# Support for reporting of RBMP

## Guidance on reporting of spatial data

# Tools and services for reporting under RBMP within WISE

# Guidance on reporting of spatial data for the WFD (RBMP)

**Version 3.0**

**December 21 2009**

**Notice**

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**Document History**

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**Plan Design Enable**

# Contents

## Section                                                                     Page

**Appendix A.1: GIS reporting sheet. Endorsed by Water Directors, June 16-17 2008**

**Appendix B.1: Description and specification of metadata elements for the reporting of the geographic information groundwater bodies under WFD and GWD**

## Document change log

1. Update from v2.0 (released 22-10-09) to v3.0 (released 21-12-09)

> Changes were made to the following sections (as result of issues raised to WFD helpdesk): 7.2.3 (coastal clarification); 7.2.5 (ERM download link); 7.2.6.1 (Figure 5 correction); 7.2.6.2 (table data correction); 7.2.6.2.1 (new section); 7.2.6.3 (GW Horizon attribute); 7.2.6.4 (PA code); 7.2.7.7 (RBD/SU template); 8.1.4 (coastal clarification); 9.2 (naming of files)

# Glossary of Terms

| Term | Meaning / Definition |
|------|----------------------|
| EC | European Commission |
| EEA | European Environmental Agency |
| ETC-W | European Topic Centre Water |
| GIS | Geographical Information System |
| GIS | Geographic Information System |
| GML | Geographic Markup Language |
| GWB | Groundwater body |
| GWD | Groundwater Directive |
| ID | Identifier |
| MS | Member State |
| MS | Member State |
| NMA | National Mapping Agency |
| POM | Programme Of Measures |
| RBD | River Basin District |
| RBMP | River Basin Management Plan |
| SWB | Surface Water Body |
| WB | Water Body |
| WFD | Water Framework Directive |
| WISE | Water Information System for Europe |
| XML | Extensible Markup Language |

# Quick Start

1.  For the 2010 Water Framework Directive reporting the following spatial information updates are expected (see section 8):
    *   River Basin Districts
    *   Sub-units (where applicable)
    *   Ground water bodies
    *   Surface water bodies
    *   Protected areas

2.  No point files should be delivered. The centroids of associated features are reported in the related reporting schema.

3.  Groundwater Bodies and Protected Areas should be submitted as multiple layers reflecting the different types. (See section 7.6)

4.  Prior to submission it is important that datasets have been evaluated and a quality assessment study carried out. Attention should be paid to alignment across national and international borders for the purpose of producing a harmonised European level dataset (Section 7).

5.  Datasets should be harmonised (see section 7.6)

6.  Submissions for 2010 reporting are expected as shape files with the file naming convention provided (see section 9).

7.  Metadata should be provided with each file (section 10).

8.  Submissions as <u>complete</u> datasets should be delivered at national level to ReportNet (see section 9.3) no later than 22nd March 2010.

# 1.  Introduction

The implementation of the WFD requires the handling of spatial data both for the preparation of the River Basin Management Plans and for the reporting to the Commission. Background to the context of GIS in WISE is given in the GIS Guidance document (Section 2).

Article 11 of the Water Framework Directive requires Member States to ensure the establishment of a programme of measures for each river basin district. Article 13 of the Water Framework Directive requires Member States to ensure that a river basin management plan is produced.

The programme of measures should take account of the analyses carried out according to Article 5 and the subsequent monitoring results collected with the network established under Article 8.

In addition and if necessary, the RBMP should therefore include an update of the reports from 2004 (Art 3), 2005 (Art 5) and 2007 (Art 8).

With the reporting of both Article 11 and 13 of the WFD in March 2010 is the scene therefore also set to update, submit or re-submit data from previous reporting of data in the WFD.

Article 15 of the Water Framework Directive (WFD) requires Member States to provide information to the European Commission concerning the river basin management plans (RBMP). The RBMP covers, among others a general description of the characteristics of the river basin district (RBD) required under Article 5 and Annex II WFD including the mapping of the location and boundaries of groundwater bodies (GWB) (Annex VII, WFD).

A set of Reporting sheets was developed to report the geographic information and the thematic information related to GWBs:

- Reporting Sheet "GIS: Geographic Information Requirements and Water Body Attributes" – included into the document: "Updated 2004-2005 Reporting sheets – final version (5. 6. 2008)"

- Reporting Sheet "GWD1: Reporting requirements from the GWD" – included in the document: "Updated 2004-2005 Reporting sheets – final version (5. 6. 2008)"

    http://circa.europa.eu/Public/irc/env/wfd/library?l=/framework_directive/w-wise_background/reporting_guidance&vm=detailed&sb=Title

These have since been updated and incorporated into Guidance Document No. 21: Guidance for reporting under the Water Framework Directive:

http://circa.europa.eu/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents/guidance_guidance_report/_EN_1.0_&a=d

# 2.  Scope

The scope of this paper is to provide a short guidance for the Member States in the preparation and reporting of geographic data under the WFD and the Groundwater Directive (GWD) for the 2010 RBMP data submission. This guidance is based on recommendations from the Guidance Document No 22 "Updated Guidance on Implementing the Geographical Information System

(GIS) Elements of the EU Water policy"[1] and will focus on more specific needs in relation to the reporting of both the RBMP and updates to previous spatial data reported under the WFD.

## 2.1     WFD reporting schemas

Fundamental to the reporting process are the schemas which have been developed from the reporting sheets. All the schemas are available online from EEA's ReportNet. The reporting schemas are not dealt with in this document. This document deals with the spatial information required for the information reported in some of those schemas. The schemas are available from this web page http://water.eionet.europa.eu/schemas/dir200060ec/resources/ along with supporting documentation.

## 2.2     Related documents

This is 'Document No.4' providing support for the WFD submission workflow. There are three other documents which provide additional support to the reporting process:

- **Document No.1: WFD reporting on River Basin Management Plans - A user manual**
  http://water.eionet.europa.eu/schemas/dir200060ec/resources/

- **Document No.2: Schema user guidance**
  http://water.eionet.europa.eu/schemas/dir200060ec/resources/

- **Document No.3: Documentation of the changes to the schemas since the previous release**
  http://water.eionet.europa.eu/schemas/dir200060ec/resources/

## 2.3     Getting help

All schemas, tools and supporting documents are available from this web page:

http://water.eionet.europa.eu/schemas/dir200060ec/resources/

If you need assistance on issues not addressed in this User Guidance please contact:

helpdeskWFD@atkinsglobal.com.

The helpdesk will assist you on any matter regarding the reporting of the WFD River Basin Management Plan including programme of measures by the deadline of 22nd of March 2010.

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[1] Common Implementation Strategy for the Water Framework Directive (2000/60/EC). Guidance Document No 9 " Updated Guidance on Implementing the Geographical Information System (GIS) Elements of the EU Water policy. 17. November 2008. http://circa.europa.eu/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents/guidance-no22-_nov08pdf_1/_EN_1.0_&a=d

# 3. As-is analysis and gap analysis

## 3.1 Groundwater bodies

The first submissions of geographic information representing GWBs were made in 2005 (Article 5 WFD). At that time only the centroid of the GWB had to be reported, the provision of geographical information of the boundaries of GWBs was not mandatory.

The following data were requested as a minimum to be provided for each GWB (under Reporting sheet GWB1):

- Unique code;

- Name (if available);

- X co-ordinate (Longitude) of the centroid of the GWB;

- Y co-ordinate (Latitude) of the centroid of the GWB; and

- Size (surface area ($m^2$), unique identifier for the horizon where separate overlying bodies exist and, if possible, volume of aquifer ($m^3$).

This was translated into the reporting schemas as follows:

| Field | Data Type | Size | Obligation | Description |
|---|---|---|---|---|
| EU_CD | Text | 42 | mandatory | Unique code for GWB at European level |
| MS_CD | Text | 40 | mandatory | Unique code for the GWB within the MS |
| LAT | Text | 9 | mandatory | Latitude of the centre of the GWB in ETRS89 projection |
| LON | Text | 9 | mandatory | Longitude of the centre of the GWB in ETRS89 projection |
| AREA | Double | | mandatory | GWB1: Total surface area of the water body in sq km |
| NAME | Text | 100 | optional | Locally used name for GWB |
| TRANSBOUNDARY | Text | 1 | optional | Does the groundwater body crass a country border |
| CAPACITY | Double | | optional | Capacity of GWB in m3 |
| HORIZON | Double | | optional | Groundwater horizon when separate overlaying GWB exist |
| LAYERED | Text | 1 | optional | Indicator for groundwater bodies with deeper relevant layers 0 = no deeper layers 1 = deeper aquifer layers |
| OUT_OF_RBD | Text | 1 | optional | Indicator if any part of GWB falls outside RBD |

An analysis of the submitted data was done by EEA/ETC-WTR in 2008[2]. Point data and polygon data of groundwater bodies were analysed and compared. It was concluded that the polygon data provided are, in general, of good quality. Many Member States provided polygon data and centroids. In some cases corrections or verifications of data were needed. Austria, United Kingdom and Slovenia provided only centroid datasets. No data are available so far from Bulgaria, Finland, Greece, Italy, Malta and Romania.

Reporting information about the groundwater horizon and whether or not overlying groundwater bodies exist was optional, thus limited information is available.

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[2] WFD Art. V groundwater body data gap analysis, v2.0, 15. September 2008, ETC/Water

The information available now shows that GWBs have been delineated quite differently between Member States but it gives no further information about GWBs. To develop a more consistent picture of groundwater bodies it will be necessary to get information on aquifer types and the 3-dimensional characteristics of GWBs, as they might overlay each other.

In future geographic information on groundwater bodies should be provided by all Member States including the information listed in the GIS Reporting sheet for RBMP reporting (see Chapter 7.1).

## 3.2    Surface water bodies

In WFD Article 5 reporting, Member States were requested to provide information on the centroids of all water bodies. During this exercise, some Member States also provided information on river stretches. This has resulted in a variety of non-homogeneous information being provided (see Figure 6.3.1a): centroids-only, centroids & river network, and centroids and river stretches.
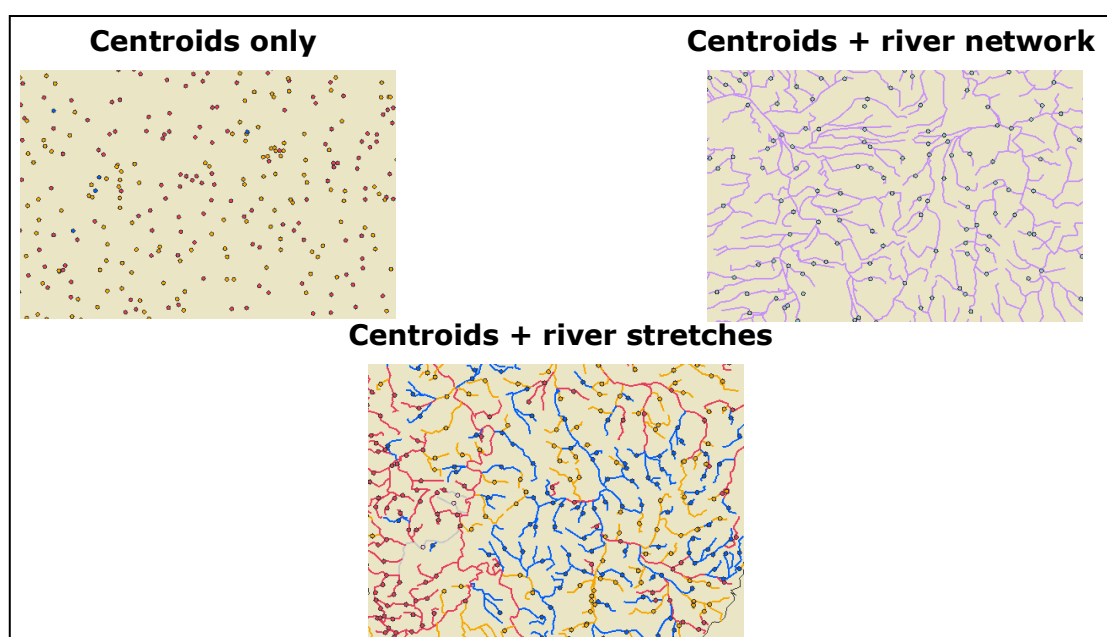


*Figure 6.3.1a Information provided by Member States for visualisation of water bodies (WFD Art. 5 2005 submission)*

Furthermore, Member States have used different methods to calculate the centroids of water bodies (see Figure 6.3.1b).
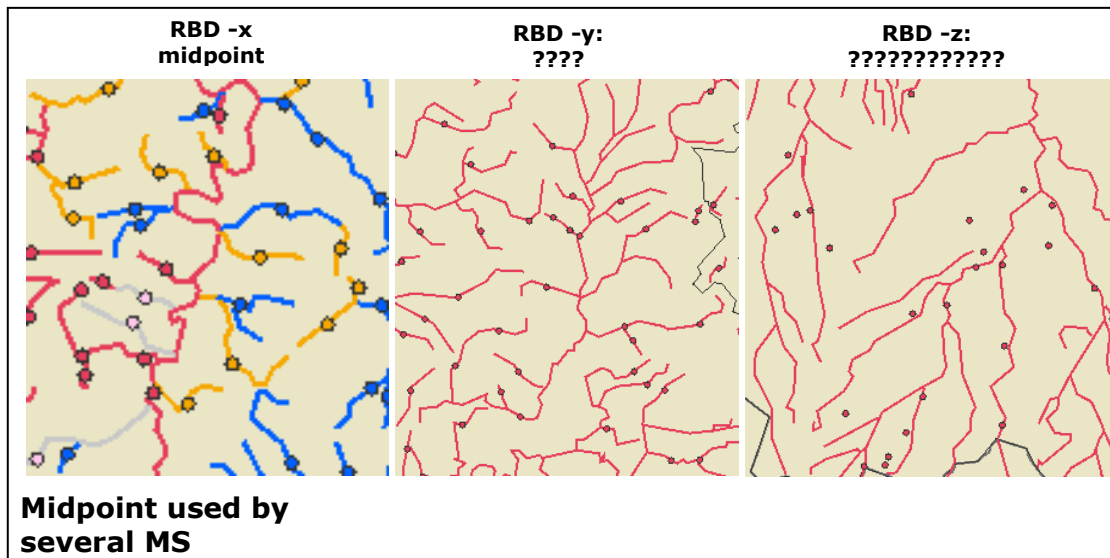
*Figure 6.3.1b Representation of water body centroids provided by MS (WFD Art. 5 2005 submission)*

This has resulted in an heterogeneous EU-wide dataset on 'water bodies'. To solve these problems it has been proposed to visualise river water bodies based on the WISE Reference GIS dataset Main Rivers. River water bodies located on Main Rivers should now be reported as hydrologically connected and harmonised river stretches (line features).[3] Thus a harmonised visualisation of reported data on river water bodies will be achieved in future.

# 4.  User requirements

Section 2.1.2 of the GIS Guidance document provides a detailed overview of the role of GIS in reporting in WISE.

For ground water bodies, the main requirements are to gain information about the types of GWBs monitored in the Member States and thus contribute to an enhanced conceptual understanding of GWBs (aquifer type, geological profile, vertical orientation, depth range, etc.); the visualisation of GWBs and related information in WISE and to allow the preparation of maps. Visualisation of areas (polygons) rather than points enables also the following of changes over time in GWB delineation.

Furthermore, the data will be used to check the consistency of data reported which are related to GWBs (e.g. monitoring stations, protected areas) and for geographical analysis at the European scale.

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[3] Presentation at WISE conference on 22-23 March 2007:
http://circa.europa.eu/Public/irc/env/wfd/library?l=/framework_directive/implementation_conventio/european_conference/presentations_speeches/part_4_23_march/deugenio-pdfpdf/_EN_1.0_&a=d

# 5.    Products

## 5.1    Maps produced for the WISE viewer

General maps produced on the basis of previous reported spatial data in relation to the WFD are described in reporting sheet GIS (see Appendix A) and contains River Basin District information.

In accordance with reporting sheet SWM3 and GWM2 will the following list of maps could be produced for the WISE map viewer on the basis of information provided in article 13. The maps will reflect the current status of the water bodies and will serve as reference for those that will be produced on the basis of the 2015 reporting and will allow observation of progress. The maps will at this stage not be used for compliance checking.

*Surface water bodies*

- Map 1: Ecological status class of natural water bodies including data at a water body level, on which BQEs the assessment is based (default setting "unknown status" is applied if no class and BQE-specific data are provided)[4];

- Map 2: Ecological potential class for HMWB - MS should specify BQE concerned (default setting "unknown potential" is applied if no class and BQE-specific data are provided);

- Map 3: Status for protected areas – if not, specify reasons for failure (if reported for other Directives (e.g. Bathing Waters, Nitrates, Habitats etc.) this information will not need to be reported again. Reporting will be required for Article 7 protected areas as these are not defined under any other Directive);

- Map 4: Achievement/exceedance of EQS for heavy metals[5] out of list of Priority Substances;

- Map 5: Achievement/exceedance of EQS for pesticides[6] out of list of Priority Substances;

- Map 6: Achievement/exceedance of EQS for industrial pollutants[7] out of list of Priority Substances;

- Map 7: Achievement/exceedance of EQS for other pollutants[8] out of list of Priority Substances;

- Map 8: Achievement/exceedance of EQS for other (national) pollutants.

*Groundwaterbodies*

- Map 1: Quantitative status – Identification of bodies that are at "good quantitative status" and those that are at "poor quantitative status";

- Map 2: Achievement/exceedance of standard for nitrates (value in Annex 1 of GWD or set according to paragraph 3 of Annex 1 GWD, and according to status assessment procedure in Article 4 of GWD);

- Map 3: Achievement/exceedance of standard for pesticides (combined total and individual value in Annex 1 of GWD or set according to paragraph 3 of Annex 1 GWD, and according to status assessment procedure in Article 4 of GWD);

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4 The WFD requires to determine the ecological status/potential class of every water body, but not to monitor all quality elements of all water bodies. Furthermore, some MS may not have appropriate monitoring for all BQE in place. The map should enable to create a disaggregated picture where only selected information is shown. It may be necessary to describe more detailed data and reporting needs to fulfil this aim.
5  cadmium, lead, mercury, nickel.
6  Alachlor, atrazine, chlorpyriphos, chlorvenfinphos, diuron, endosulfan, isoproturon, HCH, pentachlorobenzene, simazine, trifluralin.
7 Anthracene, Benzene, C10-13-chloroalkanes, Naphthalene, Nonylphenol, octylphenol, chlorinated organics (incl. SCCP, TRI, PER, DCM, Chloroform, 1,2-Dichloroethane...), PentaBDE, DEHP.
8 DDT, HCB, HCBd, TBT, PAHs (including Fluoranthene), PCP, TCB, drins.

- Map 4: Achievement/exceedance of threshold values set by Member States for other pollutants (considering in this category the list of substances as contained in Part B of Annex II of GWD and more generally any other pollutants contributing to the characterisation of groundwater bodies as being 'at risk', and according to status assessment procedure in Article 4 of GWD);

- Map 5: Trends - Identification of: (a) groundwater bodies with environmentally significant and sustained upward trends in pollutant concentrations, and (b) groundwater bodies in which trends have been reversed;

GIS data submitted by Member States will be also used to produce a **WISE Reference GIS dataset of groundwater bodies** by the EEA or its contracted partners.

GWBs provided by Member States will be merged into one dataset taking into account the description of the submitted GWBs (layered, depth range, aquifer type etc.) to produce a consistent dataset.

The data specifications of the reference dataset will be published by the EEA.

## 5.2    Examples of groundwater body visualisation

Because of their three-dimensional characteristics (GWBs might overlay each other), it is difficult to visualise them. A first step could be visualisation according to depth information, to distinguish between uppermost GWBs and deeper GWBs. The data asked for each GWB for RBMP reporting will allow this kind of visualisation (see Chapter 7.1).

A case study on the uppermost groundwater body reference layers has been prepared by ETC-WTR[9]. The visualisation was produced using the groundwater bodies from Austria, Czech Republic, Germany, Poland and Slovak Republic. The information about the horizon and knowledge about the approach taken on delineation of groundwater bodies was used. Negotiations in International Commissions of Rivers Protection (e.g. Elbe River and Oder River) were necessary for adequate visualisation.

Examples maps have been produced allowing the visualisation of the GWBS according to their horizontal location (horizons – upper layer, main layer and deep layer). The map below shows the GWBs of the Slovak Republic as an example of this approach.

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[9] WISE and GIS developments: proposal for visualisation of groundwater bodies, 23. September 2008, ETC/W, background document for the agenda point 5b on 'proposal for visualisation of groundwater bodies' at the WG D meeting on 7-8 October 2008
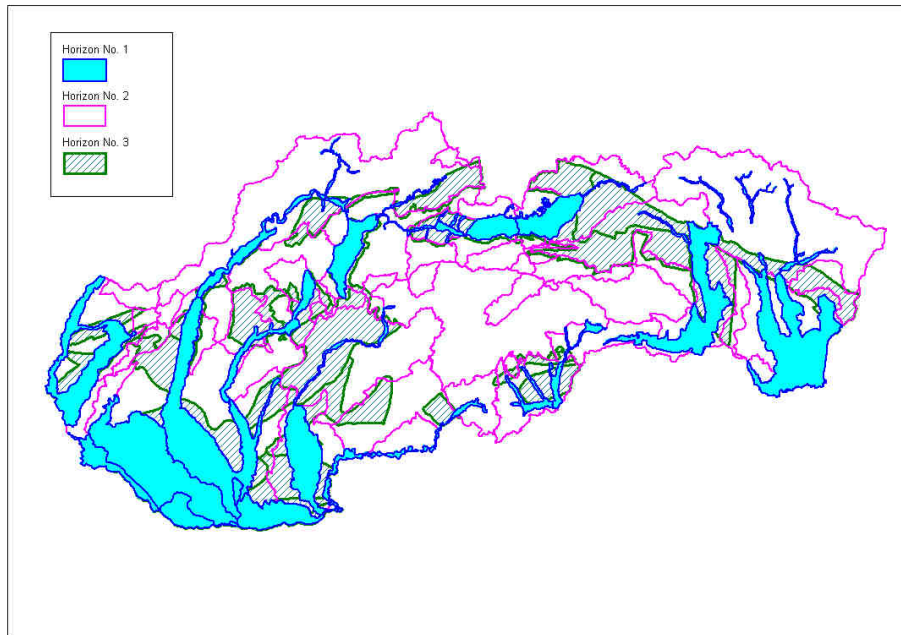
However, at the European scale, it will be difficult to show this information within one map. Thus it is proposed to produce separate maps according to the GWB depth horizon in which they occur..

The GWBs which cross country borders (transboundary GWBs) are important at the European level. Within the Danube River Basin only significant GWBs have been visualised. Transboundary GWBs are also highlighted in the GWB map of the Rhine RBD. Examples are shown below.
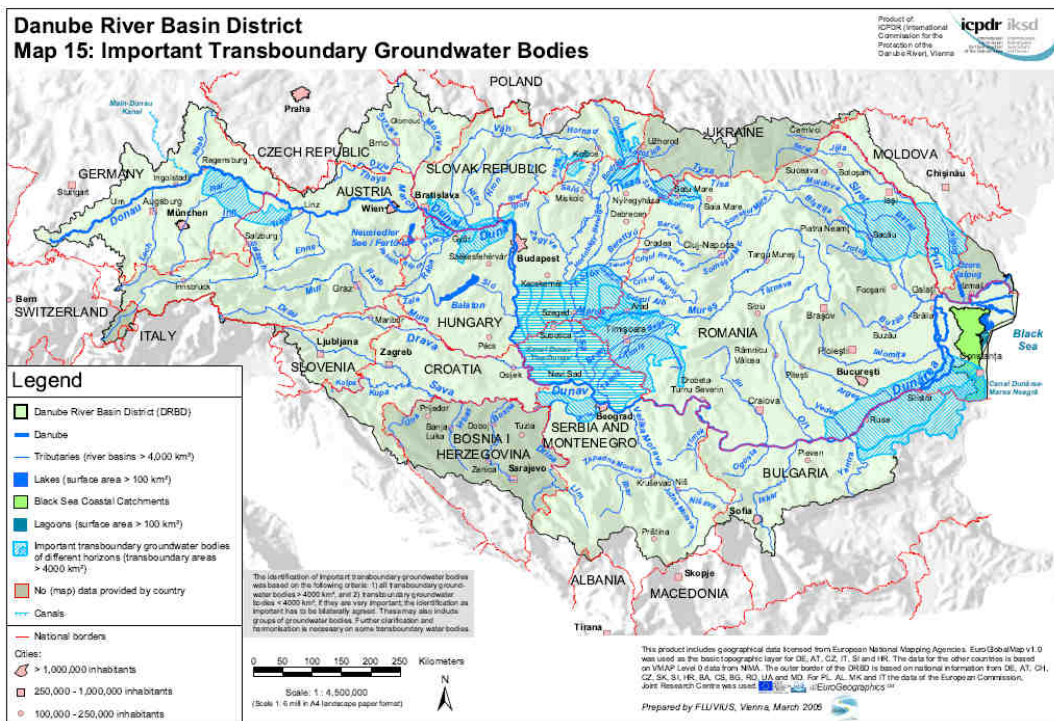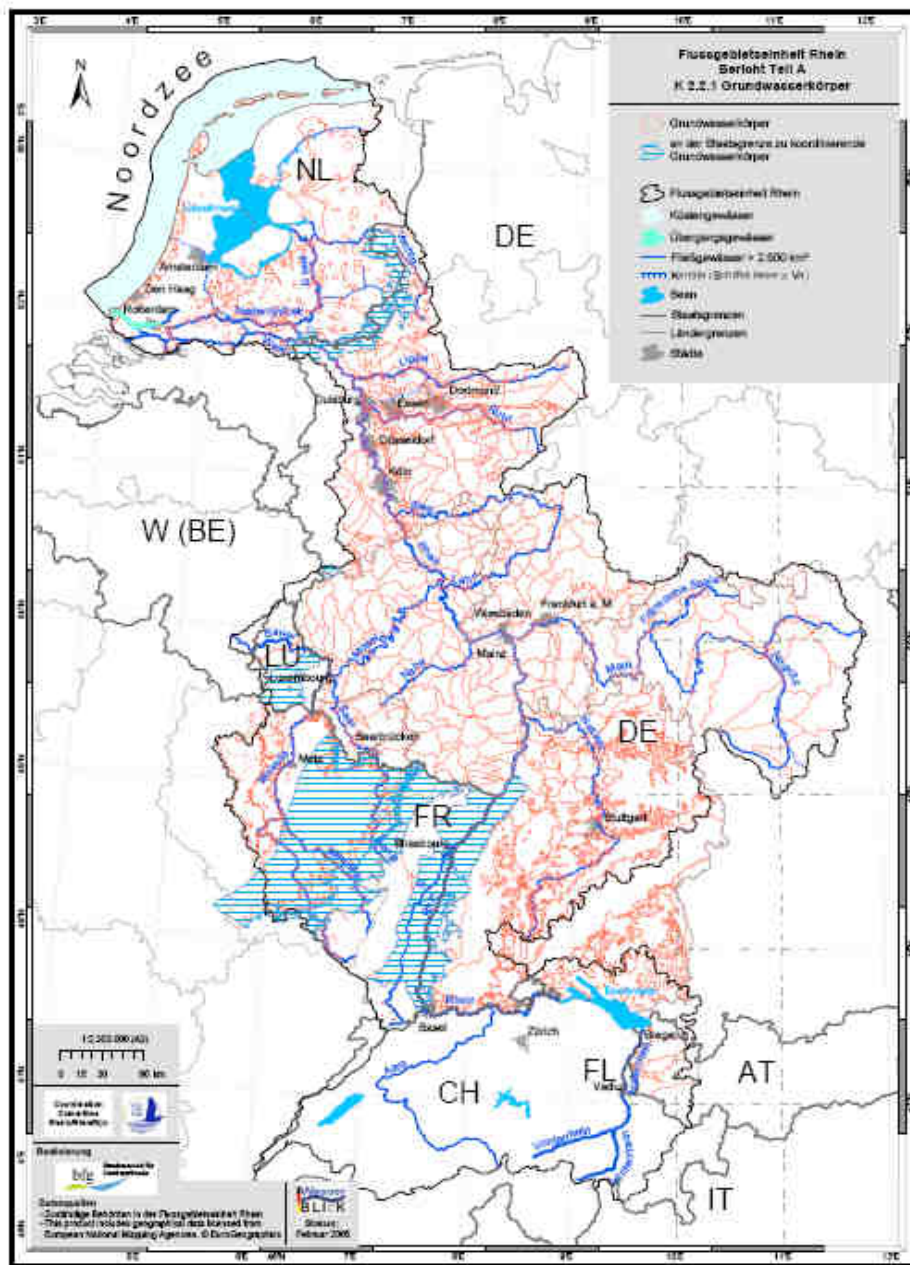
## 5.3    WISE reference GIS datasets

So far the WISE Reference GIS datasets: Large Rivers and Large Lakes and River Basin Districts have been developed. The datasets are available in the WISE map viewer. The identifiers of the River Basin Districts (identifying the RBD irrespective of country borders) and the Member State parts of RBDs can be seen at:

http://dataservice.eea.europa.eu/dataservice/metadetails.asp?id=1041.

At present stage is a new reference dataset on rivers and lakes being processed. The reference dataset will be presented for the Member States within the near future for approval. The reference dataset will "replace" the spatial dataset of rivers and lakes from Article 5. The Member States will be asked to do the appropriate split-up of the river strings to match the national definition of river water bodies. If the Member States have an additional set of selected water bodies these will be

reported and visualized as points (centroids) derived from the appropriate Lat/Lon reporting schema attributes.

# 6.  Maintenance

In accordance with the WISE reporting arrangements[10] Member States can update their data submitted to WISE at any time. Member States should ensure that the latest, correct information is available in WISE since that will be used for compliance checking and publication. But it should be emphasised, according to the CIS Guidance Document No. 2: Identification of Water bodies, groundwater bodies must be fixed for at least each RBMP period.

The quality, accuracy and validation of the information and data in WISE will be the responsibility of the Member States. Quality assurance and control processes will be carried out by the WISE partners. The Commission, the EEA or its contracted partners may contact the Member State in case there is an indication that any of the data may be erroneous or misleading. This could lead to a resubmission by the Member State.

The **WISE Reference GIS dataset of groundwater bodies** will be maintained by the EEA or its contracted partners, updated once every 6 years (at the beginning of a RBMP period) and published in WISE (WISE web viewer). The maintenance includes, among others, quality assurance and control, the management of WISE GWB-IDs, versioning and historical record of data, management and publication of metadata.

# 7.  Data content and structure

## 7.1  Context

In 2010 data should be updated that has already reported in WISE. For this reporting it is expected that the associated spatial object types below will be submitted. The associated schema is provided in parentheses.

- River Basin Districts (RBDSUCA.xsd)

- Sub-units (RBDSUCA.xsd)

- Surface Water bodies (SWB.xsd)

- Ground Water bodies (GWB.xsd)

- Protected areas (ProtArea.xsd)

The attribute information for these spatial objects are defined in the associated schemas and attribute information should only be reported against the schemas. The spatial datasets defined here should only contain an attribute for the object code which allows them to be linked to the XML submission (further information on reporting in section 7.2.6).

The XSD schemas are the master document and it is expected, and part of the quality control procedures, that all objects defined in the schema will be present in the spatial dataset, and vice versa.

The following submissions have a spatial reference (lat/long). However, under WFD reporting, point features are only reported in form of XML documents, defined by the schema:

- Groundwater monitoring stations (GroundWaterMonitoringStations.xsd)

- Surface water monitoring stations (SurfaceWaterMonitoringStations.xsd)

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[10] Guidance on practical arrangement for electronic reporting to the Water Information System for Europe (WISE); "WISE REPORTING ARRANGEMENTS"; Final Document (01/03/2007)

It is also important to note that there exist cross-schema linkages meaning a feature defined in one place will be referenced in another. Quality control procedures will ensure that the referential integrity of the overall submission is valid. This reinforces the need to reflect changes to schemas with changes to spatial datasets and to understand the linkages. The following diagram shows the cross-schema linkages for 2010 reporting. Tests are defined in the following section.
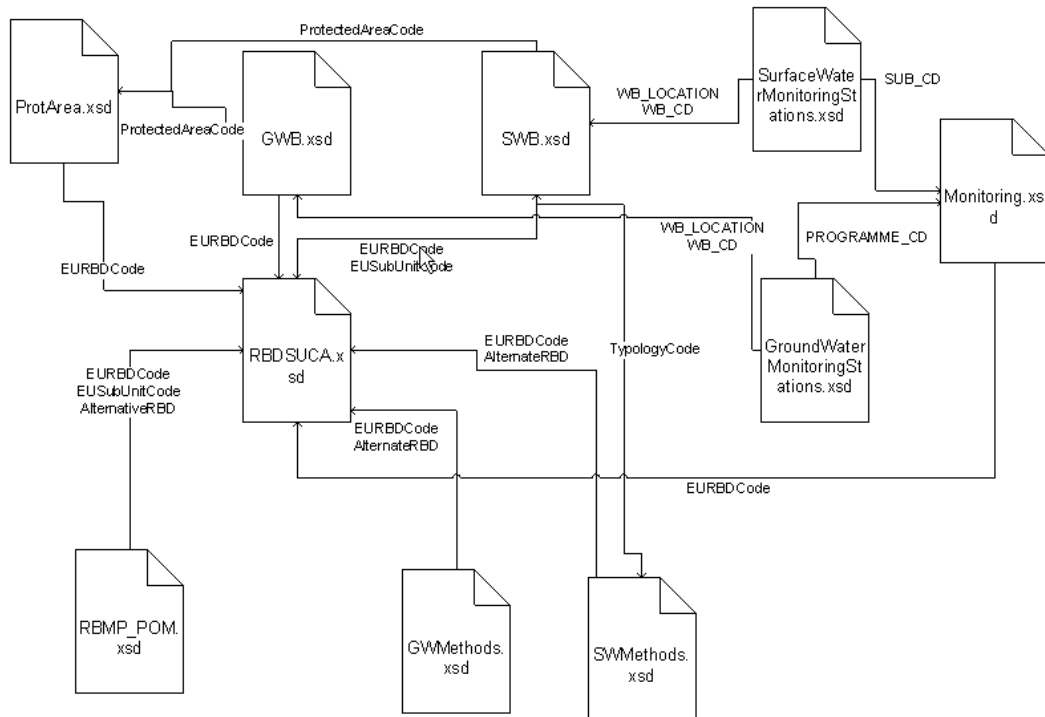


The following GIS datasets submitted by Member States are related to groundwater bodies:

- River Basin Districts;
- Sub-units;
- Groundwater monitoring stations;
- Protected areas.

The following GIS datasets submitted by Member States are related to surface water bodies:

- River Basin Districts;
- Sub-units;
- Surface water monitoring stations;
- Protected areas.

The WISE data specification gives an overview of the linkages between the objects under the Water Framework Directive. The specification can be found at (currently in DRAFT form, works best with Internet Explorer):

https://svn.eionet.europa.eu/repositories/Reportnet/Dataflows/WaterFrameworkDirective/Article13/dataModel/conceptual/wfd/

## 7.2 Data consistency and quality checking

Prior to submission it is important that datasets have been evaluated and a quality assessment study carried out. The following section provides the criteria which can be used to perform the study. The same quality control checks will be made once the spatial dataset has been submitted.

### 7.2.1 Completeness

Test that only objects defined in the associated schema are present in the spatial dataset, and vice versa. Attention should be paid to incorrect coding, excess data and duplicate data present in the dataset.

### 7.2.2 Logical consistency

Groundwater bodies

- Groundwater bodies must be assigned to only one RBD (even if they have parts outside of the respective RBD);
- Associated monitoring stations must be located within the boundaries of the respective groundwater body.

Surface water bodies

- A water body can only be assigned to *one* RBD
- A monitoring station must be assigned to a least *one* water body
- A RBD must have at least one subunit (if MS doesn't report subunits) can RBD be used as subunit

### 7.2.3 Topological consistency

The objects of one type should be positionally consistent with spatial objects of related types.

Reported elements should be considered as reference data and geometric consistency with other themes may be achieved if these other themes use the reported data as background data during the production or the validation of their own data, e.g. River Basin Districts.

Groundwater bodies

- Groundwater bodies need not cover the entire territory of a country;
- Groundwater bodies can overlay one another (if at different depth ranges);
- Overlaying groundwater bodies must not intersect if groundwater bodies laying upon each other are reported within one file (but it is recommended to provide overlaying groundwater bodies in separate files).
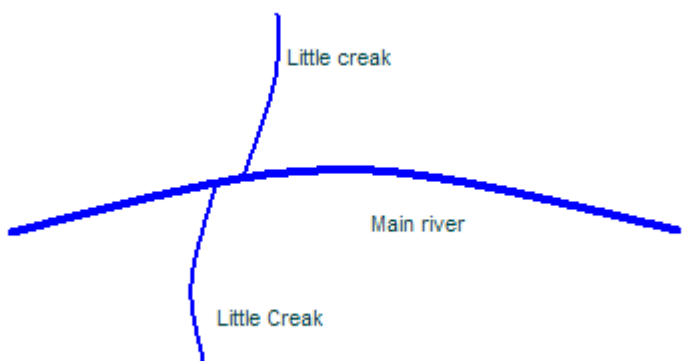
Surface water bodies

- Rivers, lakes, transitional and coastal areas CANNOT overlap
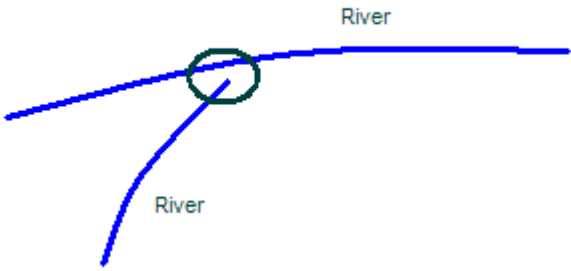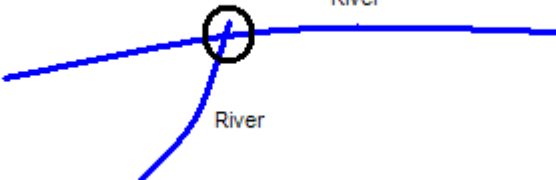- Rivers must not intersect (nodes at intersections)

- Rivers, lakes and transitional and coastal areas must be covered by subunits

- Rivers and lakes CANNOT overlap with coastal waters or transitional waters

- Outlet of each river must touch coastline

- A coastal area must not have gaps

- Coastal area must touch transitional waters, national boundaries or subunits

- RBD and subunits CANNOT overlap and have no gaps

- RBD and subunits must cover the extent of the MS

- RBD must contain at least one river

- See section XXXXX for definition of boundary of coastal waters

## 7.2.4 General topological consistency criteria

The connectivity of rivers within a country is desirable and in order to build a "clean" and closed hydrological network certain topological consistency rules need to be followed. It is recommended to follow the topological consistency measures described in Inspire Hydrography data specification (reference [10]).

Before delivering a dataset, test for topological errors using the Topological toolbox (ArcGIS) or equivalent. The following are a subset of topological errors extracted from the Inspire Hydrography data specification.

| Name | faulty point-curve connections |
|---|---|
| Description | A point-curve connection exists where different curves touch. These curves have an intrinsic topological relationship that shall reflect the true constellation. If the point-curve connection contradicts the universe of discourse, the point-curve connection is faulty with respect to this data quality measure. The data quality measure counts the number of errors of this kind. |
| Example | Two-point curve connections exist where only one should be present  **Key** 1 Junction of two rivers should be at a "+" intersection |

| Name | Missing connections due to undershoots |
|---|---|
| Description | items in the dataset, within the parameter tolerance, that are mismatched due to undershoots |

| Example 1 | <br>**Key**<br>1 Search tolerance = 3 m |
|---|---|
| Example 2 | Watercourse links should be digitised so that nodes are snapped to nodes:<br><br>Watercourse links should not be disconnected but always meet another watercourse at a node. A common digitising error is to snap the end of a link to another link, but not to the node. These links are intersecting but they do not participate in the topology of the network. |

| Name | **Missing connections due to overshoots** |
|---|---|
| Description | items in the dataset, within the parameter tolerance, that are mismatched due to overshoots |
| Example 1 | <br>**Key**<br>1 Search tolerance = 3 m |

| Name | **Invalid slivers** |
|---|---|
| Description | A sliver is an unintended area that occurs when adjacent surfaces are not digitized properly. The borders of the adjacent surfaces may unintentionally gap or overlap by small amounts to cause a topological error. |

| Example 1 | |
|---|---|
| | 
**Key**
1 Single line drain
2 Double line drain
a) Maximum area parameter prevents correct double line drain portrayal from being flagged as an error


**Key**
1 Sand
2 Sliver
3 Double line drain
b) Sliver is less than the maximum parameter and is flagged for evaluation of possible error |
| **Name** | **Invalid self-intersect errors** |
| Description | items in the data that illegally intersect with themselves |
| Example | 
**Key**
1 RBD 1
2 Illegal intersection (loop) |

## 7.2.5    Alignment across national borders

Datasets from national repositories are not necessarily geometrically aligned across national borders or to a pan-European coastline. To connect borders of River Basin Districts or rivers across national borders, it is strongly recommended for Member States to align their data with a selection of EuroRegionalMap at scale 1:250 000. This data selection essentially comprises the national borders, the coastline and hydrological features that cut across national borders. Member States will be able to download these data sets free of charge from a dedicated section of WISE.

The ERM-country boundary dataset (file: ERM v 2.2 - 1:250 000 country boundaries) can be downloaded here with the provision the data are not used for any other purpose:

http://eea.eionet.europa.eu/Members/irc/eionet-circle/etcwater/library?l=/eea-etc_reference&vm=detailed&sb=Title.

Download will be restricted to authorised persons in the water authorities.

The ERM data is in another coordinate system (GCS_WGS_1984) and care needs to be taken that data are in a common projection when aligning.

Transboundary GWBs should be harmonised with the respective neighbouring countries. Appendix B of the INSPIRE document D2.6 "Methodology for the development of Data specifications" provides recommendation regarding the geometric harmonisation of linear and polygon features across borders (edge matching).

The hydrographic network data should be edge-matched, reconciled and maintained across state borders by the respective authorities.

In considering reconciliation across state borders, the respective authorities should seek to fully resolve the positional alignment that minimises positional deficiencies.  Positional deficiencies require repeated manual interval in updates and/or detract from the use of the data in applications.

Wherever a feature crosses a border it is recommended that the parties holding the source data for this feature across the border make arrangements for the geometry to be the same across the border, i.e. that at the same levelOfDetail - no surface geometry meets a point or line geometry.

It is recommended that wherever a network crosses a border the parties holding the source data for this part of the network agree on a common node that is identical in geometry and attributes in both networks.

## 7.2.6    Addressing issues in spatial reporting

### 7.2.6.1    Ensuring a closed river water body network

The rivers dataset is delivered as lines which in many cases will be derived from a physical waters geometry which will be represented by a polygon. The Inspire Hydrography data specification lays down guidance on data capture for the creating of a river network (reference [10] - section 10) and the same recommendations can also be applied to the creation of the river waterbodies dataset:

- The centrelines of watercourse links should fall within the extent of the physical object that they represent and faithfully follow

As stated previously harmonisation between data themes needs to be considered. This is particularly applicable to the rivers and lakes datasets where a river can flow through an area of standing waters. Additionally it is important to ensure that a river network reaches the ocean through the transitional and coastal areas. To ensure logical consistency common nodes need to be established to connect the feature types even though they are reported as separate datasets.

In order to ensure a connected river network is delivered, a simplification of the river network data model set up by the WasserBLIcK-System is recommended for the purposes of WFD reporting. (The following figures are adapted from the Hydrography data specification [10],pg 91)



**Figure 1.**

**Delineation of water bodies from the real world – a river passing through a lake (see section 8.1.2 for approach to identifying water bodies)**



**Figure 2.**

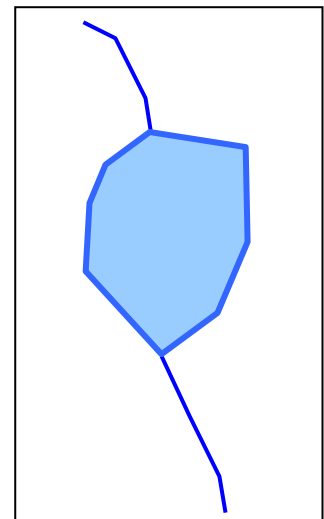**The issue with the delivery made under WFD. The lake and river water bodies are separated into two datasets.**

**However, the river network is not closed and data quality is difficult to measure. The gap could be a different type of water body or the result of a missing connection in a poorly created GIS dataset.**

Dataset 1. WFD lake waterbodies

Dataset 2. WFD river waterbodies
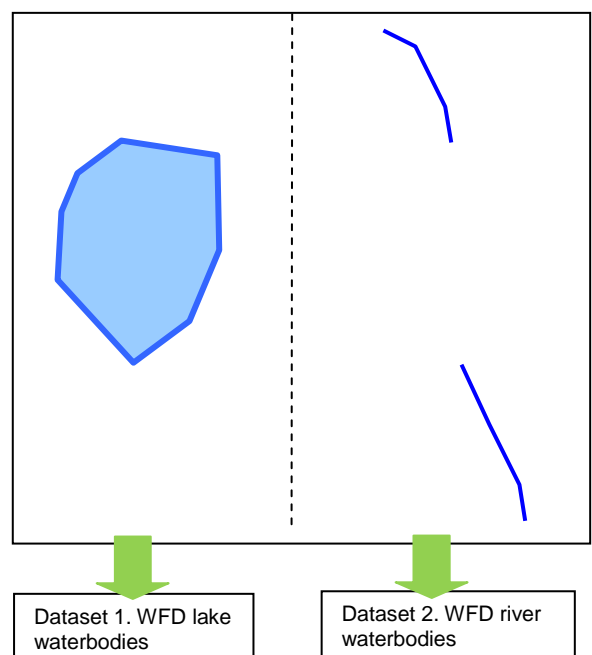
**Figure 3.**

**In order to maintain the river network – a virtual river segment is created which passes through the center of the lake between the feature nodes.**

**GIS software programs can be utilised for this processing step.**

Inferred link through lake – a virtual network segment in a lake area

node
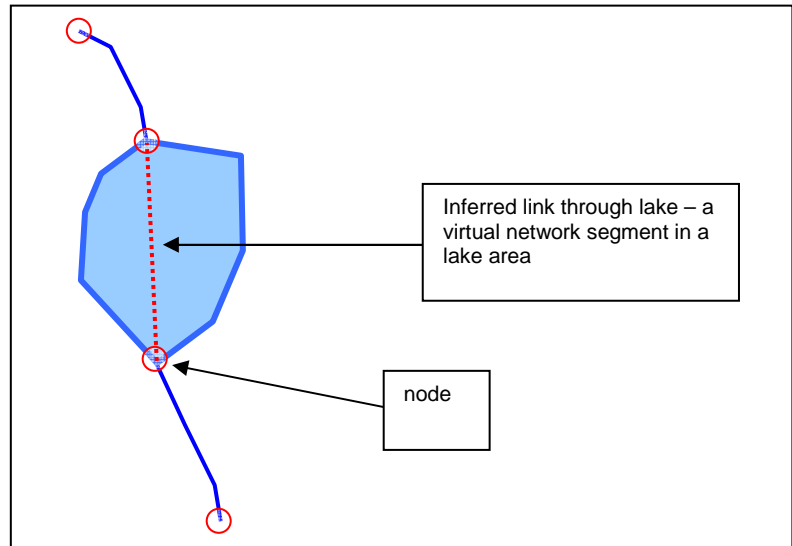
**Figure 4.**

**The two derived datsets for WFD delivery are lake and river water bodies as expected.**

**The river dataset contains real and virtual segments to create a closed river network.**
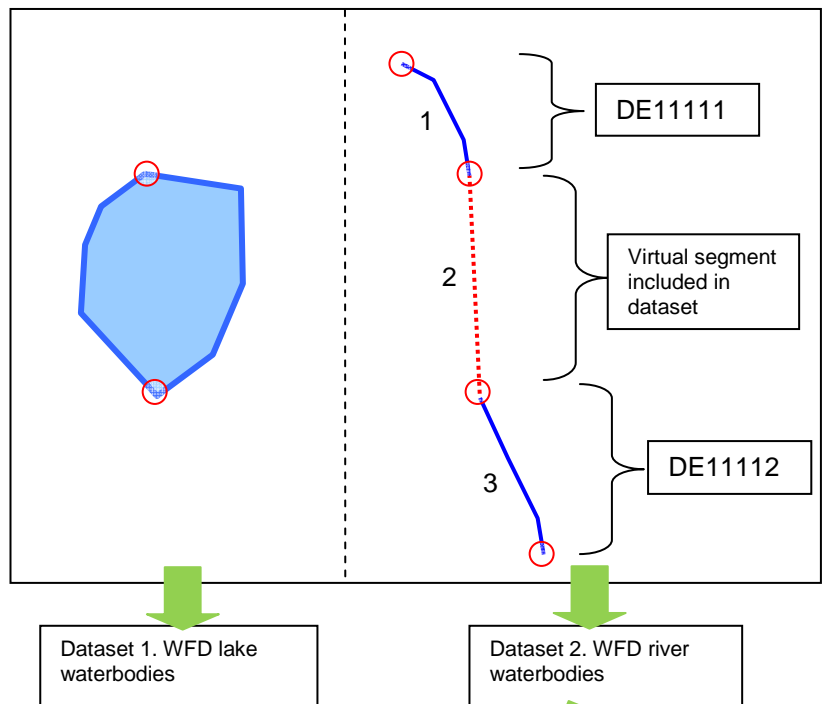
DE11111

Virtual segment included in dataset

DE11112

Dataset 1. WFD lake waterbodies

Dataset 2. WFD river waterbodies

| SegmentCode (mandatory) | EUSurfaceWaterBodyCode (Conditional: mandatory for real Water Body segment) | CONTINUA (mandatory) | WiseMainRiver (optional) – Y or N |
|---|---|---|---|
| 1 | DE11111 | Y | Y |
| 2 | | L | Y |
| 3 | DE11112 | Y | Y |

The details of the network are captured through the attributes of the segments which are identified. Each segment is given a code and where applicable the relevant EUSurfaceWaterBodyCode. Through the CONTINUA attribute, a selection from a code list (see

below) identifies whether the segment is real or virtual, and if it is virtual the type of feature it represents. Finally an optional attribute allows the segment to be classified as being part of a WISE main river.

**CONTINUA Codes**

| Name | Code |
|---|---|
| Real surface water network segment (real river or canal section) | Y |
| Real underground network segment (pipeline or natural network section) | N |
| Virtual network segment in lake area | L |
| Virtual network segment in river to connect tributary | R |
| Virtual network segment in transitional water area | T |
| Virtual network segment in coastal water area | C |
| Virtual network segment not under other classifications | V |

## River water body segmentation

One key element in most approaches to water body identification is that although water bodies will follow the geometry of the surface waters; they can begin / end at different locations. The nodes of WFD water bodies can differ from the nodes of the physical watercourse segments. Another potential issue is that a number of watercourses form a single water body for the WFD [10].

To address these issues in the attribute based model and to uphold the integrity of the closed river network the segmentation of the real world from which they are derived is maintained in the delivery of the spatial information.



**Figure 5**

**A number of watercourses can form a single water body. This segmentation is maintained in the delivery.**
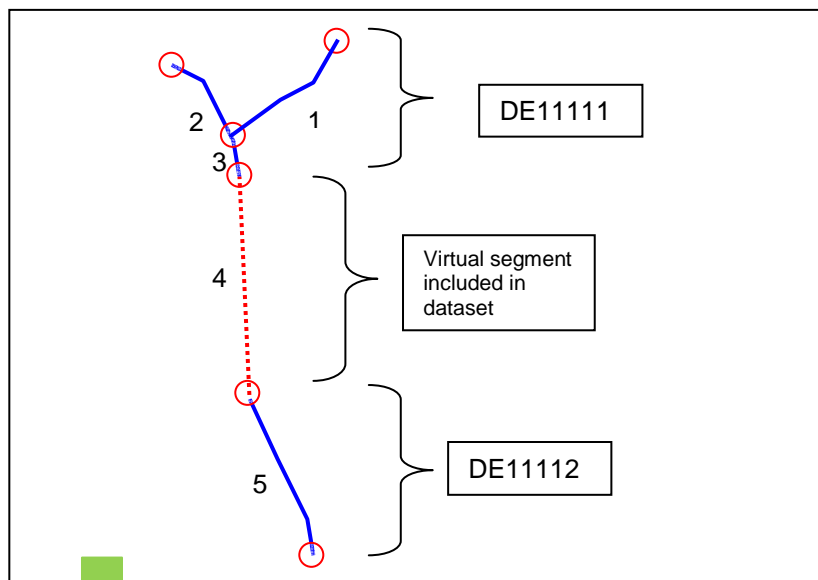
| SegmentCode (mandatory) | EUSurfaceWaterBodyCode (Conditional: mandatory for real Water Body segment) | CONTINUA (mandatory) | WiseMainRiver (optional) – Y or N |
|---|---|---|---|
| 1 | DE11111 | Y | N |

| 2 | DE11111 | Y | Y |
|---|---------|---|---|
| 3 | DE11111 | Y | Y |
| 4 |         | L | Y |
| 5 | DE11112 | Y | Y |

### 7.2.6.2 Harmonisation between water body deliveries

The previous section deals uses the example of a river passing through a lake, but this also applies to transitional and coastal water bodies as well. The following extends the example using the attribute based model to define water bodies in the real world to deliver a topologically correct network. (The following figure is adapted from the Hydrography data specification [10], pg 151.) This example also includes the additional attributes for River Segment name and code.
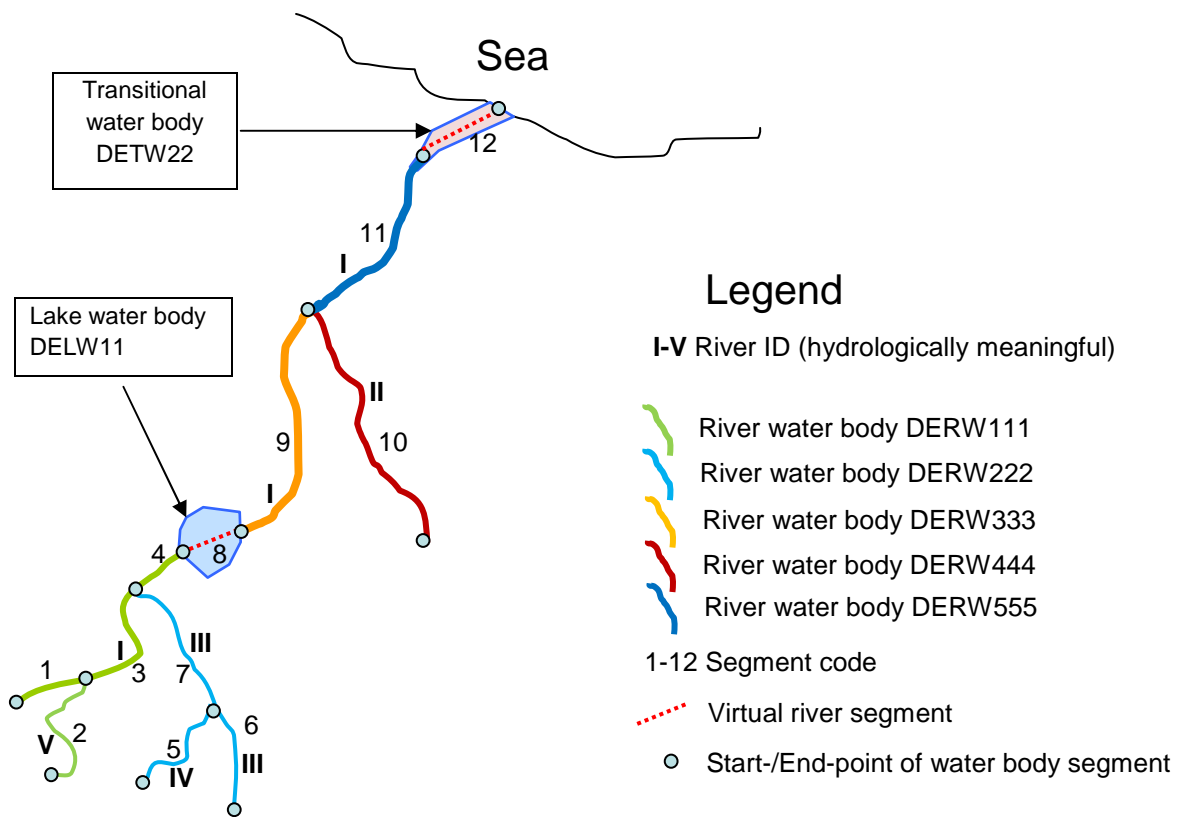


| SegmentCode | EUSurfaceWaterBodyCode | CONTINUA | WiseMainRiver | RS_NAME | RIVER_CD |
|-------------|------------------------|----------|---------------|---------|----------|
| 1 | DERW111 | Y | Y | Big River | I |
| 2 | DERW111 | Y | N | Wet stream | V |
| 3 | DERW111 | Y | Y | Big River | I |
| 4 | DERW111 | Y | Y | Big River | I |
| 5 | DERW222 | Y | N | Deep stream | IV |
| 6 | DERW222 | Y | N | Little river | III |
| 7 | DERW222 | Y | N | Little river | III |
| 8 |         | L | Y |         |    |

| 9 | DERW333 | Y | Y | Big River | I |
| 10 | DERW444 | Y | N | Side river | II |
| 11 | DERW555 | Y | Y | Little river | III |
| 12 | | T | Y | | |

### 7.2.6.2.1 Delivery of surface water bodies

The four types should be delivered in separate shape files – each following the appropriate attribute structure as detailed in the next section 7.2.7 and named according to the naming convention detailed in section 9.2, using the following abbreviations:

| Surface Water Body Type | Code |
| --- | --- |
| River water bodies | RW |
| Lake water bodies | LW |
| Transitional water bodies | TW |
| Coastal water bodies | CW |

### 7.2.6.3   Ensuring Groundwater Bodies delineation

GWBs are three-dimensional entities; however the representation of the feature will be as 2-D polygons. Borders of polygons of groundwater bodies are their projection on the surface. It is necessary that multiple overlapping groundwater bodies at different depths with non identical boundaries are distinguished in different horizons (layers). The concept of assignment of GWB-horizons to depth ranges (see chapter 8.1.6) should be supplemented by a simple numeration starting at the first GWB-horizon from the surface.

For the purpose of preparation of GWB reference layers and future WISE maps it is appropriate to specify the succession of the GWB-horizons (1, 2, 3, 4 where 1 is the first horizon from the surface). In case data for more than four horizons exist, all horizons beneath horizon 3 could be combined in horizon 4. This horizon could accordingly be named "deeper horizons".

This enumeration is mandatory for the submission of groundwater bodies.

| Horizon Code | Brief description |
| --- | --- |
| 1 | First horizon from the surface |
| 2 | Second horizon from the surface |
| 3 | Third horizon from the surface |
| 4 | Fourth and deeper horizons from the surface |

Types of GWB-horizons could optionally be added as an extra field (see section 8.1.6).

For the purposes of submission, a separate layer file should be provided for each horizon, or provide a single layer file with the horizon attribute completed.

### 7.2.6.4 Ensuring Protected Area delineation

Previous submissions have been mixed protected area types and thus often overlapping which makes further geographic analysis difficult and flawed in case statistics on topological errors are to be interpreted.

The WFD includes the following types of protected areas (ProtectedAreaType) and corresponding codes:

| ProtectedAreaType | Code |
|---|---|
| Bathing | BA |
| Birds | BI |
| Fish | FI |
| Shellfish | SH |
| Habitats | HA |
| Nitrates | NI |
| UWWT | UW |
| Article 7 Abstraction for drinking water | A7 |
| EuropeanOther | EU |
| National | NA |
| Local | LO |

For the purposes of submission a separate layer (shapefile) using the naming convention specified in section 9.2 can be provided for each layer, or a single layer file with the PA_Type attribute completed (see section 7.2.7.6).

## 7.2.7    Shape file templates

Shape file templates are provided at the following url:

http://water.eionet.europa.eu/schemas/dir200060ec/resources/spatial

- All datasets have one attribute for the unique identifier.

- The above section (7.2.7.1) describes the rationale and code lists behind the request for the four attributes in the river water bodies dataset.

- The above section (7.2.7.5) describes the rationale and code lists behind the request for the additional attribute in the groundwater bodies dataset.

- The above section (7.2.7.6) describes the rationale and code lists behind the request for the additional attribute in the protected areas dataset.

### 7.2.7.1    River water bodies shape file attributes

| Attribute name | Obligation | Type | Description |
|---|---|---|---|
| EU_SEG_CD | Mandatory | string (42) | International Code for the River Segment. <MemberStateCode>_<SEG_CD> |
| EU_CD_RW | Conditional: Mandatory for real Water Body segment | string (42) | EUSurfaceWaterBodyCode for the River Water Body as defined in the SWB reporting schema.<br><br>Code MUST have a 1-to-1 relationship with EUSurfaceWaterBodyCode and further attribute data described in the related XML file. |
| CONTINUA | Mandatory | string (2) | The codes 'Y' and 'N' describe real river segments. All other codes describe virtual river segments, to close the river network.<br><br>The correct use of this value is essential for the correct count of water bodies. (See section 7.2.6.1 above for full code list) |
| MAIN | Optional | string (2) | WISE main river. The codes 'Y' and 'N' describe whether the segment is considered a WISE main river, i.e. has a catchment size greater than 500 sq km. |
| RS_NAME | Optional | String(100) | The local name of the river segment<br><br>(Note: the name of the water body is reported as an attribute of the surface water body (SWB) schema) |
| RIVER_CD | Optional | String(42) | Hydrological or water management Code of the river. The code is valid from source to mouth of the river. |

### 7.2.7.2 Lake water bodies shape file attributes

| Attribute name | Obligation | Type | Description |
|---|---|---|---|
| EU_CD_LW | Mandatory | string (42) | EUSurfaceWaterBodyCode for the Lake Water Body as defined in the SWB reporting schema.<br><br>Code MUST have a 1-to-1 relationship with EUSurfaceWaterBodyCode and further attribute data described in the related XML file. |

### 7.2.7.3 Transitional water bodies shape file attributes

| Attribute name | Obligation | Type | Description |
|---|---|---|---|
| EU_CD_TW | Mandatory | string (42) | EUSurfaceWaterBodyCode for the Transitional Water Body as defined in the SWB reporting schema.<br><br>Codes MUST have a 1-to-1 relationship with EUSurfaceWaterBodyCode and further attribute data described in the related XML file. |

### 7.2.7.4 Coastal water bodies shape file attributes

| Attribute name | Obligation | Type | Description |
|---|---|---|---|
| EU_CD_CW | Mandatory | string (42) | EUSurfaceWaterBodyCode for the Coastal Water Body as defined in the SWB reporting schema.<br><br>Codes MUST have a 1-to-1 relationship with EUSurfaceWaterBodyCode and further attribute data described in the related XML file. |

### 7.2.7.5 Groundwater bodies shape file attributes

| Attribute name | Obligation | Type | Description |
|---|---|---|---|
| EU_CD_GW | Mandatory | string (42) | International code of the Ground Water Body as defined in the GWB reporting schema.<br><br>Code MUST have a 1-to-1 relationship with EUGroundWaterBodyCode and further attribute data described in the related XML file. |
| Horizon | Mandatory | string (2) | See section 7.2.6.3 for code list and description.<br><br>Alternatively provide separate shape files for each horizon (see file naming convention in section 9.2). |
| Horz_type | Optional | String(10) | The description of type of GWB-horizon (e.g. main, thermal, mineral... - see section 8.1.6) |

### 7.2.7.6    Protected Areas shape file attributes

| Attribute name | Obligation | Type | Description |
|---|---|---|---|
| EU_CD_PA | Mandatory | string (42) | International code of the Protected Area as defined in the Protected Areas reporting schema. Codes MUST have a 1-to-1 relationship with further attribute data described in the related XML file. |
| PA_Type | Mandatory | string (2) | See section 7.2.6.4 for code list and description. Use abbreviation for code.<br><br>Alternatively provide separate shape files for each protected area type (see file naming convention in section 9.2). |

### 7.2.7.7    River Basin District/Sub units shape file attributes

| Attribute name | Obligation | Type | Description |
|---|---|---|---|
| EU_CD_RB | Mandatory | string (42) | International code of the River Basin District as defined in the RBDSUCA reporting schema (EURBDCode). Codes MUST have a 1-to-1 relationship with further attribute data described in the related XML file. |
| EU_CD_SU | Mandatory | string (42) | International code of the Sub-unit as defined in the RBDSUCA reporting schema (EUSubUnitCode). Codes MUST have a 1-to-1 relationship with further attribute data described in the related XML file.<br><br>At least one Sub-unit must be declared for each RBD. If there is only one Sub-unit then enter the RBD code (EURBDCode) into the EUSubUnitCode. |

### 7.2.8 Production of centroids for XML schema reporting

<u>No spatial datasets under the WFD are reported as points.</u>

The data files in the reported xml schemas (Lat Lon attributes) are related to the centroids for the associated spatial object types. The centroids are used to reference the line or polygon with which they are located and the attribute information is attached to the centroid and reported in the xml schema. The reported centroids are to be consistent with the reported spatial data set. Therefore centroids should be derived from the spatial dataset. Centroids are calculated for the following:

- River Basin Districts
- Sub-units
- Surface water bodies
- Groundwater bodies
- Protected areas

When linear or area entities are represented as points (centroids) these should be 'geometric' centroids in the sense that the point should fall inside a polygon representation ("center of gravity") or for linear features be a point on the line.

**Centroids are derived in decimal degrees Longitude/Latitude in ETRS89 and reported in the appropriate schema.**

As part of quality control procedures, the centroids will be derived from the schema submissions and checked against the related spatial dataset.

### 7.2.9 ReportNet viewing and quality checking

A Reportnet conversion routine is available in the Central Data Repository (CDR) for automatic conversion of xml files containing coordinate data into the format used by Google Earth for visual inspection of x,y points (decimal degrees). For more information about Reportnet: http://www.eionet.europa.eu/rn.

ReportNet is also making shapefile (SHP) converters available to help quality assess submissions:

- SHP -> TXT: Shapefile information (metadata), for viewing in the browser
- SHP -> KML: Shapefile feature geometry and attribute values converted to valid OGC-KML version 2.2
- SHP -> GML, CSV, MapInfo file, ...

## 7.3 ID management

No two spatial objects of spatial object types can have the same identifier. The identifier has to be unique within all the spatial objects published in WISE. The identifier can not be used again if an object is modified.

The same spatial object shall be reported always using the same identifier (e.g. monitoring stations reported to SoE, WFD, Nitrates Directive, etc).

## 7.3.1    ID Structure

The following structure for a unique identifier should be used for designated water bodies. The water body identification shall be unique within both the MS as well as on EU level.

At European level the following structure should be used (e.g. EUSurfaceWaterBodyCode, EUGroundWaterBodyCode, EUSubUnitCode etc.)

MS    = a 2 character Member State identifier, in accordance with ISO 3166-1-Alpha-2 country codes[11]; and $\#_1\#_2…\#_{22}$  = an up to 22 character feature identifier that is unique within the Member State.

(symbol # = wildcard character (a wildcard character can be used to substitute for any other character or characters in a string)).

At MS level the ISO country code can be left out of the unique identifier.

According to these definitions the code for a coastal water body in Germany could look as follows:

| Name | Data type | Min/max length | Example |
|---|---|---|---|
| MS_code | character | 1-22 | CW7596 |
| EU_code | character | 3-24 | DECW7596 |

Special advice given is that:

- The local identifier shall only use the following set of characters: {"A"…"Z", "a"…"z", "0"…"9", "_", ".", "-", ","}, i.e. only letters from the Latin alphabet, digits, underscore, point, comma, and dash are allowed;

- The identifier should contain no spaces;

- Alphabetical characters should always be in UPPER CASE;

- Special characters must be avoided, such as '$', '!', '&', 'ë', 'á', etc;

- Digits should be used where practical to help avoid the above problems.

## 7.3.2    Life cycle rules

Persistence: The identifier has to remain unchanged during the life-time of a spatial object. If features are re-coded, links to historical data and links to data related to these features will be lost.

New identifiers may be created if:

- The location of a point features changes (e.g. if a monitoring station is moved upstream or downstream); threshold 125 m in accordance to the positional accuracy recommended for GIS datasets (according to the scale 1:250,000);

- The location or length of a line feature changes (e.g. if a river water body is divided or merged with another);

- The location or size of a polygon changes (e.g. if a River basin District is divided or merged with another).

Groundwaterbody example

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[11] http://www.iso.org/iso/country_codes.htm

A polygon will represent one GWB or a group of GWBs. Each polygon will be assigned with an ID to uniquely identify the spatial object. Over time, the delineation of the boundaries of GWBs might change due to new data, improved conceptual understanding, amendments of methodologies to delineate GWBs or changed management conditions or specifications. Life-cycle rules specify when the existing object is redundant and a new object with a new identifier is created.

The following life-cycle rules apply for GWBs:

- If a GWB is split into two or more GWBs, new IDs have to be assigned to the new GWBs;



- If GWBs are merged new IDs have to be assigned;



- If the size of GWBs change (smaller or larger), it is up to Member States judgement to decide when new IDs have to be assigned.

### 7.3.3 Historic data management, object lifetime management

If a spatial object is updated it will be necessary to establish a system that manages the changes of objects in time and identifies predecessors and successors. The changes per record and a link to previous reported data should be described in the metadata file, element 6.1 and have the following structure:

| Report ID | Reference date | ID of spatial object | Status flag | SuccessorID |
|---|---|---|---|---|
| WFD_ART3_2004 | 22.06.2004 | RBD1 | active | 0 |
| WFD_ART3_2004 | 22.06.2004 | RBD2 | active | 0 |
| WFD_ART3_2004 | 22.06.2004 | RBD3 | active | 0 |
| WFD_ART3_2004 | 22.06.2004 | RBD4 | active | 0 |
| WFD_ART3_2004 | 22.06.2004 | RBD5 | active | 0 |
| WFD_ART5_2005 | 22.03.2005 | RBD1 | inactive | RBD6 |
| WFD_ART5_2005 | 22.03.2005 | RBD1 | inactive | RBD7 |
| WFD_ART5_2005 | 22.03.2005 | RBD2 | inactive | |
| WFD_ART5_2005 | 22.03.2005 | RBD3 | inactive | RBD8 |
| WFD_ART5_2005 | 22.03.2005 | RBD4 | inactive | RBD8 |
| WFD_ART5_2005 | 22.03.2005 | RBD5 | active | 0 |

| Report ID | Reference date | ID of spatial object | Status flag | SuccessorID |
|---|---|---|---|---|
| WFD_ART5_2005 | 22.03.2005 | RBD6 | active | 0 |
| WFD_ART5_2005 | 22.03.2005 | RBD7 | active | 0 |
| WFD_ART5_2005 | 22.03.2005 | RBD8 | active | 0 |

Report ID:                Identifies the reporting obligation –e.g. for the RBMP reporting in 2010 the ID will be the following: WFD_RBMP_2010

Reference date:      The reference date of the latest dataset submitted (or resubmitted) to WISE. This date shall correspond with metadata element 5.3 or element 5.2

ID of spatial object:  This is the unique identifier at EU level of a spatial object – e.g. lake (EUSurfaceWaterBodyCode)

Status flag:            *active* = object valid at reporting deadline or

                         *inactive* = object no longer valid at reporting deadline. After being reported once with StateFlag = *inactive* no further reporting of this object is required.

SuccessorID:          NULL if an object is active.

                         NONE if an object is inactive with no successor

                         Or otherwise give the ID of the successor object(s) for an inactive object.

For further information on Data Management please refer to chapter 4.4.5, 4.4.6 and Appendix 9 of the GIS Guidance Document No. 9[1].

A schema defining the structure of this information for reporting is available at
http://water.eionet.europa.eu/schemas/dir200060ec/WFDObjectHistory_0p2.xsd

## 7.3.4    WISE reference GIS datasets

The production of WISE reference datasets is described in detail in the GIS Guidance document, section 6.2.

<u>River basin districts and sub-units</u>

In addition to the IDs assigned by Member States, unique IDs will be generated at EC level to uniquely identify River Basin Districts in the WISE Reference GIS dataset. This is necessary to identify and visualise **international River Basin Districts**. With the IDs assigned by Member States only the Member State part of international River Basin Districts can be identified.

The structure of the WISE code will be defined by the data provider of the reference dataset according to the specifications given in the WISE GIS guidance document, second edition. The data provider will be the EEA or its contracted partner.

<u>Groundwater bodies</u>

In addition to the IDs assigned by Member States, unique IDs will be generated at EC level to uniquely identify groundwater bodies in the WISE Reference GIS dataset. This is necessary to identify and visualise **transboundary GWBs**. With the IDs assigned by Member States only the Member State part of transboundary GWBs can be identified.

The structure of the WISE code will be defined by the data provider of the reference dataset according to the specifications given in the WISE GIS guidance document, second edition. The data provider will be the EEA or its contracted partner.

The following diagram illustrates a fictive example of MS GWB-IDs and European (WISE) GWB-IDs for a transboundary groundwater body.
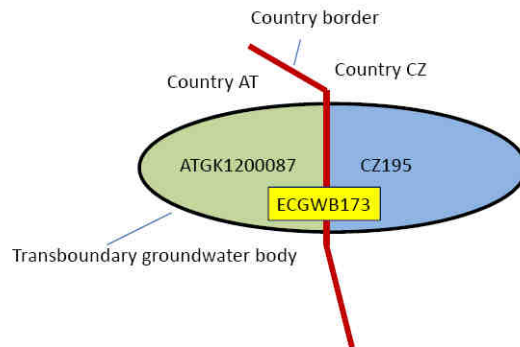


There is a transboundary GWB between AT and CZ. Both Member States delineate the national parts of the transboundary GWBs and assign IDs (EUGroundwaterBodyCode=ATGK1200087, CZ195). The boundaries of the GWB are harmonised at the country border and the GWBs are marked as transboundary. At EU level it will be identified which Member State parts of transboundary GWBs belong together and unique IDs for the total GWB will be assigned (ECGWB173).

# 8.    Data production

## 8.1    Spatial dataset identification

| Object type | Representation | Minimum area/length |
|---|---|---|
| River Basin Districts | Polygon | Within national boundaries and minimum 5,000 sq km |
| Sub-units | Polygon | Within national boundaries and be of a size between 5,000 and 50,000 sq km |
| River surface water bodies | Line | River water bodies have a catchment area > 10 sq km, BUT only those with catchment area > 500 sq km are included. The remainder are delivered as centroids only. |
| Lake surface water bodies | Polygon | Surface area ≥ 10 sq km |
| Transitional surface water bodies | Polygon | All |
| Coastal surface water bodies | Polygon | All |
| Groundwaterbodies | Polygon | Trans-national features and can also cross borders of River Basin Districts |
| Protected Areas | Polygon | All |

### 8.1.1    River Basin Districts and Sub-units

All data and information reported under the WFD is related to RBD. Thus RBD will be the main unit to analyse and visualise WFD data at the European scale.

**RBDs exceeding the threshold of 50,000 km² should be divided into subunits (SU)**. The recommended size of SU is between 5000 and 50000 sq km (but smaller are inevitable and larger are possible). Furthermore, Member States have to liberty to use their own possible existing management units to identify subunits.

At least one Sub-unit must be declared for each RBD. If there is only one Sub-unit then enter the RBD code (EURBDCode) into the EUSubUnitCode.

A preliminary analysis of sub-units can be found here
http://circa.europa.eu/Members/irc/env/wfd/library?l=/working_groups/new_wg_reporting/meetings/meeting_march1_2008/sub-unit_report_31jan

In 2009 reporting of sub-units was invited from Member States which will result in the update of the River Basin District reference layer.

**Figure 6: River Basin Districts and Sub-Units (colured) October 2009 (DRAFT)**

## 8.1.2 Water bodies

A short overview of designation of water bodies are given in this guidance document.

For further information it is recommended to read:

- Water Framework Directive [4],

- CIS Guidance document No. 2 "Identification of Water Bodies" [1]

- CIS Guidance document No. 5 "Transitional and Coastal Waters – Typology, Reference Conditions and Classification Systems "[2]

Figure 8.7 suggests the identification of surface water bodies in a hierarchical process.
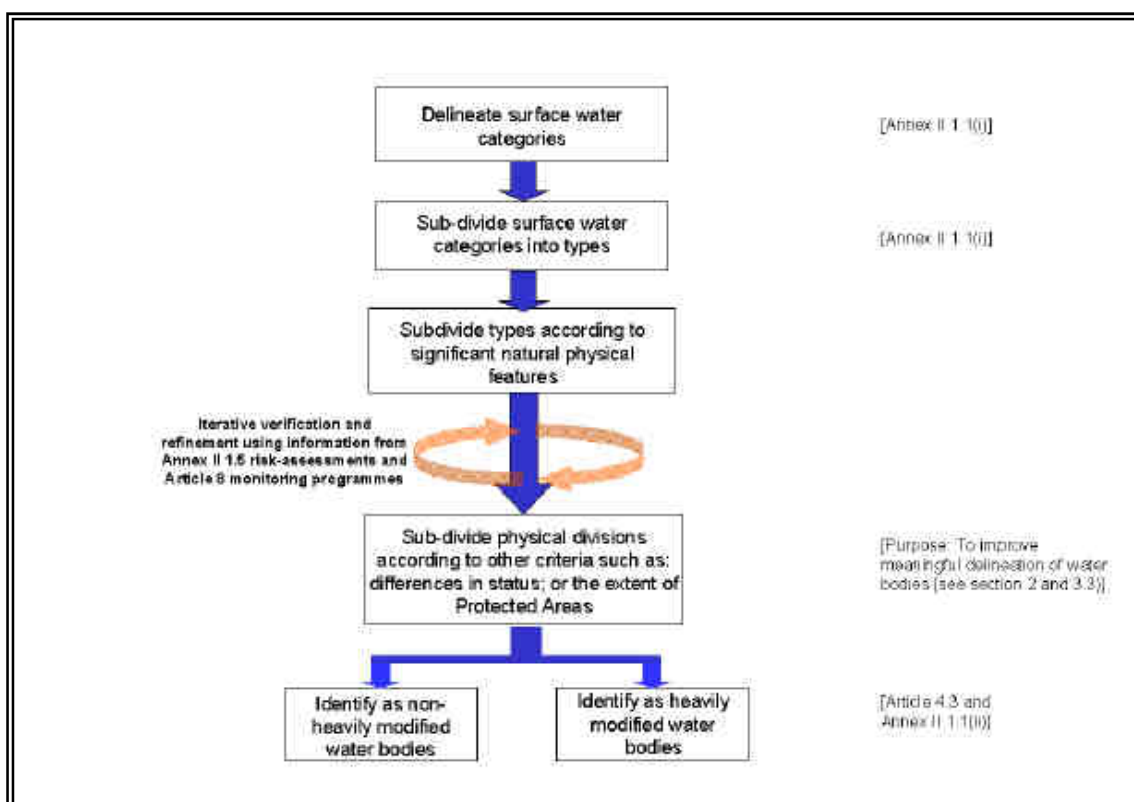


**Figure 8.7 – Summery of suggested hierarchical approach to the identification of surface water bodies, CIS Guidance document No. 2 [1], p. 11**

The WFD sets out two systems for differentiating water bodies into types, System A and System B (Annex II of the WFD). Only the System A typology specifies values for size descriptors for rivers and lakes. The smallest size range for a System A river type is 10 – 100 sq km catchment area. The smallest size range for a System A lake type is 0.5 – 1 sq km surface area. No sizes for small transitional and coastal waters are given. The application of system B must achieve, at least, the same level of differentiation as system A. It is therefore recommended to use the size of small rivers and lakes according to system A. However, it is recognised that in some regions where there are many small water bodies, this general approach will need to be adapted. Having said this, it may be appropriate to aggregate water bodies into groups for certain purposes. Further information on aggregation of water bodies can be found in Chapter 5 in CIS Guidance document No. 2 [1].

### 8.1.3 Transitional water bodies

As defined in the WFD, Article 2 (6) is "transitional waters"- bodies of surface water in the vicinity of river mouths which are partly saline in character as a result of their proximity to coastal waters but which are substantially influenced by freshwater flows".

The WFD gives no indication of the minimum size of transitional waters to be identified as separate water bodies. Although catchment size may be used as guideline for the size of identified transitional waters, it should be considered with other factors such as the size, length, volume, river, discharge and the nature of the mixing zone. Most importantly it must meet the water body definition (WFD, Article 2.10) of being a 'discrete and significant' element of surface water. Significant could mean in terms of size or risk of failing to meet good ecological status.

### 8.1.4 Coastal water bodies

As defined in the WFD, Article 2 (7) is "coastal waters" defined as surface waters on the landward side of a line, every point of which is at a distance of one nautical mile[12] on the seaward side from the nearest point of the baseline from which the breadth of territorial waters is measured, extending where appropriate up to the outer limit of transitional waters.

The coastal waters are measures on the basis of the baseline used for the measurement of the territorial waters. In many cases this baseline coincides with the coastline, but in many others it does not because of the presence of islands, bays, etc. This means in some cases the costal waters extend much more than one mile from the coast.
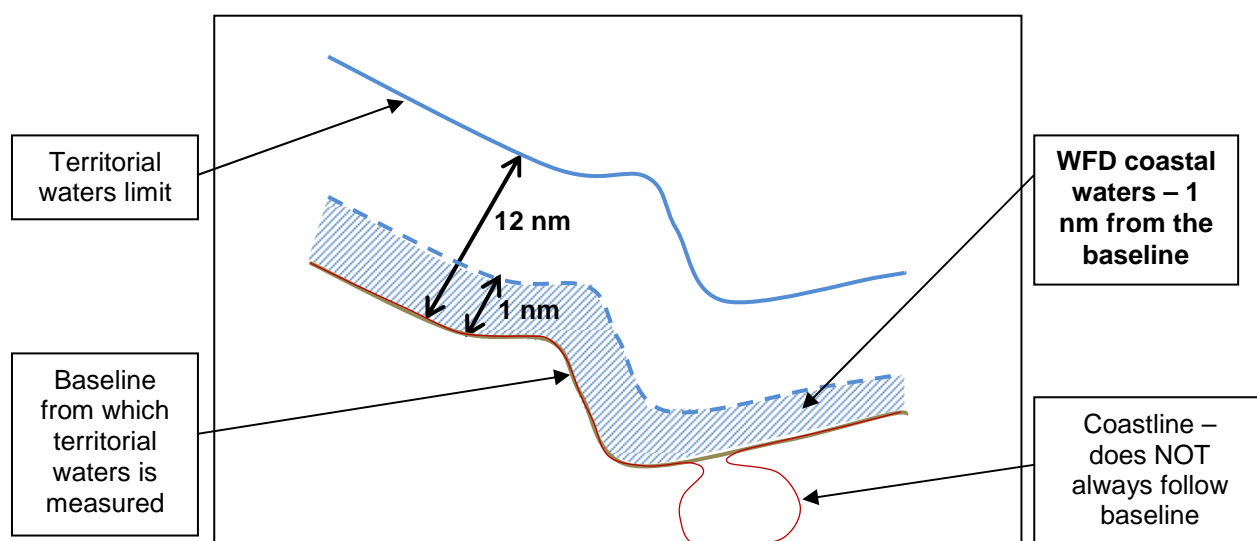


The free exchange of substances from river basin districts to the open sea takes place in coastal waters. Coastal waters must be assigned to a River Basin District or a sub-unit. This may involve the splitting of stretches of coastal water that might otherwise be considered as single water bodies. When assigning a stretch of coastal water to a River Basin District the objective is to ensure that coastal waters are assigned to the closest possible or the most appropriate natural management unit and to minimise any unnecessary splitting of coastal stretches. To ensure consistency in the approach, the following principles should be applied:

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[12] The international standard definition is: 1 nautical mile = 1,852 meters exactly.

Where possible, existing administrative boundaries could be used. Examples are, ecoregions defined within the Directive and regions defined in the Marine Conventions

The boundaries between two adjacent types should be used wherever possible to minimise unnecessary splitting of the coastline

In the general case, the coastline should be split at open coast areas rather than through natural management units such as bays or inlets. However, specific situations may exist where the splitting of natural units for management purposes can not be avoided.

## 8.1.5 River and lake water bodies

A reservoir formed by damming a river would be reported as a river water body, a reservoir formed by damming an existing lake would be reported as a lake water body. A canal would be expected to be reported as a river water body.  Reservoirs and canals would also be reported as heavily modified or artificial water bodies.

As described in the CIS Guidance document No. 2 [1] will a river stretch mainly be identified by the water category, type and physical features – but other criteria can be taken into account as well (e.g. considerations regarding pressure and impacts and protected areas). If a river is running through another water category – e.g. a lake larger than 0.5 sq km –the lake can not be defined both as a lake and river water body. The boundary of a water body must therefore be established where two different water categories meet – see Figure 8.8. A river stretch can also only be defined by one type and can also be designated by physical features that are likely to be significant in relation to the objectives of the WFD – this could for instance be a sub-division of a river on the basis of a river confluence or where a river stretch is defined as heavily modified.
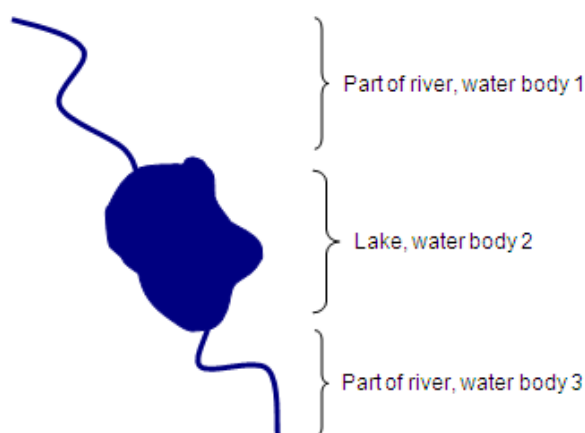


**Figure 8.8 – The boundaries between different surface water categories**

## 8.1.6 Groundwater bodies

GWBs according to Article 2.12 WFD are defined as "a distinct volume of groundwater within an aquifer or aquifers". Thus GWBs are three-dimensional. For the time being it is not possible to represent GWBs three-dimensionally in geographic information systems as there are, in most cases, not enough data available to develop three-dimensional models of GWBs. Thus the representation of the feature will be as two-dimensional polygons.

The GIS data provided should allow bodies which are overlaid to be distinguished. It should also be possible to identify GWBs which are associated to groundwater dependent aquatic and terrestrial ecosystems. Furthermore, the identification of the aquifer type of which the GWB mainly

consists, and the orientation and geological profiles of the GWB, contribute considerably to an enhanced conceptual understanding/model.

GIS data to be reported for each groundwater body are specified in Guidance Document No. 21: Guidance for reporting under the Water Framework Directive (see Chapter 13). This data will allow the description and visualisation of GWBs and groups of GWBs. Furthermore the parameter horizon should also be characterised according to the groundwater body layer (e.g. alluvial deposit layer, "main" layer, deep horizon (cenoman), thermal or mineral water).

The definition of the parameter "**horizon**", which will be used in the sense of the numerical position of groundwater body layer (e.g. 1 for the first horizon from the surface, 2 for the second horizon from the surface, 3 for the third horizon from the surface, 4 for fourth and deeper horizons from the surface) and how GWBs should be assigned to horizons is given in section 7.2.6.3. More details about the textual characterisation including examples are also provided in section 7.2.6.3. Reference to explanatory documents is provided in Chapter 13 (WG D and WG C meeting 2008).

**According to Guidance Document No. 21: Guidance for reporting under the Water Framework Directive the following should be reported for each GWB**:

- Water body code;

- Water body name;

- Shapefile/GML file:

    - Groundwaters: boundaries of groundwater bodies or groups of groundwater bodies larger than 100 sq km.

- Centroid (for all groundwater bodies) (technical specification for the calculation of the centroid to be developed in the context of the updated GIS guidance);

- For groundwater bodies or groups of groundwater bodies, if available:

    - Layered (Y/N);
    - Average depth to groundwater body (m);
    - Average thickness of groundwater body (m);
    - Assignment to a depth range where the main part of the GWB is situated in (depth ranges: 0-20m, 20-50 m, 50-200 m, >200m);
    - Directly dependent aquatic ecosystems (Y/N);
    - Directly dependent terrestrial ecosystems (Y/N);
    - Geological formation – aquifer type (according to a predefined typology);
    - Type of vertical orientation of GWB (indicated by category and visualised by symbols);
    - Volume of aquifer (m$^3$) (if possible).


Below, the data/information required are described in more detail.

**Depth information** is essential for distinguishing overlaying groundwater bodies. By requesting information on the 'average depth to…' and the 'average thickness of…' it is possible to distinguish the vertical situation and hierarchy of overlaying GWBs.

- **Layered (Y/N)?**
  Is the GWB overlaid by (a) GWB(s) or (b) overlaying (an)other GWB(s)?

- **Average depth to groundwater body (m)**
  Area-weighted mean distance between the 'groundwater surface' and the land surface.

- **Average thickness of groundwater body (m)**
  Area-weighted mean thickness of the GWB. The thickness is the vertical distance between the bottom of the GWB and the GWB table.

The confusing visualisation of overlaying GWBs can be overcome by visualising only GWBs belonging to a selected depth category/range. Therefore it is proposed to assign each GWB to a predefined depth range wherein it is mainly situated.

**Assignment to a depth range where the main part of the GWB is situated in (depth ranges: 0–20m, 20–50m, 50–200m, >200m)**
Depth range where the main volume of the GWB is situated in.

*Explanatory diagram:*
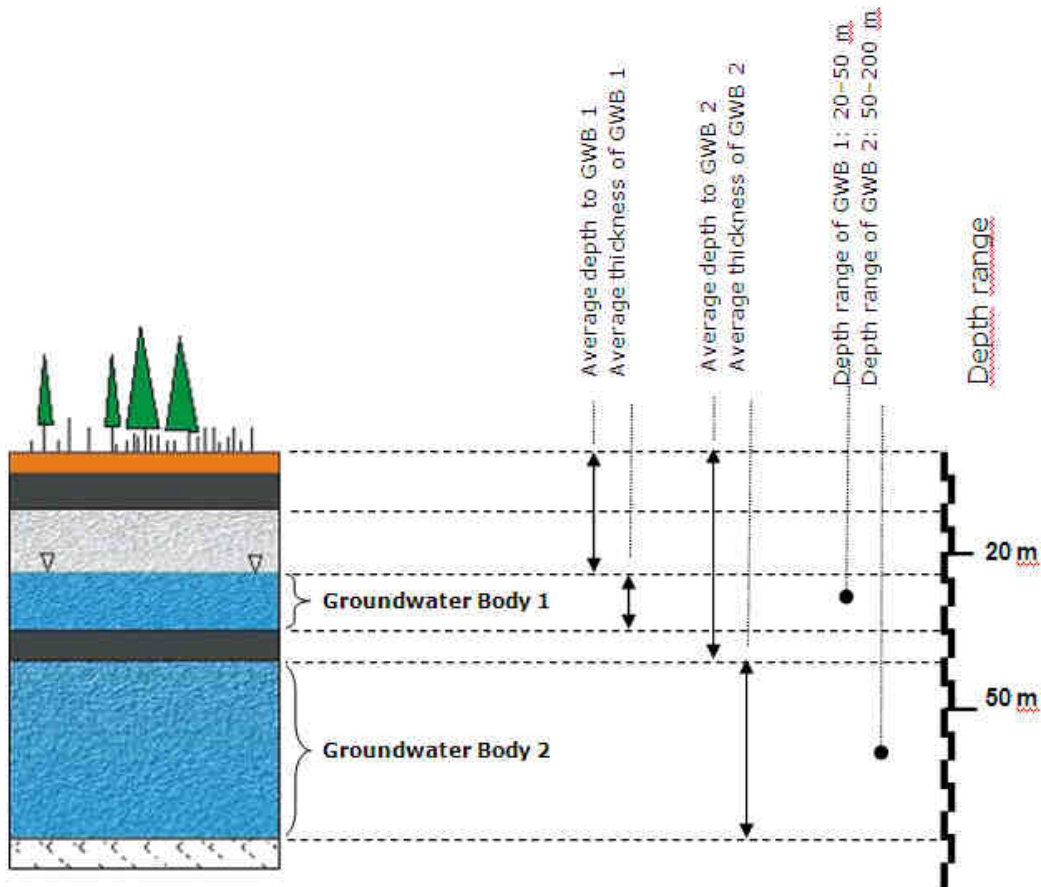


As the WFD emphasises the inter-linkage between groundwater and aquatic and terrestrial ecosystems, it is necessary to identify those GWBs directly connected to aquatic and/or terrestrial ecosystems. Therefore the follow information has been included in the data collection.
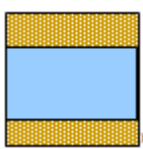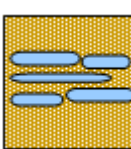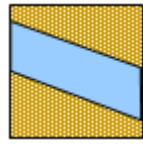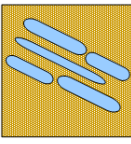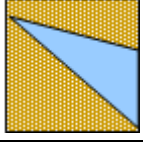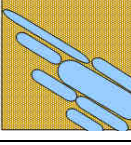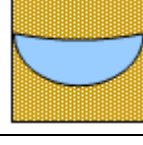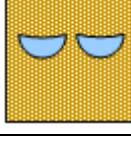
- **Directly dependent aquatic ecosystem(s) (Y/N)?**
  Are there any aquatic ecosystems directly dependent on the groundwater body.

- **Directly dependent terrestrial ecosystem(s) (Y/N)?**
  Are there any terrestrial ecosystems directly dependent on the groundwater body.

In future conceptual models or geological profiles for visualising the third dimension should be included. To achieve this, a stepwise approach is proposed. The information on the aquifer type for the hydrogeological characterisation is a key element of a conceptual model and each groundwater body should be assigned to a predefined type to which it mainly belongs. Although it is a simplification, the advantage of a predefined typology is enhanced comparability and ability to select. The proposed typology of aquifer type and permeability is fully in line with the general (simplified) legend used in the International Hydrogeological Map of Europe 1:1,500,000 (BGR & UNESCO, 2008).

- **Geological formation – aquifer type (according to a predefined typology)**
  Aquifer type (including permeability) which is predominant in the GWB. One of the following 5 types is to be selected.

  - Porous aquifer – highly productive;

  - Porous aquifer – moderately productive;

  - Fissured aquifers, including karst – highly productive;

  - Fissured aquifers, including karst – moderately productive;

  - Insignificant aquifers – local and limited groundwater.

Information on the principal vertical orientation of GWBs is an interim step on the way to the future option of including geological profiles in each GWB. As a first step, each GWB should be assigned to a category of orientations,visualised by symbols, as shown below.

- **Type of vertical orientation of GWB (indicated by category and visualised by symbols)**
  The main vertical orientation type is represented by a simple symbol:

| Type | Description | Symbol | Type | Description | Symbol |
|------|-------------|--------|------|-------------|--------|
| 1a | Horizontal, mainly continuous body |  | 1b | Horizontal, mainly smaller individual formations |  |
| 2a | Declining, mainly continuous body |  | 2b | Declining, mainly smaller individual formations |  |
| 3a | Declining and cumulative, mainly continuous body |  | 3b | Declining and cumulative, mainly smaller individual formations |  |
| 4a | Boat form, mainly continuous body |  | 4b | Smaller individual boat formed formations |  |
| 5 | Other | | | | |

Furthermore, pressure information related to groundwater bodies should be reported together with the geographic information (see Reporting sheet GIS). This information is not listed here as this guidance deals solely with the reporting of the location and boundaries of groundwater bodies.

## 8.2    Spatial resolution

### 8.2.1    **Scale**

Member States are recommended not to simplify spatial data before submitting to WISE. The accuracy of the data should however be documented in the metadata so the simplification process performed in WISE during e.g. reference data production can respect the original accuracy.

Considering both the WISE needs and the practical constraints of data availability, the GIS Working Group recommends that the required positional accuracy for reported data should be

better than 125 metres (1:250 000). The positional accuracy should always be kept as high as possible and ideally be similar to the national operational datasets.

### 8.2.2 Positional accuracy

This quality sub-element shows the closeness of reported coordinate values to values accepted as or being true. All spatial objects should be provided at the source accuracy where possible. Where more than one geometry is available at the source, the provided geometry should be the one with the highest spatial detail; i.e. a surface geometry is provided where both surface and point geometry is available or where both surface and linear geometry is available.

Considering both the WISE needs and the practical constraints of data availability, it is recommended that the **required positional accuracy** for reported data is set to **a minimum of 125 metres** (corresponding to a scale of 1:250.000) and **a maximum of 500 meters** (corresponding to a scale of 1:1.000.000). The positional accuracy should however always be kept as high as possible and ideally be to the same as the national operational datasets.

For more information see Chapter 5.1, WISE GIS guidance document, second edition.

## 8.3 Spatial representation

The spatial representation shall be vector data, where RBD, sub-units, protected areas, coastal, transitional and lake water bodies shall be represented as polygons. GWB shall for the time being be represented as two dimensional polygon features. Rivers shall be represented as line features, but will for very small river strings be represented on European level as point features (centroids) (see explanatory text in Chapter 5.3). Monitoring stations shall be represented as point features. Where spatial presentation is points then coordinates will be derived from the reporting schemas.

GWBs are three-dimensional. For the time being the spatial representation will be two dimensional and GWBs will be reported as **polygon features** representing the outer border (horizontal projection) of the groundwater body.

## 8.4 Coordinate reference system

Data should be delivered in the spheroid coordinates (decimal degrees) in the geodetic datum ETRS-89 (EPGS code 3035, http://www.epsg-registry.org/). For islands not belonging to the European continental landmass the use of ETRS89 may not applicable. For those areas the WGS84 (World Geodetic System 1984) should be used as the geodetic datum.

Vertical co-ordinates should be in metres in the "European Vertical Reference System" realised by *EVRF2000.*

At national level, a series of different coordinate reference systems is used. It is essential that conversion from a national coordinate reference system is done with care. If conversion is not done correctly data will lose positional accuracy. Proper transformation routines have to be observed.

The National Mapping Agencies (NMA) (or comparable institutions and organisations) have provided the information for the descriptions of the national Coordinate Reference Systems and for the transformation parameters between the national Coordinate Reference Systems and the European Coordinate Reference System ETRS89. Formulae can be requested from the NMAs or are directly accessible at http://crs.bkg.bund.de/crs-eu/

The transformation between national systems and the European coordinate reference system is done using the agreed transformation parameters for different countries (see the link above).

# 9.    Data exchange format

## 9.1    Formats

- Under WFD reporting, point features are only reported in form of XML documents, the main reporting guideline here is the XML schema

- Line and polygon features are reported both as shapefiles and in form of XML documents. XML documents again have their schema and the simple guidelines for shapefiles are:

  ▪ A valid shapefile under WFD reporting is a set of 4 files: geometry (*.shp), index (*.shx), attributes (*.dbf) and projection (*.prj)

  ▪ All 4 files MUST have the same (meaningful) file name (case sensitive), plus the above-mentioned file name suffixes (the latter ones either in lower or in UPPER case, but not in MiXeD case)

  ▪ There must be 1 feature attribute in the dbf file for the unique identifier (EUSurfaceWaterBodyCode, EUGroundWaterBodyCode...) depending on the reporting context

  ▪ Unique feature identifiers in the dbf file MUST have a 1-to-1 relationship with further attribute data described in the related XML file

  ▪ In order to facilitate further data processing, shapefiles shall be uncompressed inside Reportnet envelopes. If your shapefile in in ZIP format, make use of Reportnet's "Upload zipfile" function, which will uncompress your ZIP archive, before adding the files into the envelope

- When in doubt, or in case of questions: apply common sense and/or contact helpdeskWFD@atkinsglobal.com or helpdesk@eionet.europa.eu

All submitted data shall be submitted with metadata, see section 10: Metadata, for details on completing this.

### 9.1.1    GML

GML will only be required for the reporting through web services, which are not yet established.

## 9.2    Naming of files

When uploading files it is required that the file naming has the following structure:

**[Country ID]_[EURBDCode]_[Feature set name]_[Date]**

- Country ID (ISO code[11])

- River Basin District MS code (EURBDCode)

- Feature set name as an acronym (GWB/SWB/PA/RBD/SU)

- Date: this should be the date of data submission (Upload date) – YYYYMMDD

Example:  ES_Douro_GWB_20081231

Additionally, SWBs, GWBs and Protected Areas can be delivered in more files if convenient (e.g. overlaying groundwater bodies – see sections 8.1.6 and 8.1.7). If this is the case, an abbreviation of the provided feature set name type should be included.

**[Country ID]_[ EURBDCode]_[Feature set name]_[abbreviation or file numbering]_[Date]**

Examples:

ES_Douro_SWB_RW_20081231

ES_Douro_SWB_LW_20081231

ES_Douro_SWB_TW_20081231

ES_Douro_SWB_CW_20081231


ES_Douro_GWB_1_20081231

ES_Douro_GWB_2_20081231


ES_Douro_PA_BA_20081231

ES_Douro_PA_A7_20081231


If multiple files are used to report for one feature set then the metadata should state it is part of a data series (Metadata element 1.3) and the content of each file should be properly described within the metadata (Metadata element XXX).


## 9.3 Data upload

Data submission is through the ReportNet Central Data Repository (CDR) http://cdr.eea.europa.eu. Full submission instructions are detailed in Section 5 of the 'WFD reporting on River Basin Management Plans - A user manual' [5]. An eionet login is required.

Submissions made at the national level are submitted into the national level envelope created by the user. Files submitted at RBD level are added into the appropriate RBD level envelope.

Data shall be uploaded into CDR no later than 22nd of March 2010.


## 9.4 Resubmission and data update

If data are updated/resubmitted complete datasets have to be submitted.

All reported data in the WFD are linked to a geographical area or point through a set of layers with an increased level of spatial detail. It is therefore of crucial importance to update the spatial datasets so that spatial links to previous reported data are maintained if this is not the case data will be lost and the reported data from MS will appear as incomplete datasets. When updates or resubmission of data are made the guidance on historic data management in section 7.3.3 shall be followed.


Example: WFD, water bodies – reporting of risk analysis in 2005 and status in 2010:

- In 2005 according to Article 5 of the WFD, water bodies at risk of failing to reach  good status were reported;

- After this risk analysis, a monitoring network was put in place to obtain information on the status of the water bodies. The monitoring network was reported to WISE in 2007. At this time the first reference to historic data was made. The monitoring stations had to be linked to 2005 reported water bodies. If water bodies changed from 2005 to 2007, the water body dataset should have been updated as well;

- In 2010 the status of water bodies will be reported to WISE. According to the WFD it is necessary to analyse the status of water bodies previously reported in 2005. This can only be done if linkages can be made between the datasets and any changes made to water bodies between 2005 and 2010 also are reported.

# 10. Metadata

## 10.1 WISE metadata profile

Metadata is information and documentation which describes the content, quality, origin etc. and makes data understandable and shareable between users and receivers over time.

The information which should be provided for all spatial data sets reported in relation to the RBMP and additional updates to previous spatial data sets are to be found in the table in **Appendix B.1**.

Further information on both mandatory and optional metadata elements of the WISE profile can be found in both Chapter 5.5 and Appendix 11 in the GIS Guidance[1]. Metadata should be reported using the WISE profile.

Appendix 11 of the GIS Guidance provides guidance on the implementation of the profile in XML.

Geographic data submitted to WISE will not be accepted without the proper metadata as specified in the WISE metadata profile.

## 10.2 Metadata creation

The authoring and editing of metadata in WISE can be done in a number of ways including the use of a metadata editor, capable of outputting metadata according to the recognised WISE metadata XML schema. This can be carried out directly (i.e. if the tool can be configured to export according to this schema), or indirectly (i.e. using XSL transformations to map from the native XML schema of the specific tool to the WISE XML schema). A dedicated WISE metadata web-based entry page, with basic client-side validation does not exist at present time.

Until a metadata editor is released by WISE, the suggested workaround is to make use of the XML example which can be found at this url:

This example was produced using the Inspire metadata editor and then the WISE specific elements added manually afterwards. The WISE elements are marked in the document with comments. The XML uses the example elements from the metadata table in Appendix B.1

No XML Schema for developing WISE metadata will be released.

# 11. Data access and constraints

The MS have in the Guidance on practical arrangements for electronic reporting to WISE[13] agreed on the access rights for data submitted to WISE.

The access rights to data submitted to WISE are already agreed with Member States and appear in the WISE reporting arrangements[14]. Annex 1 of the Paper specifies the "WISE spatial data policy" – data use and data distribution.

## 11.1  Data usage

The Commission and the EEA are authorised to use the geographic data in the context of environmental policy definition, implementation, assessment and analysis

- as geographic reference, i.e. creating a geographical context for other data;

- for the production of maps, publications, posters, presentations, web sites and any other electronic publication on the Internet. Electronic publication will be in the form of image maps;

- for spatial and statistical analysis;

- for deriving new geographic datasets by applying data manipulation procedures, e.g. combining different geographic datasets, generalisation procedures including smoothing and dropping of spatial features, adding new attribute information15.

- For inclusion of the geographic data in other applications provided that it will not possible to extract the original geographic data.

## 11.2  Data Distribution

The Commission and the EEA are authorised to distribute geographic data, if

- the source is acknowledged and,

- the data is not used for commercial purpose – unless approved by the provider - and,

- the data provider has not explicitly restricted their dissemination beyond what specified at point 2

Category 1:   Internal use within Commission and EEA, publication as maps on paper or in electronic format as image maps

Category 2:   Distribution of derived data and products under predefined conditions with the aim of decreasing the spatial accuracy or resolution of the geographic data.

Category 3:   Distribution of original data electronically as feature service or on physical support

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[13] Guidance on practical arrangement for electronic reporting to the Water Information System for Europe (WISE). WISE reporting arrangements. Final document (01.03.2007).
http://eea.eionet.europa.eu/Public/irc/eionet-circle/eionet-telematics/library?l=/technical_developments/various_items/reporting_arrangements/_EN_1.0_&a=d

[14] Guidance on practical arrangement for electronic reporting to the Water Information System for Europe (WISE); "WISE REPORTING ARRANGEMENTS "; Final Document (01/03/2007)
[15] Examples of derived geographic data are the Main Rivers map

Furthermore it is specified in this paper that "the metadata related to the geographic data and the derived geographic data will be distributed via a data catalogue service within the Commission, the EEA and to the public without any restrictions".

# 12. Coordination and organisation

## 12.1  Helpdesk

The EEA will provide a content related help desk for questions related to these rules and procedures which will be informed related to the WISE data flow concerned. EEA will provide a central helpdesk for all technical questions. The EEA may delegate these tasks to contracted partners. The contact details of the WISE technical help desk are:

Phone: +32 2714 87 87 from Monday through Friday 9:00 to 17:00 CET

Email:        helpdesk@eionet.europa.eu

Web page:     http://nmc.eionet.europa.eu/

# 13. Reporting documents and links

[1]   Common Implementation Strategy for the Water Framework Directive (2000/60/EC). Guidance Document No 2 "Identification of Water Bodies". 2003. http://circa.europa.eu/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents/guidancesnos2sidentifica/_EN_1.0_&a=d

[2]   Common Implementation Strategy for the Water Framework Directive (2000/60/EC). Guidance Document No 5 "Transitional and Coastal Waters – Typology, Reference Conditions and Classification Systems". 2003. http://circa.europa.eu/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents/guidancesnos5scharacteri/_EN_1.0_&a=d

[3]   Common Implementation Strategy for the Water Framework Directive (2000/60/EC). Guidance Document No 22 " Updated Guidance on Implementing the Geographical Information System (GIS) Elements of the EU Water policy. 17. November 2008. http://circa.europa.eu/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents/guidance-no22-_nov08pdf_1/_EN_1.0_&a=d

[4]   Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. http://ec.europa.eu/environment/water/water-framework/index_en.html

[5]   Document No.1: WFD reporting on River Basin Management Plans - A user manual http://water.eionet.europa.eu/schemas/dir200060ec/resources/Reporting%20User%20Manual%20RBMP%20v1.1.pdf

[6]   Guidance on practical arrangement for electronic reporting to the Water Information System for Europe (WISE). WISE reporting arrangements. Final document (01.03.2007).

http://eea.eionet.europa.eu/Public/irc/eionet-circle/eionet-telematics/library?l=/technical_developments/various_items/reporting_arrangements/_EN_1.0_&a=d

[7]   INSPIRE. http://inspire.jrc.ec.europa.eu/

[8]   Reporting guidance documents for RBMP and reporting schemas

http://water.eionet.europa.eu/schemas/dir200060ec/resources/

[9]   Reporting obligation for: WFD River Basin Management Plan including programme of measures http://rod.eionet.europa.eu/obligations/521

[10]  INSPIRE Data Specification on Hydrography – Guidelines. http://inspire.jrc.ec.europa.eu/documents/Data_Specifications/INSPIRE_DataSpecification_HY_v3.0.pdf

# Appendix A

## A.1    GIS reporting sheet. Endorsed by Water Directors, June 16-17 2008.

| Reporting Sheet Code | GIS |
|---|---|
| Reporting Sheet Name | **Geographical Information Requirements and Water Body Attributes** |
| Lead DG Env | Jorge Rodriguez Romero/Violeta Vincevicienne |
| Lead WRc | Sarah France |
| Other inputs | Member States |
| Status | |
| Date | 28 May 2008 |
| Version | 4 (RBDs,  Surface Waters, Groundwaters and protected areas) |
| Next Steps | Approval by Water Directors |

**Introduction**

Articles 3 and 15 of the Water Framework Directive (WFD) require Member States to provide information to the European Commission on the identification of river basin districts and of the results of the analysis carried out under Article 5, including specific requirements to report geographic information. The first reports were made in 2004 (for Article 3) and 2005 (for Article 5). The Commission has used the information provided to make reports to the European Parliament and Council as required under Article 18 of the Directive. Some of the information has been presented as maps, based on geographic information provided by the Member States.

In 2010 Member States will be required to provide information on the river basin management plans. According to Annex VII these should include information on the general characteristics of the river basin districts. This reporting sheet identifies the geographic elements of this information that should be provided to the Commission. The data and textual aspects of the information required are identified in other reporting sheets.
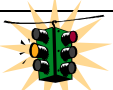
The geographical information must be provided either as GML files or as ESRI shape files. Templates are available specifying how this information will be provided. The accuracy of data collection at the Member State level should, in the long term, be to a positional accuracy of 125 m (corresponding to an input scale of approximately 1:250 000) with the minimum accuracy being to 1000 m (corresponding to approximately 1:1 000 000). According to the WFD CIS Guidance Document No. 9[16], maps are to be supplied to the Commission at a scale of 1:1 000 000 or 1: 250 000. The on-going current revision of the GIS guidance will provide further technical specifications to allow such reporting, including the way  Member States may report data at a more detailed scale if they wish.

**How will the Commission use the information provided**

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[16] The GIS guidance document is currently under revision. Future reporting of geographical information should be in accordance to the specifications agreed in the context of this process.

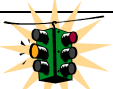The Commission will use the information to prepare European wide maps for the assessment of compliance and to present information to the Parliament, Council and general public. In some cases, reference data sets will be created to provide a common basis for assessments across the EU.

**Information to be provided**

| | **Look Out!** <br> In 2010 data should be updated from that already reported in WISE. |
|---|---|

| | **Look Out!** <br> Information that has already been reported for other purposes (e.g. UWWT Directive, to the EEA under SoE reporting) does NOT have to be provided again. |
|---|---|

| | **Look Out!** <br> The geographic information below should be harmonised to national and coastal boundaries. The technical specifications of such harmonisation are to be agreed in the context of the development of the GIS guidance. |
|---|---|

*River Basin District Information*

- Geographic information to allow a map of the RBDs to be produced,;

- Geographic information to allow a map of all river basins which have either been combined with larger river basins, or joined with neighbouring small basins to form individual RBDs as allowed under Article 3.1 to be produced;

- Geographic information to allow a map of the sub-units to be produced;

- Geographic information to allow a map to be produced of the main rivers within the RBDs of a catchment area of, at least, 500 km²;

- Geographic information to allow a map of lakes which have been assigned to the RBDs to be produced;

- Geographic information to allow a map of transitional waters relating to the main rivers within the RBD to be produced;

- Geographic information to allow a map of coastal waters which have been assigned to the RBDs to be produced,;

- Geographic information to allow a map of groundwater bodies which have been assigned to the RBDs to be produced;

- Other contextual data including:

  - River length;

  - Area of lakes, transitional and coastal waters;

## A.2 Water Body Information

The information listed below should be provided for each water body:

**Surface Water Bodies**

- Water body code
- Water body name
- Shape/GML file
    - Rivers: for water bodies on rivers with catchments>500 sq km
    - Lakes: for all lakes identified as water bodies by Member States
    - Coastal and transitional waters: for all water bodies identified
- Centroid (for all surface WBs) (technical specification for the calculation of the centroid to be developed in the context of the GIS guidance)
- Size (total length or area) at 1:250 000;
- Whether HMWB or AWB
- Type
- Significant point source discharges to surface waters
    - ID of significant point sources where data already available
    - Latitude and longitude of each significant point source (if possible)
    - Type of point source (see SWPI3)
- Significant diffuse source pollution to surface waters
    - WB Affected? (Y/N)
    - Type of source (see SWPI4)
- Significant water abstractions from surface waters
    - WB Affected? (Y/N)
    - Latitude and longitude of each abstraction (if possible)
    - Type of abstraction (see SWPI5)
- Water flow regulations and morphological alterations
    - WB Affected? (Y/N)
    - Type of Regulation/Alteration (see SWPI6)
- Significant saltwater or other intrusion
    - WB Affected? (Y/N)
- Other pressures
    - WB Affected? (Y/N)
    - Type of Pressure (to be specified see SWPI7)
- Impacts
    - Type of impact identified (see SWPI8)
- Protected areas
    - Water body within or overlapping with a protected area (Y/N)
    - Type of protected area (provide a shape file only where information is NOT reported under any other Directive. Where information has been provided under other Directives provide the unique identifier (code) of the appropriate protected area):
        - WFD Article 7

- Sites for the protection of economically significant aquatic species
- Bathing Water Directive sites (Directives 76/160/EEC and 2006/7/EC)
- Nitrate vulnerable zones (Directive 91/676/EEC)
- Sensitive Areas (91/271/EEC)
- Areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection, including relevant Nature 2000 sites (Directive 92/43/EEC and 79/409/EEC)
- Other protected areas defined under national legislation (specify – see also RPA1)
- Other protected areas defined under regional/local legislation (specify – see also RPA1)

**Groundwater Bodies**
- Water body code
- Water body name
- Shape/GML file
  o Groundwaters: boundaries of all groundwater bodies or groups of groundwater bodies identified[17].
- For groundwater bodies or groups of groundwater bodies, if available:
  o Layered (Y/N)
  o Average depth to groundwater body (m)
  o Average thickness of groundwater body (m)
  o Assignment to a depth range where the main part of the GWB is situated in (depth ranges: 0-20m, 20-50 m, 50-200 m, >200m)
  o Directly dependent aquatic ecosysteRBD (Y/N)
  o Directly dependent terrestrial ecosysteRBD (Y/N)
  o Geological formation – aquifer type (according to a predefined typology)
  o Type of vertical orientation of GWB (indicated by category and visualised by symbols)
  o Volume of aquifer ($m^3$) (if possible)
- Relevant point source discharges to groundwater
  o ID of significant point sources where data already available
  o Latitude and longitude of each relevant point source (if possible)
  o Type of point source (see GWPI3)
- Relevant diffuse source pollution to groundwater bodies
  o WB Affected? (Y/N)
  o Type of source (see GWPI4)
- Relevant abstractions from groundwater
  o WB Affected? (Y/N)
  o Latitude and longitude of each abstraction (if possible)
  o Type of abstraction (see GWPI5)
- Relevant artificial recharge of groundwater
  o WB Affected? (Y/N)
  o Type of Regulation/Alteration (see GWPI6)
- Significant saltwater or other intrusion
  o WB Affected? (Y/N)

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[17] When providing all GWB boundaries in one file please take care that the GWBs are not intersected. Alternatively provide separate files for each GWB horizon.

- Other pressures
    - WB Affected? (Y/N)
    - Type of Pressure (to be specified see GWPI8)
- Impacts
    - Type of impact identified (see GWPI9)
- Protected areas
    - Water body within or overlapping with a protected area (Y/N)
    - Type of protected area (provide a shape file only where information is NOT reported under any other Directive. Where information has been provided under other Directives provide the unique identifier (code) of the appropriate protected area):
        - WFD Article 7
        - Nitrate vulnerable zones (Directive 91/676/EEC)
        - Areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection, including relevant Nature 2000 sites (Directive 92/43/EEC and 79/409/EEC)
        - Other protected areas defined under national legislation (specify – see also RPA1)
        - Other protected areas defined under regional/local legislation (specify – see also RPA1)

# Appendix B

# B.1 Description and specification of metadata elements for the reporting of the geographic information groundwater bodies under WFD and GWD.

For further information about metadata element description and definition see Appendix 11 of Guidance Document No. 22: Updated Guidance on Implementing the Geographical Information System (GIS) Elements of the EU Water policy; Draft Guidelines – INSPIRE metadata implementing rules based on ISO 19115 and ISO 19119; ISO 19115 Geographic information – Metadata.

| Element Name | Description | Condition | Value Domain | Recommended input | Example |
|---|---|---|---|---|---|
| IDENTIFICATION | | | | | |
| 1.1 Resource title | This is a characteristic, and often-unique, name by which the resource is known. | Mandatory | Free text<br>See section 8.1of this guidance document for a list of feature types | **Derived from the type of information being reported and the place [Feature type] [Country]** | **Groundwater Bodies Austria** |
| 1.2 Resource abstract | This is a brief narrative summary of the content of the resource | Mandatory | Free text | | **Water Framework Directive (WFD) Article 5 groundwater bodies; dataset contains topography according to the scale 1:250,000 which covers the whole country; GWBs have been harmonized with neighbouring countries** |
| 1.3 Resource type | This is the type of resource described by the metadata | Mandatory | MD_ScopeCode CodeList (see Annex B of ISO 19115 for full list)<br>**Dataset**<br>**Series (if reporting multiple files e.g by Protected Area type)** | | Dataset |
| 1.4 Resource locator | The resource locator defines the link(s) to the resource and/or the link to additional information about the resource | Mandatory if a URL is available to obtain more information on the resource, and/or access related services | Character string expressed by a URL | | **http://www.geonorge.no** |
| 1.5 Unique resource identifier | A value uniquely identifying the resource | Mandatory | MD_identifier (ISO 19115)<br>Character string + | Identification of the authority providing the resource + identification of the dataset = name | **AT_ 1000_GWB_20100322** |

| | | | character string namespace | of the dataset [ISO 3166 country code]_[RiverBasinDistrict (MS_CD)]_GWB_[date of submission/upload date] | |
|---|---|---|---|---|---|
| *1.6 Coupled resource* | *Identification of the target spatial data set(s) of the services through their Unique Resources Identifiers (URI)* | *Mandatory if linkage to the service is available* | *MD_DataIdentification (ISO 19115) Character string code + character string namespace* | *Not applicable to dataset and dataset series.* | |
| 1.7 Resource language | The language(s) used within the resource | Mandatory if the resource includes textual information | Codelist ISO 639-2 The list of codes for the 23 official EU languages is: Bulgarian – **bul** Czech – **cze** Danish – **dan** Dutch – **dut** English – **eng** Estonian – **est** Finnish – **fin** French – **fre** German – **ger** Greek – **gre** Hungarian – **hun** Irish – **gle** Italian – **ita** Latvian – **lav** Lithuanian – **lit** Maltese – **mlt** Polish – **pol** Portuguese – **por** Romanian – **rum** Slovak – **slo** Slovenian – **slv** | | **dan** |

| | | | | | |
|---|---|---|---|---|---|
| | | | Spanish – **spa**<br>Swedish – **swe** | | |
| CLASSIFICATION OF SPATIAL DATASETS & SERIES | | | | | |
| 2.1 Topic category | High-level classification scheme | Mandatory | MD_TopicCategoryCode (ISO 19115) Enumeration (see B.5.2.27 of ISO 19115) | **012 (inlandWaters)** | **012** (inlandWaters) |
| *2.2 Spatial data service type* | *This is a classification to assist in the search of available spatial data services* | *Mandatory* | *Part D.3 of the MD IR* | *Not applicable to dataset and dataset series.* | |
| KEYWORDS | | | | | |
| 3.1 Keyword value | A commonly used word, formalized word or phrase used to describe the subject | Spatial data set or spatial data set series: at least one keyword from GEMET | Free text | WISE recommendations:<br>http://converters.eionet.europa.eu/xmlfile/WISE_metadata_keywords_1.xml<br>GEMET:<br>http://www.eionet.europa.eu/gemet | **Groundwater, Water Framework Directive, Groundwater Directive, Groundwater Bodies** |
| | | *Spatial data service: at least one keyword from Part D.4 of the MD IR* | *Part D.4 of the MD IR* | *Not applicable to dataset and dataset series.* | |
| 3.2 Originating controlled vocabulary | The citation of the originating controlled vocabulary shall include at least its title and a reference date (publication, last revision or creation) | Mandatory if the keyword originates from a Controlled vocabulary | Free text + date | **GEMET - Concepts, version 2.1, 2008-06-13**<br>**http://www.eionet.europa.eu/gemet** | **GEMET - Concepts, version 2.1, 2008-06-13**<br>**http://www.eionet.europa.eu/gemet** |
| GEOGRAPHIC LOCATION | | | | | |

| 4.1 Geographic bounding box | Extent of the resource in the geographic space | Spatial data set or spatial data set series: Mandatory | Decimal degrees with at least two decimals – 180.00 ≤ westBoundLongitude ≤ 180.00 <br><br> -180.00 ≤ eastBoundLongitude ≤ 180.00 <br><br> -90.00 ≤ southBoundLatitude ≤ northBoundLatitude <br><br> southBoundLatitude ≤ northBoundLatitude ≤ 90.00 | | **-81.80** <br><br> **93.20** <br><br> **71.92** <br><br> **-29.86** |
| | | *Spatial data service: Mandatory for services with an explicit geographic extent* | *Decimal degrees with at least two decimals* | *Not applicable to dataset and dataset series.* | |
| **TEMPORAL REFERENCE** | | | | | |
| 5.1 Temporal extent | Time period covered by the resource as an individual date, an interval of dates or a mix of both | At least one of the metadata elements referred to points 5.1 to 5.4 | Date <br> ISO 8601 | Provide the period covered by the spatial data reported. The period should be defined by the planning period the groundwater bodies are valid, e.g. RBMP period 2009-2015. <br><br> The input of this element is required | **From 2006-03-22 to 2010-03-22** |
| 5.2 Date of publication | Date of publication or entry into force of the resource | At least one of the metadata elements referred to | Date <br> ISO 8601 | Provide the date of the reporting deadline of the period specified with Metadata element 5.1. <br><br> The input of this element is | **2010-03-22** |

| | | | | | |
|---|---|---|---|---|---|
| | | points 5.1 to 5.4 | | required | |
| 5.3 Date of last revision | Date of last revision of the resource | At least one of the metadata elements referred to points 5.1 to 5.4 | Date ISO 8601 | Provide the date of the revision of the dataset; in case of the first data upload for the period specified with Metadata element 5.1 the Date of last revision = Date of publication. [(1) – example below]. The input of this element is required. | **2010-03-22** |
| 5.4 Date of creation | Date of creation of the resource | At least one of the metadata elements referred to points 5.1 to 5.4 | Date ISO 8601 | Optional element | |
| **QUALITY & VALIDITY** | | | | | |
| 6.1 Lineage | Statement on process history and/or overall quality of the spatial data set | Mandatory | Free text | The required input for the element Lineage is described below | |
| 6.2 Spatial resolution | Level of detail of the dataset: it shall be expressed as a set of zero to many resolution distances or equivalent scales | Mandatory | Equivalent scale expressed as an integer; resolution distance expressed as a numerical value. A distance is a Number expressing the distance value and a unit of measure of the distance value. | | Example scale: **250000** (e.g. 1:250,000 scale map) Example distance: **3 metres** |
| **CONFORMITY** | | | | | |
| 7.1 Specification | Citation of the implementing rules | Mandatory | Free text + date | | Title: **"INSPIRE Implementing rules laying down technical arrangements for the** |

| | | | | | interoperability and harmonisation of administrative boundaries" |
|---|---|---|---|---|---|
| | adopted under Article 7(1) of Directive 2007/2/EC or other specification to which a particular resource conforms | | | | Date: Date type: **publication** Date: **2009-05-15** |
| 7.2 Degree | Degree of conformity of the resource to the implementing rules adopted under Article 7(1) of Directive 2007/2/EC or other specification | Mandatory | Part D.5 of the MD IR<br>- True if conformant<br>- False if not conformant | | **true** |
| CONSTRAINTS RELATED TO ACCESS AND USE | | | | | |
| 8.1 Conditions applying to access and use | Conditions for access and use of spatial data sets and services, and where applicable, corresponding fees | Mandatory | Free text + URL if applicable for information on any fees | If data should be used only for a certain purpose, this should be named here | Example: **not to be displayed at a scale larger than 1:250,000** |
| 8.2 Limitations on public access | Limitations on public access and the reasons for them | Mandatory | Free text | (3) – the limitations to public access are described in section 11.2<br>The codelist for the input is as follows:<br>• WISE category 1<br>• WISE category 2<br>• WISE category 3 | **WISE category 3** |
| RESPONSIBLE ORGANISATIONS | | | | | |
| 9.1 Responsible party | Description of the organisation responsible for the establishment, | Mandatory | Free text + e-mail address as a character string | The following properties are expected:<br>• organisationName: CharacterString | organisationName: **Institut Géographique National**<br><br>contactInfo: |

| | | | | | |
|---|---|---|---|---|---|
| | management, maintenance and distribution of the resource | | ISO19115 CI_ResponsibleParty | • contactInfo:<br>  o address:<br>    electronicMailAddress [1..*]: CharacterString | address:<br>  electronicMailAddress:<br>  **support@ign.fr** |
| 9.2 Responsible party role | Role of the responsible organisation | Mandatory | Part D.6 of the MD IR CodeList (see B.5.5 of ISO 10115) ISO19115 CI_RoleCode | | **001** (resourceProvider) |
| METADATA | | | | | |
| 10.1 Metadata point of contact | Description of the organisation responsible for the creation and maintenance of the metadata | Mandatory | Free text + e-mail address as a character string<br><br>ISO19115 CI_ResponsibleParty | The following properties are expected:<br>• organisationName: CharacterString<br>• contactInfo:<br>  o address:<br>    ▪ electronicMailAddress [1..*]: CharacterString<br>      • role: CI_RoleCode | organisationName: **European Environment Agency**<br><br>contactInfo:<br>  o address:<br>    ▪ electronicMailAddress:<br>      **john.smith@eea.europa.eu**<br><br>role: **007** (pointOfContact) |
| 10.2 Metadata date | Date the metadata record was created or updated | Mandatory | ISO 8601 | | **2008-08-27** |
| 10.3 Metadata language | Language in which the metadata are expressed | Mandatory | Codelist ISO 639-2<br>The list of codes for the 23 official EU languages is:<br>Bulgarian – **bul**<br>Czech – **cze**<br>Danish – **dan**<br>Dutch – **dut**<br>English – **eng**<br>Estonian – **est**<br>Finnish – **fin** | | **eng** |

| | | | French – **fre**<br>German – **ger**<br>Greek – **gre**<br>Hungarian – **hun**<br>Irish – **gle**<br>Italian – **ita**<br>Latvian – **lav**<br>Lithuanian – **lit**<br>Maltese – **mlt**<br>Polish – **pol**<br>Portuguese – **por**<br>Romanian – **rum**<br>Slovak – **slo**<br>Slovenian – **slv**<br>Spanish – **spa**<br>Swedish – **swe** | | |
| WISE METADATA (additional WISE Metadata, not INSPIRE) | | | | | |
| 11.2<br>Distribution format | Provides a description of the distributor, format and version of the data to be distributed and the digital transfer options | Mandatory | Free text<br>ISO19115:<br>MD_Format (B.2.10.4)<br>MD_Distributor (B.2.10.3)<br>MD_DigitalTransfer Options (B.2.10.2) | Provide at least the Format information<br><br>Format: provide information on the format:<br>&bull; Format name<br>&bull; Format version<br><br>Distributor: provide information on the distributor<br>The following properties are expected:<br>&bull; organisationName: CharacterString<br>&bull; contactInfo:<br>  o address: | Format:<br>Name: **shape file**<br>Version: [not necessary to provide if the format is shape file; if wished, the GIS software, which has been used to export the shape file, can be named; e.g. ArcGIS9.2]<br><br>Distributor:<br> OrganisationName: **Institut Géographique National**<br> contactInfo:<br>   address:<br>electronicMailAddress: **support@ign.fr**<br><br>Digital transfer option: |

| | | | | electronicMailAddress [1..*]: CharacterString<br><br>Digital transfer option: provide information, if the data can be provided online or offline<br><br>• Online: provide the URL<br>• Offline: provide the name of the medium on which the resource can be received | Online:<br>**http://gis.umweltbundesamt.at/shop/index.jsp**<br>Offline: **cdROM** |
|---|---|---|---|---|---|
| 11.3 Metadata standard name | Name of the metadata standard (including profile name) used | Mandatory | Free text | ISO 19115 Geographic information – Metadata; WISE Metadata profile | **ISO 19115 Geographic information – Metadata; WISE Metadata profile** |
| 11.4 Metadata standard version | Version (profile) of the metadata standard used | Mandatory | Free text | ISO 19115:2003 | **ISO 19115:2003** |
| 11.5 Metadata file identifier | Unique identifier for this metadata file | Optional | Free text | Globally unique identifier – GUID http://www.guidgenerator.com/ | **e88fbdf4-c70b-4a3d-9dae-1595d8fe27ad** |
| 11.6 Metadata character set | Full name of the character coding standard used for the dataset | Optional | http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml# MD_SpatialRepresentationTypeCode | utf8 | **utf8** |
| 11.7 Reference system | Description of the spatial and temporal reference systems used in the dataset | Optional | MD_ReferenceSystem (B.2.7) | referenceSystemIdentifier:<br>code: ETRS_89<br>codeSpace: INSPIRE RS registry | **ETRS_89** |
| 11.8 Spatial representation type | Method used to spatially represent geographic | Conditional: if the resource is a dataset or | http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml | Vector | **Vector** |

| | information | dataset series | l# MD_SpatialRepresentationTypeCode | | |
|---|---|---|---|---|---|
| 11.9 Credit | Recognition of those who contributed to the resource(s) | Optional | Free text | | **Organisation X** |
| 11.10 Presentation form | Mode in which the resource is represented | Optional | http://www.isotc211.org/2005/resources/CodeList/gmxCodelists.xml#CI_PresentationFormCode | documentDigital | documentDigital |
| 11.11 Purpose | Summary of the intentions with which the resource(s) was developed | Optional | Free text | | **WFD Article 5, mapping of the location and boundaries of GWBs, developed for the first analysis of GWBs and risk assessment reported in 2005** |
| 11.12 Specific usage | Brief description of the resource and/or resource series usage | Optional | Free text | The following information is required <br>• description of the use of the resource including the reporting period or planning period the dataset is valid/should be used <br>• description of the relationship to referenced datasets | Use: **assessment of the status of groundwater bodies for the RBMP period 2009-2016** <br><br>Referenced datasets: **the dataset AT_1000_MonStat_20070322 refers to the GWB dataset; all monitoring stations provided in the dataset should be located within GWB provided with this dataset** |
| 11.13 Vertical extent | Provides vertical component of the extent of the referring object | Optional | EX_VerticalExtent | The vertical extent is provided as attribute to the dataset; no input required for this element | |

## C.1.1 Element 6.1 Lineage:  Further information

Under category "QUALITY & VALIDITY " the following information should be given by the data provider. If applicable, further needs for information can be specified:

Description of the process history, covering the total life cycle of the dataset from initial collection to its current form:

- Source information: describing the origin of the dataset;

- Process steps: record the events of transformation in the lifetime of the dataset (including information on generalisation and harmonisation)

- Intervals to maintain the dataset.

If a previous reported dataset will be updated with the current dataset, the following information should be given:

- Providing the name of the data which will be updated with the current dataset;

- Short description of the amendments done to the previous reported dataset (change of geometry and/or attributes);

- Providing a reference to a source that gives information on life cycle rules of features.

Describe the data quality. Provide statements on:

- Completeness

- Logical consistency

- Positional accuracy

- Thematic accuracy


## C.1.2 Temporal reference – Example
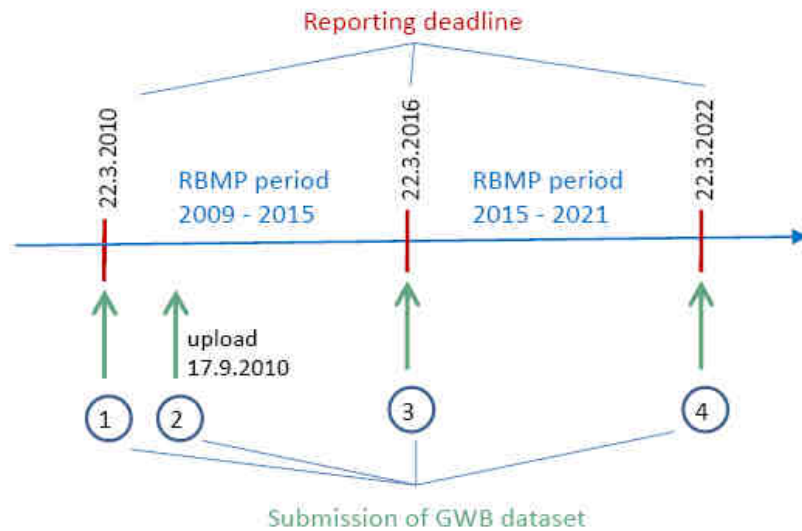
**Metadata for GWB datasets submitted**

| Example | Temporal extent | Date of publication | Date of last revision |
|---|---|---|---|
| 1 | From 22.3.2010 to 22.3.2016 | 22.3.2010 | 22.3.2010 |
| 2 | From 22.3.2010 to 22.3.2016 | 22.3.2010 | 17.9.2010 |
| 3 | From 22.3.2016 to 22.3.2022 | 22.3.2016 | 22.3.2016 |
| 4 | From 22.3.2022 to 22.3.2028 | 22.3.2022 | 22.3.2022 |