
Department for Communities and Local Government

Metadata Guidelines for Geospatial Datasets in the UK

Part 3 Metadata Quality

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Preface

This is the third part of a set of guidelines for metadata for geospatial datasets. These Guidelines are intended for general use in the UK geographic information environment, and particularly in support of the national geospatial metadata service, *gigateway*. They are primarily concerned with geospatial data (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 national geospatial metadata service (currently *gigateway*), and the UK GEMINI 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 is the third part of the guidelines. It deals with metadata quality and covers quality evaluation and quality management of metadata including guidance on establishing acceptable quality levels. 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 metadata elements.

1. INTRODUCTION

1.1 Purpose and scope

This part of the *Metadata Guidelines for Geospatial Datasets* concentrates on the quality evaluation and quality management of metadata for a national metadata service e.g. *gigateway* 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 GEMINI¹. Taken together, these references 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 GEMINI.

Just as for software development, data capture or manufacturing, quality is not an “add-on”. It is not 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 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 used before adopting them, they may not be appropriate in the reader’s particular context. Also, there will be some organisations responsible for hundreds of metadatasets and others that maintain only one or two. Therefore the guidelines need to be used with common sense when applying them to 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 GEMINI as their metadata standard 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;

¹ UK GEMINI Standard Version 1.0 2004-10-12 Cabinet Office e-Government Unit

- 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 Building quality into the metadata process

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 flow is idealised and could relate to any discovery-level metadata service. The terms and processes used are described in more detail in the rest of this Part of the Guidelines; the model serves to provide an overview and a context. Most of these processes will have to occur whether dealing with one metadataset or five hundred. In the case of the former these may not be very formal or recognised in the way described here.

The three generic roles shown on Figure 1, metadata creator, service provider and service user are introduced and defined in Part 1 of the Guidelines.

The main steps in the flow are described below:

Metadata creator:

- Selects the data resources for documentation and decides how they should be documented e.g. as one individual documentation or several.
- Uses software tools² to create the metadata; ideally these tools will perform at least elementary validation at entry. The output from this process should be metadata data conforming to a particular standard (e.g. UK GEMINI).
- Uses the same tools to update existing metadata.
- Puts all metadata through a quality control process, possibly a combination of defined automatic and manual tests. There are documented quality evaluation procedures governing these tests with acceptable quality levels (AQLs).
- Passes or fails the metadata based on the results of these tests. If it fails then it is corrected and resubmitted. Metadata which passes is deemed fit for use in the metadata service.

Interface between metadata creator and service provider - this 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.

² For example MetaGenie available from <http://www.gigateway.org.uk/>

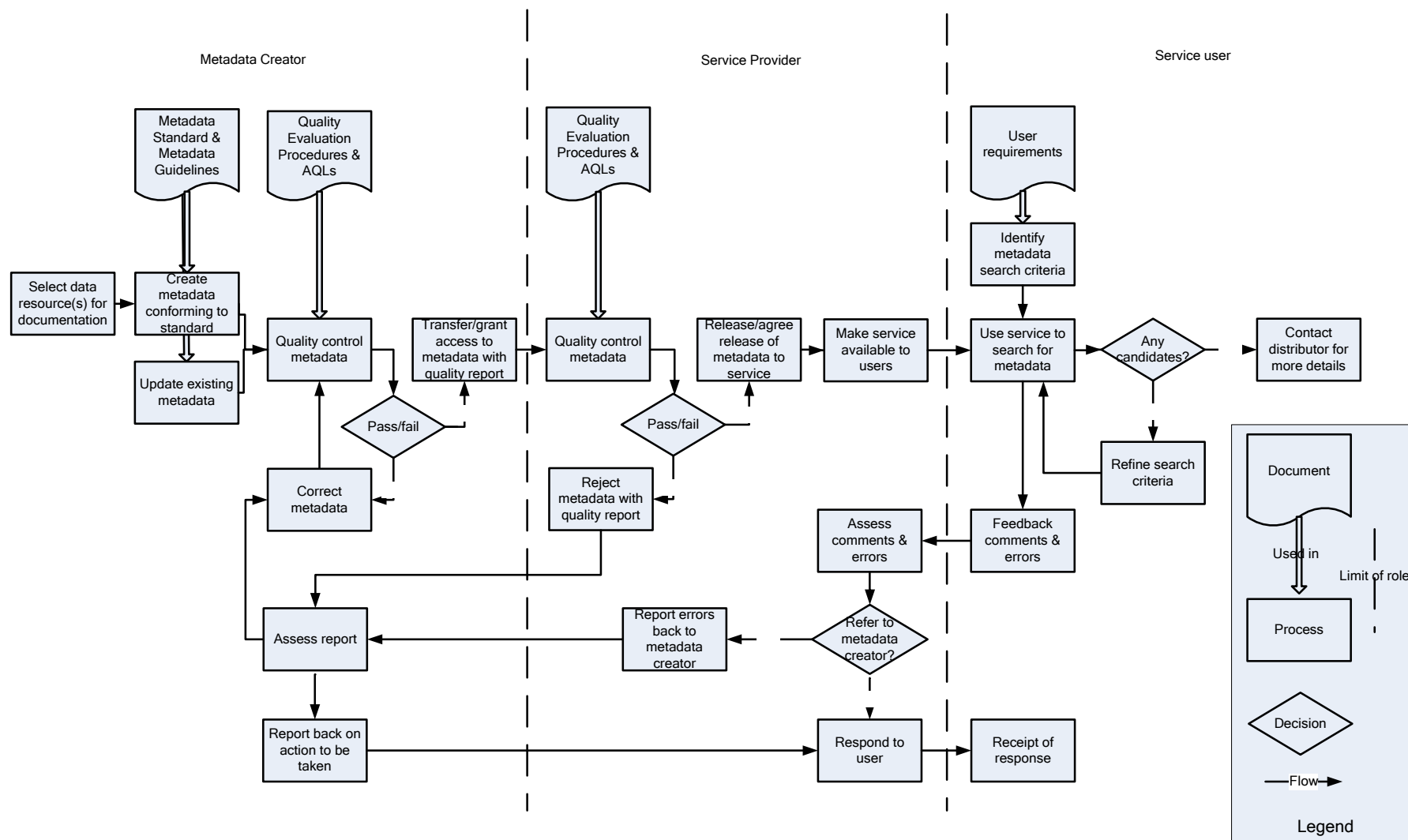


Figure 1. Idealised process model for metadata creation, maintenance, service provision and use.

Service provider:

- Operates an acceptance process using their evaluation and quality control. Where there is a distributed service in operation then the metadata creator might have to produce a certificate verifying that the metadata has been subjected to quality control and the tests show that it meets the agreed AQLs.
- May reject the metadata and refer it back to the metadata creator. The latter will need to assess the report, correct, re-test and resubmit.
- Releases the metadata to the service or agrees with the metadata creator that the metadata may be released to the service. It is then available to users for their searches based on their own user requirements.

Service user:

- Identifies their search criteria based on their requirements.
- Searches the metadata for candidate data resources. If their search is unsuccessful they will need to refine their search criteria. If it is successful then they can go and contact the distributor of the data resource(s) of interest.
- Feeds back any comments or errors they may have found. The service provider will need to assess these and either respond directly to the user or refer these back to the metadata creator for possible correction of errors. Whichever, the user needs to receive a response even if it is to take no further action.

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

- to make quality integral to the metadata creation and maintenance process (and in turn to make this integral to the overall business process);
- for an overall approach to quality assurance with clear points at which there are quality controls;
- for documented quality evaluation procedures and agreed AQLs;
- for the right tools for the job both for metadata entry and quality control (and having people trained in their use);
- for 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.

These points are developed in this document.

1.4 Using this document

The remainder of the document is in two sections with two annexes. The following indicates where you can find specific information and guidance.

- To understand about **metadata quality**, the differences with geospatial data quality, the main quality components and how these apply to UK GEMINI see:
 - 2.1 What is metadata quality?
 - 2.2 What is the difference between data and metadata quality?
 - 2.3 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 GEMINI see:
 - 2.4. What are acceptable quality levels?
 - Annex A: Aggregated AQLs applicable to metadata based on UK GEMINI
- To know about **quality assurance and quality control** in general then see:
 - 2.5 How do you 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 GEMINI then see:
 - 2.6 How do you go about evaluating metadata quality?
 - 2.7 What methods can you apply?
 - Annex B: Quality evaluation procedures for UK GEMINI metadata elements
- To find out more about **maintaining and improving metadata quality** see:
 - 2.8 Maintaining and improving metadata quality
- To better understand **quality roles** – this is particularly aimed at the larger producers and service providers - see:
 - Quality roles – metadata creator, service provider and service user.
- For a very concise distillation of what is in the rest of the document read:
 - Ten dos and don'ts of metadata quality.

2. PRINCIPLES OF METADATA QUALITY

2.1 *What is metadata quality?*

2.1.1 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:

- ‘Fitness for purpose’;
- ‘Performance against specification’;
- ‘Totality of characteristics of a product that bear on its ability to satisfy stated and implied needs’³.

In the case of metadata this can be redefined as:

- Fitness for use in a metadata service;
- Degree of conformance to a specified metadata standard;
- 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 users 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. Further, 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:

- the theme or subject matter of the data resource is correct and comprehensive;
- the area or areas that the data resource relates to are accurately and consistently recorded;
- the purpose for which the data resource can be used is clear;
- the information about how the data was collected, who owns the data and from whom the data can be obtained is reliable;
- the dates relating to capture, update and publication are accurate.

³ International Standard - ISO 8402: 1994 Quality Management and Quality Assurance – 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. Unrealistic because it implies a base against which accuracy, correctness and consistency can be measured - as we will see later, this does not exist. Unachievable because the effort required in attempting to reach “100% quality” is out of all proportion to the value added.

2.1.2 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:

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

We also have to understand the difference between the quality of the geospatial data being documented by the metadata and the quality of the metadata itself. Concepts relating to the points set out above are described in the following sections.

2.2 What is the difference between data and metadata quality?

2.2.1 Contrasting geospatial data quality and metadata quality

There is considerable overlap between the concepts relating to the quality of geospatial data and the metadata derived from this data but there are key differences.

- *The purposes are different* - geospatial data is collected to support an application or group of applications. Metadata is created in order to be able to document that data and provide information that will enable its retrieval in a metadata service.
- *The basis on which quality can be assessed is different* - as has already been discussed, metadata quality is a major determinant of the success and reliability of searches. Since metadata is the result of documenting geospatial data, the quality of the metadata is, at least in part, dependent on the quality of the data itself. If there are inaccuracies and inconsistencies in the source data then these may be reflected in the metadata.
- *The need for across and as well as within metadata consistency* – a metadata service typically uses metadata documenting geographic data drawn from a wide variety of sources, covering a broad range of topics and relating to many

geographical extents. The metadata does not only have to be consistent within a particular metadataset but also across all the instances as far as possible to ensure consistency of search results.

- *Metadata elements carry few values within a metadataset* - a metadataset may contain a large number of metadata elements but each individual element may have only one or a very few values (it may have no values if the element is optional). Geospatial data often contains a large number of attribute types and a large number of values for each type. This means that the approach to testing metadata cannot be the same as that for geospatial data with results usually being Boolean variables (true/false) rather than percentages, ratios or numbers.

2.2.2 The context for geospatial data and metadata quality

The differences between geospatial data quality and metadata quality can be illustrated by reference to the following diagram at Figure 2 which is adapted in part from ISO 19113⁴. In this diagram the view of the real world which is modelled or abstracted in the geospatial data from which the metadata is derived is termed the “universe of discourse” of the data. The universe of discourse includes everything of interest from the real (or a hypothetical) world. Thus the universe of discourse for a topographic map would include all the real world geographic objects (e.g. roads and buildings) that are modelled in the data but exclude all other real world objects (e.g. land parcels) that are not modelled.

The product specification describes how the data producer takes that universe of discourse and produces geospatial data. The quality of the data can then be evaluated and measured against that universe of discourse by the data producer. For example if the data is a topographic map, then the data producer can determine the positional accuracy and completeness of the data against the real world as abstracted and represented according to the product specification.

The metadata is however derived from the geospatial data without, in general, any reference to the original universe of discourse of the geospatial data. The universe of discourse of the metadata is typically much more limited than that of the geospatial data being, at best, the geospatial data itself and any other published information about it which is available. The metadata is produced using a metadata standard e.g. UK GEMINI. The basis for quality evaluation is the universe of discourse of the metadata which is limited.

If the geospatial data is to meet any of the user’s purposes, there has to be some overlap between their requirements and the universe of discourse of the geospatial data. The user’s view of data quality relates to their universe of discourse, in other words, their quality requirements may be within or exceed those met by the data producer. (This emphasises the need to report data quality in order to assess the fitness for purpose of a data resource.) A user trying to discover data resources suitable for their purposes will use their requirements to define their search in a metadata service. From the results of that search they will want to select candidate data resources but in order to truly assess suitability they will need to understand the quality of the data

⁴ International Standard - ISO 19113 :2002 Geographic information – Quality principles

resources themselves. Some metadata services may report data quality; those based on discovery metadata such as UK GEMINI do not usually do so which is limiting.

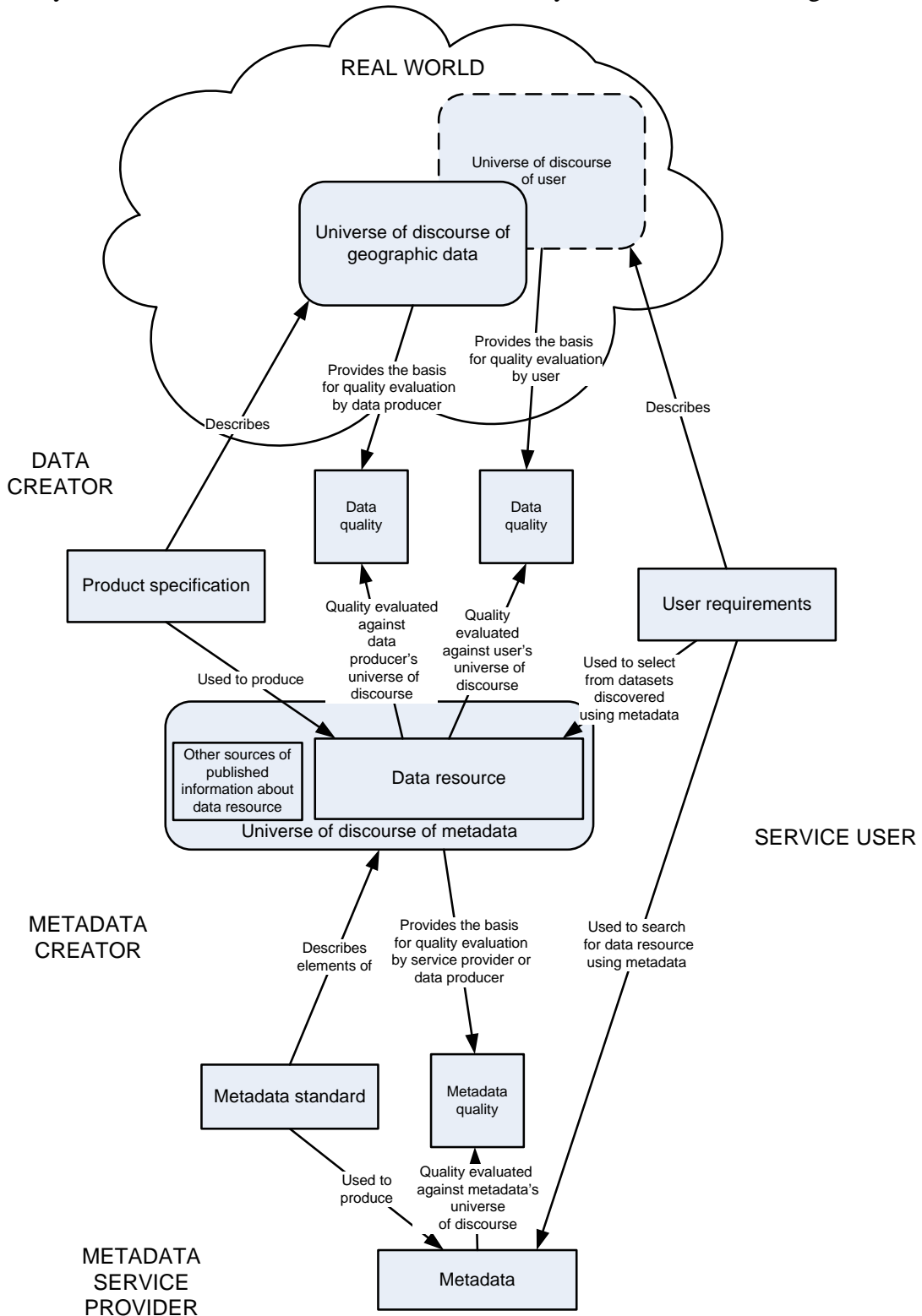


Figure 2. The context for metadata quality. Adapted in part from ISO 19113: 2002 Geographic information – Quality principles.

2.3 What are the main components of metadata quality?

2.3.1 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 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 polygon;
- Temporal accuracy – correctness of dates⁵;
- 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.

Quality sub-elements can be applied at two levels:

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

2.3.2 Applicability to UK GEMINI

The quality elements and sub-elements applicable to metadata at the discovery level based on UK GEMINI 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.

⁵ 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.

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 consistency	Adherence to logical rules for format and domain and the ordering and consistency between metadata elements.	Data type consistency	Correctness of data type to that specified in standard.
		Domain consistency	Adherence of values to domains specified in standard.
		Ordering	Presentation of items in their specified sequence (e.g. start date < finish date, west coordinate is west of east 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	Accuracy of the lateral and vertical extent of data resource as documented in metadata.	Coordinate accuracy	Accuracy of the coordinates defining the bounding box in relation to the extent of the data resource.
		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 metadata elements and the classifications given relative to the last date of update of the metadata.	Classification correctness	Correctness of classes assigned to instances of metadata elements in relation to data resource.
		Non-quantitative correctness	Correctness of non-quantitative values recorded in metadata in relation to data resource.
		Quantitative accuracy	Accuracy of the quantitative values in relation to the data resources being documented.

2.4 What are acceptable quality levels (AQLs)?

2.4.1 Basis of AQLs

Acceptable quality levels (AQLs)⁶ 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.

2.4.2 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 criteria⁷. For example aggregated AQLs could be:

- 100% pass/fail – all metadata elements in a metadataset must reach or exceed the AQL for each element;
- 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;
- 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).

2.4.3 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.
- **Achievable** – setting AQLs which are unachievable by the metadata creator has no purpose since this will result in no metadata being accepted.

⁶ Referred to as “Conformance Quality Levels” in ISO 19114: 2003 Geographic information – Quality evaluation procedures, the more familiar term is used here.

⁷ Derived in part from ISO 19114: 2003, Annex J

- **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.

2.4.4 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;
- 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.

2.4.5 Applicability to UK GEMINI

AQLs applicable to metadata based on UK GEMINI are given below in Table 2⁸. Also included is the aggregated AQL for the metadataset corresponding to an intermediate level of conformance proposed for UK GEMINI. 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.

⁸ See Table 1 for a description of the quality sub-elements.

Table 2. Examples of (i) AQLs applicable to individual metadata elements and (ii) 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 consistency	Data type consistency	No violation of specified data type	No violations of specified data type
	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** 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 all relate to logical consistency. 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.

These are set out in Table 3 below. Full details are given in Annex A.

Table 3. Proposed conformance levels for metadata applicable to UK GEMINI

Level	Definition
1. Basic	Minimum conformance required for inclusion in a metadata service: <ul style="list-style-type: none"> • all mandatory metadata elements are present with no errors of omission or commission; • if optional elements are present there are no errors of commission; • all data types are valid, no values lie outside their specified domains; • values (dates, coordinates and heights) are correctly ordered and there is relative consistency between specified dates and between named extents and coordinates.
2. Intermediate	Basic conformance plus: <ul style="list-style-type: none"> • the accuracy and correctness of the content of the mandatory metadata elements achieves or exceeds a specified aggregated AQL.
3. Full	Intermediate conformance plus: <ul style="list-style-type: none"> • the accuracy and correctness of the content of optional metadata elements achieves or exceeds a specified aggregated AQL.

2.5 How do you quality assure metadata?

As was stated in the Introduction at 1.1, 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.⁹ Examples of where quality control could operate in a metadata production flowline are shown in Figure 1 and described at 1.3.3.

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

- 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;
- prior to data export to the service provider – more comprehensive checks are made using manual and automatic checks;
- 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.

2.6 How do you go about evaluating 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 illustrated in the following diagram at Figure 3. The steps are described in Table 4.

⁹ 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

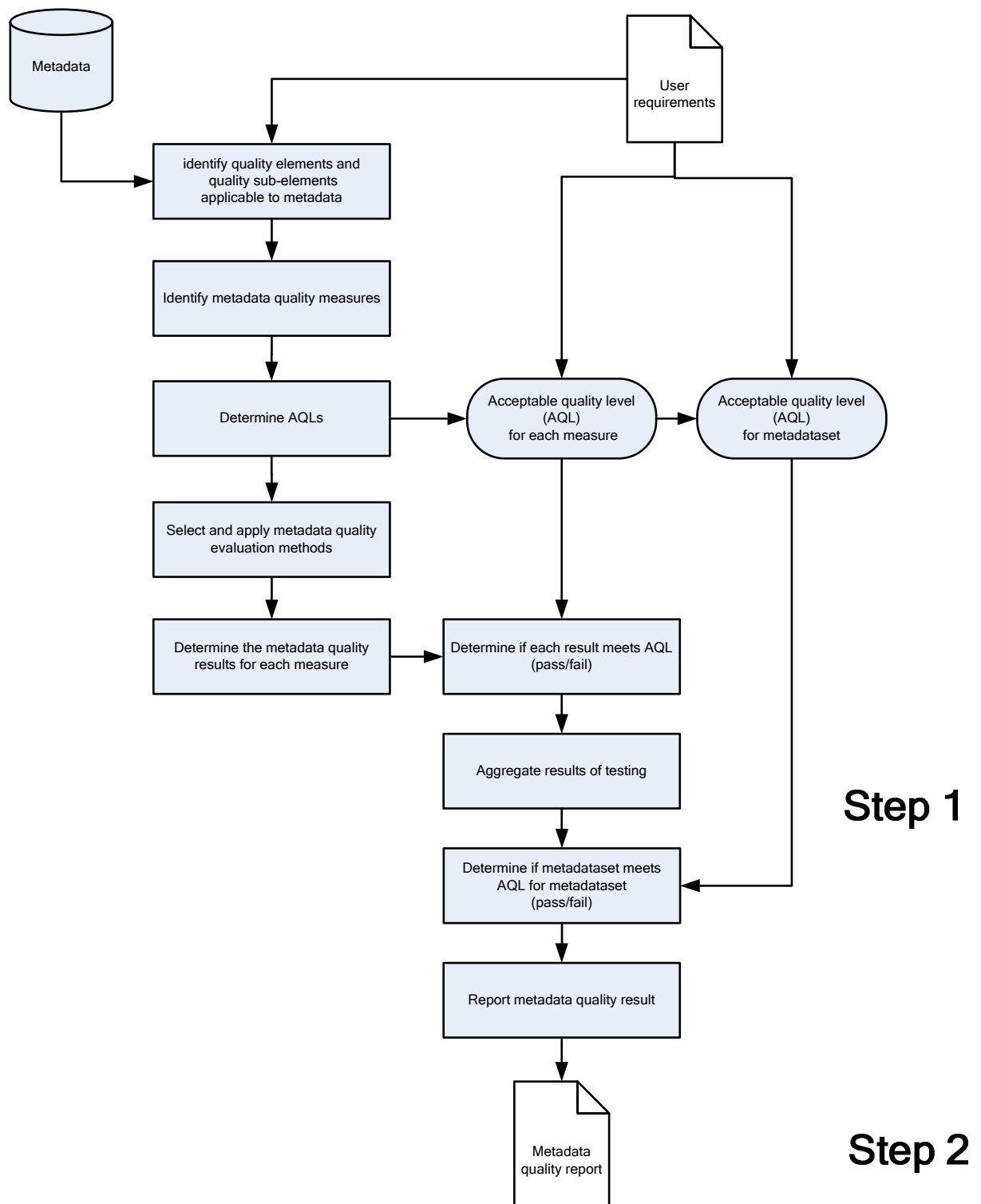


Figure 3. Steps in evaluation and reporting of metadata quality results. Adapted from ISO 19114: 2003 Geographic information – Quality evaluation procedures.

Table 4. Steps in quality evaluation (see Figure 3).

Step	Procedure	Notes
1	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 sub-elements (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 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 AQL for metadataset	Compare the aggregated result with 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

2.7 What methods can you apply?

2.7.1 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.

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

These issues are discussed below¹⁰. As will be seen, these issues are inter-related

2.7.2 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.

As discussed in 2.2 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.

2.7.3 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.

¹⁰ What follows is based in part on ISO 19114:2003 Geographic information – Quality evaluation procedures.

2.7.4 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.

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 the relevant ISO Standard on quality evaluation¹¹.

2.7.5 Applicability to UK GEMINI

Annex B contains proposed quality evaluation procedures for each metadata element created using UK GEMINI. An outline of the evaluation method is given for each of these. These are summarised in the Table 5 below.

The table once again 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.

¹¹ ISO 19114:2003 Geographic information – Quality evaluation procedures.

Table 5. Metadata quality elements and sub-elements with quality evaluation methods applicable to metadata based on UK GEMINI.

Quality element	Quality sub-elements	Evaluation method	Internal/ External (See 2.7.2)	Automatic/ Manual (See 2.7.3)	Full inspect /sampling (See 2.7.4)	Applicability (relevant metadata elements in brackets)
Completeness	Commission	Count occurrence of each element	Internal	Automatic	Full inspection	Optional metadata elements with only one permitted occurrence. (i.e. Lineage, Spatial Resolution, Additional Information Source, Metadata Standard Name, Metadata Standard Version)
	Omission	Count occurrence of each element	Internal	Automatic	Full inspection	All mandatory metadata elements. (e.g. Title, Dataset Language, Abstract, Topic Category and so on)
Logical consistency	Data type consistency	Check data type conforms to Standard	Internal	Automatic	Full inspection	All metadata elements.
	Domain consistency	Check domain conforms to Standard	Internal	Automatic	Full inspection	All metadata elements.
	Ordering	Check dates for duration and east/west, north/south and max/minimum values correctly ordered	Internal	Automatic	Full inspection	Metadata elements containing durations, latitude and longitude and maximum values. (i.e. Date, West, East, North and South Bounding Coordinates, Vertical Extent)
	Relative consistency	Check relationship of dates and extent between different metadata elements	Internal	Automatic	Full inspection	Metadata elements containing dates and geographical extents. (i.e. Dataset Reference Date and Date: East, West, North, and South Bounding Coordinates and Extent)

Quality element	Quality sub-elements	Evaluation method	Internal/ External (See 2.7.2)	Automatic/ Manual (See 2.7.3)	Full inspect /sampling (See 2.7.4)	Applicability (relevant metadata elements in brackets)
Positional accuracy	Coordinate accuracy	Using other sources check the locations referenced by the data resource are contained by the minimum definable bounding box	External	Manual (with use of software tools)	Susceptible of sampling	Metadata elements containing latitude or longitude. (i.e. North, South, East and West Bounding Coordinates)
	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.	External	Manual (with use of software tools)	Susceptible of sampling	Metadata elements containing height information. (i.e. Vertical Extent Information)
	Extent accuracy	Using other sources check the area covered by the data resource is completely contained in the stated extent(s).	External	Manual (with use of software tools)	Susceptible of sampling	Metadata elements containing extents (i.e. Extent).
Temporal accuracy	Date accuracy	Using other sources check accuracy of dates.	External	Manual	Susceptible of sampling	Metadata elements containing dates. (i.e. Date, Dataset Reference Date, Date of Update of Metadata).

Quality element	Quality sub-elements	Evaluation method	Internal/ External (See 2.7.2)	Automatic/ Manual (See 2.7.3)	Full inspect /sampling (See 2.7.4)	Applicability (relevant metadata elements in brackets)
Thematic accuracy	Classification correctness	Using other sources check each class is correct and current relative to the last date of update of the metadata.	External	Manual	Susceptible of sampling	Metadata elements using enumerated lists. (i.e. Topic Category, Spatial Reference System, Spatial Representation Type, Presentation Type, Supply Media, Frequency of Update, Access Constraints, Use Constraint).
	Non-quantitative correctness	Using other sources check each item is correct and current relative to the last date of update of metadata.	External	Manual	Susceptible of sampling	Metadata elements containing free text (i.e. Title, Alternative Title, Dataset Language, Abstract, Subject, Originator, Lineage, Vertical Extent Information, Data Format, Distributor, Additional Information Source, Online Resource, Browse Graphic, Metadata Standard Name, Metadata Standard Version).
	Quantitative accuracy	Using other sources check that the value of the item is correct.	External	Manual (with use of software tools)	Susceptible of sampling	Metadata elements containing quantitative values - other than dates coordinates or heights (i.e. Spatial Resolution).

2.8 Maintaining and improving metadata quality

2.8.1 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 is updated but not the publication or reference date. The preferred approach is to subject the metadataset to complete quality control every time it is updated.

2.8.2 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:

- feeding back and acting on errors found in metadata;
- feeding back on improvements to processes by operators of those processes;
- learning and applying lessons from the use of current processes;
- 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.

2.8.3 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 2.8.1.

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:

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

2.8.4 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:

- quality evaluation of the existing metadata;
- agreement between the metadata creators and the service provider on procedures to deal with metadata not reaching the required level;
- changes or a check on current processes to ensure that they are capable of maintaining the AQLs – this is likely to require to the sort of change management discussed at 2.8.3.
- 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.

3. QUALITY ROLES – METADATA CREATOR, SERVICE PROVIDER AND SERVICE USER

3.1 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 creator
- 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 which is described in 1.3.3 and illustrated in Figure 1.

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.

Further, in an organisation only maintaining one or a few metadatasets, then the metadata creator role will be minor although the principles remain the same.

3.2 What is the quality role of the metadata creator?

The metadata creator, who is frequently also the data producer or publisher, 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:

- understanding the quality requirements for the metadata whether established internally or by some external service provider;
- having an agreement with the service provider and clear procedures for dealing with errors and user feedback;
- establishing or agreeing AQLs that meet requirements (or at least can be practically achieved);
- providing quality assurance through flowline design with adequate quality control built-in;
- ensuring that procedures are in place for both metadata creation and maintenance;

- providing mechanisms for ensuring that changes to data resources trigger changes to the metadata;
- 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;
- having quality evaluation procedures backed by suitable testing tools;
- providing for the identification, quarantining and correction of metadata failing quality evaluation;
- 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;
- having established change control procedures;
- creating a culture of quality improvement where feedback is encouraged and lessons are learned and applied.

3.3 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. They could be expected to make, at least, 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), 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:

- understanding the user requirements and hence the quality requirements for the metadata;
- 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;
- leading on metadata quality within the metadata creator community – providing advice and training;
- developing and managing a programme to bring existing metadata on the service up to current quality levels;

- conducting quality audits to determine current data quality and provide benchmark;
- providing quality assurance with adequate quality controls built-in - the emphasis will be on consistency across metadata as much as quality levels within metadatasets;
- ensuring that metadata relating to particular data resources is not duplicated by different metadata creators;
- ensuring that procedures are in place for metadata acceptance and release to the metadata service;
- having quality evaluation procedures backed by suitable testing tools;
- providing mechanisms for ensuring that metadata creators regularly review and update the metadata;
- providing advice and support on suitable tools for metadata capture conforming to the prevailing metadata standard;
- giving adequate training of staff for the operation of the service with an emphasis on metadata quality;
- having established change control procedures agreed with metadata creators;
- having in place mechanisms for service users to feed back errors and comments;
- having procedures for processing and responding to user feedback;
- creating a culture of quality improvement where feedback is encouraged, lessons are learned and applied.

3.4 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.

4. TEN 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 GEMINI – for guidance only

Table indicates AQLs by metadata element.

Metadata elements in brackets indicate that the AQLs are conditional on the metadata element being present i.e. the metadata elements are optional.

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 Table 3 for an explanation of conformance levels.

Metadata guidelines for geospatial datasets – Part 3

Element name Elements in main element equating to a class	Metadata quality elements and Metadata quality sub-elements AQL in cells														
	Completeness		Logical consistency				Positional accuracy			Temporal accuracy	Thematic accuracy				
	Commission	Omission	Data type	Domain	Ordering	Relative	Coord accuracy	Vertical accuracy	Extent accuracy	Date accuracy	Classification	Non-quantitative	Quantitative		
Title		No omission	No violation(s) of data type	No violation(s) of domain								Item must pass			
(Alternative title)														<i>Item(s) must pass</i>	
Dataset language		No omission												Item(s) must pass	
Abstract															
Topic category													Item(s) must pass		
Subject														Item(s) must pass	
Date								Item must pass					Item must pass		
Dataset reference date									Item must pass						
(Originator)														<i>Item(s) must pass</i>	
(Lineage)	No commission														
West bounding coordinate		No omission					Item must pass		Item must pass						
East bounding coordinate															
North bounding coordinate								Item must pass							
South bounding coordinate															
Extent							All items must pass			Item(s) must pass					

Metadata guidelines for geospatial datasets – Part 3

Element name	Elements in main element equating to a class	Metadata quality elements and Metadata quality sub-elements AQL in cells														
		Completeness		Logical consistency				Positional accuracy			Temporal accuracy	Thematic accuracy				
		Commission	Omission	Data type	Domain	Ordering	Relative	Coord accuracy	Vertical accuracy	Extent accuracy	Date accuracy	Classification	Non-quantitative	Quantitative		
(Vertical extent information)			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				<i>All class instances must pass</i>				<i>All class instances must pass</i>		
	Minimum value		No omission	No violation of data type	No violation of domain	Item must pass				<i>Item must pass</i>						
	Maximum value															
	Unit of measure														<i>Item must pass</i>	
	Vertical datum															
Spatial reference system		No omission	No violation(s) of data type	No violation of domain								<i>Item must pass</i>				
(Spatial resolution)	No commission													<i>Item must pass</i>		
(Spatial representation type)													<i>Item(s) must pass</i>			
(Presentation type)																
Data format		No omission												<i>Item(s) must pass</i>		
(Supply media)														<i>Items must pass</i>		
Distributor		No omission	No violations of data type in class instances	No violations of domain in class instances									<i>All class instances must pass</i>			
	Distributor contact title		No omission	No violation of data type	No violation of domain									<i>Item must pass</i>		
	Name of distributor															
	(Postal address of distributor)	No commission												<i>Item must pass</i>		

Metadata guidelines for geospatial datasets – Part 3

Element name Elements in main element equating to a class		Metadata quality elements and Metadata quality sub-elements AQL in cells														
		Completeness		Logical consistency				Positional accuracy			Temporal accuracy	Thematic accuracy				
		Commission	Omission	Data type	Domain	Ordering	Relative	Coord accuracy	Vertical accuracy	Extent accuracy	Date accuracy	Classification	Non-quantitative	Quantitative		
Distributor (cont)	(Telephone number of distributor)	No commission		No violation of data type	No violation of domain								<i>Item must pass</i>			
	(Facsimile number of distributor)															
	(Email address of distributor)															
	(Web address of distributor)															
Frequency of update			No omission	No violation(s) of data type	No violation(s) of domain							Item must pass				
(Access constraint)														<i>Item(s) must pass</i>		
(Use constraints)																
(Additional information source)		(No commission)											<i>Item(s) must pass</i>			
(Online resource)																
(Browse graphic)																
Date of update of metadata			No omission									Item must pass				
(Metadata standard name)		No commission											<i>Item must pass</i>			
(Metadata standard version)																

ANNEX B. QUALITY EVALUATION PROCEDURES

These apply to UK GEMINI 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

Metadata element name		Title		
Obligation		Mandatory		
Number of occurrences		Single		
Data Type		CharacterString		
Domain		Free text		
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count occurrences of Title. If one then pass else fail
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type. If Character String 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 item is Free Text. If not valid Free Text then fail else pass
			Value type	Boolean variable
			Conformance level	No violation of domain
			Notes	
	Content accuracy	Non-quantitative	Quality measure	Correctness
			Measure description	Pass-Fail
			Evaluation method	Using other sources check Title of data resource correct and current relative to the Date of Update of Metadata. If other sources confirm Title or impossible to check then pass. If checks indicate discrepancy then fail.
Value type			Boolean variable	
AQL			Item must pass	
Notes			Other sources could include, product catalogues and distributor's website. Even if there are no other sources or the data resource has no formal name and one has been created, elementary checks against Abstract and of spelling, understandability and conformance to rules for entry should be made.	

Annex B.2 Alternative title

Metadata element name		Alternative title		
Obligation		Optional		
Number of occurrences		Multiple		
Data Type		CharacterString		
Domain		Free text		
Metadata quality element Metadata quality sub-element	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Alternative Title(s) present then check data type of each item. If Character String then pass else fail
			Value type	Boolean variable
			AQL	No violation of data type
			Notes	
		Domain	Quality measure	Within specified domain
			Measure description	Conditional Pass-Fail
			Evaluation method	If Alternative Title(s) present then check domain of each item. Check item is Free Text. If not valid Free Text then fail else pass
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	
	Thematic accuracy	Non-quantitative	Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Alternative Title(s) present then use other sources to check that each Alternative Title of data resource is correct and current relative to the Date of Update of Metadata. If other sources confirm Alternative Title or impossible to check then pass. If checks indicate discrepancy then fail.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks against Abstract and of spelling, understandability and conformance to rules for entry should be made. Check for duplicate entries.

Annex B.3 Dataset language

Metadata element name			Dataset language	
Obligation			Mandatory	
Number of occurrences			Multiple	
Data Type			CharacterString	
Domain			Free text	
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count occurrences of Dataset Language. If zero then fail else pass
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type of each item. If Character String 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 each item is Free Text. If valid Free Text then pass else fail
			Value type	Boolean variable
			AQL	No violations of domain
			Notes	Recommended that this conforms to a controlled vocabulary e.g. ISO 639-2 (see rules for entry in Part 2 of these Guidelines). If so, then this can be checked
	Thematic accuracy	Non-quantitative	Quality measure	Correctness
			Measure description	Pass-Fail
			Evaluation method	Using other sources check against each Language of Dataset for correctness and currency relative to the Date of Update of Metadata. If other sources confirm Language of Dataset or impossible to check then pass. If checks indicate discrepancy then fail.
			Value type	Boolean variable
			AQL	All items must pass
			Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks should be made. Is the item a recognised language and is it spelt correctly? Check for duplicate entries

Annex B.4 Abstract

Metadata element name		Abstract		
Obligation		Mandatory		
Number of occurrences		Single		
Data Type		CharacterString		
Domain		Free text		
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count occurrences of Abstract. If one then pass else fail.
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type. If Character String 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 item is Free Text. If not valid Free Text then fail else pass
			Value type	Boolean variable
			AQL	No violations of domain
			Notes	
	Thematic accuracy	Non-quantitative	Quality measure	Correctness
			Measure description	Pass-Fail
			Evaluation method	Using other sources check Abstract correct and current relative to Date of Update of Metadata If other sources confirm content and or impossible to check then pass. If checks indicate discrepancy then fail.
			Value type	Boolean variable
			AQL	All items must pass
			Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks should be made. Is the item in a recognised language and is it spelt correctly? Does the abstract conform to the rules for entry and provide a clear statement of the content of the data resources and not just general background information?

Annex B.5 Topic category

Metadata element name			Topic category	
Obligation			Mandatory	
Number of occurrences			Multiple	
Data Type			Class	
Domain			Code list	
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count occurrences of Topic Category. If zero then fail else pass
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type of each item. If code of type specified in Standard 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 of each item. If domain not within code range specified in Standard then fail else pass.
			Value type	Boolean variable
			AQL	No violations of domain
			Notes	Currently the Standard specifies integer codes in the range 001-019.
	Thematic accuracy	Classification	Quality measure	Correctness
			Measure description	Pass-Fail
			Evaluation method	Using other sources check each Topic Category is correct and current relative to the Date of Update of Metadata. If other sources confirm Topic Category or impossible to check then pass. If checks indicate discrepancy or key Topic Categories omitted then fail.
			Value type	Boolean variable
			AQL	All items must pass
			Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks should be made. Do the topic categories relate to the Abstract? Do those chosen follow the rules for data entry? Are they complete? Check for duplicate entries.

Annex B.6 Subject

Metadata element name		Subject		
Obligation		Mandatory		
Number of occurrences		Multiple		
Data Type		CharacterString		
Domain		Free text		
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count occurrences of Subject. If zero then fail else pass
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type of each item. If Character String 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 each item of Free Text. If valid Free Text then pass else fail
			Value type	Boolean variable
			AQL	No violations of domain
			Notes	
	Thematic accuracy	Non- quantitative	Quality measure	Correctness
			Measure description	Pass-Fail
			Evaluation method	Using other sources check against each Subject for correctness and currency relative to the Date of Update of Metadata. If other sources confirm Subject or impossible to check then pass. If checks indicate discrepancy then fail.
			Value type	Boolean variable
			AQL	All items must pass
			Notes	Other sources could include product catalogues and distributor’s website. Even if there are no other sources, elementary checks should be made. There should be some correlation with the Abstract and Topic Category. Check for duplicate entries.

Annex B.7 Date

Metadata element name		Date		
Obligation		Mandatory		
Number of occurrences		Single		
Data Type		Date as specified by ISO 8601		
Domain		Duration of period as specified by ISO 8601		
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count occurrences of Date. If one then pass else fail
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type. If date conforms to ISO 8601 then pass else fail.
			Value type	Boolean variable
			AQL	No violation of data type
			Notes	There must be a date even if only for a century. Nulls are not valid.
		Domain	Quality measure	Within specified domain
			Measure description	Pass-Fail
			Evaluation method	Check domain of Date. Date 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.
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	
		Ordering	Quality measure	Date ordering
			Measure description	Pass-Fail
			Evaluation method	If duration given then check consistency of date ordering. If fromdate not <= todate then fail else pass.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	

(Continued overleaf)

Metadata quality element Metadata quality sub-element	Temporal accuracy	Date accuracy	Quality measure	Date accuracy
			Measure description	Pass-Fail
			Evaluation method	Using other sources check Date for accuracy of date. (Start or finish of data capture should correspond to the dates in the data resource to the nearest year.) If fromdate (where supplied) and todate (where supplied) accurate or impossible to check then pass. If other sources indicate a discrepancy in start date (where supplied) or end date (where supplied) then fail.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks of dates should be made.

Annex B.8 Dataset reference date

Metadata element name		Dataset reference date		
Obligation		Mandatory		
Number of occurrences		Single		
Data Type		Date as specified by ISO 8601		
Domain		Date		
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count occurrences of Dataset Reference Date. If one then pass else fail
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type. If date conforms to ISO 8601 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 of Dataset Reference Date. Date should be 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). If not valid domain then fail else pass.
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	
		Relative	Quality measure	Relative dates
			Measure description	Pass-Fail
			Evaluation method	Check Dataset Reference Date against Date. If Dataset Reference Date < (todate or single) Date then fail else pass.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	This is to test that the Dataset Reference Date is equal to, or later than, the Date.

(Continued overleaf)

Metadata quality element Metadata quality sub-element	Temporal accuracy	Date accuracy	Quality measure	Date accuracy
			Measure description	Pass-Fail
			Evaluation method	Using other sources check date for accuracy. If date accurate or impossible to check then pass. If other sources indicate a discrepancy in date or then fail.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks of date and conformance to the rules for entry should be made.

Annex B.9 Originator

Metadata element name		Originator		
Obligation		Optional		
Number of occurrences		Multiple		
Data Type		CharacterString		
Domain		Free text		
Metadata quality element Metadata quality sub-element	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Originator(s) present then check data type of each item. If Character String then pass else fail
			Value type	Boolean variable
			AQL	No violation of data type
			Notes	
		Domain	Quality measure	Within specified domain
			Measure description	Conditional Pass-Fail
			Evaluation method	If Originator(s) present then check domain of each item. Check item is Free Text If not valid Free Text then fail else pass
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	
	Thematic accuracy	Non-quantitative	Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Originators(s) present then use other sources to check that each Originator is correct and current relative to the Date of Update of Metadata. If other sources confirm Originator or impossible to check then pass. If checks indicate discrepancy then fail.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks of spelling and conformance to the rules for entry should be made. Check for duplicate entries.

Annex B.10 Lineage

Metadata element name		Lineage		
Obligation		Optional		
Number of occurrences		Single		
Data Type		CharacterString		
Domain		Free text		
Metadata quality element Metadata quality sub-element	Completeness	Commission	Quality measure	Presence of excess items
			Measure description	Conditional Pass-Fail
			Evaluation method	If Lineage present then count number of occurrences. If one then pass else fail.
			Value type	Boolean variable
			AQL	No commission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Lineage present then check data type. If Character String then pass else fail
			Value type	Boolean variable
			AQL	No violation of data type
			Notes	
		Domain	Quality measure	Within specified domain
			Measure description	Conditional Pass-Fail
			Evaluation method	If Lineage present then check item is Free Text. If valid Free Text then pass else fail
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	In addition could check if item in valid language
	Thematic accuracy	Non-quantitative	Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Lineage present then using other sources check Lineage of data resource correct and current relative to the Date of Update of Metadata. If other sources confirm Lineage or impossible to check then pass. If checks indicate discrepancy then fail.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks of spelling, understandability and conformance to the rules for entry should be made.

Annex B.11 West bounding coordinate

Metadata element name		West bounding coordinate		
Obligation		Mandatory		
Number of occurrences		Single		
Data Type		Real		
Domain		-180.0 <= value <= 180.0		
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count occurrences of item. If one then pass else fail.
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	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. If -180 <= value <= 180 then pass else fail.
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	
		Ordering	Quality measure	East/West ordering
			Measure description	Pass-Fail
			Evaluation method	Check the bounding coordinates for consistency. If west bounding longitude west of east bounding longitude then pass else fail.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	

(Continued overleaf)

Metadata quality element Metadata quality sub-element	Positional accuracy	Coordinate accuracy	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 minimum definable bounding box and are current relative to the Date of Update of Metadata. If the value of the greatest westerly extent of data resource = value of west bounding longitude +/- 0.1° then pass else fail.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks against a map base should be made. Limits other than +/- 0.1° may be used as long as specified.

Annex B.12 East bounding coordinate

Metadata element name		East bounding coordinate		
Obligation		Mandatory		
Number of occurrences		Single		
Data Type		Real		
Domain		-180.0 <= value <= 180.0		
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count occurrences of item. If one then pass else fail.
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	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. If -180 <= value <= 180 then pass else fail.
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	
	Positional accuracy	Coordinate accuracy	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 minimum definable bounding box and are current relative to the Date of Update of Metadata. If the value of the greatest easterly extent of data resource = value of east bounding longitude +/- 0.1° then pass else fail.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks against a map base should be made. Limits other than +/- 0.1° may be used as long as specified.

Annex B.13 North bounding coordinate

Metadata element name		North bounding coordinate		
Obligation		Mandatory		
Number of occurrences		Single		
Data Type		Real		
Domain		-90.0 <= value <= 90.0		
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count occurrences of item. If one then pass else fail.
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	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. If -90.0 <= value <= 90.0 then pass else fail.
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	
		Ordering	Quality measure	North/South ordering
			Measure description	Pass-Fail
			Evaluation method	Check the bounding coordinates for consistency. If north bounding latitude north of south bounding latitude then pass else fail.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	

(Continued overleaf)

Metadata quality element Metadata quality sub-element	Positional accuracy	Coordinate accuracy	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 minimum definable bounding box and are current relative to the Date of Update of Metadata. If the value of the greatest northerly extent of data resource = value of north bounding latitude +/- 0.1° then pass else fail.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks against a map base should be made. Limits other than +/- 0.1° may be used as long as specified.

Annex B.14 South bounding coordinate

Metadata element name		South bounding coordinate		
Obligation		Mandatory		
Number of occurrences		Single		
Data Type		Real		
Domain		-90.0 <= value <= 90.0		
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count occurrences of item. If one then pass else fail.
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	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. If -90.0 <= value <= 90.0 then pass else fail.
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	
	Positional accuracy	Coordinate accuracy	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 minimum definable bounding box and are current relative to the Date of Update of Metadata. If the value of the greatest southerly extent of data resource = value of south bounding latitude +/- 0.1° then pass else fail.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks against a map base should be made. Limits other than +/- 0.1° may be used as long as specified.

Annex B.15 Extent

Metadata element name		Extent		
Obligation		Mandatory		
Number of occurrences		Multiple		
Data Type		Enumerated list		
Domain		Code list as defined in ISO 3166		
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count occurrences of Extent. If zero then fail else pass.
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type of each item. If code of type specified in Standard 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 of each item. If within code range specified in Standard then pass else fail.
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	
		Relative	Quality measure	Extent v latitude/longitude
			Measure description	Pass-Fail
			Evaluation method	Check that for each Extent that some part of the bounding box defined by the East and West bounding longitude and the North and South bounding latitude overlaps with some part of the polygon defined by that Extent. If overlap occurs then pass else fail.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	

(Continued overleaf)

Metadata quality element Metadata quality sub-element	Positional accuracy	Extent accuracy	Quality measure	Extent accuracy
			Measure description	Pass-Fail
			Evaluation method	Using other sources check the locations referenced by the data resource are completely contained in the Extent(s) and current relative to the Date of Update of Metadata. If other sources confirm the area completely contained then pass else fail.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks against a map base and the rules for entry should be made.

Annex B.16 Vertical extent information

Metadata element name			Vertical extent information		
Obligation			Optional		
Number of occurrences			Multiple		
Data Type			Class		
Domain			Aggregated class EX_VerticalExtent (see below)		
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items	
			Measure description	Conditional Pass-Fail	
			Evaluation method	If Vertical Extent Information class present then for each class instance check no omissions of elements. If all instances pass then pass else fail.	
			Value type	Boolean variable	
			AQL	No omission if class present	
			Notes	All elements must be present in each class instance.	
		Logical consistency	Data type	Quality measure	Valid data type
				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
				AQL	No violation of data type in each element in each class instance
				Notes	This is to test that all element values pass in each class instance.
	Domain		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. If all instances pass then pass else fail.	
			Value type	Boolean variable	
			AQL	No violation of domain in each element in each class instance	
			Notes	This is to test that all element values pass.	
	Ordering		Quality measure	Max/min ordering	
			Measure description	Conditional Pass-Fail	
			Evaluation method	If Vertical Extent Information class present then for each instance check conformance of Minimum Value element. If Minimum Value passes then pass else fail.	
			Value type	Boolean variable	
			AQL	All class instances must pass	
			Notes	This is to test that Minimum Value is less than or equal to Maximum Value in each class instance.	

(Continued overleaf)

Metadata quality element Metadata quality sub-element	Positional box accuracy	Vertical accuracy	Quality measure	Max/Min accuracy
			Measure description	Conditional Pass-Fail
			Evaluation method	If Vertical Extent Information class present then for each class instance check conformance of Minimum Value and Maximum Value. If Minimum Value and Maximum Value pass then pass else fail.
			Value type	Boolean variable
			AQL	All class instances must pass
			Notes	This is to test that Maximum and Minimum Values pass accuracy test in each class instance.
	Thematic accuracy	Non-quantitative	Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Vertical Extent Information class present then for each class instance check correctness of Unit of Measure and Vertical Datum. If Unit of Measure and Vertical Datum pass then pass else fail.
			Value type	Boolean variable
			AQL	All class instances must pass
			Notes	This is to test that Unit of Measure and Vertical Datum pass content accuracy test in each class instance.

For details of EX_VerticalExtent Class see below

EX_VerticalExtent Class

Metadata element name			Minimum value	
Obligation			Mandatory	
Number of occurrences			Single	
Data Type			Real	
Domain			Real	
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count occurrences of Minimum Value within Vertical Extent Information element. If one then pass else fail.
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	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. If Real of any value then pass else fail.
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	
		Ordering	Quality measure	Max/min consistency
			Measure description	Pass-Fail
			Evaluation method	Check the Minimum and Maximum Values for consistency. If Maximum Value => Minimum Value then pass else fail.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	
	Positional accuracy	Vertical accuracy	Quality measure	Max/Min accuracy
			Measure description	Pass-Fail
			Evaluation method	Using other sources check the minimum value of the vertical extent in the data resource. If minimum value = > Minimum Value or impossible to check then pass else fail.
Value type			Boolean variable	
AQL			Item must pass	
Notes			Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks against a contour map base should be made.	

EX_VerticalExtent Class

Metadata element name			Maximum value	
Obligation			Mandatory	
Number of occurrences			Single	
Data Type			Real	
Domain			Real	
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count occurrences of Maximum Value within Vertical Extent Information element. If one then pass else fail.
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	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. If Real of any value then pass else fail.
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	
	Positional accuracy	Vertical accuracy	Quality measure	Max/Min accuracy
			Measure description	Pass-Fail
			Evaluation method	Using other sources check the maximum value of the vertical extent in the data resource. If value = < Maximum Value or impossible to check then pass else fail.
Value type			Boolean variable	
AQL			Item must pass	
Notes			Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks against a contour map base should be made.	

EX_VerticalExtent Class

Metadata element name			Unit of measure	
Obligation			Mandatory	
Number of occurrences			Single	
Data Type			CharacterString	
Domain			Free text	
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count occurrences of Unit of Measure within Vertical Extent Information element. If one then pass else fail.
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type. If CharacterString 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. If valid Free Text then pass else fail.
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	
	Thematic accuracy	Non-quantitative	Quality measure	Correctness
			Measure description	Pass-Fail
			Evaluation method	Using other sources check Unit of Measure for correctness. If other sources confirm Unit of Measure or impossible to check then pass. If checks indicate a discrepancy then fail.
Value type			Boolean variable	
AQL			Item must pass	
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 is at least a recognised unit of measure.	

EX_VerticalExtent Class

Metadata element name			Vertical datum	
Obligation			Mandatory	
Number of occurrences			Single	
Data Type			CharacterString	
Domain			Free text	
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count occurrences of Vertical Datum within Vertical Extent Information element. If one then pass else fail.
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type. If CharacterString 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. If valid Free Text then pass else fail.
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	
	Thematic accuracy	Non-quantitative	Quality measure	Correctness
			Measure description	Pass-Fail
			Evaluation method	Using other sources check Vertical Datum for correctness. If other sources confirm Vertical Datum or impossible to check then pass. If checks indicate a discrepancy then fail.
			Value type	Boolean variable
			AQL	Item must pass
			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 is at least a recognised vertical datum e.g. "Ordnance Survey Datum - Newlyn".

Annex B.17 Spatial reference system

Metadata element name		Spatial reference system		
Obligation		Mandatory		
Number of occurrences		Single		
Data Type		Enumerated list		
Domain		Code list SpatialReferenceSystem		
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count occurrences of Spatial Reference System. If one then pass else fail
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type. If code of type specified in Standard 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. If within code range specified in Standard then pass else fail.
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	Current Standard has codes in range 001-021
	Thematic accuracy	Classification	Quality measure	Correctness
			Measure description	Pass-Fail
			Evaluation method	Using other sources check that Spatial Reference System is correct. If other sources confirm Spatial Reference System or impossible to confirm then pass. If checks indicate discrepancy then fail.
Value type			Boolean variable	
AQL			Item must pass	
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 entry appears reasonable (e.g. if Northern Ireland it is “Irish Grid” or “Irish Transverse Mercator” and not “National Grid of Great Britain”) and conforms to rules for entry.	

Annex B.18 Spatial resolution

Metadata element name		Spatial resolution		
Obligation		Optional		
Number of occurrences		Single		
Data Type		Real		
Domain		Real>0		
Metadata quality element Metadata quality sub-element	Completeness	Commission	Quality measure	Presence of excess items
			Measure description	Conditional Pass-Fail
			Evaluation method	If Spatial Resolution present then count number of occurrences. If one then pass else fail.
			Value type	Boolean variable
			AQL	No commission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Spatial Resolution present then 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	Conditional Pass-Fail
			Evaluation method	If Spatial Resolution present then check domain. If Real > 0 then pass else fail.
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	
	Thematic accuracy	Quantitative	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% ¹² 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.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks for conformance to rules for entry and reasonableness should be made (e.g. if the data resource is a 1:50,000 map then it is not going to have a spatial resolution of (say) <10 m).

¹² Proposed value – subject to modification.

Annex B.19 Spatial representation type

Metadata element name		Spatial representation type		
Obligation		Optional		
Number of occurrences		Multiple		
Data Type		Enumerated list		
Domain		Code list		
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Spatial Representation Type(s) present then check data type of each item. If code of type specified in Standard then pass else fail.
			Value type	Boolean variable
			AQL	No violation of data type
			Notes	
		Domain	Quality measure	Within specified domain
			Measure description	Conditional Pass-Fail
			Evaluation method	If Spatial Representation Type(s) present then check domain of each item. If within code range specified in the Standard then pass else fail.
	Value type		Boolean variable	
	AQL		No violations of domain	
	Notes		Currently the Standard specifies integer codes in the range 001-006.	
	Thematic accuracy	Classification	Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Spatial Representation Type(s) present then using other sources check that each item is correct. If other sources confirm Spatial Representation Type or impossible to confirm then pass. If checks indicate discrepancy then fail.
			Value type	Boolean variable
			AQL	All items must pass
			Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks should be made. Do the types relate to the Abstract? Are they complete? Do they conform to the rules for entry? Check for duplicate entries.

Annex B.20 Presentation type

Metadata element name		Presentation type		
Obligation		Optional		
Number of occurrences		Multiple		
Data Type		Enumerated list		
Domain		Code list		
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Presentation Type(s) present then check data type of each item. If code of type specified in Standard then pass else fail.
			Value type	Boolean variable
			AQL	No violation of data type
			Notes	
		Domain	Quality measure	Within specified domain
			Measure description	Conditional Pass-Fail
			Evaluation method	If Presentation Type(s) present then check domain of each item. If within code range specified in the Standard then pass else fail.
			Value type	Boolean variable
			AQL	No violations of domain
			Notes	Currently the Standard specifies integer codes in the range 001-014.
	Thematic accuracy	Classification	Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Presentation Type(s) present then using other sources check that each item is correct. If other sources confirm Presentation Type or impossible to confirm then pass. If checks indicate discrepancy then fail.
			Value type	Boolean variable
			AQL	All items must pass
			Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks should be made. Do the types relate to the Abstract? Are they complete? Do they conform to the rules for entry? Check for duplicate entries.

Annex B.21 Data format

Metadata element name			Data format	
Obligation			Mandatory	
Number of occurrences			Multiple	
Data Type			CharacterString	
Domain			Free text	
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count occurrences of Subject. If zero then fail else pass
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type of each item. If Character String 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 each item of Free Text If valid Free Text then pass else fail
			Value type	Boolean variable
			AQL	No violations of domain
			Notes	
	Thematic accuracy	Non-quantitative	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.
Value type			Boolean variable	
AQL			All items must pass	
Notes			Other sources could include product catalogues and distributor’s website. Even if there are no other sources, elementary checks should be made for conformance to rules for entry, spelling and accepted data format names. There may be some correlation with the Abstract. Check for duplicate entries.	

Annex B.22 Supply media

Metadata element name		Supply media		
Obligation		Optional		
Number of occurrences		Multiple		
Data Type		Enumerated list		
Domain		Code list		
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Supply Media present then check data type of each item. If code of type specified in Standard then pass else fail.
			Value type	Boolean variable
			AQL	No violation of data type
			Notes	
		Domain	Quality measure	Within specified domain
			Measure description	Conditional Pass-Fail
			Evaluation method	If Supply Media present then check domain of each item. If within code range specified in the Standard then pass else fail.
			Value type	Boolean variable
			AQL	No violations of domain
			Notes	Currently the Standard specifies integer codes in the range 001-018.
	Thematic accuracy	Classification	Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Supply Media present then using other sources check that each item is correct. If other sources confirm Supply Media or impossible to confirm then pass. If checks indicate discrepancy then fail.
			Value type	Boolean variable
			AQL	All items must pass
			Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks should be made. Do the types relate to the Abstract? Are they complete? Do they conform to rules for entry? Check for duplicate entries.

Annex B.23 Distributor

Metadata element name		Distributor		
Obligation		Optional		
Number of occurrences		Multiple		
Data Type		Class		
Domain		Class CI_ResponsibleParty		
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count instances of Distributor class. If one or more occur and all conform then pass else fail.
			Value type	Boolean variable
			AQL	No omission if class present.
			Notes	Distributor Contact Title and Name of Distributor must be present in each class instance.
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check conformance of each Distributor class instance to data type. If all conform then pass else fail.
			Value type	Boolean variable
			AQL	No violation of data type in each element in each class instance
			Notes	This is to test that all element values pass within each class instance
		Domain	Quality measure	Within specified domain
			Measure description	Pass-Fail
			Evaluation method	Check conformance of each Distributor class instance to domain. If all conform then pass else fail.
			Value type	Boolean variable
			AQL	No violation of domain in each element in each class instances
			Notes	This is to test that all element values pass in each class instance.
	Thematic accuracy	Non-quantitative	Quality measure	Correctness
			Measure description	Pass-Fail
			Evaluation method	Check conformance of each Distributor class instance. If all conform then pass else fail.
			Value type	Boolean variable
			AQL	All class instances must pass
			Notes	This is to test that all element values pass in each class instance.

For details of CI_ResponsibleParty Class see below

CI ResponsibleParty Class

Metadata element name			Distributor contact title	
Obligation			Mandatory	
Number of occurrences			Single	
Data Type			CharacterString	
Domain			Free text	
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count occurrences of Distributor Contact Title. If one then pass else fail.
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type. If Character String 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 item is Free Text. If valid Free Text then pass else fail
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	
	Thematic accuracy	Non- quantitative	Quality measure	Correctness
			Measure description	Pass-Fail
			Evaluation method	Using other sources check Distributor Contact Title of data resource correct and current relative to the Date of Update of Metadata. If other sources confirm Distributor Contact Title or impossible to check then pass. If checks indicate discrepancy then fail.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks of spelling and conformance to rules for entry should be made.

CI ResponsibleParty Class

Metadata element name			Name of distributor	
Obligation			Mandatory	
Number of occurrences			Single	
Data Type			CharacterString	
Domain			Free text	
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count occurrences of Name of Distributor. If one then pass else fail
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type. If Character String 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 item is Free Text. If valid Free Text then pass else fail
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	
	Thematic accuracy	Non- quantitative	Quality measure	Correctness
			Measure description	Pass-Fail
			Evaluation method	Using other sources check Name of Distributor of data resource correct and current relative to the Date of Update of Metadata. If other sources confirm Name of Distributor or impossible to check then pass. If checks indicate discrepancy then fail.
Value type			Boolean variable	
AQL			Item must pass	
Notes			Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks should be made. Is it a recognised distributor, is it spelt correctly, is the name given in full?	

CI_ResponsibleParty Class

Metadata element name			Postal address of distributor	
Obligation			Optional	
Number of occurrences			Single	
Data Type			CharacterString	
Domain			Free text	
Metadata quality element Metadata quality sub-element	Completeness	Commission	Quality measure	Presence of excess items
			Measure description	Conditional Pass-Fail
			Evaluation method	If Postal Address of Distributor present then count number of occurrences. If one then pass else fail.
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Postal Address of Distributor present then check data type. If Character String then pass else fail.
			Value type	Boolean variable
			AQL	No violation of data type
			Notes	
		Domain	Quality measure	Within specified domain
			Measure description	Conditional Pass-Fail
			Evaluation method	If Postal Address of Distributor present then check domain. If valid Free Text then pass else fail.
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	
	Thematic accuracy	Non- quantitative	Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Postal Address of Distributor present then using other sources check that item is correct and current relative to the Date of Update of Metadata If other sources confirm Postal Address of Distributor or impossible to confirm then pass. If checks indicate discrepancy then fail.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks of should be made. Is the address complete, does it have a post code, can you find it in PAF (e.g. can it be accessed on the Royal Mail website)?

CI_ResponsibleParty Class

Metadata element name			Telephone number of distributor	
Obligation			Optional	
Number of occurrences			Single	
Data Type			CharacterString	
Domain			Free text	
Metadata quality element Metadata quality sub-element	Completeness	Commission	Quality measure	Presence of excess items
			Measure description	Conditional Pass-Fail
			Evaluation method	If Telephone Number of Distributor present then count number of occurrences. If one then pass else fail.
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Telephone Number of Distributor present then check data type. If Character String 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	If Telephone Number of Distributor present then check domain. If valid Free Text then pass else fail.
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	
	Thematic accuracy	Non- quantitative	Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Telephone Number of Distributor present then using other sources check that item is correct and current relative to the Date of Update of Metadata If other sources confirm Telephone Number of Distributor or impossible to confirm then pass. If checks indicate discrepancy then fail.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks of should be made. Is the telephone number complete, can you ring the number and get the correct distributor?

CI ResponsibleParty Class

Metadata element name		Facsimile number of distributor			
Obligation		Optional			
Number of occurrences		Single			
Data Type		CharacterString			
Domain		Free text			
Metadata quality element Metadata quality sub-element	Completeness	Commission	Quality measure	Presence of excess items	
			Measure description	Conditional Pass-Fail	
			Evaluation method	If Facsimile Number of Distributor present then count number of occurrences. If one then pass else fail.	
			Value type	Boolean variable	
			AQL	No omission	
			Notes		
	Logical consistency	Data type	Quality measure	Valid data type	
			Measure description	Conditional Pass-Fail	
			Evaluation method	If Facsimile Number of Distributor present then check data type. If Character String then pass else fail.	
			Value type	Boolean variable	
			AQL	No violation of data type	
			Notes		
		Domain	Quality measure	Within specified domain	
			Measure description	Conditional Pass-Fail	
			Evaluation method	If Facsimile Number of Distributor present then check domain. If valid Free Text then pass else fail.	
			Value type	Boolean variable	
			AQL	No violation of domain	
			Notes		
		Thematic accuracy	Non- quantitative	Quality measure	Correctness
				Measure description	Conditional Pass-Fail
				Evaluation method	If Facsimile Number of Distributor present then using other sources check that item is correct and current relative to the Date of Update of Metadata If other sources confirm Facsimile Number of Distributor or impossible to confirm then pass. If checks indicate discrepancy then fail.
				Value type	Boolean variable
				AQL	Item must pass
				Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks of should be made. Is the facsimile number complete, can you contact the number and fax the correct distributor?

CI_ResponsibleParty Class

Metadata element name			Email address of distributor	
Obligation			Optional	
Number of occurrences			Single	
Data Type			CharacterString	
Domain			Free text	
Metadata quality element Metadata quality sub-element	Completeness	Commission	Quality measure	Presence of excess items
			Measure description	Conditional Pass-Fail
			Evaluation method	If Email Address of Distributor present then count number of occurrences. If one then pass else fail.
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Email Address of Distributor present then check data type. If Character String then pass else fail.
			Value type	Boolean variable
			AQL	No violation of data type
			Notes	
		Domain	Quality measure	Within specified domain
			Measure description	Conditional Pass-Fail
			Evaluation method	If Email Address of Distributor present then check domain. If valid Free Text then pass else fail.
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	
	Thematic accuracy	Non-quantitative	Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Email Address of Distributor present then using other sources check that item is correct and current relative to the Date of Update of Metadata If other sources confirm Email Address of Distributor or impossible to confirm then pass. If checks indicate discrepancy then fail.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks of should be made. Can you successfully e-mail the address?

CI_ResponsibleParty Class

Metadata element name		Web address of distributor		
Obligation		Optional		
Number of occurrences		Single		
Data Type		CharacterString		
Domain		Free text		
Metadata quality element Metadata quality sub-element	Completeness	Commission	Quality measure	Presence of excess items
			Measure description	Conditional Pass-Fail
			Evaluation method	If Web Address of Distributor present then count number of occurrences. If one then pass else fail.
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Web Address of Distributor present then check data type. If Character String 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	If Web Address of Distributor present then check domain. If valid Free Text then pass else fail.
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	
	Thematic accuracy	Non-quantitative	Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Web Address of Distributor present then using other sources check that item is correct and current relative to the Date of Update of Metadata If other sources confirm Web Address of Distributor or impossible to confirm then pass. If checks indicate discrepancy then fail.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks of should be made. Can you successfully locate the URL?

Annex B.24 Frequency of update

Metadata element name		Frequency of update		
Obligation		Mandatory		
Number of occurrences		Single		
Data Type		Enumerated list		
Domain		Code list MD_MaintenanceFrequencyCode		
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count occurrences of Frequency of Update If one then pass else fail
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type. If code of type specified in Standard 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. If within code range specified in Standard then pass else fail.
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	Current Standard has codes in range 001-012
	Thematic accuracy	Classification	Quality measure	Correctness
			Measure description	Pass-Fail
			Evaluation method	Using other sources check that Frequency of Update is correct. If other sources confirm Frequency of Update or impossible to confirm then pass. If checks indicate discrepancy then fail.
			Value type	Boolean variable
			AQL	Item must pass
			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 conforms to the rules for entry.

Annex B.25 Access constraint

Metadata element name			Access constraint	
Obligation			Optional	
Number of occurrences			Multiple	
Data Type			Enumerated list	
Domain			Code list MD_RestrictionCode	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Access Constraint(s) present then check data type of each item. If code of type specified in Standard then pass else fail.
			Value type	Boolean variable
			AQL	No violation of data type
			Notes	
		Domain	Quality measure	Within specified domain
			Measure description	Conditional Pass-Fail
			Evaluation method	If Access Constraint(s) present then check domain of each item. If within code range specified in Standard then pass else fail..
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	Current Standard has codes in range 001-008
	Thematic accuracy	Classification	Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Access Constraint(s) present then using other sources check that each constraint is correct and current relative to the Date of Update of Metadata. If other sources confirm Access Constraint or impossible to confirm then pass. If checks indicate discrepancy then fail.
			Value type	Boolean variable
			AQL	Item must pass
			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 and conforms to the rules for entry. Check for duplicate entries.

Annex B.26 Use constraints

Metadata element name		Use constraints		
Obligation		Optional		
Number of occurrences		Multiple		
Data Type		Enumerated list		
Domain		Code list MD_RestrictionCode		
	Logical consistency	Data type		
		Quality measure	Valid data type	
		Measure description	Conditional Pass-Fail	
		Evaluation method	If Use Constraint(s) present then check data type of each item. If code of type specified in Standard then pass else fail.	
		Value type	Boolean variable	
		AQL	No violation of data type	
		Notes		
		Domain		
		Quality measure	Within specified domain	
	Measure description	Conditional Pass-Fail		
	Evaluation method	If Use Constraint(s) present then check domain of each item. If within code range specified in Standard then pass else fail..		
	Value type	Boolean variable		
	AQL	No violation of domain		
	Notes	Current Standard has codes in range 001-008		
	Thematic accuracy	Classification	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 relative to the Date of Update of Metadata. If other sources confirm Use Constraint or impossible to confirm then pass. If checks indicate discrepancy then fail.
			Value type	Boolean variable
AQL			Item must pass	
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.	

Annex B.27 Additional information source

Metadata element name		Additional information source		
Obligation		Optional		
Number of occurrences		Single		
Data Type		CharacterString		
Domain		Free text		
Metadata quality element Metadata quality sub-element	Completeness	Commission	Quality measure	Presence of excess items
			Measure description	Conditional Pass-Fail
			Evaluation method	If Additional Information Source present then count number of occurrences. If one then pass else fail.
			Value type	Boolean variable
			AQL	No commission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Additional Information Source present then check data type. If Character String then pass else fail
			Value type	Boolean variable
			AQL	No violation of data type
			Notes	
		Domain	Quality measure	Within specified domain
			Measure description	Conditional Pass-Fail
			Evaluation method	If Additional Information Source present then check item is Free Text. If valid Free Text then pass else fail
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	In addition could check if item in valid language
	Thematic accuracy	Non- quantitative	Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Additional Information Source present then using other sources check Additional Information Source is correct and current relative to the Date of Update of Metadata. If other sources confirm Additional Information Source or impossible to check then pass. If checks indicate discrepancy then fail.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	Other sources could include product catalogues and distributor’s website. Even if there are no other sources, elementary checks should be made. Is the source accessible if a URL? Does it only contain references and not additional information?

Annex B.28 Online resource

Metadata element name		Online resource		
Obligation		Optional		
Number of occurrences		Multiple		
Data Type		CharacterString		
Domain		Free text		
Metadata quality element Metadata quality sub-element	Logical consistency	Data type		
		Quality measure	Valid data type	
		Measure description	Conditional Pass-Fail	
		Evaluation method	If Online Resource(s) present then check data type of each item. If Character String then pass else fail	
		Value type	Boolean variable	
		AQL	No violation of data type	
		Notes		
		Domain		
		Quality measure	Within specified domain	
		Measure description	Conditional Pass-Fail	
		Evaluation method	If Online Resource(s) present then check domain of each item. Check item is Free Text. If valid Free Text then pass else fail	
		Value type	Boolean variable	
	AQL	No violation of domain		
	Notes			
	Thematic accuracy	Non- quantitative	Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Online Resource(s) present then use other sources to check that each Online Resource is correct and current relative to the Date of Update of Metadata. If other sources confirm Online Resource or impossible to check then pass. If checks indicate discrepancy then fail.
			Value type	Boolean variable
AQL			Item must pass	
Notes			Other sources could include product catalogues and distributor’s website. Even if there are no other sources, elementary checks should be made. If a URL or other location is given, can it be accessed and the data downloaded? Check for duplicate entries.	

Annex B.29 Browse graphic

Metadata element name		Browse graphic		
Obligation		Optional		
Number of occurrences		Multiple		
Data Type		CharacterString		
Domain		Free text		
Metadata quality element Metadata quality sub-element	Logical consistency	Data type		
		Quality measure	Valid data type	
		Measure description	Conditional Pass-Fail	
		Evaluation method	If Browse Graphic(s) present then check data type of each item. If Character String then pass else fail	
		Value type	Boolean variable	
		AQL	No violation of data type	
		Notes	The metadata element relates to the location of the graphic, not the graphic itself.	
		Domain		
		Quality measure	Within specified domain	
		Measure description	Conditional Pass-Fail	
		Evaluation method	If Browse Graphic(s) present then check domain of each item. Check item is Free Text. If valid Free Text then pass else fail	
		Value type	Boolean variable	
	AQL	No violation of domain		
	Notes	As note on data type.		
	Thematic accuracy	Non- quantitative	Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Browse Graphic(s) present then use other sources to check that each Browse Graphic is correct and current relative to the Date of Update of Metadata. If other sources confirm Browse Graphic or impossible to check then pass. If checks indicate discrepancy then fail.
			Value type	Boolean variable
AQL			Item must pass	
Notes			Other sources could include product catalogues and distributor's website. Even if there are no other sources, elementary checks should be made. If a URL or other location is given, can it be accessed? Check for duplicate entries.	

Annex B.30 Date of update of metadata

Metadata element name		Date of update of metadata		
Obligation		Mandatory		
Number of occurrences		Single		
Data Type		Date as specified by ISO 8601		
Domain		Single date as specified by ISO 8601		
Metadata quality element Metadata quality sub-element	Completeness	Omission	Quality measure	Absence of items
			Measure description	Pass-Fail
			Evaluation method	Count occurrences of Date of Update of Metadata If one then pass else fail
			Value type	Boolean variable
			AQL	No omission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Pass-Fail
			Evaluation method	Check data type. If date conforms to ISO 8601 then pass else fail.
			Value type	Boolean variable
			AQL	No violation of data type
			Notes	Null dates are not valid
		Domain	Quality measure	Within specified domain
			Measure description	Pass-Fail
			Evaluation method	Check domain of Date of Update of Metadata. A single date should be given to the precision of at least a year. If valid domain then pass else fail.
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	
		Relative	Quality measure	Relative dates
			Measure description	Pass-Fail
			Evaluation method	If Date of Update of Metadata > = Dataset Reference Date then pass else fail.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	This is to check that the update date is later than or the same as the Dataset Reference Date. Should not be earlier.

(Continued overleaf)

Metadata quality element Metadata quality sub-element	Temporal accuracy	Date accuracy	Quality measure	Date accuracy
			Measure description	Pass-Fail
			Evaluation method	Using other sources check accuracy of Date of Update of Metadata. Date should correspond to the date of when the metadata was last changed or checked. If checks confirm date or impossible to check then pass. If other sources indicate a discrepancy then fail.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	This is difficult to check independently other than the test of reasonableness i.e. if the date is some years previously and yet the Abstract or Lineage refers to recent events, this will indicate that the Date of Update of Metadata have not been updated. Check for conformance to rules for entry.

Annex B.31 Metadata standard name

Metadata element name		Metadata standard name		
Obligation		Optional		
Number of occurrences		Single		
Data Type		CharacterString		
Domain		Free text		
Metadata quality element Metadata quality sub-element	Completeness	Commission	Quality measure	Presence of excess items
			Measure description	Conditional Pass-Fail
			Evaluation method	If Metadata Standard Name present then count number of occurrences. If one then pass else fail.
			Value type	Boolean variable
			AQL	No commission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Metadata Standard Name present then check data type. If Character String then pass else fail
			Value type	Boolean variable
			AQL	No violation of data type
			Notes	
		Domain	Quality measure	Within specified domain
			Measure description	Conditional Pass-Fail
			Evaluation method	If Metadata Standard Name present then check item is Free Text. If valid Free Text then pass else fail
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	
	Content accuracy	Non-quantitative	Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Metadata Standard Name present then using other sources check Metadata Standard Name correct and current relative to the Date of Update of Metadata. If other sources confirm Metadata Standard Name or impossible to check then pass. If checks indicate discrepancy then fail.
Value type			Boolean variable	
AQL			Item must pass	
Notes			Other sources could include the websites of standards bodies. Elementary checks should be made e.g. is it a recognised metadata standard, is it spelt correctly?	

Annex B.32 Metadata standard version

Metadata element name		Metadata standard version		
Obligation		Optional		
Number of occurrences		Single		
Data Type		CharacterString		
Domain		Free text		
Metadata quality element Metadata quality sub-element	Completeness	Commission	Quality measure	Presence of excess items
			Measure description	Conditional Pass-Fail
			Evaluation method	If Metadata Standard Version present then count number of occurrences. If one then pass else fail.
			Value type	Boolean variable
			AQL	No commission
			Notes	
	Logical consistency	Data type	Quality measure	Valid data type
			Measure description	Conditional Pass-Fail
			Evaluation method	If Metadata Standard Version present then check data type. If Character String then pass else fail
			Value type	Boolean variable
			AQL	No violation of data type
			Notes	
		Domain	Quality measure	Within specified domain
			Measure description	Conditional Pass-Fail
			Evaluation method	If Metadata Standard Version present then check item is Free Text. If valid Free Text then pass else fail
			Value type	Boolean variable
			AQL	No violation of domain
			Notes	
	Content accuracy	Non-quantitative	Quality measure	Correctness
			Measure description	Conditional Pass-Fail
			Evaluation method	If Metadata Standard version present then using other sources check Metadata Standard Version correct and current relative to the Date of Update of Metadata. If other sources confirm Metadata Standard Version or impossible to check then pass. If checks indicate discrepancy then fail.
			Value type	Boolean variable
			AQL	Item must pass
			Notes	Even if there are no other sources, elementary checks should be made e.g. is the version valid for the metadata standard as given in Metadata Standard Name?

[End of document]