

Metadata Guidelines for Geospatial Data Resources -Part 3

Metadata quality

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Preface

This is the third part of a set of guidelines for metadata for geospatial data resources. These Guidelines are intended for general use in the UK geographic information environment. They are primarily concerned with geospatial data and services (i.e. that which references data to a location on the surface of the Earth), and which has a limited geographic extent (i.e. is restricted to a defined territory). They have been developed within the context of a UK Location Discovery metadata service meeting the requirements of the EU INSPIRE Directive, and the UK GEMINI2 metadata standard. However, they are sufficiently broadly based to be applicable in a wider context of geospatial metadata creation and management.

The Guidelines are aimed at data managers and creators of metadata, providers of metadata services and general data users. They include guidance on quality management such that they could be used in the context of a national metadata service.

This part of the Guidelines deals with metadata quality and covers quality evaluation and quality management of metadata including guidance on establishing acceptable quality levels (AQLs). Part 1 covers the basics of metadata and provides an introduction to the other two parts. It includes a glossary of terms and set of references. Part 2 provides a set of detailed guidelines for compiling UK GEMINI 2 metadata elements. This part deals with metadata quality including guidance on establishing acceptable quality levels. It has been revised to correspond to version 2.2 of UK GEMINI.

Any comments on these guidelines or on the UK GEMINI2 metadata standard should be sent to gemini@agi.org.uk.

1. INTRODUCTION

1.1 Purpose and scope

This part of the *Metadata Guidelines for Geospatial Data Resources* describes the quality evaluation and quality management of metadata for a national metadata service or a service internal to an organisation or specialist user community.

The purpose of this Part is to introduce the principles and concepts of metadata quality in the context of metadata creation, maintenance and utilisation in a metadata service. Although these principles and concepts are applicable to any metadata service for the discovery of geospatial data resources, they are applied here with particular reference to UK GEMINI2.2. Taken together, they can be used as a guide to the quality evaluation methods and acceptable quality levels that could be employed in a metadata service based on UK GEMINI2.2.

Just as for software development, data capture or manufacturing, quality is not an "add-on", nor is it merely a cursory check at the end of the metadata creation or maintenance process. To produce metadata which is fit for the purpose, quality needs to be built into these processes. Given the right tools, procedures and above all, people trained in the processes, this need not be onerous. General guidance is therefore offered here on how quality can be built in with particular reference to the respective roles of the metadata creator, service provider and service user.

Readers should note that the following are out of scope of this Part:

- detailed operational procedures for quality evaluation in a specific context;
- specifications for software for the validation of metadata;
- service quality, e.g. performance, availability and reliability beyond the significant impact made on service quality by the quality of the metadata itself.

It should be emphasised that what follows are guidelines, they are not incontrovertible rules for how quality is to be managed. It is not possible to cover every possible type of requirement or implementation. Acceptable quality levels (AQLs) are proposed but care needs to be taken before adopting them, as they may not be appropriate in the user's particular context. Since there will be some organisations responsible for hundreds of metadatasets and others that maintain only one or two, the guidelines need to be used with common sense in a particular implementation.

1.2 Who should read this

These Guidelines are aimed primarily at those in the UK who are using, or plan to use, UK GEMINI2.2 as their metadata specification and are:

- responsible for managing the creation and maintenance of metadata;
- responsible for quality management including metadata creation and maintenance;
- proposing to start creating and maintaining metadata;
- running metadata services whether internal to an organisation or user community or at a national level.

Although this part may be of general interest to those directly responsible for entering the metadata, practical guidance on making these entries and common errors made at entry are found in Part 2 of the Guidelines.

Others who are responsible for maintaining only a few metadatasets should still find the principles described here of value. It may not be feasible or appropriate to apply the principles in the way described. Nevertheless, even if there is no formal processes for quality assurance, there still need to be checks that the quality of the data is meeting and maintaining acceptable quality levels.

1.3 Using this document

The following indicates where you can find specific information and guidance.

- To better understand **quality roles** this is particularly aimed at the larger producers and service providers, see:
 - 2. Quality roles metadata creator, service provider and service user.
- To understand **metadata quality**, the differences with geospatial data quality, the main quality components and how these apply to UK GEMINI see:
 - 3.1 What is metadata quality?
 - 3.2 What are the main components of metadata quality?
- To find out about **acceptable quality levels** (AQLs) for metadata and how these can be applied to metadata produced using UK GEMINI2.2 see:
 - 3.3 What are acceptable quality levels?
 - Annex A: Aggregated AQLs applicable to metadata based on UK GEMINI2.2.
- To know about quality assurance and quality control in general see:
 - 3.4 How to quality assure metadata
- To find out how you can **evaluate metadata quality** and the **methods** that can be used in general and specifically in relation to metadata based on UK GEMINI2.2 see:
 - 3.5 How to evaluate metadata quality
 - Annex B: Quality evaluation procedures for UK GEMINI2.2 metadata elements
 - Annex C: Quality evaluation methods
- To find out more about **maintaining and improving metadata quality** see:
 - 3.6 Maintaining and improving metadata quality.
- For a very concise distillation of what is in the rest of the document read:
 - 4 "Dos and don'ts" of metadata quality.

2. QUALITY ROLES

2.1 What are quality roles?

Between creating the metadata and discovering information about data resources there are a number of quality roles. By quality roles is meant the function or part played in maintaining and improving metadata quality. The two primary roles are:

- the metadata creator¹
- the service provider

A third role, often overlooked, is:

• the service user

An understanding of these roles and the responsibilities that these carry are essential to the continuing delivery of metadata that is fit for purpose. The roles need to be seen in the context of the overall operation for creating, maintaining and using metadata. A simple process model is introduced in Part 1 of the Guidelines. A more comprehensive process model is presented at Figure 1 showing the quality related processes in more detail.

The quality roles of each of the players are examined in more detail below. Inevitably, the account given here is idealised with a strong emphasis on maintaining and improving metadata quality. In reality, there are many contexts in which a metadata service can operate – entirely internal to one organisation or as a web-based system. Web-based systems may use one centralised metadatabase or distributed metadatabases maintained by several organisations.

The interface between metadata creator and service provider is likely to be regulated by a service level agreement (SLA). This will govern, amongst other things, the quality of metadata which passes across the interface and the procedures to be followed if metadata does not meet the AQLs or service users find fault with the metadata.

The key points to derive from this process model are the need for:

- i. quality to be made integral to the metadata creation and maintenance process (and in turn for this to be an integral part of the overall business process);
- ii. an overall approach to quality assurance with clear points at which there are quality controls;
- iii. documented quality evaluation procedures and agreed AQLs;
- iv. the right tools for the job both for metadata entry and quality control (and people trained in their use);
- v. good feedback loops from user to service provider and on to metadata creator without these there is unlikely to be any quality improvements over time.

¹ In the UK Location Programme Metadata Service, the role of metadata publisher is also identified, but in these guidelines, in essence, the creator and publisher are rolled into one.

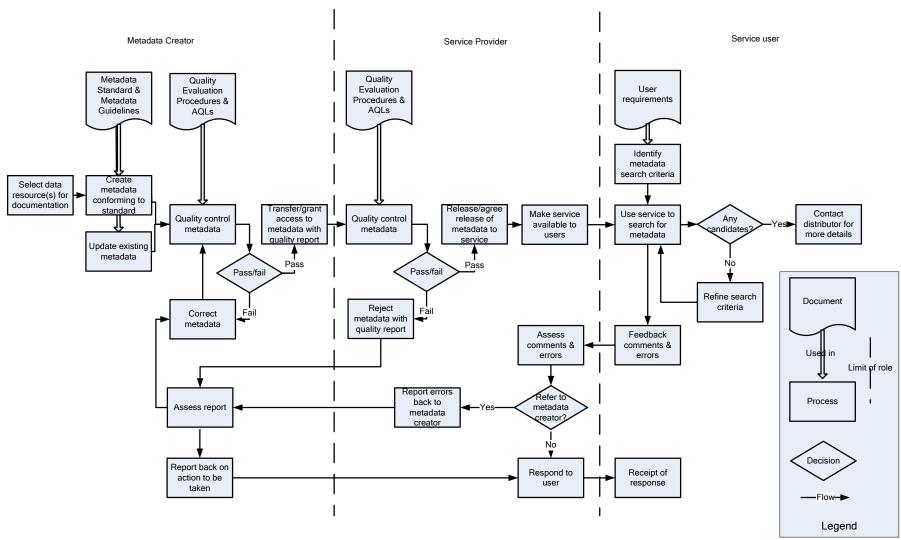


Figure 1. Idealised process model for metadata creation, maintenance, service provision and use.

2.2 What is the quality role of the metadata creator?

The metadata creator, who is frequently also the data producer, is responsible for assuring the quality of the metadata before making it available to metadata service and then maintaining the quality thereafter.

In summary, key responsibilities are likely to be:

- i. understanding the quality requirements for the metadata whether established internally or by some external service provider;
- ii. having an agreement with the service provider and clear procedures for dealing with errors and user feedback;
- iii. establishing or agreeing AQLs that meet requirements (or at least can be practically achieved);
- iv. providing quality assurance through flowline design with adequate quality control built-in;
- v. ensuring that procedures are in place for both metadata creation and maintenance;
- vi. providing mechanisms for ensuring that changes to data resources trigger changes to the metadata;
- vii. ensuring that suitable tools are available for metadata capture which conform to the prevailing metadata standard and, preferably, have some validation at time of entry;
- viii. having quality evaluation procedures backed by suitable testing tools;
- ix. providing for the identification, quarantining and correction of metadata failing quality evaluation;
- x. providing for adequate training such that staff have an understanding of the purpose of the metadata and the data resources to be documented and are familiar with the capture and test tools;
- xi. having established change control procedures;
- xii. creating a culture of quality improvement where feedback is encouraged and lessons are learned and applied.

2.3 What is the quality role of the service provider?

The service provider (who may also be part of the same organisation as the metadata creator or may be part service owner and part contractor) will have a different perspective from that of the metadata creator. However, the extent of their quality responsibilities will vary according to their remit which could range from a basic service provision through to being the main player in driving a national metadata service forward.

As a minimum, the service provider is likely to seek assurance that the metadata will not cause the service to fail. At least, they could be expected to make elementary validation checks using software when the metadata is transferred to them. If the metadata creator is exposing the metadata to the service themselves (e.g. via their own

node on a distributed internet service), then the service provider could require a quality report and a certificate stating that certain tests have been run and the metadata passed. The service provider might still insist on running their own independent tests (see Figure 1).

If the service provider has a wider remit then they will also be seeking:

- some sort of consistency across all metadata such that user searches yield a uniformity of results regardless of sources;
- fitness for purpose from a service user's perspective (although in practice this may be difficult to define).

Given the wider role, the key responsibilities are likely to be:

- i. understanding the user requirements and hence the quality requirements for the metadata;
- ii. developing and negotiating a service level agreement with the metadata creators setting out minimum AQLs and clear procedures for dealing with errors and user feedback:
- iii. leading on metadata quality within the metadata creator community providing advice and training;
- iv. developing and managing a programme to bring existing metadata on the service up to current quality levels;
- v. conducting quality audits to determine current data quality and provide a benchmark;
- vi. providing quality assurance with adequate quality controls built-in the emphasis will be on consistency across metadata as much as quality levels within metadatasets;
- vii. ensuring that procedures are in place for metadata acceptance and release to the metadata service;
- viii. having quality evaluation procedures backed by suitable testing tools;
- ix. providing mechanisms for ensuring that metadata creators regularly review and update the metadata;
- x. providing advice and support on suitable tools for metadata capture conforming to the prevailing metadata standard;
- xi. giving adequate training of staff for the operation of the service with an emphasis on metadata quality;
- xii. having established change control procedures agreed with metadata creators;
- xiii. having in place mechanisms for service users to feed back errors and comments;
- xiv. having procedures for processing and responding to user feedback;
- xv. creating a culture of quality improvement where feedback is encouraged, lessons are learned and applied.

2.4 What is the role of the service user?

The service user is the ultimate beneficiary. Without the user, there is no point in creating metadata and having a service. In many metadata services, they are afforded no quality role at all because there are no effective feedback mechanisms. However, they do not have to be passive players in this; they can be tremendous source of free (and unsolicited) comment and informal quality control.

Eventually they will vote with their feet (or more aptly their internet browsers) and cease to use the service if the quality of the metadata does not reach an acceptable level from their perspective. There is every reason for the service provider and the metadata creator to try and involve the service user. They will experience inconsistencies and notice errors. By submitting comments they can contribute to the improvement process but it has to be seen that the service provider and the metadata creator are pro-active in this area or else the users will cease to submit feedback and go elsewhere.

3. PRINCIPLES OF METADATA QUALITY

3.1 What is metadata quality?

3.1.1 The concept of metadata quality

The success of any metadata service used for the discovery of data resources is ultimately dependent on the quality of the metadata which it uses. So what is quality? Quality can be defined as:

- i. 'Fitness for purpose';
- ii. 'Performance against specification';
- iii. 'Totality of characteristics of a product that bear on its ability to satisfy stated and implied needs'².

In the case of metadata this can be redefined as:

- i. Fitness for use in a metadata service;
- ii. Degree of conformance to a specified metadata standard;
- iii. Totality of characteristics of metadata that bear on its ability to satisfy the needs of the users in their identification of data resources meeting their stated or implied needs.

We have two types of user for metadata, the service user and the service provider. Frequently, the service user's needs in the context of a metadata service are rarely stated beyond the simple need to discover data resources suitable for the user's purpose. Different service users have different requirements and expectations. Beyond the need to provide an effective and efficient service for the service users, the service provider is likely to have some very specific requirements in respect of certain aspects of the quality of the data such as data format, data type and domain without which the service cannot function let alone produce results. The service provider and ultimately, the service user will also be looking for consistency in the recording of metadata such that there is a reasonable assurance that all data resources meeting the user's search criteria are returned by the service regardless of who created the metadata in the first place.

As a minimum, the needs that have to be satisfied in the case of metadata used for the discovery of data resources having geospatial content are likely to be that:

- i. the theme or subject matter of the data resource is correct and comprehensive;
- ii. the geographic area or areas that the data resource relates to are accurately and consistently recorded;
- iii. the purpose for which the data resource can be used is clear;
- iv. the information about how the data was collected, who owns the data and from whom the data can be obtained is reliable;

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v. the dates relating to capture, update and publication are accurate.

² International Standard - ISO 9000:2000 QMS – fundamentals and vocabulary

Note the use of the terms, "correct", "comprehensive", "accurately", "consistently", "clear" and "reliable" – these are all relative terms, accurate for one user is inaccurate for another. Likewise, saying that all metadata has to be of the "highest quality" to ensure that all needs are satisfied is largely meaningless because it is, once again, a relative term. If by "highest quality" is meant that all metadata must be completely accurate, correct and consistent this is both unrealistic and unachievable. It is unrealistic because it implies a base against which accuracy, correctness and consistency can be measured. As we will see later, this does not exist. It is unachievable because the effort required in attempting to reach "100% quality" is out of all proportion to the value added.

3.1.2 Achieving acceptable metadata quality

Pragmatically, the quality achieved in metadata is going to be a compromise between what is reasonable for the metadata creator to deliver, the needs of the service provider and the (largely implied) needs of the users of the metadata service. This means that we need to be able to:

- i. specify or describe the components of the quality that is required;
- ii. set quality levels that are achievable and maintainable by the metadata creator whilst meeting the perceived needs of the users of the metadata service;
- iii. develop working practices which will support the achievement, maintenance and, ultimately, the improvement of quality levels;
- iv. measure the quality that has actually been achieved;
- v. control and manage metadata that does not meet the required quality levels.

3.2 What are the main components of metadata quality?

3.2.1 Quality elements and sub-elements

Just as in the case of geospatial data, the quality of metadata can be described in terms of a number of distinct components or elements relating to the current state of the data resource, such as:

- Completeness presence or absence of metadata;
- Logical consistency degree of adherence to logical rules;
- Positional accuracy accuracy of the bounding coordinate box or extent:
- Temporal accuracy correctness of dates³;
- Thematic accuracy accuracy or correctness of the values entered.

These elements can be further divided into sub-elements such as omission and commission in relation to completeness. Quality sub-elements can then be measured and tested in various ways to establish how well the metadata meets the metadata standard being used, subject to the limitations discussed earlier.

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³ This does not include currency or "up-to-dateness". This is considered here to be part of content accuracy i.e. entries are correct or accurate to the date of last update of the metadata.

Quality sub-elements can be applied at two levels:

- i. at the metadataset level, i.e. when assessing the quality of metadata pertaining to a single data resource;
- ii. at the metadata element level, i.e. when assessing the quality of each metadata element in a metadataset.

Note that not all quality elements and sub-elements are applicable to all of the metadata elements. For example temporal accuracy is only applicable to those metadata elements involving dates.

3.2.2 Applicability to UK GEMINI2.2

The quality elements and sub-elements applicable to metadata at the discovery level based on UK GEMINI2.2 are set out in Table 1 below. This is indicative and not exhaustive, other sub-elements may be applicable to particular applications. Nevertheless, they form the basis of the quality evaluation procedures described in these Guidelines.

Table 1. Metadata quality elements and sub-elements applicable to metadata based on UK GEMINI. Adapted in part from ISO

19113:2002 Geographic information – Quality principles.

Quality element	Description	Quality sub-element	Description
Completeness	Presence or absence of metadata.	Commission	Excess occurrences of metadata elements in metadataset
			(e.g. multiple occurrences when only a single allowed).
		Omission	Absence of occurrences of mandatory metadata elements.
Logical	Adherence to logical rules for	Data type consistency	Correctness of data type to that specified in standard.
consistency	format and domain and the ordering	Domain consistency	Adherence of values to domains specified in standard.
	and consistency between metadata elements.	Ordering	Presentation of items in their specified sequence (e.g. start date < finish date, north coordinate is north of south coordinate, the maximum value > minimum value).
		Relative consistency	Consistency of related metadata elements (e.g. dataset reference or publication date >= capture or update date, named or described extent overlaps with bounding box).
Positional	Accuracy of the lateral and vertical	Coordinate accuracy	Accuracy of the coordinates defining the bounding box
accuracy	extent of data resource as		in relation to the extent of the data resource.
	documented in metadata.	Vertical accuracy	Accuracy of height values defining the maximum and minimum height in relation to the data resource.
		Extent accuracy	Accuracy of the coverage(s) of the data resource is
		-	contained within polygon(s) defined by stated extent.
Temporal accuracy	Accuracy of dates in metadata	Date accuracy	Accuracy of date(s) in relation to the data resource or date of update of metadata.
Thematic accuracy	Accuracy of quantitative and correctness of non-quantitative	Classification correctness	Correctness of classes assigned to instances of metadata elements in relation to data resource.
	metadata elements and the	Non-quantitative	Correctness of non-quantitative values recorded in
	classifications given relative to the	correctness	metadata in relation to data resource.
	last date of update of the metadata.	Quantitative accuracy	Accuracy of the quantitative values in relation to the data resources being documented.

3.3 What are acceptable quality levels (AQLs)?

3.3.1 Basis of AQLs

Acceptable quality levels (AQLs)⁴ are threshold values applied to the results of testing data quality to determine whether the data resource (or in this case the metadata) meets criteria determined from a standard, specification or user requirements.

AQLs can be based on various types of values such as Boolean (true or false), numeric or percentage depending on the types of measures adopted. In the case of metadata these are usually Boolean. Where AQLs are being related to metadatasets as a whole (see below) these could be numeric or percentage.

3.3.2 Simple and aggregated AQLs

For metadata, AQLs can be applied to the results from tests for a specific component of quality such as 'extent accuracy' and be specific to one metadata element such as 'extent' to determine whether that metadata element meets the specified criteria.

Alternatively, AQLs can be applied to the aggregated results from a number of tests to determine whether a metadataset meets the specified criteria⁵. For example aggregated AQLs could be:

- i. 100% pass/fail all metadata elements in a metadataset must reach or exceed the AOL for each element;
- ii. Weighted pass/fail the results of individual tests for each metadata element are weighted and scored according their perceived significance. Those not achieving a threshold score are deemed to have failed;
- iii. Subset pass/fail only those metadata elements considered important, e.g. all mandatory elements must pass to achieve an overall pass.

The approach proposed for UK GEMINI is to use aggregated AQLs to define three levels of conformance; the two lowest levels are based on subsets passing with the highest level being 100% pass (see below).

3.3.3 Setting AQLs

AQLs for metadata should be SMART, i.e.

- Specific they should either relate to (i) a particular quality sub-element for the evaluation of the quality of individual metadata elements or (ii) specified groups of quality sub-elements and metadata elements when aggregating results.
- Measurable an AQL has to be measurable or else it cannot be tested effectively.

⁴ Referred to as "Conformance Quality Levels" in ISO 19114: 2003 Geographic information – Quality evaluation procedures, the more familiar term is used here.

⁵ Derived in part from ISO 19114: 2003, Annex J

- Achievable setting AQLs which are unachievable by the metadata creator has no purpose since this will result in no metadata being accepted.
- Realistic this means that there needs to be a compromise between what can be feasibly achieved by the metadata creator, what can be feasibly tested and what is deemed acceptable by the user.
- Timely in the sense of being expedient and practical, e.g. to conduct tests to measure the quality level.

AQLs cannot be created in a vacuum; a pragmatic approach has to be taken. There is no point in deriving AQLs which cannot be either measured or achieved.

3.3.4 Who should set AQLs?

At the very least, the service provider should be setting a minimum level of conformance to which all metadata available on the service should comply. This minimum level of conformance is likely to relate to completeness and logical consistency and be susceptible of software validation. Although this may mean that the service can function, it does not mean that the results of searches will be reliable. Any service provider concerned with the quality of the results will need to set AQLs which also relate to the accuracy and correctness of the metadata content.

In setting the AQLs, the service provider needs to ensure that these are achievable and realistic; the only way to do this is in dialogue and agreement with the metadata creators. The quality evaluation procedures also need to be specified whether these are automatic or manual.

The metadata creator may unilaterally wish to set more stringent AQLs for a number of reasons:

- the metadata supports internal business process;
- · rework is reduced;
- there is reduced user dissonance;
- there is greater user take-up of the geospatial data documented in the metadata.

If this is the case then they may need to set up further quality evaluation procedures to measure that these levels are being achieved.

3.3.5 Applicability to UK GEMINI2.2

AQLs applicable to metadata based on UK GEMINI2.2 are given in Table 2. Also included is the aggregated AQL for the metadataset corresponding to an intermediate level of conformance proposed for UK GEMINI2.2. This is discussed below.

Table 2 illustrates some of the difficulties of trying to apply AQLs to metadata. Although they can be specific, they are not always easily measurable given the limited basis for establishing the correctness and accuracy of much of the content. If there is no independent source of information then the evaluator has to be realistic and accept that the data passes. Or the best that can be done is to apply basic and highly subjective tests of reasonableness.

Table 2. Examples of AQLs applicable to individual metadata elements and aggregated AQLs applicable to a metadataset - for metadata based on UK GEMINI. (See Annexes A and B for full details of AQLs).

Quality element	Quality sub-element	Example AQL for metadata element	Example of aggregated AQL for metadataset			
Completeness	Commission	No multiple occurrences where single occurrence specified.	No errors of commission in metadataset			
	Omission	No absence if obligation mandatory.	No errors of omission in metadataset			
Logical	Data type consistency	No violation of specified data type	No violations of specified data type			
consistency	Domain consistency	No violation of specified domain	No violations of specified domains			
	Ordering	No inconsistency in ordering	No inconsistencies in ordering			
	Relative consistency	No relative inconsistency	No relative inconsistencies			
Positional accuracy	Coordinate accuracy	Coordinates of bounding box within +/- 0.1 degree of latitude or longitude of that independently determined	All coordinates correct.			
, , ,	Vertical accuracy	Maximum and minimum values of height envelope within +/- 100m of that independently determined	No AQL			
	Extent accuracy	Area covered by the data resource completely contained in the Extent(s) as independently determined.	All extents accurate.			
Temporal accuracy	Date accuracy	Date accurate to nearest year where determinable by independent sources.	All dates accurate.			
Thematic accuracy	Classification correctness	Classification correct to date of last metadata update where determinable by independent sources.	All classifications correct for mandatory elements.			
	Non-quantitative correctness	Content correct to date of last metadata update and in conformance with the standard where determinable by independent sources.	All non-quantitative content correct for mandatory elements.			
	Quantitative accuracy	Content within value range appropriate to metadata element and correct to date of last metadata update where determinable from independent sources.	All quantitative values correct for mandatory elements.			

Three levels of conformance and associated aggregated AQLs are proposed for metadatasets which may need to be established during the development of a metadata service.

• Conformance Level 1 - Basic

Minimum conformance required for inclusion in a metadata service:

- i. all mandatory metadata elements are present with no errors of omission or commission;
- ii. if optional or conditional elements are present there are no errors of commission;
- iii. all data types are valid, no values lie outside their specified domains;
- iv. values (dates, coordinates and heights) are correctly ordered and there is relative consistency between specified dates and between named extents and coordinates.

Conformance Level 2 - Intermediate

Basic conformance plus:

 the accuracy and correctness of the content of the mandatory metadata elements achieves or exceeds a specified aggregated AQL.

Conformance Level 3 - Full

Intermediate conformance plus:

 the accuracy and correctness of the content of optional or conditional metadata elements achieves or exceeds a specified aggregated AQL.

Conformance Level 1 is susceptible of confirmation using software validation methods because they are all internal tests (i.e. they rely on information contained in the metadata) and relate to logical consistency or completeness. This level might be expected to be adopted by a service provider as a minimum.

Conformance Level 2 is probably realistic and achievable in that it concentrates on logical consistency and the content of the mandatory metadata elements. Thus the results from searches based on location, date or topic should be reliable if it is possible to adequately test accuracy and content.

Conformance Level 3 may be unachievable or unfeasible. It may not be realistic to expect all elements to pass all individual AQLs and it may be expedient to allow a lower level of conformance. Certainly, this is unlikely to be achieved at the initiation of any service.

3.4 How to quality assure metadata

As was stated in the Introduction, quality is not an "add-on". To meet specified AQLs, quality needs to be built into the metadata creation and maintenance processes, it is not just a question of testing at the end of the production process or leaving it to the service provider to accept or reject the metadata.

The overall planning of production processes to ensure that the product meets the required quality levels is often referred to as "quality assurance" whereas "quality control" refers to the way in which quality checks are carried out during the

production process and items failing quality checks are managed. Examples of where quality control could operate in a metadata production flowline are shown in Figure 1 and described in 2.1.

During metadata creation and supply there may be a number of checks carried out:

- i. at data entry depending how the metadata is compiled it may be possible to build-in validation of certain quality components such that all mandatory metadata elements are completed, all values fall within specified domains and certain basic consistency checks are made;
- ii. prior to data export to the service provider more comprehensive checks are made using manual and automatic checks;
- iii. on receipt by the metadata service provider e.g. all metadata is run through a software validation process.

If any metadata does not pass one of these checks then there have to be procedures for identifying, quarantining and dealing with the failures.

The creation of metadata may be in the context of a broader "quality management system" in operation throughout the whole organisation. This goes further than quality assurance and embraces all those activities needed to deliver quality i.e. planning, operations, evaluations and staff training. There is a strong emphasis on prevention rather than correction and continuous quality improvement.

3.5 How to evaluate metadata quality

As indicated above, there will be certain points in the metadata creation process where quality checks will be needed. At some point or points there will need to be more formal quality evaluation and reporting, particularly in organisations producing large numbers of metadatasets or where the service provider has an acceptance process.

The purpose of quality evaluation is to establish a quality result, i.e. a value or set of values resulting from applying a particular quality measure which may then be compared to a previously established quality level. This is done through a series of steps or procedures. The main steps in respect of metadata are shown in Table 3.

⁶ The terms "quality assurance" and "quality control" are frequently interchanged leading to an erosion of meaning. The terms are used in the way defined here throughout the remainder of these Guidelines

Table 3. Steps in Metadata Quality Evaluation Process.

Step	Process
Identify quality elements and quality sub-elements applicable to metadata	See Table 1 for details of quality elements and sub-elements. The user requirements are an input to this process.
2. Identify metadata quality measures	Metadata quality measure - type of tests to be applied to evaluate each of the quality subelements (e.g. percentage of commissions).
3. Determine AQLs	AQLs are determined from:
	(i) the user requirements (e.g. those of the service provider),(ii) what can be measured and(iii) what is achievable by the metadata creator.
4. Select and apply metadata quality evaluation methods	Metadata quality evaluation method – the operations to be performed to arrive at a data quality result.
5. Determine the data quality results for each measure	Data quality result – the value or set of values together with the value type e.g. distance and value unit (e.g. metres) where applicable.
6. Determine if each result meets the AQL (pass/fail)	Compare each result with a conformance or acceptable quality level (AQL) for each measure (e.g. no omissions) and pass or fail it.
7. Aggregate results of testing	Summarise the results of the previous step.
8. Determine if metadataset meets the AQL for the metadataset	Compare the aggregated result with the acceptable quality level (AQL) for the metadataset and pass or fail it.
9. Report metadata quality result	This can be for each metadata element or a summary result for the metadataset as a whole.

3.6 Applicability to UK GEMINI2.2

Annex B contains proposed quality evaluation procedures for each metadata element created using UK GEMINI2.2. An outline of the evaluation method is given for each of these. These are summarised in Table 4. The table illustrates the difficulty of applying external tests consistently and with assurance because of the probable lack of reliable and complete independent information. Therefore checks, for example, of non-quantitative correctness may have to be partial and rely mainly on elementary and subjective checks of spelling, duplication, understandability and consistency with other entries. It should also be noted that all quality results are based on a Boolean value, i.e. true or false.

Table 4. Metadata quality elements and sub-elements with quality evaluation methods applicable to metadata based on UK GEMINI2.2

Quality element	Quality sub- elements	Evaluation method	Applicability (relevant metadata elements in brackets)
Completeness	Commission	Count occurrence of each element	Metadata elements in brackets) Metadata elements with only one permitted occurrence (e.g. Title, Lineage, Additional Information Source, Metadata Language)
	Omission	Count occurrence of each element	All mandatory metadata elements (e.g. Title, Abstract, Topic Category)
Logical consistency	Data type consistency	Check data type conforms to Specification	All metadata elements.
	Domain consistency	Check domain conforms to Specification	All metadata elements.
	Ordering	Check dates for duration and east/west, north/south and maximum/minimum values correctly ordered	Metadata elements containing durations, latitude and longitude and maximum values (i.e. Temporal Extent, Dataset Reference Date, Bounding Box, Vertical Extent Information)
	Relative consistency	Check relationship of dates and extent between different metadata elements	Metadata elements containing dates and geographical extents (i.e. Dataset Reference Date and Temporal Extent, Bounding Box and Extent)
Positional accuracy	Coordinate accuracy	Using other sources, check that the locations referenced by the data resource are contained by the minimum definable bounding box	Metadata elements containing latitude or longitude (i.e. Bounding Box)
	Vertical accuracy	Using other sources, check the maximum and minimum values for the vertical extents define a minimum envelope containing all heights referenced by the data resource.	Metadata elements containing height information (i.e. Vertical Extent Information)

Quality	Quality sub-	Evaluation method	Applicability
element	elements		(relevant metadata elements in brackets)
	Extent	Using other sources, check that the area	Metadata elements containing extents (i.e. Extent).
	accuracy	covered by the data resource is completely	
		contained in the stated extent(s).	
Temporal	Date accuracy	Using other sources check accuracy of dates.	Metadata elements containing dates (i.e. Temporal Extent,
accuracy	-		Dataset Reference Date, Metadata Date).
Thematic	Classification	Using other sources check each class is	Metadata elements using enumerated lists (i.e. Topic Category,
accuracy	correctness	correct and current relative to the last date of	Frequency of Update).
		update of the metadata.	
	Non-	Using other sources check each item is correct	Metadata elements containing free text (e.g. Title, Alternative
	quantitative	and current relative to the last date of update	Title, Dataset Language, Abstract, Keyword, Responsible
	correctness	of metadata.	Organisation, Lineage, Vertical Extent Information, Data
			Format, Additional Information Source, Resource Locator).
	Quantitative	Using other sources check that the value of	Metadata elements containing quantitative values - other than
	accuracy	the item is correct.	dates coordinates or heights (i.e. Spatial Resolution,
			Equivalent Scale).

3.7 Maintaining and improving metadata quality

3.7.1 Metadata maintenance

Metadata is unlikely to be static; the data resources which are documented by the metadata will change over time whether due to changes in the universe of discourse, product specification or geographical extent. Distributors can change or they can change their contact details. Failure to update the metadata will result in a reduction in service quality. Metadata services are replete with metadata that has not been updated for years despite the frequency of update of the resource being stated as "continuous".

Ideally, the metadata should be updated at the time of the change, if this is not feasible then there need to be periodic reviews, by the metadata creator preferably, to ensure that metadata elements in all metadatasets are current. It is often more urgent to update some details over others. For example, if the contact details of the distributor change then this needs rapid update even if there is a regime of six-monthly reviews.

Although it is possible to only quality control those metadata elements that have been updated during metadata maintenance, the danger is that the maintenance is incomplete and inconsistencies are created between elements. For example, the date for the content of the data resource (Temporal extent) is updated but not the reference date (Dataset reference date). The preferred approach is to subject the metadataset to complete quality control every time it is updated.

3.7.2 Quality improvement

Users will be looking for continuing improvements in the service and this means that there will be a drive for further quality improvement in the metadata. The process model at Figure 1 shows how metadata production and use would proceed on a day-to-day basis. For it to be an operation which is continually improving the quality of the output there need to be mechanisms for:

- i. feeding back and acting on errors found in metadata;
- ii. feeding back on improvements to processes by operators of those processes;
- iii. learning and applying lessons from the use of current processes;
- iv. managing change whether to the data resources, the AQLs or the standard.

Some feedback loops are shown in the process model, such as that initiated by the user, many other feedback loops are possible particularly during metadata creation. The key thing is that it is a true loop and not a "black hole" into which comments and reports disappear. The reporter deserves a response even if it is to say no action is being taken (preferably adding why there is no action!).

To use that old adage "prevention is better than cure", it is always going to be more cost-effective to create metadata that meets AQLs than to have to correct it every time. This is likely to be achieved through a combination of better procedures, tools and staff training. No-one knows better than the staff doing the job, they deserve to be heard and responded to where they have ideas for improving the process.

3.7.3 Change management

Change may be imposed by the service provider, can be internal or can be external such as a change to the standard. The most basic form of change, that to the data resource documented by the metadata, is discussed at 3.7.1.

Where changes are more fundamental, this needs to be a controlled process or else metadata quality will suffer. If, for example, the standard is changed and agreement is reached with the service provider that existing metadata will have to be updated and all newly created metadata has to meet the revised standard then a plan will have to be created and executed to:

- i. modify and test the capture tools;
- ii. retrain the staff;
- iii. modify quality evaluation procedures and tests (possibly involving software changes);
- iv. implement the changes in a controlled way at a time agreed with the service provider;
- v. process all existing metadata to the revised standard;
- vi. release the metadata to the service in a controlled way.

The service provider will need a complementary plan for dealing with the receipt of metadata to the revised standard or with the interface to any distributed metadatabases.

3.7.4 What to do about metadata not reaching current AQLs

If a metadata service has been running for some time but there has not been a process of quality assurance in place and no AQLs have been set, then there is the problem of dealing with metadata already in the service. To bring all metadata up to the current AQLs and ensure that these are maintained will require:

- i. quality evaluation of the existing metadata;
- ii. agreement between the metadata creators and the service provider on procedures to deal with metadata not reaching the required level;
- iii. changes or a check on current processes to ensure that they are capable of maintaining the AQLs this is likely to require the sort of change management discussed at 3.7.3.
- iv. a controlled programme of work.

This cannot be done at a stroke and will require the full co-operation of all parties. Thought could also be given to prioritising activities to ensure that key or core metadata is dealt with first.

4. "DOS AND DON'TS" OF METADATA QUALITY

- 1. **Do think about the metadata user**, they are looking for suitable data resources to solve their problems, is your metadata complete, up-to-date and accurate? Is it documented at an appropriate level too coarse or too fine a granularity? Can they discover the data resource using the extent that you have given them, are all the topics included? Are the distributor details current and correct?
- 2. **Do make metadata creation and maintenance integral with your other business process** do not make it a Cinderella process given to someone that understands little and cares less about the result.
- 3. **Do ensure that people are trained in metadata creation** and understand the data resources that they are documenting.
- 4. **Do give people the right tools for the job** make metadata entry as easy as possible and make the logical consistency checks at entry.
- 5. **Do think about quality as being built-in to the process** and not an add-on or incidental that may or may not be done at the end.
- 6. **Do strive for consistency and currency in your metadata** have periodic checks of your metadata to ensure that no changes have taken place.
- 7. **Do be pragmatic when establishing AQLs** accept that you are not striving for perfection be SMART and come up with achievable and realistic levels. Do not develop them in a vacuum; ensure there is agreement between metadata creator and service provider.
- 8. **Don't ignore the obvious checks of spelling, understandability and reasonableness** they may not be objective but they can alert you to actual or potential errors.
- 9. **Don't ignore the user and the feedback that they can provide** build this into your quality improvement.
- 10. **Don't expect to bring all existing metadata up to current expectations of quality at a stroke** it will take time to get the procedures and checks in place and to overhaul what is already in the system.

ANNEX A. AGGREGATED AQLS FOR THREE LEVELS OF CONFORMANCE

Applicable to a metadata produced with UK GEMINI2.2 – for guidance only

The Tables indicate AQLs by metadata element. Table A.1 applies to datasets and datasets series, while Table A.2 applies to services. Note that some elements are conditional. These are applicable only when the condition is met.

Metadata elements marked with (O) are optional and those marked with (C) are conditional. In both cases the AQLs are conditional on the metadata element being present.

Level 1 – all AQLs in cells with **Bold type** have to be met to achieve Level 1 conformance.

Level 2 – all AQLs in cells with **Bold type** + Normal type have to be met to achieve Level 2 conformance.

Level 3 – all AQLs in cells with **Bold type** + Normal type + *Italic type* have to be met to achieve Level 3 conformance.

See 3.3 for an explanation of conformance levels.

Table A.1 AQLs for datasets and dataset series

Element name Those marked (O) are optional,		Metadata quality elements and Metadata quality sub-elements AQL in cells												
those marked (C) are conditional	Complet	teness	Logical consistency				Positional accuracy			Temporal accuracy			Thematic accuracy	
(Elements equating to a class)	Commission	Omission	Data type	Domain	Ordering	Relative	Coord accuracy	Vertical accuracy	Extent accuracy	Date accuracy	Classifi- cation	Non- quantitative	Quantitative	
Title	No commission	No omission	No violation(s)	No violation(s)								Item must pass		
Alternative title (O)			of data type	of domain								Item(s) must pass		
Dataset language (C)		No omission										Item(s) must pass		
Abstract	No commission													
Topic category											Item(s) must pass			
Keyword												Item(s) must pass		
Temporal extent					Item must pass					Item(s) must pass				
Dataset reference date														
Lineage	No commission											Item must pass		
Extent (O)			No violation(s) of data type	No violation(s) of domain		All items must pass			Item(s) must pass					

Element name Those marked (O) are optional,			Metadata quality elements and Metadata quality sub-elements AQL in cells												
those marked (C) are conditional	Comple	teness	Logical consistency				Positional accuracy			Temporal accuracy	Thematic accuracy			
	(Elements equating to a class)	Commission	Omission	Data type	Domain	Ordering	Relative	Coord accuracy	Vertical accuracy	Extent accuracy	Date accuracy	Classifi- cation	Non- quantitative	Quantitative	
Vertical extent	information (O)	No commission if class present	No omission if class present	No violations of data type in class instances	No violations of domain in class instances	All class instances must pass			All class instances must pass				All class instances must pass		
	Minimum value	No commission	No omission	No violation(s) of data type	No violation of domain	Item must pass			Item(s) must pass						
	Maximum value														
	Coordinate reference system												Item must pass		
Spatial reference	ce system											Item must pass			
Spatial resoluti	ion (C)													Item must pass	
Resource locator (C)													Item(s) must pass		
Data format (C))														

Those marked	Element name Those marked (O) are optional, those marked (C) are conditional		Metadata quality elements and Metadata quality sub-elements AQL in cells												
those marked (Completeness		Logical consistency				Positional accuracy			Thematic accuracy			
	(Elements equating to a class)		Omission	Data type	Domain	Ordering	Relative	Coord accuracy	Vertical accuracy	Extent accuracy	Date accuracy	Classifi- cation	Non- quantitative	Quantitative	
Responsible or	ganisation		No omission	No violations of data type in class instances	No violations of domain in class instances								All class instances must pass		
	Contact position (O)	No commission		No violation of data type	No violation of domain								Item(s) must pass		
	Organisation name		No omission												
	Postal address (O)														
	Telephone number (O)														
	Facsimile number (O)														
	Email address		No omission												
	Web address O)														
	Responsible party role		No omission												
Frequency of u	Frequency of update											Items must pass			

Element name Those marked (O) are optional,		Metadata quality elements and Metadata quality sub-elements AQL in cells												
those marked (C) are con	nditional	Comple	teness	Logical consistency			Positional accuracy			Temporal accuracy	Thematic accuracy			
e	Elements equating o a class)	Commission	Omission	Data type	Domain	Ordering	Relative	Coord accuracy	Vertical accuracy	Extent accuracy	Date accuracy	Classifi- cation	Non- quantitative	Quantitative
Limitations on public acc	cess		No omission	No violation of data type	No violation of domain								Items must pass	
Use constraints														
Additional information so (O)	source	No commission												
Metadata date			No omission								Item must pass			
Metadata language (C)													Items must pass	
Metadata point of contact	et		No omission											
Unique resource identifie	er													
Resource type		No commission										Item must pass		
Conformity (C)			No omission if class present	No violations of data type in class instances	No violations of domain in class instances								All class instances must pass	
Specifi	fication		No omission	No violation of data type	No violation of domain								Items must pass	
Degree	e													
Explan	nation													
Equivalent scale (O)														Item must pass

Element name Those marked (O) are optional, those marked (C) are conditional		Metadata quality elements and Metadata quality sub-elements AQL in cells												
		Completeness		Logical consistency				Positional accuracy			Temporal accuracy	Thematic accuracy		acy
	(Elements equating to a class)	Commission	Omission	Data type	Domain	Ordering	Relative	Coord accuracy	Vertical accuracy	Extent accuracy	Date accuracy	Classifi- cation	Non- quantitative	Quantitative
Bounding box		No commission	No omission	No violation(s) of data type	No violation(s) of domain								All class instances must pass	
	West bounding longitude East bounding							Item(s) must pass						
	longitude South bounding latitude					Item must pass								
	North bounding latitude													

Table A.2 AQLs for services

Element name Those marked (O) are optional,	Metadata quality elements and Metadata quality sub-elements AQL in cells												
those marked (C) are conditional	Completeness		Logical consistency				Positional accuracy			Temporal accuracy	Thematic accuracy		racy
(Elements equating to a class)	Commission	Omission	Data type	Domain	Ordering	Relative	Coord accuracy	Vertical accuracy	Extent accuracy	Date accuracy	Classifi -cation	Non- quantitative	Quantitative
Title	No commission	No omission	No violation(s) of	No violation(s)								Item must pass	
Alternative title (O)			data type	of domain								Item(s) must pass	
Dataset language (C)		No omission										Item(s) must pass	
Abstract	No commission												
Keyword													
Temporal extent (C)					Item must pass					Item must pass			
Dataset reference date													
Lineage (O)	No commission											Item must pass	
Extent (O)			No violation(s) of data type	No violation(s) of domain		All items must pass			Item(s) must pass				

Element name Those marked (O) are optional, those marked (C) are conditional		Metadata quality elements and Metadata quality sub-elements AQL in cells												
		Comple	teness	Logical consistency				Positional accuracy			Temporal accuracy	Thematic accuracy		racy
	(Elements equating to a class)		Omission	Data type	Domain	Ordering	Relative	Coord accuracy	Vertical accuracy	Extent accuracy	Date accuracy	Classifi -cation	Non- quantitative	Quantitative
Vertical extent information (O)		No commission if class present	No omission if class present	No violations of data type in class instances	No violations of domain in class instances	All class instances must pass			All class instances must pass				All class instances must pass	
	Minimum value	No commission	No omission	No violation of data type	No violation of domain	Item must pass			Item(s) must pass					
	Maximum value													
	Coordinate reference system												Item must pass	
Spatial reference	Spatial reference system (C)											Item must pass		
Spatial resolution (C)														Item must pass
Resource locator (C)													Item(s) must pass	
Data format (O	Data format (O)													

Element name Those marked (O) are optional,		Metadata quality elements and Metadata quality sub-elements AQL in cells													
those marked (6	those marked (C) are conditional (Elements equating to a class)		teness	Logical consistency				Positional accuracy			Temporal accuracy			ccuracy	
			Omission	Data type	Domain	Ordering	Relative	Coord accuracy	Vertical accuracy	Extent accuracy	Date accuracy	Classifi -cation	Non- quantitative	Quantitative	
Responsible organisation			No omission	No violations of data type in class instances	No violations of domain in class instances								All class instances must pass		
	Contact position (O)	No commission		No violation of data type	No violation of domain								Item(s) must pass		
	Organisation name		No omission												
	Postal address (O)														
	Telephone number (O)														
	Facsimile number (O)														
	Email address		No omission												
	Web address (O)														
	Responsible party role		No omission												

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Element name Those marked (O) are optional,		Metadata quality elements and Metadata quality sub-elements AQL in cells											
those marked (C) are conditional	Comple	teness	Logical consistency			Positional accuracy			Temporal accuracy		Thematic accuracy		
(Elements equating to a class)	Commission	Omission	Data type	Domain	Ordering	Relative	Coord accuracy	Vertical accuracy	Extent accuracy	Date accuracy	Classifi -cation	Non- quantitative	Quantitative
Frequency of update (C)	No commission		No violation(s) of data type	No violation (s) of domain							Items must pass		
Limitations on public access		No omission										Items must pass	
Use constraints													
Additional information source (O)	No commission												
Metadata date		No omission								Item must pass			
Metadata language (C)												Items must pass	
Metadata point of contact		No omission											
Unique resource identifier (O)													
Spatial data service type		No omission									Item must pass		
Coupled resource												Items must pass	
Resource type	No commission										Item must pass		

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Element na Those marked	d (O) are optional,		Metadata quality elements and Metadata quality sub-elements AQL in cells											
those marked	(C) are conditional	Comple	teness	Logical consistency			Positional accuracy			Temporal accuracy		Thematic accu	racy	
	(Elements equating to a class)	Commission	Omission	Data type	Domain	Ordering	Relative	Coord accuracy	Vertical accuracy	Extent accuracy	Date accuracy	Classifi -cation	Non- quantitative	Quantitative
Conformity (C)		No omission if class present	No violations of data type in class instances	No violations of domain in class instances								All class instances must pass	
	Specification		No omission	No violation of data type	No violation of domain								Items must pass	
	Degree													
	Explanation													
Equivalent sc	ale (O)													Item must pass
Bounding box	x(C)	No commission	No omission	No violations of data type in class instances	No violations of domain in class instances								All class instances must pass	
	West bounding longitude (C)	No commission	No omission	No violation of data type	No violation of domain			Items must pass					Items must pass	
	East bounding longitude (C)													
	South bounding latitude (C)					Item(s) must pass								
	North bounding latitude (C)													

ANNEX B. QUALITY EVALUATION PROCEDURES

These apply to UK GEMINI2.2 elements and are for guidance only.

Explanation of the tables

- Each metadata element, including those equating to a class within a main element, has a separate table;
- Definitions and descriptions of metadata elements and rules for their creation are found in Part 2 of the Guidelines;
- Metadata quality elements and sub-elements are defined in Table 1 of these Guidelines;
- Quality measure type of test to be applied to evaluate a quality sub-element e.g. absence of items, validity of data type;
- Measure description type of measure used in the test, e.g. pass-fail;
- Evaluation method the operations to be performed to arrive at a metadata quality result, e.g. check data type;
- Value type type of value or unit used for reporting the metadata quality result, e.g. Boolean variable, distance in metres, percentage;
- AQL Acceptable Quality Level.

Note: Conditional Pass-Fail – this means that the procedure is conditional on the element being present, i.e. it is an optional element.

Annex B.1 Title

Metada	ta ala	mont	nama	Title
Obligat		melit i	паше	Mandatory
Number		OUITER	meac	Single
Data Ty		curre	HCCS	CharacterString
Data Ty				Free text
Domain	<u>.</u> 		Quality measure	Excess of items
			Measure description	Pass-Fail
		l c	Evaluation method	Count occurrences of Title.
		3101	Evaluation method	If more than one then fail, else pass
		Commission	Value type	Boolean variable
		ш	AQL	No commission
		Co	Notes	-
			Quality measure	Absence of items
			Measure description	Pass-Fail
	SSS		Evaluation method	Count occurrences of Title.
	ene	l u	Lianadon memou	If one or more then pass, else fail
	Completeness	Omission	Value type	Boolean variable
	mp	nis	AQL	No omission
	ပိ	Or	Notes	-
			Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type.
		e e		If Character String then pass else fail
		Data type	Value type	Boolean variable
		ata	AQL	No violation of data type
		Ã	Notes	-
	ıcy		Quality measure	Within specified domain
	steı		Measure description	Pass-Fail
	Logical consistency		Evaluation method	Check item is Free Text.
	00			If not valid Free Text then fail else pass
	cal	Domain	Value type	Boolean variable
	ogi	om	Conformance level	No violation of domain
	Ĺ		Notes	-
			Quality measure	Correctness
			Measure description	Pass-Fail
			Evaluation method	Using other sources check Title of data resource
#				correct.
nen				If other sources confirm Title or impossible to check
ent len				then pass.
me p-e	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \			If checks indicate discrepancy then fail.
ele sul			Value type	Boolean variable
ity ity	acy	ve	AQL	Item must pass
Metadata quality element Metadata quality sub-element	Thematic accuracy	Non- quantitative	Notes	Other sources could include, product catalogues and
a qi	ac	ntit		distributor's website. Even if there are no other
lat; lat;	ıtic	lua:		sources or the data resource has no formal name and
tad	ma	ղ- գ		one has been created, elementary checks against
Metadata Metadata	The	Nor		Abstract and of spelling, understandability and
				conformance to rules for entry should be made.

Annex B.2 Alternative title

Metada	ıta ele	ment	name	Alternative title
Obligat				Optional
Numbe		ccurre	ences	Multiple
Data T				CharacterString
Domair				Free text
			Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Alternative title(s) present then check data type of
				each item.
		. Se		If Character String then pass else fail
		Data type	Value type	Boolean variable
		ata	AQL	No violation of data type
		Ω	Notes	-
			Quality measure	Within specified domain
	>		Measure description	Conditional Pass-Fail
	nc.		Evaluation method	If Alternative title(s) present then check domain of
	Logical consistency			each item.
				Check item is Free Text.
	100	_		If not valid Free Text then fail else pass
	ica	Domain	Value type	Boolean variable
	goʻ	000	AQL	No violation of domain
	1	Н	Notes	-
			Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Alternative title(s) present then use other sources to
nt				check that each Alternative title of data resource is
ne				correct.
ent elei				If other sources confirm Alternative title or impossible
p-q				to check then pass. If should indicate discrepancy than fail
el su	>		Volue type	If checks indicate discrepancy then fail. Boolean variable
lity lity	ac	ve	Value type AQL	Item must pass
na na	cm	tati		_
a d	ac	ınti	Notes	Other sources could include product catalogues and distributor's website. Even if there are no other
dat dat	atic	dns		
Metadata quality element Metadata quality sub-element	Thematic accuracy	Non- quantitative		sources, elementary checks against Abstract and of
Me Me	The	No		spelling, understandability and conformance to rules
. , , ,				for entry should be made. Check for duplicate entries.

Annex B.3 Dataset language

Metadata			nama	Dotacat languaga
		пені і		Dataset language Conditional – data resource contains textual
Obligatio)II			information
Name	of oo			
Number of		curre	nces	Multiple
Data Typ	<u>e</u>			CharacterString Free text
Domain				Absence of items
			Quality measure	
			Measure description	Pass-Fail
	SS		Evaluation method	Check if resource contains textual information.
	Completeness	_		If so, then count occurrences of Dataset language.
	lete	Omission	X7 1 4	If one or more then pass, else fail
	ldu	iss	Value type	Boolean variable
	Zor)m	AQL	No omission
<u> </u>			Notes	-
			Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type of each occurrence.
		Data type		If Character String then pass else fail
		a ty	Value type	Boolean variable
)ati	AQL	No violation of data type
		Н	Notes	-
			Quality measure	Within specified domain
	>		Measure description	Pass-Fail
	Suc		Evaluation method	Check each occurrence is Free Text.
	Logical consistency			If valid Free Text then pass else fail
	suc		Value type	Boolean variable
	l cc	п	AQL	No violations of domain
	ica	nai	Notes	Recommended that this conforms to a controlled
	go	Domain		vocabulary e.g. ISO 639-2 (see rules for entry in Part
	Τ	П		2 of these Guidelines). If so, then this can be checked
			Quality measure	Correctness
			Measure description	Pass-Fail
<u>+</u>			Evaluation method	Using other sources check against each Dataset
nent				language for correctness.
element sub-elem				If other sources confirm Dataset language or
me 5-e				impossible to check then pass.
ele				If checks indicate discrepancy then fail.
ity ty	ıcy	'e	Value type	Boolean variable
Metadata quality element Metadata quality sub-elen	accuracy	ativ	AQL	All items must pass
1b	acc	ıtit	Notes	Other sources could include product catalogues and
ata	jc	uar		distributor's website. Even if there are no other
ad;	nat	- ط		sources, elementary checks should be made. Is the
Metadata Metadata	Thematic	Non- quantitative		item a recognised language and is it spelt correctly?
$\leq \leq$	\mathbf{T}	Z		Check for duplicate entries

Annex B.4 Abstract

Metada	ta ele	ment	name	Abstract
Obligat				Mandatory
Number		curre	ences	Single
Data Ty				CharacterString
Domain				Free text
			Quality measure	Excess of items
			Measure description	Pass-Fail
		n	Evaluation method	Count occurrences of Abstract.
		ssic		If more than one then fail, else pass.
		Commission	Value type	Boolean variable
		om	AQL	No commission
		ŭ	Notes	-
			Quality measure	Absence of items
			Measure description	Pass-Fail
	Completeness		Evaluation method	Count occurrences of Abstract.
	ten	n		If one or more then pass, else fail.
	ple	Omission	Value type	Boolean variable
	om	mi	AQL	No omission
	Ö	0	Notes	-
			Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type.
		be		If Character String then pass else fail
		ty	Value type	Boolean variable
		Data type	AQL	No violation of data type
	_	Д	Notes	-
	Logical consistency		Quality measure	Within specified domain
	iste		Measure description	Pass-Fail
	suc		Evaluation method	Check item is Free Text.
	100	u		If not valid Free Text then fail else pass
	ica	Domain	Value type	Boolean variable
	goʻ)on	AQL	No violations of domain
	I	I	Notes	-
			Quality measure	Correctness
			Measure description	Pass-Fail
			Evaluation method	Using other sources check Abstract correct.
				If other sources confirm content and or impossible to
nt nt				check then pass.
me			37.1	If checks indicate discrepancy then fail.
ent			Value type	Boolean variable
em lb-(AQL	All items must pass
/ el	>		Notes	Other sources could include product catalogues and
	rac	ive		distributor's website. Even if there are no other
lna Ina	cn	tat		sources, elementary checks should be made. Is the
2 C 2	; ac	ınti		item in a recognised language and is it spelt correctly?
dat dat	atic	dng		Does the abstract conform to the rules for entry and provide a clear statement of the content of the data
Metadata quality element Metadata quality sub-element	Thematic accuracy	Non- quantitative		resources and not just general background
MÉ	Th	$\stackrel{ m N}{\sim}$		information?
		<u> </u>	<u> </u>	miormation:

Annex B.5 Topic category

Metada	ıta ele	ment	name	Topic category		
Obligat				Mandatory for datasets and dataset series, optional for		
- · · · •				services		
Numbe	r of o	ccurre	ences	Multiple		
Data T	Data Type			Class		
Domair	_			Code list		
			Quality measure	Absence of items		
			Measure description	Pass-Fail		
			Evaluation method	If resource is a dataset or dataset series, then count		
	iess			occurrences of Topic category.		
	ter	uc		If one or more then pass else fail		
	Completeness	Omission	Value type	Boolean variable		
	our	mi	AQL	No omission		
	\circ	0	Notes	May not be applicable for a service		
1			Quality measure	Valid data type		
1			Measure description	Pass-Fail		
			Evaluation method	Check data type of each item.		
				If code of type specified in Standard then pass else		
		pe		fail.		
		Data type	Value type	Boolean variable		
)at	AQL	No violation of data type		
			Notes	-		
			Quality measure	Within specified domain		
	5		Measure description	Pass-Fail		
	enc		Evaluation method	Check domain of each item.		
	sist			If domain not within code range listed in Specification		
	cons		Value type	then fail else pass. Boolean variable		
	Logical consistency	.E.	Value type AQL	No violations of domain		
	gic	Domain	Notes	Currently the Specification contains integer codes in		
	Lo	Do	Titles	the range 001-019.		
			Quality measure	Correctness		
			Measure description	Pass-Fail		
			Evaluation method	Using other sources check each Topic category is		
				correct.		
				If other sources confirm Topic category or impossible		
ent				to check then pass.		
nt em				If checks indicate discrepancy or key Topic categories		
mei -el				omitted then fail.		
element sub-element			Value type	Boolean variable		
Metadata quality element Metadata quality sub-elen	ıcy		AQL	All items must pass		
Metadata quality Metadata quality	Thematic accuracy		Notes	Other sources could include product catalogues and		
ъ ъ	асс	tioi		distributor's website. Even if there are no other		
ata ata	tic	īca		sources, elementary checks should be made. Do the		
tad	ma	ssif		topic categories relate to the Abstract? Do those		
Mei Mei	The	Classification		chosen follow the rules for data entry? Are they		
				complete? Check for duplicate entries.		

Annex B.6 Keyword

Metada			name	Keyword
Obligat				Mandatory
Number		ccurre	ences	Multiple
	Data Type			CharacterString
Domain				Free text
			Quality measure	Absence of items
			Measure description	Pass-Fail
	ess		Evaluation method	Count occurrences of Keyword.
	ten	ū		If one or more then pass else fail
	Completeness	Omission	Value type	Boolean variable
	mc	mis	AQL	No omission
	ŭ	Ō	Notes	-
			Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type of each item.
		pe		If Character String then pass else fail
		Data type	Value type	Boolean variable
		ata	AQL	No violation of data type
		Ω	Notes	-
	Logical consistency		Quality measure	Within specified domain
	iste		Measure description	Pass-Fail
	nsi		Evaluation method	Check each item of Free Text.
	1 cc	lu		If valid Free Text then pass else fail
	ica	Domain	Value type	Boolean variable
	go,	_ Jon	AQL	No violations of domain
			Notes	-
			Quality measure	Correctness
			Measure description	Pass-Fail
ıt			Evaluation method	Using other sources check against each Keyword for
element sub-element				correctness.
element sub-elen				If other sources confirm Subject or impossible to
p-e				check then pass.
			Volum 4 mm o	If checks indicate discrepancy then fail.
lity lity	ac)	ve	Value type	Boolean variable
na	Thematic accuracy	tati	AQL	All items must pass
Metadata qualit Metadata qualit	ac		Notes	Other sources could include product catalogues and
dat dat	atic			distributor's website. Even if there are no other
tac tac	em;) -u		sources, elementary checks should be made. There
Me	The	Non- quantitative		should be some correlation with the Abstract and
_ , , _	_ `	, ,		Topic category. Check for duplicate entries.

Annex B.7 Temporal extent

Metada	ta ele	ment	name	Temporal extent
Obligat				Mandatory for datasets and dataset series, conditional
				for services
Numbe	r of oc	ccurre	ences	Multiple
	Data Type			Date as specified by ISO 8601
	Domain			Duration of period as specified by ISO 8601
			Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	If resource is dataset or dataset series, count
	ess			occurrences of Temporal extent.
	ten	ū		If one or more then pass else fail
	ple	ssio	Value type	Boolean variable
	Completeness	Omission	AQL	No omission
	C	0	Notes	May not be applicable for a service
			Quality measure	Valid date data type
			Measure description	Pass-Fail
			Evaluation method	Check data type.
				If date conforms to ISO 8601 then pass else fail.
		'pe	Value type	Boolean variable
		a ty	AQL	No violation of data type
		Data type	Notes	There must be a date, even if only for a century. Nulls
			0 11	are not valid.
			Quality measure	Within specified domain
			Measure description	Pass-Fail
			Evaluation method	Check domain, which may indicate duration between
				two dates. The fromdate or todate may be to any
				degree of precision allowed by ISO 8601 from century to full date and time. The fromdate or todate may be
				left blank to indicate uncertainty but not both dates
				(see Part 2 of these Guidelines).
				If valid date(s) then pass else fail.
ent		ain	Value type	Boolean variable
nent -element		Domain	AQL	No violation of domain
nent -elen		Ŏ	Notes	-
ler Sub			Quality measure	Date ordering
ty 6 ty s	ncy		Measure description	Pass-Fail
ali ali	stei		Evaluation method	If duration given then check consistency of date
nb ab	nsi			ordering.
rta rta	00	స్ట		If fromdate > todate then fail else pass.
adg adg	cal	l in	Value type	Boolean variable
Metadata quality elen Metadata quality sub	Logical consistency	Ordering	AQL	Item must pass
	L	0	Notes	-
(Contir	mod o	1	•	

(Continued overleaf)

			Quality measure	Date accuracy
			Measure description	Pass-Fail
			Evaluation method	Using other sources check Temporal extent for
				accuracy of date. (fromdate or todate of data capture
en				should correspond to the dates in the data resource to
em et				the nearest year.)
element sub-element				If fromdate (where supplied) and todate (where
ler Jub				supplied) accurate or impossible to check then pass.
	cy			If other sources indicate a discrepancy in fromdate
alit alit	ura			(where supplied) or todate (where supplied) then fail.
quality quality	accuracy	acy	Value type	Boolean variable
Metadata Metadata		accuracy	AQL	Item must pass
ads ads	emporal		Notes	Other sources could include product catalogues and
let; let;	em	ate		distributor's website. Even if there are no other
$\mathbf{Z}\mathbf{Z}$	Ľ	Ω		sources, elementary checks of dates should be made.

Annex B.8 Dataset reference date

Metada	ta ele	ment	name	Dataset reference date
Obligat	ion			Mandatory
Numbe		ccurre	ences	Multiple
Data T	vpe			Date as specified by ISO 8601
Domair	_			Date
			Quality measure	Absence of items
			Measure description	Pass-Fail
	SSS		Evaluation method	Count occurrences of Dataset reference date.
	ene	_ u		If one or more then pass else fail
	let	sio	Value type	Boolean variable
	Completeness	Omission	AQL	No omission
	ပိ	On	Notes	-
			Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	
		4)	Evaluation method	Check data type.
		ype	Value type	If comprises date and date type then pass else fail. Boolean variable
		Data type	Value type	
		Dat	AQL	No violation of data type
			Notes	- XX':41' 'C' 1 1 '
			Quality measure	Within specified domain
			Measure description	Pass-Fail
			Evaluation method	Check date is a single date not duration and may be to
				any degree of precision allowed by ISO 8601 from
				year to full date and time (see Part 2 of these
	>			Guidelines).
	enc			Check date type is one of creation, publication,
	sist			revision.
	ons			If either date or date type not valid domain then fail
	ıl c	. 5	T 7 1	else pass.
	Logical consistency	Domain	Value type	Boolean variable
	300	001	AQL	No violation of domain
	\vdash	<u> </u>	Notes	- D :
			Quality measure	Date accuracy
			Measure	Pass-Fail
			description	
element sub-element			Evaluation method	Using other sources check date for accuracy. If date
nt em				accurate or impossible to check then pass.
ne -el				If other sources indicate a discrepancy in date or then
eler ub				fail.
ity e ity s	acy		Value type	Boolean variable
Metadata quality element Metadata quality sub-elen	Temporal accuracy	Date accuracy	AQL	Item must pass
ita ta	al s	cmc	Notes	Other sources could include product catalogues and
Metadata Metadata)OC	асс		distributor's website. Even if there are no other
eta	imi	ate		sources, elementary checks of date and conformance
MM	Te	Ď		to the rules for entry should be made.
L	1	1	I	is and tot they because of made.

Annex B.9 Lineage

Metada	ta ele		name	Lineage
Obligat		ment .	шиш	Mandatory for datasets and dataset series, optional for
Jongai	.1011			services
Number	r of o	ccurre	ences	Single
	ata Type			CharacterString
Domain	**			Free text
Domain			Quality measure	Excess items
			Measure description	Conditional Pass-Fail
		Ę.	Evaluation method	Count number of occurrences of Lineage.
		sio		If more than one then fail, else pass.
		mis	Value type	Boolean variable
		Commission	AQL	No commission
		ŭ	Notes	-
			Quality measure	Absence of items
			Measure description	Conditional Pass-Fail
			Evaluation method	If resource is a dataset or dataset series, then count
	ess			number of occurrences.
	ten	nc		If one or more, then pass else fail.
	Completeness	Omission	Value type	Boolean variable
	om	m.	AQL	No omission
	Ö	0	Notes	May not be applicable for a service
			Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Lineage present then check data type.
		pe		If Character String then pass else fail
		Data type	Value type	Boolean variable
)ata	AQL	No violation of data type
	>		Notes	-
	uc		Quality measure	Within specified domain
	iste		Measure description	Conditional Pass-Fail
	Suc		Evaluation method	If Lineage present then check item is Free Text.
	gical consistency	п		If valid Free Text then pass else fail
	ica	Domain	Value type	Boolean variable
	Log)oi	AQL	No violation of domain
		<u> </u>	Notes	In addition could check if item in valid language
			Quality measure	Correctness
			Measure description	Conditional Pass-Fail
ıt			Evaluation method	If Lineage present then using other sources check
t me				Lineage of data resource correct. If other sources confirm Lineage or impossible to
ele				check then pass.
element sub-element				If checks indicate discrepancy then fail.
y el y st	>		Value type	Boolean variable
quality quality	rac	ive	AQL	Item must pass
dna Jna	noc	itat	Notes	Other sources could include product catalogues and
ta ta	c a	ant	110165	distributor's website. Even if there are no other
da da	lati	dn		sources, elementary checks of spelling,
Metadata quality element Metadata quality sub-elen	Thematic accuracy	Non- quantitative		understandability and conformance to the rules for
ΣŽ	Th	Ĭ		entry should be made.
	<u> </u>	1	l .	1 J out of made.

Annex B.10 Extent

Metada	ta ele	ment	name	Extent
Obligat	ion			Optional
Number	Number of occurrences			Multiple
Data Ty	Data Type			Class
Domain	Domain			code identifying the extent, plus optional authority
				code
			Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check that the class comprises an identifier and
				(optionally) an authority code.
		/pe		If so then pass else fail.
		a ty	Value type	Boolean variable
		Data type	AQL	No violation of data type
		1	Notes	-
			Quality measure	Within specified domain
			Measure description	Pass-Fail
			Evaluation method	Check that the identifier code and the authority code if
				present are valid values.
		u		If so, then pass else fail.
		naii	Value type	Boolean variable
		Domain	AQL	No violation of domain
			Notes	-
			Quality measure	Extent v latitude/longitude
			Measure description	Pass-Fail
			Evaluation method	Check that for each Extent that some part of the
	cy			bounding box defined by the East and West bounding
	ten			longitude and the North and South bounding latitude overlaps with some part of the polygon defined by that
	Sis			Extent.
	Logical consistency			If overlap occurs then pass else fail.
		ve	Value type	Boolean variable
		Relative	AQL	Item must pass
	ĭ	Re	Notes	_
			Quality measure	Extent accuracy
			Measure description	Pass-Fail
ent			Evaluation method	Using other sources check the locations referenced by
nt em				the data resource are completely contained in the
me Y-el				Extent(s).
element sub-element				If other sources confirm the area completely contained
ity ty	cy			then pass else fail.
quality quality	ura	асу	Value type	Boolean variable
Metadata quality element Metadata quality sub-elen	Positional accuracy	Extent accuracy	AQL	Item must pass
ata ata	al a	асс	Notes	Other sources could include product catalogues and
ada	ion	ınt		distributor's website. Even if there are no other
Metadata Metadata		3xte		sources, elementary checks against a map base and the
	$ ho_{ m C}$	Щ		rules for entry should be made.

Annex B.11 Vertical extent information

Metada	Metadata element name Vertical extent information					
Obligati		inclit l	шинс	Optional Optional		
		riirra	nces	Single		
	Number of occurrences Data Type			Class		
Data 1y Domain				Aggregated class EX_VerticalExtent (see below)		
Domain	Quality measure			Excess items		
			Measure description	Pass-Fail		
			Evaluation method	Count number of occurrences of item.		
		1018	Evaluation method	If more than one then fail else pass		
		niss	Value type	Boolean variable		
		Commission	AQL	No commission		
		Co	Notes	- Two Commission		
			Quality measure	Absence of items		
			Measure description	Conditional Pass-Fail		
			Evaluation method	If Vertical Extent Information class present then for		
	Completeness		Evaluation method	each class instance check no omissions of elements.		
		u		If all instances pass then pass else fail.		
		Omission	Value type	Boolean variable		
		nis	AQL	No omission if class present		
		Or	Notes	All elements must be present in each class instance.		
			Quality measure	Valid data type		
			Measure description	Conditional Pass-Fail		
			Evaluation method	If Vertical Extent Information class present then for		
			Evaluation method	each class instance check conformance of each		
				element. If all instances pass then pass else fail		
			Value type	Boolean variable		
		e e	AQL	No violation of data type in each element in each class		
		Data type	&-	instance		
		ata	Notes	This is to test that all element values pass in each class		
		Ã		instance.		
			Quality measure	Within specified domain		
			Measure description	Conditional Pass-Fail		
			Evaluation method	If Vertical extent information class present then for		
				each class instance check conformance of each		
				element. If all instances pass then pass else fail.		
			Value type	Boolean variable		
		٦ ا	AQL	No violation of domain in each element in each class		
		Domain		instance		
<u> </u>)on	Notes	This is to test that all element values pass in each class		
nen				instance.		
nt len			Quality measure	Max/min ordering		
me b-e			Measure description	Conditional Pass-Fail		
ele sul	>		Evaluation method	If Vertical extent information class present then for		
ity ity	Suc			each class instance check conformance of Minimum		
nal nali	iste			Value element.		
լել լել	Suc			If Minimum value passes then pass else fail.		
ats ats] c	gu	Value type	Boolean variable		
tad	ica	erii	AQL	All class instances must pass		
Metadata quality element Metadata quality sub-element	Logical consistency	Ordering	Notes	This is to test that Minimum value is less than or equal		
	I)		to Maximum value in each class instance.		

(Continued overleaf)

			Quality measure	Max/Min accuracy
			Measure description	Conditional Pass-Fail
	>		Evaluation method	If Vertical extent information class present then for
	rac			each class instance check conformance of Minimum
	accuracy	>		value and Maximum value.
		ac.		If Minimum Value and Maximum value pass then
	pox	cur		pass else fail.
	al l	ac	Value type	Boolean variable
	ion	ical	AQL	All class instances must pass
	Positional box	Vertical accuracy	Notes	This is to test that Maximum and Minimum values
+=	Ъ			pass accuracy test in each class instance.
Jen		Non-quantitative	Quality measure	Correctness
nt len			Measure description	Conditional Pass-Fail
element sub-element			Evaluation method	If Vertical extent information class present then for
ele sul				each class instance check correctness of Coordinate
ity ity	асу			reference system.
quality	nr			If Coordinate reference system passes then pass else
	accuracy	tita		fail.
ata ata		lan	Value type	Boolean variable
ade	mai	-dn	AQL	All class instances must pass
let Iet	Metadata quality Metadata quality Thematic accuracy	lon	Notes	This is to test that Coordinate reference system passes
2 2	L	Z		content accuracy test in each class instance.

For details of EX_VerticalExtent Class see below.

EX VerticalExtent Class

	EX_VerticalExtent Class Metadata element name Minimum value					
		ient na	ime	Minimum value		
Obligati				Mandatory		
Number Data Ta		curren	ces	Single		
	Data Type Domain			Real Real		
Domain				Excess items		
			Quality measure	Pass-Fail		
	_		Measure description Evaluation method	Count occurrences of Minimum value within Vertical		
			Evaluation method	extent information.		
		Sioi		If more than one then fail, else pass		
		nis	Value type	Boolean variable		
		Commission	AQL	No commission		
		ပိ	Notes	-		
			Quality measure	Absence of items		
			Measure description	Pass-Fail		
	Completeness		Evaluation method	Count occurrences of Minimum value within Vertical		
			2 variation memor	extent information element.		
		Ę.		If one or more then pass else fail.		
		Omission	Value type	Boolean variable		
		mis	AQL	No omission		
	ŭ	Ő	Notes	-		
			Quality measure	Valid data type		
			Measure description	Pass-Fail		
			Evaluation method	Check data type.		
		be		If Real then pass else fail.		
		Data type	Value type	Boolean variable		
			AQL	No violation of data type		
		L	Notes	-		
			Quality measure	Within specified domain		
			Measure description	Pass-Fail		
			Evaluation method	Check domain.		
		Domain		If Real of any value then pass else fail.		
			Value type	Boolean variable		
)or	AQL	No violation of domain		
	5		Notes	- No. / () (
	stency		Quality measure	Max/min consistency		
	sist		Measure description	Pass-Fail		
	Logical consi		Evaluation method	Check the Minimum and Maximum values for consistency.		
	al c	ing	Volue type	If Maximum value => Minimum value then pass else fail. Boolean variable		
	gic	Ordering	Value type			
	Log	Orc	AQL Notes	Item must pass		
			Quality measure	Max/Min accuracy		
nt			Measure description	Pass-Fail		
t me			Evaluation method	Using other sources check the Minimum value of the		
Metadata quality element Metadata quality sub-element			Lyanuanon memou	vertical extent in the data resource.		
lem 1b-				If Maximum value = > Minimum value or impossible to		
y el y st	Positional accuracy			check then pass else fail.		
		асу	Value type	Boolean variable		
gnt Jua	เววา	Zur.	AQL	Item must pass		
ta ta	al a	Vertical accuracy	Notes	Other sources could include product catalogues and		
ida ida	ion	cal	110165	distributor's website. Even if there are no other sources,		
eta	siti	erti		elementary checks against a contour map base should be		
$\Sigma \Sigma$	Pc	Š		made.		
	1	1	<u> </u>			

EX VerticalExtent Class

			nt Class	
Metadat		ent na	me	Maximum value
Obligation				Mandatory
	umber of occurrences ata Type			Single
	Oata Type Oomain			Real
Domain				Real
			Quality measure	Excess items Pass-Fail
			Measure description Evaluation method	Count occurrences of Maximum value within Vertical
		_	Evaluation method	extent information.
		iois		If more than one then fail, else pass
		Commission	Value type	Boolean variable
		l III	AQL	No commission
		ပိ	Notes	-
			Quality measure	Absence of items
			Measure description	Pass-Fail
	Completeness		Evaluation method	Count occurrences of Maximum value within Vertical
				extent information element.
		l n		If one or more then pass else fail.
		ssic	Value type	Boolean variable
		Omission	AQL	No omission
	C	0	Notes	-
			Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type.
		pe		If Real then pass else fail.
		Data type	Value type	Boolean variable
			AQL	No violation of data type
			Notes	- XXV.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.
			Quality measure	Within specified domain
			Measure description Evaluation method	Pass-Fail Check domain.
			Evaluation method	If Real of any value then pass else fail.
		Domain	Value type	Boolean variable
			AQL	No violation of domain
		Dζ	Notes	-
	ıcy		Quality measure	Max/min consistency
	stency		Measure description	Pass-Fail
	nsi		Evaluation method	Check the Minimum and Maximum values for consistency.
	00			If Maximum value > Minimum value then pass else fail.
	cal	ing	Value type	Boolean variable
	Logical consis	Ordering	AQL	Item must pass
	T	Or	Notes	-
			Quality measure	Max/Min accuracy
ent			Measure description	Pass-Fail
nt em			Evaluation method	Using other sources check the Maximum value of the
me)-el				vertical extent in the data resource.
ele suk	_			If value > Minimum value or impossible to check then pass
ity ity	ac)	×	V-1 4	else fail.
ual uali	cur	ırac	Value type	Boolean variable
լը ք 10 մ	ac	100	AQL	Item must pass
Metadata quality element Metadata quality sub-element	Positional accuracy	Vertical accuracy	Notes	Other sources could include product catalogues and
taci	itic	Tic.		distributor's website. Even if there are no other sources,
Me Me	Pos	Veı		elementary checks against a contour map base should be
				made.

EX VerticalExtent Class

			ent Class	
Metadata element name				Coordinate reference system
Obligation Number of occurrences				Mandatory
		urren	ces	Single
Data Type				Class
Domain				Class comprises an identifier of the coordinate reference
Quality measure				system plus an (optional) authority code
			Quality measure	Excess items
	Commission		Measure description	Pass-Fail
			Evaluation method	Count occurrences of Coordinate reference system within
		uo		Vertical extent information.
		SSi		If more than one then fail, else pass
		imi	Value type	Boolean variable
		Jon	AQL	No commission
		0	Notes	-
			Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count occurrences of Coordinate reference system within
	ıesa			Vertical Extent Information element.
	ter	uc		If one or more then pass else fail.
	ıple	ssic	Value type	Boolean variable
	Completeness	Omission	AQL	No omission
	Ö	0	Notes	-
			Quality measure	Valid data type
		ec.	Measure description	Pass-Fail
			Evaluation method	Check data type.
				If Class then pass else fail.
		ty]	Value type	Boolean variable
		Data type	AQL	No violation of data type
			Notes	-
	_		Quality measure	Within specified domain
	ncs		Measure description	Pass-Fail
	ste		Evaluation method	Check domain.
	nsi			If valid coordinate reference system identifier then pass else
	00	_		fail.
	ical	Domain	Value type	Boolean variable
	Logical consistency	on	AQL	No violation of domain
ent	7	\(\alpha\)	Notes	-
ıt M			Quality measure	Correctness
Metadata quality element Metadata quality sub-eleme			Measure description	Pass-Fail
			Evaluation method	Check that Coordinate reference system is a recognised
	ςς			coordinate reference system applicable to the data resource,
alit alit	ıra	ive		and that a selection of coordinate values are consistent with
inb dni	วว	itat		the coordinate reference system.
a a	c acı	ınti		If checks indicate a discrepancy then fail, else pass.
+ +		uan	X7 - 1 4	Boolean variable
ıdat ıdat	nati	ъb	Value type	Boolean variable
etadat	Thematic accuracy	Non-quantitative	AQL	Item must pass

Annex B.12 Spatial reference system

Metada	ta ele	ment	name	Spatial reference system
Obligat	ion			Optional, but should be provided where relevant
Number of occurrences			ences	Multiple
Data Ty	ype			Class
Domain				(optional) authority code plus code identifying the
				spatial reference system
			Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type.
		pe		If one or two codes then pass, else fail.
		Data type	Value type	Boolean variable
		ata	AQL	No violation of data type
		Д	Notes	-
	>		Quality measure	Within specified domain
	ncy		Measure description	Pass-Fail
	iste		Evaluation method	Check domain.
	Suc			If code within range specified by authority then pass,
	Logical consistency	u		else fail.
	ica	Domain	Value type	Boolean variable
	goʻ	Oon	AQL	No violation of domain
	I	П	Notes	-
			Quality measure	Correctness
	ıcy		Measure description	Pass-Fail
	Thematic accuracy	Classification	Evaluation method	Identify Spatial reference system from code and check
				that it is appropriate for the data resource.
		icat		If check indicates discrepancy then fail, else pass.
		sifi	Value type	Boolean variable
	heı	las	AQL	Item must pass
	T	\mathcal{O}	Notes	-

Annex B.13 Spatial resolution

Metada				Spatial resolution
Obligat	ion			Conditional – for datasets and dataset series where a
				resolution distance can be specified, and for services
				where there is a restriction on the spatial resolution of
				the service
Number	r of oc	curre	ences	Multiple
Data Ty	pe			Real
Domain	1			Real>0
			Quality measure	Valid data type
		be	Measure description	Conditional Pass-Fail
			Evaluation method	If Spatial resolution present then check data type.
				If Real then pass else fail.
		. ty]	Value type	Boolean variable
		Data type	AQL	No violation of data type
	_	D_{a}	Notes	-
	Logical consistency		Quality measure	Within specified domain
	ste		Measure description	Conditional Pass-Fail
	nsi		Evaluation method	If Spatial resolution present then check domain.
	8	_		If Real > 0 then pass else fail.
	[ca]	Domain	Value type	Boolean variable
	igo	on	AQL	No violation of domain
	Т	Ω	Notes	-
			Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Spatial resolution present, then using other sources
				check that the value of the item is within +/- 50% of
				the value believed to be true.
				If other sources confirm the value or impossible to
				confirm then pass.
				If checks indicate discrepancy then fail.
		acy	Value type	Boolean variable
	acy		AQL	Item must pass
	Thematic accuracy		Notes	Other sources could include product catalogues and
	асс	ve		distributor's website. Even if there are no other
	tic	tati		sources, elementary checks for conformance to rules
	ma	nti		for entry and reasonableness should be made (e.g. if
]he	Quantitative		the data resource is a 1:50,000 map then it is not going
	L)		to have a spatial resolution of (say) <10 m).

⁷ Proposed value – subject to modification.

Annex B.14 Resource locator

Metada	ta ele	ment	name	Resource locator
Obligation				Conditional – when on-line access is available
Numbe	Number of occurrences			Multiple
Data T	Data Type			CharacterString
	Domain			Free text
			Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Resource locators(s) present then check data type of
				each item.
)S		If Character String then pass, else fail
		tyl	Value type	Boolean variable
		Data type	AQL	No violation of data type
		Ω	Notes	-
			Quality measure	Within specified domain
	_		Measure description	Conditional Pass-Fail
	ncy		Evaluation method	If Resource locators(s) present then check domain of
	ste	Domain		each item.
	nsi			Check item is Free Text.
	8			If valid Free Text then pass else fail
	Logical consistency		Value type	Boolean variable
) [go		AQL	No violation of domain
	긔	Д	Notes	-
			Quality measure	Correctness
			Measure description	Conditional Pass-Fail
+2			Evaluation method	If Resource locator(s) present then use other sources
ıen				to check that each occurrence is correct and current.
nt len				If other sources confirm Resource lLocator or
me J-e				impossible to check then pass.
ty eler ty sub				If checks indicate discrepancy then fail.
	ıcy	e e	Value type	Boolean variable
	nre	ativ	AQL	Item must pass
ъ - ф.	acc	Non- quantitative	Notes	Other sources could include product catalogues and
Metadata quality element Metadata quality sub-element	tic	uar		distributor's website. Even if there are no other
	mat	. ф		sources, elementary checks should be made. If a URL
let let		lon		or other location is given, can it be accessed and the
	Thematic accuracy	Z		data downloaded? Check for duplicate entries.

Annex B.15 Data format

Metada	ta ele	ment	name	Data format
Obligation				Optional
Number	Number of occurrences			Multiple
Data Ty	Data Type			Class MD_Format from ISO 19115
Domain				The following is required:
				name of format
				version of format (date, number etc)
			Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type of each item.
		be		If Class MD_Format then pass, else fail
		Data type	Value type	Boolean variable
		ata	AQL	No violation of data type
		Ω	Notes	-
	ncy		Quality measure	Within specified domain
	ste		Measure description	Pass-Fail
	nsi		Evaluation method	Check each item contains name and version.
	03	_		If valid Free Text then pass, else fail
	Logical consistency	Domain	Value type	Boolean variable
	ogi		AQL	No violations of domain
	Т		Notes	-
			Quality measure	Correctness
			Measure description	Pass-Fail
			Evaluation method	Using other sources check against each Data format
				for correctness and currency relative to the Date of
				Update of Metadata.
				If other sources confirm Data format or impossible to
				check then pass. If checks indicate discrepancy then
				fail.
	Thematic accuracy		Value type	Boolean variable
		ve	AQL	All items must pass
	cur	Non- quantitative	Notes	Other sources could include product catalogues and
	ac	ntit		distributor's website. Even if there are no other
	ıtic	lua		sources, elementary checks should be made for
	ma)- d		conformance to rules for entry, spelling and accepted
	The	Nor		data format names. There may be some correlation
				with the Abstract. Check for duplicate entries.

Annex B.16 Responsible organisation

Metada	ta ele	ment	name	Responsible organisation
Obligat				Mandatory
	Number of occurrences			Multiple
	Data Type			Class
Domain				Class CI_ResponsibleParty
			Quality measure	Absence of items
	SS		Measure description	Pass-Fail
			Evaluation method	Count instances of Responsible organisation.
	iess			If one or more then pass, else fail.
	Completeness	uc	Value type	Boolean variable
		Omission	AQL	No omission.
		mi	Notes	At least one Responsible organisation, with
		0		responsible party role 'distributor' should be present
			Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check conformance of each Responsible organisation
				instance to data type.
				If all conform then pass, else fail.
			Value type	Boolean variable
		Data type	AQL	No violation of data type in each element in each
			* *	instance
			Notes	This is to test that all element values pass within each
			0 14	class instance
			Quality measure	Within specified domain
			Measure description	Pass-Fail
	cy		Evaluation method	Check conformance of each Responsible organisation instance to domain.
	ten			If all conform then pass, else fail.
	Logical consistency		Value type	Boolean variable
	l con		AQL	No violation of domain in each element in each class
	;al	ain	1141	instances
ent	gic	Domain	Notes	This is to test that all element values pass in each class
nt Em	$\Gamma_{\rm c}$	Δ	1.000	instance.
ment 5-element			Quality measure	Correctness
			Measure description	Pass-Fail
5 6 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	cy		Evaluation method	Check conformance of each Responsible organisation
alit alit	ıra(ive		instance.
quality quality	ວວ	itat		If all conform then pass, else fail.
rta rta	ic â	ant.	Value type	Boolean variable
ada	mat.	-dn	AQL	All class instances must pass
Metadata quality ele Metadata quality sub	Thematic accuracy	Non-quantitative	Notes	This is to test that all element values pass in each class
$\mathbf{Z}\mathbf{Z}$	Ξ	Z		instance.
				-

For details of CI_ResponsibleParty Class see below

Metadata element name Contact position				
		ient na	me	Contact position
Obligati				Optional
	Number of occurrences			Single
	Data Type			CharacterString
Domain			-	Free text
			Quality measure	Excess of items
	SS		Measure description	Pass-Fail
			Evaluation method	In each occurrence of Responsible organisation, count
	nes	lon		occurrences of Contact position.
	Completeness	Commission		If more than one then fail, else pass
			Value type	Boolean variable
		Jon	AQL	No commission
			Notes	-
			Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type.
		be		If Character String then pass else fail
		ty	Value type	Boolean variable
		Data type	AQL	No violation of data type
	_	Д	Notes	-
	Logical consistency		Quality measure	Within specified domain
	ste		Measure description	Pass-Fail
	nsi		Evaluation method	Check item is Free Text.
	8	Domain		If valid Free Text then pass else fail
	cal		Value type	Boolean variable
	igo	on	AQL	No violation of domain
			Notes	-
			Quality measure	Correctness
			Measure description	Pass-Fail
ent			Evaluation method	Using other sources, check Contact position of data
nt				resource correct.
ner -ek				If other sources confirm Contact position or impossible to
len ub				check then pass.
Metadata quality element Metadata quality sub-element	55	0	_	If checks indicate discrepancy then fail.
	ırac	tive	Value type	Boolean variable
dn;	1331	Non- quantitative	AQL	Item must pass
rta rta	Thematic accuracy	ıan	Notes	Other sources could include product catalogues and
ada ada	nat	- ф.		distributor's website. Even if there are no other sources,
let; let;	hen	on-		elementary checks of spelling and conformance to rules for
$\Sigma \Sigma$	E	Ź		entry should be made.
L			t	

	CI_ResponsibleParty Class				
Metadat		nent na	me	Organisation name	
Obligati				Mandatory	
Number	of occ	curren	ces	Single	
Data Ty	Data Type			CharacterString	
Domain				Free text	
			Quality measure	Excess of items	
			Measure description	Pass-Fail	
			Evaluation method	In each occurrence of Responsible organisation, count	
		uc		occurrences of Organisation name.	
		SSi		If more than one then fail, else pass	
		Commission	Value type	Boolean variable	
		om	AQL	No commission	
		Ö	Notes	-	
			Quality measure	Absence of items	
			Measure description	Pass-Fail	
			Evaluation method	In each occurrence of Responsible organisation, count	
	iess			occurrences of Organisation name.	
	ten	u		If one or more then pass, else fail	
	Completeness	Omission	Value type	Boolean variable	
	om	m.	AQL	No omission	
	C	0	Notes	-	
			Quality measure	Valid data type	
			Measure description	Pass-Fail	
		Data type	Evaluation method	Check data type.	
				If Character String then pass, else fail	
			Value type	Boolean variable	
		ata	AQL	No violation of data type	
	_	Д	Notes	-	
	ncy		Quality measure	Within specified domain	
	iste		Measure description	Pass-Fail	
	isu		Evaluation method	Check item is Free Text.	
	Logical consistency	Domain		If valid Free Text then pass, else fail	
	ica		Value type	Boolean variable	
	go,		AQL	No violation of domain	
	I		Notes	-	
			Quality measure	Correctness	
+			Measure description	Pass-Fail	
en			Evaluation method	Using other sources check Organisation name of data	
nt em				resource correct and current relative to the Metadata date.	
me -el				If other sources confirm Organisation name or impossible	
ele sub				to check then pass.	
ty :	ıcy	e		If checks indicate discrepancy then fail.	
ilali	ura	ıtiv	Value type	Boolean variable	
nb nb	accu	ıtita	AQL	Item must pass	
Metadata quality element Metadata quality sub-element	ic a	quantitative	Notes	Other sources could include product catalogues and	
ad; ad;	nat	- q		distributor's website. Even if there are no other sources,	
let let	Thematic accuracy	Non-		elementary checks should be made. Is it a recognised	
22	T	Z		distributor, is it spelt correctly, is the name given in full?	

Metadat	_		arty Class	Postal address
		ient na	me	Optional
Obligati Number		NI WWO	900	Single
Data Ty		urren	ces	CharacterString
Data 1y Domain				Free text
Domain		I	Quality measure	Presence of excess items
			Measure description	Conditional Pass-Fail
			Evaluation method	In each occurrence of Responsible organisation, count
	SS		Evaluation method	number of occurrences of Postal address.
	ene	ioi		If more than one then fail, else pass.
	Completeness	Commission	Value type	Boolean variable
	duu	u u	AQL	No commission
	ပ္ပ	ට	Notes	- No commission
			Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Postal address is present then check data type.
		6)	Evaluation method	If Character String then pass, else fail.
		Data type	Value type	Boolean variable
		ta t	AQL	No violation of data type
		Daí	Notes	No violation of data type
	cy.		Quality measure	Within specified domain
	en		Measure description	Conditional Pass-Fail
	sist		Evaluation method	If Postal address is present then check domain.
			Evaluation method	If valid Free Text then pass, else fail.
	Logical consistency	in	Value type	Boolean variable
	gic	Domain	AQL	No violation of domain
	Γ_0	Do	Notes	No violation of domain
			Quality measure	Correctness
				Conditional Pass-Fail
			Measure description	
at a			Evaluation method	If Postal Address is present then using other sources check
neı				that item is correct and current relative to the Metadata date
ent :ler				If other sources confirm Postal address or impossible to
p-e				confirm then pass. If checks indicate discrepancy then fail.
Metadata quality element Metadata quality sub-element	_		Volue type	Boolean variable
lity lity	ac)	ve	Value type	
ual ual	cur	ati	AQL	Item must pass
a d	Thematic accuracy	Non- quantitative	Notes	Other sources could include product catalogues and
lat: lat:	ıtic	Jua		distributor's website. Even if there are no other sources,
tad tad	mí	J- C		elementary checks of should be made. Is the address
Me	 lThe	Noi		complete, does it have a post code, can you find it in PAF
		Z		(e.g. can it be accessed on the Royal Mail website)?

Metadat	_		arty Class	Telephone number
Obligati		ient na	me	Optional
Number		III MMOTE	200	Single
		urren	ces	CharacterString
Data 1y Domain	Data Type			Free text
Domain			Quality measure	Presence of excess items
			Measure description	Conditional Pass-Fail
			Evaluation method	In each occurrence of Responsible organisation, count
	SSS	_	Evaluation method	number of occurrences of Telephone number.
	ene	SiO		If more than one then fail else pass.
	Completeness	Commission	Value type	Boolean variable
	Jui	l III	AQL	No commission
	ට	ටි	Notes	
			Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Telephone number is present then check data type.
		မ	Dydraution method	If Character String then pass else fail.
		typ	Value type	Boolean variable
		Data type	AQL	No violation of data type
		Ds	Notes	-
	ıcy	Domain	Quality measure	Within specified domain
	Logical consistency		Measure description	Pass-Fail
	nsis		Evaluation method	If Telephone number is present then check domain.
	8			If valid Free Text then pass else fail.
	cal		Value type	Boolean variable
	ogi	om	AQL	No violation of domain
	Ü	Ω	Notes	-
			Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Telephone number is present then using other sources.
				check that item is correct and current relative to the
len(Metadata date.
nt em				If other sources confirm Telephone number or impossible to
me] -el				confirm then pass.
elen				If checks indicate discrepancy then fail.
ţ, ţ	ıcy	e	Value type	Boolean variable
iali iali	ura	ativ	AQL	Item must pass
Metadata quality element Metadata quality sub-element	Thematic accuracy		Notes	Other sources could include product catalogues and
ata ata	tic	uar		distributor's website. Even if there are no other sources,
ad	mai	ь - q		elementary checks of should be made. Is the telephone
/let /let	he	Non- quantitative		number complete, can you ring the number and get the
	Z F			correct distributor?

Metadat			arty Class ime	Facsimile number
Obligati				Optional
Number		curren	ces	Single
Data Ty				CharacterString
Domain	**			Free text
			Quality measure	Presence of excess items
			Measure description	Conditional Pass-Fail
			Evaluation method	In each occurrence of Responsible organisation, count
	sea	uc		number of occurrences of Facsimile number.
	eter	ssi		If more than one then fail, else pass.
	Completeness	Commission	Value type	Boolean variable
	onc	onc	AQL	No commission
	0	0	Notes	-
			Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Facsimile Number present then check data type.
		be.		If Character String then pass, else fail.
		a ty	Value type	Boolean variable
		Data type	AQL	No violation of data type
	>	I	Notes	-
	Suc	u	Quality measure	Within specified domain
	Logical consistency		Measure description	Conditional Pass-Fail
	ons		Evaluation method	If Facsimile Number is present then check domain.
	r C		***	If valid Free Text then pass, else fail.
	gica	Domain	Value type	Boolean variable
		Dol	AQL	No violation of domain
			Notes	-
			Quality measure	Correctness Conditional Proc Fail
			Measure description	Conditional Pass-Fail
			Evaluation method	If Facsimile Number is present then using other sources
ut				check that item is correct and current relative to the Metadata date
nei				
ent eler				If other sources confirm Facsimile number or impossible to confirm then pass.
em lp-e				If checks indicate discrepancy then fail.
/ el/	>		Value type	Boolean variable
lity lity	rac	ive	AQL	Item must pass
lna Ina	cu	itati		-
Metadata quality element Metadata quality sub-element	Thematic accuracy	Non- quantitative	Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources,
dat	atic	dng		elementary checks of should be made. Is the facsimile
eta	em	-ua		number complete, can you contact the number and fax the
Ϋ́	Th	$\stackrel{\circ}{Z}$		correct distributor?
	1	1	1	correct distributor:

Metadat	ta elen	nent na	ime	Email address
Obligati				Mandatory
Number		urren	ces	Single
Data Ty				CharacterString
Domain				Free text
			Quality measure	Excess of items
			Measure description	Conditional Pass-Fail
			Evaluation method	For each occurrence of Responsible organisation, count
		uc		number of occurrences of Email address
		ssic		If more than one then fail, else pass.
		imi	Value type	Boolean variable
		Commission	AQL	No commission
			Notes	-
			Quality measure	Absence of item
			Measure description	Conditional Pass-Fail
	SS		Evaluation method	For each occurrence of Responsible organisation, count
	nes			number of occurrences of Email address
	Completeness	Omission	X7 1 4	If one or more then pass, else fail
] Jub	iiss	Value type	Boolean variable
	Col	Om	AQL	No omission
		<u> </u>	Notes	
		Data type	Quality measure Measure description	Valid data type Conditional Pass-Fail
			Evaluation method	Check data type.
			Evaluation method	If Character String then pass, else fail.
			Value type	Boolean variable
			AQL	No violation of data type
			Notes	-
	ıcy		Quality measure	Within specified domain
	Logical consistency		Measure description	Conditional Pass-Fail
	nsi		Evaluation method	Check domain.
	00			If valid Free Text then pass, else fail.
	ical	Domain	Value type	Boolean variable
	go,	ou	AQL	No violation of domain
	I	D	Notes	-
+			Quality measure	Correctness
nent			Measure description	Conditional Pass-Fail
int len			Evaluation method	Using other sources check that item is correct.
Metadata quality element Metadata quality sub-elem				If other sources confirm Email address or impossible to
	_			confirm then pass.
lity lity	acy	ve	Volue type	If checks indicate discrepancy then fail. Boolean variable
nal	cur	tati	Value type AQL	Item must pass
a q	Thematic accuracy	ntil	=	1
dat	atic	Non- quantitative	Notes	Other sources could include product catalogues and
eta	em	-u		distributor's website. Even if there are no other sources, elementary checks of should be made. Can you successfully
Ž Ž	Th	$ $ $^{\circ}_{\rm N}$		e-mail the address?
		1	Ī	e man die address:

	Matadata alamant nama Wah addrass					
Metadata element name Obligation				Web address		
				Optional		
Number		urren	ces	Single		
	Data Type			CharacterString		
Domain				Free text		
			Quality measure	Presence of excess items		
			Measure description	Conditional Pass-Fail		
	S		Evaluation method	For each occurrence of Responsible organisation, count the		
	ıes	on		number of occurrences of Web address,		
	etei	SSi		If more than one then fail else pass.		
	Completeness	Commission	Value type	Boolean variable		
	on	on	AQL	No commission		
	0)	Notes	-		
			Quality measure	Valid data type		
			Measure description	Conditional Pass-Fail		
			Evaluation method	If Web address is present then check data type.		
		be		If Character String then pass, else fail.		
		ţ	Value type	Boolean variable		
		Data type	AQL	No violation of data type		
	_	Ω	Notes	-		
	ncy		Quality measure	Within specified domain		
	Logical consistency		Measure description	Pass-Fail		
			Evaluation method	If Web address is present then check domain.		
	8	_		If valid Free Text then pass, else fail.		
	cal	Domain	Value type	Boolean variable		
	ogi	ошо	AQL	No violation of domain		
	Ĺ	D	Notes	-		
			Quality measure	Correctness		
			Measure description	Conditional Pass-Fail		
ent			Evaluation method	If Web address is present then using other sources check		
i t				that item is correct.		
her -ele				If other sources confirm Web address or impossible to		
len rp				confirm then pass.		
Metadata quality element Metadata quality sub-element	55			If checks indicate discrepancy then fail.		
	ırac	iνέ	Value type	Boolean variable		
dnî dnî	Thematic accuracy	Non- quantitative	AQL	Item must pass		
ta ta	ic a	lant	Notes	Other sources could include product catalogues and		
nda nda	nati	nb -		distributor's website. Even if there are no other sources,		
ets	ıen	-uc		elementary checks of should be made. Can you successfully		
ΣΣ	Ī	Ž		locate the URL?		
	l	l	l			

Metadat	ta elem	ent na	me	Responsible party role
Obligati	on			Mandatory
Number	of occ	urren	ces	Multiple
Data Ty	pe			CodeList
Domain				Code list ResponsiblePartyRole
			Quality measure	Absence of item
			Measure description	Pass-Fail
	S		Evaluation method	For each occurrence of Responsible organisation, count
	ıes			number of occurrences of Responsible party role
	etei	on		If one or more then pass, else fail.
	Jple	ssi	Value type	Boolean variable
	Completeness	Omission	AQL	No omission
	0	\circ	Notes	-
			Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type.
		Data type		If Code then pass, else fail.
			Value type	Boolean variable
			AQL	No violation of data type
	>		Notes	-
	Logical consistency		Quality measure	Within specified domain
	iste		Measure description	Pass-Fail
	suc		Evaluation method	Check domain.
	1 cc	п		If valid code (1-11) then pass, else fail.
	ica	Domain	Value type	Boolean variable
	go,		AQL	No violation of domain
ent		I	Notes	-
nt em			Quality measure	Correctness
me Fel			Measure description	Conditional Pass-Fail
Metadata quality element Metadata quality sub-element			Evaluation method	Using other sources check that item is correct.
	ıcy	e		If other sources confirm or impossible to confirm then pass.
	ura	utiv		If checks indicate discrepancy then fail.
ո ե	acc	tita	Value type	Boolean variable
ata ata	Thematic accuracy	Non- quantitative	AQL	Item must pass
ad	ma	р-1	Notes	Other sources could include product catalogues and
/let /let	The:	Von		distributor's website. Even if there are no other sources,
2 2	Τ	Z		elementary checks of should be made.

Annex B.17 Frequency of update

Metada	Metadata element name			Frequency of update
Obligat				Optional Optional
Number		renre	nces	Single
Data Ty		-cui i C	ZICOJ	Code list
Domain				Code list MD_MaintenanceFrequencyCode
Domain			Quality measure	Excess of items
			Measure description	Pass-Fail
	ess	u	Evaluation method	Count occurrences of Frequency of update.
	ten	ssic		If more than one then fail, else pass
	Completeness	Commission	Value type	Boolean variable
	mc	uc	AQL	No commission
	ŭ	ŭ	Notes	-
			Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type.
				If code of type specified in Specification then pass
		pe		else fail.
		Data type	Value type	Boolean variable
			AQL	No violation of data type
		П	Notes	-
	Logical consistency	Domain	Quality measure	Within specified domain
			Measure description	Pass-Fail
			Evaluation method	Check domain.
	Suc			If within code range specified in Specification then
	$\frac{5}{1}$			pass else fail.
	ica		Value type	Boolean variable
	တို	Oor	AQL	No violation of domain
	I	 	Notes	Current Standard has codes in range 001-012
			Quality measure	Correctness
			Measure description	Pass-Fail
nt			Evaluation method	Using other sources check that Frequency of update is
t me				correct. If other sources confirm Fraguency of undete or
nent -element				If other sources confirm Frequency of update or impossible to confirm then pass
em				impossible to confirm then pass. If checks indicate discrepancy then fail.
/ elen / sub	>		Value type	Boolean variable
lity lity	rac		AQL	Item must pass
lua	cui	uc	~	-
Metadata quality element Metadata quality sub-eler	Thematic accuracy	atic	Notes	Other sources could include product catalogues and
dat dat	atic	fic		distributor's website. Even if there are no other
eta:	em	ıssi		sources, elementary checks should be made to ensure that it appears reasonable in relation to the Abstract
Me Me	Th	Classification		and conforms to the rules for entry.
, ,				and comornis to the rules for entry.

Annex B.18 Limitations on public access

Metada	adata element name			Limitations on public access
Obligat				Mandatory
Number		ccurre	ences	Multiple
Data Ty				CharacterString
Domain				Free text
			Quality measure	Absence of items
			Measure description	Pass-Fail
	Completeness		Evaluation method	Count occurrences of Limitations on public access.
	ten	п		If one or more then pass else fail
	ple	SSiC	Value type	Boolean variable
	om	Omission	AQL	No omission
	Ü	0	Notes	-
			Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	Check data type of each occurrence.
		be		If CharacterString then pass else fail.
		- ty	Value type	Boolean variable
		Data type	AQL	No violation of data type
	_	Ω	Notes	-
	ncy	Domain	Quality measure	Within specified domain
	ste		Measure description	Conditional Pass-Fail
	Logical consistency		Evaluation method	Check domain of each occurrence.
	00			If free text then pass else fail.
	[ca]		Value type	Boolean variable
	go,		AQL	No violation of domain
	T	Ц	Notes	-
			Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	Using other sources check that each constraint is
				correct and current.
				If other sources confirm value or impossible to
				confirm then pass.
	Thematic accuracy		T 7 1 4	If checks indicate discrepancy then fail.
			Value type	Boolean variable
		,e	AQL	Item must pass
		Non-quantitative	Notes	Other sources could include product catalogues and
		ıtit		distributor's website. Even if there are no other
		uar		sources, elementary checks should be made to ensure
	,me	л-q		that it appears reasonable in relation to the Abstract
	The	Nor		and Distributor and conforms to the rules for entry.
				Check for duplicate entries.

Annex B.19 Use constraints

Metadat	etadata element name			Use constraints
Obligati	ion			Mandatory
Number		curre	ences	Multiple
Data Ty				CharacterString
Domain				Free text
			Quality measure	Absence of items
			Measure description	Pass-Fail
	ess		Evaluation method	Count occurrences of Limitations on public access.
	ten	uc		If one or more then pass else fail
	Completeness	Omission	Value type	Boolean variable
	om	mi	AQL	No omission
	Ö	0	Notes	-
			Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	Check data type of each occurrence.
		pe		If CharacterString then pass else fail.
		ty.	Value type	Boolean variable
		Data type	AQL	No violation of data type
	_	Q	Notes	-
	Logical consistency		Quality measure	Within specified domain
	ste		Measure description	Conditional Pass-Fail
	isu		Evaluation method	Check domain of each occurrence.
	22	7		If free text then pass else fail.
	[ca]	nair	Value type	Boolean variable
	igo,	Domain	AQL	No violation of domain
_	1	T	Notes	-
			Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Use constraint(s) present then using other sources
				check that each constraint is correct and current.
				If other sources confirm Use constraint or impossible
				to confirm then pass.
	_		** *	If checks indicate discrepancy then fail.
	Thematic accuracy	e	Value type	Boolean variable
		ativ	AQL	Item must pass
		Non-quantitative	Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks should be made to ensure that it appears reasonable in relation to the Abstract and Distributor. Check for duplicate entries
		Non-		

Annex B.20 Additional information source

Metada	Ietadata element name			Additional information source
	Obligation			Optional
Number		ccurre	ences	Single
Data Ty				CharacterString
Domain				Free text
2 0 11 10 11			Quality measure	Presence of excess items
			Measure description	Conditional Pass-Fail
			Evaluation method	If Additional Information Source present then count
	ess	n		number of occurrences.
	ten	ssic		If more than one then fail, else pass.
	Completeness	Commission	Value type	Boolean variable
	om	om	AQL	No commission
	Ŭ	ŭ	Notes	-
			Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Additional Information Source present then check
				data type.
		Data type		If Character String then pass else fail
			Value type	Boolean variable
			AQL	No violation of data type
		Д	Notes	-
	>		Quality measure	Within specified domain
	Logical consistency		Measure description	Conditional Pass-Fail
	iste		Evaluation method	If Additional Information Source present then check
	suc	Domain		item is Free Text.
	l c			If valid Free Text then pass else fail
	ica		Value type	Boolean variable
	go_	001	AQL	No violation of domain
			Notes	In addition could check if item in valid language
			Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Additional Information Source present then using other sources check Additional Information Source is
nent				correct and current relative to the Metadata date
				If other sources confirm Additional Information
ele				Source or impossible to check then pass.
element sub-elen				If checks indicate discrepancy then fail.
	>		Value type	Boolean variable
	rac	ive	AQL	Item must pass
enb enb	Thematic accuracy	itat	Notes	Other sources could include product catalogues and
Metadata quality element Metadata quality sub-elen		Non- quantitative	110168	distributor's website. Even if there are no other
da	nati	dn		sources, elementary checks should be made. Is the
eta eta	lem	-uc		source accessible if a URL? Does it only contain
ŽŽ	Th	N		references and not additional information?
L	L		l .	TOTAL TOTAL MAN

Annex B.21 Metadata date

Metada	ta elei	ment	name	Metadata date
Obligat			-	Mandatory
Number		curre	ences	Single
	Data Type			Date as specified by ISO 8601
	Domain Domain			Single date as specified by ISO 8601
Domain	•		Quality measure	Excess of items
			Measure description	Pass-Fail
		п	Evaluation method	Count occurrences of Metadata date.
		sio	Z varauton metro	If more than one then fail, else pass
		Commission	Value type	Boolean variable
			AQL	No commission
		ŭ	Notes	-
			Quality measure	Absence of items
			Measure description	Pass-Fail
	Completeness		Evaluation method	Count occurrences of Metadata date.
		됴		If one or more then pass, else fail
		Omission	Value type	Boolean variable
	Juu	nis	AQL	No omission
	$\ddot{\mathcal{C}}$	Ō	Notes	-
			Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type.
		Ō	Z varauton metro	If date conforms to ISO 8601 then pass else fail.
		typ	Value type	Boolean variable
		Data type	AQL	No violation of data type
			Notes	Null dates are not valid
			Quality measure	Within specified domain
	ıcy		Measure description	Pass-Fail
	ster		Evaluation method	Check domain of Metadata date. A single date should
	nsis			be given to the precision of at least a year.
	Logical consistency			If valid domain then pass else fail.
	cal	Domain	Value type	Boolean variable
	igc	om	AQL	No violation of domain
	ĭ	Ā	Notes	-
			Quality measure	Date accuracy
			Measure description	Pass-Fail
			Evaluation method	Using other sources check accuracy of Metadata. date
				should correspond to the date of when the metadata
it i				was last changed or checked.
				If checks confirm date or impossible to check then
ent len				pass.
eme b-e				If other sources indicate a discrepancy then fail.
quality element quality sub-element	_		Value type	Boolean variable
ity ity	Temporal accuracy		AQL	Item must pass
ual 1al	cur	×	Notes	This is difficult to check independently other than the
լ Մահ Մահ	ac	rac		test of reasonableness i.e. if the date is some years
ats	ıral	ccu		previously and yet the Abstract or Lineage refers to
tad	odι	e ac		recent events, this will indicate that the Metadata date
Metadata quality element Metadata quality sub-elen	en	Date accuracy		have not been updated. Check for conformance to
	L	I		rules for entry.

Annex B.22 Metadata language

Metada	ta ele	ment	name	Metadata language
Obligat	ion			Conditional – required for INSPIRE
Numbe	r of oc	ccurre	ences	Single
Data Ty	Data Type			CharacterString
Domair	Domain			Free text
			Quality measure	Absence of item
			Measure description	Pass-Fail
	ness	uo	Evaluation method	Count occurrences of Metadata language.
	eter	ssi		If more than one then fail else pass
	Completeness	Commission	Value type	Boolean variable
		onc	AQL	No commission
	$^{\circ}$	\circ	Notes	-
			Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type.
		pe		If Character String then pass else fail
		Data type	Value type	Boolean variable
			AQL	No violation of data type
			Notes	-
		u	Quality measure	Within specified domain
	>		Measure description	Pass-Fail
	Suc		Evaluation method	Check item is Free Text.
	Logical consistency			If valid Free Text then pass else fail
	suc		Value type	Boolean variable
] c		AQL	No violations of domain
+-	ica	nai	Notes	Recommended that this conforms to a controlled
len	gor	Domain		vocabulary e.g. ISO 639-2 (see rules for entry in Part
int len	I			2 of these Guidelines). If so, then this can be checked.
me b-e			Quality measure	Correctness
ele sul			Measure description	Pass-Fail
ity ity	acy	,e	Evaluation method	Check language of metadata for correctness of value
lalj Ialj) Jurz	ativ		of item.
ъ ъ ъ	асс	ntit.		If correct or impossible to check then pass, else fail.
Metadata quality element Metadata quality sub-element	Thematic accuracy	Non- quantitative	Value type	Boolean variable
ada	ma	b -1	AQL	Item must pass
	The		Notes	Is the item a recognised language and is it spelt
				correctly?

Annex B.23 Metadata point of contact

Metada	ta ele	ment	name	Metadata point of contact
Obligat				Mandatory
	Number of occurrences			Multiple
Data Ty	Data Type			CharacterString
Domair	Domain			Free text
			Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count instances of Metadata point of contact.
	ess			If one or more then pass, else fail.
	ter	uc	Value type	Boolean variable
	ople	Omission	AQL	No omission if item present.
	Completeness	mi	Notes	Organisation name and contact email address must be
	\mathcal{O}	0		present.
			Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type of each Metadata point of contact.
		Data type		If CharacterString then pass, else fail.
			Value type	Boolean variable
			AQL	No violation of data type in occurrence of item.
	_		Notes	-
	Logical consistency		Quality measure	Within specified domain
	ste		Measure description	Pass-Fail
	isu		Evaluation method	Check that each item contains free text.
	22			If all conform then pass else fail.
+2	[ca]	naii	Value type	Boolean variable
Jen	ogo	Domain	AQL	No violation of domain in each occurrence.
element sub-element		Ц	Notes	-
me b-e			Quality measure	Correctness
ele sul			Measure description	Pass-Fail
ity ity	acy	e	Evaluation method	Check each instance of Metadata point of contact to
lalj Ialj	, ur;	tiv		ensure that it is a valid contact and contains valid
	асс	tita		organisation name and valid contact email address.
Metadata quality element Metadata quality sub-elen	Thematic accuracy	Non-quantitative		If all conform then pass else fail.
ada	ma	1b-1	Value type	Boolean variable
/let /let	he	lon	AQL	All instances must pass
	I	Z	Notes	-

Annex B.24 Unique resource identifier

Metada	ta ele	ment	name	Unique resource identifier
Obligat	ion			Mandatory for datasets and dataset series
	Number of occurrences			Multiple
Data Ty	Data Type			Class
Domain				The class comprises a code and a codespace (optional)
			Quality measure	Absence of items
		Omission	Measure description	Pass-Fail
			Evaluation method	Count occurrences of Unique resource identifier.
				If one or more then pass, else fail
			Value type	Boolean variable
			AQL	No omission
		0	Notes	Not applicable for a service
			Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Unique resource identifier present then check data
		Data type		type of each item.
				If Character String then pass else fail
			Value type	Boolean variable
			AQL	No violation of data type
	>	П	Notes	-
	Logical consistency		Quality measure	Within specified domain
	iste		Measure description	Conditional Pass-Fail
	suc		Evaluation method	Check that domain of each element is Free Text.
	00 1	c		If valid Free Text then pass else fail
en	ica	nai	Value type	Boolean variable
element sub-element	go	Domain	AQL	No violation of domain
me -el	I	Ц	Notes	-
ele			Quality measure	Correctness
ty ty	lcy	e	Measure description	Conditional Pass-Fail
Metadata quality element Metadata quality sub-elen	ura	ıtiv	Evaluation method	Check that Unique resource identifier identifies the
րե Մ	асс	tite		data resource. If checks indicate discrepancy then fail,
ata ata	Thematic accuracy	ıan		else pass.
ade ade		<u>ф</u> -	Value type	Boolean variable
let: Iet:	her	Non- quantitative	AQL	Item must pass
2 2	T	Z	Notes	-

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Annex B.25 Spatial data service type

Metada	ta ele	ment	name	Spatial data service type
Obligation				Conditional – if resource is a service
Number	Number of occurrences			Single
Data Ty	Data Type			GenericName
Domain	Domain			Restricted list
			Quality measure	Absence of items
			Measure description	Pass-Fail
	iess		Evaluation method	Count occurrences of Spatial data service type
	ter	nc		If one or more then pass else fail
	Completeness	ssic	Value type	Boolean variable
	om	Omission	AQL	No omission
	\mathcal{C}	0	Notes	Only applicable for a service
			Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type.
		pe		If GenericName then pass else fail.
		ty.	Value type	Boolean variable
		Data type	AQL	No violation of data type
		Ω	Notes	-
			Quality measure	Within specified domain
			Measure description	Pass-Fail
			Evaluation method	Check value.
				If contained within set of allowable values then pass
				else fail.
			Value type	Boolean variable
	Logical consistency		AQL	No violation of domain
			Notes	Allowable values:
	sist			Discovery Service (discovery)
	ons			• View Service (view)
Ħ	al c	ii.		Download Service (download) Transfermentian Service (download)
neı	gica	Domain		Transformation Service (transformation) Transformation Data Services (involve)
ent ent	Γο̈́	Do		Invoke Spatial Data Service (invoke)Other Service (other)
element sub-element	- '		Quality maggung	
O O ₂	>		Quality measure Measure description	Correctness Pass-Fail
Metadata quality Metadata quality	ac		Evaluation method	Check that Spatial data service type is correct.
ua	cui	u	Evaluation method	If checks indicate discrepancy then fail.
a q a q	ac	atio	Value type	Boolean variable
Metadata Metadata	Thematic accuracy	Classification	AQL	Item must pass
tac	em;	ıssi		nom must pass
Me	The	Cla	Notes	-
, , ,	,			

Annex B.26 Coupled resource

Metada	ta ele	ment	name	Coupled resource
Obligat	ion			Mandatory for services, not applicable to data
Numbe		curre	ences	Multiple
Data Ty	Data Type			CharacterString
Domain				Unique resources identifier (URI) or locator of the
	Domani			data resources
			Quality measure	Absence of items
			Measure description	Pass-Fail
	iesa		Evaluation method	Count occurrences of Coupled resource
	ten	Omission		If one or more then pass else fail
	Completeness		Value type	Boolean variable
	om		AQL	No omission
	\mathcal{C}	0	Notes	Only applicable for a service
			Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Coupled resource(s) present then check data type of
				each item.
		be		If Character String then pass else fail
		ty	Value type	Boolean variable
	y	Data type	AQL	No violation of data type
			Notes	-
			Quality measure	Within specified domain
			Measure description	Conditional Pass-Fail
	Suc		Evaluation method	If Coupled resource(s) present then check domain of
	iste			each item.
	suc			Check item is Free Text.
	1 cc	u		If valid Free Text then pass else fail
+	Logical consistency	Domain	Value type	Boolean variable
len	go)or	AQL	No violation of domain
int len	I	I	Notes	-
me 5-e			Quality measure	Correctness
ele sul			Measure description	Conditional Pass-Fail
Metadata quality element Metadata quality sub-element	асу	,e	Evaluation method	If Coupled resource(s) present then check value
lali ialija	, urg	atiν		identifies the data resource that the service operates
1b 1	acc	ıtit		on.
ata ata	tic	uar	** *	If checks indicate discrepancy then fail, else pass.
ada	ma	b -	Value type	Boolean variable
Aet Aet	Thematic accuracy	Non- quantitative	AQL	Item must pass
	L	Z	Notes	-

Annex B.27 Resource type

Metada	ta ele	ment	name	Resource type
Obligation				Mandatory
	Number of occurrences			Single
	Data Type			Code list
Domain				Code list MD_ScopeCode (from ISO 19115)
			Quality measure	Absence of item
			Measure description	Pass-Fail
		nc	Evaluation method	Count occurrences of Resource type.
		ssic		If more than one then fail, else pass
		mi	Value type	Boolean variable
		Commission	AQL	No commission
		Ö	Notes	-
			Quality measure	Absence of items
			Measure description	Pass-Fail
	Completeness		Evaluation method	Count occurrences of Resource type.
	ter	uc		If one or more then pass else fail.
	ople	ssi	Value type	Boolean variable
	om	Omission	AQL	No omission
	\mathcal{O}	0	Notes	-
			Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type.
				If code of type specified in Standard then pass else
		pe		fail.
		ı ty	Value type	Boolean variable
		Data type	AQL	No violation of data type
			Notes	-
	>		Quality measure	Within specified domain
	gical consistency		Measure description	Pass-Fail
	iste		Evaluation method	Check domain.
	Suc			If within code range specified in Standard then pass
+	1 cc	n		else fail.
t ment	ica	nai	Value type	Boolean variable
nt em	Log	Domain	AQL	No violation of domain
elemen sub-ele	I		Notes	Allowable values are 'dataset', 'series', 'service'
ele suk			Quality measure	Correctness
ty t	ıcy		Measure description	Pass-Fail
iali ialii	ura	_	Evaluation method	Check resource and determine whether Resource type
ր Մ	acc	ior		is correct.
ta ta	tic :	icat		If correct then pass, else fail.
<u>ਜ਼</u>	- - =	ifi	Value type	Boolean variable
ada ada	ıΪ	assi	l	
Metadata quality element Metadata quality sub-elen	Thematic accuracy	Classification	AQL Notes	Item must pass

Annex B.28 Conformity

Metada	ta element name		name	Conformity
Obligat	ion			Conditional – required if claiming conformance to
				INSPIRE
Number	Number of occurrences			Multiple
Data Ty	Data Type			Class
	Domain Domain			Aggregated class (see below)
			Quality measure	Absence of items
			Measure description	Conditional Pass-Fail
			Evaluation method	If Conformity class present then for each class
	ess			instance check no omissions of elements.
	ten	uc		If all instances pass then pass else fail.
	Completeness	Omission	Value type	Boolean variable
	om	mi	AQL	No omission if class present
	C	0	Notes	All elements must be present in each class instance.
			Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Conformity class present then for each class
				instance check conformance of each element.
				If all instances pass then pass else fail
			Value type	Boolean variable
		Data type	AQL	No violation of data type in each element in each class
				instance
nt			Notes	This is to test that all element values pass in each class
t me				instance.
element sub-element			Quality measure	Within specified domain
em -qr			Measure description	Conditional Pass-Fail
/ el	cy		Evaluation method	If Conformity class present then for each class
	Logical consistency			instance check conformance.
Metadata quality element Metadata quality sub-elen	sis			If all instances pass then pass else fail.
8 8 0 8	con		Value type	Boolean variable
dat dat	al c	in	AQL	No violation of domain in each element in each class
eta	gic	Domain		instance
Ϋ́	Lo	ρο̈	Notes	This is to test that all element values pass.
			Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Conformance class present then for each class
	55			instance check correctness of Specification and
	Thematic accuracy	ive		Degree. If Specification and Degree pass then pass,
		tat		else fail.
	ic a	anti	Value type	Boolean variable
	Tati	Non-quantitative	AQL	All class instances must pass
	Ten	-uc	Notes	This is to test that Specification and Degree pass
	I	Ž		content accuracy test in each class instance.
			1	

For details of Class see below

Metadata element name Specification **Obligation** Mandatory Single **Number of occurrences** Data Type Class CI Citation (from ISO 19115) – title and reference date Domain Quality measure Absence of items **Measure description** Pass-Fail **Evaluation method** Count occurrences of Specification within Conformity Completeness If one or more then pass else fail. Omission Value type Boolean variable **AQL** No omission Notes Quality measure Valid data type Measure description Pass-Fail **Evaluation method** Check data type. If CI_Citation (title and reference date) then pass else fail. Data type Value type Boolean variable No violation of data type AQL Notes Logical consistency Quality measure Within specified domain **Measure description** Pass-Fail **Evaluation method** Check domain. If valid title and reference date then pass else fail. Metadata quality sub-element Domain Boolean variable Value type Metadata quality element **AQL** No violation of domain Notes Quality measure Correctness Thematic accuracy Non-quantitative Measure description Pass-Fail **Evaluation method** Check Specification for correctness. If correct then pass, otherwise fail. Boolean variable Value type AQL Item must pass Notes

Metadat	ta elem	ent na	me	Degree
Obligati	on			Mandatory
Number	Number of occurrences			Single
Data Ty	Data Type			Boolean
Domain				'true' or 'false'
			Quality measure	Absence of items
			Measure description	Pass-Fail
	səı		Evaluation method	Count occurrences of Degree within Conformity element.
	eter	uc		If one or more then pass, else fail.
	Completeness	Omission	Value type	Boolean variable
	om	mi	AQL	No omission
	0	0	Notes	
			Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type.
		be		If Boolean then pass, else fail.
		a ty	Value type	Boolean variable
		Data type	AQL	No violation of data type
	>		Notes	-
	Logical consistency		Quality measure	Within specified domain
	iste		Measure description	Pass-Fail
	suc		Evaluation method	Check domain.
	100	Domain		If valid Boolean then pass, else fail.
	ica		Value type	Boolean variable
	go		AQL	No violation of domain
	1		Notes	-
ent			Quality measure	Correctness
nt em			Measure description	Pass-Fail
nel -el			Evaluation method	Using other sources check Degree for correctness.
ele sub				If other sources confirm Degree or impossible to check then
ty ty	cy.	4)		pass.
Metadata quality element Metadata quality sub-element	ura	ive		If checks indicate a discrepancy then fail.
nb nb	acc	ita	Value type	Boolean variable
ata ata	Thematic accuracy	Non-quantitative	AQL	Item must pass
ad; ad;	mat	nb-	Notes	Other sources could include product catalogues and
let Iet	.heı	lon		distributor's website. The element 'explanation' will give
22	T	Z		some indication of whether degree is correct or not.

Metadat	a elem	ent na	me	Explanation
Obligation				Mandatory
Number	Number of occurrences			Single
Data Ty	Data Type			CharacterString
Domain				Free text
			Quality measure	Absence of items
			Measure description	Pass-Fail
	S		Evaluation method	Count occurrences of Explanation within Conformity
	es			element.
	etei	uo		If one or more then pass, else fail.
	Completeness	ssi	Value type	Boolean variable
		Omission	AQL	No omission
)	0	Notes	-
			Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type.
		be		If CharacterString then pass else fail.
		Data type	Value type	Boolean variable
			AQL	No violation of data type
	>		Notes	-
	juc.		Quality measure	Within specified domain
	iste		Measure description	Pass-Fail
	suc	Domain	Evaluation method	Check domain.
	1 5			If valid Free Text then pass else fail.
	ica		Value type	Boolean variable
	Logical consistency	Oon	AQL	No violation of domain
	1	Ц	Notes	-
L			Quality measure	Correctness
en			Measure description	Pass-Fail
nt em			Evaluation method	Using other sources check Explanation for correctness.
me -e				If other sources confirm Explanation or impossible to
eler				check, then pass.
ty ty	ıcy	4)		If checks indicate a discrepancy then fail.
Metadata quality element Metadata quality sub-element	nra	tiv(Value type	Boolean variable
ab	acc	tita	AQL	Item must pass
ata ata	Thematic accuracy	Non-quantitative	Notes	Other sources could include product catalogues and
ada	ma	ı-dı		distributor's website. Even if there are no other sources,
Tet Tet	hе	lon		elementary checks should be made to ensure that it is a
22	T	Ž		reasonable explanation.

Annex B.29 Equivalent scale

Metada	ta ele	ment	name	Equivalent scale
Obligat				Optional
Number	Number of occurrences			Multiple
Data Type				Real
Domain	Domain			Real>0
			Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Spatial Resolution present then check data type.
		be		If Integer then pass else fail.
		ty]	Value type	Boolean variable
		Data type	AQL	No violation of data type
	_	D_2	Notes	-
	ncs		Quality measure	Within specified domain
	ste		Measure description	Conditional Pass-Fail
	nsi		Evaluation method	If Equivalent scale present then check domain.
	9	Domain		If Integer > 0 then pass else fail.
	cal		Value type	Boolean variable
	Logical consistency		AQL	No violation of domain
	7		Notes	-
			Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Equivalent scale present then using other sources
				check that the value of the item is within +/- 50% 8 of
				the value believed to be true.
				If other sources confirm the value or impossible to
				confirm then pass.
	Thematic accuracy			If checks indicate discrepancy then fail.
			Value type	Boolean variable
		ve	AQL	Item must pass
	tic	Quantitative	Notes	Other sources could include product catalogues and
	mai	ntit		distributor's website. Even if there are no other
	hел	na		sources, elementary checks for conformance to rules
	T	O		for entry and reasonableness should be made.

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 $^{^8}$ Proposed value – subject to modification.

Annex B.30 Bounding box

Metada	ta ele	ment	name	Bounding box
Obligat	ion			Mandatory for datasets and dataset series, conditional
				for services on there being a defined extent for the
				service
Numbe	r of o	ccurre	ences	Multiple
Data T	ype			Class
Domair				Class, with the elements:
				West bounding longitude
				East bounding longitude
				South bounding latitude
				North bounding latitude
			Quality measure	Absence of items
			Measure description	Pass-Fail
	ess		Evaluation method	Count instances of Bounding box.
	ten	Ę.		If one or more then pass, else fail.
	Completeness	Omission	Value type	Boolean variable
	mc	mis	AQL	No omission.
	ŭ	Ō	Notes	-
			Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	For each element, check that data type.
		be		If all conform then pass, else fail.
			Value type	Boolean variable
			AQL	No violation of data type in each element in each
		ı ty		instance
		Data type	Notes	This is to test that all element values pass within each
		Д		class instance
			Quality measure	Within specified domain
	>		Measure description	Pass-Fail
	cal consistency		Evaluation method	Check conformance of each element to domain.
	iste			If all conform then pass, else fail.
	Suc		Value type	Boolean variable
ıt		n	AQL	No violation of domain in each element in each class
nent	ica	nain		instances
element sub-elem	Logi	Dom	Notes	This is to test that all element values pass in each class
p-e		Н	0 11	instance.
	_		Quality measure	Correctness
lity lity	ac	,e	Measure description	Pass-Fail
na	cur	ativ	Evaluation method	Check conformance of each element.
Metadata quality element Metadata quality sub-elen	ac	ntit	37-1 4	If all conform then pass, else fail.
lat: lat:	atic	uar	Value type	Boolean variable
tac		b-u	AQL	All class instances must pass
Me Me	Thematic accuracy	Non-quantitative	Notes	This is to test that all element values pass in each class
ı				instance.

For details of the elements in the class see below.

West bounding longitude

	West bounding longitude	letadata element name				
es,	Mandatory for datasets and dataset services,	Obligation				
•	conditional for services					
	Single	nces	curre	r of oc	Number	
	Real	Oata Type				
	-180.0 <= value <= 180.0				Domain	
	Excess items	Quality measure				
	Pass-Fail	Measure description				
	Count number of occurrences of item.	Evaluation method	uc			
	If more than one then fail else pass		ssic			
	Boolean variable	Value type	īmi			
	No commission	AQL	Commission			
	-	Notes	Э			
	Absence of items	Quality measure				
	Pass-Fail	Measure description				
ount	If resource is a dataset or dataset series, count	Evaluation method		S		
	occurrences of item.			Completeness		
	If one or more then pass else fail.		on	eteı		
	Boolean variable	Value type	Omission	ıple		
	No omission	AQL)mi	,on		
	May not be applicable for a service	Notes	$^{\circ}$)		
	Valid data type	Quality measure				
	Pass-Fail	Measure description				
	Check data type.	Evaluation method				
	If Real then pass else fail.		'pe			
	Boolean variable	Value type	Data type			
	No violation of data type	AQL)ata			
	-	Notes	I	y		
				suc		
			main	onsiste		
••		Evaluation method				
<u>ıl.</u>				ıl c		
				;ic		
	NO VIOLATION OF domain		J01			
	Pour Line hour or reserve		I			
	- ·					
no logations						
		Evaluation method				
i tile					ınt	
t of data					it ime	
					nen ele	
1/- U.I					len ub-	
		Value type	acy	al accuracy	y e	
			cur		alit alit	
logues and	•		асс		dn; dn;	
			ate		ta ta	
			din	ion	ıda ıda	
			30C	siti	lets eta	
			ŭ	P_{C}	$\mathbf{Z}\mathbf{Z}$	
ne locan the tof dude +	Within specified domain Pass-Fail Check domain. If -180 <= value <= 180 then pass else fail. Boolean variable No violation of domain - Bounding box accuracy Pass-Fail Using other sources check the limits of the locareferenced by the data resource fall within the minimum definable bounding box. If the value of the greatest westerly extent of daresource = value of west bounding longitude + then pass else fail. Boolean variable Item must pass Other sources could include product catalogue distributor's website. Even if there are no other sources, elementary checks against a map base be made. Limits other than +/- 0.1° may be use long as specified.	Quality measure Measure description Evaluation method Value type AQL Notes Quality measure Measure description Evaluation method Value type AQL Notes	Coordinate accuracy Domain	Positional accuracy Logical consistency	Metadata quality element Metadata quality sub-element	

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East bounding longitude

Metada	ta ele	ment	name	East bounding longitude
Obligat				Mandatory for datasets and dataset services,
				conditional for services
Number	r of oc	curre	ences	Single
Data Ty	ype			Real
Domain				-180.0 <= value <= 180.0
			Quality measure	Excess items
			Measure description	Pass-Fail
		nc	Evaluation method	Count number of occurrences of item.
		ssi		If more than one then fail else pass
		Commission	Value type	Boolean variable
		om	AQL	No commission
		\mathcal{O}	Notes	-
			Quality measure	Absence of items
			Measure description	Pass-Fail
	S		Evaluation method	If resource is a dataset or dataset series, count
	nes			occurrences of item.
	ete.	on		If one or more then pass else fail.
	Completeness	Omission	Value type	Boolean variable
	Jon)mi	AQL	No omission
)	Notes	May not be applicable for a service
			Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type.
		/pe		If Real then pass else fail.
		Data type	Value type	Boolean variable
)at	AQL	No violation of data type
	5		Notes	- XX'.1' 'C' 1 1 '
	enc		Quality measure	Within specified domain
	ogical consistency		Measure description	Pass-Fail Check domain.
	ons	omain	Evaluation method	
	al c		Volue trme	If -180 <= value <= 180 then pass else fail. Boolean variable
	gic		Value type	No violation of domain
	Log	Do	AQL Notes	140 VIOIAUOII OI QOIIIAIII
		-		Bounding box accuracy
			Quality measure Measure description	Pass-Fail
			Evaluation method	Using other sources check the limits of the locations
			Evaluation method	referenced by the data resource fall within the
ent				minimum definable bounding box.
i i i				If the value of the greatest easterly extent of data
ner -ele				resource = value of east bounding longitude +/- 0.1°
ler ub		-		then pass else fail.
ty e	Positional accuracy	ac)	Value type	Boolean variable
alit alit		-cm	AQL	Item must pass
Metadata quality element Metadata quality sub-element		Coordinate accuracy	Notes	Other sources could include product catalogues and
ita ita		ıate		distributor's website. Even if there are no other
ada ada		din.		sources, elementary checks against a map base should
let:		001		be made. Limits other than +/- 0.1° may be used as
$\mathbf{Z}\mathbf{Z}$	P	P Z		long as specified.
	П			long as specified.

South bounding latitude

Metada	Aetadata element name			South bounding latitude
Obligat			<u> </u>	Mandatory for datasets and dataset services,
3				conditional for services
Numbe	r of o	ccurre	ences	Single
Data Ty	Data Type			Real
Domair	•			-90.0 <= value <= 90.0
			Quality measure	Excess items
			Measure description	Pass-Fail
		nc Ju	Evaluation method	Count number of occurrences of item.
		ssic		If more than one then fail else pass
		Commission	Value type	Boolean variable
		omo	AQL	No commission
		\mathcal{O}	Notes	-
			Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	If resource is a dataset or dataset series, count
	ies			occurrences of item.
	ter	uc		If one or more then pass else fail.
	əldı	SSi	Value type	Boolean variable
	Completeness	Omission	AQL	No omission
	\circ	0	Notes	May not be applicable for a service
			Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type.
		pe		If Real then pass else fail.
		Data type	Value type	Boolean variable
			AQL	No violation of data type
		Д	Notes	-
			Quality measure	Within specified domain
		Domain	Measure description	Pass-Fail
			Evaluation method	Check domain.
+				If -90.0 <= value <= 90.0 then pass else fail.
t ment			Value type	Boolean variable
nt em		ou	AQL	No violation of domain
me:)-el		П	Notes	-
elei sub	_		Quality measure	North/South ordering
Metadata quality element Metadata quality sub-elen	ncs		Measure description	Pass-Fail
	Logical consistency	8	Evaluation method	Check the bounding coordinates for consistency.
	nsi			If South bounding latitude south of North bounding
ata ata	00			latitude then pass else fail.
ade ade	cal	rin	Value type	Boolean variable
let: let:	ogi	Ordering	AQL	Item must pass
$\mathbf{Z}\mathbf{Z}$	ļ	Ō	Notes	-

(Continued overleaf)

			Quality measure	Bounding box accuracy
			Measure description	Pass-Fail
			Evaluation method	Using other sources check the limits of the locations
+				referenced by the data resource fall within the
len				minimum definable bounding box.
nt em				If the value of the greatest southerly extent of data
me -el				resource = value of South bounding latitude +/- 0.1°
element sub-element		>		then pass else fail.
	acy	rac	Value type	Boolean variable
quality quality	accuracy	e accuracy	AQL	Item must pass
16 t			Notes	Other sources could include product catalogues and
Metadata Metadata	nal	nat		distributor's website. Even if there are no other
	itio	rdi		sources, elementary checks against a map base should
Aet Aet	Positional	Coordinate		be made. Limits other than +/- 0.1° may be used as
	Ь)		long as specified.

North bounding latitude

Metada	Metadata element name			North bounding latitude
Obligat			-	Mandatory for datasets and dataset services,
5 10 8 111				conditional for services
Numbe	r of o	curre	ences	Single
	Data Type			Real
Domair	_			-90.0 <= value <= 90.0
			Quality measure	Excess items
			Measure description	Pass-Fail
		nc	Evaluation method	Count number of occurrences of item.
İ		ssi		If more than one then fail else pass
		Commission	Value type	Boolean variable
		omo	AQL	No commission
		\circ	Notes	-
			Quality measure	Absence of items
			Measure description	Pass-Fail
	S		Evaluation method	If resource is a dataset or dataset series, count
	nes			occurrences of item.
	ete	on		If one or more then pass else fail.
	Completeness	SSi	Value type	Boolean variable
	,on	Omission	AQL	No omission
			Notes	May not be applicable for a service
		Data type	Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type.
				If Real then pass else fail.
			Value type	Boolean variable
			AQL	No violation of data type
			Notes	-
		Domain	Quality measure	Within specified domain
			Measure description	Pass-Fail
			Evaluation method	Check domain.
n t			X7.1	If -90.0 <= value <= 90.0 then pass else fail.
ent element			Value type	Boolean variable
			AQL	No violation of domain
elemen sub-ele			Notes	North/Couth and sing
luality ele luality su	55		Quality measure	North/South ordering
	enc		Measure description Evaluation method	Pass-Fail Chark the bounding coordinates for consistency
	sist		Evaluation method	Check the bounding coordinates for consistency.
				If north bounding latitude north of south bounding
a qı a qı	ono			Latitude then pass also feil
lata qı lata qı	al con	gui	Value type	latitude then pass else fail.
stadata qı stadata qı	gical con	lering	Value type	Boolean variable
Metadata quality element Metadata quality sub-eler	Logical consistency	Ordering	Value type AQL Notes	

(Continued overleaf)

			Quality measure	Bounding box accuracy
			Measure description	Pass-Fail
			Evaluation method	Using other sources check the limits of the locations
-				referenced by the data resource fall within the
en				minimum definable bounding box.
nt em				If the value of the greatest northerly extent of data
ne] -el				resource = value of north bounding latitude +/- 0.1°
element sub-element		>		then pass else fail.
	ıcy	rac	Value type	Boolean variable
quality quality	accuracy	accuracy	AQL	Item must pass
nb nb	acc		Notes	Other sources could include product catalogues and
ata ata	nal	nat		distributor's website. Even if there are no other
ad:	tioi	rdi		sources, elementary checks against a map base should
Metadata Metadata	ositional	Coordinate		be made. Limits other than +/- 0.1° may be used as
2 2	Pe	C		long as specified.

Annex C. Quality Evaluation Methods

C.1 Basic issues

The purpose of quality evaluation is to establish a quality result. Once the quality elements and sub-elements and their relevant measures have been identified, then quality evaluation methods have to be used to arrive at metadata quality result.

In arriving at suitable methods there are a number of basic issues that need to be resolved.

- i. What is going to be the basis for evaluating quality are external sources available or can we only test against the metadata itself?
- ii. Can some or all of the methods be automated?
- iii. Are tests going to be based on a full inspection of all metadata or only a sample?

These issues are inter-related and are discussed below. What follows is based in part on ISO 19114:2003 Geographic information – Quality evaluation procedures. These Guidelines do not include specific guidance on sampling methods nor do they propose suitable pass/fail criteria for batch testing; this is a major topic in its own right. The reader is referred to ISO 19114.

C.2 Basis for tests

Methods can be divided into:

- *internal* these test metadata quality using only information contained within the metadata itself. For example, tests of logical consistency for data type and domain need only the metadata;
- *external* these test metadata quality using whatever external sources may be available. For example, tests of positional accuracy or content correctness require information from sources independent of the metadata.

To effectively measure all elements of metadata quality both internal and external methods are required.

There are particular difficulties with assessing the quality of metadata because the universe of discourse is effectively much more limited than that of the data resource being documented. In some cases, for example if the service provider is testing the metadata, the data resource may not be available. This can limit external testing to whatever external sources are available and constrains what can be done. It can also introduce some elements of subjectivity such as reasonableness and understandability.

C.3 Automation of methods

For some types of measures, the evaluation methods may be susceptible of automation, this is typically so in the case of direct methods using internal sources. Measures of logical consistency frequently fall into this category where data types or domains are being tested. In other cases visual inspection will be needed.

C.4 Full inspection or sampling

Full inspection involves the testing of every item within scope which may be every instance of every metadata element or may be every metadataset in a batch of metadata. Typically, full inspection is relevant to small populations of metadata or automated methods.

Sampling involves the use of a sampling method such as random sampling such that sufficient items are tested to give a meaningful metadata quality result. This may be appropriate where large volumes of metadatasets from a single metadata creator need to be evaluated, for example by a service provider. Including metadatasets from a number of different metadata creators in a single sampling batch would not be appropriate unless the sampling was stratified by metadata creator.