Assessment Information

[CoreTrustSeal Requirements 2017–2019](#)

Repository: Polar Data Catalogue
Website: https://www.polardata.ca/
Certification Date: 16 February 2021

This repository is owned by: University of Waterloo

Polar Data Catalogue

Notes Before Completing the Application

We have read and understood the notes concerning our application submission.

True

Reviewer Entry

Reviewer 1

Comments:

Reviewer 2

Comments:

CORE TRUSTWORTHY DATA REPOSITORIES REQUIREMENTS

Background & General Guidance

Glossary of Terms

BACKGROUND INFORMATION

Context

R0. Please provide context for your repository.

Repository Type. Select all relevant types from:

Domain or subject-based repository, Institutional repository, National repository system; including governmental, Research project repository

Brief Description of Repository

The wealth of knowledge and data generated by Polar researchers must be properly managed to ensure its long-term integrity and availability to the public and to fellow researchers. Consequently, the Polar Data Catalogue's primary goal as a repository is to ensure this management and maximize the exchange and accessibility of relevant data, and to leave a lasting legacy. The Polar Data Catalogue (PDC) was developed as a collaborative effort between the ArcticNet Network of Centres of Excellence, Indigenous and Northern Affairs Canada, the Department of Fisheries and Oceans Canada (DFO), and the Canadian Cryospheric Information Network (CCIN) to facilitate exchange of information about the Canadian Arctic among researchers and other user groups, including northern communities and international programs. We archive and serve online research and monitoring data from all of the polar regions but have a primary focus and user-group in Canada. For more information about the organizations and agencies participating in CCIN/PDC development, including programs which have contributed metadata and data to the PDC since 2007, please refer to https://ccin.ca/index.php/about/partners. Partners and Affiliates of the CCIN/PDC include but are not limited to: ArcticNet, Canadian Space Agency, Conservation of Arctic Flora and Fauna (CBMP-CAFF), Centre d'Études Nordiques (CEN) at ULaval, Canadian Polar Data Network (CPDN), Fisheries and Oceans (DFO) Canada, Environment and Climate Change Canada, Inuit Tapiriit Kanatami, International Polar Year (IPY) Canada, Global Water Futures, Polar Knowledge Canada (POLAR), Nunavut General Monitoring Programs and Northern Contaminants Program (NCP). These partnerships provide funding and guidance meanwhile contributing their data collections to the CCIN/PDC to ensure new and relevant research is made available to the public.

Brief Description of the Repository's Designated Community.

In the mid-1990's, the CCIN/PDC was developed to facilitate data management for Cryospheric science in Canada. Created through the collaboration between departments of the Canadian government (the Canadian Space Agency, Environment Canada, and Natural Resources Canada), The University of Waterloo and Neotix research Inc., the main objectives of the CCIN/PDC have been to provide data and information management infrastructure for the Canadian Cryospheric research community; to enhance public awareness and access to Cryospheric information and related data; and to facilitate the exchange of information between researchers, northern communities, decision makers, and the public.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

Level of Curation Performed. Select all relevant types from:

B. Basic curation – e.g. brief checking; addition of basic metadata or documentation, C. Enhanced curation – e.g. conversion to new formats; enhancement of documentation

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

Comments

The CCIN/PDC repository ensures accessibility to all its users and as such provides data in non-proprietary formats. The CCIN/PDC does not directly enhance the data submitted but, through the collaboration with the submitter, discrepancies and/or enhancements can be recommended and applied. This includes clarification of values, identifying impossible values within the dataset, and converting files from .xlsx to .csv.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:

Accept

Outsource Partners. If applicable, please list them.

Environment Computing within the University of Waterloo provides secured physical housing and power for our physical servers and computational infrastructure (see R16). This is an institutional agreement, whereby the aforementioned resources are available to the CCIN/PDC under research server/storage services, as offered by Environment Computing.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

Other Relevant Information.

The CCIN/PDC repository serves roles on the regional, national and global scale. At the regional scale, we serve as the data repository for projects funded by the Nunavut General Monitoring Plan and the Government of Canada's Northern Contaminants Program, both of which fund research projects in Canada's territorial north. At the National level, CCIN/PDC serves as the country's repository for Antarctic data collections, thus fulfilling a portion of Canada obligation's under the Antarctic treaty. Further, CCIN/PDC participates in, and has historically organized, major national conferences/workshops on data management within Canada (i.e. the Canadian Polar Data Workshop). Finally, at the international level, we have partnered with Environment and Climate Change Canada to be the Canadian node of the Global Cryosphere Water a part of the World Meteorological Organization. Finally, at the international level, CCIN/PDC served at the data repository of the International Polar Year (2007-2008) and consequently holds the metadata records for Canadian projects funded by that project.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

ORGANIZATIONAL INFRASTRUCTURE

I. Mission/Scope

R1. The repository has an explicit mission to provide access to and preserve data in its domain.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:
4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:
4 – The guideline has been fully implemented in the repository

Response:

The wealth of knowledge and data generated through polar research must be managed to ensure exchange and maximize accessibility of relevant data, especially from publicly-funded activities, and to leave a lasting legacy (Parsons et al., 2011; Pulsifer et al., 2013). The Canadian Cryospheric Information Network (CCIN) was developed in the mid-1990's to fulfill this need. The main objectives of CCIN/PDC have been to provide a data and information management infrastructure for the Canadian Cryospheric research community, ensure data preservation to enhance public awareness and access to Cryospheric information and related data, and to facilitate the exchange of information between researchers, northern communities, decision makers, and the public (https://ccin.ca/about).

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

II. Licenses

R2. The repository maintains all applicable licenses covering data access and use and monitors compliance.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Response:

The CCIN/PDC advocates for free and open access to all of the data in our archive. We have worked closely with ArcticNet to form a Data Policy promoting free exchange of data and information (https://www.polardata.ca/pdcinput/public/data-policy.pdf), and as an IPY Canada data archive, we also comply with the IPY Data Policy. We have also worked with the Canadian Space Agency and the Canadian Ice Service to provide RADARSAT-1 imagery to the public, free of charge, but pursuant to license terms (available by going to https://www.polardata.ca/pdcsearch/ and clicking on "RADARSAT Polar Science Dataset"). Pursuant to the data repositories protocols on sensitive data, when completing a submission to the CCIN/PDC the submitter has the option to classify their documents into a "limited category" which reduces access to CCIN/PDC users. The limited categories include "Limited: pre-existing data have been used and are subject to access restrictions", "Limited: data involves human subjects", "Limited: data involves intellectual property issues, related to traditional or local knowledge", "Limited: release of data may cause harm to the environment or to the public", and "Limited: currently under analysis for publication". These options allow CCIN/PDC users to classify the data submitted and ensures sensitive information does not get released. If the data is classified as any of the above options, it will not be publicly available, but rather the owner of the data will provide their contact information to approve the retrieval of their sensitive data on a case-by-case basis. Currently the CCIN/PDC does not monitor how the individuals retrieving the published data use these data.

Thanks to comments from the Reviewers, we are now aware of the UNESCO policy guidelines for the development and promotion of open access. Moreover, PDC plans to commence redevelopment of its Search application in 2021, and this will include updating its various terms of use statements, as per the UNESCO licensing principles. Specifically, PDC has created an internal ticket, so that this issue is tracked and addressed, in the application redevelopment specifications. For reference, the current user agreements are contained in a separate document, attached along with this application (see Annex A).

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
For the next renewal, and to increase transparency, it would be better to include links to online public versions of the user agreements rather than annexing them.

III. Continuity of access

R3. The repository has a continuity plan to ensure ongoing access to and preservation of its holdings.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:
4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:
4 – The guideline has been fully implemented in the repository

Response:

The CCIN/PDC is dedicated to ensuring the continuity of access to the files held within the repository. The CCIN/PDC's preservation plan includes advocating for free and open access to all of the data in our archive. In addition, in the event of a large scale technical failure, the CCIN/PDC has a fully functional disaster recovery instance that can be publicly exposed in a very short amount of time to resume normal production activities, thereby avoiding significant discontinuity in service. In the event of catastrophic damage to the entire building and/or locale where physical servers are housed, CCIN/PDC data are kept on physical media in a separate secured location so that a full rebuild of the system is possible.

PDC does guarantee a fixed preservation period for its holdings. However, in the event of involuntary organizational dissolution, we have arranged that a physical instance (as described above) representing our final organizational snapshot will be physically housed within the department of Geography and Environmental Management at the University of Waterloo. This will allow any subsequent organization or existing partner to reconstitute any/all data and collections for inclusion within their own holdings. In addition, current and future metadata are already propagated among our partners, as well as numerous external entities, thereby ensuring substantial redundancy.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
For the future, it would be good to work towards an agreement that includes a preservation component, instead of purely hosting a snapshot.

IV. Confidentiality/Ethics

R4. The repository ensures, to the extent possible, that data are created, curated, accessed, and used in compliance with disciplinary and ethical norms.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:
4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:
4 – The guideline has been fully implemented in the repository

Response:

The confidentiality/ethics policy is outlined on the CCIN/PDC website (https://www.polardata.ca/pdcinput/public/privacypolicy) which states we are committed to preserving and safeguarding the users' right to privacy. As part of this commitment and since the Database is housed at the Canadian Cryospheric Information Network (CCIN), this Privacy Policy applies to the use of the Database. CCIN maintains strict client information privacy policies and uses state of the art technologies to safeguard user information and communications from unauthorized intrusions. CCIN recognizes that the growth of online services, including Internet services, has created additional privacy concerns. Online privacy concerns focus primarily on the protection of "user identifiable" information, which an individual or other user reasonably expects to be kept private. As the term suggests, "user identifiable" information is information that, when associated with an individual identifies that individual - for example, a user's name, address, telephone number, and e-mail address. CCIN will not sell, trade, or disclose to third parties any user identifiable information derived from the registration for or use of an CCIN online service -- including user names and addresses -- without the consent of the user (except as required by subpoena, search warrant, or other legal process or in the case of imminent physical harm to the users or others). When CCIN uses other agents, contractors or companies to perform services on its behalf, CCIN will ensure that the organization protects user identifiable information consistent with this Policy. If CCIN includes names and any other user identifiable information in a directory that CCIN creates from

information we receive as an online service provider, the organization will give the user the opportunity to have their information excluded from that directory.

The repository allows the submitter to classify the sensitivity of their own data. The curation of the data and anything else prior is on the onus of the submitter. Once the data are submitted to the repository, the Data Manager who has training from the Data Curation Forum 2019, for ethical and data risk training sessions, has the capability to handle the processing and management of submitted datasets. Furthermore, if the dataset has been submitted, accepted, and preserved, the owner of the metadata has the option to provide their information for potential users to contact them for permission to access the data. Although, to ensure the privacy of the metadata/data owner, the option to use the PDC services to act as a 'middle man' and make the request on the behalf of the user, are also able to be utilized to ensure the privacy of the owner(s). Currently, submitters are not required to physically or electronically sign the related policies. However, they do have to accept the PDC terms of use, in order to create a PDC account. Furthermore, given the time that has elapsed since many of these policies and documents were put into place, PDC plans to explore the feasibility and utility of redrafting such agreements, with particular interest in addressing emerging trends, such as the FAIR data principles.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

V. Organizational infrastructure

R5. The repository has adequate funding and sufficient numbers of qualified staff managed through a clear system of governance to effectively carry out the mission.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:
4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:
4 – The guideline has been fully implemented in the repository

Response:

The CCIN/PDC is hosted by the University of Waterloo which is a recognized institution and ensures long-term stability and sustainability. This allows for secured personnel to attend annual meetings and training events that benefit both the repository's needs as well as the development of personnel. The overarching governing structure is the Interdisciplinary Centre of Climate Change (IC3) with which the CCIN/PDC has recently partnered. This governing structure includes partnerships with government personnel (Environment Canada), University of Waterloo, and CCIN/PDC. This includes an overarching director to oversee the goals of IC3. The following CCIN/PDC positions are considered permanent with the University of Waterloo: Faculty advisor, Associate Director, Data Manager, System Administrator. In addition, an Outreach coordinator and software developers are hired on contract to fulfill specific tasks. The University of Waterloo provides a surplus of opportunities for staff to attend ongoing training and professional development.

The Faculty advisor role is to provide high-level guidance of the CCIN/PDC, where and when necessary represent the CCIN/PDC at national international conferences and workshops, and when necessary contribute to personnel decisions.

The Associate Director has a broader Data Science and Data engineering background to successfully drive the vision of the CCIN/PDC. This includes a strong understanding of the current and future trends in data science that will be crucial for ensuring that future developments of the CCIN/PDC conforms to the larger data communities standards. This role also manages the day-to-day activities of the CCIN/PDC, supervises personnel, oversee budgets, craft and submit proposals, and represent the CCIN/PDC within IC3 and the University.

The Data Manager's role is responsible for working with CCIN/PDC users to ensure that metadata and data deposits conform to CCIN/PDC standards and assigns DOI's. This person works closely with our clients to ensure timely reviews and deposit records within the repository. This position also helps with the preparation of data management plans, works closely with the CCIN/PDC team to ensure continuous operation of CCIN/PDC infrastructure. As well as, provides representation at national and international conferences and workshops.

The System Administrator looks after all computer infrastructure. This role is currently 0.5 FTE. The system administrator specifically ensures the reliability of each file upload to the CCIN/PDC. These tasks include; Renaming files according to current naming conventions, File decompressions, File compressions, File transfers between systems, Virus checking and verifications. This allows for point source technical problems to be addressed, if they may arise.

The Software Developer is employed to achieve the current and future technological state of the CCIN/PDC and provide software development expertise.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

VI. Expert guidance

R6. The repository adopts mechanism(s) to secure ongoing expert guidance and feedback (either inhouse or external, including scientific guidance, if relevant).

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:
4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:
4 – The guideline has been fully implemented in the repository

Response:

The CCIN/PDC Advisory Council is comprised of representatives from the Federal Government, Universities, and Indigenous Groups that are involved in polar research and data management activities (https://ccin.ca/about/advisory). These include members from Polar Knowledge Canada, University of Laval, and Carleton University, among others. The characteristics of the Advisory Council are as follows: members must of the potential to contribute relative to the CCIN/PDC mission, and the membership is voluntary. The council meets once per year (typically at annual science meeting where more ad hoc members will be in attendance). The CCIN/PDC also provides all users with the email address which is monitored both by the Associate Director and Data Manager to receive feedback as well as to support expert guidance to the repository's users. In order to stay current with general data preservation matters, the CCIN/PDC Associate Director participates in the CCADI working group as well as CCIN/PDC employees attend the Canadian Polar Data Workshop meeting approximately every two years.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:

DIGITAL OBJECT MANAGEMENT

VII. Data integrity and authenticity

R7. The repository guarantees the integrity and authenticity of the data.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry
Reviewer 1

Comments:
4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:
4 – The guideline has been fully implemented in the repository

Response:

The PDC is a repository of metadata and data that describes and provides access to diverse data sets generated by Arctic and Antarctic researchers. The metadata records follow ISO 19115 and Federal Geographic Data Committee (FGDC) standard formats to provide exchange with other data centres.

The metadata repository allows for maintaining links to metadata and other datasets. This is done by the submitter of the metadata. They are required to identify the Principal investigator(s), links to existing data and are required to produce an existing DOI if the data have already been published; this is to avoid duplication and protect the integrity of the data submitted. To ensure a valid DOI has been submitted, the Data Manager is required to complete a web search to ensure that it is a current DOI from an accredited institution. Once a submission is made, the submitter cannot make changes to their metadata until the Data Manager reviews the submission and either approves or sends it back for review. Once a file is submitted and approved, the original submitter is able to make updates to the file and resubmit it for the data manager's review and approval. This allows for accountability and provides the opportunity for the repository to determine if changes have been addressed. The dataset is not published until the changes are reviewed and approved. This is outlined in the CCIN/PDC's "Best Practices" PDF outlined on the PDC website (https://www.polardata.ca/pdcinput/public/PDC_Best_Practices_FULL.pdf). The Data Manager is also tasked with assessing the integrity of the data in both the Windows and Apple OS. This is to assure there are no special characters that are displayed in the metadata and datasets that are submitted. Furthermore, this process ensures that the

authenticity of data for universal data usage in the future is guaranteed.

In addition, continuing data integrity is ensured at the database and file system levels by recurring automated maintenance routines. In particular, MD5 checksum values are determined for datafiles upon submission and these values are regularly recalculated and checked against the stored values in the primary database, in order to verify data integrity. Other properties are similarly stored in the database and to verify data integrity, such as file size and last modified date.

Versioning control of updated datasets include the original dataset as submitted and accepted. Rather, the inclusion of the updated set with a 'V2' designation is added. In order to ensure that users are aware of the distinction, both the metadata will be updated to include this information as well as the updated README file uploaded with the new set will outline the versioning differences. Meanwhile, the metadata record that has a corresponding DOI from the PDC and stored with DataCite also gets updated alongside the metadata held in the PDC, this ensures consistency.

Maintaining logs once a submission has been made is a part of the Data Managers duties. This is completed by opening and assigning a JIRA ticket and keeping track of all correspondence and work completed by the Data Manager. This ensures for transparency as well as task tracking to ensure all open tickets are maintained/ followed up on in a timely manner. Once the entirety of the submission process is complete, the ticket is marked as complete but is still available to be reviewed in the future if needed.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

VIII. Appraisal

R8. The repository accepts data and metadata based on defined criteria to ensure relevance and understandability for data users.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:
4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:
4 – The guideline has been fully implemented in the repository

Response:

This is determined by using a standardized metadata form that also incorporates descriptive instructions, adapted from the ISO19115 and Federal Geographic Data Committee (FGDC) standard formats to provide exchange with other data centres. The explicit instructions for this form include the necessary requirements that need to be met in order for the data to be archived. The fields that are mandatory to be filled in by the submitter include: Title of Data, Data Citation, Study Site, Purpose, Abstract, Plain Language Summary, Responsible parties, Links to data, Data Status, Maintenance and Update Frequency, Research Program, Research Coordinates, Time period, Keywords, and Data Security. This robust inclusion of information ensures the standardization of quality control checks, both from a technical perspective done by the software, and by the Data Manager who may find discrepancies within the submission and elect to "Send Back" for the user to correct errors/make adjustments/elaborate.

The repository does not place restrictions on its users to determine the use of data once submitted. All recommended formats and submission requirements are outlined and published on the PDC website under the "help" page. (Can be found at: https://www.polardata.ca/pdcinput/public/help). Both metadata and datafile submissions will only be approved after the submitter meets the outlined standards. Datafiles must be submitted in a non-proprietary format, such as .txt/.csv/NetCdf, although a proprietary format may accompany the non-proprietary if insisted by the user. These formats and versioning is to be included and outlined in the README that accompanies all data. Data is only accepted if it is complete and accompanied by a README which outlines all special variables/ characters/ parameters of units etc. Furthermore, the repository does not place restrictions on who can submit data to the PDC repository.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

IX. Documented storage procedures

R9. The repository applies documented processes and procedures in managing archival storage of the data.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Response:

The procedures for managing archival data are maintained in our internal wiki. Data access security is implemented at the software layer via standard Spring framework security libraries and at the hardware level by restricted access to the file system that houses the underlying files. CCIN/PDC uses multiple redundant Production instances of the database, with a full Disaster Recovery instance of both the database and the file system. The Production instances are propagated to the Disaster Recovery instance, as well as other physical locations outside of our system, at regular recurring intervals, to ensure both backup and recovery functionality (see R15 for a description of the archival storage process). In addition, to enforce consistency and detect data deterioration, all files are assigned an MD5 value upon submission and the database executes a regularly scheduled task where the MD5 values are recalculated and compared to the original assignments and any discrepancies are reported. This allows for rollback to an earlier state (see R15) if needed.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

X. Preservation plan

R10. The repository assumes responsibility for long-term preservation and manages this function in a planned and documented way.

Compliance Level:

3 – The repository is in the implementation phase

Reviewer Entry

Reviewer 1

Comments:
3 – The repository is in the implementation phase

Reviewer 2

Comments:
3 – The repository is in the implementation phase

Response:

With respect to physical preservation, the CCIN/PDC clearly stipulates its liability and warranties, within its accompanying Terms of Use (https://www.polardata.ca/pdcinput/public/termsofuse). In the event of involuntary organizational dissolution, we have an existing plan for long-term preservation of PDC holdings, as described in R3. Execution of this plan is managed through documentation contained with our secure internal wiki (see R15) and begins with full physical data export of all organizational assets (e.g. metadata, data, database and VM configurations, etc.), followed by a dissemination plan, as described in R3.

With respect to long-term preservation of accessibility, CCIN/PDC has recently begun steps to address the FAIR principles (https://www.go-fair.org/fair-principles). Specifically, in conjunction with our participation in the Canadian Consortium for Arctic Data Interoperability (https://ccadi.ca/), we are implementing technical solutions to address FAIR and this has prompted a reconsideration of our internal data standards, especially related to the perpetuation of file formats and standards. Our perspective is that our holdings are stratified in terms of risk for file format preservation. We are confident that data contributed in common formats such as .TXT, .CSV, etc. will endure without intervention. However, we recognize that other segments need to be addressed to ensure proper preservation. Currently, we are investigating the Network Common Data Form (NetCDF) as a target format for conversion of ad hoc and proprietary datasets. As a proof of concept, we are in the process of developing an ETL pipeline to convert large batches of ship data from an ad hoc format into NetCDF, so that it can be preserved in a more broadly recognized format. The results of this undertaking will be used to inform our future strategy on overall file format preservation efforts. Finally, CCIN/PDC will incorporate our recent stance on FAIR into a formal mission statement that more accurately characterizes our latest views and objectives on the preservation and dissemination of polar data.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
For the next renewal, it would be good to work towards an agreement with a partner or external organisation to take over responsibility for preserving your holdings in the event of an organisational dissolution (see also R3), rather than only hosting a snapshot.

It is also expected to see some progress in your investigation of suitable preservation formats for ad hoc and proprietary datasets.

XI. Data quality

R11. The repository has appropriate expertise to address technical data and metadata quality and ensures that sufficient information is available for end users to make quality-related evaluations.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Response:

The processes of a data manager includes proof-reading, requesting elaboration/clarifications from submitters, as well as general quality assurance checks. This includes, but is not limited to, the CCIN/PDC Data Manager and colleagues at partner organizations (appointed by the CCIN/PDC and provided appropriate authority on our system) who are responsible for review of contributed data and metadata, and are informed of the proper procedures and requirements for approval of incoming descriptive metadata and data objects. These procedures are documented in "Approval checklists" and include detailed content review of submitted metadata and visual inspection of submitted data files. When problems are found, the Approver works with the researcher to correct mistakes and add missing information before approval is granted. Examples of quality assurance checks include, the inclusion of a README for data files that outline parameters, units, software versioning, data cleaning, versioning, directory structure, definitions of acronyms/codes/abbreviations, geographical location(s), quality assurance completed by owner, and relatable datasets, all completed and reported by the owner of the data.

XII. Workflows

R12. Archiving takes place according to defined workflows from ingest to dissemination.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Response:

Standard workflows are documented and maintained within our internal wiki. Depositors are made aware of CCIN/PDC data handling policies via the intake process for metadata and data submission. The intake process involves a combination of automated (i.e. computational) data validation and manual (i.e. human) curation, in order to appraise and enforce the quality of the data. To ensure security, the related workflows are isolated from other CCIN/PDC activities and implemented as a secured administrative module to which only limited personnel have access. CCIN/PDC manages a broad range of heterogeneous datasets and this does impact workflows with respect to qualitative appraisal in that significant manual curation is required. CCIN/PDC has recently implemented JIRA and this tool is expected facilitate the documenting and change management of workflows. An example work flow includes metadata submitted -> JIRA ticket created -> Data manager review of submission -> Data manger logs (time and comments) either sent back for revision/ approval of metadata in Ticket -> ticket is either updated with all correspondence or updates completed OR ticket is marked as completed if no alterations are needed and metadata has been approved. This ticket is then available to be re-opened if data is submitted at a later date or remains open and updated if datafiles accompany the metadata submission until the entire interaction/review is complete.

XIII. Data discovery and identification

R13. The repository enables users to discover the data and refer to them in a persistent way through proper citation.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Response:

The CCIN/PDC is a repository of metadata and data that describe and provides access to diverse data sets generated by Arctic and Antarctic researchers. The metadata records follow ISO 19115 and Federal Geographic Data Committee (FGDC) standard formats to provide exchange with other data centres. The records cover a wide range of disciplines from natural sciences and policy, to health and social sciences. The CCIN/PDC Geospatial Search tool is available to the public and researchers alike and allows searching data using a mapping interface and other parameters (https://www.polardata.ca/). Data that is held within the repository is available for public use. The data can be discovered through numerous search databases. These can be found at https://www.polardata.ca/pdcsearch/. A "lite" version is also provided for users with low band-width. Search databases include Polar Data Catalogue, Canadian Ice service Sea Ice Charts, RADARSAT Arctic SAR Imagery, and RADARSAT Mosaics of Antarctica. These would be classified as numerous search Facilities. Specifically, under the Polar Data Catalogue search, the metadata records are displayed first with a prompt allowing users to further investigate what datasets are available for download through the discovery of these metadata records, which are established by the ISO 19115 standards. The repository offers standardized data citations for users who are citing the data. This is in the following format:

Surname, First Initial. (YEAR of last modification). Title of Metadata. City, Country: Canadian Cryospheric Information Network (CCIN). (dx.doi.org/"DOI" / Unpublished data).

In addition, in order to facilitate automated (i.e. computational) discovery and acquisition of metadata, CCIN/PDC uses catalogue services (OGC-CSW) and the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) to provide structured metadata harvesting capability.

Through a partnership with DataCite International the assignment of completed submissions to the CCIN/PDC are to receive a findable Digital Objective Identifier (DOI). The CCIN/PDC output become discoverable and associated metadata are made available to the scientific community. These DOIs are monitored to ensure that the links are up to date and accurately describe the datafiles. Once a completed metadata and datafile combination has been submitted, approved and made publicly available, a persistent identifier/ digital object identifier (DOI) is assigned under the 10.21963 DataCite prefix unless the partner program would prefer their own prefix to be used, and we have the authority to create and assign such prefix to the corresponding metadata files. In conjunction with this, CCIN/PDC partners with schema.org to make the published citations even more findable via searches we do not currently run.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

XIV. Data reuse

R14. The repository enables reuse of the data over time, ensuring that appropriate metadata are available to support the understanding and use of the data.

Compliance Level:

3 – The repository is in the implementation phase

Reviewer Entry

Reviewer 1

Comments:
3 – The repository is in the implementation phase

Reviewer 2

Comments:
3 – The repository is in the implementation phase

Response:

The CCIN/PDC ensures future usage by implementing the ISO 19115 standard for geographic metadata, for all contributions to the repository. In addition, contributors are required to include a README file that precisely defines the dependent variables associated with their particular data. In particular, this README file allows abbreviations and acronyms which are defined, variables/parameters and units are described, data treatment and methodology are described, headings are explained, known limits of the data/problems are mentioned (this should include explanations of missing data, negative values (for parameters this is not expected for), no reads are explained), reference to papers describing methodology, if applicable, and related datasets are properly cited. In addition, to support data reuse over time, all files are assigned an MD5 value upon submission and the database executes a regularly scheduled task where the MD5 values are recalculated and compared to the original assignments and any discrepancies are reported. Preservation is ensured from a technical standpoint via backups, redundancy, etc. however, CCIN/PDC is in the process of strengthening and formalizing copyrights, permissions, and custody issues. (Please find the current Policy at https://www.polardata.ca/pdcinput/public/data-policy.pdf). Because of the highly heterogeneous nature of the data contained within CCIN/PDC, we do not mandate file format requirements. Therefore, file format obsolescence considerations are at the discretion of individual submitter, not the PDC itself. However, PDC does strongly discourage the use of proprietary file formats, as explained in our best practices document, as well as personal correspondence, when necessary. In addition, in accordance with the FAIR principles (https://www.go-fair.org/fair-principles), we are assessing our policy on data formats, with respect to long-term preservation (see R10).

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

TECHNOLOGY

XV. Technical infrastructure

R15. The repository functions on well-supported operating systems and other core infrastructural software and is using hardware and software technologies appropriate to the services it provides to its Designated Community.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer 1

Comments:
4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:
4 – The guideline has been fully implemented in the repository

Response:

The CCIN/PDC uses an enterprise resource planning approach to integrate our processes and software toward customized support for community standards, including OGC-CSW, OAI-PMH, and ISO 19115 standards. OGC-CSW and OAI-PMH services are provided through the deployment of community-supported implementations of GeoNetwork and GeoServer not developed by CCIN/PDC, while ISO 19115 compliance is implemented locally at the persistence layer of our software stack. Planned infrastructure development includes the potential migration of some portion of the data from a relational framework to a NoSQL paradigm. An inventory of software is maintained and documented using our internal wiki, which is available only on a secured basis for PDC staff. In particular, the wiki is used with respect to operating system and software requirements to enumerate past and present suites (i.e. combinations of resources at various versions) as an indicator of release codependence and compatibility (e.g. OpenJDK 6 with Tomcat 7) so that upgrades can be planned and managed. No real-time streaming is currently implemented or planned.

CCIN/PDC software applications can be divided into two categories: Those developed within the organization (e.g. PDC Search, PDC Input, etc.) and those created as open-source projects (e.g. GeoNetwork, GeoServer, etc.) for use by the geospatial community. In either case, these applications are implemented in Java as WARs and run by CCIN/PDC using Apache Tomcat, with a Linux operating system, thereby providing our public web applications. These applications are subsequently reliant on PostgreSQL, which is used to provide the database, and persistence capabilities that are required. Therefore, CCIN/PDC implements its own local instance of PostgreSQL, as well as an instance of MongoDB that is currently used for initial work relating to the potential utility of NoSQL as a future storage paradigm.

CCIN/PDC carries out regular archival storage for metadata (i.e. databases) and data (i.e. files). This involves frequent scripted backups, primarily to SHARCNET (https://www.sharcnet.ca), as well as other secondary locations. In addition, a manual backup is performed that involves copying all files (i.e. data), databases (i.e. metadata), and application source code onto an external drive array that is securely housed in our safe deposit box at an offsite location. Moreover, backups are performed in a serial fashion to the various locations, so as to provide a chronological collection of snapshots. This is intended to allow multiple restore system restore points, in the event that corrupted contents have been propagated to archival storage.

Reviewer 1

Comments:

Accept

Reviewer 2

Comments:
Accept

XVI. Security

R16. The technical infrastructure of the repository provides for protection of the facility and its data, products, services, and users.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:
4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:
4 – The guideline has been fully implemented in the repository

Response:

All CCIN/PDC web applications are developed using the Spring Framework which provides commercial grade security libraries and standard implementations. This ensures that all standard practices with respect to authentication and data access have been implemented at the software level. In addition, we periodically update the associated software libraries, as well as keeping associated resources (e.g. Java, Tomcat, etc.) and the operating system up-to-date. We also monitor technological trends to gauge the potential adoption of better technologies as they emerge and/or changes in best practices and implementations. From a hardware perspective, we employ a fully replicated Production system (two instances) with a separate third instance for disaster recovery. In addition, all of our systems are located in secured facilities maintained by the University of Waterloo.

In the event of an outage, our separate disaster recovery instance can be activated to provide recovery of normal operations. In addition, in the event of a large scale technical failure, the CCIN/PDC has a fully functional disaster recovery instance that can be publicly exposed in a very short amount of time to resume normal production activities, thereby avoiding significant discontinuity in service. In the event of catastrophic damage to the entire building and/or locale where physical servers are housed, CCIN/PDC data are kept on physical media in a separate secured location so that a full rebuild of the system is possible.

In addition, we are currently in the process of arranging a formal penetration test to be conducted by an IT security team at the University of Waterloo.

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

APPLICANT FEEDBACK

Comments/feedback

These requirements are not seen as final, and we value your input to improve the core certification procedure. To this end, please leave any comments you wish to make on both the quality of the Catalogue and its relevance to your organization, as well as any other related thoughts.

Response:

Reviewer 1

Comments:

Reviewer 2

Comments:

ANNEX A

Terms of Use of the Polar Data Catalogue Geospatial Search Tool

The Polar Data Catalogue, as described in the ArcticNet Data Policy, is composed of databases of metadata and accessible archives of certain data sets compiled by the Canadian Cryospheric Information Network (CCIN).

1.   Use of this Database

The material of this Database is owned by a variety of Research Programs, including, but not limited to, ArcticNet, the Northern Contaminants Program ("NCP"), NSERC funded programs and the Government of Canada Program for the International Polar Year ("IPY") 2007-2008; and the Database is operated by the Canadian Cryospheric Information Network in partnership with ArcticNet. Your use of this Database is subject to the following terms and all applicable laws. By accessing and browsing this Database, you accept, without limitation or qualification, these terms. If you do not agree with any of the terms, please do not use this Database.

This Database is formed of specific data and metadata provided by recognized researchers ("Researcher"), with their express consent. For the purpose of these terms, the data and metadata provided by Researcher include, without limitation, design, HTML text, graphics, files, photographs, codes, software layout, images, illustrations, articles, design forms and the selection and arrangement thereof (the "Content").

Please note that the addition of such Content in the Database does not constitute an endorsement by ArcticNet, IPY-Canada and the other providing programs, or CCIN of any such Content provided by the Researcher. The Research Programs, CCIN and ArcticNet have no control or power over such Content.

2.   License and Database access

Researcher grants you a limited license to make personal use only of their Content. Such grant does not include, without limitation: (a) any resale or commercial use of this Content; (b) modification, adaptation or translation of any data not intended to be modified, adapted or translated; (c) copying, imitating, mirroring, reproducing, distributing, publishing, downloading, displaying, performing, posting or transmitting any Content in any form or by any means, including, but not limited to, electronic, mechanical, photocopying, recording or otherwise. By using this tool, except as noted above, you are not conveyed any right or license by implication, estoppel, or otherwise in or under a patent, trademark, copyright, or proprietary right of ArcticNet, other research programs, CCIN, the Researcher or any third party.

If you want to accomplish an act that is clearly forbidden under this Section, you have to contact the Researcher owning the Content you are targeting in order to obtain written consent from him/her authorizing you to act.

Research programs providing data, CCIN or ArcticNet may terminate this license and your use of or access to the Database if you make or permit any unauthorized use of this Database or Content. Such actions by you may violate applicable laws including, without limitation, copyright, patents and trademark laws and communications regulations and statutes.

3.   Exclusion of Warranties

Research Programs, CCIN and ArcticNet makes no representation or warranty regarding the functionality or condition of this Database, its suitability for use, or that its use will be uninterrupted or error-free. THE DATABASE AND ALL ITS CONTENT ARE PROVIDED TO YOU "AS IS" WITHOUT WARRANTIES OF ANY KIND. RESEARCH PROGRAMS, CCIN AND ARCTICNET DISCLAIM ALL WARRANTIES OR CONDITIONS, WRITTEN OR ORAL, STATUTORY, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, NO REPRESENTATION OR WARRANTY THAT (I) THE CONTENT CONTAINED IN OR MADE AVAILABLE THROUGH THE DATABASE WILL BE OF MERCHANTABLE QUALITY AND FIT FOR A PARTICULAR PURPOSE, (II) THE DATABASE OR ITS CONTENT WILL BE ACCURATE, COMPLETE, CURRENT, RELIABLE, OR TIMELY, (III) THAT THE OPERATION OF THE DATABASE WILL BE UNINTERRUPTED OR ERROR-FREE, (IV) THAT

ANNEX A

DEFECTS OR ERRORS IN THE DATABASE OR THE CONTENT, BE IT HUMAN OR COMPUTER ERRORS, WILL BE CORRECTED, (V) THAT THE DATABASE WILL BE FREE FROM VIRUSES OR HARMFUL COMPONENTS, AND (VI) THAT COMMUNICATIONS TO OR FROM THE DATABASE WILL BE SECURE AND/OR NOT INTERCEPTED. The Content is not intended to provide specific technical, business, accounting or other advice for your individual circumstances, and you should consult your own professional advisors to determine how any information or material provided on this Database apply to your individual circumstances. These exclusions are in addition to any specific exclusion otherwise provided in these terms. To the extent that the jurisdiction to which you are subject does not allow exclusion of certain warranties, such exclusions which are not permitted, do not apply.

4.   Limitation of Liability

RESEARCH PROGRAMS, CCIN, OR ARCTICNET WILL NOT BE LIABLE FOR ANY DAMAGES, EITHER DIRECT OR INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL, FOR USE OF OR INABILITY TO USE PRODUCTS OR SERVICES OF ANY KIND, DELAY OF OR PARTIAL DELIVERY, TERMINATION OF RIGHTS OR LOSS OF PROFITS, DATA, BUSINESS OR GOODWILL, WHETHER ON A CONTRACTUAL OR EXTRACONTRACTUAL BASIS, OR TO PROVIDE INDEMNIFICATION OR ANY OTHER REMEDY TO YOU OR ANY THIRD PARTY. THE FOREGOING LIMITATION SHALL APPLY EVEN IF ARCTICNET OR CCIN KNEW OF OR OUGHT TO HAVE KNOWN OF THE POSSIBILITY OF SUCH DAMAGES. Your sole and exclusive remedy is to discontinue using and accessing this Database. To the extent that the jurisdiction to which you are subject does not allow any part of such limitation, such part does not apply.

5.   Ownership and Confidentiality

The Content is provided by Researcher, and Research programs, CCIN and ArcticNet does not represent or warrant that such Content does not infringe the rights of any other person or entity.

6.   Links

Links and references to other Internet websites are provided to you as a convenience only. Research Programs, CCIN and ArcticNet have not reviewed and do not expressly or impliedly endorse other Internet websites or any information or material, or the accessibility thereof, via such links, and do not assume any responsibility for any such other Internet websites, information or material posted thereon, or products or services offered thereon

7.   Governing Law

This Database is covered by the provision of the Copyright Act, by Canadian laws and policies. Such provisions serve to identify the information source and, in specific instances, to prohibit the reproduction of materials without written permission. You agree to be bound by such laws and to submit to the jurisdiction of the Canadian courts in connection with the interpretation or application of these terms.

8.   Changes to Terms

Research Programs, CCIN or ArcticNet may modify, alter or otherwise update the terms applicable to this Database from time to time without notice, and you agree to be bound by such terms as are in effect at the time at which you access the Database.

9.   Third-party Materials
Some of the content found in this database is subject to copyrights, patents trademark laws and communication regulations and statues held by other organizations and Web sites. This is particularly true of sites that are jointly operated by a Governmental institution or external organizations in partnership with research programs included in the Polar Data Catalogue. In such cases, different restrictions on the personal use of the Database content may apply and the policy of the other organizations or web sites take precedent over the PDC policy.

10.   Contact information

ANNEX A

If you have any questions or concerns about the Database terms, practices, third party material, or about your personal information if you provide any, please contact CCIN:

By phone at: 1-519-888-4567 x 32689
By email at: pdc@uwaterloo.ca
By mail at: Canadian Cryospheric Information Network
Department of Geography and Environmental Management
University of Waterloo,
200 University Avenue West,
Waterloo, ON   N2L 3G1

Or ArcticNet:

By Phone at: 1-418-656-2411
By email at: pdc@arcticnet.ulaval.ca
By mail at: ArcticNet Inc.
Pavillon Alexandre-Vachon,
Room 40811045, avenue de la Médecine,
Laval University Quebec City (Québec)
G1V 0A6

RADARSAT End User License Agreement

IMPORTANT - READ CAREFULLY BEFORE OPENING DATA PACKAGE. THIS DOCUMENT IS A LEGAL AGREEMENT BETWEEN YOU, THE CANADIAN SPACE AGENCY ("CSA") AS OWNER OF THE DATA AND MDA GEOSPATIAL SERVICES INC. AS MASTER LICENCEE FROM CSA OF THE DATA. OPENING THE ENCLOSED DATA PACKAGE MAKES YOU THE END USER (THE "LICENCEE") OF THE DATA CONTAINED THEREIN AND INDICATES YOUR ACCEPTANCE OF THE TERMS AND CONDITIONS IN THE LICENCE AGREEMENT AND LIMITED WARRANTY (COLLECTIVELY THE "LICENCE"). IF YOU DO NOT AGREE WITH THE TERMS AND CONDITIONS, YOU SHOULD, WITHOUT BREAKING THE SEAL, RETURN THE ENCLOSED PACKAGE AND THE OTHER ITEMS WHICH ARE PART OF THIS PRODUCT WITHIN TWO (2) WEEKS OF RECEIPT TO MDA GEOSPATIAL SERVICES INC. AND YOU WILL RECEIVE A FULL REFUND.

BY OPENING THIS PACKAGE, THE LICENCEE ACKNOWLEDGES THAT IT HAS READ THIS LICENCE, UNDERSTANDS IT, AND AGREES TO BE BOUND BY ITS TERMS AND CONDITIONS. THE LICENCEE ALSO AGREES THAT THIS LICENCE IS THE COMPLETE AND EXCLUSIVE AGREEMENT BETWEEN THE PARTIES AND SUPERSEDES ALL PROPOSALS OR PRIOR AGREEMENTS, ORAL OR WRITTEN, ANY OTHER COMMUNICATIONS BETWEEN THE PARTIES RELATING TO THE SUBJECT MATTER HEREIN. THIS LICENCE CANNOT BE MODIFIED OR RESCINDED, NOR MAY ANY OF ITS TERMS BE CANCELLED OR WAIVED.

GRANT OF LICENCE: The enclosed package contains CSA Data, Data Products and accompanying written materials (collectively the "Data") containing intellectual property rights proprietary to CSA and under licence to MDA Geospatial Services Inc. and its sublicencee(s).

The Licencee agrees that the Data may be used only for the internal business use of the Licencee and may not be reproduced, published, distributed, sold, leased, rented, licenced, copied or disposed of in any other manner. The Licencee acknowledges that the Data is a valuable and unique asset and is disclosed to the Licencee on the basis that it represents confidential information. The Licencee will only disclose the Data to its employees, contractors and consultants directly related to the Licencee's internal use of the Data. In addition, the Licencee agrees to take appropriate action, by instruction, agreement or otherwise, with any persons or organizations permitted access to the Data, including appropriate security measures to prevent illegal disclosure, all so as to enable the Licencee to satisfy its obligations contained herein.

Use of the Data by anyone other than the Licencee shall constitute infringement of these rights. Upon payment for the use of the Data, MDA Geospatial Services Inc. grants to the Licencee a limited, perpetual, non-exclusive licence to use this copy of the Data. This Licence certifies the Licencee to:

ANNEX A

1. make the authorized number of internal copies of the Data in support of the Licencee's use of the Data but not to network or distribute the Data for Licencee's use or otherwise;

2. use the Data solely for internal purposes of the Licencee. Contractors or consultants working for the Licencee may have access to the Data for purposes related to the Licencee's internal use of the Data; and

3. the purchaser agrees to respect CSA copyright interest and, in particular, shall not distribute or sell RADARSAT Derived Image Products (DIP) or copies thereof unless they have been authorized to do so in writing from MDA Geospatial Services Inc. DIPs include but are not limited to, mosaics, geocoding, sub-scenes and sub-sampling.

4. reproduce and distribute Value-Added Products from the Data where ""Value-Added Products"" are defined as Data that includes a significant addition of other information including but not limited to:

1. manual and digital interpretation and classifications of the Data or Data Product

2. products derived from the Data and Data Products and which do not retain the pixel structure of the original Data or Data Product such as Digital Terrain Models; and

3. imagery obtained by combining Data from two or more sensors or satellites.

CSA and MDA Geospatial Services Inc. reserve all rights not specifically granted to Licencee. The Licencee will be held legally responsible for any copyright infringement which is caused or encouraged by its failure to abide by the terms of this Licence. For greater certainty, the Licencee may not copy, modify or transfer the Data, in whole or in part, other than as expressly set out in this Agreement.

OWNERSHIP OF DATA: The Licencee owns the magnetic or other physical media on which the Data is originally or subsequently recorded or fixed, but an express condition of this Licence is that CSA retains title and ownership of the Data recorded on the original diskette copy and all subsequent copies of the Data, regardless of the form in or media on which the original and other copies may exist. This Licence is not a sale of the original Data or any copy, translation or compilation thereof, in whole or in part. The access to and use of the Data does not grant the Licencee any right to use, without prior written consent, any trademarks, tradenames or logo of CSA or others.

RESTRICTION ON TRANSFER: This Licence and the Data may not be transferred to anyone without the prior written consent of MDA Geospatial Services Inc. Any transferee of the Licence shall be bound by the terms and conditions of this Licence. The Licencee is strictly prohibited from distributing, leasing, selling or otherwise disposing of the Data. For the purposes of this Licence, any distribution or disposition by Licencee to any branch, agency, office, division, subdivision, subsidiary or affiliate of the Licencee is strictly prohibited without the consent of MDA Geospatial Services Inc. The Licencee shall not reverse engineer, decompile or disassemble the Data or transfer the Data to another machine readable language, or attempt any foregoing.

TERMINATION: This Licence will terminate automatically without notice from MDA Geospatial Services Inc. if (i) the Licencee fails to comply with any of its provisions, (ii) the Licencee becomes insolvent or bankrupt, or (iii) the Licencee passes a resolution for the winding up of its affairs. Upon termination, the Licencee shall destroy all copies of the Data and any accompanying written materials, including any modified copies, translations or compilations thereof, if any.

GOVERNING LAW: This Licence is governed by the applicable laws of Canada and the Province of British Columbia, and shall enure to the benefit of CSA and/or MDA Geospatial Services Inc., their successors and assigns. The parties irrevocably and specifically attorn to the exclusive jurisdiction of the Courts of the Province of British Columbia. The parties expressly exclude the application of the United Nations Convention on Contracts for the International Sales of Goods and the implementing legislation thereto.

ANNEX A

DISCLAIMER OF WARRANTY AND LIMITED WARRANTY: The entire risk as to the results and the performance of the Data is assumed by the Licencee. The Data is provided ""as is"" without warranty of any kind, other than MDA Geospatial Services Inc. warrants that the storage media on which the Data is supplied to Licencee is free from defects in materials and workmanship under normal use and service for a period of ninety (90) days from the date of purchase. CSA's entire liability and the Licencee's exclusive remedy with respect to the Data is, at MDA Geospatial Services Inc.'s option, to either (a) return the purchase price paid by the Licencee directly to MDA Geospatial Services Inc. or distributor of the Data, whichever is less or (b) replace the Data that does not meet this Limited Warranty.

In no event shall CSA or anyone else who has been involved in the creation, production, distribution or delivery of the Data, be liable for any damages whatsoever (including, without limitation, damages for loss of profits, business interruption, loss of business information, and the like, or any consequential damages) arising out of or resulting from the use of or inability to use the Data or the performance of the Data, storage media or other CSA provided material, whether in an action in contract or tort, including, but not limited to, negligence.

Except as provided above, CSA and MDA Geospatial Services Inc. disclaim all warranties, either expressed or implied, including but not limited to implied warranties of merchantable quality, merchantability, durability or fitness for a particular purpose, with respect to the Data and any accompanying written materials.

THE ABOVE IS THE ONLY WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, IN LIEU OF ANY OTHER WARRANTY INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, THAT ARE MADE BY CSA AND MDA GEOSPATIAL SERVICES INC. FOR THIS PRODUCT. ORAL OR WRITTEN INFORMATION OR ADVICE OR OTHER AFFIRMATION OR FACT INCLUDING, BUT NOT LIMITED TO, STATEMENTS REGARDING PERFORMANCE OF DATA GIVEN BY CSA AND/OR MDA Geospatial Services Inc., THEIR AGENTS OR EMPLOYEES, MDA Geospatial Services Inc.'S DEALERS OR DISTRIBUTORS, SHALL NOT CREATE ANY OTHER WARRANTY OR IN ANY WAY INCREASE THE SCOPE OF THIS LIMITED WARRANTY AND THE LICENCEE MAY NOT RELY ON ANY SUCH INFORMATION OR ADVICE.

LIST OF DERIVED IMAGE PRODUCTS (DIPs):

Sub-sampled scenes, sub-scenes and imagettes

* Basic image processing such as speckle-filtering, appliance of LUT, histogram equalization, contrast stretching, etc.

Coloured composite image using multiple data sets

* Non-orthorectified mosaic with or without a simple layout

Orthorectified scene or sub-scene derived from a DTED Level 0 or 1 or 2 DEM with or without a simple layout

Orthorectified mosaic derived from a DTED Level 0 or 1 or 2 DEM with or without a simple layout

* Georeferenced space maps with index map, mapsheet reference, layout, embedded names, etc.

* Geocoded space maps with index map, mapsheet reference, layout embedded names, etc.

* Orthorectified space maps with index map, mapsheet reference, layout embedded names, etc. Orthorectification performed with a DTED Level 0 or 1 or 2 DEM

RADARSAT End-User Licence Agreement - Updated July 2006

GOVERNMENT USER RADARSAT-2 END USER LICENSE AGREEMENT

ANNEX A

THIS END USER LICENSE AGREEMENT ("LICENSE") IS A LEGAL AGREEMENT BETWEEN YOU ("LICENSEE") and MacDONALD, DETTWILER AND ASSOCIATES LTD. ("MDA"), LOCATED AT 13800 COMMERCE PARKWAY, RICHMOND, BRITISH COLUMBIA, CANADA V6V 2J3. LICENSEE WILL BE DEEMED TO HAVE ACCEPTED AND AGREED TO THE TERMS AND CONDITIONS OF THIS LICENSE IF LICENSEE (i) BREAKS THE SEAL OF ANY PACKAGE CONTAINING SATELLITE IMAGERY GENERATED FROM RADARSAT-2 ("PRODUCT"), (ii) INSTALLS AND/OR USES THE PRODUCT; OR (iii) RETAINS THE PRODUCT FOR MORE THAN FOURTEEN (14) CALENDAR DAYS. IF LICENSEE DOES NOT AGREE WITH THE TERMS AND CONDITIONS OF THIS LICENSE, LICENSEE MUST RETURN THE ENCLOSED PACKAGE TO MDA WITHIN FOURTEEN (14) CALENDAR DAYS OF LICENSEE'S RECEIPT OF THE PRODUCT WITHOUT (I) BREAKING THE SEAL OR (II) INSTALLING AND/OR USING THE PRODUCT.

1. OWNERSHIP:

The Product is licensed, not sold. All title in and to all intellectual property in or related to the Product is and will remain the exclusive property of MDA. MDA owns and will continue to own all title in any copy, translation, modification, adaptation, or derivation of the Product, including any kind of output that contains the pixel structure and information of the original imagery data from the delivered Product. However, in the case of Value Added Products, the LICENSEE will own all title to any such Value Added Products generated by the LICENSEE.

2. GRANT OF LICENSE:

MDA grants to LICENSEE a limited, non-transferable, non-exclusive, perpetual license to use the Product and any accompanying written materials, and anything derived therefrom, solely as set forth in this License (the "Grant of License"). Except as specifically set out herein, no license, right or title in or to any of the Product or any other intellectual property of MDA, is granted by this License.

3. WARRANTY:

MDA warrants that the original storage media on which the Product is supplied to initial LICENSEE will be free from material defects in materials and workmanship under normal use and service for a period of thirty (30) calendar days from the date of initial LICENSEE's receipt of the Product. THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESS, IMPLIED OR STATUTORY. MDA SPECIFICALLY DISCLAIMS ALL OTHER WARRANTIES INCLUDING BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE OR AGAINST INFRINGEMENT. LICENSEE IS SOLELY RESPONSIBLE FOR SELECTION OF THE PRODUCT TO ACHIEVE LICENSEE'S INTENDED RESULTS OR FOR LICENSEE'S PARTICULAR APPLICATIONS, AND NO WARRANTIES, GUARANTIES OR REPRESENTATIONS ARE MADE REGARDING THE USE OR THE RESULTS OF THE USE OF THE PRODUCT IN TERMS OF ITS CORRECTNESS, ACCURACY, RELIABILITY, CURRENTNESS OR OTHERWISE.

4. LIMITATION ON LIABILITY:

REGARDLESS OF WHETHER ANY REMEDY SET FORTH HEREIN FAILS TO ACHIEVE ITS ESSENTIAL PURPOSE, IN NO EVENT WILL THE LIABILITY, IF ANY, OF MDA FOR DAMAGES RELATING TO THE PRODUCT OR OTHERWISE ARISING OUT OF, RELATED TO, OR IN ANY WAY CONNECTED WITH THIS LICENSE EXCEED THE ACTUAL AMOUNT LICENSEE PAID FOR THE SPECIFIC PRODUCT THAT DIRECTLY GAVE RISE TO THE DAMAGES CLAIMED, REGARDLESS OF THE FORM OF ACTION, WHETHER BASED ON CONTRACT, NEGLIGENCE, PRODUCTS LIABILITY, TRADE PRACTICES, OR OTHERWISE. IN NO EVENT WILL MDA BE LIABLE FOR ANY CONSEQUENTIAL, INDIRECT, SPECIAL, PUNITIVE, OR INCIDENTAL DAMAGES OR LOST PROFITS, WHETHER FORESEEABLE OR UNFORESEEABLE, OF ANY KIND. THE LIMITATIONS CONTAINED IN THIS SECTION ARE NOT MADE WHERE PROHIBITED BY LAW.

5. SATELLITE REGULATIONS & EXPORT CONTROL LAWS:

ANNEX A

LICENSEE will comply with all applicable satellite licensing and import and export laws, restrictions and regulations of all applicable jurisdictions that may be in effect during the term of this License.

6. TERMINATION:

MDA may terminate this License, effective immediately, upon notice to LICENSEE, if LICENSEE breaches any provision of this License. Upon termination of this License, all rights granted to LICENSEE hereunder will immediately cease.

7. GOVERNING LAW:

This License will be governed by and construed in accordance with the laws of the Province of British Columbia and the laws of Canada applicable therein, and the courts of the Province of British Columbia will have non-exclusive jurisdiction to hear matters arising under this License.

8. MISCELLANEOUS:

(1) This License is the complete and exclusive agreement between LICENSEE and MDA as to the matters set forth herein and integrates all prior discussions and understandings. (2) This License cannot be modified or rescinded, nor may any of its terms be cancelled or waived, unless approved in writing by MDA. (3) Acceptance of this License is expressly limited to the terms and conditions set forth herein; any additional or inconsistent terms provided by LICENSEE in any other documents such as a LICENSEE purchase order, that are applicable to the License, will not have any legally binding effect. (4) The failure of MDA to insist upon strict performance of any of the terms and conditions of this License will not be deemed a waiver of any rights or remedies that MDA may have and will not be deemed a waiver of any subsequent default of the terms and conditions of this License. (5) Neither this License nor any of the rights or obligations hereunder may be assigned or transferred by LICENSEE without the prior written consent of MDA. This restriction on assignment or transfer will apply to assignments or transfers by operation of law, as well as by contract, merger or consolidation. (6) In the event that any provision of this License is declared invalid or unenforceable, the remaining provisions of this License will continue in full force and effect. (7) Upon notice, MDA or MDA inspection staff acceptable to Licensee may inspect LICENSEE's records, accounts and books relating to the use of the Product to ensure that the Product is being used in accordance with this License. (8) LICENSEE acknowledges that any actual or threatened breach of Section 2 would likely cause MDA irreparable harm that could not be fully remedied by monetary damages. So, LICENSEE agrees that MDA will have the right, in addition to any other remedy available to it, to seek injunctive or other equitable relief from a court of competent jurisdiction, without proof of actual damage, as may be necessary to prevent such breach.

9. AUTHORIZED LICENSEE:

Unless otherwise prohibited by MDA, this Government User License applies to a single country's government departments and agencies at the national level (e.g. central or federal) and sub-national level (e.g. state, provincial, territorial, or regional), which may be located at multiple facilities. Government-owned commercial entities, local governments (e.g. municipalities, counties, prefectures) or universities are not authorized users under this Government User License. For greater certainty, LICENSEE may not distribute, transfer or otherwise make available the Product to any other users, without the prior written consent of MDA.

10. PERMITTED USES:

In accordance with the Grant of License set out in Section 2 above, LICENSEE agrees and understands that it MAY:

a. make an unlimited number of soft and hard copies of the Product for the internal use of LICENSEE and internal backup purposes only;
b. provide the Product to LICENSEE's employees and/or contractors or consultants directly related to LICENSEE's internal use of the Product. The contractors or consultants are under a duty of confidentiality no less restrictive than LICENSEE's duty hereunder. The contractors or consultants must not retain the Product or copies thereof after completion of LICENSEE's internal project;

c. store, post or process the Product in a system that is not accessible by the public through the use of sufficient information assurance measures;

d. provide any SLC Data generated from Spotlight beam mode via a physical delivery protocol or an electronic delivery protocol where the SLC Data are encrypted using an encryption software certified by NIST;

e. excluding SLC Data - release hardcopy prints of the Product, publish the Product in research reports, journals, trade papers or similar publications, and post the Product or DIP, to Internet web sites provided that such Product is in a secure format that allows only printing and viewing and prohibits manipulating the Product's pixel or metadata; all providing that such release, publishing or posting is solely for non-commercial uses and that the Copyright notice is conspicuously displayed alongside the Product; and

f. subject to the provisions set out in Section 11 - develop, reproduce and distribute any Value Added Product (as defined in Section 12 below) generated from the Product by the LICENSEE.

11. PROHIBITED USES:

Without limiting the generality of the foregoing, LICENSEE agrees and understands that it MAY NOT:

a. sell, lease, rent, sub-license, or transfer the Product, in any other manner whatsoever;

b. reverse engineer, disassemble, decompile or adapt the Product;

c. post the Product to Internet web sites in a non secure format that allows manipulation of the Product;

d. alter or remove any Copyright notice or proprietary legend contained in or on the Product;

e. on its own, or permit any third party to, release or publish hardcopies of SLC Data in any beam mode or post such SLC Data on any publicly accessible network;

f. further process, or permit any third party to further process SLC Data to generate any product with (a) an impulse response resolution in either range or azimuth finer than (i) 2.0 metres for single- or dual-polarization modes, (ii) 6.0 metres for quad-polarization beam modes, where resolution is measured horizontally in the ground plane;

g. if applicable, further process, or permit any third party to further process Spotlight beam mode to generate any product with an impulse response resolution finer than 2.0 metres in range and 0.74 meters in azimuth, where resolution is measured horizontally in the ground plane; and

h. use, or permit any third party to generate a Value Added Product using interferometric processing techniques from at least one scene of RADARSAT-2 SLC Data where the interval of collection is less than 24 days. Such Value Added Products include interferograms, coherent change detection products, or interferometric digital elevation models.

12. DEFINITIONS:

In this License the following terms will have the following meanings: "Data Product" means a detected radar image obtained by the processing of SLC Data to include information such as geo-referencing, radiometric corrections and multi-looking. Data Products do not contain or retain phase information. "Derived Image Product" or "DIP" means a product derived from SLC Data or Data Products that still contain all or substantially all of the pixel structure and information of the original SLC Data or Data Products. Derived Image Products do not contain or retain phase information. Derived Image Products include without limitation:

* any sub-sampled scenes, sub-scenes and imagettes
* any products enhanced by basic image processing techniques including, without limitation, speckle-filtering, application of Look Up Table (LUT), histogram equalization, contrast stretching
* coloured composite image using multiple RADARSAT-2 scenes or sub-scenes
* non-orthorectified mosaics with or without a simple layout
* orthorectified scenes or sub-scenes derived from a Digital Terrain Elevation Data (DTED) Level 0 or 1 or 2 Digital Elevation Model (DEM) with or without a simple layout
* orthorectified mosaics derived from a DTED Level 0 or 1 or 2 DEM with or without a simple layout
* georeferenced radar maps which include, without limitation, index maps, mapsheet references, layout embedded names
* geocoded radar maps which include, without limitation, index maps, mapsheet references, layout embedded names

ANNEX A

* orthorectified radar maps which include, without limitation, index maps, mapsheet references, layout embedded names
* any orthorectified products performed with a DTED Level 0 or 1 or 2 DEM

"Single-Look Complex Data" or "SLC Data" means a formatted raw data product where signal data has been converted to a computer readable structure containing target phase and amplitude information, and which has undergone processing that includes range and azimuth compression and Doppler focusing while retaining phase information. "Value Added Product" or "VAP" means any products that (a) are processed SLC Data using interferometric processing techniques, such as interferograms, coherent change detection products or interferometric digital elevation models; or (b) include a material addition of other external information or have undergone significant enhancement, but do not retain any pixels of the original SLC Data, Data Products or Derived Image Products. Value Added Products do not contain or retain phase information.

13. COPYRIGHT:

The following copyright notice must be conspicuously displayed alongside the Product, or any portion thereof: "RADARSAT-2 Data and Products MacDONALD, DETTWILER AND ASSOCIATES LTD. (year of acquisition)- All Rights Reserved" and "RADARSAT is an official mark of the Canadian Space Agency" must appear as a credit;

14. LANGUAGE:

This License may be provided in English, French and Spanish. In the event of any discrepancies, omissions, or errors between the languages, the English language version shall take precedence.