Operation*

The use of a solution based in part on database technologies keeps the need for intervention from the site manager to a minimum. Since the site is fed dynamically by the database, all new information entered in the database is immediately accessible on the site. Manual updating is thus kept to a minimum and dissemination delays are almost nil.

Thus, according to the approach that has been accepted, all the information related to a follow-up report is completed on-line by the producer of the report (e.g. the summary record). The study author will thus have access to one or several data entry forms and must be able to fill them in. If possible, these forms will be developed with menus offering lists of choices, leaving as little room as possible for entry of information in text form.

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<sup>6</sup> Chris Sherman, The Invisible Web, in WebSearch <http://websearch.about.com/internet/websearch/library/weekly/aa061199.htm>

After the initial entry of a report into the bank, all additions and modifications to the descriptive record of a report could be done by the producer of the study or the tool manager. To avoid any undesired changes, updates would require password authentication.

## 5.2 Constraints on Implementation

Four large categories have been identified related to the dissemination of environmental follow-up studies: political, legal, institutional, and organizational.

### 5.2.1 Political constraints

In Canada, since the environment is an area of jurisdiction shared between federal and provincial governments, differing governmental direction and policy between these two levels or among organizations from various provinces can complicate, if not paralyze, the implementation and operation of a data bank on environmental follow-up. Proper co-operation between the organizations, agencies and ministries operating in Canada and in the provinces is necessary to enable the sharing of information and documents in a common data bank.

### 5.2.2 Legal constraints

Legal constraints fall into two categories, those related to the confidentiality of the information contained in the document and the other related to intellectual property.

#### *Confidentiality*

Generally speaking, in our society, the impact assessment process requires a certain transparency on the part of proponents. In fact, as part of the process in Canada and the provinces, the public is called upon to participate and significant attention can be given to consultation. For example, documents related to a project (notably impact assessments, guidelines and analysis reports) are made public. Thus, there should be nothing standing in the way of distributing information contained in the environmental follow-up reports as a requirement of the regulatory authorization process, given its public nature.

Even if, in a general way, proponent co-operation is acquired through the environmental assessment process, dissemination of the information contained in the environmental follow-up reports may present some difficulties. In fact, the secrecy surrounding some industrial processes may be an obstacle to the dissemination of certain technical information. In some cases, ensuring the confidentiality of some of the information arising from environmental follow-ups may be justified.

It becomes the responsibility of the authorities involved to take the necessary measures to develop a fair balance between the public's right to information and the protection of third-party strategic information. However, this balance cannot be achieved without first and foremost taking into account "that disclosure would be in the public interest as it relates to public health, public safety or protection of the environment."<sup>7</sup> To do this,

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<sup>7</sup> Government of Canada. 1999. *Access to Information Act*. Chapter A1.

we must take into account the standards set by federal and provincial laws on access to information in public administrations and organizations that entrench and contain the public's right to information.

However, in all cases, refusal to distribute this type of information must be exceptional and in cases when it has been established by the proponent in question that it may cause irreparable harm.

### *Intellectual property*

In general, the notion of intellectual property includes two large areas:

- copyright that protects literary, graphic, musical, software and database material; and
- industrial property that protects technical and scientific inventions, processes and knowledge, brands, industrial designs, etc.

In the context of environmental follow-up of an environmental assessment, the idea of intellectual property raises the following questions:

#### **a) Copyright**

Most environmental follow-up generates written studies and reports. Most of these studies and their results are copyrighted.

The generic idea of copyright includes the protection of pecuniary rights, (reproduction, adaptation, dissemination, publication) and moral rights (right to paternity and right to integrity).

Copyright protection is automatic. It requires no registration process and takes effect upon creation of the work. In general, copyright is valid in Canada for the life of the author and for a period of 50 years after death. However, there are exceptions.

#### **b) Intellectual property and marketing**

Copyright includes an economic component (reproduction, adaptation, dissemination and publication rights). It is particularly important to clarify these rights in situations in which project results will be commercially exploited.

Notwithstanding the existence of a summary record or an abstract, it therefore seems that for each document entered into the potential data bank, there should be an agreement with its author or the individual to whom the author has ceded her or his rights (e.g. the proponent) so that access and dissemination by electronic means can be authorized. This agreement can stipulate that the act of entering the document into the database constitutes a *de facto* renunciation of copyright.

With respect to hyperlinks to documents located on other Web sites, it seems according to Carrière (1997) that, "...individually, links are not subject to copyright protection, whereas a compilation of links may be protected; an original group of links from basic documents or even from other links can become a derivative work which is then protected; finally, without contractual prohibition, it is possible to create links between various documents of which one is not the copyright owner without violating either trademark or copyrights, either economic or moral."

### *5.2.3 Institutional constraints*

Three types of institutional constraints are related to the dissemination of environmental follow-up study results: those dealing with the language of dissemination, those regarding validation and harmonization of contents, and those related to dissemination delays.

#### *Language of dissemination*

Federal organizations are generally subject to the Official Languages Act, which requires them to provide services in both of Canada's official languages, French and English.

However, it seems that not all the documents held by these organizations must be published in both languages. This is particularly the case for the Agency, which is responsible for managing the FEAI and distributing studies dealing with environmental follow-up. In several cases, the documents are all entered into the index in their original language, whether French or English. However, the analyses produced by the Agency are published in both languages.

In the provinces, documents are generally produced in the language of use. One would suppose that they would therefore be distributed in their original language. However, the summary record, and eventually the abstract, should be written in both official languages so that users can become aware of the existence of such studies.

#### *Validation and harmonization of contents*

As previously mentioned, the content of environmental follow-up reports is not standardized and it varies a great deal from one producer to another.

To make up, at least in part, for the lack of uniformity in the documents produced, the Agency made public a guide to the preparation of follow-up study reports for proponents and responsible authorities (Canadian Environmental Assessment Agency, 1997). The ministère de l'Environnement du Québec also plans to produce a guide specifically on environmental follow-up to provide proponents and their consultants with guidance in conducting follow-up programs and in preparing reports that present the results of these activities.

Thus, only the report authors, and not the managing organization, can accept any responsibility for the contents of the studies contained in the data bank.

### *Timeliness of publication*

With respect to the timeliness of report production, the data bank manager will have little power to obtain the documents as quickly as possible. According to agreements to be negotiated with the various producers or organizations receiving follow-up reports, a document transfer process will be implemented. The number of steps and intermediaries in this process must be kept to a minimum.

### *5.2.4 Organizational constraints*

The implementation of a mechanism for the dissemination of follow-up reports brings up a number of questions related to issues within the organization:

- Who will manage the chosen dissemination tool (keep it up-to-date)?
- Who will oversee the implementation of, and be responsible for, the required hardware and software infrastructures?
- Who will finance the implementation and operation costs?

The following sections provide a brief overview of the complex nature of these questions and the obstacles to overcome in achieving the desired goal. Several options were studied to determine the type of organization that could best ensure management of the dissemination tools proposed in Section 5.1.

### *The managing organization*

The organization managing the data bank implemented to disseminate the follow-up studies could be a governmental organization, a private business, a university or a non-governmental organization (NGO).

#### **a) Governmental organization**

Although several governmental organizations or ministries already have an infrastructure appropriate for such a task (library, documentation centre, computer resources, etc.) and receive many documents that could become part of the data bank several individuals interviewed (e.g. representatives of environmental groups, consultants and managing organizations) had difficulties with leaving the management of such a tool to an organization that is independent of the authorization process, unless the permanence of the tool is ensured.

In addition, in a project with such a Canada-wide scope, co-operation between the federal or provincial organizations could become complicated for political reasons. Co-operation between departments at the same level of government may also become complicated because of conflict between the proponent departments and those dedicated to environmental protection.

Finally, note that the mission of distributing environmental follow-up results throughout Canada is not currently the responsibility of any existing organization.

**b) Private business**

Private business could take responsibility for implementing such a dissemination tool, but to recover costs and generate a reasonable profit, the organization should be able to rely on existing co-operation agreements, which again evokes the political problems mentioned previously, without raising the issue of potential funding problems.

**c) University**

Several stakeholders in the university environment and from other areas have suggested giving management of such a data bank to a university library. In their opinion, universities have the advantage of being totally independent both of the organizations that require follow-up reports (governments) and of those that produce them (proponents, consultants). However, the implementation of such a database is beyond the primary role of such an organization to meet the basic needs of its users (students and researchers).

**d) Non-governmental organization**

Among the potential users interviewed, several indicated that they preferred a managing organization that does not report to any organization with control or regulatory power is derived from any level of government. However, the organization should be able to rely on appropriate financing that would ensure its permanence, an important condition for most stakeholders interviewed who would favour such a solution.

In fact, it would be beneficial for the tool manager not to be subject in any way to any of the organizations that require environmental follow-up. Furthermore, such an organization, the sole mandate of which would be dissemination of the lessons learned from environmental follow-up, could develop trusting relationships with the various project partners and could draw together participants from diverse backgrounds.

***Responsibility for implementation***

The ideal dissemination solution is a dynamic Web site. This brings up the question of hosting the site. The responsibility of the hosting organization is essentially the deployment and proper operation of the dissemination platform (hardware, networking, Web server and related software, computer security).

The technology that supports Web servers makes it possible to separate the management and updating aspects of the site from hosting. This means that the Web site can be hosted in one of the following three ways:

- a) site on a dedicated server, deployed and maintained entirely by the managing organization;
- b) site on a dedicated server, deployed and maintained by a hosting organization separate from the managing organization; and
- c) site on a shared server, deployed and maintained by a third party.

The costs associated with these various options can vary considerably; therefore, they must also be taken into account when selecting the preferred solution.

### *Funding*

In the current context, there are many funding constraints. Since government responsibilities, with respect to environmental follow-up, are spread out among many departments in different levels of government, it becomes difficult to identify who could provide financial support for the implementation and operating costs of activities related to the dissemination of environmental follow-up studies.

Operating on a cost-recovery basis could be planned, but this solution implies billing users for the service (suppliers or users of the data), which goes against the primary objective, which is to distribute the information as widely as possible.

Finally, it is always possible to solicit sponsors but this makes the permanence of the implementing organization questionable, since it would constantly have to fight to retain the funding required for its survival.



## 6.0 Suggested Dissemination Strategy

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In light of the needs previously expressed and the limitations identified, the suggested strategy focuses on disseminating the results of follow-up activities to a huge audience. In fact, in light of the many follow-up initiatives, the almost complete absence of co-operative action to distribute this information seems almost contradictory. This observation led to the suggestion of a strategy for implementing an organization dedicated to this task.

The suggested action plan is, however, pragmatic: it uses a modular structure that makes it possible to obtain short-term results, that is, within a year.

The need to create an independent organization, responsible specifically for the collection and widest possible dissemination of the results of environmental follow-up activities, seems to be an essential basic principle underlying the nine-point strategy suggested below (6.1 to 6.9). This organization could therefore, commensurate with its means, devote itself entirely to this task.

The second principle recognizes that the great number of stakeholders involved in follow-up is thus the reason for the proposal of a fragmented structure, rather than a centralized one.

### 6.1 Managing organization

In light of the political restrictions identified previously, a NGO seems to be the most appropriate for ensuring the leadership required to manage the project. However, this organization must already have established credibility and have a recognized ability in order to convince various stakeholders of the serious nature of the undertaking.

The NGO option offers the ability to create an organization dedicated exclusively to the dissemination of information on environmental follow-up and could devote all of its human, material and financial resources to this task. This organization could also be set up quickly, with a minimum of administrative, legal or financial limitations. It could be headed by a board of directors that would bring together a wide range of representatives from the field, such as users from different backgrounds, representatives of affected governmental organizations and even proponents.

A partnership between the Ontario Association for Impact Assessment (OAIA) and the AQÉI would be a potential avenue for the implementation of this organization. In fact, these two associations already have a certain level of credibility in their home provinces and in Canada, as a result of their constant involvement in the field of impact assessment and environmental follow-up. Their active and sustained participation in the growth of this area of activity through the organization of conferences, seminars, workshops and through the production of reports, position papers, etc., has meant they are two significant actors in this field in Canada.

## 6.2 Business plan

A business plan for the data bank must be developed in order to clarify the organization's nature, and the human and financial resources required to complete the project.

## 6.3 Implementation timeline

Set a realistic deadline for setting up the Web site. Since the site will change over the years, this deadline must be periodically revised.

## 6.4 Funding sources

Implementing this organization requires human and material resources, which in turn require adequate funding.

To do this, several funding sources have been identified. These potential contributors are organizations that could benefit from the dissemination tool, such as governmental organizations (proponents and regulatory organizations), private developers, producers' associations, etc. Agreements should be made between the data bank manager and the various major partners in order to ensure the organization's funding over the medium term (five years).

## 6.5 Removing legal restrictions

Discussions with the regulatory authorities to identify and set up a solution that would make it possible to remove the legal restrictions related to the public right to information, intellectual property and confidentiality that may limit the dissemination of environmental follow-up results.

## 6.6 Developing a summary record

Prepare and have various stakeholders evaluate a standardized summary record based on information fields and keywords, making it possible for proponents to send information about their follow-up studies in a format that is directly compatible with the database.

## 6.7 Selecting a hosting organization

Taking technical and financial limitations into account, identify and negotiate the hosting of the future Web site with a partner.

## 6.8 Building the dissemination tools

This phase is divided into six components that can be set up independently of one another, thus encouraging gradual implementation of the dissemination tool.

- a) Set up a static Web site about environmental follow-up and link it to other sites that may contain relevant information. This fragmented, rather than centralized, structure eliminates discussions about integrating information under a single organization, thus limiting the potential for differences of opinion and conflict.

- b) Make the site dynamic using a database of the follow-up reports (initially limited to the information on the summary records), and a search interface based on the contents of these records.
- c) Integrate a summary into the database making it possible for the user to judge whether the report meets her or his needs.
- d) Give access to the full content of the follow-up reports. This component includes posting the full text of the reports on-line, as well as maps, figures, illustrations, etc.
- e) Link the summary record to the related documents produced before or after the follow-up program (guidelines and environmental assessment reports, government analysis reports, etc.).
- f) Add information from other countries to the database.
- g) Increase the size of the database to enable the addition of raw data and searches of this data using multiple search criteria.
- h) Create an Internet portal, a tool specialized in environmental follow-up that includes user access to guides and directives, a discussion forum connecting specialists with the public, a news bulletin board or a directory of resources and other links to specialized Web sites, so users can expand their knowledge.

## 6.9 Data collection and initial entry in the database

Make agreements with the various organizations that might provide environmental follow-up studies to the data bank in order to set up a protocol that would make it possible to systematically collect the required information. An model agreement should be prepared for this purpose.

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## Appendix 1

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### AQÉI Interview Protocol

### AQÉI Research Project

#### *Development of a strategy for the dissemination of environmental follow-up results*

The **Association québécoise pour l'évaluation d'impacts (AQÉI)**, with the financial participation of the Canadian Environmental Assessment Agency (CEAA), Hydro-Québec, the Ministère de l'Environnement du Québec and Fisheries and Oceans Canada, is undertaking a research and development project in the field of environmental follow-up. Its mandate runs from December 2000 to March 2001.

The **OBJECTIVE** of this project is to “Promote the dissemination of the results of studies dealing with environmental follow-up, in order to integrate this information into the process of continuous environmental assessment improvement”.

The **FINAL PHASE** in this study is the development of a strategy for the implementation of a dissemination tool and to make recommendations.

To complete its research, **AQÉI is asking for the cooperation of potential users of this environmental follow-up studies dissemination tool**. More specifically, this would involve identifying needs, clarifying the typical information to be collected and identifying the limitations on the dissemination of these studies (confidentiality, language, etc.).

If you are a potential user, we would be delighted to know what your needs are and to collect your comments in this area. Here are some of the questions that you would be asked:

- How or for what purpose would you use such a data bank?
- How should the information be organized?
- What organization should manage such a data bank (AQÉI, MENV, governmental agency, private sector, etc.)?
- Should the Web site offer information other than the content of environmental follow-up studies?
- Should it include results of studies produced outside Québec?

Do not hesitate to contact me directly.

Jean-Marc Evenat, M.Sc. (Env.)

Head researcher, AQÉI

Phone: (514) 878-2626 (ext. 321)

Fax: (514) 397-0085

E-mail: [enevj@rswinc.com](mailto:enevj@rswinc.com)



## Appendix 2



### EMAP search results

#### Search EMAP Bibliographic Database

This screen is designed to access the EMAP bibliography. The entire set of citations can be retrieved by pressing the Submit button. Searches can be focussed by specifying values for one or more of the fields below. Fields with lists of items will accept multiple selections by holding down the Ctrl key. When multiple items are selected for a field (e.g. authors and records), those {items or records?} that match any, not all, of the selections will be returned. When items are selected from multiple fields (e.g. authors and keywords), records that match all of the selections will be returned. To start a new query, press Ctrl R or the Reset button to refresh the screen.

---

Author/Editor:

Aas P
Aber JD
Adams AM
Adams DA
Adams JV

Keyword:

butyltins
habitat linear appraisal system
pesticides
polychlorinated biphenyls
abundance estimates

Publication Type:	Year:
BOOK	1984
BOOK SECTION	1985
CONFERENCE PROCEEDINGS	1986
JOURNAL ARTICLE	1987
REPORT	1988

Title:

Abstract:

Order search results by: **Publication Type** ▾

Format of search results: **Citation** ▾

**Submit** **Reset** **Help**

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## EMAP Publication Listing

### Publication Type: Journal Article

Stober J, Jones RD, Scheidt DJ. 1994. Ultra trace level mercury in the Everglades ecosystem, a multi-media canal pilot study. *Water, Air, & Soil Pollution* 80(1-4):991-1001.  
Abstract

### Publication Type: Report

Stober J, Scheidt DJ, Jones RD, Thornton KW, Gandy L, Stevens D, Trexler J, Rathbun S. 1998. South Florida ecosystem assessment monitoring for adaptive management: Implications for ecosystem restoration. Final Technical Report - Phase I. Athens (GA): U.S. Environmental Protection Agency, Office of Research and Development, Region 4, Science and Ecosystem Support Division. Report nr EPA/940/R-98/002.  
Abstract

Two publications satisfied search criteria.

## Abstract

**Title:** Ultra trace level mercury in the Everglades ecosystem, a multi-media canal pilot study

**Authors:** Stober J, Jones RD, Scheidt DJ.

**Publication Date:** 1994

**Abstract:** The Florida Everglades ecosystem is composed of the largest deposit (9600 km<sup>2</sup>) of near neutral peat in the world extending south of Lake Okeechobee to Florida Bay. The federal Central and South Florida Flood Control Project (C&SF) has sectioned the historic Everglades with a system of canals and levees to control water for urban and agricultural development, resulting in pronounced hydrologic modifications to the natural system. As a part of a comprehensive ecological risk assessment of mercury (Hg) contamination in the Everglades ecosystem, a pilot study of canals was initiated in September 1993 to determine the extent and magnitude of total (HgT) and methylmercury (MeHg) in water, sediment and fish. A probability-based random sampling grid was used to obtain consistent estimates of Hg contamination over this large geographic area. Two hundred canal sampling locations were selected as probability samples by associating grid points on the sampling frame with specific canal sections for independent sampling cycles. Of this number 50 locations were randomly selected for sampling in this pilot study. The selected canal points were sampled from north to south during a six-day period. Cumulative distributions with 95 per cent confidence intervals were calculated and used to determine a canal system median concentration for selected water, sediment and fish constituents. The per cent exceedance of each median, by hydrologic sub-area, was determined to demonstrate the existence and direction of spatial gradients in the system. North to south (high to low) gradients were apparent for total phosphorus (TP), sulfate (SO<sub>4</sub>), dissolved organic carbon (DOC), conductance, HgT and MeHg in water. However, the gradients were reversed from south to north for HgT in sediments and fish (*Gambusia* sp.). The greatest Hg concentrations in *Gambusia* sp. occurred in the same canals where largemouth bass had previously been found to be most contaminated.

## Appendix 3

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### Federal Environmental Assessment Index (FEAI)

FEAI Reference Number 17456

#### Identification

FEAI Reference Number	17456
Project Title	Bronson Slope Mine Project
Department	Fisheries and Oceans Canada
Reason for Involvement	law list
Location	
Drainage Region	Pacific Coastal
Ecozone	Pacific Maritime
Location (in Canada)	Bronson Creek
District/County	Cassiar
Province	British Columbia
Latitude/Longitude	56° 41' 00" / 131° 05' 00"
NTS Reference	104B11
Description	
Type of project	Point
Subject Descriptor	environment mining
Environmental Assessment Type	comprehensive study
Multiple Undertaking	No
Environmental Assessment Start Date	August 22, 1998
Primary Undertaking	Construction
Physical Work	Construction/development of Mine and Milling Facility
RA Reference Number	0000-000005921

#### Contact

##### Environmental Assessment Contact

##### Document Listing Contact

GORDON ENNIS (PRO)  
DFO-PUBLIC REGISTRY OFFICER- PACIFIC REGION  
360-555 WEST HASTINGS STREET  
555 WEST HASTINGS STREET  
VANCOUVER, BC  
V6B 5G3  
Telephone: (604) 666-8407  
Fax: (604) 666-0417  
E-Mail: EnnisGo@pac.dfo-mpo.gc.ca  
see Environmental Assessment Contact

top

[Français] [Contact Us] [Help] [Search] [Canada Site]  
[Home] [About the Agency] [News Releases] [What's New] [Other Sites] [Five-Year Review] [Federal Environmental Assessment Index] [Environmental Assessments] [Training and Research] [Legislation and Guidance] [Publications] [Sitemap]  
Date Modified: 2000-09-01                      Important Notices

## Appendix 4

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### MENV bibliographic entry (ENVIRODOQ)

Document 3 de 262

**Author:** Consortium Roche/Dessau.  
**Title:** Aménagement hydroélectrique Sainte-Marguerite-3 : suivi environnemental 1994-1995 : inventaire de la grande et de la petite faune.  
**Publisher:** Sainte-Foy: Le Consortium, 1995.  
**Description:** multiple pages: illustrations, references, maps.  
**Notes:** This report gives the results of the first surveys conducted in 1994 and 1995 as part of the monitoring of large and small animals, before, during and after the construction of the Ste-Marguerite-3 hydroelectric installations. These surveys made it possible to establish a reference point for the populations of moose, beaver and other small animals, as well as the characteristics of the habitats used by these animals in the projected reservoir area before the start of construction, as well as in the whole Sainte-Marguerite River drainage basin, north of the planned SM-3 dam.  
**Subjects:** Wildlife (Note: no bullet)  
Beaver  
Species at risk  
Endangered species  
Ecological inventory  
Hydro-electric development  
Habitat  
Sainte-Marguerite River (0721)  
**Collaboration:** Hydro-Québec.  
**Call Number:** EN990407 QQEN

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## Appendix 5

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### List of individuals interviewed

#### *Governmental Agencies*

- Julien Baudrand, Direction des évaluations environnementales, ministère de l'Environnement du Québec
- François Boulanger, Canadian Environmental Assessment Agency
- Luc Valiquette, Direction des évaluations environnementales, ministère de l'Environnement du Québec

#### *First Nations Administrative Organization*

- Ginette Lajoie, Cree Regional Authority

#### *University*

- Pierre André, Département de géographie, Université de Montréal
- Marc Lucotte, Institut des sciences de l'environnement, UQAM
- Michel Raymond, Département des sciences biologiques, UQAM
- Jean-Pierre Revéret, Institut des sciences de l'environnement, UQAM

#### *Proponents*

- Yves Bédard, Ministère des Transports du Québec
- Robert Denis, Hydro-Québec
- Jean Legris, Direction de l'environnement forestier, ministère des Ressources naturelles
- Marie Claude Savoie, Maclaren Energy

#### *Consultants*

- Yves Comtois, SNC-Lavalin Environment Inc.
- Michel Couillard, Environnement Illimité Inc.
- Christian Morissette, D&G Enviro-Group Inc.
- Jean Roberge, lawyer
- André Tessier, consultant
- Gilles Vaillancourt, Nove Environnement Inc.

#### *Environmental Groups*

- John Burcombe, Mouvement au Courant

## Appendix 6

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### List of proposed fields

#### *Preliminary list of proposed fields for data entry*

##### *Project*

Proponent name:

Project name:

##### *About the document*

Report author(s): Author 1 Author 2 Author 3

Report type: Phase report Final report Annual report

Publisher name:

Date of publication: dd/mm/yyyy

Documents attached: yes no drop-down list of attached documents

##### *Project Date and Location*

Geographic co-ordinates: latitude: longitude:

UTM co-ordinates:

Follow-up program years(s): xxxx to xxxx

Administrative region (15): region number and/or name (drop-down list)

Region: Southern Quebec, James Bay, etc. (drop-down list)

Environment: urban, agricultural, forested, coastal, lacustrine, etc. (drop-downlist)

Drainage basin: river name, basin number(drop-down list)

Regional county municipality: (drop-down list)

##### *Project Type*

Drop-down list

- electricity production
- electricity transportation
- dam, dyke, reservoir or other water catchment or bypass
- water purification
- oil or gas facility or pipeline
- telecommunication
- mine
- forestry operation
- fishery

- agriculture
- factory or industrial facility
- nuclear or uranium mining facility
- canal or locks
- port or marine infrastructure
- railway
- road, bridge
- airport, aerodrome or landing strip
- waste management facility
- recreational/tourism equipment
- other

### *Components Subject to Follow-up*

#### *Physical environment*

- water
  - surface water
    - quality
      - biological chemical physical
    - hydrodynamics
  - ground water
    - quality
    - level
    - dynamics
- air
  - particulates
  - gas
- soil
  - quality
  - stability
- sediment
  - quality
  - sedimentology
- climate
- radiation
- electromagnetic waves
- vibrations
- sound environment

### *Biological environment*

- wildlife
  - terrestrial fauna
    - mammals
      - species
      - habitat
    - amphibian/reptile
      - species
      - habitat
  - avian fauna
    - species
    - habitat
  - aquatic fauna
    - fresh water
      - species
      - habitat
    - salt water
      - species
      - habitat
  - species at risk
- plant life
  - land
    - species
    - habitat
  - aquatic
    - species
    - habitat
  - semi-aquatic
    - species
    - habitat
  - species at risk
- biodiversity

### *Human environment*

- health/quality of life
- public safety
- land use
  - infrastructure and equipment
  - building
  - leisure and tourism
  - agriculture
  - industry
  - business
  - transportation
  - other

- economy
  - primary sector
  - secondary sector
  - tertiary sector
  - traditional activities
  - other
- culture
  - archaeology
  - heritage buildings
  - language
  - other
- landscape

### *Mitigation Measures*

- type of measure
  - liquid waste treatment
  - solid waste treatment
  - gaseous waste treatment
  - bioengineering
  - wildlife management
    - land
    - aquatic
    - aviary



## Appendix 7

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### Detailed technical description of proposed solutions

Currently, there are many choices of available software that would make it possible to build the ideal solution for dissemination described in this document. Some options are based on commercial tools, others are in the public domain (public domain, open source).

#### *Software components*

As mentioned, the architecture of the ideal dissemination solution is based on a technological hybrid that combines a dynamic Web site and a database. With this approach, the user interface relies entirely on Web browser capacities; data is managed by a storage component located on a remote server (the database server may be different from the Web server). The connection between the Web browser and the database is effected by the Web server, via a gateway that is more or less integrated into the Web server. This is called three-tier architecture.

The storage component is usually built around a relational data base management system (DBMS) (e.g. Oracle, Informix, Access).

#### *Web Server*

Certain server side solutions are limited to specific computer (hardware and operating system) platforms (e.g. Windows NT on Intel or Alpha hardware architecture). This is the case with the Microsoft Internet Information Server (IIS), which the advantage of integrating both the Web server and the Web/RDBMS gateway, and offering access to a basic array of commercial data, such as Microsoft Structured Query Language (SQL) Server and Access.

With respect to Web servers in the public domain, it should be noted that the Apache server, <<http://apache.org>>, according to Netcraft, supports approximately 60 per cent of currently active Web sites.<sup>8</sup>

#### *• RDBMS and Web server gateway*

Again, the tools are sometimes dedicated to specific platforms (e.g. Active Server Page [ASP], a dynamic Web page technology by Microsoft, integrated into IIS; or Access, a RDBMS on the Windows platform). Others are cross-platform applications, but specific to certain Web servers. Finally, the last are not only cross-platform applications, but cross-server ones also; this makes it possible to access multiple RDBMS. For example, the dynamic Web page generator language, hypertext pre-processor (PHP), <<http://www.php.net>>, with its 37 per cent penetration rate of Apache servers in February 2001, represents almost 20 per cent of active Web sites, or RDBMS mySQL and PostgreSQL.

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<sup>8</sup> The *Netcraft Web Server Survey*. {Note: not in the list of Documents Reviewed. List author or source, year and then title, Web site should be listed in the list of Documents Reviewed.}

It must be added that these tools are either in the commercial or public domains. The former usually have a significant purchase price, the latter are usually available free, particularly for non-commercial use.

The assumption that standards and technical support for commercial tools are usually superior in terms of quality and accessibility is open to question. However, tools in the public domain, since they have a wide base of users, have a community of very active users; bugs are well-documented and often rapidly fixed, and these tools usually become standards well ahead of their commercial equivalents.

If the dissemination tool is hosted on a dedicated server belonging to the managing organization, there are very few constraints encountered as a result of the technological infrastructure because it will be set up to meet the needs of the chosen software solution.

In the case of third party hosting, the limitations may not really be significant. For example, it will be impossible to impose the use of a particular component (server, gateway, DBMS) because of incompatibility with the deployment platform, or between the chosen components and those already installed on the service provider's or the organization's server.

### *Comparative study of existing technological combinations*

Without compiling an exhaustive list of combinations that might enable implementation of the proposed dissemination solutions, it is possible to identify several common combinations in both the commercial and public domains that should also be evaluated against the following criteria:

- independence of platform and operating system (cross-platform);
- ability to grow (scalable);
- quality and accessibility of technical support;
- existence of a community of developers and integrators; and
- compatibility with existing standards.

All three of the combinations suggested below have proven abilities, present very different characteristics with respect to deployment and flexibility, and finally give an overview of the infrastructures that may be found at potential host organizations.

**Websserver: Microsoft IIS**

**Dynamic content generator: ASP**

**Database: ODBC**

**Operating system: Windows NT**

The first combination is made up entirely of Microsoft tools and is thus tightly integrated. There is no question as to component compatibility, since Active Server Page (ASP), the dynamic page creation gateway, is an integral part of the MIIS. Open DataBase Connection (ODBC) is also a standard for RDBMS access under Windows

32/9x/2000/NT, and there are handlers for the majority of commercial RDBMS. This combination can also rely on the support of Microsoft and a wide base of users and integrators.

This combination can easily support a significant increase in demand, a significant quality in view of the subsequent development phases.

However, its main disadvantage lies in its rigidity (deployment being limited to one platform) and its proprietary technology.

**Webserver: Apache**

**Dynamic content generator: Cold Fusion**

**Database: ODBC**

**Operating system: Windows NT**

Apache is a Web server known for its speed and efficiency under high demand and for its stability under all conditions. In addition, it has the advantage of being able to run under virtually every operating system, any one of the many flavours of UNIX, Windows, MacOS or Linux. In addition, it is on the Linux public domain operating system (note that Apache is also in the public domain) that the server acquired its credentials.

Cold Fusion is a dynamic Web page application, like ASP, developed by Allaire, <<http://www.allaire.com>>. Cold Fusion has carved out a significant market share for itself on the Windows platform, as a result of the flexibility of its programming language (specialized tags are interpreted in order to generate dynamic page content). Like ASP, Cold Fusion can draw from most commercial RDBMS, either through specific links (Oracle, Informix, Sybase) or via ODBC.

Cold Fusion has the main advantage of being a cross-platform application (UNIX, Windows, Linux), is portable and can be redeployed on most operating systems.

However, despite its popularity in the Windows world, Cold Fusion is still relatively unknown among the Web development community.

**Web server: Apache**

**Dynamic content generator: PHP**

**Database: PostgreSQL or MySQL**

**Operating system: Linux**

PHP is a server side development language for building dynamic Web sites. Like Cold Fusion, PHP is a cross-platform application. It is also governed by open source development rules and thus is free, and currently enjoys a significant community of developers and integrators. For the same reason, it can rely on a range of specialized modules, such as access modules for various RDBMS and a portable document format (PDF) module

that makes it possible to generate documents in this format on the fly. PHP can be combined into one module with an Apache server, allowing very tight integration of the two tools and an appreciable increase in performance.

PostgreSQL, <<http://www.postgresql.com>>, and MySQL, <<http://www.mysql.com>>, are also RDBMS that grew out of the open source philosophy. The two RDBMS are often used with PHP to create dynamic sites. Although less common than other commercial DBMS (e.g. Oracle, PostgreSQL and MySQL), they rely on essentially the same fundamental functionality as do all DBMS; therefore, requests can be made in SQL format.

This last solution is therefore especially attractive not only in terms of cost, but also in terms of flexibility and cross-platform application.

## Appendix 8

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### Potential approaches to managing report contents

Environmental follow-up reports are produced in the most varied of publication formats, both electronic and hard copy. Although currently we can expect all reports to be produced electronically, formatting involves significant constraints because users may not have, or be familiar with, all the tools and software used to produce these reports. The question of electronic formats also involves the concept of their life cycles, since some new technologies make the previous ones obsolete.

The issue of the electronic version of contents can be handled in three ways. The first attempts to solve the problem without resorting to any miracle cures. The other two approaches are more technologically limited, both for the dissemination tool manager and the report producers. They require the implementation of guidelines that are in no way imposed by the dissemination tool manager, but should be developed by the authorities who order the follow-up studies. Therefore, they are only planned for later implementation phases.

#### **Approach 1: Simple hyperlink to the electronic document in its original format**

This is the simplest approach and is the one planned for the first phase of implementation of the dissemination tool. It involves submitting a copy of the report to a local or remote server, in its original electronic format, and linking it to the database by a hyperlink. The database should also hold information on the electronic format used to produce the report, so that the potential user can determine whether or not it can be used.

#### **Approach 2: Standardization in PDF**

The first suggested approach is to plan for the standard production of all reports in a widely available electronic format using official guidelines from all other responsible authorities or indirect encouragement from a disseminating organization, such as the manager of the dissemination tool.

For this purpose, PDF, a proprietary technology introduced by the Adobe company, could be an interesting avenue. This format is currently very popular as a result of the Acrobat Reader viewing software distributed free of charge by Adobe. Therefore, it is widely accessible.

PDF makes it possible to integrate, in one electronic file, text, specialized content, data tables, photos and images, maps, plans and illustrations. PDF is in fact an on-screen representation of the printed document. (The format is drawn directly from the PostScript page description language, also developed by Adobe for electronic printing).

In addition, it also allows full-text searches via the Web using tools installed on the disseminator's server, which is of considerable advantage.

This approach, even if it seems to be the most desirable, is tied to decisions which are made at the responsible agencies and departments, and over which the managing organization has no power, except to encourage co-operators in the data bank to publish their reports in the desired format, as previously mentioned.

### **Approach 3: Use of the XML format**

This approach suggests implementing a report production chain that results in conversion to eXtensible Markup Language (XML) format, a structured document mark-up language introduced in 1998 by the World Wide Web Consortium (W3C).<sup>9</sup>

XML is not an electronic format, but an information structuring technology designed for electronic information-sharing; in addition, it has become the foundation for emerging e-commerce mechanisms.

Therefore, the main advantage of XML is its complete neutrality with respect to multiple proprietary formats. Due to its structure, an XML document can easily be converted both in printed form and in virtually any electronic publication format, and notably in PDF and HyperText Markup Language (HTML) format. HTML is the Web page description language, as well as an extension. Consequently, it is not necessary to save the same document in a multitude of proprietary formats because XML can theoretically permit the generation of documents for publication in the desired electronic format, on the fly. This possibility is still subject to the availability of software that enables conversion to specific electronic formats.

The XML format also lends itself very easily to both multiple criteria and plain text searches, since the document content is stored within the XML structure itself. Each XML document is also fully accessible by automatic Web indexers.

In the case of a dissemination tool such as the one proposed here, XML also presents many advantages, such as enabling the generation, on the fly, of summary records which are modifiable at will.

Currently, the main technical obstacle to the implementation of such an approach essentially is the preparation of XML files. There is, in fact, no commercial software that integrates the creation of XML documents into the typical report production chain. In the event that this approach is used for the publication of the report contents, it would be necessary to implement a production method using the most widely available production tools.

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<sup>9</sup> <<http://www.w3c.org>>

## Appendix 9

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### Glossary of technical terms

**Data Bank:** Group of information organized around one subject, usable directly and suggested in consultation with users (translation of a definition given by the Office de la langue française, 1999).

**Database:** Structured sets of interrelated records in which the data are organized according to certain criteria in order to use them (translation of a definition given by the Office de la langue française, 1999).

**DBMS:** Data Base Management System. Hardware and software system whose purpose is to ensure the automatic management of a database and to allow the creation, modification, use and protection of data.

**Dedicated or single-purpose server:** A server whose task is entirely devoted to a single, integrated application (however, the application can be the sum of several software applications).

**Dynamic content:** Dynamic content (Web sites) are Web documents that are generated on the fly, by various means, according to user requests. They are characteristically volatile.

**Field:** Specified areas defined by the user or designer of a program for the storage of basic information of a particular type.

**Host:** A provider offering a host service, free or for a fee, that allows use of disk space on its server in order to disseminate Web sites and personal pages on the Internet.

**HTML:** HyperText Markup Language. A document-tagging language for publication purposes.

**Open source:** Software developed co-operatively and communally that, with its source code, may be copied, modified and redistributed, thus evolving continuously toward a more refined version.

**Portal:** A Web site home page which offers, in addition to a search engine, hyperlinks with a great deal of attractive information and services, designed to guide Internet users and facilitate access to the network but above all, to draw them and develop their loyalty to the site so it becomes their port of entry to the Internet.

**RDBMS:** Relational Data Base Management System. An RDBMS is a DBMS that allows data to be managed according to the relational model.

**Relational model database:** A model that breaks down a database into entities and into relationships between these entities.

**Remote:** Used to describe all network components that are not under the user's direct control, but to which the user can connect.

**Shared server:** A server shared by several independent applications.

**Static content:** Web site content can be static or dynamic. Static content is usually structured in the form of a series of HTML files, commonly called Web pages, that are updated manually or automatically at varying intervals. (See HTML and Dynamic content.)

**(Site) Structure:** All the information contained on a Web site is usually structured in the form of individual pages that are organized in a directory tree or a hierarchical file structure.