

USGIN U.S. Geoscience Information Network

Use of ISO 19139 xml schema to describe geoscience information resources.

Version 1.1

Title:

Use of ISO 19139 xml schema to describe geoscience information dataset, dataset series, and services resources

Specification URLs:

http://resources.usgin.org/iso/19139/usgin/1.1/

Latest released version:

http://lab.usgin.org/profiles/usgin-iso-19139-profile

Creator:

USGIN Standards and Protocols Drafting Team

Creation date:

8/18/2009

Last revision date:

2/2/2010 7:03 PM

Document Status:

Public Release V. 1.1.0

Publisher:

Arizona Geological Survey

Description:

This document is a profile for using ISO19139 xml schema for North American Profile of ISO 19115 and ISO 19119 metadata. The profile provides guidance for the population of ISO19139 dataset and dataset series documents to enable interoperability of catalog service clients with multiple servers conforming to this profile.

Contributor:

See acknowledgements

Identifier:

gin2010-009

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Revision History

| Version | Date | Comments | Ву |
|---------|------------|--|-------------------|
| 0.1 | 2009-08-18 | Initial draft document | Wolfgang Grunberg |
| 0.2 | 2009-10-16 | Revisions, addition of material, re-title, focus on use of ISO 19139 | Stephen Richard |
| 0.7 | 2009-10-28 | Revising adding material done, circulate for review, comment. No discussion of serviceIdentification section as yet; this will have to be added, at which point the file title will be revised. | Stephen Richard |
| 0.7.1 | 2009-11-19 | Revisions, crosschecked with ISO 19139 and NAP Profile, added dataset metadata example | Wolfgang Grunberg |
| 0.8 | 2009-11-24 | SMR review, editing based on W. Grunberg comments | Stephen Richard |
| 0.8.1 | 2009-11-30 | Codelist review, approved previous tracked changes | Wolfgang Grunberg |
| 0.9 | 2009-12-03 | Add section on distribution and distributor, review and accept changes | Stephen Richard |
| 0.9.1 | 2009-12-04 | First public release of draft dataset and dataset series profile, Word and PDF file preparation | Wolfgang Grunberg |
| 0.9.2 | 2009-12-07 | Review WG edits, comments | Stephen Richard |
| 0.9.3 | 2009-12-11 | Split out data identification element into separate tables for MD_DataIdentification and SV_ServiceIdentification; add service metadata elements. | Stephen Richard |
| 0.9.4 | 2009-12-23 | Review dataset and service metadata sections; update metadata examples | Wolfgang Grunberg |
| 0.9.7 | 2010-01-08 | Service metadata overhaul | Stephen Richard |
| 0.9.8 | 2010-01-11 | Review service metadata overhaul | Wolfgang Grunberg |
| 1.0.0 | 2010-01-11 | Second public release of draft dataset and dataset series profile, Word and PDF file preparation | Wolfgang Grunberg |
| 1.0.1 | 2010-01-20 | Additional examples, codeList overhaul | Wolfgang Grunberg |
| 1.0.5 | 2010-01-27 | Change recommendation for codelist usage to use ISO identifiers; update codelist discussion. Update distribution format discussion. | Stephen Richard |
| 1.0.7 | 2010-01-29 | Review and formatting | Wolfgang Grunberg |
| 1.0.8 | 2010-02-02 | Final review | Stephen Richard |
| 1.1.0 | 2010-02-02 | Public release, Word and PDF file preparation | Wolfgang Grunberg |

Acknowledgement

Many individuals and organizations have contributed to or inspired the development of these Guidelines.

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Funding Provided by:

National Science Foundation under EAR-0753154 to the Arizona Geological Survey acting on behalf of the Association of American State Geologists.

US Department of Energy under award DE-EE0001120 to Boise State University.

Special Thanks to (alphabetically):

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1 Introduction

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- 2 A key component of a distributed information network is a catalog system, a collection of resources that allow
- 3 data and service providers to register resources, and data consumers to locate and use those resources. Cur-
- 4 rently, many online catalogs are web pages with collections of URLs for services, or services are discovered
- 5 accidently or by word of mouth. The vision is to enable a web client (portal) to search across one or more me-
- 6 tadata registries without having to configure the client individually for each of the registries that will be
- 7 searched. Thus, metadata providers can focus on data development, without having to also develop web
- 8 clients to enable search of that metadata.
- 9 The Open Geospatial Consortium (OGC) Catalog Service for the Web (CSW) specification defines a collection
- of basic operations for searching catalogs of metadata via the web. Engineering the desired interoperability
- 11 requires adding additional constraints on CSW operation; one of the major constraints is selection of the xml
- schema that will be used to encode metadata for the service. The core CSW specification requires use of a
- 13 basic xml schema that includes content defined by the Dublin Core Metadata specification. This document
- 14 concerns use of the ISO19115/ISO19115 content models implemented using the ISO19139 xml schema for
- 15 encoding of metadata content. Some more specific constraints on use of this implementation may be included
- in the separate document (planned) describing metadata constraints for different kinds of resources.
- 17 A set of other USGIN resource registry and discovery service profile documents discuss the other constraints
- and best practices to enable catalog interoperability. These include a profile for use of the CSW specification,
- 19 providing details on how requests and search criteria should be encoded. A profile that describes metadata
- 20 content required for different resources adds additional detail for specific resources. Finally vocabularies for
- 21 categorizing resources and specifying other metadata properties are documented in a separate document;
- these vocabularies will need to be published in a web accessible registry to make them accessible.

1.1 Normative References

- The following referenced documents are indispensable for the application of this document. For dated refer-
- ences, only the edition cited applies. For undated references, the latest edition of the referenced document
- 26 (including any amendments) applies.
- 27 **ISO 19115** designates these two normative references:
- 28 ISO 19115:2005, Geographic information Metadata
- 29 ISO 19115/Cor.1:2006, Geographic information Metadata, Technical Corrigendum
- 30 **ISO 19119** designates these normative references:
- ISO 19119:2005, Geographic information Services
- ISO 19119:2005/Amd 1:2008. Extensions of the service metadata model ISO 19108 designates:
- ISO 19108:2005, Geographic information Temporal Schema
- 34 35

- ISO 639-2, Codes for the representation of names of languages Part 2: Alpha-3 code control ISO 8601, Data
- 36 elements and interchange formats Information interchange Representation of dates and times
- 37 **ISO/TS 19139:2007**, Geographic information Metadata XML Schema Implementation
- 38 **OGC 07-006r1**, OpenGIS Catalog Services Specification version 2.0.2, Corrigendum 2 release, 2007
- 39 **OGC 07-045**, OpenGIS Catalogue Services Specification 2.0.2 ISO Metadata Application Profile, Version
- 40 1.0.0, 2007
- 41 INCITS 453-2009, North American Profile of ISO 19115:2003 Geographic Information Metadata (NAP-
- 42 Metadata), 2009, American National Standards Institute, Inc.
- 43 ISO 10646-1, Information technology Universal Multiple-Octet Coded Character Set (UCS) Part 1: Archi-
- 44 tecture and Basic Multilingual Plane

RFC 2119, Key words for use in RFCs to Indicate Requirement Levels, Network Working Group, 1997.

1.2 Purpose

The USGIN development team is proposing to use ISO 19115/19119 metadata as the content model, and the ISO 19139 xml schema for encoding this content in xml documents that will be provided by USGIN CSW ser-vices. This profile conforms to most of the provisions of the North American Profile of ISO metadata (INCITS 453-2009, referred to as NAP), except it allows multiple distributor-format-transferOptions bindings for re-source distribution, and recommends use of ISO19115 codelist values unless a required codelist value is one of those added by NAP. This USGIN profile document is meant to provide guidance on the use of the ISO19139 XML schema to encode metadata for geoscience resources, with sufficient guidance that develop-ers of client or server applications using this service can produce interoperable implementations of the OGC Catalog Service for the Web (CSW). The focus of the profile is to enable interoperable catalog services for discovery, evaluation, and access to information resource of interest to geoscientists.

1.3 Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in Internet RFC 2119.

Application profile: a schema that consists of data elements drawn from one or more namespaces, combined together by implementers, and optimized for a particular local application. (Rachel Heery and Manjula Patel, 2000, http://www.ariadne.ac.uk/issue25/app-profiles/)

Catalog application: Software that implements a searchable metadata registry. The application must support the ability to register information resources, to search the registered metadata, to support the discovery and binding to registered information resources within an information community.

Codelist (also as Code list): a controlled vocabulary that is used to populate values for an xml element.

Data product specification: a definition of the data schema and value domains for a dataset. The data schema specifies entities (features), properties associated with each entity, the data type used to specify property values, cardinality for property values, and if applicable, other logical constraints that determine data validity. Value domains are specified for simple data types—strings or numbers, and may include controlled vocabularies for terminology required to specify some properties.

Dataset series: collection of datasets sharing the same product specification (ISO 19115). ISO 19115 does not define product specification. For the purposes of USGIN, a product specification defines a data schema, any required controlled vocabularies, and recommended practices for use of schema (see Data product specification).

Dataset: an identifiable collection of data (ISO19115). USGIN refines this concept to represent a collection of data items in which individual data items are identified and accessible. USGIN extends the concept of data items to include physical artifacts like books, printed maps and diagrams, photographs, and material samples-any identifiable resource of interest. DCMI definition is "Data encoded in a defined structure" with additional comment "Examples include lists, tables, and databases. A dataset may be useful for direct machine processing." Metadata for the collection is a different type than metadata for individual items in the collection (dataset vs. features). Criteria for what unifies the collection are variable (topic, area, author...). Data items may represent intellectual content -- information content and organization (data schema) -- or may represent particular manifestations (formats) of an intellectual artifact.

Interoperability: "The capability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units." ISO/IEC 2382-01 (SC36 Secretariat, 2003)

Metadata element: a discrete unit of metadata (ISO 19115), an attribute of a metadata entity. A metadata element contains some content specifying the value of the element; this content may be simple—a number or string, or may be another metadata entity.

- 93 Metadata entity: a named set of metadata elements describing some aspect of a resource.
- 94 **Metadata register**: an information store that contains a collection of registered metadata records, maintained
- 95 by a metadata registry. (ISO 11179)
- 96 **Metadata registry**: an information system for assignment of unambiguous identifiers to administered metada-
- 97 ta records. (ISO 11179)
- 98 Metadata section: Part of a metadata document consisting of a collection of related metadata entities and
- 99 metadata elements (ISO 191115).
- 100 Metadata: data about a resource in some context. Generalize from ISO 11179 definition of metadata, which
- 101 constrains the scope to data about data. For USGIN purposes, metadata may describe any resource—
- including electronic, intellectual, and physical artifacts. Metadata represent resource characteristics that can
- be queried and presented for evaluation and further processing by both humans and software.
- 104 **Profile**: set of one or more base standards and where applicable the identification of chosen clauses,
- 105 classes, subsets, options and parameters of those base standards that are necessary for accomplishing a par-
- 106 ticular function [ISO 19101, ISO 19106]
- 107 Resource: An identifiable thing that fulfills a requirement. Usage here is closer to definition used in RDF
- 108 (www.w3.org/TR/REC-rdf-syntax), generalized from ISO19115, which defines resource as an 'asset or means
- that fulfills a requirement' without defining asset or means. "An object or artifact that is described by a record in
- the information model of a catalogue" (OGC 07-006r1)
- 111 **Service metadata**: metadata describing the operations and information available from a server.
- 112 **Source Specification**: The specification or standard that is being profiled.
- 113 User Community: A group of users, e.g. within a supply-chain industry, the members of which decide to make
- a similar usage of the source specification in order to be able to interoperate.
- Note that throughout this document, the names of xml elements are shown in this typecase. Long X-paths
- 117 have been broken with non-breaking hyphen characters. Note that hyphens are not used in any xml attribute
- or element name, so if they appear in the text, they are strictly for better text wrapping. In Xpath expressions
- 119 /../ indicates that some elements have been omitted from the path.

1.4 ISO Schemas Location

- 121 ISO I9139 xml schemas are in an online repository at http://schemas.opengis.net/iso/19139/. Two versions are
- posted: 20060504 and 20070417. Unfortunately, these two directories both contain schema with the same tar-
- get namespace, so there is no clear way to distinguish applications that are based on one or the other. The
- medatadaEntity.xsd in the two directories is identical; other schema have not been compared (but see discus-
- sion paper gin2009-005 at http://lab.usgin.org/node/269). The 20070417 directory contains schema imple-
- menting ISO Technical Specification 19139:2007 (dated 2007 Apr 17), which appear to include the changes
- 127 from ISO 19115:2003 Cor 1:2006(E), but this is not declared in any included documentation (need metadata
- on the metadata schema!).

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- The 20070417 version of the ISO 19139 schemas references GML 3.2.1. However, there is no mention of the
- 130 SRV namespace (http://www.isotc211.org/2005/srv) anywhere in this ISO 19139 version. The SRV names-
- pace is where, in our metadata documents using the 2006 version, we specified all our information about dy-
- namic, online services such as WFS and WMS, so the 20070417 version is not useful for metadata catalogs
- 133 that register services.
- 134 In order to create metadata for both static datasets and dynamic, online services and for use with CSW, the
- 135 OGC created an xml schema that merges the schema for ISO19115 (dataset metadata) and ISO19119 (ser-
- vice metadata) (see section D.1.5, page 105 in OGC 07-045). The way that was accomplished was by creating
- a schema located at http://schemas.opengis.net/csw/2.0.2/profiles/apiso/1.0.0/apiso.xsd. This schema simply
- 138 imports .. iso/19139/20060504/gmd/gmd.xsd and .. iso/19139/20060504/srv/srv.xsd. Thus for CSW 2.0.2 im-
- 139 plementations, the 20060504 versions of the ISO19139 schema must be used.

2 Overview of the Profile

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2.1 General Objectives

- 143 The Profile defines:
- mandatory and conditional metadata sections, metadata entities, and metadata elements
- the minimum set of metadata elements for any resource in order to conform to the Profile
- the core metadata for geographic datasets
- optional metadata elements that allow for a more extensive standard description of resources
- some recommended practices to increase the utility and interoperability of metadata.

149 **2.2 Requirements**

- 150 **M** (mandatory). Metadata element must have a valid value.
- 151 **C** (conditional). Metadata element is mandatory based on values of other metadata elements in the metadata
- 152 record.

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- 153 **O** (optional). Metadata element may be null in a valid document.
- 154 X (not used). Metadata element is not used by a Profile. The element may be included where it is schema va-
- lid, but may be ignored by applications implementing the profile.

2.3 Use cases to be supported

- 157 This section includes a number of user scenarios that motivate development of a catalog application for the
- 158 US Geoscience Information Network. At its heart, the problem is to find resources of interest via the internet,
- 159 based on criteria of topic, place, or time, evaluate resources for an intended purpose, and learn how to access
- those resources. Detailed metadata describing a resource data schema or describing service or application
- operation are outside the scope of the ISO19139 schema, and depend on linked documents like OGC getCa-
- pabilities, WSDL, and ISO19110 feature catalogs.
- 163 Basic search A user specifies a geographic bounding box and one or more text keywords to constrain the
- resources of interest, and searches a metadata catalog using these criteria. The user is presented with a web
- page containing a list of resources that meet the criteria, with links for each resource that provide additional
- detailed metadata, and direct access to the resource if an online version is accessible, e.g. as a web page,
- 167 Adobe Acrobat document, or online application.
- A portal application provides user with a map window that contains some simple base map information (politi-
- 169 cal boundaries, major roads and rivers). User wishes to assemble a variety of other data layers for a particular
- area to view in the portal map view, e.g. slope steepness, geologic units, bedding orientation, and vegetation
- type for a hazard assessment. User centers map view on area of interest, then using an 'add data' tab, ac-
- 172 cesses a catalog application that allows them to search for web map services that display the desired data-
- sets. After obtaining the results and reviewing the metadata for the located services, user selects one or more
- to add to the table of contents for the portal map viewer. Response from catalog has sufficient information to
- enable the portal application to load and display the resource (e.g. serviceType, OnlineResourceLinkage).
- 176 User searches for boreholes in an area. Returned metadata records have links to metadata for related infor-
- mation, like logs of different types, core, water quality data, etc. that the user can follow to browse related re-
- sources.

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- 179 Complex search examples:
 - Search based on related resources, for example a search for boreholes that have core for which photographs are available online.

- Boreholes that penetrate the Escabrosa formation.
- Sample locations for samples with uranium-lead geochronologic data.
- Find links to pdfs of publications by Harold Drewes on southeast Arizona.
- Find geologic maps at scale < 100,000 in the Iron Mountains.
- Who has a physical copy of USGS I-427?
- A catalog operator wishes to import and cache catalog records from a collaborating catalog that have been inserted or updated during the last month (harvest).

2.4 Resources of interest

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Table 1 summarizes the geoscience information resources of interest to the community that can be registered and discovered using this metadata profile. Note that this collection of resource types includes several kinds of resources that are not typically associated with ISO19115/ISO19119, which were created specifically for geospatial resources.

Table 1. Summary of resource types described by metadata for US Geoscience Information Network catalogs. Resource type **names in bold** have been prioritized for implementation in version one catalogs. The Resource type names include the type hierarchy encoded with the broader (parent) resource type indicated in the Broader Resource Type column.

| Resource Type hie- rarchy | Broader Re- source Type | Source | Definition |
|---------------------------------|----------------------------|--|--|
| Collection | | DCMI resource Types http://dublincore.org/do cuments/dcmi-type- vocabulary/ | An aggregation of resources. A collection is described as a group; its parts may also be separately described. (from http://www.ukoln.ac.uk/metadata/dcmi/collection-application-profile/): The term "collection" can be applied to any aggregation of physical or digital items. Those items may be of any type, so examples might include aggregations of natural objects, created objects, "born-digital" items, digital surrogates of physical items, and the catalogs of such collections (as aggregations of metadata records). The criteria for aggregation may vary: e.g. by location, by type or form of the items, by provenance of the items, by source or ownership, and so on. Collections may contain any number of items and may have varying levels of permanence. A "collection-level description" provides a description of the collection as a unit: the resource described by a collection-level description is the collection, rather than the individual items within that collection. Collection-level descriptions are referred to in Michael Heaney's <i>An Analytical Model of Collections and their Catalogues</i> as "unitary finding-aids". |
| Dataset | Collection | DCMI resource Types http://dublincore.org/do cuments/dcmi-type- vocabulary/ | A collection of data items in which individual data items are identified and accessible. DCMI definition is "Data encoded in a defined structure." with additional comment "Examples include lists, tables, and databases. A dataset may be useful for direct machine processing." The container may be a stand-alone digital file (mdb, spreadsheet, table in a Word document), a web service, or an enterprise database. Metadata for the collection is a different type than metadata for individual items in the collection. Criteria for what unifies the collection are variable (topic, area, author). Synonym: structured data collection. This resource type represents the intellectual artifact the information content and organization; the dataset may have more than one manifestation (format) as a list, a table, databases, using different software implementations. |

| Catalog | Dataset | USGIN | A collection of data items that index resources, as in metadata records; a metadata registry. The resource represents the information content and organization. Catalogs are accessed using other resources, like an interactiveResource or Service, and may have different formats. |
|--|------------|--|---|
| Physical arti- fact collec- tion | Collection | USGIN | A collection of identifiable physical objects, unified based on some criteria. Criteria for defining a collection may be who collected, where curated, why collected, kind of material |
| Document | | USGIN | A packaged body of intellectual work; has an author, title, some status with respect to Review/authority/quality. USGS peer reviewed would be a 'status property'. Have to account for gray literature, unpublished documents, etc. A document may have a variety of physical manifestations (pdf file, hardbound book, tiff scan, Word processor document), and versions may exist as the document is traced through some publication process. May be map, vector graphics, text. Sound, moving images are included as document types. |
| Image | Document | DCMI resource Types http://dublincore.org/do cuments/dcmi-type- vocabulary/ | A visual representation other than text. Comment: Examples include images and photographs of physical objects, paintings, prints, drawings, other images and graphics, animations and moving pictures, film, diagrams, maps, musical notation. Note that Image may include both electronic and physical representations. |
| StillImage | Image | DCMI resource Types http://dublincore.org/do cuments/dcmi-type- vocabulary/ | A static visual representation. Comment: Examples include paintings, drawings, graphic designs, plans and maps. Recommended best practice is to assign the type Text to images of textual materials if the intent of the image is to capture the textual content as opposed to the appearance of the medium containing the text. Instances of the type Still Image must also be describable as instances of the broader type Image. Subtype of Image. |
| Human- generated im- age | StillImage | USGIN | Image produced by human drawing or painting, using any media. May be entirely product of human imagination, human perception of the world, or a human-modified photographic image. |
| Photograph | StillImage | USGIN | Image produced by optical device with chemical or electronic image capture; represents things in the field of view directly as captured by the device. Photographs may be modified by human processing; there is a continuum between photographs and human-generated image. Distinction between the two is largely based on intention |
| Remote sens- ing Earth im- age | StillImage | USGIN | Image of earth surface acquired by an air born or earth-orbiting sensor. May be georeferenced such that location in the image directly corresponds to location on the earth. |
| Мар | StillImage | USGIN | Human-generated depiction of some part of the earth using a mathematical system of correspondence between geometry in the image and location on the earth. |

| MovingImage | Document | DCMI resource Types http://dublincore.org/do cuments/dcmi-type- vocabulary/ | A series of visual representations imparting an impression of motion when shown in succession. Comment: Examples include animations, movies, television programs, videos, zoetropes, or visual output from a simulation. Instances of the type Moving Image must also be describable as instances of the broader type Image. Subtype of Image. Commonly include sound |
|-------------------------------------|----------|--|--|
| Sound | Document | DCMI resource Types http://dublincore.org/do cuments/dcmi-type- vocabulary/ | A resource primarily intended to be heard. Comment: Examples include a music playback file format, an audio compact disc, and recorded speech or sounds. |
| Text | Document | DCMI resource Types http://dublincore.org/do cuments/dcmi-type- vocabulary/ | A resource consisting primarily of words for reading. Comment: Examples include books, letters, dissertations, poems, newspapers, articles, archives of mailing lists. Note that facsimiles or images of texts are still of the genre Text. |
| Hypertext document collection | Text | USGIN | A collection of files that contains http hyperlinks between them. Links to documents or other resources outside of the collection are possible. The criteria for determining membership in the collection are somewhat arbitrary, but in general the 'site' should contain related documents authored and managed by the same agent. |
| Event | | DCMI resource Types http://dublincore.org/do cuments/dcmi-type- vocabulary/ | A non-persistent, time-based occurrence. Metadata for an event provides descriptive information that is the basis for discovery of the purpose, location, duration, and responsible agents associated with an event. Examples include an exhibition, webcast, conference, workshop, open day, performance, battle, trial, wedding, tea party, and conflagration. |
| Project | Event | USGIN | Project represents a funded activity that has some purpose; projects have associated extents, which represent the area of interest for the project. This extent serves as a mechanism to filter descriptions and concepts in the information system for those that may be related to the project based on spatial relationships. Projects in a large organization will likely have hierarchical (part-whole) relationships. |
| Model | | USGIN | Algorithm, workflow; an abstract representation of a collection of related processes, objects and relationships. A model resource may be related to various kinds of document that portray the model, or to software that implements the model, or with datasets as input or output. Not clear that there is a compelling use case for cataloging models separately from the software or documents that are manifestations of the model. |
| Physical artifact | | DCMI resource Types http://dublincore.org/do cuments/dcmi-type- vocabulary/ | General category for physical resources that are indexed by metadata records; also root of an artifact type hierarchy. An identifiable physical object. Identification is always a function of some human intention, thus differentiating an artifact from other 'natural' things. Note that digital representations of, or surrogates for, these objects should use Image, Text or one of the other types. |

| Service | | DCMI resource Types http://dublincore.org/do cuments/dcmi-type- vocabulary/ | A system that provides one or more functions via a network interface designed for machine interaction. An implementation of an interface to some sort of digital resource, using either a 'pull' model in which client requests some content from the service, and receives that content in a single 'response' package, or a 'push' model in which client establishes connection and monitors for change events (update, new data) from service. Difficult to draw line on when a service provides 'files' and when it provides 'data', because responses are always in a form that could be considered a file. Also includes interfaces to digital resources that provide a continuous (with some sampling interval?) feed of some sort of data. |
|-----------------------------------|------------------------------|--|--|
| Software | | USGIN | A computer program in source or compiled form. Comment: Examples include a C source file, MS-Windows .exe executable, or Perl script. |
| Stand-Alone- Application | Software | DCMI resource Types http://dublincore.org/do cuments/dcmi-type- vocabulary/ | Identifiable stand alone software application. Identity of resource is based on function performed, input and output requirements, and authorship. The same application may be packaged in different file formats to run in different software environments; thus an application will have one or more associated digital files. For the purposes of this catalog scheme, stand alone applications are software that can be packaged in a single file that can be transferred between machines, unpackaged and compiled or installed on a computer meeting specified hardware and software environment conditions, to execute the described function on that computer, independent of any network connection. |
| Interactive- Resource | Software | DCMI resource Types http://dublincore.org/do cuments/dcmi-type- vocabulary/ | A resource requiring interaction from the user to be understood, executed, or experienced. Comment: Examples include forms on Web pages, applets, multimedia learning objects, chat services, or virtual reality environments. Interactive resources are software driven. From the point of view of the catalog, they are accessed by a URL to a web site that is the interface for operating the application. The application operates by interaction with one or more human participants. The application requires network connection to operate, is accessible via the internet, and requires human interaction. |
| Structured dig- ital data item | | USGIN | An individually identifiable item in a structured digital data collection. Characterized by a schema, and some particular values. In ISO11179 terms, this is an instance of a data element. Tagging, commenting, reviewing, rating community interaction with catalog will probably require metadata records about particular data items in cataloged datasets (including metadata items in catalogs.) |
| Sampling point, site, station | Structured digital data item | From ScienceBase item types, SMR redux | A resource that is a location-based container/base for observation data. Should this be generalized to OGC O&M samplingFrame to include other sampling geometry (borehole, image footprint) Analogous in function to a keyword, but carries metadata on who located, when, why, how |

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3 USGIN Usage of Metadata Elements

3.1 Core spatial dataset, dataset series, and service elements

Table 2 is a listing of ISO19115 metadata elements used to describe any resource. Tables 3 and 4 provide specifics for describing datasets and services. Note that in the USGIN context, dataset is construed quite broadly to include any kind of georeferenced information resource, including physical samples and hard copy documents. The service metadata elements are defined by ISO19119. The root element of ISO xml-encoded metadata is MD_Metadata. Elements are discussed in this table in the order that they appear in the metadata document. Not all elements are discussed in detail. In a number of places where USGIN makes no specific provisions, we defer to recommendations in the North American Profile for ISO metadata (INCITS 453, referred to as NAP). Note that throughout this and the subsequent tables, the names of xml elements are shown in this typecase. Long X-paths have been broken with non-breaking hyphen characters. Hyphens are not used in any xml attribute or element name, so if they appear in the text, they are strictly for text wrapping.

Table 2. Description best practices for ISO19139 metadata elements in USGIN profile. This table includes base elements.

| ISO 19115 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments |
|---|------------------------|---|
| Metadata file identifier (O) fileIdentifier | M-M | This identifies this metadata record, as opposed to DatasetURI, which identifies the described resource. A unique metadata record identifier must be included to allow CSW operations such as GetRecordByld or harvest transactions. This identifier should be copied during harvest operations. Ideally there is one metadata record describing each resource, such that there should be a one-to-one mapping between metadata fileIdentifiers and DatasetURIs. However, not all described resources will have a DatasetURI, and the metadata record is a different resource from the resource it describes, and thus should not have the same identifier. The protocol used to generate the identifier does not matter, as long as it generates globally unique identifier strings. Services that rely on natural keys (e.g. serviceURL and layerID) are expected to put the key values in this field. Although there is technically no limit on the length of the identifier string, suggested best practice is to keep the string length less than 255 so the string will fit in legacy database string value fields. USGIN, ANZLIC, and the OGC CSW profiles for ISO metadata (OGC 07-045) recommend the use of the UUID (Universally Unique Identifier) for the fileIdentifier. The fileIdentifier is used to identify duplicate copies of metadata records, to reference one metadata record from another (via MD_DataIdentification/aggregationInfo), or to reference metadata from a described resource (e.g. DS_Dataset/has/MD_Metadata). If there is a difference between the two metadata records then one can determine the appropriate version by the content of other elements in the metadata record. The authoritative metadata record should be the only one made publicly available in metadata search systems such as a catalog service. The OpenGIS® Catalogue Services Specification 2.0.2 - ISO Metadata Application Profile (OGC 07-045) mandates that "To simplify catalogue mining each MD DataIdentification instance being part of a |

| ISO 19115 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments |
|---|------------------------|--|
| | | MD_Metadata instance must have an identifier having a code value that is equal to the fileIdentifier of the owning MD_Metadata instance." USGIN is attempting to make the semantics of identifiers clear, with the provision (see Unique resource identifier in Table 3, below) that the identifier in MD_DataIdentification/citation/CI_Citation/identifier/MD_Identifier identifies the cited resource. This may be identical with the resource described by the metadata, in which case its value is MD_Metadata/dataSetURI, or it may be a publication that is the intellectual source of the described resource, in which case it is a different identifier. This USGIN provision, the OGC 07-045 recommendation is rejected because it obfuscates what the citation identifier refers to. |
| Metadata language (M) language | M-M | NAP specifies that language string is composed of a language code (ISO639-2/T) and an alpha3 country code (ISO3166-1). The syntax is " <iso639-2 code="" language="" letter="" t="" three=""><;><black code="" language=""><;><black code="" language="">1 three letter country code>" Language code is given in lowercase. Country code is given in uppercase, e.g. fra; CANCurrently, it appears that most CSW client and server applications only support the three letter language code; if testing reveals that this provision causes too much difficulty it will be changed. In the mean time, filtering for metadata in a particular language without a country localization may be done using a wild-card search for the three letter language code.</black></black></iso639-2> |
| Metadata character set (C) characterSet | M-M | NAP specifies default name is "utf8", with codeListValue = "RI_458", codelist = "http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_95". However, due to interoperability problems, USGIN recommends use of ISO codelists: codeListValue="utf8" codelist= "http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/Codelist/ML_gmxCodelists.xml#-CI_CharacterSetCode. See 4.17.3 Codelists for discussion of codelist usage. USGIN requires that a character set code is defined to facilitate CSW servers (deegree, GeoNetwork, etc.). |
| Parent metadata record (O) parentIdentifier | O-X | Not used in USGIN profile. Used in ISO19115 to inherit metadata properties from parent to child records; USGIN CSW service implementations do not require clients to be able to navigate parent links to obtain inherited metadata properties, or to process filters using parent links, so this element is not used. To represent relationships between described resources use MD_Identification/aggregationInfo. |

| ISO 19115 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments |
|--|------------------------|---|
| Resource type (C) hierarchyLevel | M-M | Cardinality is 1*. NAP and ISO codelists are equivalent. See 4.17.3 Codelists for discussion of encoding of codelist values. Due to interoperability problems, USGIN mandates use of ISO codelists. At least one MD_ScopeCode codelist value is required. Codelist is {attribute, attributeType, collectionHardware, collectionSession, dataset, series, nonGeographicDataset, dimensionGroup, feature, featureType, propertyType, fieldSession, software, service, model, tile}. The European INSPIRE Implementing Rules (MD_IR_and_ISO_20090218) proscribes the code list for the first hierarchyLevel xml element in an MD_Metadata document to be one of {dataset, service, series}, or the metadata set will be considered out of scope for the directive (see section 4.6 Resource Type). This property essentially categorizes the indexed resource with types that determine the metadata content and the required behavior to access the indexed resource. ISO Example – dataset metadata: <gmd:hierarchylevel> <gmd:md_scopecode< td=""></gmd:md_scopecode<></gmd:hierarchylevel> |
| Resource hierarchy level name (C) hierarchyLevelName | O-M | ISO 19115 assumes that the metadata hierarchy level name defaults to "dataset" if it is not documented. NAP does not use it, recognizing that it is redundant. USGIN makes this property mandatory to identify the USGIN resource type from Table 1 (above). Default USGIN hierarchyLevelName.CharacterString is "Dataset". Encode hierarchy by including hierarchyLevelName elements for all broader resource categories. E.g. default should also include a hierarchyLevelName="Collection" element. For services USGIN hierarchyLevelName.CharacterString is "Service". As use cases develop that provide rationale for definition of sub-categories of service, the resource category list will be expanded. Example – dataset metadata: <gmd:hierarchylevelname> <gmo:characterstring>Dataset <gmo:characterstring>Collection </gmo:characterstring></gmo:characterstring></gmd:hierarchylevelname> <gco:characterstring>Collection</gco:characterstring> |

| ISO 19115 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments |
|---|------------------------|---|
| Metadata point of contact (M) | M-M | Cardinality on contact is 1*. USGIN requires at least one CI_ResponsibleParty with |
| Contact/CI_ResponsibleParty | | role.CI_RoleCode@codeListValue = "originator" (CI_RoleCode element value = "originator") that identifies the original source of the metadata record. If the point of contact for users to report errors, updates to metadata, etc. is different than the originator, an additional contact/CI_ResponsibleParty element may be included with role.CI_RoleCode@codeListValue = "pointOfContact" (Cl_RoleCode element value="pointOfContact"). See 4.17.3 Codelists for discussion of encoding of codelist values. ISO Role codes applicable in this context include: {custodian, owner, distributor, originator, pointOfContact}. NAP adds {editor}. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. The point of contact information (either originator or pointOfContact) must include a contact email address (electronicMailAddress). This is in addition to the NAP rule that count of (individualName + organisationName + positionName) > 0 for any CI_ResponsibleParty element. The contactInfo/CI_Contact/onlineResource/CI_OnlineResource element for the CI_ResponsibleParty with role.CI_RoleCode@codeListValue = "originator" has CI_OnlineResource/name = "icon", the CI_OnlineResource/linkage/URL will be assumed to points to an icon image file (e.g. tif, png, jpg) for the metadata originator. This Icon will be displayed in search results to credit the metadata originator. Metadata harvesters must harvest and maintain all metadata originator information so that the origin of metadata records can be credited, and should harvest the point of contact information if it is different. If the service providing the metadata records wishes to identify itself in result records, this information should be included in an additional Mp_Metadata/contact/CI_ResponsibleParty element, with role.CI_RoleCode@codeListValue = "distributor". Other responsible party roles applying to the metadata record (not the described resource) may also be specified here. |
| Metadata date stamp (M) dateStamp | M-M | USGIN profile requires use of dateStamp/gco:DateTime (Note this contrasts with INSPIRE mandate to use dateStamp/gco:Date). This is the date and time when the metadata record was created or updated (following NAP). The dateStamp is assumed to be updated to reflect any change in the metadata record that the metadata publisher wishes to propagate through the USGIN catalog system. This is the time stamp that will be used by harvesters to determine if a metadata needs to be updated in a harvesting catalog. |
| Metadata standard name (O) metadataStandardName | M-M | NAP specifies "NAP - Metadata". USGIN profile conformant metadata is indicated by using " ISO-USGIN" Use is mandatory to indicate that the metadata record conforms to this profile. |
| Metadata standard version (O) metadataStandardVersion | O-M | For this version of the USGIN profile, use "1.0" Use is mandatory to specify the version of the profile used |

| ISO 19115 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments |
|---|------------------------|--|
| DataSet Identifier (O) dataSetURI | O-C | For USGIN, this is a string that uniquely identifies the described resource. If the resource has an identifier, it should be included here; if the resource will be referenced from other metadata, it must have an identifier here. Any kind of resource (not only datasets) may have an identifier. The protocol for the identifier is not specified, but some sort of documented scheme to assure uniqueness should be used (UUID, URN). Some implementations place a URL for online access in the dataSetURI; for USGIN profile, the MD_Distribution/transferOptions/MD_DigitalTransferOptions/online/CI_OnlineResource is used to specify URLs for access to the resource. The dataSetURI should be considered an opaque identifier. This will avoid ambiguity about where to find URLs for online access to a described resource. If the dataset is coupled to a service, the value of the MD_Metadata/dataSetURI attribute is the unique resource identifier used by srv:coupledResource to link the service with the dataset. The OpenGIS® Catalogue Services Specification 2.0.2 - ISO Metadata Application Profile (OGC 07-045) Annex F recommends that MD_DataIdentification/citation/CI_Citation/identifier/MD_Identifier/code match the identifiers specified by SV_ServiceIdentification/operatesOn and SV_Service-Identification/coupledResource for linking a described service to datasets that the service operates on. As discussed for fileIdentifier (above), this requires that a MD_DataIdentification/citation/citation/citation/citation/identifier explicitly for the dataset is included in the metadata record, in which case its value is the same as MD_Metadata/dataSetURI. |
| Other languages (C) locale | C-C | Other languages used in metadata free text description. If description in more than one language is provided, this property should indicate what those languages are. The primary language used for metadata description is identified with MD_Metadata/language and characterSet and any additional languages are identified by MD_Metadata/locale/PT_locale elements, in which the language is provided according to ISO 639-2/T three-letter terminology codes in lowercase, and an optional country is provided according to ISO 3166-1 three-letter codes in uppercase, and mandatory characterEncoding. See 4.17.3 Codelists for discussion of encoding of codelist values. NAP has a LanguageNameCodes codelist in their registry (http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_116), but this only points to ISO639-2. The a listing of codes in this codelist is available at http://www.loc.gov/standards/iso639-2/php/code_list.php. However, due to interoperability problems, USGIN prefers ISO over NAP codelists. The ISO code list catalog at http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/Codelist/ML_gm xCodelists.xml includes a LanguageCode codelist that includes the ISO 639-2 codes, in which the three letter codes are identifiers, and a gml:name, which is the English language name of the language is included. Unfortunately, only eng and fra are included in this codelist catalog. Go figure. Alternate names in other languages are also included in this catalogue. This catalogue should be referenced as the codeList for USGIN language elements as follows: NAP Example – dataset metadata: 'gmd:1pcale' yeght y |

| ISO 19115 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments |
|---|------------------------|---|
| | | <gmd:languagecode></gmd:languagecode> |
| | | <pre><gmd:languagecode< pre=""></gmd:languagecode<></pre> |
| | | <pre>codeList="http://www.loc.gov/standards/iso639-2/php/code_list.php"</pre> |
| | | <pre>codeListValue="fra">French</pre> |
| | | |
| | | <pre><gmd:characterencoding></gmd:characterencoding></pre> |
| | | <pre><gmd:md_charactersetcode< pre=""></gmd:md_charactersetcode<></pre> |
| | | <pre>codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_95"</pre> |
| | | <pre>codeListValue="RI_458">utf8</pre> /gmd:MD_CharacterSetCode> |
| | | |
| | | |
| | | |
| | | ISO Example – dataset metadata: |
| | | <pre><gmd:locale></gmd:locale></pre> |
| | | <pre><gmd:pt_locale id="FR"></gmd:pt_locale></pre> |
| | | <pre><gmd:languagecode></gmd:languagecode></pre> |
| | | <pre><gmd:languagecode< pre=""></gmd:languagecode<></pre> |
| | | <pre>codeList="http://www.loc.gov/standards/iso639-2/php/code_list.php"</pre> |
| | | <pre>codeListValue="fra">French</pre> |
| | | |
| | | <pre><gmd:characterencoding></gmd:characterencoding></pre> |
| | | <pre><gmd:md_charactersetcode< pre=""></gmd:md_charactersetcode<></pre> |
| | | <pre>COdeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/</pre> |
| | | ISO_19139_Schemas/resources/Codelist/gmxCodelists.xml#MD_CharacterSetCode" |
| | | <pre>codeListValue="utf8">UTF-8</pre> |
| | | |
| | | |
| | | |
| | | The INSPIRE 19115/19 2009-02-18 guidelines use this codeList for language codes, but use the three |
| | | letter abbreviation as the element value, not the gml:name from the codelist catalog. NAP examples |
| | | (INCITES 453, 2009) reference the NAP codelist (IC_116), use the three letter code as the codeListVa- |
| | | lue, and the languageCode element value is the name of the language apparently using that language, |
| | | e.g. codeListValue = 'fra', element value Français. Given these variations, it is recommended that search |
| | | for a particular languageCode use the codeListValue as the criteria, with the three letter codes as the |
| | | search value. |

| ISO 19115 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments |
|---|------------------------|---|
| [role] Resource spatial representation (O) spatialRepresentationInfo | 0-0 | Best practice is to include metadata for spatial representation if the described resource is a georeferenced dataset. Metadata for Spatial data representation are derived from ISO 19107. Metadata is instantiated as one or more of MD_GridSpatialRepresentation, MD_VectorSpatialRepresentation, MD_Georectified, or MD_Georeferenceable classes. USGIN profile follows NAP for spatial representation metadata. Vector Spatial Representation is required if point or vector objects exist in the dataset. If MD_VectorSpatialRepresentation is used, either spatialRepresentationInfo/MD_VectorSpatial-Representation/topologyLevel or spatialRepresentationInfo/MD_VectorSpatialRepresentation/geometricObjects shall be provided, or both." (NAP) MD_GridSpatialRepresentation or one of its subtypes (MD_Georectified, or MD_Georeferenceable) is required if dataset objects are gridded. MD_Georectified should be used if the grid (image) is georeferenced, and MD_Georeferenceable is used if the grid (image) can be georeferenced. Follow NAP optionality if these elements are used. |
| Resource spatial representation vector topology (O) spatialRepresentationInfo/-MD_VectorSpatialRepresentation /topologyLevel | C-C | Code that specifies the degree of complexity of spatial relationships between features in a dataset. Value is from ISO codelist MD_TopologyLevelCode. (Code names in this list include {geometryOnly, topology1D, planarGraph, fullPlanarGraph, surfaceGraph, fullSurfaceGraph, topology3D, fullTopology3D, abstract}. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN mandates use of ISO codelists. See 4.17.3 Codelists for discussion of encoding of codelist values. It is unclear precisely what these values mean in terms of the topology encoding. To be useful, assertion that topology is present should indicate that topological relationships that may be implicit in the encoded vector geometry are explicitly represented (e.g. by correlation tables—left poly, right poly for a polyline) in the data. |
| Resource spatial representation vector geometric objects (O) spatialRepresentationInfo/-MD_VectorSpatialRepresentation/geometricObjects | C-C | "Identification of the objects used to represent features in the dataset." (NAP) Provides a geometry type and count for the number of objects of each type. Use the ISO MD_GeometricObjectTypeCode codelist. Code names in this list are: {complex, composite, curve, point, solid, surface}. The ISO and NAP codelists are equivalent. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN mandates use of ISO codelists. See 4.17.3 Codelists for discussion of encoding of codelist values. |
| [role] Resource's spatial reference system (O) referenceSystemInfo | 0-0? | Description of the spatial and/or temporal reference systems used in the dataset. NAP specifies { (identificationInfo/spatialRepresentationType/MD_SpatialRepresentationTypeCode= "vector") or (/MD_SpatialRepresentationTypeCode = "grid") or (/MD_SpatialRepresentationTypeCode = "tin") implies count referenceSystemInfo >= 1) }. See 4.17.3 Codelists for discussion of encoding of codelist values. NAP and ISO codelists are equivalent; USGIN mandates use of ISO codelist. |

| ISO 19115 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments |
|---|------------------------|--|
| Reference System identifier code (O) referenceSystemInfo/- MD_ReferenceSystem/- referenceSystemIdentifier/- RS_Identifier/code | C-C | If referenceSystemInfo is included, then the RS_Identifier element must include at least a code value. For USGIN the code should be a value from the EPSG Geodetic Parameter Dataset register (http://www.epsg-registry.org/) in the form "EPSG:nnnn" where nnnn is the EPSG code number for the CRS. If the CRS is not defined in the EPSG registry, then the procedure specified in the NAP profile should be followed, e.g. the CRS shall be described according to ISO 19111 and ISO/TS 19127, assigned an identifier, and registered with an authority such that it may be referenced here. The RS_Identifier/codespace in this case should identify the registry authority where the CRS definition is registered, such that the definition can be located. Best Practice for USGIN purposes is to provide georeferenced data using one of the EPSG defined coordinate reference systems if this is possible. |
| Metadata extension information (O) metadataExtensionInfo | X-X | Not used in this profile. |
| Resource identification information (M) identificationInfo | M-M | Cardinality 1*. The content of this element identifies the described resource. For resources that are not services, use MD_DataIdentification (see Table 3), otherwise SV_ServiceIdentification is required (see Table 4). |
| [role] Content information (O) contentInfo | 0-0 | Characteristics describing the feature catalog, coverage, or image data. MD_ContentInformation is an abstract class. One or more of MD_FeatureCatalogueDescription or MD_CoverageDescription or MD_ImageDescription elements may be used to specify this content. MD_FeatureCatalogueDescription describes content in a feature service or dataset like an ESRI geodatabase that may have more than one feature, e.g. geologic unit outcrop polygons, fault line features, and point observation locations for strike and dip data. The MD_FeatureCatalogueDescription only provides a CI_Citation link to the full feature catalog, which may use ISO19110 or ISO11179. MD_CoverageDescription is for datasets that are one of the types listed in napMD_CoverageContentTypeCode: image, thematicClassification, physical-Measurement. A coverage is a data structure that acts as a function to return values from its range for any direct position within its spatiotemporal domain (OGC 07-067r5). Image coverages return values for light intensity in a given wavelength range, thematicClassification coverages return codes corresponding to some domain concept, and physicalMeasurement coverages return values representing some physical quantity like magnetic susceptibility, density, resistivity. USGIN currently makes no recommendation for use of contentInfo; follow NAP recommendations (see INCITS 453). |
| [role] Resource distribution information (O) distributionInfo | 0-0 | This element provides information to inform users how to obtain or access the described resource. Cardinality is 01. US GIN profile specifies that if distribution information is included (MD_Distribution is not null), then at least one MD_Distribution/distributionFormat and one MD_Distribution/transferOptions element is required, and the specified format is available via the specified transfer options. See section 4.13 'Use of MD_Distribution and MD_Distributor' for instructions for more complicated combinations of distributor, format, transfer options, and ordering instructions. |

| ISO 19115 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments |
|---|------------------------|---|
| Resource distribution format (O) distributionInfo/- MD_Distribution/- distributionFormat | 0-0 | Information on the format or physical manifestation of the resource. If the resource is a physical resource, like a book, rock sample, paper document, the distributionFormat/MD_Format/name is mandatory, and must be from the USGIN distribution format codelist. For digital resources, the format specifies the file type, either using a MIME type, or formatted string. Pattern for digital resources: [ven-dor:applicationName]/fileExtension. The vendor and application names may not be applicable, and could be omitted, but the '/' and file extension should always be present. If the format consists of a single file, the file extension is a three letter file-type abbreviation assigned by the vendor. For services, list the output formats offered by the service in distributioninfo as a collection of distribution-Format/MD_Format elements if all formats are applicable to all service requests, or if the mapping between requests and formats is obvious. Encoding of the format name should use whatever convention is used by the service to specify that output format in requests made to the service. (see 4.14 Distribution Format). |
| Resource distributor information (O) distributionInfo/- MD_Distribution/distributor/- MD_Distributor/ | O-C | <u>USGIN differs from NAP</u> in this case (but not with ISO19115) by allowing multiple distributors, and binding between distributors, transfer options, and formats. For USGIN profile, each distributor/MD_Distributor is a binding between one or more transfer options and the distributor formats that are available through that/those transfer options (MD_DigitalTransferOptions/onLine/CI_OnlineResource in particular). If different formats are available from the same distributor, or have different transfer options, these should be represented as different distributor/MD_Distributor instances. See section 4.13 'Use of MD_Distribution and MD_Distributor' for instructions on use of these elements. |
| Resource distributor responsible party (O) distributionInfo/- MD_Distribution/- distributor/MD_Distributor/- distributorContact/- CI_ResponsibleParty | C-C | If distributionInfo is not null, MD_Distributor is required, which requires one CI_ResponsibleParty. For responsible party, count of (individualName + organisationName + positionName) > 0, and CI_RoleCode is required. ISO Role codes applicable in this context include: {resourceProvider, custodian, owner, distributor, pointOfContact, publisher, author}. NAP adds some potentially useful values. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 'Codelists' for details on codelist encoding. |
| Resource distributor order process (O) distributionInfo/- MD_Distribution/distributor/- MD_Distributor/- distributionOrderProcess/- MD_StandardOrderProcess | 0-0 | Information on the availability of the service which includes at least one of fees, available date and time, ordering instructions, or turnaround. |

| ISO 19115 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments |
|---|------------------------|--|
| Resource distributor format (O) distributionInfo/- MD_Distribution/distributor/- MD_Distributor/- distributorFormat/MD_Format | (O-C) | See section 4.14Distribution Format ' for instructions on use of these elements. |
| Resource distributor online distribution linkage (O) distributionInfo/- MD_Distribution/distributor/- MD_Distributor/- distributorTransferOptions/- MD_DigitalTransferOptions/- online/- CI_OnlineResource/linkage | M-M | Digital transfer options are "Technical means and media by which a dataset is obtained from the distributor." NAP requires CI_OnlineResource/linkage and CI_OnlineResource/protocol in CI_OnlineResource. The CI_OnlineResource/linkage element should contain the complete URL to access the resource directly (see section 4.13). CI_OnlineResource requires a Linkage element that is a gmd:URL. |
| Resource distributor online distribution linkage (O) distributionInfo/- MD_Distribution/- distributor/MD_Distributor/- distributorTransferOptions/- MD_DigitalTransferOptions/- online/- CI_OnlineResource/protocol | M-M | The CI_OnlineResource/protocol element defines a valid internet protocol used to access the resource. USGIN mandates use of protocol mnemonics from the Official Internet Protocol Standards registry published on the Web at http://www.rfc-editor.org/rfcxx00.html . 'ftp' or 'http' are common values. If no mnemonic has been assigned, use the rfc number. |
| Resource distributor online distribution linkage (O) distributionInfo/- MD_Distribution/distributor/- MD_Distributor/- distributorTransferOptions/- MD_DigitalTransfer- Options/online/- CI_OnlineResource/name | 0-0 | The CI_OnlineResource/name element may duplicate the file name if the URL is a link to a file, but it is recommended to provide a user-friendly label for the file that could be presented in a user interface. |

| ISO 19115 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments |
|--|------------------------|--|
| Resource distributor online distribution application profile (O) distributionInfo/- MD_Distribution/distributor/- MD_Distributor/- distributorTransferOptions/- MD_DigitalTransferOptions/- online/CI_OnlineResource/- applicationProfile | C-C | applicationProfile is required if the CI_OnlineResource/linkage does not connect to a web page, and another software application is needed to use the indicated file resource. The applicationProfile character string should specify the software using the following recommended syntax: "vendor:application name/application version", e.g. "Microsoft:Word/2007", or "ESRI:ArcGIS/9.3" |
| Resource distributor online distribution function (O) distributionInfo/- MD_Distribution/distributor/- MD_Distributor/- distributorTransferOptions/- MD_DigitalTransferOptions/- online/CI_OnlineResource/- function | O-C | CI_OnlineResource/function is required by USGIN to indicate how linkage is to be used. Valid values for CI_OnlineFunctionCode in this role are summarized in Table 7. If the resource is accessible as a web service, the metadata for the service should be separate metadata record with the dataset(s) exposed through the service identified in the service metadata record as coupledResources. The NAP function code vocabulary extends the ISO codelist, and this list will likely need to be customized further. |
| Resource distribution transfer options (O) distributionInfo/- MD_Distribution/- transferOptions/- MD_DigitalTransferOptions | C-C | MD_DigitalTransferOptions provides information on digital distribution of resource. See section 4.13 'Use of MD_Distribution and MD_Distributor' for instructions on use of this element. Details on encoding for MD_DigitalTransferOptions are above in the distributorTransferOptions elements description. |
| [role] Data quality information (O) dataQualityInfo | C-C | Either dataQualityInfo/DQ_DataQuality/report or dataQualityInfo/DQ_DataQuality/lineage is mandatory if a dataQualityInfo element is present. dataQualityInfo/DQ_DataQuality/scope is required, with value from MD_ScopeCode: {attribute, attributeType, collectionHardware, collectionSession, dataset, series, nonGeographicDataset, dimensionGroup, feature, featureType, propertyType, fieldSession, software, service, model, tile}. The ISO and NAP codelists are identical, so USGIN mandates use of ISO codelists. See 4.17.3 Codelists for discussion of encoding of codelist values. dataQualityInfo has cardinality 0*. See section 4.19 Data quality for individual parts of a resource for discussion of data quality with resource parts. |

| ISO 19115 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments |
|---|------------------------|--|
| Data quality scope (O) dataQualityIn- fo/DQ_DataQuality/scope | C-C | Mandatory if DQ_DataQuality is not null. Specifies the extent of characteristics for which data quality information is reported. Value is from MD_ScopeCode: {attribute, attributeType, collection-Hardware, collectionSession, dataset, series, nonGeographicDataset, dimensionGroup, feature, featureType, propertyType, fieldSession, software, service, model, tile}. The ISO and NAP codelists are identical, so USGIN mandates use of ISO codelists. See 4.17.3 Codelists for discussion of encoding of codelist values. |
| Data quality scope level description (O) dataQualityInfo/- DQ_DataQuality/- scope/levelDescription | C-C | DQ_DataQuality/scope/levelDescription is mandatory if/scope/DQ_Scope/level/MD_ScopeCode = "attributeType" or "featureType". levelDescription specifies the aspect of the larger resource described by the containing dataQualityInfo/DQ_DataQuality element. The data type for the levelDescription child elements are reference only; the documentation in ISO19115 (2003, section B.4.4, p. 91) indicates that these are references to ISO19109 (Application Schema) elements describing attributes or features in the application scheme. For USGIN these will be xlink:href or unidered URIs. Only the features and attributes child elements are used by the USGIN profile. See section 4.19 Data quality for individual parts of a resource for more discussion of levelDescription. |
| Data quality report (O) dataQualityInfo/- DQ_DataQuality/report | C-C | If a DQ_DataQuality/report element is included, at least one of the 15 possible data quality elements must be present, and multiple report elements are allowed within each DQ_DataQuality element. Each of these <code>AbstractDQ_element</code> subtypes has optional nameOfMeasure, measureIdentification, measureDescription, evaluationMethodType, evaluationMethodDescription, evaluationProcedure, and dateTime elements, and one or two required result elements. The <code>AbstractDQ_element</code> /result is either a DQ_ConformanceResult or a DQ_QuantitativeResult, each of which has required and optional subelements. Inclusion of this report metadata should follow recommendations in NAP. |
| Data quality lineage (O) dataQualityInfo/- DQ_DataQuality/lineage | C-C | USGIN follows NAP rule that count(lineage/LI_Lineage/source + lineage/LI_Lineage/sourceStep + lineage/LI_Lineage/statement) >0 for spatial dataset and spatial dataset series. Not applicable to services. USGIN recommended practice is described in section 4.19. |
| Data quality lineage statement (O) dataQualityInfo/- DQ_DataQuality/lineage/- LI_Lineage/statement | C-C | INSPIRE makes general lineage/LI_Lineage/statement mandatory. "General explanation of the data producer's knowledge of the dataset lineage" NAP. USGIN recommended practice is described in section 4.19. |

| ISO 19115 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments |
|--|------------------------|--|
| Data quality lineage source (O) dataQualityInfo/- DQ_DataQuality/lineage/- LI_Lineage/source | C-C | Each source/LI_Source element describes a source data resource that is input into a processStep. NAP provision is that LI_Source/description is mandatory if LI_Source/sourceCitation and LI_Source/sourceExtent are not provided. If used, the LI_Source/description includes the source medium name from the CodeList napMD_MediumNameCode, followed by <;> <blank space=""> and a free text description, e.g. "dvd; source satellite image." If the source is part of a processing chain, the LI_Source/processStep/LI_ProcessStep provides "Information about an event related to the creation process for the source data." (INCITS 453). This is interpreted to mean that the link from a source to a process step is to a process step for which the described source is an output. USGIN recommended practice is described in section 4.19.</blank> |
| Data quality lineage process step (O) dataQualityInfo/- DQ_DataQuality/lineage/- LI_Lineage/processStep | C-C | An event in the development of the dataset. Each step requires a free text description, and may have a free text rationale, dateTime stamp when process was complete, 0 to many CI_ResponsibleParty elements identifying parties involved in the process, and finally 0 to many source/LI_Source associations to identify data that is input into the process step. Best practice recommended for USGIN is that source association from a process step is to inputs to a process, and processStep associations from a source element link an output resource to a process step that produced it. See USGIN recommended practice is described in section 4.19. |
| [role] Portrayal catalog information (O) portrayalCatalogueInfo | 0-0 | portrayalCatalogueInfo/MD_PortrayalCatalogReference/portrayalCatalogueCitation/CI_Citation element identifying a catalogue that contains symbols and rules to depict a resource. A portrayal catalog is a collection of defined symbols used to depict, to humans, features on a map. No documentation in ISO19115 about how this is supposed to work. ISO 19117 defines the structure of a Portrayal Catalogue. No USGIN recommended practices here yet. |

| ISO 19115 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments |
|---|------------------------|--|
| [role] Metadata constraint information (O) metadataConstraints | 0-0 | This element specifies use constraints for access to the metadata record. Use constraints for accessing the describe resource are in resourceConstraint/MD_Constraint in MD_DatasetIdentification or MD_ServiceIdentification. Follow NAP for specification of access constraints. NAP provision is that metadataConstraints/MD_Constraints/useLimitation is mandatory when MD_Constraints is used to specify metadataConstraints. When one of the subtypes MD_LegalConstraints or MD_SecurityConstraints is used, useLimitation is optional. MD_LegalConstraints are specified by MD_RestrictionCode. ISO codelist values are {copyright, patent, patentPending, trademark, license, intellectualPropertyRights, restricted, otherRestrictions}. NAP codelist adds {licenseUnrestricted, licenseEndUser, licenseDistributor, privacy, statutory, confidential, sensitivity}. See 4.17.3 Codelists for discussion of encoding of codelist values. otherConstraints is a free text element required by NAP if accessConstraints or useConstraints is set to "otherRestrictions." For an example: "Data only to be used for the purposes for which they were collected." MD_SecurityConstraints has various optional free text values, and a required MD_SecurityConstraints/classification from ISO MD_ClassificationCode: {unclassified, restricted, confidential, secret, topSecret}. NAP adds {sensitive, forOfficialUseOnly}. See 4.17.3 Codelists for discussion of encoding of codelist values. |
| [role] Application schema information (O) applicationSchemaInfo | 0-0 | Information about the information schema of the resource applicationSchemaInfo/MD_Application-SchemaInformation element has mandatory name/CI_Citation, schemaLanguage free text, and constraintLanguage free text. The MD_ApplicationSchemaInformation element also allows inclusion of an actual schema document as ASCII, or a binary graphicsFile or softwareDevelopmentFile. Multiple applicationSchemaInfo elements may be used for different presentations of a single schema, or for different kinds of schema (e.g. physical, logical, conceptual). This element provides information about the maintenance schedule or history of the metadata record. |
| [role] Metadata maintenance information (O) metadataMaintenance | 0-0 | Only one MD_MaintenanceInformation element may be included, with a required MD_MaintenanceFrequencyCode. The ISO codelist is {continual, daily, weekly, fortnightly, monthly, quarterly, biannually, annually, asNeeded, irregular, not-Planned, unknown}. NAP adds {semimonthly}. See 4.17.3 Codelists for discussion of encoding of codelist values. |
| [role] Series information (O) series | X-X | The MD_Metadata/series element that appears in the ISO19139 schema appears to implement the metadata application model in ISO19115:2003 Figure 3, which is a UML class diagram defining the classes of geographic information to which metadata applies. The series role appears to allow modeling aggregation of datasets into various kinds of aggregation classes like DS_Series, DS_StereoMate, DS_Initiave NAP does not mention it. Use case appears for bundling collections of related metadata records to allow simpler cross referencing and resolution of inherited property values Not Used by USGIN. |

| ISO 19115 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments |
|---|------------------------|---|
| [role] Described resource (O) describes | X-X | The MD_Metadata/describes element that appears in the ISO19139 schema appears to implement the metadata application model in ISO19115:2003 Figure 3, which is a UML class diagram defining the classes of geographic information to which metadata applies. The describes association models the link from a metadata record to the described resource Not used by USGIN. |
| [role] Property type description (O) propertyType | X-X | The MD_Metadata/propertyType element that appears in the ISO19139 schema appears to implement the metadata application model in ISO19115:2003 Figure 3, which is a UML class diagram defining the classes of geographic information to which metadata applies. The propertyType association apparently models the fact that a metadata record might be attribute-level metadata—that is describing an individual property value assignment Not used by USGIN. |
| [role] Feature type description (O) featureType | X-X | Although an MD_Metadata/featureType element that appears in the ISO19139 schema appears to implement the metadata application model in ISO19115:2003 Figure 3, which is a UML class diagram defining the classes of geographic information to which metadata applies. The featureType association apparently models the fact that a metadata record might describe an individual feature Not used by USGIN. |
| [role] Feature attributes (O) featureAttribute | X-X | Although an MD_Metadata/featureAttribute element that appears in the ISO19139 schema appears to implement the metadata application model in ISO19115:2003 Figure 3, which is a UML class diagram defining the classes of geographic information to which metadata applies. The featureAttribute association apparently models the fact that a metadata record might be attribute-level metadata—that is describing an individual property value assignment; distinction between propertyType and featureAttribute is not explained Not used by USGIN. |

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3.2 Dataset Identification properties (MD_DataIdentification)

The difference between metadata for services, and metadata for other resources is in the identificationInfo part of the ISO19139 xml schema. Service metadata utilizes the SV_ServiceIdentification element to provide a description and identification of a service (see 3.3 Service identification elements (SV_ServiceIdentification). This section documents use of MD_DataIdentification for metadata describing other resources of interest in the geoscience information network.

Table 3. Dataset Identification properties (MD_DataIdentification)

| ISO 19115 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments on MD_DataIdentification |
|--|------------------------|---|
| Resource citation (M) identificationInfo[1]/- MD_DataIdentification/- citation/CI_Citation | M-M | The citation attribute provides information for citing the described resource. Citation is defined by Webster as "an act of quoting". The precise semantics of what an identification/citation is supposed to be are not very well articulated in ISO19115. For USGIN purposes, this should be viewed as information to identify the intellectual origin of the content in the described resource, along the lines of a citation in a scientific journal. Required content for a CI_Citation element are title, date, and responsibleParty. |
| Resource title (M) identificationInfo[1]/- MD_DataIdentification/- citation/CI_Citation/title | M-M | USGIN recommends using titles that inform the human reader about the dataset's content as well as its context. |
| Resource reference date (M) identificationInfo/- MD_DataIdentification/- citation/CI_Citation/date/- CI_Date/date/ | M-M | Best practice is to include at least the date of publication or creation of the resource. The date of the resource reported in the citation corresponds to the resource's last update version according to its update frequency. CI_Date content includes a date and dateType. Date for USGIN profile uses xs:date data type, defined thus "date uses the date/timeSevenPropertyModel, with hour, minute, and second required to be absent . timezoneOffset· remains optional" (http://www.w3.org/TR/xmlschema11-2). Example date encoding: 2000-12-12+13:00, 2006-10-01. If the month or day is not known, encode as '00', for example '2006-00-00'. DateType is from napCl_DateTypeCode which identifies the event used for the temporal aspect of the resource. This date is distinct from the dateStamp for the metadata record, or the EX_Extent/temporalElement that specifies the time period to which the resource content is applicable. |

| ISO 19115 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments on MD_DataIdentification |
|---|------------------------|--|
| Unique resource identifier (O) identificationInfo/- MD_DataIdentification/- citation/CI_Citation/- identifier/MD_Identifier | C-C | NAP makes MD_Identifier mandatory for dataset and dataset series. For USGIN, if the Citation has an identifier that is different from the identifier for the described resource (MD_Metadata/dataSetURI), it must be included here. For USGIN purposes, this element content value should be only considered an identifier for the citation, without any assumption that it will use http protocol. The identifier may be resolvable to a URL, if a protocol prefix specifies an identifier scheme that is resolvable (e.g. http, urn), but this is not necessary for a valid document, and should not be assumed when processing metadata documents. The USGIN profile requires the use of MD_Identifier element to identify resources. RS_Identifier may substitute for MD_Identifier in the ISO19139 schema, but the USGIN profile requires use of MD_Identifier. If additional codespace and version content is associated with the identifier, it should be encoded as MD_Identifier/authority/CI_Citation/alternateTitle and MD_Identifier/authority/-CI_Citation/edition |
| Resource responsible party (O) identificationInfo/- MD_DataIdentification/- citation/CI_Citation/- citedResponsibleParty | M-M | CI_Citation cardinality exactly one required. USGIN requires at least one CI_ResponsibleParty following the NAP rule that count of (individualName + organisationName + positionName) > 0. The CI_ResponsibleParty/role/CI_RoleCode@codeListValue is from CI_RoleCode. See 4.17.3 Codelists for discussion of encoding of codelist values. For most intellectual content, the responsible party is what would normally be considered the author of a work. Best practice is to include point of contact information for the resource in MD_DataIdentification/pointOfContact/ CI_ResponsibleParty. Guidance on use of role codes would be helpful for consistency, but has not been developed as yet. |
| Resource presentation form (O) identificationInfo/- MD_DataIdentification/- citation/CI_Citation/- presentationForm | O-C | The form in which the cited resource is available. Note that the citation is to the original source of intellectual content in the described resource, and its presentation may be different from the format for distribution described in the metadata. USGIN recommends that this element is required if there is a difference between the cited resource presentation format and the distribution format(s) listed in the distributionInfo/MD_Distribution section of the metadata record. presentationForm uses CodeList = CI_PresentationFormCode, with ISO code names {documentDigital, documentHardcopy, imageDigital, imageHardcopy, mapDigital, mapHardcopy, modelDigital, modelHardcopy, profileDigital, profileHardcopy, tableDigital, tableHardcopy, videoDigital, videoHardcopy, audioDigital}. NAP adds {audioHardcopy, multimediaDigital, multimediaHardcopy, diagramDigital, diagramHardcopy}. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 Codelists for details on codelist encoding. |
| Resource series (O) identificationInfo/- MD_DataIdentification/- citation/CI_Citation/series | 0-0 | Information about the (publication) series or collection of which the resource is a part. NAP rule: (name + issueldentification) > 0. |

| ISO 19115 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments on MD_DataIdentification |
|--|------------------------|---|
| Resource other citation details (O) identificationInfo/- MD_DataIdentification/- citation/CI_Citation/- otherCitationDetails | 0-0 | "Other information to complete a citation." NAP |
| Resource collective title (O) identificationInfo/- MD_DataIdentification/- citation/CI_Citation/- collectiveTitle | O-C | Title of the combined resource that the cited resource is part of, for example the cited resource may be a paper in an anthology, in which case the anthology title would be the collective title. Required if the cited resource is part of such a collective work. |
| Resource abstract (M) identificationInfo/- MD_DataIdentification/abstract | M-M | A free text summary of the content, significance, purpose, scope, etc. of the resource. Exactly one value. |
| Resource purpose (O) identificationInfo/- MD_DataIdentification/purpose | 0-0 | "Summary of the intentions for which the dataset was developed. Purpose includes objectives for creating the dataset and what the dataset is to support." NAP |
| Resource status (O) identificationInfo/- MD_DataIdentification/status | M-M | Value is from MD_ProgressCode codelist. ISO values are {completed, historicalArchive, obsolete, onGoing, planned, required, underdevelopment}. NAP adds {proposed}. Obsolete is synonymous with deprecated. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 Codelists for details on codelist usage. |
| Resource point of contact (O) identificationInfo/- MD_DataIdentification/- pointOfContact | O-C | CI_ResponsibleParty element here would contain information for point of contact to access the resource. This information is mandatory for physical resources such as core, cuttings, samples, manuscripts. US-GIN rule that count of (individualName + organisationName + positionName) > 0. The CI_Responsible-Party/role/CI_RoleCode is from CI_RoleCode codelist. ISO role codes for physical resource point of contact are {custodian, owner, pointOfContact}; other point of contact role codes may apply for other resources. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 Codelists for details on codelist usage. |

| ISO 19115 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments on MD_DataIdentification |
|---|------------------------|--|
| Resource maintenance (O) identificationInfo/- MD_DataIdentification/- resourceMaintenance | 0-0 | This element provides information about the maintenance schedule or history of the resource (or some subset/part of the resource specified by the scope and scope description) described by the metadata record. 0 to many MD_MaintenanceInformation elements may be included. Different MD_MaintenanceInformation elements are required to have different napMD_ScopeCode or MD_ScopeDescription. Usage of MD_ScopeDescription is poorly described, and no actual examples of usage could be found; it would appear to allow identification of a set of attribute or features (by name?), or feature instances or attribute instances (identified how?), or a dataset, to which the maintenance information applies. Use MD_MaintenanceFrequencyCode codelist. ISO values are {continual, dai-ly, weekly, fortnightly, monthly, quarterly, biannually, annually, asNeeded, irregular, notPlanned, unknown}. NAP adds {semimonthly}. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 Codelists for details on codelist usage. |
| Graphic overview of resource (O) identificationInfo/- MD_DataIdentification/- graphicOverview | 0-0 | Highly recommended to include a URL providing a web-accessible visual representation of the resource if it is applicable to the described resource, particularly for geographic datasets that may be represented by maps. If MD_BrowseGraphic is included, MD_BrowseGraphic/filename character string is mandatory. USGIN Recommended practice is to provide a complete URL as a gco:characterString value for the filename property. Use napMD_FileFormatCode code values (http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_115) in fileType/CharacterString, but because of schema problems, encoding the xsi:Type for the codelist extension is not recommended. See section 4.17.3 Codelists for details on codelist usage. Repeatable element; multiple values may present different resolutions, or different parts of resource. Names associated with overview should provide sufficient information for user to distinguish these. |
| Resource format (O) identificationInfo/- MD_DataIdentification/- resourceFormat | X-X | This element is not used by NAP or USGIN; this information is encoded in MD_Metadata/distributionInfo/MD_Distribution/ in USGIN metadata (see 4.13 <i>Use of MD_Distribution and MD_Distributor</i>). |
| Resource keywords (O) identificationInfo/- MD_DataIdentification/- descriptiveKeywords/MD_Keyword | 0-0 | Best Practice for USGIN profile metadata is to supply keywords to facilitate the discovery of metadata records relevant to the user. USGIN Keywords: USGIN keyword vocabularies are in development. Future versions of this profile may include required keyword vocabularies. Other Keywords: Keyword Type - allowed values from MD_KeywordTypeCode. ISO codelist includes {discipline, place, stratum, temporal, theme}. NAP adds {product, subTopicCategory}. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 Codelists for details on codelist usage. USGIN requires that MD_Keyword/keyword contain a CharacterString (see section 4.16). USGIN best practice is to include keywords in English. |

| ISO 19115 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments on MD_DataIdentification |
|---|------------------------|---|
| Condition applying to access and use of resource (O) identificationInfo/- MD_DataIdentification/- resourceConstraints/ | 0-0 | Restrictions on the access and use of a resource or metadata. Follow NAP for specification of resource-Constraints. This attribute provides information for access control to the described resource itself. In some situations, the metadataConstraints may allow a user to learn of the existence of a resource that they may not actually be able to access without further clearance. Constraints may be represented by MD_Constraint, MD_LegalConstraint, or MD_SecurityConstraint. |
| Aggregation information (O) identificationInfo/- MD_DataIdentification/- aggregationInfo/- MD_AggregateInformation | 0-0 | This element includes either a citation for or identifier of an associated dataset, along with the type of association between the datasets, and optionally the activity that produced the dataset. MD_AggregateInformation requires either aggregateDataSetName/CI_Citation or aggregateDataSetIdentifier/MD_Identifier. MD_AggregateInformation/associationType is mandatory, from DS_AssociationTypeCode. ISO codelist includes {crossReference, largerWorkCitation, partOfSeamless_Database, source, stereoMate}. NAP adds {isComposedOf}. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 Codelists for details on codelist usage. If the related resource has an associated metadata record, USGIN recommended practice is to include the identifier for that metadata record in aggregateDataSetIdentifier/MD_Identifier. For related resources that do not have a metadata record, aggregateDataSetName/CI_Citation may be used; this element is optional if aggregateDataSetIdentifier has a value. For USGIN profile, this property, rather than MD_Metadata/parentIdentifier, should be used to indicate relationships between described resources. |
| Spatial Representation Type (O) MD_DataIdentification/spatialR epresentationType/ | 0-0 | value from MD_SpatialRepresentationTypeCode list. ISO codelist includes {vector, grid, textTable, tin, stereoModel, video}. ISO and NAP codelists have the same terms, USGIN mandates use of ISO codelists. See section 4.17.3 <i>Codelists</i> for details on codelist usage. |
| Resource spatial resolution (O) MD_DataIdentification/- spatialResolution/- MD_resolution/equivalentScale/ MD_RepresentativeFraction/- denominator | C-C | USGIN requires use of equivalentScale//denominator to express spatial resolution, in order to be more easily interoperable. ISO19139 schema requires MD_resolution to be specified by an equivalentScale/MD_RepresentativeFraction/denominator or a distance (or both), so if a distance is available, that should be supplied as well. The resolution distance represents the smallest length between two resolvable points in the dataset. To calculate equivalentScale given a resolution distance, recommended practice is to divide the resolution distance in meters by 0.0005. This assumes that the smallest distance resolvable in a map display for human usage is 0.5 mm. |

| ISO 19115 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments on MD_DataIdentification |
|---|------------------------|--|
| Resource language (O) identificationInfo/- MD_DataIdentification/language | M-M | Language for content of described resource. The mandatory optionality is inherited from NAP, although it does not make sense for non-language based content like images or physical samples. Default value is 'eng'. If language is not applicable to the described resource use 'zxx'. Multiple instances of this element indicate that the linguistic content of the resource is available in multiple languages. Three-letter language code followed by an optional three-letter country code: {ISO 639-2/T three letter language code> (<;> <blank space=""><iso 3166-1="" 639="" <a="" are="" at="" available="" code="" codelists="" code}="" country="" given="" href="http://www.loc.gov/standards/iso639-2/php/code_list.php" in="" is="" iso="" language="" letter="" lowercase.="" three="" uppercase.="">http://www.loc.gov/standards/iso639-2/php/code_list.php. ISO 3166-1 codelists are at http://www.iso.org/iso/english_country_names_and_code_elements.</iso></blank> |
| Topic category identificationInfo/- MD_DataIdentification/- topicCategory | C-C | NAP specifies that topicCategory code shall be provided when hierarchyLevel is set to "dataset" or "dataset series". Codes are from MD_TopicCategoryCode, the ISO codelist includes {farming, biota, boundaries, climatologyMeterologyAtmosphere, economy, elevation, environment, geoscientificInformation, health, imageryBaseMapsEarthCover, intelligence—Military, inlandWater, location, oceans, planningCadastre, society, structure, transportation, utilitiesCommunication}. The NAP and ISO codelists are the same, USGIN mandates use of ISO codelists. See section 4.17.3 Codelists for details on codelist usage. Most USGIN resources will have MD_TopicCategoryCode = "geoscientificInformation", which is the default value for this profile. More specific topic categorization should be done using keywords. |
| Resource content extent identificationInfo/- MD_DataIdentification/extent/- EX_Extent | C-C | Defines the spatial (horizontal and vertical) and temporal region to which the content of the resource applies. For USGIN, the spatial extent is a rectangle that bounds the geographic extent to which resource content applies. NAP specifies required when hierarchyLevel is set to 'dataset'. Best Practice for USGIN is to include an extent for any resource with content related to some geographic or temporal location. For geoscience resources, the temporal extent may be expressed using time ordinal eras from a geologic time scale if the resource is related to some particular geologic time. USGIN specifies count(description + geographicElement + temporalElement) >0 |
| Resource content extent description identificationInfo/- MD_DataIdentification/extent/- EX_Extent/description | C-C | Free text that describes the spatial and temporal extent of the dataset. USGIN specifies that description is mandatory if a geographicElement or temporalElement is not provided. Note that if geographic place names are used to express the geographic extent, USGIN profile specifies that these should be encoded using keyword with keyword type code = 'place.' Geographic names may be duplicated in the EX_Extent/description. |
| Resource content extent bounding box identificationInfo/- MD_DataIdentification/extent/- EX_Extent/geographicElement/- EX_GeographicBoundingBox | O-C | USGIN profile requires that if an EX_Extent/geographicElement is supplied, it include a geographic bounding box with bounding latitude and longitude expressed using World Geodesic System WGS 84 decimal degrees. The corner coordinates for the geographic bounding box must not coincide in one point, because this may result in fatal errors with some CSW implementations. Point locations must thus be represented as tiny rectangles. USGIN recommended practice is to place the actual point location in the lower left corner of the rectangle. |

| NAP- USGIN M/C/O | Comments on MD_DataIdentification |
|------------------------|---|
| C-X | Not used by USGIN profile, use keyword with type code = 'place'. This ISO19115 element provides an MD_Identifier element that identifies a geographic location by name. MD_Identifier provides an authority/CI_Citation that specifies the authority for a location name, and a code, which is a text string identifying the location. For the purposes of USGIN metadata, this information should be encoded using keywords, for which the napMD_KeywordTypeCode = 'place'; the thesaurus/CI_Citation has the same content as EX_GeographicDescription/authority/CI_Citation, and the keyword is the same as the EX_GeographicDescription/code. |
| C-X | Not used by USGIN profile. To improve interoperability, USGIN mandates the use of Geographic Bounding Box instead of bounding polygon. "An element which describes inclusions or exclusions in a resource. The enclosed boundary of the dataset expressed in x-y coordinates." |
| 0-0 | Property contains information about temporal extent to which resource is applicable. For many geoscience resources, this would be the geologic time period(s) to which the resource applies. USGIN mandates use of TimePeriod for all temporal extents. The default time extent for beginPosition@frame and endPosition@frame attributes are #ISO-8601. For geologic time extents, USGIN requires the values for beginPosition@frame and endPosition@frame to be populated using numeric time coordinates in Ma, measured positive increasing older with an origin at 1950 CE (see Temporal extents). The default frame attribute value for geologic time coordinates is "urn:cgi:trs:CGI:StandardGeologicTimeMa" ISO 8601 Default Example: <pre> <gml:timeperiod gml:id="IdModern"></gml:timeperiod></pre> |
| | USGIN M/C/O C-X |

| ISO 19115 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments on MD_DataIdentification |
|--|------------------------|--|
| Resource spatio-temporal extent (O) identificationInfo/- MD_DataIdentification/extent/- EX_Extent/temporalElement/- EX_SpatialTemporalExtent/ | O-X | Not used. Although use of EX_SpatialTemporalExtent is allowed by ISO19139 and NAP, USGIN mandates encoding space time location with EX_TemporalExtent and EX_GeographicBoundingBox. |
| Resource vertical extent (O) identificationInfo/- MD_DataIdentification/extent/- EX_Extent/verticalElement/- EX_VerticalExtent | 0-0 | Vertical extent is used to provide elevation location for resources that have an explicit vertical location. Most common example will be samples related to vertical location in a borehole. The borehole trace is the vertical CRS within which the sample will be located, typically using coordinates measured in linear distance from the collar (or ground level, or Kelly bushing) of the borehole. EX_VerticalExtent has minimumValue, maximumValue that are real numbers, and a verticalCRS verticalCRS has (minimally) an xlink:href attribute which references an EPSG registry code (http://www.epsg-registry.org/). For interoperability, USGIN mandates use of a VerticalCRS with origin at World mean sea level (MSL), with elevations measured up positive in meters; the URI for this VerticalCRS is "urn:ogc:def:crs:EPSG::5714" |

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3.3 Service identification elements (SV_ServiceIdentification)

Table 4. Service Identification properties (SV_ServiceIdentification)

| ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments on SV_ServiceIdentification |
|---|------------------------|---|
| Resource service citation (M) identificationInfo[1]/- SV_ServiceIdentification/- citation/CI_Citation | M-M | The citation attribute provides information for citing the described service. Note that for scientific citation purposes, a citation for the intellectual content of the information presented by the service would be found in the MD_DataIdentification/citation/CI_Citation for datasets identified in the operatesOn section of SV_ServiceIdentification. Citation is defined by Webster as "an act of quoting". For USGIN purposes, this should be viewed as information to identify the intellectual origin or authority for the content in the described resource, along the lines of a citation in a scientific journal. The purpose of the citation for the service is to identify a particular service instance as a unique entity. Required content for a CI_Citation element are title, date, and responsibleParty. |
| Resource title (M) identificationInfo[1]/- SV_ServiceIdentification/- citation/CI_Citation/title | M-M | USGIN recommends that the title in a service identification citation should uniquely identify the particular service instance, and inform the human reader about the service content, function, and context. |
| Resource reference date (M) identificationInfo/- SV_ServiceIdentification/- citation/CI_Citation/date/- CI_Date/date/ | M-M | The citation date for a service may indicate the creation date, when the service first became operational, the publication date, when the service first became public, or the revision date, which specifies the date of most recent update. If the service is no longer online, a notAvailable or superseded date may be specified. These are differentiated by the DateType. CI_Date content includes a date and dateType. Date for USGIN profile uses xs:date data type, defined thus "date uses the date/timeSevenPropertyModel, with hour. , -minute , and -second required to be absent . -timezoneOffset remains -optional " (http://www.w3.org/TR/xmlschema11-2). |
| | | Example date encoding: 2000-12-12+13:00, 2006-10-01. If the month or day is not known, encode as '01', for example '2006-01-01'. DateType is from napCl_DateTypeCode which identifies the event used for the temporal aspect of the resource. This date is distinct from the dateStamp for the metadata record, or the EX_Extent/temporalElement that specifies the time period to which the resource content is applicable. ISO Cl_DateTypeCode names that apply to services include {creation, publication, revision}. NAP adds {notAvailable, superseded}. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 Codelists for details on codelist usage. |

| ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments on SV_ServiceIdentification |
|--|------------------------|--|
| Unique resource identifier (O) identificationInfo/- SV_ServiceIdentification/- citation/CI_Citation/- identifier/MD_Identifier | C-O | For USGIN, because the Citation is for the service, this identifier should be identical to MD_Metadta/dataSetURI, and is therefore optional. For USGIN purposes, this element content value is only an identifier for the citation; it is not a URL for accessing the service. The USGIN profile requires the use of MD_Identifier element to identify resources. RS_Identifier may substitute for MD_Identifier in the ISO19139 schema, but the USGIN profile requires use of MD_Identifier. If additional codespace and version content is associated with the identifier, it should be encoded as MD_Identifier/authority/CI_Citation/alternateTitle and MD_Identifier/authority/CI_Citation/edition |
| Resource responsible party (O) identificationInfo/- SV_ServiceIdentification/- citation/CI_Citation/- citedResponsibleParty | M-M | USGIN requires at least one CI_ResponsibleParty following the NAP rule that count of (individualName + organisationName + positionName) > 0. The CI_ResponsibleParty/role/CI_RoleCode is from nap-CI_RoleCode. For a service, the point of contact information for questions or reporting problems should be in SV_ServiceIdentification/pointOfContact/CI_ResponsibleParty. The service citation responsible party would logically identify the parties responsible for creating (implementing) and publishing the service. ISO Role code names applicable to a service citation include {originator, principal-Investigator, processor, author, publisher}, and NAP adds {collaborator}. Other codelist values ISO {resourceProvider, custodian, owner}, and NAP {rightsHolder, mediator} would logically be specified in the SV_ServiceIdentification/pointOfContact element. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 Codelists for details on codelist usage. |
| Resource presentation form (O) identificationInfo/- SV_ServiceIdentification/- citation/CI_Citation/- presentationForm | 0-0 | The form in which the service is available, which in the case of a service is only through the service implementation described by the metadata record, so the information here is not generally very useful. Note that the citation is to the original source of intellectual content in the described resource should be in MD_DataIdentification/citation/CI_Citation that describes the datasets operated on by the service. presentationForm uses the CI_PresentationFormCode codelist; ISO code names that are applicable to a service citation include {documentDigital, imageDigital, mapDigital, modelDigital, profileDigital, tableDigital, videoDigital, audioDigital}. NAP adds {multimedia-Digital, diagramDigital}. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 Codelists for details on codelist usage. |
| Resource series (O) identificationInfo/- SV_ServiceIdentification/- citation/CI_Citation/series | 0-0 | Information about the series or collection of which the cited service is a part. NAP rule: (name + issuel-dentification) > 0. At this point there is not much precedent for aggregating services into a formal series, so in general this element is probably not applicable to services. |

| ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments on SV_ServiceIdentification |
|---|------------------------|--|
| Resource other citation details (O) identificationInfo/- SV_ServiceIdentification/- citation/CI_Citation/- otherCitationDetails | 0-0 | Free text information useful to identify and cite the described service instance, usage is not specified by this profile. |
| Resource collective title (O) identificationInfo/- SV_ServiceIdentification/- citation/CI_Citation/- collectiveTitle | 0-0 | Free text title of a "combined resource of which the service is a part." At this point there is not much precedent for aggregating services into a collections, so in general this element is probably not applicable to services. Use aggregation info to link layer-specific service metadata records to a metadata record for the aggregate service that serves the layer. |
| Resource abstract (M) identificationInfo/- SV_ServiceIdentification/- abstract | M-M | A free text summary of the content, significance, purpose, scope, etc. of the service described by this metadata. Exactly one value. |
| Resource purpose (O) identificationInfo/- SV_ServiceIdentification/- purpose | 0-0 | Text summary of the intentions for which the service was developed, including objectives for creating the service and use cases it is designed to support. One value optional. |
| Resource status (O) identificationInfo/- SV_ServiceIdentification/- status | M-M | Value is from MD_ProgressCode codelist. ISO Code names applicable to services include {completed, obsolete, onGoing, planned, required, underDevelopment}. NAP adds {proposed}. Obsolete is synonymous with deprecated. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 Codelists for details on codelist usage. |
| Resource point of contact (O) identificationInfo/- SV_ServiceIdentification/- pointOfContact | 0-0 | pointOfContact/CI_ResponsibleParty element for service metadata should contain information for a point of contact to report problems with the service. Element is optional but highly recommended! USGIN rule that count of (individualName + organisationName + positionName) > 0. The CI_ResponsibleParty/role/CI_RoleCode@codeListValue is from CI_RoleCode; applicable name for the point of contact party are from the ISO codelist {resourceProvider, custodian, owner}. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN mandates use of ISO codelists. See section 4.17.3 Codelists for details on codelist usage. |

| ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments on SV_ServiceIdentification |
|--|------------------------|--|
| Resource maintenance (O) identificationInfo/- SV_ServiceIdentification/- resourceMaintenance | 0-0 | This element provides information about the maintenance schedule or history of the service described by the metadata record. For a service, only one MD_MaintenanceInformation elements may be included; for which the MD_ScopeDescription MD_ScopeCode will be 'service'. If MD_MaintenanceInformation is present, then maintenanceAndUpdateFrequency is mandatatory, populated by a MantenanceFrequency-Code; ISO names in this code list are {continual, daily, weekly, fortnightly, monthly, quarterly, biannually, annually, asNeeded, irregular, notPlanned, unknown}. NAP adds {semimonthly}. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 Codelists for details on codelist usage. NAP specified best practice is that when SV_ServiceIdentification/status is set to "onGoing," either the attribute MD_MaintenanceInformation/dateOfNextUpdate or MD_MaintenanceInformation/userDefinedMaintenanceFrequency must be provided. Maintenance information for data the service presents should be included in the dataset metadata for |
| | | Maintenance information for data the service presents should be included in the dataset metadata for coupleResources associated with the service. |
| Graphic overview of resource (O) identificationInfo/- SV_ServiceIdentification/- graphicOverview | 0-0 | Highly recommended to include a small image visual representation of the resource provided by a map or image service. For geographic feature or data services, a graphic overview might show the geographic distribution of available data. If MD_BrowseGraphic is included, MD_BrowseGraphic/filename character string is mandatory. USGIN Recommended practice is to provide a complete URL as a gco:characterString value for the filename property. Use napMD_FileFormatCode code values (http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_115) in fileType/CharacterString. Although USGIN mandates use of napMD_FileFormatCode for specifying file type, the full encoding of the xsi:type= "napm:napMD_FileFormatCode_PropertyType" in the CharacterString element causes validation problems, and is not recommended. See section 4.17.3 Codelists for details on encoding of the file format code, which is special because this is a NAP extension to the ISO base specification. Repeatable element; multiple values may present different resolutions, or different parts of resource. Names associated with overview should provide sufficient information for user to distinguish these. |
| Resource format (O) identificationInfo/- SV_ServiceIdentification/- resourceFormat | O-X | The format of service response documents varies at the operation level, and for a particular operation, different output formats may be requested. A listing of all possible options here without bindings to the operations that respond with that format is not useful. NAP does not include this role in the list of properties associated with SV_ServiceIdentification |

| ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments on SV_ServiceIdentification |
|---|------------------------|---|
| Resource keywords (O) identificationInfo/- SV_ServiceIdentification/- descriptiveKeywords/MD_Keyword | 0-0 | Best Practice for USGIN profile metadata is to supply keywords to facilitate the discovery of metadata records relevant to the user. USGIN Keywords: USGIN keyword vocabularies are in development. Future versions of this profile may include required keyword vocabularies. Other Keywords: Keyword Type - allowed ISO values from MD_KeywordTypeCode: {discipline, place, stratum, temporal, theme}. NAP adds {product, subTopicCategory}. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, |
| | | USGIN recommends use of ISO codelists. See section 4.17.3 Codelists for details on codelist usage. USGIN requires that MD_Keyword/keyword contain a CharacterString (see section 4.16). USGIN best practice is to include keywords in English. |
| Resource specific usage (O) identificationInfo/- SV_ServiceIdentification/- resourceSpecificUsage/ | O-X | NAP excludes this property in INCITS 453, figure 64 p.175, but it is schema valid under http://schemas.opengis.net/iso/19139/20060504/serviceMetadata.xsd , which is the service metadata schema imported by apiso.xsd for the OGC CSW profile for ISO19115/19 metadata. Property not used by USGIN. |
| Condition applying to access and use of resource (O) identificationInfo/-SV_ServiceIdentification/-resourceConstraints/ | 0-0 | Restrictions on the access and use of a service. Follow NAP for specification of resourceConstraints. This attribute provides information for access control to the described service. In some situations, the metadataConstraints may allow a user to learn of the existence of a resource that they may not actually be able to access without further clearance. Follow NAP for specification of resourceConstraints. Constraints may be represented by MD_Constraint, MD_LegalConstraint, or MD_SecurityConstraint. The attribute MD_Constraint/useLimitation is mandatory unless MD_LegalConstraint or MD_SecurityConstraint is provided. Condition applying to access and use of resource - ISO19119 duplicates this property as SV_ServiceIdentification/restrictions. NAP specifies that SV_ServiceIdentification/resourceConstraints is to be used, and SV_ServiceIdentification/restrictions is not to be used; USGIN profile follows this provision. |

| ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments on SV_ServiceIdentification |
|--|------------------------|--|
| Aggregation information (O) identificationInfo/- | 0-0 | This element includes either a citation for or identifier of an associated service or dataset, along with the type of association, and optionally the activity that produced the dataset. |
| SV_ServiceIdentification/- aggregationInfo/- MD_AggregateInformation | | MD_AggregateInformation requires either aggregateDataSetName/CI_Citation or aggregateDataSet-Identifier/MD_Identifier. associationType is mandatory, from DS_AssociationTypeCode. ISO code names in this list include {crossReference, largerWorkCitation, partOfSeamless-Database, source, stereoMate}. NAP adds {isComposedOf}. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 Codelists for details on codelist usage. The only currently recognized use for this aggregation would be to associate metadata for individual layers with metadata for a service that provides a collection of layers. If the related resource has an associated metadata record, USGIN recommended practice is to include |
| | | the identifier for that metadata record in aggregateDataSetIdentifier/MD_Identifier. For related resources that do not have a metadata record, aggregateDataSetName/CI_Citation may be used; this element is optional if aggregateDataSetIdentifier has a value. |
| | | For USGIN profile, this property, rather than MD_Metadata/parentIdentifier, should be used to indicate relationships between described resources. |
| Resource service type (M) identificationInfo/- SV_ServiceIdentification/- serviceType | M-M | Exactly one value required. USGIN mandates use of a LocalName value (http://schemas.opengis.net/iso/-19139/20060504/srv/serviceMetadata.xsd allows either localName or ScopedName). There is not as yet a standard registry of service types and identifiers that can serve as an authority for serviceTypes. An interim list of service types and identifiers is included in section 7.1 ServiceType (with the ad hoc codespace URI 'http://resources.usgin.org/registry/serviceType201001'). Valid values for OGC services are {WMS, WFS, WCS, CSW,} |
| | | Example: |
| | | <pre><srv:servicetype> <gco:localname codespace="http://resources.usgin.org/registry/serviceType201001">WMS</gco:localname> </srv:servicetype></pre> |
| Resource service type version (O) identificationInfo/- SV_ServiceIdentification/- serviceTypeVersion | O-C | Multiple serviceTypeVersion tags may not be implemented in some harvesting server applications - US-GIN recommends a reverse chronological order for supported versions. Constraint: if various versions are available, it is mandatory to list versions that are supported. Default is oldest version of service. |

| ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments on SV_ServiceIdentification |
|---|------------------------|--|
| Resource service access properties (O) identificationInfo/- SV_ServiceIdentification/- accessProperties | 0-0 | Optional MD_StandardOrderProcess element to provide information on the availability of the service which include: fees, available date and time, ordering instructions, turnaround. Ordering instructions and turnaround are not applicable to web services. |
| Resource service restrictions (O) identificationInfo/- SV_ServiceIdentification/- restrictions | O-X | Not used by USGIN; use resourceConstraints as per NAP. |
| Keywords (O) identificationInfo/- SV_ServiceIdentification/- keywords | O-X | Not used by USGIN; use descriptiveKeywords as per NAP |
| Resource service content extent (O) identificationInfo/- SV_ServiceIdentification/- extent/EX_Extent | C-C | Defines the spatial (horizontal and vertical) and temporal region to which the content of the resource applies. For USGIN, the spatial extent is a rectangle that bounds the geographic extent to which resource content applies. Best Practice for USGIN is to include an extent for any resource with content related to some geographic or temporal location. For geoscience resources, the temporal extent may be expressed using time ordinal eras from a geologic time scale if the resource is related to some particular geologic time. USGIN specifies count(description + geographicElement + temporalElement) >0 |
| Resource service content extent description () identificationInfo/- SV_ServiceIdentification/- extent/EX_Extent/description | C-C | Free text that describes the spatial and temporal extent of the dataset. USGIN specifies that description is mandatory if a geographicElement or temporalElement is not provided. Note that if geographic place names are used to express the geographic extent, USGIN profile specifies that these should be encoded using keyword with keyword type code = 'place'. Geographic names may be duplicated in the EX_Extent/description. |
| Resource service content extent bounding box () identificationInfo/- SV_ServiceIdentification/- extent/EX_Extent/- geographicElement/- EX_GeographicBoundingBox | O-C | USGIN profile requires that if an EX_Extent/geographicElement is supplied, it include a geographic bounding box with bounding latitude and longitude expressed using WGS 84 decimal degrees. The corner coordinates for the geographic bounding box must not coincide in one point, because this may result in fatal errors with some CSW implementations. Point locations must thus be represented as tiny rectangles. USGIN recommended practice is to place the actual point location in the lower left corner of the rectangle. |

| ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments on SV_ServiceIdentification |
|---|------------------------|--|
| Resource service content extent geographic description () identificationInfo/- SV_ServiceIdentification/- extent/EX_Extent/geographic- Element/EX_Geographic- Description | C-X | Not used by USGIN profile, use keyword with type code = 'place'. This ISO19115 element provides an MD_Identifier element that identifies a geographic location by name. MD_Identifier provides an authority/CI_Citation that specifies the authority for a location name, and a code, which is a text string identifying the location. For the purposes of USGIN metadata, this information should be encoded using keywords, for which the MD_KeywordTypeCode = 'place'; the thesaurus/CI_Citation has the same content as EX_GeographicDescription/authority/CI_Citation, and the keyword is the same as the EX_GeographicDescription/code. |
| Resource service content extent bounding polygon () identificationInfo/- SV_ServiceIdentification/- extent/EX_Extent/- geographicElement/- EX_BoundingPolygon | C-X | To improve interoperability, USGIN mandates use of Geographic Bounding Box; bounding polygons may be present, but may be ignored by harvesters. |
| Resource service temporal extent (O) identificationInfo/- SV_ServiceIdentification/- extent/EX_Extent/temporal- Element/EX_TemporalExtent/- extent/TimePeriod | 0-0 | Property contains information about temporal extent to which resource is applicable. For many geoscience resources, this would be the geologic time period(s) to which the resource applies. Although the ISO19139 xml schema allows temporal extents to be instants, intervals, or ordered eras, USGIN mandates use of only TimePeriod for temporal extent in order to make metadata interoperable. USGIN mandates that values for beginPosition@frame and endPosition@frame must be populated. The default frame property value is "#ISO-8601", for standard calendar date and time. For geologic time extents, USGIN requires the values for beginPosition@frame and endPosition@frame to be populated using numeric time coordinates in Ma, measured positive increasing older with an origin at 1950 CE (see Temporal extents). The default frame attribute value for geologic time coordinates is "urn:cgi:trs:CGI:StandardGeologicTimeMa". See section 4.21, below. |
| Resource service spatio-temporal extent (O) identificationInfo/- SV_ServiceIdentification/- extent/EX_Extent/- temporalElement/- EX_SpatialTemporalExtent/ | O-X | Although use of EX_SpatialTemporalExtent is allowed by ISO19139 and NAP, USGIN best practice is to encode space time location with EX_TemporalExtent and EX_GeographicBoundingBox. Other optional extent elements may be included, but they may be ignored by client implementations processing the metadata document. |

| ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments on SV_ServiceIdentification |
|---|------------------------|--|
| Resource service vertical extent (O) identificationInfo/- SV_ServiceIdentification/- extent/EX_Extent/- verticalElement/- EX_VerticalExtent | 0-0 | Vertical extent is used to provide elevation location for resources that have an explicit vertical location. Most common example will be samples related to vertical location in a borehole. The borehole trace is the vertical CRS within which the sample will be located, typically using coordinates measured in linear distance from the collar (or ground level, or Kelly bushing) of the borehole. EX_VerticalExtent has minimumValue, maximumValue that are real numbers, and a verticalCRS verticalCRS has (minimally) an xlink:href attribute which references an EPSG registry code (http://www.epsgregistry.org/). The default VerticalCRS code is for the World mean sea level (MSL) in meters: "urn:ogc:def:crs:EPSG::5714" |
| Coupled Resource () identificationInfo/- SV_ServiceIdentification/- coupledResource | 0-0 | This element correlates operations (identified by operationName) with datasets (identified by identifier). For logical consistenty, and SV_coupledResource/identifier values should be equal to MD_DataIdentification/citation/CI_Citation/identifier/MD_Identifier/code for a dataset that is the target of a SV_ServiceIdentification/operatesOn element (either in an inline MD_DataIdentification/citation/code element, or a @uuidref attribute). This element is necessary to implement the many-to-many relationship between data sources and operations in a single service. |
| Coupled Resource operation name (M) identificationInfo/- SV_ServiceIdentification/- coupledResource/- SV_CoupledResource/- operationName | M-M | String, the name of the service operation: GetMap, GetFeature, etc. There is no internal check in the metadata record that the given operation name is valid. |
| Coupled Resource identifier (M) identificationInfo/- SV_ServiceIdentification/- coupledResource/- SV_CoupledResource/identifier | M-M | Identifier of a given tightly coupled dataset. Equal to MD_DataIdentification/citation/CI_Citation/identifier/MD_Identifier/code for a dataset that is the target of a SV_ServiceIdentification/operatesOn element (either in an inline MD_DataIdentification/citation/code element, or a @uuidref attribute). |
| Coupled Resource scoped name (X) identificationInfo/- SV_ServiceIdentification/- coupledResource/- SV_CoupledResource/ScopedName | X-O | OGC 07-045 application profile for ISO metadata using CSW 2.0.2 extends SV_CoupledResource with a ScopedName, defined as a scoped identifier of the resource in the context of the given service instance (e.g. layer name or featureTypeName). This is necessary for users to generate service requests (like GetMap or GetFeature) based on ISO service metadata. |

| ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments on SV_ServiceIdentification |
|---|------------------------|--|
| Service coupling type (M) identificationInfo/- SV_ServiceIdentification/- | M-M | Type of coupling between service and associated data (if exists) - "Qualitative information on the tightness with which the service and the associated data are coupled." NAP. NAP uses the napSV_CouplingType codelist. |
| couplingType | | According to ISO: |
| | | loose - service instance is loosely coupled with a data instance, i.e. no MD_DataIdentification class has to be described (ISO 19119). |
| | | mixed - service instance is mixed coupled with a data instance, i.e. MD_DataIdentification describes the associated data instance and additionally the service instance might work with other external data instances (ISO 19119 / ISO 19115). |
| | | tight - service instance is tightly coupled with a data instance, i.e. MD_DataIdentification class MUST be described. (ISO 19119 / ISO 19115) |
| | | According to OGC: |
| | | loose - A service instance that is not associated with a specific dataset or dataset collection. Loo- selycoupled services may have an association with data types through the service type defini- tion. Dataset metadata need not be provided in the service metadata. |
| | | mixed - A service that is associated with a specific dataset or dataset collection. Service metadata shall describe both the service and the geographic dataset, the latter being defined in accordance with ISO 19115. But this service instance can also be used with external data (i.e. data that is not described by the operatesOn association). |
| | | tight - An information resource that is hosted on a specific set of hardware and accessible over a network. |
| Service operations (M) identificationInfo/- SV_ServiceIdentification/- containsOperations | M-M | "This element is intended for use to describe the operations performed by the service". However, the ISO19119 model includes insufficient detail to completely describe all parameters necessary to automate connection to a service. Widely used xml formats exist to describe service function, including OGC getCapabilities.xml and W3C Web Service Description Language (WSDL). Following INSPIRE guidelines, USGIN does not use the srv:containsOperations. It is a required element in the ISO19139 (20060504) srv.xsd xml schema, so it should be populated with the attribute gco:nilReason='Missing'. Although this is xml schema valid, it may break some existing client implementations; we need to work with developers to correct these problems. |
| | | For information describing function of the service see distributionInfo//transferOptions//online//linkage where online//name = 'serviceDescription'; this should provide a URL for getCapabilities or a WSDL document, depending on the service type. |

| ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments on SV_ServiceIdentification |
|---|------------------------|---|
| Service operation name (M) | M-X | not used by this profile |
| <pre>identificationInfo/- SV_ServiceIdentification/- containsOperations/- SV_OperationMetadata/- operationName</pre> | | |
| Service operation distributed computing platforms (M) identificationInfo/- SV_ServiceIdentification/- containsOperations/- SV_OperationMetadata/DCP | M-X | not used by this profile |
| Service operation description (O) identificationInfo/- SV_ServiceIdentification/- containsOperations/- SV_OperationMetadata/- operationDescription | O-X | not used by this profile |
| Service operation invocation name (O) identificationInfo/- SV_ServiceIdentification/- containsOperations/- SV_OperationMetadata/- invocationName | O-X | not used by this profile |
| Service operation online resource (M) identificationInfo/- SV_ServiceIdentification/- containsOperations/- SV_OperationMetadata/- connectpoint | M-X | not used by this profile; see distributionInfo//transferOptions//onLine |

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|-----|--|

| ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata | NAP- USGIN M/C/O | Comments on SV_ServiceIdentification | |
|---|------------------------|--|--|
| Service operates on (O) | O-C | "Provides information on the datasets that the service operates on." ISO 19119. | |
| <pre>identificationInfo/- SV_ServiceIdentification/- operatesOn</pre> | | With tightly coupled references, operatesOn must include a map or feature layer's valid MD_DataIdentification element inline or a @uuidref attribute value that explicitly links to an existing dataset metadata record that describes the same layer. | |
| | | Mandatory if metadata for datasets on which the service operates are available. The value of SV_ServiceIdentification/operatesOn@uuidref or SV_ServiceIdentification/operatesOn/MD_Data-Identification/citation/CI_Citation/identifier/MD_Identifier/code must correspond to one of the SV_ServiceIdentification/coupledResource/MD_CoupledResource/identifier values. If the metadata record for the coupled dataset is a separate gmd:MD_Metadata record, the service described in the service metadata record should be identified as a distribution for the dataset. | |
| | | Explicitly linked reference example: | |
| | | <pre><srv:operateson <="" pre="" uuidref="13cele84-c887-4fd8-b888-8d021b1fa4c2" xlink:href="http://resources.azgs.org/geonetwork/srv/en/metadata.show?id=8717"></srv:operateson></pre> | |
| | | <pre>xlink:title="azgs:azgeochron"/></pre> | |

3.4 USGIN specification constraints and recommendations

- Summary of constraints to ISO19115, ISO119, ISO19139, and NAP (INCITS 453) introduced by USGIN profile.
- Require fileIdentifier

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- Require hierarchyLevelName
 - Require metadataStandardName and metadataStandardVersion
- Require DatasetURI if there is one
- Allow multiple distributor-format-transfer option combinations for a single resource.
- Representation of aggregated resources done using identificationInfo/MD_DataIdentification/aggregationInfo/MD_AggregateInformation, not MD_Metadata/parentIdentifier
 - Geographic extent must be represented by bounding box in WGS 84 decimal degrees
- Vertical resource extend uses CRS referenced to mean sea level, meters, measured positive up.
 - Resolution is expressed using equivalentScale/MD RepresentativeFraction/denominator
 - Language for resource must be specified
 - Introduces recommended distribution format codes (Table 6) for distributionFormat/name introduced for categorization of physical resources, like a book, rock sample, paper document. USGIN recommends use of MIME types if they are registered for the format, and provides a recommended syntax for file formats that do not have corresponding MIME types.
 - Introduces a ServiceType codelist recommended for use population the srv:ServiceType (Table 11)
 - Introduces recommended CI_OnlineResource/name strings (Table 12) to identify special online resources link icons for branding.

As a convention for using controlled vocabularies on characterString elements without the overhead of a new namespace and xml schema, USGIN proposes that use a controlled vocabulary be indicated by using xsi:type on the gco:characterString element to make the type gml:CodeType, which then requires a codeSpace attribute (see 4.14.2-Non digital resources and 7.2-Linkage name conventions). This codeSpace should be the URI for the vocabulary used, with the implication that the CharacterString element value will then be an identifier from that vocabulary. This essentially turns the CharacterString into a GML scoped name or gco:LocalName element.

3.5 USGIN specification extensions

- Summary of extensions to ISO19115, ISO119, ISO19139, and NAP (INCITS 453) introduced by USGIN profile.
- 256 Allow use of identificationInfo/SV ServiceIdentification/coupledResource/-
- 257 SV_CoupledResource/ScopedName defined by OGC 07-045 ISO profile for CSW 2.0.2, use to provide WMS
- 258 layer names or WFS feature names for service requests.

4 Usage notes for Metadata Elements

260 This section presents additional information and discussion to supplement that in Table 1.

4.1 Metadata file identifier

MD_Metadata/fileIdentifier is unique identifier for the metadata file. Some metadata profiles suggest that the metadata field UUID should be the same as the UUID for the described resource. This seems problematic. In the USGIN scheme, the metadata record is considered an independently identified resource from the resource it describes. The described resource identifier is the Unique resource identifier (Dataseturi, 4.8, below).

4.2 Metadata hierarchy

The ISO19115 specification (especially Annex H) discusses the use of metadata hierarchy, in which a resource may inherit metadata properties from parent metadata records in the hierarchy. For example a dataset in a dataset series might inherit all of the metadata content from the parent dataset series metadata record, except for dataset-specific data quality metadata. The linkage would be made through MD_Metadata/parentIdentifier. This kind of nesting seems problematic in a CSW environment in terms of how queries could be constructed, and the kind of client behavior that would be required to navigate the parent links to acquire 'inherited' properties from 'parent' records. For catalog service purposes, US-GIN mandates that in metadata records returned by services, all inherited properties in such a hierarchy should be included explicitly in the metadata document, as opposed to implicitly through the parentIdentifier link. Internal document links may be used where allowed by the xml schema for identified elements repeated in a single response document.

4.3 Metadata Contact vs. Resource Citation vs. Resource Contact

There are various locations to store contact information within an ISO 19139 metadata record. Here is a summary of the required contact properties and their significance as it pertains to the USGIN Profile.

- MD_Metadata/contact/CI_ResponsibleParty or "metadata point of contact" describes how to contact the party responsible for the metadata record to allow users to report errors, updates to metadata etc. The mandatory CI_RoleCode is set to "pointOfContact".
- MD_Metadata/identificationInfo/[MD_DataIdentification] | SV_ServiceIdentification]/-citation/CI_Citation/citedResponsibleParty/CI_ResponsiblerParty provides information to identify the intellectual origin of the content in the described resource. This is straight forward when citing library resources (books, journals, etc.) but less clear when defining the intellectual origin of, for example, physical samples. The mandatory CI_RoleCode is set to one of the ISO codelist values {custodian, owner, distributor, originator, pointOfContact, principalInvestigator, publisher, author}. NAP codelist values {collaborator, editor, rights holder} may also apply.
- MD_Metadata/identificationInfo/[MD_DataIdentification || SV_ServiceIdentification]/pointOfContact/CI_ResponsibleParty or "resource point of contact" contains information on who to contact to access the described resource. The mandatory CI_RoleCode is set to one of the ISO codelist values {resourceProvider, custodian, owner, user, distributor, originator, pointOfContact, principalInvestigator, processor, publisher, author}. NAP codelist values {collaborator, editor, mediator, rights holder} may also apply.

Optional contact information in the distribution section of the metadata provides point of contact for individual distribution processes.

4.4 Resource Title

- 303 Resource titles should provide sufficient information to distinguish the resource for other similar re-
- 304 sources. They are not required to be globally unique, but users will be presented only with the resource
- 305 title in CSW brief response documents. It is thus a disservice to have significant duplication of title strings.

4.5 Resource Abstract

Ideally the resource abstract provides a succinct summary of the content of the resource, the purpose for which it was originally created, some indication of important quality parameters to help evaluate fitness for other purposes, any significant constraints on use of the resource, and a list of distribution options.

4.6 Resource Type

- The ISO 19115 MD_Metadata/hierarchyLevel property provides a high level categorization of resource
- 312 types. The European INSPIRE Implementing Rules (MD IR and ISO 20090218) proscribes the code list
- for the first hierarchyLevel xml element in an MD Metadata document to be one of {dataset, ser-
- 314 vice, series}, or the metadata set will be considered out of scope for the directive. Thus, metadata
- 315 meant to be utilized by INSPIRE catalogs must follow this rule. The full ISO MD_ScopeCode list has a
- 316 wider (and more useful) variety of resource categories; one or more hierarchyLevel elements using these
- 317 codes could follow the first one with an INSPIRE-valid code in the first element to maintain INSPIRE
- 318 compliance.

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- Table 1 in this document includes a more geoscience-domain-specific list of resource types, and values
- from this list should be used in one or more hierarchyLevelName elements. To enable resource-category-
- 321 type searches to find narrower subcategories without complex query processing, hierarchyLevelName
- 322 elements for the resource type and all broader/more general resource type categories should be included.
- The hierarchical categorization of the resources is encoded with the most specific category first, and pro-
- gressively broader categories listed subsequently. Thus, harvesters that only take the first hierarchy-
- 325 LevelName element will get the most specific value. For example, if the resource is a photograph:

```
326
      <qmd:hierarchyLevelName>
327
            <gco:CharacterString>Photograph</gco:CharacterString>
328
      </gmd:hierarchyLevelName>
329
      <qmd:hierarchyLevelName>
330
            <gco:CharacterString>StillImage</gco:CharacterString>
331
      </gmd:hierarchyLevelName>
332
      <qmd:hierarchyLevelName>
333
            <gco:CharacterString>Image</gco:CharacterString>
334
      </gmd:hierarchyLevelName>
335
      <gmd:hierarchyLevelName>
336
            <gco:CharacterString>Document</gco:CharacterString>
```

Note that the distinction of resource type and format is not always clear. Table 1 attempts to define resource types that are not specifically bound to a particular format, but are defined based on the kind of content. Format is interpreted as relating to specific approaches to encoding content and committing it to some sort of media.

4.7 Resource Locator

</gmd:hierarchyLevelName>

URL's for online access to resources are encoded in USGIN ISO 19139 metadata documents in the element MD_Distribution/transferOptions/MD_DigitalTransferOptions/online/CI_OnlineResource. Consistent use of this rule eliminates ambiguity on where to locate the URL to access a resource. Work still remains to develop conventions for use of the CI_OnlineResource subelements protocol, application-

Profile, name, description, and function to enable metadata clients to reliably access referenced re-

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4.8 Unique Resource Identifier

350 The MD Metadata/DataSetURI property should be a globally unique identifier for the described resource. The protocol used for this identifier is not proscribed by the USGIN Profile, but if it does not have a know 351 352 resolution service, the capabilities document for a CSW service providing the metadata should have at 353 least a text explanation of how to resolve URI's used by the service. Protocols with available resolvers in-

354 clude http (use the WWW DNS system) and doi (http://dx.doi.org/). Some authorities using urn: protocols 355

are also implementing or have resolver services in place.

4.9 Browse Graphics

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394 395 NAP profile (INCITS 453-2009) defines napMD_FileFormatCode_PropertyType using the ISO19139 extension procedure; including this as an xsi:Type attribute on gmd:fileType adds codespace and code-ListValue to the gmd:fileType element, but this causes validation problems with imported xml schema in the schema defining the new property type. USGIN mandates use of napMD_FileFormatCode list (http://www.fgdc.gov/nap/metadata/register/codelists.html#IC 115) simply by using the format name strings in that codelist as the characterString values in gmd:FileType.

```
363
      <qmd:MD BrowseGraphic>
364
        <qmd:fileName>
365
          <qco:CharacterString>http://publicdocs.mnr.gov.on.ca/View.asp?-
366
                   Document_ID=9632&Attachment_ID=18204</gco:CharacterString>
367
        </gmd:fileName>
368
        <qmd:fileDescription>
369
            <gco:CharacterString>Base Map from OMNR</gco:CharacterString>
370
        </gmd:fileDescription>
371
        <qmd:fileType>
372
        <!-- this is a napMD_FileFormatCode_PropertyType codelist value -->
373
            <gco:CharacterString>jpg</gco:CharacterString>
374
        </gmd:fileType>
375
      </gmd:MD_BrowseGraphic>
```

Code example 1. Encoding url, display name and file type for browse graphic.

4.10 Resolution and equivalentScale

For spatial datasets, some indication of the resolution of the data is very useful for evaluating fitness for use. From a data perspective, resolution is specified by a distance that represents the smallest length between two resolvable points in the dataset. For a grid or coverage, this would be the average distance between sample points. From data portrayal perspective, an equivalentScale is reported, representing the scale at which the portrayal was intended to be viewed. To calculate equivalentScale given a resolution distance, recommended practice is to divide the resolution distance in meters by 0.0005. This assumes that the smallest distance resolvable in a map display for human usage is 0.5 mm.

4.11 Resource Language

USGIN metadata is assumed to use American English and by default documents should be returned. Other localizations may be implemented, but in order to avoid complexity with PT Text and LocalizedCharacterString, USGIN recommended practice is to implement services for different languages as different services, each of which serves CharacterStrings in the language specified by the MD Metadata/language element.

4.12 Encoding of Vertical Extents

A vertical extent must specify the vertical coordinate reference system (CRS). In many cases this will be reference to Earth mean sea level or some similar datum, but for boreholes, vertical referencing is defined relative to a borehole trace, with the datum at the ground surface (borehole collar, or Kelly bushing). For interoperability, vertical extents should be converted to meters measured vertically positive from mean

- 396 sea level. This puts the onus to convert down hole coordinates for deviated holes on the metadata pro-397 vider. Users searching for resources specific to some depth below the surface will have to convert this to 398 an elevation relative to sea level in order to query the CSW providing this metadata.
- 399 EX VerticalElement has minimumValue, maximumValue that are real numbers, and a verticalCRS, which 400 has (minimally) an xlink:href attribute which references an EPSG registry code (http://www.epsg-401 registry.org/). For interoperability, USGIN mandates use of a VerticalCRS with origin at World mean sea 402 level (MSL), with elevations measured up positive in meters; the URI for this VerticalCRS is 403 "urn:ogc:def:crs:EPSG::5714"
- 404 Other vertical extent elements may be included referenced to ground surface, Kelly bushing or other ref-405 erence systems. These will be useful only is as far as they are understood by client software. The vertical CRS must be specified by an SC VerticalCRS element, which has (minimally): 406
 - a name/RS Identifier,

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- a scope characterString,
- exactly one datum/CD VerticalDatum, which requires a scope CharacterString, and for USGIN an anchorDefinition character string
- exactly one coordinateSystem/CS_VerticalCS, which has a name/RS_Identifier, and one axis With axisAbbrev, axisDirection/CS AxisDirection, and axisUnitID/UnitOfMeasure.

4.13 Use of MD Distribution and MD Distributor

- The ISO19115 model provides two possible paths for specifying information about how a resource is distributed, i.e. how a user can access the resource. The MD_Distribution element may have 0 to many distributionFormat, distributor, and transferOptions child elements (see Figure 1). On the other hand, each of the distributor child elements may have 0 to many distributor-Format and distributor-Transfer0ption elements. Several major existing applications that consume ISO19139 xml metadata files (ESRI GeoPortal Toolkit and GeoNetwork) are configured out of the box to expect format and transfer option information to be at the MD Distribution/distributionFormat and MD Distribution/transferOptions path. This works fine as long as there are not different format or transfer options from different distributors, or different transferOptions for different formats. In these cases, a binding between distributor, format, and transfer options necessitates use of the MD Distribution/distributor/MD Distributor path to distributorFormat and distributorTransferOptions (and distributionOrderProcess) information that works together.
- 426 In order to accommodate both existing applications that utilize content in the MD Distribution/dis-427 tributionFormat and MD_Distribution/transferOptions elements, and situations that require binding be-428 tween distributor, order process, format, and transfer options, the USGIN profile mandates that if multiple 429 MD Distribution/distributionFormat Or MD Distribution/transferOptions elements are included in a 430 document, all formats must be available via all the specified transfer options, and the content of these 431 elements should be included in line. If multiple MD Distribution/distributor elements are present, with-432 out child MD Distributor/distributorFormat OT MD Distributor/distributorTransferOptions elements, 433 then all formats and transfer options are available from all distributors.
- 434 To specify different bindings between distributor, order process, format, and transfer options, a separate 435 MD Distribution/distributor/MD Distributor instance is included for each binding. One MD_Distributor/distributorFormat and one MD_Distributor/distributorTransferOptions element 436 437 should be included for applications that expect content in these elements, and the format and transfer op-438 tions specified by these elements should apply to the first distributor/MD_Distributor element. Re-439 peated CI ResponsibleParty, MD StandardOrderProcess, MD Format or MD DigitalTransferOption ele-440 ments in the distributor/MD Distributor elements should be specified by reference (xlink:href to gml:id 441 of first occurrence of the element within the document). The implication is that the distributionOrderProcess/MD StandardOrderProcess.distributorFormat/MD Format.anddistributorTransferOptions/-
- 442
- 443 MD DigitalTransferOptions child elements of a single MD Distributor are all compatible with each other.
- 444 USGIN differs from NAP by allowing multiple distributor elements, but since this is schema valid under
- 445 ISO19139 xml schema, and the extra elements can be ignored by applications expecting only a single
- 446 distributor element, this should not cause incompatibility.

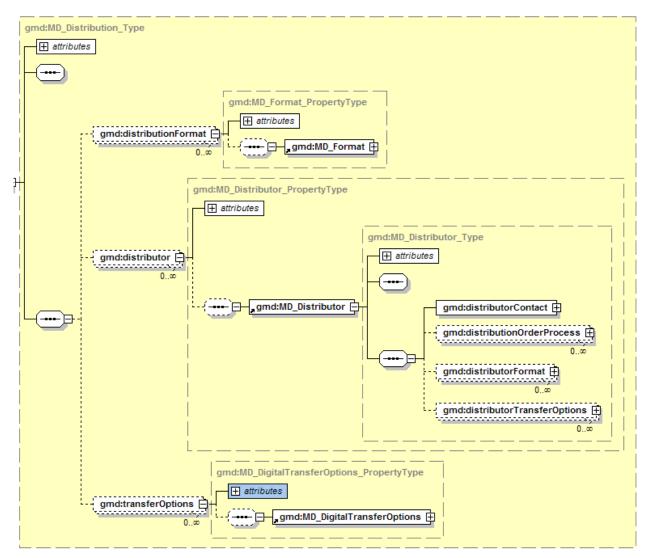


Figure 1. gmd:MD_Distribution_Type diagram

4.14 Distribution Format

If the resource is a physical resource, like a book, rock sample, paper document, the distribution/../MD_Format/name is mandatory, and USGIN recommends use of terms from distribution format codelist (see Table 6). Note that format is partially orthogonal from resource type (Table 1). A document may be available in various digital (pdf, tiff, doc, txt) or non-digital (book, loose sheets) formats

4.14.1 Digital resources

The format vocabulary needs to be designed to work in the framework of the distribution/../-MD_DigitalTransferOptions, which provides protocol, applicationProfile, name, and function subelements for online resources, and medium name and MD_MediumFormatCode for offline resources. For digital resources it provides a place to record file-format information that does not have any other obvious home. Examples in INCITS 453, INSPIRE 19115/19, and ANZLIC 2007 populate MD_Format/name with values like 'ESRI ARC/INFO Coverage', 'ESRI shapefile', 'ESRI ARC/INFO Export e00', and 'MapInfo MID/MIF' all pertain to digital resources. If a MIME format (http://www.iana.org/assignments/media-types/) is defined for a digital file format, the MIME media-type code should be used. If no appropriate MIME type is

registered with IANA, USGIN mandates that the distribution format for digital resources should specify the file format using a pattern that includes vendor, application name, and file extension.

Pattern for digital resources: [vendor:applicationName]/fileExtension. The vendor and application names may not be applicable, and could be omitted, but the '/' and file extension should always be present. If the format consists of a single file, the file extension is a three letter file-type abbreviation assigned by the vendor. If the format consists of a package of files (e.g. an ArcGIS file geodatabase), the file extension is a name that in most cases should be obvious from vendor usage. The accompanying MD_Format/version value should indicate the version of application software if the format is specific to some version.

Service metadata includes distribution information as well as dataset metadata. OGC services commonly allow specification of different output formats, and the formats offered are listed in the OGC capabilities document. It is tempting to list the output formats offered by the service in distributioninfo as a collection of distributionFormat/MD Format elements, but this is only useful if all formats are applicable to all service requests, or if the mapping between requests and formats is obvious. Version 2.4 of GeoNetwork harvests OGC getCapabilities documents, and puts the format information in a collection of srv:connectPoint/CI OnlineResource/protocol elements, with connectPoint elements for each format available on each request. ISO 19119 defines connectPoint as 'handle for accessing the service interface'. Using this to encode different available output formats seems a bit of a stretch. Because of the USGIN decision that operation metadata is best conveyed to metadata consumers by providing a link to a service-specific description file (getCapabilities or WSDL), the SV OperationMetadata element is not used by the USGIN profile. Thus the recommendation is to list the output formats offered by the service in distributioninfo as a collection of distributionFormat/MD Format elements if all formats are applicable to all service requests, or if the mapping between requests and formats is obvious. Encoding of the format name should use whatever convention is used by the service to specify that output format in requests made to the service.

Table 5. Example format strings for digital files. These are to be used only if an appropriate MIME type is not defined.

| ESRI:ARCINFO/Coverage |
|-----------------------------|
| /shapefile |
| ESRI:ARCINFO/e00 |
| PitneyBowes:MapInfo/mid |
| ESRI:ArcGIS/mdb |
| ESRI:ArcGIS/fileGeodatabase |
| Microsoft:Access/mdb |

4.14.2 Non digital resources

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503 504 The MD_Format element is the only format information for resources that do not have digital transfer options, and USGIN proposes Table 6 as a vocabulary for use to specify format of non-digital resources. Although this codelist could be implemented as a schema extension, for the time being we propose to use it as a controlled vocabulary specified by profile and practice, rather than schema. Use of such controlled vocabulary can be indicated by using xsi:type on the gco:characterString element to make the type gml:CodeType, which then requires a codeSpace attribute. The distribution format Identifier from Table 6 should be used as the element value. Example encoding:scool-characterString xsi:type="gml:CodeType"

codeSpace="http://resources.usgin.org/registry/distributionFormatNames201001">sample:core</gco: CharacterString>

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Table 6. USGIN Distribution formats for non digital resources. URI for this codelist is http://resources.usgin.org/registry/distributionFormatNames201001

| Identifier | Name | Parent format | Scope |
|-----------------------|-------------------------|------------------|---|
| physicalArtifact | Physical artifact | | described resource is a physical object |
| sample | Sample | physicalArtifact | Use for uncategorized sample. A |
| sample:core | Core | sample | Cylindrical rock sample extracted from Earth with a coring drill |
| sample:cuttings | Cuttings | sample | Small rock fragments recovered from drilling process as sample of material being drilled |
| sample:fluid | Fluid | sample | Sample of a fluid |
| sample:handSample | Hand sam- ple | sample | Single piece or pieces of material. |
| hardCopy | Hard copy manuscript | physicalArtifact | A physical copy of a document on paper, film, or other similar material. |
| hardCopy:book | Book | hardcopy | Manuscript printed on paper, bound into a single volume |
| hardCopy:manuscript | Manuscript | hardCopy | Other printed or written representation on physical media, usually paper or mylar, includes unbound books, index cards, loose notes, file folders of papers |
| hardCopy:printedImage | Printed im- age | hardCopy | Image on paper or other opaque or semi- opaque media. |
| printedImage:paperMap | Paper map | printedImage | Map image on a single sheet |
| hardCopy:filmImage | Film image | hardCopy | Image on film, viewed by passing light through the film. Includes single still images and collections of connected images for a movie. |
| fieldSite | Field site | | resource is a station located on or in the Earth, generally of interest as a sampling site at which other resources were collected or originated. |
| tapeRecording | Tape recording | | use for sound resources that are recorded on magnetic tape. |

4.15 CI_OnlineResource

For USGIN profile, each distributor/MD_Distributor is a binding between one or more transfer options and the distributor formats that are available through that/those transfer options (MD_DigitalTransfer-Options/onLine/CI_OnlineResource in particular). If different formats are available from the same distributor, but have different transfer options, these should be represented as different distributor/-MD Distributor instances.

In order to enable client applications to determine how to directly connect to a resource, there needs to be agreement on what content is required in the CI_OnlineResource element, and how it will be encoded.

The linkage property provides a URL for accessing the resource. The role of the protocol, application-Profile, name and function properties is to provide sufficient additional information for a client application to automatically connect a user with the online resource. The description property may be used to provide information about the online resource, and more usefully, to provide an explanation of how the other content of the CI OnlineResource element is to be used to access the resource.

 The ESRI GeoPortal toolkit looks for the presence of MD_Metadata/distributionInfo/MD_Distribution/transferOptions/MD_DigitalTransferOptions/online/CI_OnlineResource/function/CI_OnlineFunctionCode/@codeListValue attribute with a non-null value. Only one content type is allowed for each resource. The values must either be an integer between 1 and 10, or a string from the codelist (see Table 7). The value is made lower case, stripped of white space, and then converted to a numeric value ranging from 001 to 010 if its numeric, or compared to see if it starts with a value from the codelist. Thus 'live data', 'live DataAnd maps ArcIMS image service' are all valid and would match 'livedata'. Note that this use of the codeListValue attribute is not consistent with its definition as an identifier for the codelist entry (see section 4.17.3 Codelists).

Table 7. OnlineFunctionCode values from NAP (INCITS 453) and ESRI Geoportal toolkit v. 3.1. ISO codelist terms are indicated by '(ISO)' after the code in column 1. ESRI content types and codes are from the GeoPortal Toolkit v3.1 User Guide (2007); correlation of these with NAP OnlineFunctionCodes is based on the user guide and interpretation by this profile.

| OnLine- FunctionCode | USGIN profile usage | ESRI resource types | ESRI code |
|-------------------------|---|---------------------------------|-----------|
| browsing | CI_OnlineResource/linkage is a valid URL for a web application that enables user to explore and seek information about the resource from a Web browser | | |
| browsing | Use case not documented by ESRI | application | 006 |
| browsing | Use case not documented by ESRI | geographicactivity | 010 |
| download | Use case not documented by ESRI. Infer that URL provides an ArcGIS layer file (or functionally similar file) with links to data and portrayal instructions. | mapfile | 009 |
| download (ISO) | CI_OnlineResource/linkage is a valid URL that will initiate transfer of data to the local system. ESRI GPT requires that file extension for file is one of .zip, .e00, .gz, .tgz, .dbf, .tar, .shp, .rar, .xls, .txt, .dwg, .dxf, .dgn | download, down- loadabledata | 002 |
| download (ISO) | ESRI GPT requires one of following file extensions: .gif, .jpg, .jpeg, .bmp, .pdf, .pmf, .tif, .tiff, .cal, .pct, .pict, .eps, .mxd, .av, .mpg, .mpeg, .wmv, .img, .rm. | staticmapimage | 004 |
| emailService (NAP) | USGIN not used; functionally equivalent to ISO 'information'. CI_OnlineResource/linkage is a valid URL that accesses instructions for connection to an email service providing the described resource content via emails | | |
| fileAccess (NAP) | USGIN not used; functionally equivalent to ISO 'information'. CI_OnlineResource/linkage is a valid URL for direct retrieval of a file containing the described resource, typically through the use of http or ftp protocol (or their secure variants) | | |

| OnLine- FunctionCode | USGIN profile usage | ESRI resource types | ESRI code |
|-------------------------|--|--|-----------|
| information (ISO) | CI_OnlineResource/linkage is a valid URL that will access a web page providing information about the resource content. | Information, other- document, docu- ment | 005 |
| offlineAccess (ISO) | CI_OnlineResource/linkage is a valid URL that will access a web page providing instructions for requesting the resource from the provider. | offlinedata, offli- neAccess | 003 |
| order (ISO) | CI_OnlineResource/linkage is a valid URL that will access a web page to initiate an ordering process for obtaining the resource. | order, geographic- service | 007 |
| search (ISO) | CI_OnlineResource/linkage is a valid URL that will access a search interface for seeking out specific information content contained by resource, e.g. the metadata describes a database, and this linkage accesses a search interface to search the database | search, clearing- house | 008 |
| upload (NAP) | CI_OnlineResource/linkage is a valid URL for a web interface to transfer data from a local storage device or system to be included in the described resource. | | |
| webMapService (NAP) | CI_OnlineResource/linkage is a valid URL for Web -based map request service, which may return custom georeferenced map images, streamed features, raster data, or surface data to a mapping client, e.g. ArcIMS, OCG WMS, WFS, WCS service | livedata | 001 |
| webService (NAP) | CI_OnlineResource/linkage is a valid URL that accesses a standard web service description document with instructions for the connection to a Web service (other than a Web map service) providing direct online access to the described resource. Example description document may be a Web Services Description Language (WSDL) file or OGC getCapabilities file. | | 001 |

4.16 Responsible parties and logos

Metadata should include a URL that locates a thumbnail logo for organizations related to the metadata origination, the organization hosting the catalog that returned the metadata, the organization that originated the data, and the organization hosting online services that provide access to the data. The standard place to put URL's in ISO19139 metadata is in the CI_Contact/onlineResource/CI_OnlineResource/-linkage attribute. For URL's that indicate icon thumbnails, the CI_OnlineResource/name should be 'icon'.

The metadata originator information should be in a MD_Metadata/contact/CI_ResponsibleParty element with role code 'originator' to identify the original source of the metadata record, for which the CI_Contact/../CI_OnlineResource/linkage is a URL that points to an Icon for the metadata originator. This Icon will be displayed in search results to credit the metadata originator. Metadata harvesters should harvest and maintain this information so that the origin of metadata records can be credited.

The organization hosting the catalog that returned the metadata record should specified in a

MD_Metadata/contact/CI_ResponsibleParty element with role code 'distributor', for which the CI_Contact/

/CI_OnlineResource/linkage is a URL that points to an Icon for the metadata server hosting organization.

This information need not be harvested, because it will be replaced by information describing the harvesting catalog service.

The organization that originated the data is specified by MD_Metadata/identificationInfo/MD_Data-

The organization that originated the data is specified by MD_Metadata/identificationInfo/MD_Data-Identification/citation/../CI_ResponsibleParty with RoleCode ='originator', and /CI_OnlineResource/name='icon'. This will distinguish the citation responsible party element containing the icon linkage from CI_ResponsibleParty elements with RoleCode='author' or 'editor', which would provide an online linkage directly to the responsible party as specified by CI_OnlineResource protocol, applicationProfile, name, function, and description elements.

The organization hosting a service providing online access to described data is specified by MD_Metadata/distributionInfo/MD_Distribution/distributor/MD_Distributor/distributorContact/-CI_ResponsibleParty with RoleCode ='resourceProvider' or 'distributor', and ../CI_OnlineResource/name='icon'. Because the cardinality of distributorContact responsible party and online resources is 1, only one linkage can be provided for a distributor, and the metadata author must decide whether that will be a link to an icon, or a link to a web site or other resource related to the distributor.

```
564
      <qmd:contact>
565
        <qmd:CI ResponsibleParty>
566
          <qmd:organisationName>
567
            <qco:CharacterString>Arizona Geological Survey/qco:CharacterString>
568
          </gmd:organisationName>
569
          <gmd:contactInfo>
570
            <gmd:CI_Contact>
              <qmd:onlineResource>
571
572
                 <gmd:CI_OnlineResource>
573
                   <qmd:linkage>
574
                     <gmd:URL>http://www.azgs.az.gov/logo/metadata/azgs.png/gmd:URL>
575
                   </gmd:linkage>
576
                   <qmd:name>
577
                     <gco:CharacterString>icon</gco:CharacterString>
578
                   </gmd:name>
                 </gmd:CI_OnlineResource>
579
580
              </gmd:onlineResource>
581
            </gmd:CI Contact>
582
          </gmd:contactInfo>
583
          <qmd:role>
584
            <qmd:CI RoleCode codeL-
585
      ist="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/Codeli
586
      st/gmxCodelists.xml#CI_RoleCode"
587
              codeListValue="originator">originator
588
          </gmd:role>
589
        </gmd:CI_ResponsibleParty>
590
      </gmd:contact>
```

4.17 Extensions to CharacterString

4.17.1 Web extensions

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ISO 19139 defines several extensions to gco:CharacterString in the gmx namespace. These are defined as members of an xml substitution group for gco:CharacterString, and include gmx:Anchor, gmx:FileName, and gmx:MimeFileType. gmx:Anchor is used for URL's linking to online web resources, and include a URI attribute associated with the character string that is the human-readable label for the link. gmx:FileName adds a filename URI attribute that specifies a machine-readable absolute path to the loca-

598 tion of the file, the human readable file name specified by the character string, gmx:MimeFileType adds a 599 MIME type/subtype attribute to a character string that specifies a human readable file type. The gmx na-600 mespace is not imported into other ISO19139 schema in the normative schema. In order to create schema-valid documents that use these extensions, explicit namespace-declaration must be made to the gmx 602 schema in instance documents. At the present time, use of these elements does not seem widespread. 603 The current version of GeoNetwork, a commonly used catalog service implementation, does not support use of gmx: Anchor. Thus, in this version of the USGIN profile, these extension classes are not used. 604

4.17.2 Language localization

Another extension to gco:CharacterString allows substitution by PT_FreeText or LocalisedCharacter-String. LocalisedCharacterString adds a locale/PT Locale property to the CharacterSTring element that can specify the language, country, and character encoding for the string. PT_FreeText allow substitution of a collection of LocalisedCharacterString elements for any CharacterString, each localized to a different language/country.

These various possibilities create potential to break interoperability. To avoid this problem, Other localizations may be implemented, but in order to avoid complexity with PT Text and LocalizedCharacterString, USGIN recommended practice is to implement services for different languages as different services, each of which serves CharacterStrings in the language specified by the MD Metadata/language element.

4.17.3 Codelists

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641 642 ISO 19139 defines a "CodeListValue_Type" XML Class Type with three attributes:

```
<xs:complexType name="CodeListValue_Type">
 <xs:simpleContent>
    <xs:extension base="xs:string">
      <xs:attribute name="codeList" type="xs:anyURI" use="required"/>
      <xs:attribute name="codeListValue" type="xs:anyURI" use="required"/>
      <xs:attribute name="codeSpace" type="xs:anyURI"/>
    </xs:extension>
  </xs:simpleContent>
</xs:complexType>
```

The codeList attribute contains a URL that references a codeList definition within a registry or a codelist catalogue. As currently used in the metadata services we have studied, the codeList is not used to identify a vocabulary; rather it provides a locator (functionally equivalent to xlink:href) for an online resource, typically a web page or xml file, that contains definitions of the codelists. Different services provide different URL's, possibly linking to different kinds of resources (e.g. web page or xml file), for the same codelist. Thus, the values in this attribute can not be used for automated determination of the code list in use in a metadata document.

The codeListValue attribute carries the identifier of the codelist value definition. This identifier is the value expressed in the name column of the tables in ISO 19115, Annex B. The codelist catalogue (or registry) located by the codeList attribute is expected to contain an explicit name and definition of the value in the default language of the metadata, as well as alternate expressions in different code spaces, some of them corresponding to the different locales supported by the metadata.

The codeSpace attribute is an optional identifier (URI); when present it refers to an alternative expression of the codelist value definition. In the example in ISO19139, section 8.5.5.1 (p. 30), the codeSpace URI for the domain code is the string "domainCode", and the value from the domainCode column in a codelist definition table in ISO 19115, Annex B is included as the value of the xml CodeList element in this case.

643 Codelist elements in the ISO19139 XML schema are assigned to type CodeListValue Type, and also included in a substitution group for gco:CharacterString. These codeList elements are thus substitutable for 644 645 elements typed gco:CharacterString. Consequently, any CodeList instance is an XML element that takes 646 a string value and has three XML attributes defined by the CodeListValue Type XML Class Type. A cor-647 responding XML Class Property Type is defined for each of these CodeList elements, and this property 648 type is used to restrict the values in XML CharacterString attributes to the code list.

The ISO specification uses an unfortunate choice of name for the 'codeListValue' attribute that is defined to be a identifier, apparently with the intention that it is a language-neutral concept identifier that might be associated with various language-localized labels for the concept. NAP CodeList registries (http://www.fgdc.gov/nap/metadata/register) contrast with the codelists defined in the tables in ISO 19115 Annex B in that the identifier (the 'name' column the ISO19115 Annex B tables) is an integer identifier with the prefix 'RI'. This would appear to correspond functionally to the 'domainCode' values in the ISO19115 Annex B tables, which ISO19139 indicates should be the codeListValue when the code-Space="domainCode".

NAP and INSPIRE usage is consistent with the ISO19139 definition of codeListValue as an identifier, with the name or label for the codeList concept included as the value of the CodeList element. The 'name' column in ISO 19115, Annex B tables, which is described as the content for the codeListValue by ISO19139, contains English words that are the same as the labels one would use in English. In the CT_CodeListCatalogues in the ISO publicly available standards registry for ISO 19139 (http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources), which one would think are normative, the CodeListDictionary/codeEntry/CodeDefinition elements only include gml:description and gml:identifier elements, but no gml:name elements. So based on this ISO guidance, it appears that one would have to encode CodeList element thus:

Extensions to ISO codelists are implemented in two ways. If new values are added to an ISO codelist, the CodeListProperty_Type still points at the ISO CodeList_Type, but the codeList attribute on instances of this element points to the extended codelist. The following example shows use of a DateTypeCode added to the ISO19115 date type code list in the North American Profile:

Note that the ISO codelists use the codeListValue name as the codeList identifier, creating ambiguity between the human-readable label/name for the codeListValue concept, and its opaque/language-neutral identifier. USGIN NAP codeList usage follows the example metadata encoding in Appendix E of NAP profile document (INCITS 453, 2009). In these examples the codeListValue is the identifier from the NAP registry specified by the codeList, with the prefix 'RI_' added, and the code name/label is the value of the codeList xml element. NAP provides names and identifiers for codes.

INSPIRE guidelines (INSPIRE ISO19115/119, 2009-02-18) recommend a similar approach, using the ISO identifier string for the code list element value, which appears to match the intention of ISO19139.

The unfortunate situation is that NAP and ISO define different identifiers for the same codelist values, and because the 'codeList' attribute is defined as a locator for a codelist resource (not a vocabulary identifier) and is used differently by different metadata providers, there is no reliable automated test one can make to determine if NAP or ISO identifiers are being used. In order to avoid interoperability problems, USGIN profile mandates that elements with a data type that is a CodeList_PropertyType use the following encoding, following the NAP and INSPIRE pattern:

For elements that use ISO codelists:

Note that in these encodings, the codeList attribute value functions as an identifier; thus the exact strings in the examples should be used (with the #localAnchor at the end modified as appropriate for the identified codelist). The ISO codelists are in much wider use at this time than the NAP codelists (as far as we can tell from surveying existing services), but we recognize that some of the terms added in the NAP codelists may be required for metadata describing some of the resources in the USGIN scope (Table 1). Table 8 summarizes differences between the ISO and NAP codelists. The recommended practice is to use ISO codelists wherever possible, encoded as in the examples above. NAP codes may be used where necessary, but if the above convention is followed, and the NAP name is equivalent to the ISO identifier for codelists that are the same, which is generally the case, then the two approaches are interoperable if search criteria for a particular value look for the element value (e.g. 'creation' in the example above), not the codeListValue attribute value (e.g. 'creation' or 'RI_366').

If a new codelist is created to restrict text in an ISO element whose type is simply CharacterString (e.g. HierarchyLevelName), then characterString values are encoded by soft-typing the element that takes the character string using the xsi:type attribute. The following example uses the FileFormatCodeList, which is the only code list vocabulary added to the collection of codelists defined by ISO 19115 by the North American Profile.

A NAP-defined codelist property type is defined in a NAP-defined namespace (URI = http://www.cits.-rncan.gc.ca/html/brodeurj/.protege/.napMetadata/napMetadataWebsite/napMetadataTools/napXsd/-napm), defined in an xml schema made available by the profile developers, and this namespace must be defined in xml documents using the xsi:type. In order for the document to validate, the namespace must provide a schema location in the xml document root element as well. Schema fragment from the XML schema defining the napm namespace

(http://www.cits.rncan.gc.ca/html/brodeurj/.protege/.napMetadata/tools/napXsd/napm/napm.xsd). Unfortunately, because of conflicting element definitions in imported and included schema from other namespaces, this schema may not validate with some validation tools. The following fragment defines the property type used to restrict a value domain to the new code list in the xml fragment above:

As a convention for using controlled vocabularies on characterString elements without the overhead of a new namespace and xml schema, USGIN proposes that use a controlled vocabulary be indicated by using xsi:type on the gco:characterString element to make the type gml:CodeType, which then requires a codeSpace attribute (see 4.14.2 Non digital resources and 7.2 Linkage name conventions). This codeSpace should be the URI for the vocabulary used, with the implication that the CharacterString element value will then be an identifier from that vocabulary. This essentially turns the CharacterString into a GML scoped name or gco:LocalName element.

| Codelist (ISO / NAP) | Coded Values/Names | Comments |
|---|---|-------------------|
| CI_DateTypeCode | creation, publication, revision | ISO 19115 (B.5.2) |
| napCI_DateTypeCode | , notAvailable, inForce, adopted, deprecated, superseded | NAP expansion |
| CI_OnLineFunction- Code | download, information, offlineAccess, order, search | ISO 19115 (B.5.3) |
| nap- CI_OnLineFunction- Code | , upload, webService, emailService, browsing, fileAccess, webMapService | NAP expansion |
| CI_PresentationForm- Code nap- CI_PresentationForm- Code | documentDigital, documentHardcopy, imageDigital, imageHardcopy, mapDigital, mapHardcopy, modelDigital, modelHardcopy, profileDigital, profileHardcopy, tableDigital, tableHardcopy, videoDigital, videoHardcopy, audioDigital | ISO 19115 (B.5.4) |
| | , audioHardcopy, multimediaDigital, multimediaHardcopy, diagramDigital, diagramHardcopy | NAP expansion |
| CI_RoleCode napCI_RoleCode | resourceProvider, custodian, owner, user, distributor, originator, pointOfContact, principalInvestigator, processor, publisher, author | ISO 19115 (B.5.5) |
| | , collaborator, editor, mediator, rightsHolder | NAP expansion |
| DQ_EvaluationMethod- TypeCode napDQ_Evaluation- MethodTypeCode | <pre>directInternal, directExternal, indi- rect</pre> | ISO 19115 (B.5.6) |
| DS_AssociationType- Code napDS_Association- | <pre>crossReference, largerWorkCitation, partOfSeamlessDatabase, source, ste- reoMate</pre> | ISO 19115 (B.5.7) |
| TypeCode | , isComposedOf | NAP expansion |
| DS_InitiativeType- Code napDS_Initiative- TypeCode | campaign, collection, exercise, experiment, investigation, mission, sensor, operation, platform, process, program, project, study, task, trial | ISO 19115 (B.5.8) |
| MD_CellGeometryCode | point, area | ISO 19115 (B.5.9) |
| napMD_CellGeometry- Code | , voxel | NAP expansion |

| MD_CharacterSetCode ucs2, ucs4, utf7, utf8, utf16, 8859part2, 8859part3, 8859part1, 8859part2, 8859part1, 8859part2, 8859part | Codelist (ISO / NAP) | Coded Values/Names | Comments |
|--|----------------------------------|--|--|
| tial, secret, topSecret mapMD_Classification code m., sensitive, forOfficialUseOnly MD_CoverageContent- TypeCode mapMD_Coverage- contentTypeCode not used by NAP and USGIN MD_DataTypeCode not used by NAP and USGIN MD_DimarypeCode napMD_DimarypeCode napMD_DimarypeCode napMD_GeometricObject- TypeCode napMD_GeometricObject- TypeCode napMD_GeometricObject- TypeCode napMD_GeometricObject- TypeCode napMD_Maintenance- Tode MD_Maintenance- FrequencyCode MD_Maintenance- FrequencyCode mapMD_Maintenance- FrequencyCode mapMD_MediumFormatCode napMD_MediumFormatCode na | napMD_CharacterSet- | 8859part1, 8859part2, 8859part3, 8859part4, 8859part5, 8859part6, 8859part7, 8859part8, 8859part9, 8859part10, 8859part11, 8859part13, 8859part14, 8859part15, 8859part16, jis, shiftJIS, eucJP, usAscii, ebcdic, | ISO 19115 (B.5.10) |
| MD_CoverageContent- TypeCode MD_CoverageContent- TypeCode MD_CoverageContentTypeCode MD_DataTypeCode MD_GeometricObject- TypeCode MD_DataTypeCode MD_DataTypeCode MD_DataTypeCode MD_GeometricObject- TypeCode MD_DataTypeCode MD_Maintenance- FrequencyCode MD_MediumFormatCode MD_MediumFormatCo | Code | | ISO 19115 (B.5.11) |
| TypeCode napMD_DataTypeCode MD_DataTypeCode not used by NAP and USGIN MD_DimensionName TypeCode napMD_DimensionName TypeCode napMD_DimensionName TypeCode napMD_GeometricObject- TypeCode napMD_Imaging-Condition- Code napMD_Imaging-Condition- Code napMD_MEdimitenance- FrequencyCode MD_Maintenance- FrequencyCode MD_Maintenance- FrequencyCode MD_Maintenance- FrequencyCode MD_MediumFormatCode napMD_MediumFormatCode napMD_MediumForma | | , sensitive, forOfficialUseOnly | NAP expansion |
| not used by NAP and USGIN tElement, abstractClass, aggregateC-lass, specifiedClass, datatypeClass, interfaceClass, unionClass, metaClass, typeClass, characterString, integer, association MD_DimensionName-TypeCode napMD_DimensionName-TypeCode napMD_DimensionName-TypeCode napMD_GeometricObject-TypeCode napMD_GeometricObject-TypeCode napMD_ImagingCondition-Code napMD_Imaging-ConditionCode MD_ImagingCondition-Code napMD_MediumFormatCode napMD_MediumFormat-Code napMD_M | TypeCode napMD_Coverage- | | ISO 19115 (B.5.12) |
| TypeCode napMD_DimensionName- TypeCode MD_GeometricObject- TypeCode napMD_Geometric- ObjectTypeCode MD_ImagingCondition- Code napMD_Imaging- ConditionCode napMD_KeywordTypeCode napMD_KeywordType- Code MD_Maintenance- FrequencyCode napMD_Maintenance- FrequencyCode napMD_MediumFormatCode napMD_MediumF | not used by NAP and | tElement, abstractClass, aggregateC- lass, specifiedClass, datatypeClass, interfaceClass, unionClass, metaClass, typeClass, characterString, integer, | The MD_MetadataExtension Information element and its codelists are not used by NAP and |
| TypeCode napMD_Geometric-ObjectTypeCode MD_ImagingCondition-Code napMD_Imaging-ConditionCode MD_KeywordTypeCode napMD_KeywordTypeCode napMD_KeywordTypeCode napMD_Maintenance-FrequencyCode napMD_Maintenance-FrequencyCode napMD_Maintenance-FrequencyCode napMD_MediumFormatCode | TypeCode napMD_DimensionName- | | ISO 19115 (B.5.14) |
| Code napMD_Imaging- ConditionCode MD_KeywordTypeCode napMD_KeywordType- Code MD_Maintenance- FrequencyCode napMD_Maintenance- FrequencyCode napMD_MediumFormatCode napMD_MediumFormatCode napMD_MediumFormatCode napMD_MediumFormatCode napMD_MediumFormat- Code quitty, fog, heavySmokeOrDust, night, rain, semiDarkness, shadow, snow, ter- rainMasking ISO 19115 (B.5.17) ISO 19115 (B.5.18) NAP expansion NAP expansion ISO 19115 (B.5.19) ISO 19115 (B.5.19) | TypeCode napMD_Geometric- | | ISO 19115 (B.5.15) |
| theme , product, subTopicCategory MD_Maintenance- FrequencyCode napMD_Maintenance- FrequencyCode napMD_Maintenance- FrequencyCode mapMD_Maintenance- mapMD_Maintenance- FrequencyCode mapMD_Maintenance- mapMD_Maintenance- mapMD_Maintenance- plantal mapMD_Maintenance- mapMD_Maintenanc | Code napMD_Imaging- | quitty, fog, heavySmokeOrDust, night, rain, semiDarkness, shadow, snow, ter- | ISO 19115 (B.5.16) |
| , product, subTopicCategory MD_Maintenance- FrequencyCode napMD_Maintenance- FrequencyCode napMD_Maintenance- FrequencyCode napMD_Maintenance- FrequencyCode nually, asNeeded, irregular, not- Planned, unknown , semimonthly MD_MediumFormatCode napMD_MediumFormat- Code NAP expansion ISO 19115 (B.5.18) NAP expansion NAP expansion ISO 19115 (B.5.19) | napMD_KeywordType- | | ISO 19115 (B.5.17) |
| FrequencyCode napMD_Maintenance- FrequencyCode monthly, quarterly, biannually, annually, asNeeded, irregular, not- Planned, unknown my_MediumFormatCode napMD_MediumFormat- Code monthly, quarterly, biannually, annually, annually, asNeeded, irregular, not- Planned, unknown NAP expansion ISO 19115 (B.5.19) iso9660RockRidge, iso9660AppleHFS | Code | , product, subTopicCategory | NAP expansion |
| MD_MediumFormatCode napMD_MediumFormat- Code Cpio, tar, highSierra, iso9660, iso9660RockRidge, iso9660AppleHFS ISO 19115 (B.5.19) | FrequencyCode napMD_Maintenance- | monthly, quarterly, biannually, an- nually, asNeeded, irregular, not- | ISO 19115 (B.5.18) |
| napMD_MediumFormat- iso9660RockRidge, iso9660AppleHFS | | , semimonthly | NAP expansion |
| Code, UDF NAP expansion | napMD_MediumFormat- | | ISO 19115 (B.5.19) |
| | Code | , UDF | NAP expansion |

| Codelist (ISO / NAP) | Coded Values/Names | Comments |
|---|---|--|
| MD_MediumNameCode napMD_MediumNameCode | cdRom, dvd, dvdRom, 3halfinchFloppy, 5quarterInchFloppy, 7trackTape, 9trackTape, 3480Cartridge, 3490Cartridge, 3580Cartridge, 4mmCartridgeTape, 8mmCartridgeTape, digitalLinearTape, onLine, satellite, telephoneLink, hardcopy, hardcopyDiazoPolyester08, hardcopyCardMicrofilm, hardcopyMicrofilm240, hardcopyMicrofilm35, hardcopyMicrofilm70, hardcopyMicrofilmGeneral, hardcopyMicrofilmMicrofiche, hardcopyNegativePhoto, hardcopyPaper | ISO 19115 (B.5.20) |
| | , hardcopyDiazo, hardcopyPhoto, hard- copyTracedPaper, hardDisk, USBFlash- Drive, lquarterInchCartridgeTape | NAP expansion |
| MD_ObligationCode not used by NAP and USGIN | mandatory, optional, conditional | ISO 19115 (B.5.21) - The MD_MetadataExtension Information element and its codelists are not used by NAP and USGIN. |
| MD_PixelOrientation- Code napMD_Pixel- OrientationCode | center, lowerLeft, lowerRight, upper-Right, upperLeft | ISO 19115 (B.5.22) |
| MD_ProgressCode napMD_ProgressCode | completed, historicalArchive, obsolete, onGoing, planned, required, underDevelopment | ISO 19115 (B.5.23) |
| | , proposed | NAP expansion |
| MD_RestrictionCode napMD_Restriction- Code | copyright, patent, patentPending, trademark, license, intellectualPropertyRights, restricted, otherRestrictions | ISO 19115 (B.5.24) |
| | , licenseUnrestricted, licenseEndUser, licenseDistributor, privacy, statutory, confidential, sensitivity | NAP expansion |
| MD_ScopeCode napMD_ScopeCode | attribute, attributeType, collection- Hardware, collectionSession, dataset, series, nonGeographicDataset, dimen- sionGroup, feature, featureType, pro- pertyType, fieldSession, software, service, model, tile | ISO 19115 (B.5.25) |

| Codelist (ISO / NAP) | Coded Values/Names | Comments |
|---|---|---|
| MD_Spatial- RepresentationType- Code napMD_Spatial- RepresentationType- Code | vector, grid, textTable, tin, stereo-Model, video | ISO 19115 (B.5.26) |
| MD_TopicCategoryCode napMD_TopicCategory- Code | farming, biota, boundaries, climatologyMeterologyAtmosphere, economy, elevation, environment, geoscientificInformation, health, imageryBaseMapsEarthCover, intelligenceMilitary, inlandWater, location, oceans, planning-Cadastre, society, structure, transportation, utilitiesCommunication | ISO 19115 (B.5.27) |
| MD_TopologyLevelCode napMD_TopologyLevel- Code | geometryOnly, topology1D, planarGraph, fullPlanarGraph, surfaceGraph, full-SurfaceGraph, topology3D, fullTopology3D, abstract | ISO 19115 (B.5.28) |
| SV_CouplingType napSV_CouplingType | loose, mixed, tight | ISO 19119 (Amend- ment 1; C.2.8) |
| SV_Parameter- Direction napSV_Parameter- Direction | in, out, in/out | ISO 19119 (Amendment 1; C.2.9 |
| LanguageCode | see http://www.loc.gov/standards/iso639- 2/php/code_list.php | no complete NAP or ISO registry found |
| not used by ISO nap_DCPList | XML, CORBA, JAVA, COM, SQL, WebServices | NAP specific codelist – not used by USGIN due to poorly defined semantics and use. |
| not used by ISO napMD_FileFormatCode | bil, bmp, bsq, bzip2, cdr, cgm, cover, csv, dbf, dgn, doc, dwg, dxf, e00, ecw, eps, ers, gdb, geotiff, gif, gml, grid, gzip, html, jpg, mdb, mif, pbm, pdf, png, ps, rtf, sdc, shp, sid, svg, tab, tar, tiff, txt, xhtml, xls, xml, xwd, zip, wpd | NAP specific codelist – not formally used by USGIN, but these cha- racter strings should are to be used to po- pulate fileType ele- ments. |

4.18 Geographic bounding box

- USGIN profile requires that if an EX_Extent/geographicElement is supplied, it include a geographic bounding box with bounding latitude and longitude expressed using WGS 84 decimal degrees.
- The corner coordinates for the geographic bounding box must not coincide in one point, because this may
- 761 result in fatal errors with some CSW implementations. Point locations must thus be represented as tiny
- rectangles. USGIN recommended practice is to place the actual point location in the lower left corner of
- 763 the rectangle.

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4.19 Data quality for individual parts of a resource

The use of dataQualityInfo/DQ_DataQuality/scope presents challenges for determining how to represent metadata with finer granularity about particular feature or attribute instances, some attribute in the scope of a single dataset, some particular dataset within a series.

Determining best practices for finer-granularity metadata requires consideration of likely use cases. Note that data quality statements may provide information on lineage, completeness, logical consistency, thematic accuracy, temporal accuracy, or positional accuracy. Note also that the USGIN profile is designed for use in a geoscience domain-wide resource catalog meant to enable discovery, evaluation, and access to information resources. Use cases involve filtering metadata records based on data quality statements, or using those statement to evaluate datasets or feature instances for fitness to a user's purpose. These might include:

- 1) data quality statements for individual datasets in a series, to determine if a dataset in the series might be appropriate for the desired use.
- 2) data quality statements associated with different attributes of a feature on the dataset series level, e.g. all structure orientations (the attribute) have some standard quantitative attribute accuracy for all features in all datasets in a series, to determine if any data in the series might be appropriate for the desired use.
- 3) data quality statements associated with different attributes of a feature on the dataset level, e.g. all structure orientations have some standard quantitative attribute accuracy for all features in a particularly subset of datasets in a series. This may be assigned on an individual dataset level, or to subsets, e.g. a measurement procedure changed at some point during development of the series that changes the attribute accuracy for all subsequently acquired data. These quality statements might be used to determine which dataset in a series might be appropriate for the desired use, or if a particular dataset is useful.
- 4) data quality statements for one or more particular features that are contained in a dataset. These statements might be used to select particular feature instances to download or use for an analysis.
- 5) data quality statements for particular attribute value assignments on particular features in a dataset. These statements might be used to select particular feature instances to download or use for an analysis.

In a dataspace environment of the sort envisioned for a community data network (Franklin et al, 2005), the ISO19115 hierarchy level 'series' is useful for high-level data discovery and evaluation, but actual data acquisition and usage occur at the dataset level. Attribute- and feature-scoped data quality information would be useful in dataset and series level metadata for discovery and evaluation, but featureInstance and attributeInstance data quality information only come in to play for the data acquisition and usage in the context of a dataset.

799 In the architecture of the system as currently envisioned, only the lineage and accuracy aspects (not the 800 completeness and logical consistency, which apply at a dataset level) of data quality make sense for fea-801 ture and attribute instance level metadata, and this information is better accounted for by an observation 802 and measurement view of the data (e.g. ISO 19156) through a feature service, not a metadata service. 803 Inclusion of instance level dataQuality statements might make sense in metadata that is bundled with a 804 data collection in a data delivery package, but this is out of scope for this profile. In the CSW environ-805 ment, if a data provider wishes to enable search using feature- or attribute-instance data quality criteria, 806 these should be exposed by presentation metadata records for each feature- or attribute-instance.

The ISO19115 content model provides several possible approaches to fine-granularity metadata:

1) using MD_Metadata/hierarchyLevel and MD_Metadata/parentIdentifier

- 2) using MD_Metadata/identificationInfo/MD_DataIdentification/aggregationInfo associations
- 3) using MD_Metadata/ dataQualityInfo/DQ_DataQuality/scope/levelDescription elements to bind data quality assertions to parts of the larger resource that are identified by object references from the metadata document.

The USGIN profile does not use approach 1, with parentIdentifier links associating MD_Metadata records with parent metadata. This approach is useful for metadata that is packaged with data collections in order to reduce duplication of metadata information that is inherited from series to datasets in that series, and perhaps to individual features and attributes in the application schema for the series, or feature and attribute instances in particular datasets. In the context of resource discovery using a CSW service, queries cannot be posed in terms of these kinds of inheritance relationships, and result sets should be complete metadata records for the resources located by a search.

The USGIN profile uses approach 2, aggregationInfo associations between metadata records for related resources. In a data discovery environment, links to related resources may be very useful to lead users to other resources that their search criteria did not directly uncover. The associationType property on these links provides additional useful information for assessing whether the related resources might be useful. Given this approach, data quality information for datasets in a series would not be accessed through DQ_DataQuality elements in the series metadata, with levelDescription/MD_ScopeDescription/Dataset elements providing DataSetURI's for each described component dataset. Under the USGIN profile, identification of datasets in a series that meet some data quality criteria would search for datasets that have MD_Metadata/identificationInfo/MD_DataIdentification/aggregationInfo/MD_AggregateInformation/-aggregateDataSetIdentifier equal to the dataSetURI for the series, with ../AggregateInformation/-associationType/DS_AssociationTypeCode equal to 'largerWorkCitation', along with whatever quality criteria were required.

USGIN profile uses multiple dataQualityInfo/DQ_DataQuality elements to provide optional data quality statements for individual attributes and features in a dataset, with one dataQualityInfo element for each attribute on each feature about which the data quality is described. According to the ISO19139 (20060504) schema implementing ISO19115, each of these dataQualityInfo elements has exactly one ../DQ_Scope, which in turn may have 0 to many levelDescription/MD_ScopeDescription elements. Each levelDescription/MD_ScopeDescription contain only one of attributes, features, featureInstances, attributeInstances, dataset or other elements. An individual MD_ScopeDescription may specify multiple attributes, features, featureInstances, or attributeInstances. MD_ScopeDescription/other is not used in the USGIN profile at this time. MD_ScopeDescription/dataset is not used because data quality statements about a dataset are indicated by dataQualityInfo/../DQ_Scope/level/MD_ScopeCode = 'dataset', in which case DQ_Scope/levelDescription/MD_ScopeDescription elements will be ignored; data quality statements about a dataset in a series are included in a metadata record for the dataset that is associated with the series through MD_Metadata/MD_DataIdentification../MD_AggregateInformation/-aggregateDataSetIdentifier.

DQ_Scope/levelDescription/MD_ScopeDescription/attributes and ../features are specified using object references to GF_AttributeType and GF_FeatureType elements according to section B.4.4 of ISO19115(2003). These are metaclasses defined in ISO19109, and their implementation is out of scope for this profile. Table 9 presents recommendations for use of ../DQ_DataQuality/scope/-levelDescription/MD_ScopeDescription child elements based on consideration of the above use cases, interpretation of the UML diagrams for ISO19109 and the sketchy text in section B.4.4 of ISO19115(2003).

Table 9. Usage of data quality scope description elements

| scopeDescription type (and cardinali- ty) | Reference target | USGIN profile provisions |
|---|--|---|
| attributes (1*) | Identifier for an attribute type defined in the application schema identified by | Use for specifying attribute level data quality for all attributes of a particular type in a particular feature in a dataset or series. levelDescrip- |

| scopeDescription type (and cardinali- ty) | Reference target | USGIN profile provisions |
|---|--|---|
| 7, | MD_Metadata/application- SchemaInfo//CI_Citation | tion/MD_ScopeDescription/attributes elements are allowed only when DQ_Scope/- level/MD_ScopeCode = 'attributeType'. The element value is an xlink:href or uuidref to an attribute defined in the application schema for the dataset. The xlink:title may be used to give the name of the attribute as it appears in the dataset if this is useful. To be useful, the MD_Metadata/applicationSchemaInfo element must provide sufficient information to resolve the attribute identifier. |
| features (1*) | Identifier for an feature type defined in the application schema identified by MD_Metadata/application-SchemaInfo//CI_Citation | Use for specifying feature level data quality for all features of a particular type in a dataset or series. levelDescription/MD_ScopeDescription/-attributes elements are allowed only when DQ_Scope/level/MD_ScopeCode = 'featureType' or 'attributeType'. The identified feature type is the target of the data quality statement if MD_ScopeCode is 'featureType', else it identifies the feature that contains the described attribute. The element value is an xlink:href or unidref to a feature defined in the application schema for the dataset. The xlink:title may be used to give the name of the feature as it appears in the dataset if this is useful. To be useful, the MD_Metadata/-applicationSchemaInfo element must provide sufficient information to resolve the featureType identifier. |
| featureInstances (1*) | A resolvable identifier for a particular featureInstance within the scope of the resource identified by MD_Metadata/DataSetURI | Out of scope, not used by USGIN. Instance level quality statements are provided via a feature service. |
| attributeInstaces (1*) | A resolvable identifier for a particular attributeInstance within the scope of the resource identified by MD_Metadata/DataSetURI | Out of scope, not used by USGIN. Instance level quality statements are provided via a feature service. |
| dataset (1) | A resolvable identifier for a particular dataset within the scope of the resource identified by MD_Metadata/-DataSetURI | Not used by USGIN. Dataset data quality is described in records with DQ_Scope/- level/MD_ScopeCode = 'dataset', and metadata for datasets in a series is represented by separate dataset records for CSW purposes. |
| other (1) | A resolvable identifier for some other resource within the scope of the resource identified by MD_Metadata/-DataSetURI | Not used by USGIN, undefined semantics. |

4.20 Lineage

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Lineage in data quality section has to do with processing steps that have altered the resource in some fashion. Each step has some input resources, identified by source citations associated with the process step. The LI_ProcessStep element does not directly identify its output resource, so in a lineage that involves a chain of steps with intermediate resources, the sourceStep association from LI_Source links a resource to a processing step that it is output from.

If a resource has simply been downloaded from some online repository, or copied from some physical media (CD, DVD), with no modification, then it is considered an identical resource, and no lineage is implied. The MD_DataIdentification/citation/CI_Citation should identify this source; the MD_Metadata/distributionInfo should report information on how the data were obtained. Based on this approach, a LI_Lineage that reports no processSteps, only a source link, does not make sense. LI Lineage/source/LI Source is thus not used by USGIN metadata.

A GIS dataset originally digitized from a published geologic map, put online, obtained by an online download, and reprojected would report one processStep (reprojection) with source/LI_Source that has a CI_Citation for the downloaded data. This LI_Source would have a sourceStep pointing to an LI_ProcessStep for the original digital conversion from the paper map, and the LI ProcessStep/source/LI Source would contain the citation for the original paper map.

In order to enable xpath queries for any of the sources or processSteps in a processing chain, all related LI_Source and LI_ProcessStep elements should be directly nested within the LI_Lineage element, and the processStep/source and LI_Source/sourceStep associations should be by reference.

Code example 1: Simplified example of a complex processing and source history using LI_Lineage.

```
877
     <?xml version="1.0" encoding="UTF-8"?>
878
      <LI Lineage
879
       xmlns="http://www.isotc211.org/2005/gmd"
       xmlns:gco="http://www.isotc211.org/2005/gco"
880
881
       xmlns:xlink="http://www.w3.org/1999/xlink"
882
       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
883
       xsi:schemaLocation="http://www.isotc211.org/2005/gmd
884
     http://schemas.opengis.net/iso/19139/20070417/gmd/dataQuality.xsd">
885
886
          <LocalisedCharacterString>The digital data described by this metadata was
887
     originally compiled digitally from two published maps; this digital dataset
888
     was then reprojected to produce the described re-
889
     source.</LocalisedCharacterString>
890
       </statement>
891
       cessStep>
892
          <LI ProcessStep id="1">
893
            <description>
894
              <LocalisedCharacterString>digital compilation of 2
895
     maps</LocalisedCharacterString>
896
            </description>
            <source xlink:href="#10"/>
897
898
            <source xlink:href="#20"/>
899
         </LI ProcessStep>
900
       </processStep>
901
       cessStep>
902
          <LI_ProcessStep id="2">
903
            <description>
904
              <LocalisedCharacterString>digital map compilation reprojected, should
905
     have some way to specify projection parameters?, output is LI_Source id=70
906
      </LocalisedCharacterString>
907
            </description>
908
            <source xlink:href="#40"/>
```

```
909
          </LI_ProcessStep>
910
        </processStep>
911
        <source>
912
          <LI Source id="40">
913
            <description>
914
              <LocalisedCharacterString>a digital compilation of 2 maps, output of
915
     processStep ID=1, input into reprojection process</LocalisedCharacterString>
916
            description>
917
            <sourceStep xlink:href="1"/>
918
          </LI Source>
919
        </source>
920
        <source>
921
          <LI_Source id="10">
922
            <description>
923
              <LocalisedCharacterString>ultimate source--some published
924
     map</LocalisedCharacterString>
925
            </description>
926
      <!--no source processing recorded for production of paper map so no sourceS-
927
     tep-->
928
          </LI_Source>
929
        </source>
930
        <source>
931
          <LI Source id="20">
932
            <description>
933
              <LocalisedCharacterString>another published
934
     map</LocalisedCharacterString>
935
            </description>
936
          </LI Source>
937
        </source>
938
        <source>
939
          <LI Source id="70">
940
            <description>
941
              <LocalisedCharacterString>a reprojected version of the digital compi-
942
      lation</LocalisedCharacterString>
943
            </description>
944
            <sourceStep xlink:href="2"/>
945
          </LI Source>
946
        </source>
947
      </LI_Lineage>
```

An LI_Lineage may be constructed that involves a number or resources and processing steps, and this lineage may be referenced by metadata for all the resources involved in the processing. The LI_Lineage/source/LI_Source/sourceCitation/CI_Citation/identifier/MD_Identifier is a reference to the MD_Metadata/fileIdentifier for the metadata for each resource in the chain. This approach allows the metadata record to record relationships through process steps between resources.

4.21 Temporal extents

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Resource temporal extent (identificationInfo/MD_DataIdentification/extent/EX_Extent/-temporalElement/EX_TemporalExtent/extent/ TimePeriod) is used to specify the temporal interval to which the content of a resource applies. Default reference frame for time is calendar date and time encoded using ISO-8601:

<gml:endPosition indeterminatePosition="now"/> is the correct way to represent "Present" in ISO or
GML as one of the boundaries of a timePeriod.

The ISO 19139 xml schema allows TM_PeriodTimePeriod to be quantified by a gml:TimeInstant or gml:TimePeriod element. In order to promote interoperability, the USGIN profile mandates use of gml:TimePeriod for specifying temporal extent for a resource.

For geologic time extents, the time coordinates for the beginPosition and endPosition should be expressed numerically in Ma. This convention allows search for resources pertinent to intervals of geologic time using simple numeric comparisons instead of the complex hierarchical concept expansions that would be necessary to use named eras from a stratigraphic time scale. Encoding example:

The frame for the beginPosition and endPosition is a URI for standard geologic time, measured positive getting older, with an origin at 1950 CE, in units of millions of years.

4.22 Operation metadata

The srv namespace elements based on ISO 19119 are inadequate to provide the content necessary to automate connection to a generic service. This is due in part to poorly defined semantics and use cases for the elements that are there (DCP, applicationProfile, protocol, MD_Format, serviceType, operation-Name vs. invocationName, connectPoint), and partly due to incomplete content model (where to put allowed outputFormat parameter values or supported query operations for CSW or WMS). The ISO 19119 model for service metadata does not include a mechanism to specify valid values for operation parameters. For instance, OGC WMS and CSW services both support an output format parameter, and OGC capabilities documents provide a listing of the supported output formats, but where do these go in ISO19139 xml documents? Does the described service support http POST or GET method? This information is necessary in order to compose valid service requests.

USGIN proposes to follow the INSPIRE (INSPIRE 19115/119, 2009) guideline to use a distribution-Info/../transferOptions/../online/../linkage element point to a WSDL or OGC getCapabilities document (see xml files at http://www.webservice-energy.org/metadata/), and make srv:SV_Operation-Metadata nil. WSDL and getCapabilities were designed to describe service operation, and it seems counterproductive to invent another scheme to do the same thing. Because of the difficulty in creating usable abstract model that accounts for any and all possible services, it makes more sense to allow service description documents specific to different service frameworks.

In order to identify the linkage element that locates the service description document, USGIN mandates using CI_OnlineResource/name = "serviceDescription" (from the table in section 7.2 Linkage name conventions) as the in the CI_OnlineResource element with the linkage to the service description. It may also be useful to provide a mapping between ServiceType and a guidance for the kind of document the CI_OnlineResource/linkage_URL locates.

1010 5 Abbreviations

CSW Metadata Catalog for the Web. Also abbreviated as CS-W and CS/W

GeoSciML Geoscience Markup Language
GML Geographic Markup Language

GUID Global Unique Identifier

IEC International Electrotechnical Commission

ISO International Organization for Standardization

UML Unified Modeling Language

URI Universal Resource Identifier

USGIN U.S. Geoscience Information Network

WCS Web coverage Service

WFS Web Feature Service

XML eXtensible Markup Language

XSD XML Schema Definition

XSL eXtensible Stylesheet Language

XSLT XSL Transformations

XLink XML Linking Language

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6 References

1013 **6.1 Cited literature**

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1014 Franklin, Michael, Halevy, Alon, and Maier, David, 2005, From databases to dataspaces: a new ab-1015 straction for information management: ACM SIGMOD Record, V. 34, No. 4, ISSN:0163-5808. 1016 [ANZLIC, 2007] ANZLIC Metadata Profile Guidelines, Version 1.0: Turner, ACT, ANZLIC - the Spatial Information Council, ISBN: 978-0-646-46940-9, 372 p. 1017 [INSPIRE ISO19115/119] Drafting Team Metadata and European Commission Joint Research Cen-1018 tre, 2009-02-18, INSPIRE Metadata Implementing Rules: Technical Guidelines based on EN ISO 1019 19115 and EN ISO 19119, v. 1.1: European Commission Joint Research Centre, 1020 1021 MD_IR_and_ISO_20090218.

7 Codelists

7.1 ServiceType

INSPIRE metadata Implementing Rules (*OJ L 326, 4.12.2008*) section D3 mandate the use of the value domain listed in Table 10 to categorize spatial data service types. These values are better suited for CI_OnlineFunctionCode used to specify CI_OnlineResource/online/Function. The USGIN team interprets the ISO scope notes to allow more useful content for service type, specifying an actual service specification like OGC WMS. USGIN draft ServiceType vocabulary is reported in Table 11.

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Table 10. INSPIRE SPATIAL DATA SERVICE TYPE (for information only, not used by USGIN)

| Туре | Description | |
|----------------|-----------------------------|--|
| discovery | Discovery Service | |
| view | View Service | |
| download | Download Service | |
| transformation | Transformation Service | |
| invoke | Invoke Spatial Data Service | |
| other | Other Services | |

Table 11. USGIN service type vocabulary. This is an interim listing of serviceTypes. The code list URI for this registry is http://resources.usgin.org/registry/serviceType201001.

| Identifier | Name | Description |
|------------|----------------------------------|--|
| WMS | OGC Web Map service | provides a simple HTTP interface for requesting geo-registered map images from one or more distributed geospatial databases. A WMS request defines the geographic layer(s) and area of interest to be processed. The response to the request is one or more geo-registered map images (returned as JPEG, PNG, etc) that can be displayed in a browser application. The interface also supports the ability to specify whether the returned images should be transparent so that layers from multiple servers can be combined or not. (http://www.opengeospatial.org/standards/wms) |
| WFS | OGC Web Feature service | http://www.opengeospatial.org/standards/wfs |
| WCS | OGC Web coverage ser- vice | defines a standard interface and operations that enables interoperable access to geospatial "coverages" [http://www.opengeospatial.org/ogc/glossary/c]. The term "grid coverages" typically refers to content such as satellite images, digital aerial photos, digital elevation data, and other phenomena represented by values at each measurement point. |
| CSW | OGC Web cat- alog service | supports the ability to publish and search collections of descriptive information (metadata) about geospatial data, services and related resources. Providers of resources use catalogues to register metadata that conform to the provider's choice of an information model; such models include descriptions of spatial references and thematic information. (http://www.opengeospatial.org/standards/cat) |

| Identifier | Name | Description | |
|-------------|--|---|--|
| SOS | OGC Sensor observation service | provides an API for managing deployed sensors and retrieving sensor data and specifically "observation" data. Whether from in-situ sensors (e.g., water monitoring) or dynamic sensors (e.g., satellite imaging), measurements made from sensor systems contribute most of the geospatial data by volume used in geospatial systems today. (http://www.opengeospatial.org/standards/sos) | |
| WPS | OGC Web Processing service | provides rules for standardizing how inputs and outputs (requests and responses) for geospatial processing services, such as polygon overlay. The standard also defines how a client can request the execution of a process, and how the output from the process is handled. It defines an interface that facilitates the publishing of geospatial processes and clients' discovery of and binding to those processes. The data required by the WPS can be delivered across a network or they can be available at the server. (http://www.opengeospatial.org/standards/wps) | |
| SPS | OGC Sensor planning ser- vice | defines interfaces for queries that provide information about the capabilities of a sensor and how to task the sensor. The standard is designed to support queries that have the following purposes: to determine the feasibility of a sensor planning request; to submit such a request; to inquire about the status of such a request; to update or cancel such a request; and to request information about other OGC Web services that provide access to the data collected by the requested task. | |
| OAI- PMH | Open Archives Initiative Proto- col for Metada- ta Harvesting | provides an application-independent interoperability framework based on metadata harvesting. | |

Example usage:

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1043 1044 <srv:serviceType>
 <gco:LocalName</pre>

 $\verb|codeSpace="http://resources.usgin.org/registry/serviceType201001">WMS</gco:LocalName>| The control of the c$

</srv:serviceType>

7.2 Linkage name conventions

The cardinality of the online element in DigitalTransferOptions is 0..*. In order to distinguish the nature of various linkages that might be provided, above and beyond function, protocol, and applicationProfile, USGIN profile mandates use of the following names to associate with links to identify important linkages.

Table 12. USGIN Names to identify special linkage URL's for CI_Online Resource. CodeList URI = http://resources.usgin.org/registry/linkageName201001

| Identifier | Name (eng) | Usage |
|--------------------|---------------------|---|
| icon | icon | linkage url is link to a thumbnail icon. Icon pixel height and width range? |
| serviceDescription | Service Description | linkage url is link to getCapabilities or WSDL that describes a service using a formal syntax such that computer programs can automate connection to the service. |
| baseURL | Base URL | Base url for service. Assumes that ServiceType specifies a well know service type such that requests can be constructed |

| | | without significant additional information. |
|---------------|----------------|---|
| serviceClient | Service Client | URL is linkage to a web application that allows the user to access the service |
| webpage | Web page | URL locates a web page with instructions for accessing the service. This provides the user with information to implement a connection to the service, but does not enable automated service access. |

Example usage:

Use of such controlled vocabulary can be indicated by using xsi:type on the gco:characterString element to make the type gml:CodeType, which then requires a codeSpace attribute. The distribution format Identifier from Table 6 should be used as the element value. For compatibility with systems that can not process this encoding, the code identifier should be included as the element value as well as the code-ListValue.

8 Examples

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8.1 USGIN ISO 19139 Minimum Dataset Metadata

In the following listing, text in green is comments; XML elements are in blue, XML attributes are in black, and attribute values are in purple.

```
1069
        <?xml version="1.0" encoding="UTF-8"?>
1070
1071
        **********************************
1072
        *** Minimum example of a ISO 19139 Geospatial Dataset Metadata
1073
1074
        *** based on the USGIN v1.1 Profile
        *** by USGIN Standards and Protocols Drafting Team
1075
        *** U.S. Geoscience Information System (USGIN) - http://lab.usgin.org
1076
1077
        *** Contributors: Wolfgang Grunberg, Stephen M Richard
        *** 01/20/2010
1078
1079
        *** DISCLAIMER: this is not an authoritative metadata example but an aide to get started.
1080
        *** Scope notes are mostly from NAP or ISO documentation; refer to
1081
        *** the USGIN profile document for more specific and reliable guidelines.
1082
        *** Validated against http://www.isotc211.org/2005/gmd (ISO 19115, CSW 2.0.2 AP ISO 1.0).
1083
1084
        *** Follows the USGIN ISO 19139 Dataset Metadata Profile v1.1.
1085
        *** a derivative of the North American Profile (NAP)
1086
        ***
1087
        *** NOTES:
1088
        *** - Codelists:
1089
        *** Most ISO metadata profiles and applications use ISO codelists or codelists that use ISO's
1090
        codelist names. NAP does not use ISO codelist names. USGIN recommends using ISO over NAP
1091
        codelists to ensure interoperability. Remember, the codeList attribute points to a Uniform
1092
        Resource Identifier (URI) which defines an item's identity. It can be a URN or a URL.
1093
        *** - napm schema extension:
1094
        ***
1095
        http://www.cits.rncan.gc.ca/html/brodeurj/.protege/.napMetadata/napMetadataWebsite/napMetadataToo
1096
        ls/napXsd/napm is the namespace for NAP extensions in xmlns:napm. Its schema is located at
1097
        http://www.cits.rncan.gc.ca/html/brodeurj/.protege/.napMetadata/tools/napXsd/napm/napm.xsd.
1098
        However, that schema does not resolve properly because it also refernces a local copy of gmd.
1099
        USGIN does not follow this NAP requirement because it constitutes a barier to interoperability.
1100
        *** - Language code:
1101
1102
        *** NAP demands <ISO639-2/T three letter language code - lower case><;><blank space><ISO3166-1
        three letter country code - upper case>. However, NAP's requirement is not interoperable and
1103
        USGIN prefers ISO's <ISO639-2/T three letter language code - lower case> formatting.
1104
1105
        *** KEY: (NAP-USGIN) - M/C/O/X (Mandatory, Conditional, Optional, Not Used)
1106
        1107
1108
1109
        <!-- USGIN ISO 19139 geospatial dataset metadata record -->
1110
        <qmd:MD Metadata</pre>
1111
         xmlns:gmd="http://www.isotc211.org/2005/gmd"
1112
         xmlns:gco="http://www.isotc211.org/2005/gco"
1113
         xmlns:gml="http://www.opengis.net/gml"
1114
         xmlns:xlink="http://www.w3.org/1999/xlink"
1115
         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
1116
         xsi:schemaLocation="http://www.isotc211.org/2005/gmd
1117
        http://schemas.opengis.net/csw/2.0.2/profiles/apiso/1.0.0/apiso.xsd">
1118
         <!-- (M-M) Metadata file identifier - A unique File Identifier (GUID) - USGIN recommends using
1119
        a valid Universally Unique Identifier (UUID) -->
1120
         <qmd:fileIdentifier>
1121
           <qco:CharacterString>08fb00c8-0882-4bf7-b07f-fd37050c5efc/qco:CharacterString>
1122
1123
         </gmd:fileIdentifier>
         <!-- (M-M) Metadata language - NAP demands <ISO639-2/T three letter language code - lower
1124
        case><i><blank space><ISO3166-1 three letter country code - upper case>. However, NAP's
1125
        requirement is not interoperable and USGIN prefers ISO's <ISO639-2/T three letter language code -
1126
        lower case> formatting. -->
```

```
1127
          <!-- NAP Example -->
1128
          <!--
1129
          <amd:language>
1130
            <gco:CharacterString>eng; USA</gco:CharacterString>
1131
          </amd:language>
1132
1133
          <!-- ISO Example -->
1134
          <amd:language>
1135
            <gco:CharacterString>eng</gco:CharacterString>
1136
1137
          </amd:language>
          <!-- (M-M) Metadata character set - NAP specifies default is "utf8", codelist =
1138
        napMD_CharacterSetCode. USGIN requires that a character set code is defined to facilitate CSW
1139
        servers (deegree, GeoNetwork, etc.). -->
1140
          <gmd:characterSet>
1141
            <!-- MD_CharacterSetCode names: {ucs2, ucs4, utf7, utf8, utf16, 8859part1, 8859part2,
1142
        8859part3, 8859part4, 8859part5, 8859part6, 8859part7, 8859part8, 8859part9, 8859part10,
1143
        8859part11, 8859part13, 8859part14, 8859part15, 8859part16, jis, shiftJIS, eucJP, usAscii,
1144
        ebcdic, eucKR, big5, GB2312} -->
1145
           <!-- NAP example -->
1146
            <!--
1147
            <qmd:MD CharacterSetCode
1148
              codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_95"
1149
             codeListValue="RI_458">utf8</gmd:MD_CharacterSetCode>
1150
1151
            <!-- ISO example -->
1152
            <qmd:MD CharacterSetCode</pre>
1153
1154
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1155
        Codelist/gmxCodelists.xml#MD_CharacterSetCode"
1156
              codeListValue="utf8">UTF-8</gmd:MD_CharacterSetCode>
1157
1158
          </gmd:characterSet>
          <!-- (M-M) Resource type - Define if this record is a: dataset (default), service, feature,
1159
        software, etc. -->
1160
          <gmd:hierarchyLevel>
1161
            <!-- MD_ScopeCode code names: {attribute, attributeType, collectionHardware,
1162
        collectionSession, dataset, series, nonGeographicDataset, dimensionGroup, feature, featureType,
1163
        propertyType, fieldSession, software, service, model, tile}. -->
1164
            <!-- NAP example -->
1165
            <!--
1166
            <gmd:MD_ScopeCode
1167
             codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_108"
1168
             codeListValue="RI_622">dataset</gmd:MD_ScopeCode>
1169
1170
            <!-- ISO example -->
1171
1172
            <gmd:MD_ScopeCode</pre>
1173
         codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1174
        Codelist/gmxCodelists.xml#MD_ScopeCode"
1175
              codeListValue="dataset">dataset</gmd:MD_ScopeCode>
1176
          </gmd:hierarchyLevel>
1177
          <!-- (O-M) Resource hierarchy level name - ISO 19115 assumes that the metadata hierarchy level
1178
1179
        name defaults to "dataset" if it is not documented. NAP does not use it, recognizing that it is
        redundant. USGIN makes this property mandatory to identify the USGIN resource type (see USGIN
1180
        Profile, "Resources of Interest"). Default USGIN hierarchyLevelName.CharacterString is "Dataset."
1181
        Encode hierarchy by including hierarchyLevelName elements for all broader resource categories.
        E.g. default should also include a hierarchyLevelName="Collection" element. For services USGIN
1182
1183
        hierarchyLevelName.CharacterString is "Service". As use cases develop that provide rationale for
1184
        definition of sub-categories of service, the resource category list will be expanded. -->
1185
1186
          <gmd:hierarchyLevelName>
            <gco:CharacterString>Dataset</gco:CharacterString>
1187
          </gmd:hierarchyLevelName>
1188
          <!-- (M-M) Metadata point of contact - Point of contact for the metadata record, e.g. for users
1189
        to report errors, updates to metadata, etc. -->
1190
          <qmd:contact>
1191
            <qmd:CI ResponsiblePartv>
1192
              <!-- (M-M) (individualName + organisationName + positionName) > 0 -->
1193
1194
              <qmd:individualName>
1195
                <gco:CharacterString>Stephen Richard</gco:CharacterString>
1196
              </gmd:individualName>
1197
1198
              <gmd:organisationName>
```

```
1199
                  <gco:CharacterString>Arizona Geological Survey</gco:CharacterString>
1200
1201
1202
1203
1204
1205
1206
                </gmd:organisationName>
                <!--
                <gmd:positionName>
                 <gco:CharacterString>Metadata Czar</gco:CharacterString>
                </gmd:positionName>
                <qmd:contactInfo>
1200
1207
1208
1209
                  <gmd:CI_Contact>
                   <!-- Phone -->
                    <!--
1210
                    <gmd:phone>
1211
1212
1213
1214
1215
1216
1217
1218
1219
1220
                      <gmd:CI_Telephone>
                        <gmd:voice>
                          <gco:CharacterString>520.770.3500</gco:CharacterString>
                        </gmd:voice>
                        <qmd:facsimile>
                          <gco:CharacterString>520.770.3505
                        </amd:facsimile>
                      </gmd:CI_Telephone>
                    </gmd:phone>
                    -->
1221
1222
1223
1224
1225
1226
1227
1228
1229
1231
1232
1233
1234
1235
1236
1237
1238
1239
1241
1242
1241
                    <!-- Address -->
                    <amd:address>
                      <gmd:CI_Address>
                        <!--
                        <gmd:deliveryPoint>
                          <gco:CharacterString>416 W. Congress St., Suite 100/gco:CharacterString>
                        </gmd:deliveryPoint>
                        <gmd:city>
                          <gco:CharacterString>Tucson</gco:CharacterString>
                        </gmd:city>
                        <gmd:administrativeArea>
                          <gco:CharacterString>Arizona</gco:CharacterString>
                        </gmd:administrativeArea>
                        <gmd:postalCode>
                          <gco:CharacterString>85701-1381</gco:CharacterString>
                        </gmd:postalCode>
                        <qmd:country>
                          <gco:CharacterString>USA</gco:CharacterString>
                        </gmd:country>
                        -->
                        <!-- (O-M) Metadata point of contact e-mail address - mandatory in USGIN -->
                        <gmd:electronicMailAddress>
                          <gco:CharacterString>metadata@azgs.az.gov
1244
1245
                        </gmd:electronicMailAddress>
                      </gmd:CI_Address>
1246
                    </gmd:address>
1247
                  </gmd:CI_Contact>
1248
1249
                </gmd:contactInfo>
                <!-- (M-M) ISO 19139 Mandatory: contact role -->
1259
1250
1251
1252
1253
1254
1255
                <qmd:role>
                 <!-- CI_RoleCode names: {resourceProvider, custodian, owner, user, distributor,
         originator, pointOfContact, principalInvestigator, processor, publisher, author} - NAP expands
         with {collaborator, editor, mediator, rightsHolder}. -->
                 <!-- NAP example -->
                 <!--
1256
                  <gmd:CI_RoleCode
1257
1258
1259
                   codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_90"
                   codeListValue="RI_414">pointOfContact</gmd:CI_RoleCode>
1260
                 <!-- ISO example -->
1261
1262
1263
                  <gmd:CI_RoleCode
           codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1264
1265
1266
         Codelist/gmxCodelists.xml#CI_RoleCode"
                   codeListValue="pointOfContact">point of contact</gmd:CI_RoleCode>
                </amd:role>
1267
             </gmd:CI_ResponsibleParty>
1268
           </gmd:contact>
```

```
1269
          <!-- (M-M) Metadata date stamp - USGIN profile requires use of dateStamp/gco:DateTime (Note
1270
1271
1272
1273
1274
1275
1276
1277
1278
1279
1280
         this contrasts with INSPIRE mandate to use dateStamp/gco:Date). This is the date and time when
         the metadata record was created or updated (following NAP). -->
          <gmd:dateStamp>
            <!-- Requires an extended ISO 8601 formatted combined UTC date and time string (2009-11-
         17T10:00:00) -->
             <gco:DateTime>2010-01-14T10:00:00/gco:DateTime>
          </gmd:dateStamp>
          <!-- (M-M) metadata standard - NAP specifies "NAP - Metadata". USGIN profile conformant
         metadata is indicated by using "ISO-NAP-USGIN" -->
          <gmd:metadataStandardName>
             <gco:CharacterString>ISO-NAP-USGIN
1281
1282
1283
1284
          </gmd:metadataStandardName>
          <!-- (O-M) USGIN profile version -->
          <gmd:metadataStandardVersion>
             <gco:CharacterString>1.1
1285
1286
1287
          </gmd:metadataStandardVersion>
          <!-- (M-M) Resource identification information - At least one of MD DataIdentification
1288
1289
1290
         (dataset, dataset series) or SV_ServiceIdentification (service) is required.
          <gmd:identificationInfo>
             <!-- Resource Dataset or Dataset Series Identification -->
1290
1291
1292
1293
             <gmd:MD_DataIdentification>
               <qmd:citation>
                 <!-- (M-M) Resource citation - For USGIN purposes, this should be viewed as information
1294
         to identify the intellectual origin of the content in the described resource, along the lines of
1294
1295
1296
1297
1298
1299
1300
         a citation in a scientific journal. Required content for a CI_Citation element are title, date,
         and responsibleParty -->
                 <qmd:CI Citation>
                  <!-- (M-M) Resource title - USGIN recommends using titles that inform the human reader
         about the dataset's content as well as its context. -->
                   <qmd:title>
1301
                    <qco:CharacterString>USGIN minimum metadata example XML file. Note that this example
1302
         includes conditional minimum elements that may or may not apply to a specific resource and its
1303
         metadata.</gco:CharacterString>
1304
                   </amd:title>
1305
                   <!-- (M-M) Resource reference date - Best practice is to include at least the date of
1306
         publication or creation of the resource. The date of the resource reported in the citation
1307
         corresponds to the resource's last update version according to its update frequency. CI_Date
1308
         content includes a date and dateType. Date for USGIN profile uses xs:date data type, defined thus
1309
         "date uses the date/timeSevenPropertyModel, with hour, minute, and second required to be absent.
1310
1311
         timezoneOffset • remains optional" (http://www.w3.org/TR/xmlschema11-2). -->
                   <qmd:date>
1312
                     <gmd:CI_Date>
1313
                       <qmd:date>
1314
                         <!-- Requires an extended ISO 8601 formatted combined UTC date and time string
1315
         (2001-12-17T09:30:47) -->
1316
                         <gco:DateTime>2010-01-14T09:30:47
1317
                       </gmd:date>
1318
                       <qmd:dateType>
1319
1320
1321
1322
                         <!-- CI DateTypeCode names: {creation, publication, revision} - NAP expands with
         {notAvailable, inForce, adopted, deprecated, superseded}. -->
                         <!-- NAP example -->
                         <!--
1323
1324
1325
                           codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_87"
                           codeListValue="RI_367">publication</qmd:CI_DateTypeCode>
1326
                           -->
1327
1328
1329
                           <!-- ISO example -->
                         <gmd:CI_DateTypeCode
1330
1331
1332
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
         Codelist/gmxCodelists.xml#CI_DateTypeCode"
                           codeListValue="publication">publication</gmd:CI_DateTypeCode>
1333
                       </gmd:dateType>
1334
1335
1336
                     </gmd:CI_Date>
                   </gmd:date>
                   <!-- (C-C) Unique resource identifier - NAP makes MD_Identifier mandatory for dataset
1337
1338
1339
        For USGIN purposes, this element content value should be only considered an identifier for the citation, without any assumption that it will use http protocol. The identifier may be
1340
         resolvable to a URL, if a protocol prefix specifies an identifier scheme that is resolvable (e.g.
```

```
1341
        http, urn...), but this is not necessary for a valid document, and should not be assumed when
1342
        processing metadata documents.
1343
                   For USGIN, IF the Citation has an identifier that is different from the identifier for
1344
        the described resource (MD_Metadata/dataSetURI), it must be included here. RS_Identifier may
1345
        substitute for MD_Identifier in the ISO19139 schema, but the USGIN profile requires use of
1346
        MD_Identifer. If additional codespace and version content is associated with the identifier, it
1347
        should be encoded as MD_Identifier/authority/ CI_Citation/ alternateTitle and MD_Identifier/
1348
        authority/ CI_Citation/ edition -->
1349
                 <gmd:identifier>
1350
                    <gmd:MD_Identifier>
1351
                     <qmd:code>
1352
                       <!-- 13 digit ISBN example -->
1353
                       <gco:CharacterString>isbn:000-0-0000-0</gco:CharacterString>
1354
                     </amd:code>
1355
                    </gmd:MD_Identifier>
1356
1357
                  </gmd:identifier>
                  <!-- (M-M) Resource responsible party - The citation attribute provides information for
1358
        citing the described resource. Citation is defined by Webster as "an act of quoting". The precise
1359
        semantics of what an identification/citation is supposed to be are not very well articulated in
1360
        ISO19115. For USGIN purposes, this should be viewed as information to identify the intellectual
1361
        origin (or property) of the content in the described resource, along the lines of a citation in a
1362
        scientific journal. Required content for a CI_Citation element are title, date, and
1363
        'responsibleParty'. -->
1364
                 <gmd:citedResponsibleParty>
1365
                    <qmd:CI ResponsibleParty>
1366
                     <!-- (C-C) (individualName + organisationName + positionName) > 0 -->
1367
                     <1--
1368
                     <gmd:individualName>
1369
                       <gco:CharacterString>Wolfgang Grunberg</gco:CharacterString>
1370
1371
1372
                     </gmd:individualName>
                     <gmd:organisationName>
1373
                       <gco:CharacterString>Arizona Geological Survey/gco:CharacterString>
1374
                     </gmd:organisationName>
1375
                     <!--
1376
                     <gmd:positionName>
1377
1378
                       <gco:CharacterString>IT Specialist</gco:CharacterString>
                     </gmd:positionName>
1379
1380
                     <!-- (O-C) Contact Information - (phone + deliveryPoint + electronicMailAddress ) >
1381
1382
        0 -->
                     <gmd:contactInfo>
1383
                       <gmd:CI_Contact>
1384
                         <qmd:phone>
1385
                           <gmd:CI_Telephone>
1386
                             <gmd:voice>
1387
                               <gco:CharacterString>520-770-3500
1388
                             </amd:voice>
1389
                             <qmd:facsimile>
1390
                               <gco:CharacterString>520-770-3505</gco:CharacterString>
1391
                             </gmd:facsimile>
1392
                           </gmd:CI_Telephone>
1393
                         </gmd:phone>
1394
                         <!--
1395
                         <amd:address>
1396
                           <gmd:CI_Address>
1397
                             <gmd:deliveryPoint>
1398
                               <gco:CharacterString>416 W. Congress St., Suite 100/gco:CharacterString>
1399
                             </gmd:deliveryPoint>
1400
                             <qmd:citv>
1401
                               <gco:CharacterString>Tucson</gco:CharacterString>
1402
                             </amd:city>
1403
                             <gmd:administrativeArea>
1404
                               <gco:CharacterString>Arizona</gco:CharacterString>
1405
                             </gmd:administrativeArea>
1406
                             <gmd:postalCode>
1407
                               <gco:CharacterString>85701</gco:CharacterString>
1408
                             </gmd:postalCode>
1409
                             <amd:country>
1410
                               <gco:CharacterString>USA</gco:CharacterString>
1411
                             </gmd:country>
1412
                             <gmd:electronicMailAddress>
```

```
1413
                               <gco:CharacterString>metadata@azgs.az.go</gco:CharacterString>
1414
                             </gmd:electronicMailAddress>
1415
                           </gmd:CI_Address>
1416
                         </gmd:address>
1417
1418
                       </gmd:CI_Contact>
1419
                     </gmd:contactInfo>
1420
                     <!-- (M-M) ISO 19139 Mandatory: contact role - Guidance on use of role codes would
1421
        be helpful for consistency, but has not been developed as yet.. -->
1422
                     <md:role>
1423
                       <!-- CI_RoleCode names: {resourceProvider, custodian, owner, user, distributor,
1424
        originator, pointOfContact, principalInvestigator, processor, publisher, author} - NAP expands
1425
        with {collaborator, editor, mediator, rightsHolder}. -->
1426
                       <!-- NAP example -->
1427
                       <!--
1428
                       <gmd:CI_RoleCode
1429
                         codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_90"
1430
                         codeListValue="RI_414">pointOfContact</gmd:CI_RoleCode>
1431
1432
                       <!-- ISO example -->
1433
                       <gmd:CI_RoleCode
1434
1435
         codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1436
        Codelist/gmxCodelists.xml#CI_RoleCode"
1437
                         codeListValue="pointOfContact">point of contact</gmd:CI_RoleCode>
1438
                     </amd:role>
1439
                   </gmd:CI_ResponsibleParty>
1440
                 </gmd:citedResponsibleParty>
1441
                </gmd:CI_Citation>
1442
              </gmd:citation>
1443
             <!-- (M-M) Resource Abstract - A free text summary of the content, significance, purpose,
1444
        scope, etc. of the resource. Exactly one value. -->
1445
             <qmd:abstract>
1446
                <gco:CharacterString>Example for the minimum required elements in a USGIN dataset
1447
        metadata record.</gco:CharacterString>
1448
             </gmd:abstract>
1449
              <!-- (M-M) Resource Status - -->
1450
             <qmd:status>
1451
               <!-- Value is from MD_ProgressCode names: {completed, historicalArchive, obsolete,
1452
        onGoing, planned, required, underDevelopment} - NAP expands with {proposed}. Obsolete is
1453
        synonymous with deprecated. -->
1454
               <!-- NAP example -->
1455
               <!--
1456
                <gmd:MD_ProgressCode
1457
                 codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_106"
1458
                 codeListValue="RI_593">completed</gmd:MD_ProgressCode>
1459
1460
               <!-- ISO Example -->
1461
               <gmd:MD_ProgressCode
1462
1463
         codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1464
        Codelist/gmxCodelists.xml#MD_ProgressCode"
1465
                 codeListValue="completed">completed</gmd:MD_ProgressCode>
1466
              </amd:status>
1467
              <!-- (O-C) Resource point of contact (access contact) - CI_ResponsibleParty element here
1468
        would contain information for point of contact to access the resource. This information is
1469
        mandatory for physical resources such as core, cuttings, samples, manuscripts. -->
1470
             <qmd:pointOfContact>
1471
                <gmd:CI_ResponsibleParty>
1472
                 <!-- (M-M) (individualName + organisationName + positionName) > 0 -->
1473
                 <!--
1474
                 <gmd:individualName>
1475
                   <gco:CharacterString>Steve Rauzi</gco:CharacterString>
1476
                 </gmd:individualName>
1477
                 -->
1478
                 <gmd:organisationName>
1479
                   <gco:CharacterString>Arizona Geological Survey/gco:CharacterString>
1480
                 </gmd:organisationName>
1481
1482
                 <qmd:positionName>
1483
                   <gco:CharacterString>Oil and Gas Administrator</gco:CharacterString>
1484
                 </gmd:positionName>
```

```
1485
                  -->
1486
                  <!-- (O-C) Contact Information - If a resource point of contact is required then (phone
1487
        + deliveryPoint + electronicMailAddress) > 0 -->
1488
                  <gmd:contactInfo>
1489
                    <qmd:CI Contact>
1490
                      <!--
1491
                      <gmd:phone>
1492
                        <gmd:CI_Telephone>
1493
                          <qmd:voice>
1494
                            <qco:CharacterString>520-770-3500</qco:CharacterString>
1495
                          </amd:voice>
1496
                          <qmd:facsimile>
1497
                            <gco:CharacterString>520-770-3505
1498
                          </gmd:facsimile>
1499
                        </gmd:CI_Telephone>
1500
                      </gmd:phone>
1501
1502
                      -->
                      <gmd:address>
1503
                        <gmd:CI_Address>
1504
                          <!--
1505
                          <qmd:delivervPoint>
1506
                            <gco:CharacterString>416 W. Congress St., Suite 100/gco:CharacterString>
1507
                          </gmd:deliveryPoint>
1508
1509
                          <amd:citv>
                            <gco:CharacterString>Tucson</gco:CharacterString>
1510
                          </gmd:city>
1511
                          <gmd:administrativeArea>
1512
1513
                            <gco:CharacterString>Arizona</gco:CharacterString>
                          </gmd:administrativeArea>
1514
                          <gmd:postalCode>
1515
1516
                            <gco:CharacterString>85701</gco:CharacterString>
                          </gmd:postalCode>
1517
                          <gmd:country>
1518
                            <gco:CharacterString>USA</gco:CharacterString>
1519
                          </gmd:country>
1520
1521
1522
1523
                          <gmd:electronicMailAddress>
                            <gco:CharacterString>Steve.rauzi@azgs.az.go
                          </gmd:electronicMailAddress>
1524
                        </gmd:CI Address>
1525
1526
1527
1528
1529
1530
1531
1532
                      </gmd:address>
                    </gmd:CI_Contact>
                  </gmd:contactInfo>
                  <!-- (M-M) ISO 19139 Mandatory: contact role - Guidance on use of role codes would be
        helpful for consistency, but has not been developed as yet. -->
                  <gmd:role>
                    <!-- The CI_ResponsibleParty/role/CI_RoleCode is from CI_RoleCode names:</pre>
        {resourceProvider, custodian, owner, user, distributor, originator, pointOfContact,
1533
1534
1535
        principalInvestigator, processor, publisher, author} - NAP expands with {collaborator, editor,
        mediator, rightsHolder \ . -->
                    <!-- NAP example -->
1536
1537
1538
                    <!--
                    <gmd:CI_RoleCode
                      codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_90"
1539
                      codeListValue="RI_414">pointOfContact/gmd:CI_RoleCode>
1540
1541
                    <!-- ISO example -->
1542
                    <gmd:CI_RoleCode
1543
1544
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1545
        Codelist/gmxCodelists.xml#CI_RoleCode"
1546
                      codeListValue="pointOfContact">point of contact/gmd:CI_RoleCode>
1547
                  </gmd:role>
1548
                </gmd:CI_ResponsibleParty>
1549
              </gmd:pointOfContact>
1550
              <!-- (M-M) Resource language - Multiple instances of this element indicate that the
1551
        linguistic content of the resource is available in multiple languages -->
1552
              <qmd:language>
1553
                <!-- ISO 639-2/T three-letter language code in lowercase
1554
1555
        (http://www.loc.gov/standards/iso639-2/). -->
                <gco:CharacterString>eng</gco:CharacterString>
1556
              </gmd:language>
```

```
1557
             <!-- (C-C) Topic category - NAP specifies that topicCategory code shall be provided when
1558
        hierarchyLevel is set to "dataset" or "dataset series". Most USGIN resources will have
1559
        topicCategory="geoscientificInformation", which is the default value for this profile. More
1560
        specific topic categorization should be done using keywords. NAP declares not applicable to
1561
        services. -->
1562
             <gmd:topicCategory>
1563
             <!-- MD_TopicCategoryCode names: {farming, biota, boundaries,
1564
        1565
        health, imageryBaseMapsEarthCover, intelligenceMilitary, inlandWater, location, oceans,
1566
1567
        planningCadastre, society, structure, transportation, utilitiesCommunication} -->
               <gmd:MD_TopicCategoryCode>geoscientificInformation/gmd:MD_TopicCategoryCode>
1568
             </gmd:topicCategory>
1569
             <!-- (C-C) Resource content extent - Defines the spatial (horizontal and vertical) and
1570
        temporal region to which the content of the resource applies. For USGIN, the spatial extent is a
1571
        rectangle that bounds the geographic extent to which resource content applies. NAP specifies
1572
        required when hierarchyLevel is set to 'dataset'. USGIN specifies (description +
1573
1574
        geographicElement + temporalElement) > 0. -->
             <gmd:extent>
1575
               <qmd:EX Extent>
1576
                 <!-- (C-C) Resource Content extent description - Free text that describes the spatial
1577
        and temporal extent of the dataset. USGIN specifies that description is mandatory if a
1578
        geographicElement or temporalElement is not provided. Note that if geographic place names are
1579
        used to express the geographic extent, USGIN profile specifies that these should be encoded using
1580
1581
        keyword with keyword type code = 'place.' Geographic names may be duplicated in the
        EX_Extent/description. -->
1582
                 <!--
1583
                 <gmd:description>
1584
                   <qco:CharacterString>Some spatio-temporal description.</qco:CharacterString>
1585
                 </gmd:description>
1586
1587
                 <!-- (O-C) Resource content extent bounding box -USGIN profile requires that if an
1588
        EX_Extent/geographicElement is supplied, it include a geographic bounding box with bounding
1589
        latitude and longitude expressed using WGS 84 decimal degrees. The corner coordinates for the
1590
        geographic bounding box must not coincide in one point, because this may result in fatal errors
1591
        with some CSW implementations. Point locations must thus be represented as tiny rectangles. USGIN
1592
        recommended practice is to place the actual point location in the lower left corner of the
1593
        rectangle. -->
1594
1595
                 <gmd:geographicElement>
                   <gmd:EX_GeographicBoundingBox>
1596
                     <gmd:extentTypeCode>
1597
                       <gco:Boolean>1</gco:Boolean>
1598
                     </gmd:extentTypeCode>
1599
                     <gmd:westBoundLongitude>
1600
                       <gco:Decimal>-109.911001
1601
                     </gmd:westBoundLongitude>
1602
                     <gmd:eastBoundLongitude>
1603
                      <gco:Decimal>-109.910999</gco:Decimal>
1604
                     </gmd:eastBoundLongitude>
1605
                     <gmd:southBoundLatitude>
1606
                       <gco:Decimal>34.772899
1607
                     </gmd:southBoundLatitude>
1608
                     <gmd:northBoundLatitude>
1609
                       <gco:Decimal>34.772901
1610
                     </gmd:northBoundLatitude>
1611
                   </gmd:EX_GeographicBoundingBox>
1612
                 </gmd:geographicElement>
1613
               </gmd:EX_Extent>
1614
             </gmd:extent>
1615
             <!-- (0-0) Resource temporal extent - -->
1616
1617
             <qmd:extent>
1618
               <gmd:EX_Extent>
1619
                 <gmd:temporalElement>
1620
                   <gmd:EX_TemporalExtent>
1621
                     <qmd:extent>
1622
1623
1624
                       --><!-- Default ISO time frame example --><!--
                       <gml:TimePeriod gml:id="IdModern">
                        <qml:name>Y2KX</qml:name>
1625
                         --><!-- USGIN requires the beginPosition and endPosition's frame property to be
1626
        defined. The default value is #ISO-8601. --><!--
1627
                        <qml:beginPosition frame="#ISO-8601">2010-01-00T00:00:00/qml:beginPosition>
1628
                        <qml:endPosition frame="#ISO-8601">2010-12-31T24:00:00</qml:endPosition>
```

```
1629
1630
1631
1632
1633
1634
1635
1636
1637
                          </gml:TimePeriod>
                          --><!-- Geologic time frame example --><!--
                          <gml:TimePeriod gml:id="IdJurassic">
                            <gml:name>Jurassic</pml:name>
                            --><!-- USGIN requires the beginPosition and endPosition's frame property to be
         defined. The default value is #ISO-8601. --><!--
                            <gml:beginPosition</pre>
         frame="urn:cgi:trs:CGI:StandardGeologicTimeMa">203</pml:beginPosition>
                            <qml:endPosition frame="urn:cgi:trs:CGI:StandardGeologicTimeMa</pre>
1638
1639
1640
         ">135</gml:endPosition>
                          </gml:TimePeriod>
                        </gmd:extent>
1641
1642
                     </gmd:EX_TemporalExtent>
                   </gmd:temporalElement>
1643
1644
                 </gmd:EX_Extent>
               </gmd:extent>
1645
               -->
1646
1647
             </gmd:MD_DataIdentification>
           </gmd:identificationInfo>
1648
1649
         </gmd:MD_Metadata>
1650
```

1652 1653

1654

1655

8.2 USGIN ISO 19139 Dataset Metadata

In the following listing, text in green is comments; XML elements are in blue, XML attributes are in black, and attribute values are in purple.

```
1656
       <?xml version="1.0" encoding="UTF-8"?>
1657
1658
              *****
1659
        *** Example ISO 19139 Geospatial Dataset Metadata based on the USGIN v1.1 Profile
1660
        *** by USGIN Standards and Protocols Drafting Team
1661
        *** U.S. Geoscience Information System (USGIN) - http://lab.usgin.org
1662
        *** Contributors: Wolfgang Grunberg, Stephen M Richard
        *** 01/20/2010
1663
1664
       ***
1665
        *** DISCLAIMER: this is not an authoritative metadata example but an aide to get started.
1666
        *** Scope notes are mostly from NAP or ISO documentation; refer to
1667
        *** the USGIN profile document for more specific and reliable guidelines.
1668
1669
        *** Validated against http://www.isotc211.org/2005/gmd (ISO 19115, CSW 2.0.2 AP ISO 1.0).
1670
        *** Follows the USGIN ISO 19139 Dataset Metadata Profile v1.1.
1671
1672
       *** a derivative of the North American Profile (NAP)
1673
       *** NOTES:
1674
       *** - Codelists:
1675
        *** Most ISO metadata profiles and applications use ISO codelists or codelists that use ISO's
1676
       codelist names. NAP does not use ISO codelist names. USGIN recommends using ISO over NAP
1677
1678
        codelists to ensure interoperability. Remember, the codeList attribute points to a Uniform
       Resource Identifier (URI) which defines an item's identity. It can be a URN or a URL.
1679
        *** - napm schema extension:
1680
       ***
1681
       http://www.cits.rncan.gc.ca/html/brodeurj/.protege/.napMetadata/napMetadataWebsite/napMetadataToo
1682
        ls/napXsd/napm is the namespace for NAP extensions in xmlns:napm. Its schema is located at
1683
       http://www.cits.rncan.qc.ca/html/brodeurj/.proteqe/.napMetadata/tools/napXsd/napm/napm.xsd.
1684
       However, that schema does not resolve properly because it also references a local copy of gmd.
1685
       USGIN does not follow this NAP requirement because it constitutes a barier to interoperability.
1686
        *** - Language code:
1687
        *** NAP demands <ISO639-2/T three letter language code - lower case><;><blank space><ISO3166-1
1688
1689
        three letter country code - upper case>. However, NAP's requirement is not interoperable and
       USGIN prefers ISO's <ISO639-2/T three letter language code - lower case> formatting.
1690
1691
        *** KEY: (NAP-USGIN) - M/C/O/X (Mandatory, Conditional, Optional, Not Used)
1692
1693
        1694
1695
        <!-- USGIN ISO 19139 geospatial dataset metadata record -->
1696
        <gmd:MD_Metadata
1697
        xmlns:qmd="http://www.isotc211.org/2005/qmd"
1698
         xmlns:gco="http://www.isotc211.org/2005/gco"
1699
         xmlns:gml="http://www.opengis.net/gml"
1700
         xmlns:xlink="http://www.w3.org/1999/xlink"
1701
         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
1702
1703
         xsi:schemaLocation="http://www.isotc211.org/2005/gmd
       http://schemas.opengis.net/csw/2.0.2/profiles/apiso/1.0.0/apiso.xsd">
1704
         <!-- (M-M) Metadata file identifier - A unique File Identifier (GUID) - USGIN recommends using
1705
       a valid Universally Unique Identifier (UUID) -->
1706
         <gmd:fileIdentifier>
1707
           <gco:CharacterString>00C02E67-F1ED-473D-A240-068CCB041A73/gco:CharacterString>
1708
         </gmd:fileIdentifier>
1709
1710
         <!-- (M-M) Metadata language - NAP demands <ISO639-2/T three letter language code - lower
        case><;><blank space><ISO3166-1 three letter country code - upper case>. However, NAP's
1711
       requirement is not interoperable and USGIN prefers ISO's <ISO639-2/T three letter language code -
1712
       lower case> formatting. -->
1713
         <!-- NAP Example -->
1714
         <!--
1715
         <gmd:language>
1716
           <gco:CharacterString>eng; USA</gco:CharacterString>
1717
```

```
1718
1719
          <!-- ISO Example -->
1720
1721
1722
          <qmd:language>
            <gco:CharacterString>eng</gco:CharacterString>
          </amd:language>
1723
1724
1725
          <!-- (M-M) Metadata character set - NAP specifies default is "utf8", codelist =
        napMD_CharacterSetCode. USGIN requires that a character set code is defined to facilitate CSW
        servers (deegree, GeoNetwork, etc.). -->
1726
          <gmd:characterSet>
1727
1728
1729
        <!-- MD_CharacterSetCode names: {ucs2, ucs4, utf7, utf8, utf16, 8859part1, 8859part2,
8859part3, 8859part4, 8859part5, 8859part6, 8859part7, 8859part8, 8859part9, 8859part10,</pre>
         8859part11, 8859part13, 8859part14, 8859part15, 8859part16, jis, shiftJIS, eucJP, usAscii,
1730
1731
         ebcdic, eucKR, big5, GB2312}. -->
            <!-- NAP example -->
1732
1733
1734
1735
            <!--
            <gmd:MD_CharacterSetCode</pre>
              codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_95"
              codeListValue="RI_458">utf8</gmd:MD_CharacterSetCode>
1736
1737
            <!-- ISO example -->
1738
            <gmd:MD_CharacterSetCode</pre>
1739
1740
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1741
        Codelist/gmxCodelists.xml#MD_CharacterSetCode"
1742
              codeListValue="utf8">UTF-8</gmd:MD_CharacterSetCode>
1743
          </gmd:characterSet>
1744
          <!-- (M-M) Resource type - Define if this record is a: dataset (default), service, feature,
1745
        software, etc. -->
1746
          <gmd:hierarchyLevel>
1747
            <!-- MD_ScopeCode code names: {attribute, attributeType, collectionHardware,
1748
         collectionSession, dataset, series, nonGeographicDataset, dimensionGroup, feature, featureType,
1749
        propertyType, fieldSession, software, service, model, tile}. -->
1750
            <!-- NAP example -->
1751
            <!--
1752
1753
            <qmd:MD ScopeCode
              codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_108"
1754
              codeListValue="RI_622">dataset</gmd:MD_ScopeCode>
1755
1756
            <!-- ISO example -->
1757
            <gmd:MD_ScopeCode</pre>
1758
1759
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1760
        Codelist/gmxCodelists.xml#MD_ScopeCode"
1761
              codeListValue="dataset">dataset</gmd:MD_ScopeCode>
1762
          </gmd:hierarchyLevel>
1763
          <!-- (O-M) Resource hierarchy level name - ISO 19115 assumes that the metadata hierarchy level
1764
        name defaults to "dataset" if it is not documented. NAP does not use it, recognizing that it is
1765
         redundant. USGIN makes this property mandatory to identify the USGIN resource type (see USGIN
1766
         Profile, "Resources of Interest"). Default USGIN hierarchyLevelName.CharacterString is "Dataset."
1767
        Encode hierarchy by including hierarchyLevelName elements for all broader resource categories.
1768
        E.g. default should also include a hierarchyLevelName="Collection" element. For services USGIN
1769
1770
        hierarchyLevelName.CharacterString is "Service". As use cases develop that provide rationale for
        definition of sub-categories of service, the resource category list will be expanded. -->
1771
          <gmd:hierarchyLevelName>
1772
            <gco:CharacterString>Dataset
1773
          </gmd:hierarchyLevelName>
1774
          <!-- (M-M) Metadata point of contact - Point of contact for the metadata record, e.g. for users
1775
        to report errors, updates to metadata, etc. -->
1776
          <qmd:contact>
1777
            <gmd:CI_ResponsibleParty>
1778
              <!-- (M-M) (individualName + organisationName + positionName) > 0 -->
1779
              <gmd:individualName>
1780
                <gco:CharacterString>Stephen Richard
1781
              </gmd:individualName>
1782
              <qmd:organisationName>
1783
                <gco:CharacterString>Arizona Geological Survey/gco:CharacterString>
1784
              </gmd:organisationName>
1785
              <qmd:positionName>
1786
                <gco:CharacterString>Metadata Czar</gco:CharacterString>
1787
              </gmd:positionName>
1788
              <gmd:contactInfo>
1789
                <gmd:CI_Contact>
```

```
1790
                 <!-- Phone -->
1791
                 <gmd:phone>
1792
1793
                   <qmd:CI Telephone>
                     <gmd:voice>
1794
                       <gco:CharacterString>520.770.3500</gco:CharacterString>
1795
1796
                     </gmd:voice>
                     <gmd:facsimile>
1797
                       <gco:CharacterString>520.770.3505
1798
                     </gmd:facsimile>
1799
                   </gmd:CI_Telephone>
1800
                 </gmd:phone>
1801
                 <!-- Address -->
1802
                 <qmd:address>
1803
                   <gmd:CI_Address>
1804
                     <qmd:deliveryPoint>
1805
                       <gco:CharacterString>416 W. Congress St., Suite 100/gco:CharacterString>
1806
                     </gmd:deliveryPoint>
1807
                     <gmd:city>
1808
                       <gco:CharacterString>Tucson</gco:CharacterString>
1809
                     </gmd:city>
1810
                     <gmd:administrativeArea>
1811
                       <gco:CharacterString>Arizona
1812
                     </gmd:administrativeArea>
1813
                     <qmd:postalCode>
1814
                       <gco:CharacterString>85701-1381</gco:CharacterString>
1815
                     </gmd:postalCode>
1816
                     <qmd:country>
1817
                       <gco:CharacterString>USA</gco:CharacterString>
1818
                     </gmd:country>
1819
                     <!-- (O-M) Metadata point of contact e-mail address - mandatory in USGIN -->
1820
1821
1822
                     <gmd:electronicMailAddress>
                       <gco:CharacterString>metadata@azgs.az.gov
                     </gmd:electronicMailAddress>
1823
                   </gmd:CI_Address>
1824
                 </gmd:address>
1825
                 <!-- (0-0) online resources - this is the online resource to contact the metadata
1826
        person-->
1827
1828
                 <gmd:onlineResource>
                   <gmd:CI_OnlineResource>
1829
                     <qmd:linkage>
1830
                       <gmd:URL>http://www.azgs.az.gov
1831
                     </amd:linkage>
1832
                     <gmd:protocol>
1833
                       <gco:CharacterString>http</gco:CharacterString>
1834
                     </gmd:protocol>
1835
                     <qmd:description>
1836
                       <gco:CharacterString>Arizona Geological Survey Web Site/gco:CharacterString>
1837
                     </gmd:description>
1838
                   </gmd:CI_OnlineResource>
1839
                 </gmd:onlineResource>
1840
                 <!-- (0-0) hours of service -->
1841
1842
                 <qmd:hoursOfService>
                   <gco:CharacterString>8 AM to 5 PM Mountain Standard time (no daylight
1843
        savings)CharacterString>
1844
                 </gmd:hoursOfService>
1845
                 <!-- (0-0) contact instructions -->
1846
1847
                 <gmd:contactInstructions>
                   <gco:CharacterString>Contact Steve Rauzi [Steve.Rauzi@azgs.az.gov] or call Oil and Gas
1848
        Commission Staff at Arizona Geological Survey, 520-770-3500.</gco:CharacterString>
1849
                 </gmd:contactInstructions>
1850
                </gmd:CI_Contact>
1851
              </gmd:contactInfo>
1852
              <!-- (M-M) ISO 19139 Mandatory: contact role -->
1853
1854
               <!-- CI_RoleCode names: {resourceProvider, custodian, owner, user, distributor,
1855
        originator, pointOfContact, principalInvestigator, processor, publisher, author} - NAP expands
1856
        with {collaborator, editor, mediator, rightsHolder}.
1857
               <!-- NAP example -->
1858
                <!--
1859
                <qmd:CI RoleCode
1860
                 codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_90"
1861
                 codeListValue="RI_414">pointOfContact/gmd:CI_RoleCode>
```

```
1862
1863
               <!-- ISO example -->
1864
               <gmd:CI_RoleCode
1865
1866
         codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1867
        Codelist/gmxCodelists.xml#CI_RoleCode"
1868
                 codeListValue="pointOfContact">point of contact</gmd:CI_RoleCode>
1869
              </amd:role>
1870
            </gmd:CI_ResponsibleParty>
1871
1872
         </gmd:contact>
         <!-- (X-O) Metadata should include a URL that locates a thumbnail logo for organizations
1873
        related to the metadata origination, the organization hosting the catalog that returned the
1874
1875
        metadata, the organization that originated the data, and the organization hosting online services
        that provide access to the data. -->
1876
          <qmd:contact>
1877
            <gmd:CI_ResponsibleParty>
1878
             <qmd:organisationName>
1879
               <gco:CharacterString>Arizona Geological Survey/gco:CharacterString>
1880
              </gmd:organisationName>
1881
              <gmd:contactInfo>
1882
               <gmd:CI_Contact>
1883
                 <qmd:onlineResource>
1884
                   <gmd:CI_OnlineResource>
1885
                     <!-- Icon image file (e.g. tif, png, jpg, gif) for the metadata originator. This
1886
        Icon will be displayed in search results to credit the metadata originator. -->
1887
                     <gmd:linkage>
1888
                       <gmd:URL>http://www.azgs.az.gov/logo/metadata/azgs.png/gmd:URL>
1889
                     </amd:linkage>
1890
                     <!-- (X-C) For URL's that indicate icon thumbnails, the CI_OnlineResource/name
1891
        should be 'icon'. -->
1892
                     <qmd:name>
1893
                       <gco:CharacterString>icon</gco:CharacterString>
1894
                     </gmd:name>
1895
                   </gmd:CI_OnlineResource>
1896
                 </gmd:onlineResource>
1897
               </gmd:CI_Contact>
1898
              </gmd:contactInfo>
1899
              <gmd:role>
1900
               <!-- CI_RoleCode names: {resourceProvider, custodian, owner, user, distributor,
1901
        originator, pointOfContact, principalInvestigator, processor, publisher, author} - NAP expands
1902
        with {collaborator, editor, mediator, rightsHolder}.
1903
               <!-- NAP example -->
1904
               <!--
1905
               <gmd:CI_RoleCode
1906
                 codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_90"
1907
                 codeListValue="RI_413">originator</gmd:CI_RoleCode>
1908
1909
               <!-- ISO example -->
1910
               <gmd:CI_RoleCode
1911
1912
         codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1913
        Codelist/gmxCodelists.xml#CI_RoleCode"
1914
                 codeListValue="originator">originator</gmd:CI_RoleCode>
1915
              </gmd:role>
1916
            </gmd:CI_ResponsibleParty>
1917
         </gmd:contact>
1918
          <!-- (M-M) Metadata date stamp - USGIN profile requires use of dateStamp/gco:DateTime (Note
1919
        this contrasts with INSPIRE mandate to use dateStamp/qco:Date). This is the date and time when
1920
        the metadata record was created or updated (following NAP). -->
1921
         <gmd:dateStamp>
1922
           <!-- Requires an extended ISO 8601 formatted combined UTC date and time string (2009-11-
1923
        17T10:00:00) -->
1924
            <gco:DateTime>2009-11-17T10:00:00
1925
1926
         <!-- (M-M) metadata standard - NAP specifies "NAP - Metadata". USGIN profile conformant
1927
1928
        metadata is indicated by using "ISO-NAP-USGIN" -->
         <gmd:metadataStandardName>
1929
            <gco:CharacterString>ISO-NAP-USGIN
1930
          </gmd:metadataStandardName>
1931
          <!-- (O-M) USGIN profile version -->
1932
          <gmd:metadataStandardVersion>
1933
            <gco:CharacterString>1.1
```

```
1934
          </gmd:metadataStandardVersion>
1935
          <!-- (O-C) Dataset Identifier - For USGIN, this is a string that uniquely identifies the
1936
        described resource. If the resource has an identifier, it should be included here; if the
1937
        resource will be referenced from other metadata, it must have an identifier here. If the dataset
1938
        is coupled to a service, the value of the MD_Metadata/dataSetURI attribute is the unique resource
1939
        identifier used by srv:coupledResource to link the service with the dataset. For the USGIN
1940
        profile, the MD_Distribution/transferOptions/MD_DigitalTransferOptions/ online/CI_OnlineResource
1941
        is used to specify URLs for access to the resource. -->
1942
          <qmd:dataSetURI>
1943
            <!-- Uniform Resource Identifier (URI) -->
1944
            <gco:CharacterString>http://azgs.az.gov/resource/00C02E67-F1ED-473D-A240-
1945
        068CCB041A73</gco:CharacterString>
1946
          </gmd:dataSetURI>
1947
          <!-- (C-C) Other Languages - If description in more than one language is provided, this
1948
        property should indicate what those languages are. The primary language used for metadata
1949
        description is identified with MD_Metadata/language and characterSet and any additional languages
1950
        are identified by MD_Metadata/locale/PT_locale elements, in which the language is provided
1951
        according to ISO 639-2/T three-letter terminology codes in lowercase, and an optional country is
1952
        provided according to ISO 3166-1 three-letter codes in uppercase, and mandatory
1953
        characterEncoding. -->
1954
          <!-- This locale element example implies that all character string elements are available in
1955
        English (from the MD_Metadata/language element), and in French. -->
1956
          <!--
1957
          <gmd:locale>
1958
            <gmd:PT_Locale id="FR">
1959
              <qmd:languageCode>
1960
                <gmd:LanguageCode</pre>
1961
1962
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1963
        Codelist/ML_gmxCodelists.xml#LanguageCode"
1964
                 codeListValue="fra">Français</gmd:LanguageCode>
1965
              </gmd:languageCode>
1966
              <gmd:characterEncoding>
1967
                --><!-- ISO example --><!--
1968
                <gmd:MD_CharacterSetCode</pre>
1969
1970
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1971
        Codelist/gmxCodelists.xml#MD_CharacterSetCode"
1972
                  codeListValue="utf8">UTF-8</gmd:MD_CharacterSetCode>
1973
              </gmd:characterEncoding>
1974
            </gmd:PT_Locale>
1975
          </gmd:locale>
1976
1977
          <!-- (0-0) Resource spatial representation - Spatial representation information for the dataset
1978
        (resource). Best practice is to include metadata for spatial representation if the described
1979
        resource is a georeferenced dataset. -->
1980
          <gmd:spatialRepresentationInfo>
1981
            <gmd:MD_VectorSpatialRepresentation>
1982
              <gmd:topologyLevel>
1983
                <!-- MD_TopologyLevelCode names: {geometryOnly, topology1D, planarGraph, fullPlanarGraph,
1984
        surfaceGraph, fullSurfaceGraph, topology3D, fullTopology3D, abstract} -->
1985
                <!-- NAP Example -->
1986
1987
                <gmd:MD_TopologyLevelCode</pre>
1988
                 codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_111"
1989
                 codeListValue="RI_510">geometryOnly/gmd:MD_TopologyLevelCode>
1990
1991
                <!-- ISO Example -->
1992
                <gmd:MD_TopologyLevelCode</pre>
1993
1994
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1995
        Codelist/gmxCodelists.xml#MD_TopologyLevelCode"
1996
                 codeListValue="geometryOnly">geometry only/gmd:MD_TopologyLevelCode>
1997
              </gmd:topologyLevel>
1998
              <!-- (C-C) Identification of the objects used to represent features in the dataset - -->
1999
              <gmd:geometricObjects>
2000
                <gmd:MD_GeometricObjects>
2001
                 <gmd:geometricObjectType>
2002
                   <!-- MD_GeometricObjectTypeCode names: {complex, composite, curve, point, solid,
2003
        surface -->
2004
                   <!-- NAP Example -->
2005
                    <!--
```

```
2006
                    <gmd:MD_GeometricObjectTypeCode</pre>
2007
                     codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_99"
2008
                     codeListValue="RI_510">surface/gmd:MD_GeometricObjectTypeCode>
2009
2010
                    <!-- ISO Example -->
2011
2012
                    <gmd:MD_GeometricObjectTypeCode</pre>
2013
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
2014
        Codelist/gmxCodelists.xml#MD_GeometricObjectTypeCode"
2015
                     codeListValue="surface">surface</gmd:MD_GeometricObjectTypeCode>
2016
                  </gmd:geometricObjectType>
2017
                </gmd:MD_GeometricObjects>
2018
              </gmd:geometricObjects>
2019
            </gmd:MD_VectorSpatialRepresentation>
2020
          </gmd:spatialRepresentationInfo>
2021
2022
          <!-- (0-0) Resource's spatial reference system - Description of the spatial and/or temporal
        reference systems used in the dataset. NAP specifies
2023
2024
        {identificationInfo/spatialRepresentationType/MD_SpatialRepresentationTypeCode = "vector") or
        (../MD_SpatialRepresentationTypeCode = ""grid"") or (../MD_SpatialRepresentationTypeCode =
2025
        ""tin"") implies count referenceSystemInfo >= 1) } -->
2026
          <gmd:referenceSystemInfo>
2027
            <gmd:MD_ReferenceSystem>
2028
              <!-- ISO 19115:2003 Corrigendum 1:2006 removes CRS and projection parameter information,
2029
        and uses ISO 19111 instead -->
2030
              <gmd:referenceSystemIdentifier>
2031
                <qmd:RS Identifier>
2032
2033
                  <!-- (C-C) Reference System identifier code - For USGIN the code should be a value from
        the EPSG Geodetic Parameter Dataset register (http://www.epsg-registry.org/) in the form
2034
        "EPSG:nnnn" where nnnn is the EPSG code number for the CRS. -->
2035
2036
                    <gco:CharacterString>EPSG:5701</gco:CharacterString>
2037
                  </amd:code>
2038
                  <gmd:codeSpace>
2039
                    <gco:CharacterString>urn:ogc:def:crs</gco:CharacterString>
2040
                  </gmd:codeSpace>
2041
                </gmd:RS_Identifier>
2042
              </gmd:referenceSystemIdentifier>
2043
            </gmd:MD ReferenceSystem>
2044
          </gmd:referenceSystemInfo>
2045
          <!-- (X-X) Metadata extension information - not used in USGIN -->
2046
          <!--
2047
          <qmd:metadataExtensionInfo/>
2048
          -->
2049
          <!-- ***********
2050
          <!-- (M-M) Resource identification information - At least one of MD_DataIdentification
2051
2052
        (dataset, dataset series) or SV_ServiceIdentification (service) is required. -->
          <qmd:identificationInfo>
2053
            <!-- Resource Dataset or Dataset Series Identification -->
2054
            <gmd:MD_DataIdentification>
2055
              <amd:citation>
2056
                <!-- (M-M) Resource citation - For USGIN purposes, this should be viewed as information
2057
2058
        to identify the intellectual origin of the content in the described resource, along the lines of
        a citation in a scientific journal. Required content for a CI_Citation element are title, date,
2059
        and responsibleParty -->
2060
2061
                <gmd:CI_Citation>
                  <!-- (M-M) Resource title - USGIN recommends using titles that inform the human reader
2062
        about the dataset's content as well as its context. -->
2063
                  <gmd:title>
2064
                   <gco:CharacterString>Scanned Borehole Compensated Sonic Log for 0391, Kerr-McGee08
2065
        Navajo</gco:CharacterString>
2066
                 </amd:title>
2067
                  <!-- (0-0) Alternate title -->
2068
                  <!--
2069
                  <gmd:alternateTitle>
2070
                   <gco:CharacterString>some alternate title</gco:CharacterString>
2071
2072
                  </gmd:alternateTitle>
2073
                 <!-- (M-M) Resource reference date - Best practice is to include at least the date of
2074
        publication or creation of the resource. The date of the resource reported in the citation
2075
        corresponds to the resource's last update version according to its update frequency. CI_Date
2076
        content includes a date and dateType. Date for USGIN profile uses xs:date data type, defined thus
```

```
2077
         "date uses the date/timeSevenPropertyModel, with hour, minute, and second required to be absent.
2078
2079
         timezoneOffset• remains optional" (http://www.w3.org/TR/xmlschemal1-2). -->
                   <gmd:date>
2080
                     <qmd:CI Date>
2081
2082
                       <gmd:date>
                         <!-- Requires an extended ISO 8601 formatted combined UTC date and time string
2083
         (2001-12-17T09:30:47) -->
2084
                         <gco:DateTime>2001-12-17T09:30:47
2085
                       </gmd:date>
2086
                       <gmd:dateType>
2087
                         <!-- CI_DateTypeCode names: {creation, publication, revision} _ NAP expands with
2088
         {notAvailable, inForce, adopted, deprecated, superseded}.-->
2089
                         <!-- NAP Example -->
2090
                         <!--
2091
                         <gmd:CI_DateTypeCode</pre>
2092
                           codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_87"
2093
                           codeListValue="RI_367">publication</gmd:CI_DateTypeCode>
2094
2095
2096
                         <!-- ISO Example -->
                         <gmd:CI_DateTypeCode</pre>
2097
2098
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
2099
         Codelist/gmxCodelists.xml#CI_DateTypeCode"
2100
                           codeListValue="publication">publication</gmd:CI_DateTypeCode>
2101
                       </gmd:dateType>
2102
                     </gmd:CI_Date>
2103
2104
2105
2106
2107
2108
                   </gmd:date>
                   <!-- (C-C) Unique resource identifier - NAP makes MD_Identifier mandatory for dataset
         and dataset series.
         For USGIN purposes, this element content value should be only considered an identifier for the citation, without any assumption that it will use http protocol. The identifier may be
         resolvable to a URL, if a protocol prefix specifies an identifier scheme that is resolvable (e.g.
2109
         http, urn...), but this is not necessary for a valid document, and should not be assumed when
2110
         processing metadata documents.
2111
                     For USGIN, IF the Citation has an identifier that is different from the identifier for
2111
2112
2113
2114
2115
         the described resource (MD_Metadata/dataSetURI), it must be included here. RS_Identifier may
         substitute for MD_Identifier in the ISO19139 schema, but the USGIN profile requires use of
         MD_Identifer. If additional codespace and version content is associated with the identifier, it
         should be encoded as MD_Identifier/authority/ CI_Citation/ alternateTitle and MD_Identifier/
2115
2116
2117
2118
2119
2120
2121
2122
         authority/ CI_Citation/ edition -->
                   <!--
                   <gmd:identifier>
                     <gmd:MD_Identifier>
                       <amd:code>
                         --><!-- 13 digit ISBN example --><!--
                         <gco:CharacterString>urn:isbn:000-0-000-00000-0/gco:CharacterString>
2123
2124
2125
                       </gmd:code>
                     </gmd:MD_Identifier>
                   </gmd:identifier>
2126
2127
2128
2129
                   <!-- (M-M) Resource responsible party - USGIN requires at least one CI_ResponsibleParty
         following the NAP rule. Best practice is to include point of contact information for the resource
         in MD_DataIdentification/pointOfContact/CI_ResponsibleParty.
2129
2130
2131
2132
2133
2134
2135
2136
                   <gmd:citedResponsibleParty>
                     <gmd:CI_ResponsibleParty>
                       <!-- (C-C) (individualName + organisationName + positionName) > 0 -->
                       <qmd:individualName>
                         <gco:CharacterString>Steve Rauzi
                       </gmd:individualName>
                       <gmd:organisationName>
2137
2138
2139
2140
                         <gco:CharacterString>Arizona Geological SurveyCharacterString>
                       </gmd:organisationName>
                       <gmd:positionName>
                         <gco:CharacterString>Oil and Gas Administrator</gco:CharacterString>
2141
2142
2143
                       </gmd:positionName>
                       <!-- (O-C) Contact Information - (phone + deliveryPoint + electronicMailAddress ) >
         0. -->
2144
2145
2146
                       <gmd:contactInfo>
                         <gmd:CI_Contact>
                           <gmd:phone>
2147
                             <gmd:CI_Telephone>
2148
                               <gmd:voice>
```

```
2149
                                  <gco:CharacterString>520-770-3500
2150
2151
2152
                                </amd:voice>
                                <gmd:facsimile>
                                  <gco:CharacterString>520-770-3505/gco:CharacterString>
2152
2153
2154
2155
2156
2157
2158
2159
                                </gmd:facsimile>
                              </gmd:CI_Telephone>
                            </gmd:phone>
                            <amd:address>
                              <gmd:CI_Address>
                                <qmd:delivervPoint>
                                  <gco:CharacterString>416 W. Congress St., Suite 100</gco:CharacterString>
                                </gmd:deliveryPoint>
2161
2162
                                <gmd:city>
                                  <gco:CharacterString>Tucson</gco:CharacterString>
2163
2164
2165
                                </gmd:city>
                                <gmd:administrativeArea>
                                  <gco:CharacterString>Arizona</gco:CharacterString>
2166
2167
                                </gmd:administrativeArea>
                                <qmd:postalCode>
2167
2168
2169
2170
2171
2172
2173
2174
                                  <gco:CharacterString>85701</gco:CharacterString>
                                </gmd:postalCode>
                                <qmd:country>
                                  <gco:CharacterString>USA</gco:CharacterString>
                                </amd:country>
                                <gmd:electronicMailAddress>
                                  <gco:CharacterString>Steve.rauzi@azgs.az.go</gco:CharacterString>
2174
2175
2176
2177
2178
2179
2180
2181
                                </gmd:electronicMailAddress>
                              </gmd:CI Address>
                            </gmd:address>
                          </gmd:CI_Contact>
                        </gmd:contactInfo>
                        <!-- (M-M) ISO 19139 Mandatory: contact role - Guidance on use of role codes would
         be helpful for consistency, but has not been developed as yet.. -->
2182
2183
2184
                          <!-- CI_RoleCode names: {resourceProvider, custodian, owner, user, distributor,
         originator, pointOfContact, principalInvestigator, processor, publisher, author} - NAP expands
2185
2186
2187
2188
         with {collaborator, editor, mediator, rightsHolder}. -->
                          <!-- NAP example -->
                          <!--
                          <qmd:CI RoleCode
2189
2190
2191
2192
2193
2194
2195
2196
2197
2198
                           codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_90"
                            codeListValue="RI 414">pointOfContact</qmd:CI RoleCode>
                          <!-- ISO example -->
                          <gmd:CI_RoleCode
           codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
         Codelist/gmxCodelists.xml#CI_RoleCode"
                            codeListValue="pointOfContact">point of contact/gmd:CI_RoleCode>
                        </amd:role>
2199
2200
2201
2202
2203
2204
                      </gmd:CI ResponsibleParty>
                    </gmd:citedResponsibleParty>
                    <!-- (O-C) Dataset Presentation Form - USGIN mandates required if there is a significant
         difference between the resource's presentation format and distribution format. -->
                   <!--
                   <qmd:presentationForm>
2205
                    --><!-- CI_PresentationFormCode names: {documentDigital, documentHardcopy, imageDigital,
2206
         image-Hardcopy, mapDigital, mapHardcopy, modelDigital, model-Hardcopy, profileDigital,
2207
2208
2209
         profileHardcopy, tableDigital, tableHardcopy, videoDigital, videoHardcopy, audioDigital} - NAP
         expands with {audioHardcopy, multimediaDigital, multimediaHardcopy, diagramDigital,
         diagramHardcopy}.-->
2210
                      <!-- NAP Example -->
2211
2212
2213
2214
2215
2216
                      <!--
                      <gmd:CI_PresentationFormCode</pre>
                        codeList="http://www.fqdc.gov/nap/metadata/register/codelists.html#IC 89"
                        codeListValue="RI_391">mapDigital</gmd:CI_PresentationFormCode>
                     <!-- ISO Example -->
2217
2218
                      <gmd:CI_PresentationFormCode</pre>
```

```
2219
2220
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
2221
2222
2223
2224
2225
2226
2227
2228
2229
2230
         Codelist/qmxCodelists.xml#CI PresentationFormCode"
                       codeListValue="mapDigital">digital map/gmd:CI_PresentationFormCode>
                   </gmd:presentationForm>
                   <!-- (0-0) Resource series - Information about the series or collection of which the
         cited resource is a part. Follow NAP rule (name + issueIdentification) > 0. -->
                   <!--
                   <md:series>
                     <gmd:CI_Series>
                       <gmd:name>
2231
2232
2233
2234
2235
2236
2237
2238
2239
                         --><!-- Name of the publication series or aggregate dataset of which the
         referenced dataset is a part. --><!--
                         <gco:CharacterString>Borehole Collection
                       </gmd:name>
                       <qmd:issueIdentification>
                          --><!-- Identification of the series' issue information. --><!--
                         <gco:CharacterString>Volume 10</gco:CharacterString>
                       </gmd:issueIdentification>
                       <gmd:page>
2240
                         --><!-- Identification of the articles' page number(s). --><!--
2241
2242
                         <gco:CharacterString>100-110</gco:CharacterString>
                       </amd:page>
2243
2244
                     </gmd:CI_Series>
                   </gmd:series>
2244
2245
2246
2247
2248
2249
                   <!-- (0-0) Resource other citation details -->
                   <!--
                   <gmd:otherCitationDetails/>
                   -->
2250
2251
2252
2253
                   <!-- (O-C) Resource collective title - Title of the combined resource that the cited
         resource is part of, for example the cited resource may be a paper in an anthology, in which case
         the anthology title would be the collective title. Required if the cited resource is part of such
         a collective work. -->
2254
                   <!--
2255
2256
2257
2258
2259
2260
2261
2262
2263
2264
2265
                   <gmd:collectiveTitle/>
                   -->
                 </gmd:CI_Citation>
               </gmd:citation>
               <!-- (M-M) Resource Abstract - A free text summary of the content, significance, purpose,
         scope, etc. of the resource. Exactly one value. -->
               <gmd:abstract>
                 <gco:CharacterString>Digital files containing Tiff images of scanned logs. Scanned using
         Neutra scanner hardware.</gco:CharacterString>
               </gmd:abstract>
               <!-- (0-0) Resource purpose - Summary of the intentions for which the dataset was
2266
2267
         developed. Purpose includes objectives for creating the dataset and what the dataset is to
         support. -->
2268
2269
               <!--
               <gmd:purpose/>
2270
2271
2272
               -->
               <!-- (M-M) Resource Status - -->
               <qmd:status>
2273
2274
                 <!-- MD_ProgressCode names: {completed, historicalArchive, obsolete, onGoing, planned,
         required, underDevelopment } - NAP expands with {proposed}. Obsolete is synonymous with
2275
2276
         deprecated. -->
                <!-- NAP Example -->
2277
2278
2279
                 <!--
                 <gmd:MD_ProgressCode
                   codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_106"
2280
                   codeListValue="RI_593">completed</gmd:MD_ProgressCode>
2281
2282
2283
                 -->
                 <!-- ISO Example -->
                 <gmd:MD_ProgressCode</pre>
2284
2285
2286
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
         Codelist/gmxCodelists.xml#MD_ProgressCode"
2287
                   codeListValue="completed">completed/gmd:MD_ProgressCode>
2288
               </gmd:status>
```

```
2289
              <!-- (O-C) Resource point of contact - CI_ResponsibleParty element here would contain
2290
        information for point of contact to access the resource. This information is mandatory for
2291
2292
2293
2294
2295
2296
        physical resources such as core, cuttings, samples, manuscripts. -->
              <gmd:pointOfContact>
                <qmd:CI ResponsiblePartv>
                  <!-- (M-M) (individualName + organisationName + positionName) > 0 -->
                  <gmd:individualName>
                    <gco:CharacterString>Steve Rauzi
2297
2298
2299
2300
                  </gmd:individualName>
                  <qmd:organisationName>
                    <gco:CharacterString>Arizona Geological Survey/gco:CharacterString>
                  </gmd:organisationName>
2301
2302
                  <gmd:positionName>
                    <gco:CharacterString>Oil and Gas Administrator</gco:CharacterString>
2303
                  </gmd:positionName>
2304
2305
2306
2307
                  <!-- (O-C) Contact Information - If a resource point of contact is required then (phone
        + deliveryPoint + electronicMailAddress) > 0. -->
                  <gmd:contactInfo>
                    <qmd:CI Contact>
2308
2309
                      <gmd:phone>
                        <gmd:CI_Telephone>
2310
2311
2312
2313
2314
                          <qmd:voice>
                           <gco:CharacterString>520-770-3500</gco:CharacterString>
                          </amd:voice>
                           <gco:CharacterString>520-770-3505
2314
2315
2316
2317
2318
2319
2320
2321
                          </gmd:facsimile>
                        </gmd:CI_Telephone>
                      </gmd:phone>
                      <gmd:address>
                        <gmd:CI_Address>
                          <gmd:deliveryPoint>
                           <gco:CharacterString>416 W. Congress St., Suite 100</gco:CharacterString>
</gmd:deliveryPoint>
                          <gmd:city>
                           <gco:CharacterString>Tucson
                          </gmd:city>
                          <gmd:administrativeArea>
                            <gco:CharacterString>Arizona
                          </gmd:administrativeArea>
                          <gmd:postalCode>
                           <gco:CharacterString>85701</gco:CharacterString>
                          </gmd:postalCode>
                          <gmd:country>
                           <gco:CharacterString>USA
                          </gmd:country>
                          <gmd:electronicMailAddress>
                            <gco:CharacterString>Steve.rauzi@azgs.az.go
                          </gmd:electronicMailAddress>
                        </gmd:CI_Address>
                      </gmd:address>
                    </gmd:CI_Contact>
                  </gmd:contactInfo>
                  <!-- (M-M) ISO 19139 Mandatory: contact role - Guidance on use of role codes would be
2343
2344
        helpful for consistency, but has not been developed as yet. -->
                  <amd:role>
2345
                    <!-- CI_RoleCode names: {resourceProvider, custodian, owner, user, distributor,
2346
        originator, pointOfContact, principalInvestigator, processor, publisher, author} - NAP expands
2347
2348
2349
        with {collaborator, editor, mediator, rightsHolder}. -->
                   <!-- NAP example -->
                    <!--
2350
                    <qmd:CI RoleCode
2351
2352
2353
                      codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_90"
                      codeListValue="RI_414">pointOfContact</gmd:CI_RoleCode>
2354
2355
2356
                    <!-- ISO example -->
                    <gmd:CI_RoleCode
2357
2358
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
        Codelist/gmxCodelists.xml#CI RoleCode"
2359
                      codeListValue="pointOfContact">point of contact</gmd:CI_RoleCode>
2360
                  </gmd:role>
```

```
2361
                </gmd:CI_ResponsibleParty>
2362
              </gmd:pointOfContact>
2363
              <!-- (0-0) Resource Maintenance - This element provides information about the maintenance
2364
2365
        schedule or history of the resource (or some subset/part of the resource specified by the scope
        and scope description) described by the metadata record. 0 to many MD_MaintenanceInformation
2366
2367
2368
        elements may be included.
              <gmd:resourceMaintenance>
                <gmd:MD_MaintenanceInformation>
2369
2370
2371
2372
                  <gmd:maintenanceAndUpdateFrequency>
                    <!-- MD_MaintenanceFrequencyCode names: {continual, daily, weekly, fortnightly,
        monthly, quarterly, biannually, annually, asNeeded, irregular, not-Planned, unknown } - NAP
        expands with {semimonthly}. -->
2373
2374
                    <!-- NAP Example -->
                    <!--
2375
2376
2377
2378
2379
                    <gmd:MD_MaintenanceFrequencyCode</pre>
                      codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_102"
                      codeListValue="RI_540">asNeeded</gmd:MD_MaintenanceFrequencyCode>
                    <!-- ISO Example -->
2380
2381
2382
                    <gmd:MD_MaintenanceFrequencyCode</pre>
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
2383
2384
2385
        Codelist/gmxCodelists.xml#MD_MaintenanceFrequencyCode"
                      codeListValue="asNeeded">as needed</gmd:MD_MaintenanceFrequencyCode>
                  </gmd:maintenanceAndUpdateFrequency>
2386
                </gmd:MD MaintenanceInformation>
2387
2388
2389
              </gmd:resourceMaintenance>
              <!-- (0-0) Graphic overview of resource - USGIN best practice is to provide xlink:href URL
        to file if it is available online, as an attribute of the MD_BrowseGraphic element. If
2390
2391
2392
        MD_BrowseGraphic is included, MD_BrowseGraphic/filename character string is mandatory.
        Recommended practice is to use the Anchor extension of CharacterString xml element from ISO19139,
        which provides a url as an attribute and a text string as a label for the link.
2393
              <qmd:graphicOverview>
2394
                <gmd:MD_BrowseGraphic>
2395
                  <gmd:fileName>
2396
                    <gco:CharacterString>http://azgs.az.gov/resource/00C02E67-F1ED-473D-A240-
2397
        068CCB041A73/preview.jpg</gco:CharacterString>
2398
                  </gmd:fileName>
2399
                  <gmd:fileDescription>
2400
                    <gco:CharacterString>preview map</gco:CharacterString>
2401
                  </gmd:fileDescription>
2402
                  <!-- Use napMD_FileFormatCode code list
2403
        (http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_115). List names are {bil, bmp, bsq,
2404
        bzip2, cdr, cgm, cover, csv, dbf, dgn, doc, dwg, dxf, e00, ecw, eps, ers, gdb, geotiff, gif, gml,
2405
        grid, gzip, html, jpg, mdb, mif, pbm, pdf, png, ps, rtf, sdc, shp, sid, svg, tab, tar, tiff, txt,
2406
        xhtml, xls, xml, xwd, zip, wpd} See Codelists section for discussion of encoding of codelist
2407
        values. Note that to use this napm namespace extension in a valid xml document, the namespace
2408
2409
        xmlns:napm=http://www.cits.rncan.gc.ca/html/brodeurj/.protege/.napMetadata/napMetadataWebsite/nap
2410
        MetadataTools/napXsd/napm must be included in the root element of the document. -->
2411
                  <!-- The current napm.xsd schema conflicts with qmd because it refernces a local copy of
2412
2413
        the OGC qmd schema at
        http://www.cits.rncan.gc.ca/html/brodeurj/.protege/.napMetadata/tools/napXsd/gmd/ Until this is
2414
        resolved, the gmd:fileType attributes can be omitted. However, USGIN requires the use of
2415
2416
        napMD_FileFormatCode names. -->
                  <!-- NAP Example -->
2417
                  <!--
2418
                  <gmd:fileType
2419
                    xsi:type="napm:napMD_FileFormatCode_PropertyType"
2420
                    codeList="http://www.fgdc.gov/nap/metadata/register/registerItemClasses.html#IC_115"
2421
                    codeListValue="RI 711">
2422
                    <gco:CharacterString>jpg</gco:CharacterString>
2423
                  </gmd:fileType>
2424
2425
                  <!-- ISO Example -->
2426
2427
                  <gmd:fileType>
                    <gco:CharacterString>jpg</gco:CharacterString>
2428
                  </gmd:fileType>
2429
                </gmd:MD_BrowseGraphic>
2430
              </gmd:graphicOverview>
2431
              <!-- (X-X) Resource Format - This element is not used by NAP or USGIN; this information is
2432
        encoded in MD_Metadata/distributionInfo/MD_Distribution/ in USGIN metadata. -->
```

```
2433
              <!--
2434
              <qmd:resourceForma/>
2435
              -->
2436
2437
              <!-- (O-O) Resource keywords - Best Practice for USGIN profile metadata is to supply
        keywords to facilitate the discovery of metadata records relevant to the user. USGIN requires
2438
2439
        that MD_Keyword/keyword contain a CharacterString. USGIN best practice is to include keywords in
        English -->
2440
              <!-- Theme keywords -->
2441
              <gmd:descriptiveKeywords>
2442
                <qmd:MD Keywords>
2443
                 <gmd:keyword>
2444
                   <gco:CharacterString>Scanned Gamma Ray Neutron/gco:CharacterString>
2445
                  </gmd:keyword>
2446
                  <gmd:keyword>
2447
                    <gco:CharacterString>NMAL</gco:CharacterString>
2448
                  </gmd:keyword>
2449
                  <amd:kevword>
2450
                    <gco:CharacterString>borehole</gco:CharacterString>
2451
                  </amd:kevword>
2452
                 <!-- Keyword Type - allowed values from MD_KeywordTypeCode names: {discipline, place,
2453
        stratum, temporal, theme} - NAP expands with {product, subTopicCategory}. -->
2454
                  <gmd:type>
2455
                   <!-- NAP Example -->
2456
                   <!--
2457
                   <gmd:MD_KeywordTypeCode</pre>
2458
                     codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_101"
2459
2460
                     codeListValue="RI_528">theme</gmd:MD_KeywordTypeCode>
2461
                   <!-- ISO Example -->
2462
                    <gmd:MD_KeywordTypeCode</pre>
2463
2464
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
2465
        Codelist/gmxCodelists.xml#MD_KeywordTypeCode"
2466
                     codeListValue="theme">theme</gmd:MD_KeywordTypeCode>
2467
                  </gmd:type>
2468
                </gmd:MD_Keywords>
2469
              </gmd:descriptiveKeywords>
2470
              <!-- Temporal keywords -->
2471
              <gmd:descriptiveKeywords>
2472
                <qmd:MD Keywords>
2473
2474
                  <qmd:keyword>
                    <gco:CharacterString>Frasian</gco:CharacterString>
2475
                  </gmd:keyword>
2476
                  <gmd:keyword>
2477
                    <gco:CharacterString>Upper Devonian</gco:CharacterString>
2478
                  </gmd:keyword>
2479
                  <qmd:kevword>
2480
                    <gco:CharacterString>Devonian
2481
                  </gmd:kevword>
2482
                  <gmd:keyword>
2483
                    <gco:CharacterString>Paleozoic</gco:CharacterString>
2484
2485
                  </gmd:keyword>
                  <!-- Keyword Type - allowed values from MD_KeywordTypeCode names: {discipline, place,
2486
        stratum, temporal, theme} - NAP expands with {product, subTopicCategory}. -->
2487
                 <gmd:type>
2488
                   <!-- NAP Example -->
2489
                    <!--
2490
                    <gmd:MD_KeywordTypeCode</pre>
2491
                     codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_101"
2492
                     codeListValue="RI_527">temporal</gmd:MD_KeywordTypeCode>
2493
2494
                   <!-- ISO Example -->
2495
                    <gmd:MD_KeywordTypeCode
2496
2497
         codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
2498
        Codelist/gmxCodelists.xml#MD_KeywordTypeCode"
2499
                     codeListValue="temporal">temporal
2500
                  </gmd:type>
2501
                </gmd:MD_Keywords>
2502
              </gmd:descriptiveKeywords>
2503
              <!-- Place keywords -->
2504
              <gmd:descriptiveKeywords>
```

```
2505
                 <gmd:MD_Keywords>
2506
                   <qmd:kevword>
2507
                     <gco:CharacterString>Arizona</gco:CharacterString>
2508
                   </gmd:keyword>
2509
                   <amd:kevword>
2510
                     <gco:CharacterString>T41N R27E S22 NE NE</gco:CharacterString>
2511
2512
                   </gmd:keyword>
                   <!-- Keyword Type - allowed values from MD_KeywordTypeCode names: {discipline, place,
2513
         stratum, temporal, theme} - NAP expands with {product, subTopicCategory}. -->
2514
2515
                   <qmd:type>
                     <!-- NAP Example -->
2516
                     <!--
2517
2518
                     <gmd:MD_KeywordTypeCode</pre>
                       codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_101"
2519
2520
2521
2522
2523
2524
2526
2526
2527
2528
2529
2531
2532
2533
2534
2535
2536
2537
2538
2539
                       codeListValue="RI_525">place</gmd:MD_KeywordTypeCode>
                     <!-- ISO Example -->
                     <gmd:MD_KeywordTypeCode</pre>
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
         Codelist/gmxCodelists.xml#MD_KeywordTypeCode"
                       codeListValue="place">place/gmd:MD_KeywordTypeCode>
                   </gmd:type>
                 </gmd:MD_Keywords>
               </gmd:descriptiveKeywords>
               <!-- (0-0) Condition applying to access and use of resource - Follow NAP for specification
         of resourceConstraints. This attribute provides information for access control to the described
         resource itself. In some situations, the metadataConstraints may allow a user to learn of the
         existence of a resource that they may not actually be able to access without further clearance.
         Constraints may be represented by MD_Constraint, MD_LegalConstraint, or MD_SecurityConstraint. --
               <gmd:resourceConstraints>
                 <gmd:MD_LegalConstraints>
                   <gmd:useLimitation>
                     <gco:CharacterString>none</gco:CharacterString>
2540
                   </gmd:useLimitation>
2541
2542
                 </gmd:MD_LegalConstraints>
               </gmd:resourceConstraints>
2543
               <!-- (0-0) Aggregation information - The citation for or name of an aggregate dataset, the
2544
         type of aggregate dataset, and optionally the activity which produced the dataset. -->
2544
2545
2546
2547
2548
2549
               <gmd:aggregationInfo>
                 <!-- MD_AggregateInformation requires either aggregateDataSetName/CI_Citation or
         aggregateDataSetIdentifier/MD_Identifier.
                 <gmd:MD_AggregateInformation>
                   <!-- Related dataset name -->
2550
2551
                   <gmd:aggregateDataSetName>
                     <gmd:CI_Citation>
2552
2553
                         <gco:CharacterString>Related Resource's Title</gco:CharacterString>
2554
                       </gmd:title>
2555
                       <qmd:date>
2556
2557
2558
                         <gmd:CI_Date>
                           <gmd:date>
                             <gco:DateTime>2001-12-17T09:30:47</gco:DateTime>
2559
2560
                           </gmd:date>
                           <gmd:dateType>
2561
                             <!-- NAP Example -->
2562
                             <!--
2563
2564
                             <gmd:CI_DateTypeCode</pre>
                               codeList="http://www.fqdc.gov/nap/metadata/register/codelists.html#IC_87"
2565
                               codeListValue="RI_367">publication/gmd:CI_DateTypeCode>
2566
2567
                             <!-- ISO Example -->
2568
2569
                             <gmd:CI_DateTypeCode</pre>
2570
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
2571
         Codelist/gmxCodelists.xml#CI_DateTypeCode"
2572
                               codeListValue="publication">publication/gmd:CI_DateTypeCode>
2573
                           </gmd:dateType>
2574
                         </gmd:CI_Date>
2575
                       </gmd:date>
2576
                     </gmd:CI_Citation>
```

```
2577
                 </gmd:aggregateDataSetName>
2578
                 <!-- Data Set Identifier -->
2579
                 <qmd:aggregateDataSetIdentifier>
2580
2581
                   <gmd:MD_Identifier>
                     <amd:code>
2582
                       2583
2584
                     </gmd:code>
                   </gmd:MD_Identifier>
2585
                 </gmd:aggregateDataSetIdentifier>
2586
                 <!-- (M-M) Association Type is mandatory.. -->
2587
                 <qmd:associationType>
2588
                   <!-- Use DS_AssociationTypeCode names: {crossReference, largerWorkCitation,
2589
2590
        partOfSeamlessDatabase, source, stereoMate} - NAP expands with {isComposedOf}. -->
                   <!-- NAP Example -->
2591
2592
                   <!--
                   <gmd:DS_AssociationTypeCode</pre>
2593
                     codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_92"
2594
                     codeListValue="RI_428">crossReference</gmd:DS_AssociationTypeCode>
2595
2596
                   <!-- ISO Example -->
2597
                   <gmd:DS_AssociationTypeCode</pre>
2598
2599
         codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
2600
        Codelist/gmxCodelists.xml#DS_AssociationTypeCode"
2601
                     codeListValue="crossReference">cross reference</gmd:DS_AssociationTypeCode>
2602
                 </gmd:associationType>
2603
               </gmd:MD_AggregateInformation>
2604
              </amd:aggregationInfo>
2605
              <!-- (0-0) Spatial Representation Type - napMD_SpatialRepresentationTypeCode names {vector,
2606
        grid, textTable, tin, stereoModel, video} -->
2607
             <!--
2608
              <gmd:spatialRepresentationType/>
2609
              -->
2610
             <!-- (C-C) Resource spatial resolution - USGIN requires use of
2611
        equivalentScale/../denominator to express spatial resolution, in order to be more easily
2612
        interoperable.
2613
             <gmd:spatialResolution>
2614
               <gmd:MD_Resolution>
2615
                 <qmd:equivalentScale>
2616
                   <gmd:MD_RepresentativeFraction>
2617
2618
                     <gmd:denominator>
                       <gco:Integer>100000</gco:Integer>
2619
                     </gmd:denominator>
2620
                   </gmd:MD_RepresentativeFraction>
2621
                 </gmd:equivalentScale>
2622
               </gmd:MD_Resolution>
2623
              </gmd:spatialResolution>
2624
              <!-- (M-M) Resource language - Multiple instances of this element indicate that the
2625
        linguistic content of the resource is available in multiple languages -->
2626
             <qmd:language>
2627
               <!-- (M-M) Metadata language - use the ISO639-2/T three letter language code in lower
2628
2629
        case. -->
               <gco:CharacterString>eng</gco:CharacterString>
2630
              </gmd:language>
2631
              <!-- (C-C) Topic category - NAP specifies that topicCategory code shall be provided when
2632
        hierarchyLevel is set to "dataset" or "dataset series". Most USGIN resources will have
2633
        topicCategory="geoscientificInformation", which is the default value for this profile. More
2634
        specific topic categorization should be done using keywords. NAP declares not applicable to
2635
        services. -->
2636
             <gmd:topicCategory>
2637
              <!-- MD_TopicCategoryCode names: {farming, biota, boundaries,
2638
        climatologyMeterologyAtmosphere, economy, elevation, environment, geoscientificInformation,
2639
        health, imageryBaseMapsEarthCover, intelligenceMilitary, inlandWater, location, oceans,
2640
        planningCadastre, society, structure, transportation, utilitiesCommunication} -->
2641
               <qmd:MD_TopicCategoryCode>geoscientificInformation/qmd:MD_TopicCategoryCode>
2642
              </gmd:topicCategory>
2643
              <!-- (C-C) Resource content extent - Defines the spatial (horizontal and vertical) and
2644
        temporal region to which the content of the resource applies. For USGIN, the spatial extent is a
2645
        rectangle that bounds the geographic extent to which resource content applies. NAP specifies
2646
        required when hierarchyLevel is set to 'dataset'. USGIN specifies (description +
2647
        geographicElement + temporalElement) > 0. -->
2648
             <gmd:extent>
```

```
2649
                <qmd:EX Extent>
2650
                  <!-- (C-C) Resource Content extent description - Free text that describes the spatial
2651
        and temporal extent of the dataset. USGIN specifies that description is mandatory if a
2652
        geographicElement or temporalElement is not provided. Note that if geographic place names are
2653
        used to express the geographic extent, USGIN profile specifies that these should be encoded using
2654
2655
        keyword with keyword type code = 'place.' Geographic names may be duplicated in the
        EX_Extent/description. -->
2656
                  <gmd:description>
2657
                    <gco:CharacterString>Some spatio-temporal description.</gco:CharacterString>
2658
                  </gmd:description>
2659
                  <!-- (O-C) Resource content extent bounding box -USGIN profile requires that if an
2660
        EX_Extent/geographicElement is supplied, it include a geographic bounding box with bounding
2661
        latitude and longitude expressed using WGS 84 decimal degrees. The corner coordinates for the
2662
        geographic bounding box must not coincide in one point, because this may result in fatal errors
2663
        with some CSW implementations. Point locations must thus be represented as tiny rectangles. USGIN
2664
        recommended practice is to place the actual point location in the lower left corner of the
2665
        rectangle. -->
2666
                 <gmd:geographicElement>
2667
                   <qmd:EX GeographicBoundingBox>
2668
                     <gmd:extentTypeCode>
2669
                       <gco:Boolean>1</gco:Boolean>
2670
                     </gmd:extentTypeCode>
2671
                     <gmd:westBoundLongitude>
2672
                       <gco:Decimal>-109.911001
2673
                     </gmd:westBoundLongitude>
2674
                     <qmd:eastBoundLongitude>
2675
                       <gco:Decimal>-109.910999
2676
2677
                     </gmd:eastBoundLongitude>
                     <gmd:southBoundLatitude>
2678
                       <gco:Decimal>34.772899
2679
                     </gmd:southBoundLatitude>
2680
                     <gmd:northBoundLatitude>
2681
                       <gco:Decimal>34.772901
2682
                     </gmd:northBoundLatitude>
2683
                    </gmd:EX_GeographicBoundingBox>
2684
                  </gmd:geographicElement>
2685
                 <!-- (C-X) Resource content extent geographic description - Not used by USGIN profile,
2686
        use keyword with type code = 'place' (with thesaurus if necessary). -->
2687
                 <!-
2688
                 <qmd:geographicElement>
2689
                   <gmd:EX_GeographicDescription/>
2690
                  </gmd:geographicElement>
2691
2692
                 <!-- (C-X) Resource content extent bounding polygon - Not used by USGIN profile. To
2693
        improve interoperability, USGIN mandates the use of Geographic Bounding Box instead of bounding
2694
        polygon. "An element which describes inclusions or exclusions in a resource. The enclosed
2695
        boundary of the dataset expressed in x-y coordinates." NAP mandates this element if no other
2696
        Geographic Bounding Box, Geographic Description, Temporal Element, or Vertical Element are
2697
        provided. -->
2698
                 <1--
2699
                  <qmd:geographicElement>
2700
2701
2702
                   <gmd:EX_BoundingPolygon/>
                 </gmd:geographicElement>
2703
2704
                </gmd:EX_Extent>
              </amd:extent>
2705
              <!-- (0-0) Resource temporal extent - -->
2706
              <gmd:extent>
2707
2708
                <gmd:EX_Extent>
                 <qmd:temporalElement>
2709
                   <gmd:EX_TemporalExtent>
2710
                     <qmd:extent>
2711
                       <!-- Default ISO time frame example -->
2712
2713
                       <!--
                       <qml:TimePeriod qml:id="IdModern">
2714
2715
2716
                         <gml:name>Y2KX</pml:name>
                         --><!-- USGIN requires the beginPosition and endPosition's frame property to be
        defined. The default value is #ISO-8601. --><!--
2717
                         <gml:beginPosition frame="#ISO-8601">2010-01-00T00:00:00/gml:beginPosition>
2718
                         <qml:endPosition frame="#ISO-8601">2010-12-31T24:00:00</qml:endPosition>
2719
                       </gml:TimePeriod>
2720
```

```
2721
2722
2723
                         <!-- Geologic time frame example -->
                         <qml:TimePeriod gml:id="IdJurassic">
                           <qml:name>Jurassic
2724
2725
                           <!-- USGIN requires the beginPosition and endPosition's frame property to be
         defined. The default value is #ISO-8601. -->
2726
2727
2728
                           <gml:beginPosition</pre>
         frame="urn:cgi:trs:CGI:StandardGeologicTimeMa">203</gml:beginPosition>
                           <gml:endPosition frame="urn:cgi:trs:CGI:StandardGeologicTimeMa"</pre>
2729
2730
2731
2732
         ">135</gml:endPosition>
                         </gml:TimePeriod>
                       </gmd:extent>
                     </gmd:EX_TemporalExtent>
2733
2734
                   </gmd:temporalElement>
                 </gmd:EX_Extent>
2735
2736
2737
2738
2738
2739
               </gmd:extent>
               <!-- (O-X) Resource spatio-temporal extent - Not used. Although use of
         EX_SpatialTemporalExtent is allowed by ISO19139 and NAP, USGIN mandates encoding space time
         location with EX_TemporalExtent and EX_GeographicBoundingBox. -->
              <!--
2740
2741
               <gmd:extent>
                 <gmd:EX_Extent>
2742
                   <gmd:temporalElement>
2743
                     <gmd:EX_SpatialTemporalExtent/>
2744
                   </gmd:temporalElement>
2745
                 </gmd:EX_Extent>
2746
               </gmd:extent>
2746
2747
2748
2749
2750
2751
2752
2753
               <!-- (0-0) Resource vertical extent -->
               <qmd:extent>
                 <gmd:EX_Extent>
                   <qmd:verticalElement>
                     <gmd:EX_VerticalExtent>
                       <gmd:minimumValue>
2754
2755
                         <gco:Real>-100</gco:Real>
                       </gmd:minimumValue>
2756
2757
                       <qmd:maximumValue>
                         <gco:Real>200</gco:Real>
2758
2759
                       </gmd:maximumValue>
                       <!-- Use EPSG register of geodetic parameters such as at http://www.epsg-
2760
         registry.org/. The default VerticalCRS is World mean sea level (MSL): urn:ogc:def:crs:EPSG::5714
2761
2762
                       <qmd:verticalCRS xlink:href="urn:ogc:def:crs:EPSG::5714 "/>
2763
                     </gmd:EX_VerticalExtent>
2764
2765
                   </gmd:verticalElement>
                 </gmd:EX_Extent>
2766
               </gmd:extent>
2767
             </gmd:MD_DataIdentification>
2768
          </gmd:identificationInfo>
2769
          <!-- ************
2770
          <!-- (0-0) Content information - Characteristics describing the feature cataloguecatalog,
2771
         coverage, or image data. USGIN currently makes no recommendation for use of contentInfo; follow
2772
2773
         NAP recommendations (see INCITS 453). -->
2774
          <qmd:contentInfo/>
2775
2776
          <!-- (O-O) Resource distribution information - This element provides information to inform
2777
         users how to obtain or access the described resource. NOTE: there are several ways elements can
2778
         be nested within MD_Distribution -->
2779
2780
          <qmd:distributionInfo>
             <gmd:MD_Distribution>
2781
              <!-- (0-0) Resource distribution format - Information on the format or physical
2782
         manifestation of the resource. If the resource is a physical resource, like a book, rock sample,
2782
2783
2784
2785
2786
2786
2787
2788
         paper document, the distributionFormat/MD_Format/name is mandatory, and must be from the USGIN
         distribution format codelist. -->
              <!--
               <gmd:distributionFormat/>
               <!-- (O-C) Resource distributor information - USGIN differs from NAP in this case (but not
2789
         with ISO19115) by allowing multiple distributors, and binding between distributors, transfer
2790
         options, and formats. -->
2791
               <gmd:distributor>
```

```
2792
                <!-- For USGIN profile, each distributor/MD_Distributor is a binding between one or more
2792
2793
2794
2795
2796
2797
2798
2799
        transfer options and the distributor formats that are available through that/those transfer
        options (MD_DigitalTransferOptions/onLine/CI_OnlineResource in particular). If different formats
        are available from the same distributor, or have different transfer options, these should be
        represented as different distributor/MD Distributor instances. See the USGIN Profile section 'Use
        of MD_Distribution and MD_Distributor' for instructions on use of these elements. -->
                <gmd:MD_Distributor>
                  <qmd:distributorContact>
2800
                    <!-- (C-C) Distribution responsible party - For CI_ResponsibleParty, count of
2801
        (individualName + organisationName + positionName) > 0 -->
2802
                    <gmd:CI_ResponsibleParty>
2803
                     <gmd:organisationName>
2804
                        <gco:CharacterString>Arizona Geological Survey/gco:CharacterString>
2805
                      </gmd:organisationName>
2806
                     <!-- (C-C) If CI_ResponsibleParty exists, the role element is required -->
2807
                      <gmd:role>
2808
                        <!-- Use CI_RoleCode names {resourceProvider, custodian, owner, user, distributor,
2809
        originator, pointOfContact, principalInvestigator, processor, publisher, author} - NAP expands
2810
        with {collaborator, editor, mediator, rightsHolder}. -->
2811
                       <!-- NAP Example -->
2812
                        <!--
2813
                        <gmd:CI_RoleCode
2814
                         codeList="http://www.fqdc.gov/nap/metadata/register/codelists.html#IC_90"
2815
                         codeListValue="RI_412">distributor</gmd:CI_RoleCode>
2816
2817
                        <!-- ISO Example -->
2818
2819
2820
                       <gmd:CI_RoleCode
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
2821
2822
        Codelist/gmxCodelists.xml#CI_RoleCode"
                         codeListValue="distributor">distributor</qmd:CI RoleCode>
2823
                      </amd:role>
2824
                    2825
                  </gmd:distributorContact>
2826
                  <!-- (0-0) Resource distributor order process - Information on the availability of the
2827
2828
        service which includes at least one of fees, available date and time, ordering instructions, or
        turnaround. -->
2829
                  <gmd:distributionOrderProcess>
2830
                    <gmd:MD_StandardOrderProcess>
2831
                     <gmd:fees>
2832
                        <gco:CharacterString>variable fees/gco:CharacterString>
2833
                     </qmd:fees>
2834
2835
                      <gmd:orderingInstructions>
                       <gco:CharacterString>ordering instructions
2836
                      </gmd:orderingInstructions>
2837
                      <qmd:turnaround>
2838
                       <gco:CharacterString>one to two weeks.</gco:CharacterString>
2839
                      </gmd:turnaround>
2840
                    </gmd:MD_StandardOrderProcess>
2841
                  </gmd:distributionOrderProcess>
2842
                  <!-- (O-C) Resource distributor format - USGIN profile specifies that the
2843
2844
        distributionInfo/MD_Distribution/distributionFormat may be included in the document (its schema
        valid...), but distribution format information must be duplicated in a
2845
        distributionInfo/distributor/MD_Distributor/distributorFormat element or the content can be lost
2846
2847
                  <qmd:distributorFormat>
2848
                    <gmd:MD_Format>
2849
                     <!-- Use USGIN distribution format code values. See the "Online resource format
2850
        names" section of the USGIN Profile -->
2851
2852
                       <gco:CharacterString>Adobe:Acrobat/pdf</gco:CharacterString>
2853
                      </gmd:name>
2854
                     <amd:version>
2855
                        <gco:CharacterString>8.0</gco:CharacterString>
2856
                      </gmd:version>
2857
2858
                    </gmd:MD_Format>
                  </gmd:distributorFormat>
2859
                  <!-- Resource distributor transfer options - Provides information about the technical
2860
        means and media used by the distributor. -->
2861
                  <qmd:distributorTransferOptions>
2862
                    <gmd:MD_DigitalTransferOptions>
2863
                     <gmd:onLine>
```

```
2864
                        <qmd:CI OnlineResource>
2865
                          <!-- (M-M) Resource distributor on-line distribution linkage - Digital transfer
2866
        options are "technical means and media by which a dataset is obtained from the distributor." NAP
2867
        requires CI_OnlineResource/linkage and CI_OnlineResource/protocol in CI_OnlineResource. -->
2868
                          <gmd:linkage>
2869
2870
                           <!-- The linkage element should contain the complete URL to access the
        resource directly. CI_Online-Resource requires a Linkage element that is a gmd:URL. -->
2871
                           <gmd:URL>http://azgs.az.gov/resource/00C02E67-F1ED-473D-A240-
2872
        068CCB041A73/borehole_report.pdf</gmd:URL>
2873
                          </gmd:linkage>
2874
                          <gmd:protocol>
2875
                           <!-- The protocol element defines a valid internet protocol used to access the
2876
2877
        resource. NAP recommended best practice is that the protocol should be taken from an official
        controlled list such as the Official Internet Protocol Standards published on the Web at
2878
        http://www.rfc-editor.org/rfcxx00.html or the Internet Assigned Numbers Authority (IANA) at
2879
        http://www.iana.org/numbers.html. 'ftp' or 'http' are common values. -->
2880
                            <gco:CharacterString>http</gco:CharacterString>
2881
                          </gmd:protocol>
2882
                          <!-- (C-C) Resource distributor online distribution application profile -
2883
        applicationProfile is required if the CI_OnlineResource/linkage does not connect to a web page,
2884
        and another software application is needed to use the indicated file resource. The
2885
        applicationProfile character string should specify the software using the following recommended
2886
        syntax: "vendor:application name/application version", e.g. "Microsoft:Word/2007", or
2887
        "ESRI:ArcGIS/9.3" -->
2888
                          <gmd:applicationProfile>
2889
                           <gco:CharacterString>Adobe:Acrobat/8.0</gco:CharacterString>
2890
                          </gmd:applicationProfile>
2891
                          <amd:name>
2892
                           <!-- The CI_OnlineResource/name element may duplicate the file name if the URL
2893
        is a link to a file, but it is recommended to provide a user-friendly label for the file that
2894
        could be presented in a user interface. -->
2895
                           <gco:CharacterString>borehole_report.pdf</gco:CharacterString>
2896
                          </gmd:name>
2897
                          <gmd:description>
2898
                           <gco:CharacterString>Downloadable PDF document/gco:CharacterString>
2899
                          </gmd:description>
2900
                          <!-- (O-C) Resource distributor online distribution function -
2901
        CI_OnlineResource/function is required by USGIN to indicate how linkage is to be used. If the
2902
        resource is accessible as a web service, the metadata for the service should be separate metadata
2903
        record with the dataset(s) exposed through the service identified in the service metadata record
2904
2905
        as coupledResources. -->
                          <qmd:function>
2906
                           <!-- CI_OnlineFunctionCode names: {download, information, offlineAccess,</pre>
2907
2908
        order, search} - NAP expands with {upload, webService, emailService, browsing, fileAccess,
        webMapService}. -->
2909
                           <!-- NAP Example -->
2910
                           <!--
2911
                           <gmd:CI_OnLineFunctionCode</pre>
2912
                             codeList="http://www.fqdc.gov/nap/metadata/register/codelists.html#IC_88"
2913
                             codeListValue="RI_375">download</gmd:CI_OnLineFunctionCode>
2914
2915
2916
2917
                           <!-- ISO Example -->
                           <gmd:CI_OnLineFunctionCode</pre>
2918
2919
2920
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
        Codelist/gmxCodelists.xml#CI OnLineFunctionCode"
                             codeListValue="download">download</gmd:CI_OnLineFunctionCode>
2921
                          </gmd:function>
2922
                        </gmd:CI_OnlineResource>
2923
                      </gmd:onLine>
2924
                    </gmd:MD_DigitalTransferOptions>
2925
                  </gmd:distributorTransferOptions>
2926
                </gmd:MD_Distributor>
2927
              </gmd:distributor>
2928
              <!-- (C-C) Resource distribution transfer options - MD_DigitalTransferOptions provides
2929
2930
2931
        information on digital distribution of resource. See USGIN Profile 'Use of MD_Distribution and
        MD_Distributor' for instructions on use of this element. Details on encoding for
        MD_DigitalTransferOptions are above in the distributorTransferOptions elements description. -->
2932
              <!--
2933
              <gmd:transferOptions/>
2934
              -->
2935
            </gmd:MD_Distribution>
```

```
2936
                </gmd:distributionInfo>
2937
                <!-- (C-C) Data quality Information - NAP requires either dataQualityInfo/DQ_DataQuality/report
2938
             or dataQualityInfo/ DQ_DataQuality/lineage if
2939
2940
2941
2942
2943
             dataQualityInfo/DQ_DataQuality/scope/DQ_Scope/level = 'dataset'.
                <qmd:dataOualitvInfo>
                   <gmd:DQ_DataQuality>
                      <!-- (C-C) Data quality scope - Mandatory if DQ_DataQuality is not null. Specifies the
             extent of characteristics for which data quality information is reported. -->
2944
                      <gmd:scope>
2945
                         <gmd:DQ_Scope>
2946
                             <gmd:level>
2947
                              <!-- MD_ScopeCode names: {attribute, attributeType, collectionHardware,
2948
             collectionSession, dataset, series, nonGeographicDataset, dimensionGroup, feature, featureType,
2949
             propertyType, fieldSession, software, service, model, tile}. -->
2950
                               <!-- NAP Example -->
2951
2952
                               <!--
                               <gmd:MD_ScopeCode</pre>
2953
                                  codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_108"
2954
                                  codeListValue="RI_622">dataset</gmd:MD_ScopeCode>
2955
2956
                               <!-- ISO Example -->
2957
                                <gmd:MD_ScopeCode</pre>
2958
2959
               codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
2960
             Codelist/gmxCodelists.xml#MD_ScopeCode"
2961
                                 codeListValue="dataset">dataset</gmd:MD_ScopeCode>
2962
2963
                             </gmd:level>
                             <!-- (C-C) Data quality scope level description - NAP provision is that
2964
             DQ_DataQuality/scope/levelDescription is mandatory if scope/DQ_Scope/level is not equal to
2965
2966
             'dataset' or 'series'. USGIN adds requirement that DataQuality/scope/levelDescription is
             \verb|mandatory| if DQ_DataQuality/scope/DQ_Scope/level/MD_ScopeCode.codeListValue| is not equal to the mandatory of the property of the propert
2967
             MD_MetadataHierarchy/hierarchyLevel/MD_ScopeCode.codelistvalue level. -->
2968
                            <!--
2969
                             <gmd:levelDescription>
2970
                                <gmd:MD_ScopeDescription>
2971
                                  --><!-- NAP BP: One and only one of the following must be entered: attributes,
2972
             features, featureInstances, attributeInstances, dataset, or other as appropriate. Encoding of the
2973
             values for the levelDescription element is unclear from the ISO or INCITs documentation. --><!--
2974
                                  <gmd:attributes></gmd:attributes>
2975
                                </gmd:MD_ScopeDescription>
2976
2977
                             </gmd:levelDescription>
                            -->
2978
                         </gmd:DQ_Scope>
2979
2980
                      </gmd:scope>
                      <!-- (C-C) Data quality report - If a DQ_DataQuality/report element is included, at least
2981
             one of the 15 possible data quality elements must be present, and multiple report elements are
2982
             allowed within each DQ_DataQuality element. -->
2983
                      <!--
2984
                      <qmd:report>
2985
                         <gmd:DQ_CompletenessCommission>
2986
                            <qmd:nameOfMeasure>
2987
2988
                                <gco:CharacterString>Name of Measure</gco:CharacterString>
                             </gmd:nameOfMeasure>
2989
                            <qmd:result>
2990
2991
                               <gmd:DQ_QuantitativeResult>
                               <qmd:valueUnit>a unit
2992
                                  <gmd:value>
2993
                                     <gco:Record>a value</gco:Record>
2994
                                  </gmd:value>
2995
                                </gmd:DQ_QuantitativeResult>
2996
                            </amd:result>
2997
                         </gmd:DQ_CompletenessCommission>
2998
                      </gmd:report>
2999
3000
                      <!-- (C-C) Data quality lineage - INSPIRE makes general lineage/LI_Lineage/statement
3001
             mandatory. USGIN follows NAP rule that count(lineage/LI_Lineage/source +
3002
             lineage/LI_Lineage/sourceStep + lineage/LI_Lineage/statement ) > 0 for spatial dataset and
3003
             spatial dataset series. Not applicable to services. -->
3004
                      <gmd:lineage>
3005
                         <gmd:LI_Lineage>
3006
                            <!-- (C-C) Data quality lineage statement - General explanation of the data producer's
3007
             knowledge of the dataset lineage. -->
```

```
3008
3009
                   <gco:CharacterString>This dataset is maintained by the Arizona Geological
3010
        Survey.</gco:CharacterString>
3011
3012
                 <!-- (C-C) Data quality lineage source - Each source/LI Source element describes a
3013
        source data resource that is input into a processStep. NAP provision is that
3014
        LI_Source/description is mandatory if LI_Source/sourceCitation and LI_Source/sourceExtent are
3015
        not provided. The attribute description includes the source medium name code (CodeList
3016
        napMD_MediumNameCode) followed by <;><blank space> and a free text description, e.g. "dvd; source
3017
        satellite image." -->
3018
                 <!--
3019
                 <gmd:source/>
3020
                 -->
3021
                 <!-- (C-C) Data quality lineage process step - An event in the development of the
3022
        dataset. Best practice recommended for USGIN is that source association from a process step is to
3023
        inputs to a process, and processStep associations from a source element link an output resource
3024
        to a process step that produced it. -->
3025
3026
                 <!--
                 <qmd:processStep>
3027
                   <gmd:LI_ProcessStep>
3028
                     <gmd:description>
3029
                       <gco:CharacterString></gco:CharacterString>
3030
                     </gmd:description>
3031
                   </gmd:LI_ProcessStep>
3032
                 </gmd:processStep>
3033
3034
               </gmd:LI_Lineage>
3035
              </gmd:lineage>
3036
            </gmd:DQ_DataQuality>
3037
         </gmd:dataQualityInfo>
3038
          <!-- (0-0) Portrayal catalog information - A portrayal cataloguecatalog is a collection of
3039
        defined symbols used to depict, to humans, features on a map. No documentation in ISO 19115 about
3040
        how this is supposed to work. ISO 19117 defines the structure of a Portrayal Catalogue. No USGIN
3041
        recommended practices here yet. -->
3042
         <!--
3043
         <gmd:portrayalCatalogueInfo/>
3044
3045
         <!-- (0-0) Metadata constraint information - This element specifies use constraints for access
3046
        to the metadata record. -->
3047
         <gmd:metadataConstraints>
3048
            <!-- Constraints -->
3049
            <qmd:MD Constraints>
3050
             <!-- NAP provision is that metadataConstraints/MD_Constraints/useLimitation is mandatory
3051
        when MD_Constraints is used to specify metadataConstraints. -->
3052
              <qmd:useLimitation>
3053
                <gco:CharacterString>fair use</gco:CharacterString>
3054
              </gmd:useLimitation>
3055
            </gmd:MD_Constraints>
3056
         </gmd:metadataConstraints>
3057
          <gmd:metadataConstraints>
3058
            <!-- Legal constraint -->
3059
            <gmd:MD_LegalConstraints>
3060
              <!-- When one of the subtypes MD_LegalConstraints or MD_SecurityConstraints is used,
3061
        useLimitation is optional. -->
3062
             <qmd:useLimitation>
3063
               <gco:CharacterString>one</gco:CharacterString>
3064
              </gmd:useLimitation>
3065
              <gmd:accessConstraints>
3066
               <!-- MD_RestrictionCode names: {copyright, patent, patentPending, trademark, license,
3067
        intellectualPropertyRights, restricted, otherRestrictions} - NAP expands with
3068
        {licenseUnrestricted, licenseEndUser, licenseDistributor, privacy, statutory, confidential,
3069
        sensitivity}. -->
3070
               <!-- NAP Example -->
3071
               <!--
3072
                <qmd:MD RestrictionCode</pre>
3073
                 codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_107"
3074
                 codeListValue="RI_609">otherRestrictions</gmd:MD_RestrictionCode>
3075
3076
               <!-- ISO Example -->
3077
               <gmd:MD_RestrictionCode</pre>
```

```
3078
3079
                  codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3080
               Codelist/gmxCodelists.xml#MD_RestrictionCode"
3081
                                codeListValue="otherRestrictions">other restrictions/gmd:MD_RestrictionCode>
3082
                         </gmd:accessConstraints>
3083
                         <gmd:useConstraints>
3084
                            <!-- MD_RestrictionCode names: {copyright, patent, patentPending, trademark, license,
3085
               intellectualPropertyRights, restricted, otherRestrictions} - NAP expands with
3086
               {licenseUnrestricted, licenseEndUser, licenseDistributor, privacy, statutory, confidential,
3087
               sensitivity \}. -->
3088
                            <!-- NAP Example -->
3089
                            <!--
3090
                            <gmd:MD_RestrictionCode</pre>
3091
                               codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_107"
3092
                               codeListValue="RI_609">otherRestrictions</gmd:MD_RestrictionCode>
3093
3094
                            <!-- ISO Example -->
3095
                             <gmd:MD_RestrictionCode</pre>
3096
3097
                  codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3098
               Codelist/gmxCodelists.xml#MD_RestrictionCode"
3099
                                \verb|codeListValue| = \verb|cotherRestrictions|| > \verb|cotherrestrictions|| < | \texttt{gmd}: \texttt{MD}_RestrictionCode|| > | \texttt{MD}
3100
                         </gmd:useConstraints>
3101
                         <!-- (C-C) otherConstraints is a free text element required by NAP if accessConstraints or
3102
               useConstraints is set to "otherRestrictions." -->
3103
                         <qmd:otherConstraints>
3104
                             <gco:CharacterString>Data only to be used for the purposes for which they were
3105
               collected.</gco:CharacterString>
3106
                         </gmd:otherConstraints>
3107
3108
                      </gmd:MD_LegalConstraints>
                  </gmd:metadataConstraints>
3109
                  <gmd:metadataConstraints>
3110
                      <!-- Security constraints -->
3111
                      <gmd:MD_SecurityConstraints>
3112
                         <gmd:classification>
3113
                            <!-- MD_SecurtyConstraints has various optional free text values, and a required
3114
               MD_SecurityConstraints/classification from MD_ClassificationCode names: {unclassified,
3115
               restricted, confidential, secret, topSecret} - NAP expands with {sensitive, forOfficialUseOnly}.
3116
3117
                             <!-- NAP Example -->
3118
3119
3120
                            <!--
                             <qmd:MD ClassificationCode</pre>
                               codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_96"
3121
3122
                               codeListValue="RI_484">unclassified</gmd:MD_ClassificationCode>
3123
                            <!-- ISO Example-->
3124
                             <gmd:MD_ClassificationCode</pre>
3125
3126
                  codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3127
               Codelist/gmxCodelists.xml#MD_ClassificationCode"
3128
                               codeListValue="unclassified">unclassified</qmd:MD_ClassificationCode>
3129
3130
3131
3132
3133
                         </gmd:classification>
                      </gmd:MD_SecurityConstraints>
                  </gmd:metadataConstraints>
                  <!-- (0-0) Application schema information - Information about the conceptual schema of the
               dataset. -->
3134
3135
                  <qmd:applicationSchemaInfo>
3136
                      --><!-- (M-M) The applicationSchemaInfo/MD_ApplicationSchemaInformation element has mandatory
3137
               name/CI_Citation, schemaLanguage free text, and constraintLanguage free text. --><!--
3138
                      <gmd:MD_ApplicationSchemaInformation>
3139
                         <qmd:name>
3140
3141
                            <gmd:CI_Citation>
                                <qmd:title>
3142
                                   <gco:CharacterString>schema title string
3143
                                </gmd:title>
3144
3145
                                <gmd:date>
                                   <qmd:CI Date>
3146
3147
                                          <gco:DateTime>2001-12-17T09:30:47</gco:DateTime>
3148
                                       </gmd:date>
3149
                                      <gmd:dateType>
```

```
3150
                        --><!-- NAP Example -->
3151
                        <!--
3152
3153
3154
                        <gmd:CI_DateTypeCode</pre>
                          codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_87"
                          codeListValue="RI_367">publication</gmd:CI_DateTypeCode>
3155
3156
3157
                        <!-- ISO Example --><!--
                        <gmd:CI_DateTypeCode
3158
3159
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3160
         Codelist/gmxCodelists.xml#CI_DateTypeCode"
3161
                          codeListValue="publication">publication/gmd:CI_DateTypeCode>
3162
                      </gmd:dateType>
3163
                    </gmd:CI_Date>
3164
                  </gmd:date>
3165
3166
3167
                </gmd:CI_Citation>
              </amd:name>
              <qmd:schemaLanguage>
3168
                <gco:CharacterString>some schema language
3169
              </gmd:schemaLanguage>
3170
3171
              <gmd:constraintLanguage>
                <gco:CharacterString>some constraint language/gco:CharacterString>
3172
              </gmd:constraintLanguage>
3173
            </gmd:MD_ApplicationSchemaInformation>
3174
          </gmd:applicationSchemaInfo>
3175
3176
3177
          <!-- (O-O) Metadata maintenance information - This element provides information about the
        maintenance schedule or history of the metadata record. -->
3178
          <gmd:metadataMaintenance>
3179
3180
            <gmd:MD_MaintenanceInformation>
              <qmd:maintenanceAndUpdateFrequency>
3181
                <!-- Only one MD_MaintenanceInformation element may be included, with a required
3182
        MD_MaintenanceFrequencyCode names: {continual, daily, weekly, fortnightly, monthly, quarterly,
3183
        biannually, annually, asNeeded, irregular, not-Planned, unknown } - NAP expands with
3184
         {semimonthly}. -->
3185
                <!-- NAP Example -->
3186
                <!--
3187
                <gmd:MD_MaintenanceFrequencyCode</pre>
3188
                  codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_102"
3189
                  codeListValue="RI_540">asNeeded</pmd:MD_MaintenanceFrequencyCode>
3190
3191
                <!-- ISO Example -->
3192
                <gmd:MD_MaintenanceFrequencyCode</pre>
3193
3194
3195
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
         Codelist/gmxCodelists.xml#MD_MaintenanceFrequencyCode"
3196
                  codeListValue="asNeeded">as needed</gmd:MD_MaintenanceFrequencyCode>
3197
              </gmd:maintenanceAndUpdateFrequency>
3198
            </gmd:MD_MaintenanceInformation>
3199
          </gmd:metadataMaintenance>
3200
          <!-- (X-X) Series information - Not used by USGIN. -->
3201
3202
          <!--
          <gmd:series/>
3203
3204
          <!-- (X-X) Described resource - Not used by USGIN. -->
3205
          <!--
3206
          <gmd:describes/>
3207
          -->
3208
3209
          <!-- (X-X) Property type description - Not used by USGIN. -->
3210
          <gmd:propertyType/>
3211
3212
3213
3214
          <!-- (X-X) Feature type description - Not used by USGIN -->
          <!--
          <qmd:featureType/>
3215
3216
3217
          <!-- (X-X) Feature attributes - Not used by USGIN -->
          <!--
3218
          <gmd:featureAttribute/>
3219
          -->
3220
         </gmd:MD_Metadata>
```

3221

3222

8.3 USGIN ISO 19139 Service Metadata

3223 3224

3225

In the following listing, text in green is comments; XML elements are in blue, XML attributes are in black, and attribute values are in purple.

```
3226
3227
        <?xml version="1.0" encoding="UTF-8"?>
3228
3229
3230
        *** Example ISO 19139 Geospatial Service Metadata based on the USGIN v1.1 Profile
3231
3232
3233
3234
3235
3236
3237
3238
3239
        *** with explicitly linked references to coupled resources (map layers) for a WMS service
        *** by USGIN Standards and Protocols Drafting Team
        *** U.S. Geoscience Information System (USGIN) - http://lab.usgin.org
        *** Contributors: Wolfgang Grunberg, Stephen M Richard
        *** 01/20/2010
        *** DISCLAIMER: this is not an authoritative metadata example but an aide to get started.
        *** Scope notes are mostly from NAP or ISO documentation; refer to
        *** the USGIN profile document for more specific and reliable guidelines.
3240
3241
        *** Validated against http://www.isotc211.org/2005/gmd (ISO 19115, CSW 2.0.2)
3242
3243
        *** and http://www.isotc211.org/2005/srv (ISO 19119, CSW 2.0.2)
        *** Follows the USGIN ISO 19139 Dataset Metadata Profile v1.1
3244
        *** a derivative of the North American Profile (NAP)
3245
        ***
3246
        *** NOTES:
3247
        *** - Codelists:
3248
        *** Most ISO metadata profiles and applications use ISO codelists or codelists that use ISO's
3249
3250
3251
3252
        codelist names. NAP does not use ISO codelist names. USGIN recommends using ISO over NAP
        codelists to ensure interoperability. Remember, the codeList attribute points to a Uniform
        Resource Identifier (URI) which defines an item's identity. It can be a URN or a URL.
        *** - napm schema extension:
3253
3254
3255
        ***
        http://www.cits.rncan.gc.ca/html/brodeurj/.protege/.napMetadata/napMetadataWebsite/napMetadataToo
        ls/napXsd/napm is the namespace for NAP extensions in xmlns:napm. Its schema is located at
3255
3256
3257
3258
3259
3260
3261
3262
        http://www.cits.rncan.gc.ca/html/brodeurj/.protege/.napMetadata/tools/napXsd/napm/napm.xsd.
        However, that schema does not resolve properly because it also refernces a local copy of gmd.
        USGIN does not follow this NAP requirement because it constitutes a barier to interoperability.
        *** - Language code:
        *** NAP demands <ISO639-2/T three letter language code - lower case><;><blank space><ISO3166-1
        three letter country code - upper case>. However, NAP's requirement is not interoperable and
        USGIN prefers ISO's <ISO639-2/T three letter language code - lower case> formatting.
3263
3264
        *** KEY: (NAP-USGIN) - M/C/O/X (Mandatory, Conditional, Optional, Not Used)
3265
3266
3267
        **************************************
3268
        <!-- USGIN ISO 19139 geospatial service metadata record with explicitly linked references to
3269
        coupled resources (map layers) for a WMS service -->
3270
3271
3272
        <gmd:MD_Metadata</pre>
          xmlns:gmd="http://www.isotc211.org/2005/gmd"
          xmlns:gco="http://www.isotc211.org/2005/gco"
3273
          xmlns:gml="http://www.opengis.net/gml"
3273
3274
3275
3276
3277
3278
3279
3280
          xmlns:srv="http://www.isotc211.org/2005/srv"
          xmlns:xlink="http://www.w3.org/1999/xlink"
          xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
          xsi:schemaLocation="
            http://www.isotc211.org/2005/qmd http://schemas.opengis.net/iso/19139/20060504/qmd/qmd.xsd
            http://www.isotc211.org/2005/srv http://schemas.opengis.net/iso/19139/20060504/srv/srv.xsd
3281
3282
3283
          <!-- (M-M) Metadata file identifier - A unique File Identifier (GUID) - USGIN recommends using
        a valid Universally Unique Identifier (UUID) -->
          <amd:fileIdentifier>
3284
            <gco:CharacterString>53e3ad439d6043e25d875f3959445c3d7d9a1</gco:CharacterString>
3285
          </amd:fileIdentifier>
3286
          <!-- (M-M) Metadata language - NAP demands <ISO639-2/T three letter language code - lower
3287
        case><;><blank space><ISO3166-1 three letter country code - upper case>. However, NAP's
3288
        requirement is not interoperable and USGIN prefers ISO's <ISO639-2/T three letter language code -
3289
        lower case> formatting. -->
3290
          <!-- NAP Example -->
```

```
3291
3292
          <gmd:language>
3293
            <gco:CharacterString>eng; USA</gco:CharacterString>
3294
3295
          </gmd:language>
3296
3297
3298
          <!-- ISO Example -->
          <gmd:language>
            <gco:CharacterString>eng</gco:CharacterString>
3299
3300
          <!-- (M-M) Metadata character set - NAP specifies default is "utf8", codelist =
3301
         napMD_CharacterSetCode. USGIN requires that a character set code is defined to facilitate CSW
3302
        servers (deegree, GeoNetwork, etc.). -->
3303
          <gmd:characterSet>
            <!-- MD_CharacterSetCode names: {ucs2, ucs4, utf7, utf8, utf16, 8859part1, 8859part2,
3304
3305
        8859part3, 8859part4, 8859part5, 8859part6, 8859part7, 8859part8, 8859part9, 8859part10,
3306
         8859part11, 8859part13, 8859part14, 8859part15, 8859part16, jis, shiftJIS, eucJP, usAscii,
3307
         ebcdic, eucKR, big5, GB2312}.
3308
            <!-- NAP example -->
            <!--
3309
3310
            <gmd:MD_CharacterSetCode</pre>
3311
              codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_95"
3312
              codeListValue="RI_458">utf8/gmd:MD_CharacterSetCode>
3313
3314
            <!-- ISO example -->
3315
            <gmd:MD_CharacterSetCode</pre>
3316
3317
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3318
        Codelist/gmxCodelists.xml#MD_CharacterSetCode"
3319
              codeListValue="utf8">UTF-8/gmd:MD_CharacterSetCode>
3320
3321
          </gmd:characterSet>
          <!-- (M-M) Resource type - Define if this record is a: dataset (default), service, feature,
3322
        software, etc. -->
3323
          <gmd:hierarchyLevel>
3324
3325
            <!-- MD_ScopeCode code names: {attribute, attributeType, collectionHardware,
         collectionSession, dataset, series, nonGeographicDataset, dimensionGroup, feature, featureType,
3326
        propertyType, fieldSession, software, service, model, tile}. -->
3327
            <!-- NAP example -->
3328
            <!--
3329
            <gmd:MD_ScopeCode
3330
3331
3332
              codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_108"
              codeListValue="RI_631">service</gmd:MD_ScopeCode>
3333
            <!-- ISO example -->
3334
3335
3336
3337
            <gmd:MD_ScopeCode</pre>
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
        Codelist/gmxCodelists.xml#MD ScopeCode"
3338
              codeListValue="service">service</gmd:MD_ScopeCode>
3339
          </gmd:hierarchyLevel>
3340
          <!-- (O-M) Resource hierarchy level name - ISO 19115 assumes that the metadata hierarchy level
3341
        name defaults to "dataset" if it is not documented. NAP does not use it, recognizing that it is
3342
3343
3344
         redundant. USGIN makes this property mandatory to identify the USGIN resource type (see USGIN
         Profile, "Resources of Interest"). Default USGIN hierarchyLevelName.CharacterString is "Dataset."
        Encode hierarchy by including hierarchyLevelName elements for all broader resource categories.
3345
3346
         E.g. default should also include a hierarchyLevelName="Collection" element. For services USGIN
        hierarchyLevelName.CharacterString is "Service". As use cases develop that provide rationale for
3347
        definition of sub-categories of service, the resource category list will be expanded. -->
3348
          <gmd:hierarchyLevelName>
3349
            <gco:CharacterString>Service
3350
          </gmd:hierarchyLevelName>
3351
          <!-- (M-M) Metadata point of contact - Point of contact for the metadata record, e.g. for users
3352
         to report errors, updates to metadata, etc. -->
3353
          <qmd:contact>
3354
            <gmd:CI_ResponsibleParty>
3355
              <!-- (M-M) (individualName + organisationName + positionName) > 0 -->
3356
              <gmd:individualName>
3357
                <gco:CharacterString>Ryan Clark</gco:CharacterString>
3358
              </gmd:individualName>
3359
              <gmd:organisationName>
3360
                <gco:CharacterString>Arizona Geological Survey</gco:CharacterString>
3361
              </gmd:organisationName>
3362
              <gmd:positionName>
```

```
3363
                <gco:CharacterString>GIS Manager
3364
              </gmd:positionName>
3365
              <qmd:contactInfo>
3366
                <gmd:CI_Contact>
3367
                 <!-- Phone -->
3368
                  <gmd:phone>
3369
                    <gmd:CI_Telephone>
3370
3371
                     <amd:voice>
                       <gco:CharacterString>520.770.3500</gco:CharacterString>
3372
3373
                     </amd:voice>
                     <gmd:facsimile>
3374
                       <gco:CharacterString>520.770.3505</gco:CharacterString>
3375
3376
                     </gmd:facsimile>
                    </gmd:CI_Telephone>
3377
3378
3379
3380
                  </gmd:phone>
                  <!-- Address -->
                  <qmd:address>
                    <gmd:CI_Address>
3381
                     <amd:delivervPoint>
3382
                       <gco:CharacterString>416 W. Congress St., Suite 100</gco:CharacterString>
3383
                     </gmd:deliveryPoint>
3384
                     <qmd:citv>
3385
                       <gco:CharacterString>Tucson</gco:CharacterString>
3386
                     </gmd:city>
3387
                     <gmd:administrativeArea>
3388
                       <gco:CharacterString>Arizona</gco:CharacterString>
3389
3390
                     </gmd:administrativeArea>
                     <qmd:postalCode>
3391
                       <gco:CharacterString>85701-1381
3392
                     </gmd:postalCode>
3393
                     <qmd:country>
3394
                       <gco:CharacterString>USA</gco:CharacterString>
3395
                     </gmd:country>
3396
                     <!-- (O-M) Metadata point of contact e-mail address - mandatory in USGIN -->
3397
                     <gmd:electronicMailAddress>
3398
                       <gco:CharacterString>metadata@azgs.az.gov
3399
                     </gmd:electronicMailAddress>
3400
                    </gmd:CI_Address>
3401
                  </gmd:address>
3402
                  <!-- (0-0) online resources - this is the online resource to contact the metadata
3403
        person-->
3404
                  <amd:onlineResource>
3405
                    <gmd:CI_OnlineResource>
3406
                     <gmd:linkage>
3407
                       <gmd:URL>http://www.azgs.az.gov</pmd:URL>
3408
                     </gmd:linkage>
3409
                     <gmd:protocol>
3410
                       <gco:CharacterString>http</gco:CharacterString>
3411
                     </gmd:protocol>
3412
                     <qmd:description>
3413
                       <gco:CharacterString>Arizona Geological Survey Web Site/gco:CharacterString>
3414
                     </gmd:description>
3415
                    </gmd:CI_OnlineResource>
3416
                  </gmd:onlineResource>
3417
                  <!-- (0-0) hours of service -->
3418
                  <amd:hoursOfService>
3419
                    <gco:CharacterString>8 AM to 5 PM Mountain Standard time (no daylight
3420
        savings)CharacterString>
3421
                  </gmd:hoursOfService>
3422
                  <!-- (0-0) contact instructions -->
3423
                  <gmd:contactInstructions>
3424
                   <gco:CharacterString>Fill out contact form at http://www.azgs.az.gov
3425
        </gco:CharacterString>
342<u>6</u>
                  </gmd:contactInstructions>
3427
                </gmd:CI Contact>
3428
              </gmd:contactInfo>
3429
              <!-- (M-M) ISO 19139 Mandatory: contact role -->
3430
              <qmd:role>
3431
                <!-- CI_RoleCode names: {resourceProvider, custodian, owner, user, distributor,
3432
        originator, pointOfContact, principalInvestigator, processor, publisher, author} - NAP expands
3433
        with {collaborator, editor, mediator, rightsHolder}.
3434
                <!-- NAP example -->
```

```
3435
                <!--
3436
                <qmd:CI RoleCode
3437
                 codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_90"
3438
                 codeListValue="RI_414">pointOfContact</gmd:CI_RoleCode>
3439
3440
               <!-- ISO example -->
3441
                <gmd:CI_RoleCode
3442
3443
         codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3444
        Codelist/gmxCodelists.xml#CI_RoleCode"
3445
                 codeListValue="pointOfContact">point of contact/gmd:CI_RoleCode>
3446
              </amd:role>
3447
            </gmd:CI_ResponsibleParty>
3448
         </gmd:contact>
3449
         <!-- (X-0) Metadata should include a URL that locates a thumbnail logo for organizations
3450
        related to the metadata origination, the organization hosting the catalog that returned the
3451
        metadata, the organization that originated the data, and the organization hosting online services
3452
        that provide access to the data. -->
3453
         <qmd:contact>
3454
            <gmd:CI_ResponsibleParty>
3455
              <gmd:organisationName>
3456
               <gco:CharacterString>Arizona Geological Survey</gco:CharacterString>
3457
              </gmd:organisationName>
3458
              <qmd:contactInfo>
3459
                <gmd:CI_Contact>
3460
                 <qmd:onlineResource>
3461
                   <qmd:CI OnlineResource>
3462
                     <!-- Icon image file (e.g. tif, png, jpg) for the metadata originator. This Icon
3463
        will be displayed in search results to credit the metadata originator. -->
3464
                     <gmd:linkage>
3465
                       <gmd:URL>http://www.azgs.az.gov/logo/metadata/azgs.png</gmd:URL>
3466
                     </gmd:linkage>
3467
                     <!-- (X-C) For URL's that indicate icon thumbnails, the CI_OnlineResource/name
3468
        should be 'icon'. -->
3469
                     <gmd:name>
3470
                       <gco:CharacterString>icon
3471
                     </gmd:name>
3472
                   </gmd:CI_OnlineResource>
3473
                 </gmd:onlineResource>
3474
                </qmd:CI_Contact>
3475
              </gmd:contactInfo>
3476
              <md:role>
3477
               <!-- CI_RoleCode names: {resourceProvider, custodian, owner, user, distributor,
3478
        originator, pointOfContact, principalInvestigator, processor, publisher, author} - NAP expands
3479
        with {collaborator, editor, mediator, rightsHolder}. -->
3480
               <!-- NAP example -->
3481
               <!--
3482
               <gmd:CI_RoleCode
3483
                 codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_90"
3484
                 codeListValue="RI_413">originator</gmd:CI_RoleCode>
3485
3486
               <!-- ISO example -->
3487
               <gmd:CI_RoleCode
3488
3489
         codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3490
        Codelist/gmxCodelists.xml#CI RoleCode"
3491
                 codeListValue="originator">originator</gmd:CI_RoleCode>
3492
              </gmd:role>
3493
            </gmd:CI_ResponsibleParty>
3494
         </gmd:contact>
3495
          <!-- (M-M) Metadata date stamp - USGIN profile requires use of dateStamp/gco:DateTime (Note
3496
        this contrasts with INSPIRE mandate to use dateStamp/gco:Date). This is the date and time when
3497
        the metadata record was created or updated (following NAP). -->
3498
          <qmd:dateStamp>
3499
            <!-- Requires an extended ISO 8601 formatted combined UTC date and time string (2009-11-
3500
        17T10:00:00) -->
3501
            <gco:DateTime>2009-11-17T10:00:00
3502
          </gmd:dateStamp>
3503
         <!-- (M-M) metadata standard - NAP specifies "NAP - Metadata". USGIN profile conformant
3504
        metadata is indicated by using "ISO-NAP-USGIN" -->
3505
          <gmd:metadataStandardName>
3506
            <gco:CharacterString>ISO-NAP-USGIN</gco:CharacterString>
```

```
3507
          </gmd:metadataStandardName>
3508
          <!-- (O-M) USGIN profile version -->
3509
          <qmd:metadataStandardVersion>
3510
            <gco:CharacterString>1.1
3511
3512
          </gmd:metadataStandardVersion>
          <!-- (O-C) Dataset Identifier - For USGIN, this is a string that uniquely identifies the
3513
        described resource. If the resource has an identifier, it should be included here; if the
3514
        resource will be referenced from other metadata, it must have an identifier here. If the dataset
3515
        is coupled to a service, the value of the MD_Metadata/dataSetURI attribute is the unique resource
3516
        identifier used by srv:coupledResource to link the service with the dataset. For the USGIN
3517
        profile, the MD_Distribution/transferOptions/MD_DigitalTransferOptions/ online/CI_OnlineResource
3518
        is used to specify URLs for access to the resource. -->
3519
3520
          <!-- This locale element example implies that all character string elements are available in
        English (from the MD_Metadata/language element), and in French. -->
3521
3522
3523
          <!--
          <gmd:locale>
            <gmd:PT_Locale id="FR">
3524
3525
              <gmd:languageCode>
                <amd:LanguageCode</pre>
3526
3527
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3528
        Codelist/ML_gmxCodelists.xml#LanguageCode"
3529
                  codeListValue="fra">Français</gmd:LanguageCode>
3530
3531
              </gmd:languageCode>
              <gmd:characterEncoding>
3532
                --><!-- ISO example --><!--
3533
3534
                <gmd:MD_CharacterSetCode</pre>
3535
3536
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
        Codelist/gmxCodelists.xml#MD_CharacterSetCode"
3537
3538
                  codeListValue="utf8">UTF-8/gmd:MD_CharacterSetCode>
              </gmd:characterEncoding>
3539
            </gmd:PT_Locale>
3540
          </gmd:locale>
3541
          -->
3542
          <!-- (C-C) Other Languages - If description in more than one language is provided, this
3543
        property should indicate what those languages are. The primary language used for metadata
3544
        description is identified with MD_Metadata/language and characterSet and any additional languages
3545
        are identified by MD_Metadata/locale/PT_locale elements, in which the language is provided
3546
        according to ISO 639-2/T three-letter terminology codes in lowercase, and an optional country is
3547
3548
        provided according to ISO 3166-1 three-letter codes in uppercase, and mandatory
        characterEncoding. -->
3549
            <!--
3550
            <gmd:locale/>
3551
3552
            -->
          <!-- (0-0) Resource spatial representation - Spatial representation Information for the dataset
3553
        (resource). Best practice is to include metadata for spatial representation if the described
3554
        resource is a georeferenced dataset. -->
3555
          <!--
3556
          <gmd:spatialRepresentationInfo/>
3557
          -->
3558
          <!-- (0-0) Resource's spatial reference system - Description of the spatial and/or temporal
3559
        reference systems used in the dataset.
3560
            NAP specifies {
3561
        (identificationInfo/spatialRepresentationType/MD_SpatialRepresentationTypeCode= "vector") or
3562
        (.../MD\_SpatialRepresentationTypeCode = "grid"") \ or \ (.../MD\_SpatialRepresentationTypeCode = "tin")
3563
        implies count referenceSystemInfo >= 1) } -->
3564
          <gmd:referenceSystemInfo>
3565
            <qmd:MD ReferenceSystem>
3566
              <!-- ISO 19115:2003 Corrigendum 1:2006 removes CRS and projection parameter information. It
3567
        uses the new ISO 19111 instead -->
3568
              <gmd:referenceSystemIdentifier>
3569
                <gmd:RS_Identifier>
3570
                  <!-- (C-C) Reference System identifier code - For USGIN the code should be a value from
3571
        the EPSG Geodetic Parameter Dataset register (http://www.epsg-registry.org/) in the form
3572
        "EPSG:nnnn" where nnnn is the EPSG code number for the CRS. -->
3573
                  <gmd:code>
3574
                   <gco:CharacterString>EPSG:5701
3575
                  </amd:code>
3576
3577
                  <qmd:codeSpace>
                    <gco:CharacterString>urn:ogc:def:crs</gco:CharacterString>
3578
                  </gmd:codeSpace>
```

```
3579
                </gmd:RS Identifier>
3580
              </gmd:referenceSystemIdentifier>
3581
            </gmd:MD ReferenceSystem>
3582
          </gmd:referenceSystemInfo>
3583
         <!-- (X-X) Metadata extension information - not used in USGIN -->
3584
         <!--
3585
         <gmd:metadataExtensionInfo/>
3586
          -->
3587
         <!--************
3588
         <!-- (M-M) Resource identification information - At least one of MD_DataIdentification
3589
        (dataset, dataset series) or SV_ServiceIdentification (service) is required.
3590
         <qmd:identificationInfo>
3591
            <!-- Resource Service Identification -->
3592
            <srv:SV_ServiceIdentification>
3593
              <qmd:citation>
3594
               <!-- (M-M) Resource citation - For USGIN purposes, this should be viewed as information
3595
        to identify the intellectual origin of the content in the described resource, along the lines of
3596
        a citation in a scientific journal. Required content for a CI_Citation element are title, date,
3597
        and responsibleParty -->
3598
                <gmd:CI_Citation>
3599
                 <!-- (M-M) Resource title - USGIN recommends using titles that inform the human reader
3600
        about the dataset's content as well as its context.
3601
3602
                   <gco:CharacterString>Arizona Geological Survey Web Map Service/gco:CharacterString>
3603
                 </gmd:title>
3604
                 <!-- (0-0) Alternate title -->
3605
                 <!--
3606
                 <qmd:alternateTitle/>
3607
                 -->
3608
                 <!-- (M-M) Resource reference date - Best practice is to include at least the date of
3609
        publication or creation of the resource. The date of the resource reported in the citation
3610
        corresponds to the resource's last update version according to its update frequency. CI_Date
3611
        content includes a date and dateType. Date for USGIN profile uses xs:date data type, defined thus
3612
        "date uses the date/timeSevenPropertyModel, with hour, minute, and second required to be absent.
3613
        timezoneOffset remains optional" (http://www.w3.org/TR/xmlschemal1-2). -->
3614
                 <qmd:date>
3615
                   <gmd:CI_Date>
3616
                     <qmd:date>
3617
                       <!-- Requires an extended ISO 8601 formatted combined UTC date and time string
3618
        (2001-12-17T09:30:47) -->
3619
                       <gco:DateTime>2009-11-22T23:35:22
3620
                     </gmd:date>
3621
3622
                     <gmd:dateType>
                       <!-- CI_DateTypeCode names: {creation, publication, revision} _ NAP expands with
3623
        {notAvailable, inForce, adopted, deprecated, superseded}.-->
3624
                       <!-- NAP Example -->
3625
                       <!--
3626
                       <gmd:CI_DateTypeCode
3627
                         codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_87"
3628
                         codeListValue="RI_368">revision</gmd:CI_DateTypeCode>
3629
                         -->
3630
                       <!-- ISO Example -->
3631
                       <gmd:CI_DateTypeCode</pre>
3632
3633
         codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3634
        Codelist/gmxCodelists.xml#CI_DateTypeCode"
3635
                         codeListValue="revision">revision</gmd:CI_DateTypeCode>
3636
                     </gmd:dateType>
3637
                   </gmd:CI Date>
3638
                 </gmd:date>
3639
                 <!-- (C-O) Unique resource identifier - For USGIN, because the Citation is for the
3640
        service, this identifier should be identical to MD_Metadta/dataSetURI, and is therefore optional.
3641
        For USGIN purposes, this element content value is only an identifier for the citation; it is not
3642
        a URL for accessing the service. The USGIN profile requires the use of MD_Identifier element to
3643
        identify resources. RS_Identifier may substitute for MD_Identifier in the ISO19139 schema, but
3644
        the USGIN profile requires use of MD_Identifer. If additional codespace and version content is
3645
        associated with the identifier, it should be encoded as
3646
        MD_Identifier/authority/CI_Citation/alternateTitle and
3647
        MD_Identifier/authority/CI_Citation/edition -->
3648
                 <!--
3649
                 <gmd:identifier>
3650
                   <gmd:RS_Identifier>
```

```
3651
                     <amd:code>
3652
                       3653
                     </amd:code>
3654
                   </gmd:RS_Identifier>
3655
                 </gmd:identifier>
3656
3657
                 <!-- (M-M) Resource responsible party - The citation attribute provides information for
3658
        citing the described resource. Citation is defined by Webster as "an act of quoting". The precise
3659
        semantics of what an identification/citation is supposed to be are not very well articulated in
3660
        ISO19115. For USGIN purposes, this should be viewed as information to identify the intellectual
3661
        origin (or property) of the content in the described resource, along the lines of a citation in a
3662
        scientific journal. Required content for a CI_Citation element are title, date, and
3663
        'responsibleParty'. -->
3664
                 <gmd:citedResponsibleParty>
3665
                   <gmd:CI_ResponsibleParty id="R264537">
3666
                     <!-- (M-M) (individualName + organisationName + positionName) > 0 -->
3667
                     <!--
3668
                     <gmd:individualName/>
3669
                     -->
3670
                     <gmd:organisationName>
3671
                       <gco:CharacterString>Arizona Geological Survey</gco:CharacterString>
3672
                     </gmd:organisationName>
3673
                     <qmd:positionName>
3674
                       <gco:CharacterString>GIS Manager
3675
                     </gmd:positionName>
3676
                     <!-- (O-C) Contact Information - (phone + deliveryPoint + electronicMailAddress ) >
3677
        0. Best practice is to include at least an e-mail address -->
3678
                     <qmd:contactInfo>
3679
                      <gmd:CI_Contact>
3680
                        <gmd:address>
3681
                          <qmd:CI Address>
3682
                            <qmd:electronicMailAddress>
3683
                              <gco:CharacterString>webServices@azgs.az.gov</gco:CharacterString>
3684
                            </gmd:electronicMailAddress>
3685
                          </gmd:CI_Address>
3686
                        </amd:address>
3687
                       </gmd:CI_Contact>
3688
                     </gmd:contactInfo>
3689
                     <!-- (M-M) ISO 19139 Mandatory: contact role - Guidance on use of role codes would
3690
        be helpful for consistency, but has not been developed as yet. -->
3691
3692
                      <!-- CI_RoleCode names: {resourceProvider, custodian, owner, user, distributor,
3693
        originator, pointOfContact, principalInvestigator, processor, publisher, author} - NAP expands
3694
        with {collaborator, editor, mediator, rightsHolder}. -->
3695
                      <!-- NAP example -->
3696
                       <!--
3697
                      <qmd:CI RoleCode
3698
                        codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_90"
3699
                        codeListValue="RI_408">resourceProvider/gmd:CI_RoleCode>
3700
3701
                      <!-- ISO example -->
3702
                      <gmd:CI_RoleCode</pre>
3703
3704
         codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3705
3706
        Codelist/gmxCodelists.xml#CI_RoleCode"
                        codeListValue="resourceProvider">resource provider</gmd:CI_RoleCode>
3707
                     </gmd:role>
3708
                   </gmd:CI_ResponsibleParty>
3709
                 </gmd:citedResponsibleParty>
3710
                 <!-- (O-O) Resource Presentation Form - The form in which the service is available,
3711
        which in the case of a service is only through the service implementation described by the
3712
        metadata record, so the information here is not generally very useful. Note that the citation is
3713
        to the original source of intellectual content in the described resource should be in
3714
        MD_DataIdentification/citation/CI_Citation that describes the datasets operated on by the
3715
        service. -->
3716
                 < 1 _ _
3717
                 <gmd:presentationForm gco:nilReason="not applicable"/>
3718
                 -->
3719
                 <!-- (0-0) Resource series - Information about the series or collection of which the
3720
        cited service is a part. NAP rule: (name + issueIdentification) > 0. At this point there is not
3721
        much precedent for aggregating services into a formal series, so in general this element is
3722
        probably not applicable to services. -->
```

```
3723
                  <!--
3724
                  <gmd:series/>
3725
3726
3727
                  -->
                  <!-- (0-0) Resource other citation details -->
                  <!--
3728
3729
                  <gmd:otherCitationDetails/>
3730
                  <!-- (O-C) Resource collective title - At this point there is not much precedent for
3731
        aggregating services into a collections, so in general this element is probably not applicable to
3732
3733
        services. -->
3734
                  <gmd:collectiveTitle/>
3735
3736
                  -->
                </gmd:CI_Citation>
3737
3738
3739
3740
              </gmd:citation>
              <!-- (M-M) Resource Abstract - A free text summary of the content, significance, purpose,
        scope, etc. of the resource. Exactly one value. \operatorname{---}
3741
                <gco:CharacterString>A collection of Web Map Service (WMS) layers created and maintained
3742
        by the Arizona Geological Survey.</gco:CharacterString>
3743
              </gmd:abstract>
3744
              <!-- (0-0) Resource purpose - Summary of the intentions for which the service was
3745
        developed, including objectives for creating the service and use cases it is designed to support.
3746
3747
3748
                <qco:CharacterString>To provide geologic data for the state of Arizona at 1:1,000,000
3749
        scale online and free-of-charge.
3750
3751
3752
              </gmd:purpose>
              <!-- (M-M) Resource Status - -->
              <gmd:status>
3753
3754
                <!-- MD_ProgressCode names: {completed, historicalArchive, obsolete, onGoing, planned,
        required, underDevelopment } - NAP expands with {proposed}. Obsolete is synonymous with
3755
        deprecated. -->
3756
                <!-- NAP Example -->
3757
                <!--
3758
                <gmd:MD_ProgressCode</pre>
3759
                 codeList="http://www.fqdc.gov/nap/metadata/register/codelists.html#IC_106"
3760
3761
                  codeListValue="RI_593">completed</gmd:MD_ProgressCode>
3762
                <!-- ISO Example -->
3763
                <gmd:MD_ProgressCode</pre>
3764
3765
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3766
        Codelist/gmxCodelists.xml#MD_ProgressCode"
3767
                  codeListValue="completed">completed</gmd:MD_ProgressCode>
3768
              </amd:status>
3769
              <!-- (O-C) Resource service point of contact (access contact) - CI_ResponsibleParty element
3770
        here would contain information for point of contact to access the resource. This information is
3771
        mandatory for physical resources such as core, cuttings, samples, manuscripts. -->
3772
              <qmd:pointOfContact>
3773
                <!-- CI Responsible party has an id in order to allow reuse of this element later in the
3774
3775
        document by an internal href; see distributionInfo/../distributor near end of document -->
                <gmd:CI_ResponsibleParty>
3776
                  <!-- (M-M) (individualName + organisationName + positionName) > 0 -->
3777
                  <gmd:individualName>
3778
                    <gco:CharacterString>Ryan Clark</gco:CharacterString>
3779
                  </gmd:individualName>
3780
                  <gmd:organisationName>
3781
                    <gco:CharacterString>Arizona Geological Survey/gco:CharacterString>
3782
                  </gmd:organisationName>
3783
                  <gmd:positionName>
3784
                    <gco:CharacterString>GIS Manager
3785
                  </gmd:positionName>
3786
                  <!-- (O-C) Contact Information - If a resource point of contact is required then (phone
3787
        + deliveryPoint + electronicMailAddress) > 0. Best practice is to include at least an email
3788
        address. -->
3789
                  <gmd:contactInfo>
3790
                    <qmd:CI Contact>
3791
                      <gmd:phone>
3792
                       <qmd:CI Telephone>
3793
                          <qmd:voice>
3794
                           <gco:CharacterString>520-770-3500
```

```
3795
                         </amd:voice>
3796
                         <gmd:facsimile>
3797
                           <gco:CharacterString>520-770-3505
3798
                         </gmd:facsimile>
                       </gmd:CI_Telephone>
3799
3800
                     </gmd:phone>
3801
                     <gmd:address>
3802
                       <qmd:CI Address>
3803
3804
                           <gco:CharacterString>416 W. Congress St. Suite 100characterString>
3805
                         </gmd:deliveryPoint>
3806
                         <gmd:city>
3807
                          <gco:CharacterString>Tucson
3808
                         </gmd:city>
3809
                         <gmd:administrativeArea>
3810
                          <gco:CharacterString>Arizona</gco:CharacterString>
3811
                         </gmd:administrativeArea>
3812
                         <gmd:postalCode>
3813
                          <gco:CharacterString>85701</gco:CharacterString>
3814
                         </gmd:postalCode>
3815
                         <gmd:country>
3816
                          <gco:CharacterString>USA
3817
                         </gmd:country>
3818
                         <gmd:electronicMailAddress>
3819
                           <gco:CharacterString>ryan.clark@azgs.az.gov</gco:CharacterString>
3820
                         </gmd:electronicMailAddress>
3821
3822
                       </gmd:CI_Address>
                     </gmd:address>
3823
                     <!--(0-0) "Information about Internet hosted resources: availability; URL; protocol
3824
3825
        used; resource name; resource description, and resource function." NAP -->
                     <qmd:onlineResource>
3826
                       <gmd:CI_OnlineResource>
3827
                        <gmd:linkage>
3828
                           <gmd:URL>http://75.101.143.247:8080/gsvr/wms</gmd:URL>
3829
                         </gmd:linkage>
3830
                         <qmd:protocol>
3831
                          <gco:CharacterString>http</gco:CharacterString>
3832
                         </gmd:protocol>
3833
                       </gmd:CI_OnlineResource>
3834
                     </gmd:onlineResource>
3835
3836
                   </gmd:CI_Contact>
                 </gmd:contactInfo>
3837
                 <!-- (M-M) ISO 19139 Mandatory: contact role - Guidance on use of role codes would be
3838
        helpful for consistency, but has not been developed as yet. -->
3839
                 <qmd:role>
3840
                   <!-- CI_RoleCode names: {resourceProvider, custodian, owner, user, distributor,
3841
        originator, pointOfContact, principalInvestigator, processor, publisher, author} - NAP expands
3842
        with {collaborator, editor, mediator, rightsHolder}. -->
3843
                   <!-- NAP example -->
3844
                   <!--
3845
                   <qmd:CI RoleCode
3846
                     codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_90"
3847
                     codeListValue="RI_414">pointOfContact</gmd:CI_RoleCode>
3848
3849
                   <!-- ISO example -->
3850
                   <qmd:CI RoleCode
3851
3852
         codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3853
        Codelist/gmxCodelists.xml#CI_RoleCode"
3854
                     codeListValue="pointOfContact">point of contact/gmd:CI_RoleCode>
3855
                 </amd:role>
3856
               </gmd:CI_ResponsibleParty>
3857
             </gmd:pointOfContact>
3858
              <!-- (0-0) Resource Maintenance - This element provides information about the maintenance
3859
        schedule or history of the service described by the metadata record. For a service, only one
3860
        MD_MaintenanceInformation elements may be included; for which the MD_ScopeDescription
3861
        napMD_ScopeCode will be `service'. If MD_MaintenanceInformation is present, then
3862
        maintenanceAndUpdateFrequency is mandatory.
3863
             <qmd:resourceMaintenance>
3864
               <qmd:MD MaintenanceInformation>
3865
                 <gmd:maintenanceAndUpdateFrequency>
```

```
3866
                   <!-- MD_MaintenanceFrequencyCode names: {continual, daily, weekly, fortnightly,
3867
        monthly, quarterly, biannually, annually, asNeeded, irregular, not-Planned, unknown} - NAP
3868
        expands with {semimonthly}. -->
3869
                   <!-- NAP Example -->
                   <!--
3870
3871
3872
                   <gmd:MD_MaintenanceFrequencyCode</pre>
                     codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_102"
3873
                     codeListValue="RI_540">asNeeded</gmd:MD_MaintenanceFrequencyCode>
3874
3875
                   <!-- ISO Example -->
3876
                   <gmd:MD_MaintenanceFrequencyCode</pre>
3877
3878
3879
         codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
        Codelist/gmxCodelists.xml#MD_MaintenanceFrequencyCode"
3880
                     codeListValue="asNeeded">as needed//gmd:MD_MaintenanceFrequencyCode>
3881
                  </gmd:maintenanceAndUpdateFrequency>
3882
                </gmd:MD_MaintenanceInformation>
3883
              </gmd:resourceMaintenance>
3884
              <!-- (0-0) Graphic overview of resource - Highly recommended to include a small image
3885
        visual representation of the resource provided by a map or image service. For geographic feature
3886
        or data services, a graphic overview might show the geographic distribution of available data.
3887
        If MD_BrowseGraphic is included, MD_BrowseGraphic/filename character string is mandatory. USGIN
3888
        Recommended practice is to provide a complete URL as a qco:characterString value for the filename
3889
        property. -->
3890
             <!--
3891
              <qmd:qraphicOverview/>
3892
3893
              <!-- (O-X) Resource Format - This element is not used by USGIN; this information is encoded
3894
        in MD_Metadata/distributionInfo/MD_Distribution/ in USGIN metadata. -->
3895
             <!--
3896
              <qmd:resourceFormat>
3897
3898
             <!-- (O-O) Resource keywords - Best Practice for USGIN profile metadata is to supply
3899
        keywords to facilitate the discovery of metadata records relevant to the user. USGIN requires
3900
        that MD_Keyword/keyword contain a CharacterString. USGIN best practice is to include keywords in
3901
        English -->
3902
             <!-- Theme keywords -->
3903
              <gmd:descriptiveKeywords>
3904
                <gmd:MD_Keywords>
3905
                 <qmd:keyword>
3906
                   <gco:CharacterString>WMS</gco:CharacterString>
3907
                 </amd:kevword>
3908
                  <gmd:keyword>
3909
                   <gco:CharacterString>GEOSERVER</gco:CharacterString>
3910
                  </gmd:keyword>
3911
                  <gmd:keyword>
3912
                   <gco:CharacterString>AZGS/gco:CharacterString>
3913
                  </gmd:keyword>
3914
                  <qmd:kevword>
3915
                   <gco:CharacterString>GEOLOGY
3916
                  </amd:kevword>
3917
                 <!-- Keyword Type - allowed values from MD_KeywordTypeCode names: {discipline, place,
3918
        stratum, temporal, theme} - NAP expands with {product, subTopicCategory}. -
3919
                 <qmd:type>
3920
                   <!-- NAP Example -->
3921
                   <!--
3922
                   <gmd:MD_KeywordTypeCode
3923
                     codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_101"
3924
                     codeListValue="RI_528">theme</gmd:MD_KeywordTypeCode>
3925
3926
                   <!-- ISO Example -->
3927
                   <gmd:MD_KeywordTypeCode</pre>
3928
3929
         codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3930
        Codelist/gmxCodelists.xml#MD_KeywordTypeCode"
3931
                     codeListValue="theme">theme/gmd:MD_KeywordTypeCode>
3932
                  </gmd:type>
3933
                </gmd:MD_Keywords>
3934
              </gmd:descriptiveKeywords>
3935
              <!-- Temporal keywords -->
3936
3937
              <gmd:descriptiveKeywords/>
```

```
3938
3939
              <!-- Place keywords -->
3940
              <gmd:descriptiveKeywords>
3941
                <gmd:MD_Keywords>
3942
                  <amd:kevword>
3943
                    <gco:CharacterString>ARIZONA</gco:CharacterString>
3944
                  </gmd:keyword>
3945
                  <!-- Keyword Type - allowed values from MD_KeywordTypeCode names: {discipline, place,
3946
        stratum, temporal, theme} - NAP expands with {product, subTopicCategory}. -->
3947
                  <amd:type>
3948
                   <!-- NAP Example -->
3949
                   <!--
3950
                   <gmd:MD_KeywordTypeCode</pre>
3951
                     codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_101"
3952
                     codeListValue="RI_525">place</gmd:MD_KeywordTypeCode>
3953
3954
                   <!-- ISO Example -->
3955
                    <gmd:MD_KeywordTypeCode</pre>
3956
3957
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3958
        Codelist/gmxCodelists.xml#MD_KeywordTypeCode"
3959
                     codeListValue="place">place/gmd:MD_KeywordTypeCode>
3960
                  </gmd:type>
3961
                </gmd:MD_Keywords>
3962
              </gmd:descriptiveKeywords>
3963
              <!-- (O-X) Resource specific usage - NAP excludes this property in INCITS 453, figure 64
3964
        p.175, but it is schema valid under
3965
        http://schemas.opengis.net/iso/19139/20060504/serviceMetadata.xsd, which is the service metadata
3966
        schema imported by apiso.xsd for the OGC CSW profile for ISO19115/19 metadata. Property not USED
3967
        by USGIN. -->
3968
              <!--
3969
              <gmd:resourceSpecificUsage/>
3970
              -->
3971
              <!-- (0-0) Condition applying to access and use of resource - Restrictions on the access
3972
        and use of a service. Follow NAP for specification of resourceConstraints. This attribute
3973
        provides information for access control to the described service. In some situations, the
3974
        metadataConstraints may allow a user to learn of the existence of a resource that they may not
3975
        actually be able to access without further clearance. Follow NAP for specification of
3976
        resourceConstraints. -->
3977
              <qmd:resourceConstraints>
3978
                <gmd:MD_LegalConstraints>
3979
                  <qmd:useLimitation>
3980
                    <gco:CharacterString>Read only</gco:CharacterString>
3981
                  </gmd:useLimitation>
3982
                  <qmd:accessConstraints>
3983
3984
                   <!-- MD_RestrictionCode names: {copyright, patent, patentPending, trademark, license,
3985
        intellectualPropertyRights, restricted, otherRestrictions} - NAP expands with
3986
        {licenseUnrestricted, licenseEndUser, licenseDistributor, privacy, statutory, confidential,
3987
        sensitivity}. -->
3988
                   <!-- NAP Example -->
3989
                   <!--
3990
                    <gmd:MD_RestrictionCode</pre>
3991
                     codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_107"
3992
                     codeListValue="RI_602">copyright</gmd:MD_RestrictionCode>
3993
3994
                    <!-- ISO Example -->
3995
                    <gmd:MD_RestrictionCode</pre>
3996
3997
          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3998
        Codelist/gmxCodelists.xml#MD_RestrictionCode"
3999
                     codeListValue="copyright">copyright</gmd:MD_RestrictionCode>
4000
                  </gmd:accessConstraints>
4001
                  <gmd:otherConstraints>
4002
                    <gco:CharacterString>NONE</gco:CharacterString>
4003
                  </gmd:otherConstraints>
4004
                </gmd:MD_LegalConstraints>
4005
              </gmd:resourceConstraints>
4006
              <!-- (O-X) Aggregation information - The citation for the aggregate service or the name of
4007
        the aggregate service, the type of aggregate service, and optionally the activity which produced
4008
        the service. The citation for or name of an aggregate dataset, the type of aggregate dataset, and
4009
        optionally the activity which produced the dataset. For USGIN profile, this property, rather than
```

```
4010
        MD_Metadata/parentIdentifier, should be used to indicate relationships between described
4011
        resources. -->
4012
             <!--
4013
              <gmd:aggregationInfo/>
4014
              -->
4015
              <!-- (M-M) Service type - Choose a service type name from a registry of services. USGIN
4016
        mandates use of a LocalName value from the service type listing in the ServiceType section of the
4017
        USGIN ISO19139 profile document, with the codespace http://resources.usgin.org/registry/
4018
        serviceType201001 -->
4019
              <srv:serviceType>
4020
               <!-- Valid values for OGC services would be then {<WMS, WFS, WVS, CSW, ...} -->
4021
4022
                <qco:LocalName
        codeSpace="http://resources.usgin.org/registry/serviceType201001">WMS</qco:LocalName>
4023
4024
              </srv:serviceTvpe>
4025
              <!-- (O-C) Resource service type version - Multiple serviceTypeVersion tags may not be
4026
4027
        implemented in applications - USGIN recommends a reverse chronological order for supported
        versions. Constraint: if various versions are available, mandatory to list versions that are
4028
4029
        supported. Default is oldest version of service. -->
              <srv:serviceTypeVersion>
4030
               <gco:CharacterString>1.3.0
4031
              </srv:serviceTypeVersion>
4032
              <srv:serviceTypeVersion>
4033
               <gco:CharacterString>1.1.3
4034
              </srv:serviceTypeVersion>
4035
              <srv:serviceTypeVersion>
4036
               <gco:CharacterString>1.1.1</gco:CharacterString>
4037
              </srv:serviceTypeVersion>
4038
              <!-- (0-0) Resource service access properties - Information on the availability of the
4039
        service which includes attributes from Standard Order Process. Applicable sub elements for
4040
        service are: fees, and available date and time. -->
4041
             <!--
4042
              <srv:accessProperties/>
4043
4044
             <!-- (O-X) Resource service restrictions - Not used by USGIN; use resourceConstraints as
4045
        per NAP. -->
4046
             <!--
4047
              <srv:restrictions/>
4048
              -->
4049
             <!-- (O-X) Keywords - Not used by USGIN; use descriptiveKeywords as per NAP -->
4050
             <1--
4051
              <srv:keywords/>
4052
4053
4054
             <!-- (C-C) Service Extent - Defines the spatial (horizontal and vertical) and temporal
4055
        region to which the content of the resource applies. For USGIN, the spatial extent is a rectangle
4056
        that bounds the geographic extent to which resource content applies. Best Practice for USGIN is
4057
        to include an extent for any resource with content related to some geographic or temporal
4058
        location. For geoscience resources, the temporal extent may be expressed using time ordinal eras
4059
        from a geologic time scale if the resource is related to some particular geologic time. USGIN
4060
        specifies count(description + geographicElement + temporalElement) >0 -->
4061
4062
               <gmd:EX_Extent>
4063
                 <!-- (C-C) Resource Content extent description - Free text that describes the spatial
4064
        and temporal extent of the dataset. USGIN specifies that description is mandatory if a
4065
        geographicElement or temporalElement is not provided. Note that if geographic place names are
4066
        used to express the geographic extent, USGIN profile specifies that these should be encoded using
4067
        keyword with keyword type code = 'place.' Geographic names may be duplicated in the
4068
        EX_Extent/description. -->
4069
                 <!--
4070
                 <gmd:description/>
4071
                 -->
4072
                 <!-- (O-C) Resource content extent bounding box -USGIN profile requires that if an
4073
        EX_Extent/geographicElement is supplied, it include a geographic bounding box with bounding
4074
4075
        latitude and longitude expressed using WGS 84 decimal degrees.
        The corner coordinates for the geographic bounding box must not coincide in one point, because
4076
        this may result in fatal errors with some CSW implementations. Point locations must thus be
4077
        represented as tiny rectangles. USGIN recommended practice is to place the actual point location
4078
        in the lower left corner of the rectangle. -->
4079
                 <gmd:geographicElement>
4080
                   <gmd:EX_GeographicBoundingBox>
4081
                     <gmd:westBoundLongitude>
```

```
4082
                        <gco:Decimal>-114.815</gco:Decimal>
4083
                      </gmd:westBoundLongitude>
4084
                      <qmd:eastBoundLongitude>
4085
                        <gco:Decimal>-108.984</gco:Decimal>
4086
                      </gmd:eastBoundLongitude>
4087
                      <gmd:southBoundLatitude>
4088
                        <gco:Decimal>31.25</gco:Decimal>
4089
                      </gmd:southBoundLatitude>
4090
                      <gmd:northBoundLatitude>
4091
                        <gco:Decimal>37.004</gco:Decimal>
4092
                      </gmd:northBoundLatitude>
4093
                    </gmd:EX_GeographicBoundingBox>
4094
                  </gmd:geographicElement>
4095
                  <!-- (C-X) Resource content extent geographic description - Not used by USGIN profile,
4096
        use keyword with type code = 'place' (with thesaurus if necessary). -->
4097
                  <!--
4098
                  <gmd:geographicElement>
4099
                    <gmd:EX_GeographicDescription/>
4100
                  </gmd:geographicElement>
4101
4102
                  <!-- (C-X) Resource content extent bounding polygon - To improve interoperability, USGIN
4103
        mandates use of Geographic Bounding Box; bounding polygons may be present, but may be ignored by
4104
        harvesters. -->
4105
                  <!--
4106
                  <gmd:geographicElement>
4107
                   <qmd:EX BoundingPolygon/>
4108
                  </gmd:geographicElement>
4109
4110
                  <!-- (0-0) Resource temporal extent -->
4111
                  <!--
4112
                  <qmd:extent>
4113
                    <gmd:EX_Extent>
4114
                      <gmd:temporalElement>
4115
                        <gmd:EX_TemporalExtent>
4116
                          <qmd:extent>
4117
                           --><!-- Default ISO time frame example --><!--
4118
                           <gml:TimePeriod gml:id="IdModern">
4119
                             <gml:name>Y2KX</pml:name>
4120
                              -><!-- USGIN requires the beginPosition and endPosition's frame property to
4121
        be defined. The default value is #ISO-8601. --><!--
4122
4123
                             <gml:beginPosition frame="#ISO-8601">2010-01-00T00:00:00/gml:beginPosition>
                             <gml:endPosition frame="#ISO-8601">2010-12-31T24:00:00</pml:endPosition>
4124
                           </gml:TimePeriod>
4125
                            --><!-- Geologic time frame example --><!--
4126
                           <gml:TimePeriod gml:id="IdJurassic">
4127
                             <gml:name>Jurassic
4128
                              --><!-- USGIN requires the beginPosition and endPosition's frame property to
4129
        be defined. The default value is #ISO-8601. --><!--
4130
                             <qml:beginPosition</pre>
4131
        frame="urn:cgi:trs:CGI:StandardGeologicTimeMa">203/gml:beginPosition>
4132
                             <qml:endPosition frame="urn:cqi:trs:CGI:StandardGeologicTimeMa</pre>
4133
        ">135</gml:endPosition>
4134
                           </gml:TimePeriod>
4135
                         </gmd:extent>
4136
                       </gmd:EX_TemporalExtent>
4137
                      </gmd:temporalElement>
4138
                    </gmd:EX_Extent>
4139
                  </gmd:extent>
4140
                  -->
4141
                  <!-- (O-X) Resource spatio-temporal extent - Not used. Although use of
4142
        EX_SpatialTemporalExtent is allowed by ISO19139 and NAP, USGIN mandates encoding space time
4143
        location with EX_TemporalExtent and EX_GeographicBoundingBox. -->
4144
                  <!--
4145
                  <gmd:extent>
4146
                    <qmd:EX Extent>
4147
                      <gmd:temporalElement>
4148
                       <gmd:EX_SpatialTemporalExtent/>
4149
                      </gmd:temporalElement>
4150
                    </gmd:EX_Extent>
4151
4152
                  </gmd:extent>
4153
                  <!-- (0-0) Resource service vertical extent -->
```

```
4154
                  <!--
4155
                  <gmd:verticalElement>
4156
                   <qmd:EX VerticalExtent>
4157
                      <gmd:minimumValue>
4158
                       <gco:Real>-100</gco:Real>
4159
                      </gmd:minimumValue>
4160
                      <gmd:maximumValue>
4161
                       <qco:Real>200</qco:Real>
4162
                      </gmd:maximumValue>
4163
                      --><!-- Use EPSG register of geodetic parameters such as at http://www.epsg-
4164
        registry.org/. The default VerticalCRS is World mean sea level (MSL): urn:ogc:def:crs:EPSG::5714
4165
        --><!--
4166
                      <gmd:verticalCRS xlink:href="urn:ogc:def:crs:EPSG::5714 "/>
4167
                    </gmd:EX_VerticalExtent>
4168
                  </gmd:verticalElement>
4169
4170
4171
                </srv:extent>
4172
              <!-- (0-0) Coupled Resources - This element correlates operations (identified by
4173
        operationName) with datasets (identified by identifier). For logical consistency
4174
        SV_coupledResource/identifier values should be equal to
4175
        MD_DataIdentification/citation/CI_Citation/identifier/MD_Identifier/code for a dataset that is
4176
        the target of a SV_ServiceIdentification/operatesOn element (either in an inline
4177
4178
        \verb|MD_DataIdentification/citation../code| element, or a @uuidref attribute). This element is
        necessary to implement the many-to-many relationship between data sources and operations in a
4179
        single service. -->
4180
              <!-- NOTE: This is an example for TIGHTLY coupled resources with EXPLICIT links. This means
4181
        that the example resource service's WMS layers are described in existing and separate metadata
4182
        records. -->
4183
              <srv:coupledResource>
4184
                <srv:SV CoupledResource>
4185
                 <!-- (M-M) Coupled resource operation name - Name of the service operation: GetMap,
4186
        GetFeature, etc. -->
4187
                  <srv:operationName>
4188
                   <gco:CharacterString>GetMap</gco:CharacterString>
4189
                  </srv:operationName>
4190
                  <!-- (M-M) Coupled Resource identifier - Identifier of a given tightly coupled dataset.
4191
        Equal to MD_DataIdentification/citation/CI_Citation/identifier/MD_Identifier/code for a dataset
4192
        that is the target of a SV_ServiceIdentification/operatesOn element (either in an inline
4193
        MD_DataIdentification/citation../code element, or a @uuidref attribute).
4194
4195
                  <srv:identifier>
                    <qco:CharacterString>8215ed91-6c92-4ae9-b094-8b58ddd5e7e0/qco:CharacterString>
4196
                  </srv:identifier>
4197
                  <!-- (X-O) Coupled Resource scoped name - OGC 07-045 application profile for ISO
4198
        metadata using CSW 2.0.2 extends SV_CoupledResource with a ScopedName, defined as a scoped
4199
        identifier of the resource in the context of the given service instance (e.g. layer name or
4200
        featureTypeName). This is necessary for users to generate service requests (like GetMap or
4201
        GetFeature) based on ISO service metadata. Note that if multiple WMS layers are related to a
4202
        single dataset, separate coupledResource elements are required for each layer because the
4203
4204
        cardinality of ScopedName here is 0 or 1.-->
                  <gco:ScopedName>azgs:trace_nonmetals_earthchem
4205
4206
4207
                </srv:SV_CoupledResource>
              </srv:coupledResource>
              <srv:coupledResource>
4208
                <srv:SV_CoupledResource>
4209
                  <srv:operationName>
4210
                    <gco:CharacterString>GetMap</gco:CharacterString>
4211
                  </srv:operationName>
4212
4213
                  <srv:identifier>
                    <gco:CharacterString>55932c11-67d6-4414-8a5f-a45f7dc3ecf6// gco:CharacterString>
4214
                  </sry:identifier>
4215
                  <gco:ScopedName>azgs:trace_metals_earthchem</gco:ScopedName>
4216
4217
4218
                </srv:SV_CoupledResource>
              </srv:coupledResource>
              <srv:coupledResource>
4219
4220
4221
                <srv:SV_CoupledResource>
                  <srv:operationName>
                   <gco:CharacterString>GetMap</gco:CharacterString>
4222
                  </srv:operationName>
4223
4224
                  <srv:identifier>
                    <gco:CharacterString>8504f947-39d6-4c1f-a4fa-672534f94856// CharacterString>
4225
                  </srv:identifier>
```

```
4226
4227
                   <gco:ScopedName>azgs:trace_alk_alkearth_earthchem</gco:ScopedName>
                 </srv:SV_CoupledResource>
4228
4229
4230
4231
4232
4233
              </srv:coupledResource>
              <srv:coupledResource>
                <srv:SV CoupledResource>
                  <srv:operationName>
                    <gco:CharacterString>GetMap</gco:CharacterString>
                  </srv:operationName>
4234
4235
4236
4237
                  <srv:identifier>
                    <qco:CharacterString>4dbd380c-7ba4-49d6-b34c-7f9415dde6f0
                   </srv:identifier>
                  <gco:ScopedName>azgs:ree_earthchem</gco:ScopedName>
4238
4239
                </srv:SV_CoupledResource>
              </srv:coupledResource>
4240
              <srv:coupledResource>
4241
                <srv:SV_CoupledResource>
4242
                  <srv:operationName>
4243
4244
                    <gco:CharacterString>GetMap</gco:CharacterString>
                  </srv:operationName>
4245
4246
                  <srv:identifier>
                    <gco:CharacterString>a3120268-1fb4-496a-84cc-c3a02dd0be16// gco:CharacterString>
4247
                  </srv:identifier>
4248
                  <gco:ScopedName>ncgmp:mapunitpolys</gco:ScopedName>
4249
                </srv:SV_CoupledResource>
4250
              </srv:coupledResource>
4251
4252
4253
4254
              <srv:coupledResource>
                <srv:SV_CoupledResource>
                  <srv:operationName>
                    <gco:CharacterString>GetMap</gco:CharacterString>
4255
4256
4257
                  </srv:operationName>
                  <srv:identifier>
                    <gco:CharacterString>39d94525-b1d6-494f-a739-357088e5a2e9/gco:CharacterString>
4258
4259
                  </sry:identifier>
                  <gco:ScopedName>azgs:earthfissures</gco:ScopedName>
4260
                </srv:SV_CoupledResource>
4261
              </srv:coupledResource>
4262
              <srv:coupledResource>
4263
4264
                <srv:SV_CoupledResource>
                  <srv:operationName>
4265
                    <gco:CharacterString>GetMap</gco:CharacterString>
4266
4267
4268
                  </srv:operationName>
                  <srv:identifier>
                    <gco:CharacterString>13cele84-c887-4fd8-b888-8d021b1fa4c2// gco:CharacterString>
4269
4270
4271
                  </srv:identifier>
                  <gco:ScopedName>azgs:azgeochron</gco:ScopedName>
                 </srv:SV_CoupledResource>
4272
              </srv:coupledResource>
4273
              <!-- (M-M) Service coupling type - Type of coupling between service and associated data (if
4274
         exists) - "Qualitative information on the tightness with which the service and the associated
4275
        data are coupled." NAP. -->
4276
4277
4278
4279
              <!-- According to ISO: -->
              <!-- 1) loose - service instance is loosely coupled with a data instance, i.e. no
        MD_DataIdentification class has to be described (ISO 19119). -->
              <!-- 2) mixed - service instance is mixed coupled with a data instance, i.e.
4280
        MD_DataIdentification describes the associated data instance and additionally the service
4281
        instance might work with other external data instances (ISO 19119 / ISO 19115). -->
4282
              <!-- 3) tight - service instance is tightly coupled with a data instance, i.e.
4283
        MD_DataIdentification class MUST be described. (ISO 19119 / ISO 19115) -->
4284
4285
              <!-- According to OGC: -->
              <!-- 1) loose - A service instance that is not associated with a specific dataset or
4286
        dataset collection. Loosely coupled services may have an association with data types through the
4287
        service type definition. Dataset metadata need not be provided in the service metadata. -->
4288
              <!-- 2) mixed - A service that is associated with a specific dataset or dataset collection.
4289
4290
         Service metadata shall describe both the service and the geographic dataset, the latter being
        defined in accordance with ISO 19115. But this service instance can also be used with external
4291
4292
4293
        data (i.e. data that is not described by the operatesOn association). -->
              <!-- 3) tight - An information resource that is hosted on a specific set of hardware and
        accessible over a network. -->
4294
              <srv:couplingType>
4295
                <!-- SV_CouplingType names: {loose, mixed, tight} -->
4296
                <!-- NAP Example -->
4297
                <!--
```

```
4298
4299
                        <srv:SV_CouplingType</pre>
                           codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_114"
4300
                           codeListValue="RI 685">tight</srv:SV CouplingType>
4301
4302
                        <!-- ISO Example -->
4303
                        <srv:SV_CouplingType</pre>
4304
4305
               codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
4306
             Codelist/gmxCodelists.xml#SV_CouplingType"
4307
                           codeListValue="tight">tight</srv:SV CouplingType>
4308
                      </srv:couplingType>
4309
                     <!--***-->
4310
                     <!-- (M-M) Service operation - "Operations performed by the service" NAP. Each
4311
             SV_OperationMetadata element describes the signature of one and only one method provided by the
4312
             service. -->
4313
                     <!-- See WMS GetCapabilities for operation metadata -->
4314
                     <srv:containsOperations gco:nilReason="missing"/>
4315
                     <!-- (O-C) Service operates on - "Provides information on the datasets that the service
4316
             operates on" ISO 19119. With tightly coupled references, operatesOn must include a map or
4317
             feature layer's valid MD_DataIdentification element inline or a @uuidref attribute value that
4318
             explicitly links to an existing dataset metadata record that describes the same layer. Mandatory
4319
             if linkage to datasets on which the service operates are available. The value of
4320
             SV_ServiceIdentification/operatesOn@uuidref or
4321
4322
             {\tt SV\_ServiceIdentification/operatesOn/MD\_DataIdentification/citation/cI\_Citation/identifier/MD\_Identification/citation/identifier/MD\_Identification/citation/identifier/MD\_Identification/citation/identifier/MD\_Identification/identifier/MD\_Identifier/MD\_Identification/identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/MD\_Identifier/M
             tifier/code must correspond to one of the coupledResource/MD_CoupledResource/identifier values.
4323
             If the metadata record for the coupled dataset is a separate gmd:MD_Metadata record, the service
4323
4324
4325
4326
4327
4328
4329
             described in the service metadata record should be identified as a distribution for the dataset.
                     <!-- NOTE: In this explicitly linked reference example, the unidref property must point to
             an existing (already loaded) CSW metadata record! -->
                     <srv:operatesOn</pre>
                        uuidref="13cele84-c887-4fd8-b888-8d021b1fa4c2"
4330
                        xlink:href="http://resources.azgs.org/geonetwork/srv/en/metadata.show?id=8717"
4331
                        xlink:title="azgs:azgeochron"/>
4332
                     <srv:operatesOn</pre>
4333
                        uuidref="39d94525-b1d6-494f-a739-357088e5a2e9"
4334
                        xlink:href="http://resources.azgs.org/geonetwork/srv/en/metadata.show?id=8718"
4335
                        xlink:title="azgs:earthfissures"/>
4336
                     <srv:operatesOn</pre>
4337
                        uuidref="a3120268-1fb4-496a-84cc-c3a02dd0be16"
4338
                        xlink:href="http://resources.azgs.org/geonetwork/srv/en/metadata.show?id=8719"
4339
                        xlink:title="ncgmp:mapunitpolys"/>
4340
                     <srv:operatesOn</pre>
4341
                        uuidref="4dbd380c-7ba4-49d6-b34c-7f9415dde6f0"
4342
                        xlink:href="http://resources.azgs.org/geonetwork/srv/en/metadata.show?id=8720"
4343
                        xlink:title="azgs:ree_earthchem"/>
4344
                     <srv:operatesOn</pre>
4345
                        uuidref="8504f947-39d6-4c1f-a4fa-672534f94856"
4346
                        xlink:href="http://resources.azgs.org/geonetwork/srv/en/metadata.show?id=8721"
4347
                        xlink:title="azgs:trace_alk_alkearth_earthchem"/>
4348
                     <srv:operatesOn</pre>
4349
                        uuidref="55932c11-67d6-4414-8a5f-a45f7dc3ecf6"
4350
                        xlink:href="http://resources.azgs.org/geonetwork/srv/en/metadata.show?id=8722"
4351
                        xlink:title="azgs:trace_metals_earthchem"/>
4352
4353
                        uuidref="8215ed91-6c92-4ae9-b094-8b58ddd5e7e0"
4354
                        xlink:href="http://resources.azgs.org/geonetwork/srv/en/metadata.show?id=8723"
4355
                        xlink:title="azgs:trace_nonmetals_earthchem"/>
4356
                   </srv:SV ServiceIdentification>
4357
               </gmd:identificationInfo>
4358
4359
               <!-- (0-0) Content information - Characteristics describing the feature cataloguecatalog,
4360
             coverage, or image data. USGIN currently makes no recommendation for use of contentInfo; follow
4361
             NAP recommendations (see INCITS 453). -->
4362
                  <!--
4363
                   <gmd:contentInfo gco:nilReason="missing"/>
4364
                   -->
4365
               <!-- (0-0) Resource distribution information - This element provides information to inform
4366
             users how to obtain or access the described resource. For service metadata, the only
4367
             distribution is the interface offered by the described service. The distributionFormat is nil
4368
             because the format depends on the operation and request. TransferOptions is used to provide the
4369
            URL's for accessing the service and a serviceDescription resource (WSDL, getCapabilities, web
```

```
4370
        page..). Distributor is used to identify the agent that is responsible for hosting the service. -
4371
4372
          <gmd:distributionInfo>
4373
4374
4375
            <gmd:MD_Distribution>
              <!-- (0-0) Resource distribution format - Information on the format or physical
        manifestation of the resource. If the resource is a physical resource, like a book, rock sample,
4376
4377
        paper document, the distributionFormat/MD_Format/name is mandatory, and must be from the USGIN
        distribution format codelist. In the case of a service, the format information is operation and
4378
4379
        request dependent. -->
              <!--
4380
              <gmd:distributionFormat gco:nilReason="missing"/>
4381
              -->
4382
              <!-- (O-C) Resource distributor information - For a service, the distributor element
4383
        identifies the agent that is responsible for hosting the service, probably the same as the
4384
        CI_ResponsibleParty for the service identification citation. -->
4385
              <!-- in this example, the distributor is the same as the metadata point of contact, so the
4386
        CI_Responsible party is included by reference to the element earlier in the document -->
4387
              <qmd:distributor>
4388
                <gmd:MD_Distributor>
4389
                  <gmd:distributorContact xlink:href="#R264537"/>
4390
                </gmd:MD_Distributor>
4391
              </gmd:distributor>
4392
              <!-- (C-C) Resource distribution transfer options - MD_DigitalTransferOptions provides
4393
        information on digital distribution of resource. See USGIN Profile 'Use of MD_Distribution and
4394
        MD_Distributor' for instructions on use of this element. Details on encoding for
4395
        MD_DigitalTransferOptions are above in the distributorTransferOptions elements description. -->
4396
              <qmd:transferOptions>
4397
                <gmd:MD_DigitalTransferOptions>
4398
                 <!-- Two online elements are included, one for the serviceDescription and one for the
4399
        baseURL, which in this case is the full URL for the OGC getCapabilities document -->
4400
                  <qmd:onLine>
4401
                   <gmd:CI_OnlineResource>
4402
                     <!-- (M-M) Resource distributor on-line distribution linkage - Digital transfer
4403
        options are "technical means and media by which a dataset is obtained from the distributor." NAP
4404
        requires CI_OnlineResource/linkage and CI_OnlineResource/protocol in CI_OnlineResource. -->
4405
                     <gmd:linkage>
4406
                       <!-- This linkage element contains the complete URL to access the getCapabilities
4407
        document directly. If the service is described by a WSDL document, this would be a URL for the
4408
        WSDL description of service operation. CI_Online-Resource requires a Linkage element that is a
4409
        gmd:URL. -->
4410
                        <qmd:URL>http://75.101.143.247:8080/gsvr/wms?SERVICE=WMS&amp;
4411
        http://75.101.143.247:8080/gsvr/wms?SERVICE=WMS&</qmd:URL>
4412
                     </gmd:linkage>
4413
                     <!-- The protocol element defines a valid internet protocol used to access the
4414
        resource. NAP recommended best practice is that the protocol should be taken from an official
4415
        controlled list such as the Official Internet Protocol Standards published on the Web at
4416
        http://www.rfc-editor.org/rfcxx00.html or the Internet Assigned Numbers Authority (IANA) at
4417
        http://www.iana.org/numbers.html. 'ftp' or 'http' are common values. -->
4418
                     <gmd:protocol>
4419
                       <gco:CharacterString>http</gco:CharacterString>
4420
                     </gmd:protocol>
4421
4422
                     <!-- Linkage names for service URL's are from "Linkage name conventions" section in
        the USGIN ISO19139 profile document. -->
4423
                     <gmd:name>
4424
                       <gco:CharacterString>serviceDescription</gco:CharacterString>
4425
                     </gmd:name>
4426
                     <!-- Service Description -->
4427
4428
                     <gmd:description>
                       <gco:CharacterString>Full URL to request the OGC getCapabilities document. This is
4429
        the mechanism used to acquire detailed operation description for USGIN
4430
        metadata.</gco:CharacterString>
4431
                     </gmd:description>
4432
                    </gmd:CI_OnlineResource>
4433
                  </gmd:onLine>
4434
4435
                  <qmd:onLine>
                    <gmd:CI_OnlineResource>
4436
                     <!-- (M-M) Resource distributor on-line distribution linkage - Digital transfer
4437
        options are ""technical means and media by which a dataset is obtained from the distributor.""
4438
        NAP requires CI_OnlineResource/linkage and CI_OnlineResource/protocol in CI_OnlineResource. -->
4439
                      <gmd:linkage>
4440
                       <!-- This linkage element contains the base URL to compose requests to the
4441
        service. CI_Online-Resource requires a Linkage element that is a gmd:URL. -->
```

```
4442
                       <gmd:URL>http://75.101.143.247:8080/gsvr/wms?
4443
                     </gmd:linkage>
4444
                     <!-- The protocol element defines a valid internet protocol used to access the
4445
        resource. NAP recommended best practice is that the protocol should be taken from an official
4446
        controlled list such as the Official Internet Protocol Standards published on the Web at
4447
        http://www.rfc-editor.org/rfcxx00.html or the Internet Assigned Numbers Authority (IANA) at
4448
        http://www.iana.org/numbers.html. 'ftp' or 'http' are common values. -->
4449
                     <qmd:protocol>
4450
                       <gco:CharacterString>http</gco:CharacterString>
4451
                     </amd:protocol>
4452
        <!-- Linkage names for service URL's are from "Linkage name conventions" section in the USGIN
4453
        ISO19139 profile document -->
4454
                     <gmd:name>
4455
                       <gco:CharacterString>baseURL</gco:CharacterString>
4456
                     </gmd:name>
4457
                     <gmd:description>
4458
                       <qco:CharacterString>Base URL for service access; append standard WMS request
4459
        parameters to compose query.</gco:CharacterString>
4460
                     </amd:description>
4461
                   </gmd:CI_OnlineResource>
4462
                 </gmd:onLine>
4463
                </gmd:MD_DigitalTransferOptions>
4464
              </gmd:transferOptions>
4465
            </gmd:MD_Distribution>
4466
         </amd:distributionInfo>
4467
         <!-- (C-C) Data quality Information - NAP requires either dataQualityInfo/DQ_DataQuality/report
4468
        or\ dataQualityInfo/DQ\_DataQuality/lineage\ if\ dataQualityInfo/DQ\_DataQuality/scope/DQ\_Scope/level
4469
        = 'dataset'. -->
4470
         <!--
4471
         <gmd:dataQualityInfo/>
4472
         -->
4473
         <!-- (O-O) Portrayal catalog information - A portrayal cataloguecatalog is a collection of
4474
        defined symbols used to depict, to humans, features on a map. No documentation in ISO 19115 about
4475
        how this is supposed to work. ISO 19117 defines the structure of a Portrayal Catalogue. No USGIN
4476
        recommended practices here yet. -->
4477
         <!--
4478
         <gmd:portrayalCatalogueInfo/>
4479
         -->
4480
         <!-- (0-0) Metadata constraint information - This element specifies use constraints for access
4481
        to the metadata record. -->
4482
         <!--
4483
         <qmd:metadataConstraints/>
4484
4485
         <!-- (O-O) Application schema information - Information about the conceptual schema of the
4486
        dataset. This would be populated with a citation to a schema, or may have an inline binary file
4487
        representing the schema. No USGIN provision for usage of this element. -->
4488
         <!--
4489
         <gmd:applicationSchemaInfo/>
4490
          -->
4491
         <!-- (0-0) Metadata maintenance information - This element provides information about the
4492
        maintenance schedule or history of the metadata record. -->
4493
4494
         <gmd:metadataMaintenance/>
4495
4496
         <!-- (X-X) Series information - Not used by USGIN. -->
4497
         <!--
4498
         <gmd:series/>
4499
          -->
4500
4501
         <!-- (X-X) Described resource - Not used by USGIN. -->
4502
         <qmd:describes/>
4503
4504
         <!-- (X-X) Property type description - Not used by USGIN. -->
4505
         <!--
4506
         <gmd:propertyType/>
4507
4508
         <!-- (X-X) Feature type description - Not used by USGIN -->
4509
          <!--
4510
         <gmd:featureType/>
4511
          -->
4512
         <!-- (X-X) Feature attributes - Not used by USGIN -->
4513
         <!--
```

4514 4515 4516

<gmd:featureAttribute/>

-->

</gmd:MD_Metadata>

4517