

Data Management Principles and Guidelines for Polar Research and Monitoring in Canada

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1. Introduction

Canadian programs and organizations that fund, carry out, and/or otherwise support research and monitoring in Northern Canadian, Arctic, and Antarctic regions have a responsibility for promoting and ensuring the proper management of data and information resulting from their activities. Effective data stewardship is essential to ensure that valuable data resources are accessible now and in the future to advance our knowledge and understanding of the polar regions, promote public awareness, and support informed decision making at the local, national, and international levels. In addition, accurate and retrievable data are an essential component of research and are necessary to verify and defend, when required, the process and outcomes of research.

This Document describes the principles and guidelines for management of data and information generated through Canadian polar research and monitoring programs. These principals and guidelines support the long-term preservation of and timely access to important polar datasets and information. The Document has been developed through a collaboration between the Northern Contaminants Program (NCP), the Nunavut General Monitoring Plan (NGMP), and Polar Knowledge Canada (POLAR), and the principles and guidelines contained herein are consistent with and complementary to the data-related principles and policies of Canada's three federal granting agencies (the Natural Sciences and Engineering Research Council of Canada (NSERC), the Social Sciences and Humanities Research Council of Canada (SSHRC) and the Canadian Institutes of Health Research (CIHR))^{1,2,3}, the Canadian northern Territories' *Pan-Northern Approach to Science*⁴, the Government of Canada Open Data program⁵, and the Scientific Committee on Antarctic Research (SCAR)⁶. This Document is directly modeled on:

- The International Arctic Science Committee's 2013 *Statement of Principles and Practices for Arctic Data Management*⁷; and
- Oxford University's *Policy in the Management of Research Data and Records*⁸,

With additional text from:

- The Polar Data Catalogue *Data Policy* developed by the ArcticNet Network of Centres of Excellence and the Canadian Cryospheric Information Network⁹;
- The Australian Antarctic Program *Data Policy*¹⁰;
- The International Polar Year 2007-2008 *Data Policy*¹¹;

¹ <http://www.science.gc.ca/default.asp?lang=En&n=83F7624E-1>

² http://www.nserc-crsng.gc.ca/NSERC-CRSNG/policies-politiques/Tri-OA-Policy-Politique-LA-Trois_eng.asp

³ http://www.sshrc-crsh.gc.ca/about-au_sujet/policies-politiques/statements-enonces/aboriginal_research-recherche_autochtone-eng.aspx

⁴ <http://www.anorthernvision.ca/PanNorthernScience.html>

⁵ <http://open.canada.ca/en/open-data-principles>

⁶ http://www.scar.org/scar_media/documents/scadm/SCAR_39_DataPolicy.pdf

⁷ http://iasc.info/images/data/IASC_data_statement.pdf

⁸ <http://researchdata.ox.ac.uk/university-of-oxford-policy-on-the-management-of-research-data-and-records/>

⁹ <https://www.polardata.ca/pdcinput/public/data-policy.pdf>

¹⁰ https://data.aad.gov.au/aadc/about/data_policy.cfm

- The Northern Contaminants Program *Call for Proposals 2016-2017*¹²;
- The Beaufort Regional Environmental Assessment *Data and Information Management Policy*¹³;
- The U.S. National Science Foundation *Data Sharing Policy*¹⁴; and
- 2013¹⁵ and 2014¹⁶ data management reports from the Canadian Polar Data Network to the Canadian High Arctic Research Station.

2. Objective

The objective of this Document is to serve as a guide to assist researchers, communities, and institutions in applying consistent approaches to data management and to clarify roles and responsibilities of researchers, funders, and collaborators.

3. Principles of Data Management

The participating programs and organizations (“the Programs” - see Appendix A for a list of the Programs) seek to ensure long-term preservation of and access to data through application of the following principles:

- Data are **preserved** by collecting, storing, and retaining data using formats that preserve the data beyond the duration of the original research project;
- Data are **discoverable** by applying commonly accepted standards and reporting protocols in the use of metadata;
- Data are **accessible** by supporting full, free, and open access with minimal delay, using a secure and curated repository or other platforms; and
- Data are **ethically managed** by respecting legal and ethical obligations, including consent, privacy, and confidentiality; Indigenous peoples’ rights; secondary use of data; and data linkage.

4. Application

This Document applies to all research and monitoring activities that are funded or supported by the participating Programs or are working in collaboration with the Programs and have agreed to adhere to these principles. See Appendices B and C for information on the Programs and their requirements and mandates. The Programs will not be liable for any damages, either direct or indirect, incidental, special, or consequential, related to the use of or the inability to use their data and information products and services of any kind.

¹¹ http://www.ipy.org/index.php?ipy/detail/ipy_data_policy/

¹² <https://www.aadnc-aandc.gc.ca/eng/1449513781489/1449514050945>

¹³ <http://www.beaufortrea.ca/wp-content/uploads/2013/03/BREA-Data-and-Information-Management-Policy.pdf>

¹⁴ <http://www.nsf.gov/bfa/dias/policy/dmp.jsp>

¹⁵ Canadian Polar Data Network, 2013. *Data and Information Management for Arctic Science and Technology: A Proposed Approach for the Canadian High Arctic Research Station*, 80 pp.

¹⁶ Canadian Polar Data Network, 2014. *Data Management Planning and Development Support to the Canadian High Arctic Research Station*, 20 pp.

This Document will be reviewed periodically by the Programs to ensure the principles and guidelines herein remain relevant. The Programs retain authority to revise this Document as deemed necessary. In the event of revisions, consultations will be made with affected stakeholders. New Programs are welcome and can be added to the list of participating organizations on an ongoing basis.

5. Definitions and Types of Data

5.1. Data and Metadata

The Programs, in collaboration with the Canadian and international polar data management community, seek to promote the highest standards in the stewardship of data and metadata resources resulting from polar research and monitoring activities.

5.1.1. Definition of Data

These principles and guidelines take a very broad approach to the concept of “data,” recognizing that it may take many forms, and, depending on the field of research or monitoring, can mean different things. This includes but is not limited to: survey results, written observations, software, interview transcripts, photographs, automatic measurements, hand-drawn maps, stories, video footage, and physical samples (see 5.2. below).¹⁷ Thus, this Document’s definition of data incorporates all ways of knowing: Western/academic, Indigenous, traditional, and local ways of knowing.

There are five primary categories or sources of data:

- **Institutional Data:** Data systematically collected or produced by Program scientists as required for their Program.
- **Funded Data:** Data collected or produced by funded projects, partially funded projects, or otherwise supported by a Program and consistent with and supportive of the mission of that Program.
- **External Data:** Data from external repositories or data providers, including existing operational data streams and historical sources, Canadian federal and territorial programs, Statistics Canada, industry, international institutions, or others, as relevant.
- **Rescued Data:** Data retrieved from unpublished sources, e.g., field notebooks, records on outdated storage media, or photographic records, which are often at risk of loss.
- **Traditional and Local Knowledge (TLK):** TLK itself is a cumulative body of knowledge and beliefs about the relationship of living beings (including humans) with one another and with their environment, acquired and used in ways that may be different from Western systems of knowledge. Research involving TLK may not fit within the data models or standards of conventional Western research regimes¹⁸. Nonetheless, TLK may still be managed in conventional repositories, subject to privacy or other relevant considerations.

¹⁷ Scassa, T. Intellectual property and research data: Key issues and challenges in the Canadian North. (Draft paper).

¹⁸ Scassa, T. Intellectual property and research data: Key issues and challenges in the Canadian North. (Draft paper).

5.1.2. Definition of Metadata

“Metadata” provide the information about a dataset, specifically the *what, where, when, by whom* it was collected, its current location, and any access information.

Metadata facilitates the understanding, use, and management of data and is a tool for networking and collaboration. Standardized metadata records consist of a defined set of information fields that must be completed to allow automatic sharing of records via interoperability between metadata management facilities and data portals.

Currently, metadata should conform to the North American Profile of the ISO 19115¹⁹ Metadata Standard for Geographic Information, which is the government of Canada’s standard for geospatial metadata. Metadata may also conform to the historic FGDC standard (Federal Geographic Data Committee Content Standard for Digital Geospatial Metadata, FGDC-STD-001-1998²⁰).

5.2. Physical Samples as Research Data

The products of research and monitoring activities may also include physical samples, preserved and living biological specimens including microbiological cultures, and other non-digital material.

Researchers are responsible for the preservation, documentation, and ethical use of these physical samples according to existing standards relevant to the type of sample collected.

Researchers are expected to allow scientific sharing and investigation in accordance with the International Council on Archives’ Standards and Guidelines²¹, the Society of American Archivists’ Core Values Statement and Code of Ethics²², the Canadian Tri-Agency guidance on Ownership of Collections and Specimens²³, and other guidance from the museum, research, or other applicable community.

Such non-digital holdings should be described in a metadata record.

Appendix D provides information on possible storage locations for physical samples.

5. Ethically Open Access

In accordance with:

- The Twelfth WMO Congress, Resolution 40 (Cg-XII, 1995)²⁴;

¹⁹ <http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=16553§ion=text>

²⁰ http://www.fgdc.gov/standards/projects/FGDC-standards-projects/metadata/base-metadata/v2_0698.pdf

²¹ <http://www.icacds.org.uk/eng/standards.htm>

²² <http://www2.archivists.org/statements/saa-core-values-statement-and-code-of-ethics>

²³ http://www.nserc-crsng.gc.ca/Professors-Professeurs/FinancialAdminGuide-GuideAdminFinancier/Responsibilities-Responsabilites_eng.asp

²⁴ http://www.wmo.int/pages/prog/www/ois/Operational_Information/Publications/Congress/Cg_XII/res40_en.html

- The Thirteenth WMO Congress, Resolution 25 (Cg-XIII, 1999)²⁵;
- The ICSU 1996 General Assembly Resolution²⁶;
- The ICSU World Data System Data Policy²⁷; and
- The ICSU Report of the CSPR Assessment Panel on Scientific Data and Information²⁸,

and to support open access practices to maximize the benefit of the efforts put into proper stewardship of data, the Programs, through this Document, encourage data contributors to make research and monitoring data available fully, freely, and openly, with minimal delay.

The only exceptions to the requirement of full, free, open, and permanent access are:

- Where human subjects are involved or in situations where small sample sizes may compromise anonymity, confidentiality shall be protected as appropriate and guided by the principles of informed consent and the legal rights of affected individuals;
- Where TLK is concerned, rights of the knowledge holders shall not be compromised;
- Where data release may cause harm or compromise security or safety, specific aspects of the data may need to be protected (for example, locations of nests of endangered birds or locations of sacred sites); and
- Where pre-existing data are subject to access restrictions, access to data or information using this pre-existing data may be partially or completely restricted.

6. Roles and Responsibilities

6.1. General Requirements

- 6.1.1. The Programs, the Data Repository (see 7.2.2. below), data contributors, project sponsors, and external collaborators will work in partnership to implement good practices and meet relevant legislative, funding agency, and regulatory requirements.
- 6.1.2. Data should be retained for as long as they are of continuing value to the stakeholder community, and as long as specified by the research funder, legislative, and other regulatory requirements. In many instances, stakeholders will resolve to retain research data for a period that exceeds the minimum requirement.
- 6.1.3. If data are to be deleted or destroyed, either because the agreed period of retention has expired or for legal or ethical reasons, this should be done so in

²⁵ http://www.wmo.int/pages/prog/hwrrp/documents/Resolution_25.pdf

²⁶ http://www.icsu.org/publications/general-assembly/29GA/29GA_Resolutions_adopted.pdf/

²⁷ <http://www.icsu-wds.org/organization/data-policy>

²⁸ http://www.icsu.org/publications/reports-and-reviews/priority-area-assessment-on-scientific-data-and-information-2004/PAA_Data_and_Information_report.pdf

accordance with all legal, ethical, funder and collaborator requirements and with particular concern for confidentiality and security.

- 6.1.4. In the case where creation of data is partially or fully supported by more than one organization or project, researchers will seek to comply with all applicable data management policies and requirements. Agreements will be formed between all organizations as needed to ensure careful consideration of applicable policies and consistent stewardship of all data. If there are discrepancies between the requirements or principles of data stewardship, which may be inconsistent with the principles of free and open data access, these discrepancies should be documented in the Data Management Plan of the project proposal (see Appendix E for guidance on creating a Data Management Plan). At minimum, the researchers must submit a metadata record to the Data Repository to indicate the presence of the data and project.

6.2. Responsibilities of the Programs

- 6.2.1. The Programs acknowledge their obligations to ensure that sound systems are in place to promote the best practices in managing data and information, including through clear policy, guidance, supervision, training, and support.
- 6.2.2. The Programs are responsible for maintaining a secure Data Repository. The Polar Data Catalogue (PDC, www.polardata.ca), which is jointly supported by the Programs and others, is currently the primary and default Data Repository for metadata and data from the Programs. Data in the Data Repository will be preserved and made available indefinitely, unless there are compelling reasons to do otherwise.
- 6.2.3. The Programs will establish and maintain a Data Advisory Group to meet regularly to steward this Document, develop template Data Management Plans for use in proposals, establish standards and increase awareness of new developments which will enhance stewardship of programmatic data and information. The Data Advisory Group will be composed of one representative from each Program and one from the Data Repository and is open to other data management experts or parties who are interested in contributing to the Group's activities.
- 6.2.4. Data Management Plans will be archived and used as reference for future policy and application.
- 6.2.5. The Programs in partnership with Data Repository staff at the PDC will provide training, support, and advice to project members and funded researchers to facilitate efficient and accurate metadata and data entry.
- 6.2.6. If a researcher requests that data be archived in a repository other than the default Data Repository, the Programs can help identify sustainable long-term data hosting facilities that meet recognized standards. However, there may be situations where data must be stored in locations or repositories which are not standardized or officially recognized. These situations will be assessed on a case-by-case basis by the Data Advisory Group.

- 6.2.7. Archiving and access requirements of all metadata records, datasets, or other research products involving TLK submitted to the Data Repository will be considered on a case-by-case basis by the Data Advisory Group.

The Programs are responsible for ensuring that research data and metadata:

- 6.2.8. Are accessible to the general public, consistent with appropriate ethical, data sharing, and open access principles, as confirmed by review and approval by the Data Repository's data managers;
- 6.2.9. Are identifiable, retrievable, and accessible when requested;
- 6.2.10. Are secure and safe;
- 6.2.11. Are stewarded in a manner that is compliant with the applicable legal obligations and requirements of funding bodies.

The Programs, through the Data Repository, are also responsible for:

- 6.2.12. Providing access to services and facilities for the storage, backup, deposit, and retention of data that allow researchers to meet their requirements under these guidelines and those of the funders of their research;
- 6.2.13. Directly harvesting and incorporating appropriate metadata records that already exist in external catalogues, as identified by the researchers; and
- 6.2.14. Providing a persistent locator, in the form of a unique digital object identifier (DOI), for data archived in the Data Repository. This recognizes the intellectual work required to create a useful dataset and allows the dataset to be recognized and cited through formal publication activities, including formal publication of the data itself.

6.3. Responsibilities of Researchers

Compliance with the requirements in this Document, including submission of metadata and data according to an approved Data Management Plan (see Appendix E for guidelines), is a condition of funding by the Programs.

Researchers are responsible for:

- 6.3.1. Providing data and metadata that are accurate, complete, authentic, and reliable;
- 6.3.2. Developing and documenting clear procedures and/or requirements for the collection, storage, use, re-use, access, and retention or destruction of the research data associated with their research. This shall include, where appropriate, defining protocols and responsibilities in a joint or multi-institution collaborative research project. The information should be incorporated, where appropriate, in a Data Management Plan;

- 6.3.3. Acquiring approvals from appropriate Institutional Review Boards, Research Ethics Boards, and/or Indigenous communities, and complying with their requirements, licenses, and permits; and
- 6.3.4. Ensuring that any data management-related requirements placed on their research by funding bodies or regulatory agencies or under the terms of a research contract are also met.

The Programs also require that:

- 6.3.5. Metadata will be provided to the Data Repository as early in the project as possible, typically within the year of collection, to ensure external awareness of the data;
- 6.3.6. Entry of metadata into the Data Repository is completed and confirmed by the project leader or by a research team member delegated such responsibility by the leader;
- 6.3.7. The project leader ensures the quality, accuracy, and completeness of the metadata to facilitate understanding of the nature and limitations of the data;
- 6.3.8. Metadata in the Data Repository be updated by the project leader or delegate during or after a project so that it accurately describes the final state of the data;
- 6.3.9. Data will be uploaded by the project leader or delegate to the Data Repository as soon as possible after entry of the metadata record. Any upload or access delays beyond one year after the end of the project must be brought to the attention of the Data Advisory Group;
- 6.3.10. If data are archived in a repository other than the default Data Repository, a full explanation and documentation regarding the long-term preservation standards and procedures of the repository shall be provided in the data management plans of the proposal, and a link to the external location shall be provided by the project leader or delegate in the metadata; and
- 6.3.11. Data creators acknowledge support from the Programs and other granting agencies and industries, where appropriate, in all presentations and publications of results of funded projects.

In addition, when submitting data to the Data Repository, researchers are responsible for ensuring that the data are:

- 6.3.12. Quality checked by the contributor and provided in standard, non-proprietary file formats so that the data are accessible, in their simplest useful form, and understandable for the long term; and
- 6.3.13. Accompanied by complete descriptive documentation, in addition to the metadata, defined as the information necessary for data to be independently understood by users and to ensure proper stewardship, discovery, access, and effective use.

Any exceptions to these standards must be documented in the Data Management Plans of the project proposal and approved by the Data Advisory Group.

7. Contact Information

Questions arising from this Document can be addressed to any of the Programs listed in Appendix A or the following:

Julie Friddell
Director, Canadian Cryospheric Information Network/Polar Data Catalogue
Department of Geography & Environmental Management
University of Waterloo
200 University Avenue West
Waterloo, Ontario, Canada N2L 3G1
fdc@uwaterloo.ca
<http://www.ccin.ca/>
1-519-888-4567 x 32689

Appendix A: Participating Programs and Organizations (“the Programs”)

- **Northern Contaminants Program**
Northern Science and Contaminants Research Directorate
Indigenous and Northern Affairs Canada
15 Eddy Street, 14th Floor
Gatineau, QC K1A 0H4 Canada
Phone: 819-934-6105
plcn-ncp@aandc-aadnc.gc.ca
- **Nunavut General Monitoring Plan Secretariat**
Indigenous and Northern Affairs Canada
Nunavut Regional Office
PO Box 2200
Iqaluit, NU X0A 0H0
Phone: 1-855-897-6988
Fax: (867) 975-4560
ngmp-psgn@aandc-aadnc.gc.ca
www.ngmp.ca
- **Polar Knowledge Canada**
Polar Knowledge Canada | Savoir polaire Canada
360 – 1710 Albert Street | 360 – 1710 rue Albert
Ottawa, ON K1R 7X7 Canada
Telephone | Téléphone (613) 943-8605
info@polar.gc.ca

Appendix B: Specific Data-Related Project/Program Requirements

Project/Program Name	Requirements	Consequence(s) of Noncompliance
Northern Contaminants Program (NCP)	<ul style="list-style-type: none"> • Confirmation of metadata uploaded to the Data Repository, by March each year • Synopsis of research report, including data-related activities, by April each year 	Holdback of funds
Nunavut General Monitoring Program (NGMP)	<ul style="list-style-type: none"> • Confirmation of metadata uploaded to the Data Repository, by March each year • Upload of data files to the Data Repository (or another approved repository), within 1 year of end of project funding 	Holdback of funds
Polar Knowledge Canada (POLAR)	<ul style="list-style-type: none"> • Confirmation of metadata uploaded to the Data Repository within 60 days of March 31st (end of fiscal) • Upload of data files to the Data Repository (or another approved repository), within 1 year of end of project funding 	Holdback of funds

Appendix C: Mandates of the Programs

1. Northern Contaminants Program (NCP)

The overall objective of the Northern Contaminants Program (NCP) is to reduce and, where possible, eliminate contaminants from the Arctic environment while providing information to Northerners about contaminants in traditional/country foods to make informed decisions about their food use. The NCP is working towards achieving this objective through world-class scientific research and monitoring. This work is used to influence the development and implementation of international/global agreements to reduce and/or eliminate the production, use and release of contaminating substances into the environment. The results of this research and monitoring also form the basis for assessing risks to human health associated with contaminants in traditional/country foods. This information is used by national and regional health authorities to develop dietary advice to northerners, particularly those who are dependent on marine mammals and fish as an important part of their diets.

Given that data have a potential value beyond that envisaged during their original collection, NCP strongly supports secure preservation and free and open exchange of relevant data that enhance both current and future research and leave a lasting legacy.

This statement of Data Management Principles and Guidelines supports the NCP mission and the basic principles of knowledge generation as follows:

- By streamlining and reducing the burden of the data management process on contributors and users;
- By helping to maximize the value and utility of the data that contributors collect, document, generate, and share;
- By providing guidance on how to safeguard and make NCP data publicly accessible and re-usable;
- By providing a framework for NCP data to be handled in a consistent manner; and
- By considering the rights of data collectors, knowledge holders, knowledge generators, data recipients and users, and the public.

2. Nunavut General Monitoring Plan (NGMP)

The Nunavut General Monitoring Plan (NGMP) is a key component of the Nunavut Land Claims Agreement (NLCA). To implement the NGMP, the Government of Canada works with its Nunavut partners to collect and analyze information relating to the ecosystemic and socio-economic health of Nunavut.

There is a requirement for general monitoring to collect and analyse information on the long term state and health of the ecosystemic and socio-economic environment in the Nunavut Settlement Area. Government, in co-operation with the Nunavut Planning Commission, shall be responsible for developing a general monitoring plan and for directing and co-ordinating general monitoring and data collection. This includes the requirement that all funding recipients complete a Data Access Agreement, submit metadata at the beginning of their projects to the Polar Data Catalogue, and submit all data before project completion.

The NGMP is a partnership project managed by a steering committee consisting of representatives from the Nunavut Planning Commission, Nunavut Tunngavik Inc., the Government of Nunavut, and Indigenous and Northern Affairs Canada (INAC) on behalf of the Government of Canada. The Secretariat is housed within INAC.

3. Polar Knowledge Canada (POLAR)

Polar Knowledge Canada (POLAR) is a federal agency (departmental corporation) that was established with the coming into force of the *Canadian High Arctic Research Station Act* on June 1, 2015. The Act merged the mandate and functions of the Canadian Polar Commission and the pan-northern science and technology program associated with the Canadian High Arctic Research Station (CHARS) project of Aboriginal Affairs and Northern Development Canada (AANDC), now Indigenous and Northern Affairs Canada (INAC). The purpose of Polar Knowledge Canada as stated in the *Act* is to:

- Advance knowledge of the Canadian Arctic in order to improve economic opportunities, environmental stewardship and the quality of life of its residents and all other Canadians;
- Promote the development and dissemination of knowledge of the other circumpolar regions, including the Antarctic;
- Strengthen Canada's leadership on Arctic issues; and
- Establish a hub for scientific research in the Canadian Arctic.

Responsibilities

The functions of Polar Knowledge Canada are to:

- Undertake scientific research and develop technology;
- Implement scientific research and technology development programs and projects;
- Promote the testing, application, transfer, diffusion and commercialization of technology;
- Publish and disseminate studies, reports and other documents; and
- Complement national and international networks of expertise and of facilities.

In a time of rapid Arctic environmental and cultural change, it is recognized that data preservation, discovery, and exchange are central and increasingly important to

scientific collaboration. Leadership in preservation, discovery, and exchange is also critical for sustaining the increase in Arctic cooperation resulting from the International Polar Year 2007-2008 (IPY). Given that data have a potential value beyond that initially envisaged during their original collection, POLAR strongly supports secure preservation and free and open exchange of relevant data and information that enhance both current and future research.

While it is acknowledged that there will be exceptions to open access data in certain situations (see the section in the Document on “Ethically Open Access”), POLAR has designed and implemented a resilient data and information management program to ensure the preservation of its data and make them available to all Canadians.

Appendix D: Preservation and Storage of Physical Samples as Data

Physical samples associated with research and monitoring activities are sources of data and can be considered data themselves, thus it is important to properly steward and preserve physical samples. Museums and other repositories are often the most appropriate locations for storing physical samples, but other arrangements may be more applicable in certain circumstances. In 1999, the three federal granting agencies—the Natural Sciences and Engineering Research Council of Canada (NSERC), the Social Sciences and Humanities Research Council of Canada (SSHRC) and the Canadian Institutes of Health Research (CIHR), in collaboration with the Canadian Museum of Nature, established a [Framework for Researchers](#)²⁹ that outlines the proper care, maintenance, ownership and long-term storage of collections and specimens. Pertinent considerations from the Framework document are copied here:

- “Where available, researchers should follow established guidelines and best practices developed by the relevant professional association on how best to collect, preserve and use specimens and artifacts in their research. The collections staff of long-term repositories are also a prime source of expertise in these areas, particularly in the life and biomedical sciences.”
- “For natural history disciplines, researchers should consult the *Guidelines for the Care of Natural History Collections*³⁰ developed by the Society for the Preservation of Natural History Collections, as well as manuals specific to various collections groups³¹.”
- “All objects in a collection should be fully documented and labeled according to established standards of the discipline. Such documentation should include, at a minimum, the identity of the object (if determined), the date and manner in which it was acquired, a detailed description of its geographic provenance and a numeric geo-reference, a description of its physical and biotic environment, the name of the collector, and the date of the collection. This information enhances objects, makes them more accessible to other researchers, and the only permanent record should the objects themselves deteriorate or be destroyed. Researchers working with collections may consider learning “best practices” to properly develop and manage documentation and archival records.”

In particular, scientifically valuable collections of animal, culture, plant or geological specimens, or archaeological artifacts collected in the Canadian Arctic should be deposited in an appropriate, permanent repository in which the specimens will be available to the research community in perpetuity. Non-Canadian sample collectors should aim to deposit all or a portion of their collections in a Canadian institution. Researchers should consult with curators and collection managers prior to conducting their field research, to identify an appropriate repository and make arrangements for the

²⁹ http://www.nserc-crsng.gc.ca/NSERC-CRSNG/Policies-Politiques/frameworkresearchers-cadrechercheurs_eng.asp

³⁰ <http://cool.conservacion-us.org/byorg/spnhc/spnhc1.html>

³¹ http://www.nserc-crsng.gc.ca/NSERC-CRSNG/Policies-Politiques/frameworkresearchers-cadrechercheurs_eng.asp#foot12

eventual deposition of their collections.

The Canadian Museum of Nature houses an extensive collection of Arctic natural history specimens³², and the Alliance of Natural History Museums of Canada, which includes many provincial museums, provides further information on proper care of physical collections³³. Other storage and preservation locations include universities, botanical gardens, and other federal institutions.

³² <http://nature.ca/en/research-collections/collections>

³³ http://www.naturalhistorymuseums.ca/index_e.htm

Appendix E: Data Management Plan Guidelines

The following information constitutes the required components of a Data Management Plan and should be included in the project proposal. The information below should be used in conjunction with the requirements on metadata included in this Document and may be used in the creation of metadata records for your project.

1. Names of the Principal Investigator and members of the research team
2. Location(s) of the data collection activities
3. Purpose: A one-paragraph summary of the intentions with which the dataset will be developed, that includes:
 - a. The research question(s)
 - b. The research domain
 - c. Methods
 - d. Expected results
4. Abstract: A description of data to be collected and managed, that includes:
 - a. Brief descriptive title(s) of dataset(s)
 - b. Information about incorporation of TLK data, if applicable
 - c. Types of data, samples, physical collections, software, curriculum materials, expected location of research (including GPS coordinates), and other materials or information to be produced during the course of the project
 - d. File formats and estimate of total expected volume of data in MB, GB, etc.
 - e. Plans for documentation and proposed method(s) for describing data
 - f. Timelines of data submission and schedule of data release, including any requests for temporary or permanent limits to access
 - g. Information about incorporation of any data funded by other organizations
5. Confirmation that the project will conform to the requirements in this Document and any exceptions requested
6. Documentation of necessary provisions for appropriate protection of privacy or confidentiality or other applicable ethical and/or legal rights and data management protocols, and justification for requested exception(s) to the default open data policy
7. Confirmation that the project will preserve data in the default Data Repository or, alternatively, request a justification for an exception to use an appropriately recognized alternative archive. This would include a full explanation and documentation regarding the long-term preservation standards and procedures of the alternative repository and confirmation that appropriate documentation and access through appropriate portals are provided.
8. Provision of copies of participant and/or community consent forms
9. Documentation for incorporation of TLK, if applicable
10. If applicable, any additional data preservation or archiving considerations, including specialized ownership and control of data or intellectual property