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Athens, Greece, 9 September 2019

Agenda Item 6: IMAP Pilot Info System and Related Quality Assurance Issues; Data Standards and Data Dictionaries; MAP Data Management Policy

Schemes for Database Quality and Quality Assurance and Quality Control (QA/QC) of Data related to Pollution

UNEP/MAP
Athens, 2019

Note by the Secretariat

At their 19th Ordinary Meeting (COP 19, Athens, Greece, 9-12 February 2016), the Contracting Parties to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention) in Decision IG.22/7 adopted the Integrated Monitoring and Assessment Programme and Related Assessment Criteria (IMAP), with principles and timeline for its implementation.

In the framework of the UN Environment/MAP Programme of Work (PoW) for 2018–2019 (Decision IG.23/14), INFO/RAC is leading the work on the development of the "Info/MAP platform and platform for the implementation of IMAP fully operative and further developed, connected to MAP components' information systems and other relevant regional knowledge platforms, to facilitate access to knowledge for managers and decision-makers, as well as stakeholders and the general public" (output 1.5.1). It is expected that the Contracting Parties will start reporting monitoring data as of mid-2019 for the **pre-**selected Common Indicators and laying down the basis for building a fully operational IMAP Info System, by the end of the initial phase of IMAP. The (Pilot) IMAP Info System will be able to receive and process data according to the proposed Data Standards and Data Dictionaries (DDs and DSs) that set the basic information on data reporting requirements within IMAP.

The present document introduces the schemes of the data quality components, both in terms of Database Quality Management and Quality Assurance and Quality Control (QA/QC), that should govern the monitoring data flows and quality assurance procedures within the IMAP for EO5 and EO9 for interested parties. Building on the experience of the MED POL Monitoring Database for almost 20 years, this document revisits the main QA approaches and proposes for final data validation a new categorization for the datasets submitted to the Secretariat.

This new categorization of the datasets submitted by the Contracting Parties, in between Data Quality Management and QA/QC, should produce a positive effect in the medium-term, as well as establish the basics for a dynamic, inclusive, flexible and powerful IMAP database where the information could be used with confidence to produce robust and reliable knowledge on the status of the Mediterranean ecosystem to inform back the Contracting Parties.

The Meeting of the Ecosystem Approach Correspondence Group on Pollution Monitoring reviewed and agreed on the proposed Schemes for Quality Assurance and Control of Data related to Pollution, requesting the Secretariat to ensure that the schemes of data quality assurance and quality assurance of data assessment are provided separately. Consequently, the Meeting recommended submission of the reviewed document (UNEP/MED WG 473/9) to the Meeting of the MED POL Focal Points.

The Meeting of MED POL Focal Points held in Istanbul, Turkey on 29- 31 May 2019 agreed on the proposed Schemes for Database Quality and Quality Assurance and Quality Control of Data related to Pollution and recommended their submission for approval of the 7th Meeting of EcAp Coordination Group.

List of Abbreviations / Acronyms

CI	Common Indicator
CORMON	Correspondence Group on Monitoring
DDs	Data Dictionaries
DSs	Data Standards
EcAp	Ecosystem Approach
EEA	European Environmental Agency
EO	Ecological Objective
IMAP	Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria
INFO/RAC	Regional Activity Centre for Information and Communication
MAP	Mediterranean Action Plan
MEDPOL	Programme for the Assessment and Control of Marine Pollution in the Mediterranean Sea
MED QSR	Mediterranean Quality Status Report
MSFD	Marine Strategy Framework Directive
PoW	Programme of Work
QA	Quality Assurance
QC	Quality Control

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1. Introduction to data quality

1. The 'data quality' management process is without a doubt the most important component of the overall data management system structure to ensure 'quality data'. The data management involves also data policy, data warehousing and data security components to mention a few. However, 'quality data' should guide and support any data-related endeavour, such as the gathering of environmental information through scientific-based monitoring strategies to assess the status of the marine environment (e.g. UNEP /MAP IMAP and similar programs worldwide).

2. Through guaranteeing data quality, one can be sure that the next steps, both in terms of monitoring and assessments, will be based on robust information and demonstrable environmental facts (i.e. defendable and reproducible); and therefore, the marine environmental Mediterranean knowledge will be constructed minimizing flaws. The 'data quality' approach is a common approach to ensure, control and optimize the value of data from observations in all fields, such as science, medicine, business and politics to mention few. However, the 'data quality' concept has many functional attributes.

3. The schemes for Quality Assurance and Control of Data for MED POL Monitoring Database and IMAP (Pilot) Info System can be organized on two levels. On the first level, there is a monitoring data Quality Assurance and Quality Control (QA/QC) for each IMAP Common Indicator; on the second level, there is a full Database Quality Management and Reporting Schemes. These need to be built in the IMAP (Pilot) Info System considering present functional modules (i.e. MEDPOL Database approach), both for data technical validation and data flagging, respectively. Furthermore, the reporting data flows are proposed in the present document as a three-fold QA organisational approach in the data quality chain taking into account the overarching data quality chain with regards to the Database Quality Management. For this reason, the application of herein proposed overall quality frameworks for IMAP Common Indicators under EO5 and EO9 needs the organizational levels 1 and 2 to be aligned and complemented by a flagging approach (i.e. based on Quality Categories to estimate the final value of datasets) per each IMAP Common Indicators proposed later in Table 4. A full compatibility between the two QA levels (both levels 1 and 2, plus level 3) needs to be ensured. The full compatibility and flows between the two first QA levels (i.e. 1 and 2) and the third level needs to be ensured for the optimal quality of data in the IMAP (Pilot) Info System.

4. There are basic attributes (i.e. specific requirements of the 'data' within the overall quality framework) to be fulfilled to guarantee both the 'data quality' from an objective point of view and their fit-for-purpose, under the overall Database Quality Management, including the Reporting Schemes as illustrated in Figure 1. From both technical and user perspectives, there are some main attributes which makes the data (ca. databases) to be of quality, particularly for environmental datasets.

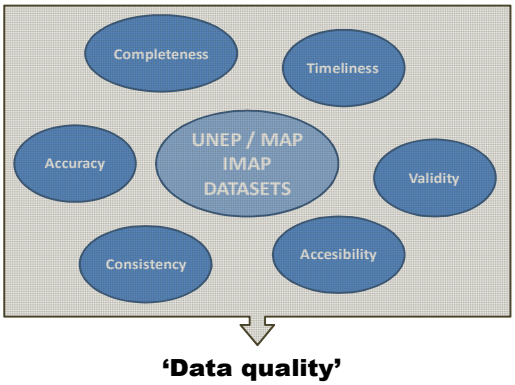

Figure 1. Main attributes for the IMAP Common Indicators 'data quality' as one of the-dimensions of the database quality management system for IMAP Info System.

5. Therefore, Completeness, Accuracy, Consistency, Timeliness, Accessibility and Validity are the main attributes to be fulfilled to obtain 'quality data'. An explanation of each is provided below:

- **Completeness:** refers to the fact that the provided information is both data (i.e. the parameter of interest) and associated metadata (i.e. environmental information, such as geographical coordinates where the sample was collected). Therefore, a dataset without its associated metadata (i.e. attributes to the data) would be useless for further data evaluation and spatial assessment purposes to derive information and environmental state assessments. The completeness needs to be ensured with good organizational practices of monitoring and sample processing flows.

- **Accuracy**: refers to the degree to which the result of a measurement approaches the correct value or reference value (i.e. the true value). To be accurate and precise (i.e. minimize the associated uncertainty to the measurement/data) is the primary objective of the analytical quality systems implemented in chemical laboratories and conforms the basis to report measurements and their associated uncertainties. To this end, internal and external quality assurance (QA) schemes and practices should be established in the Quality Assurance Manual.

- **Consistency:** refers at the attribute of being capable to produce a result (i.e. data collection, measurement) with the same level of performance over time indifferently of the external constrains. Therefore, the concept is similar to the analytical reproducibility, although extended to any type of data (i.e. data and associated metadata).

- **Accessibility:** refers to a user's ability to access or retrieve data stored within a database or other repositories, as well as its maintenance. Non-accessible data is not useful from a user's perspective.

- **Timeliness:** refers to the requisite of the data to be reported in a timely manner to ensure the maximization of the value of the collected data from a user's perspective. In environmental databases, this attribute is fundamental to generate environmental assessment that serves their purpose.

- **Validity** (fit-for-purpose): this attribute relates to the fact that the 'data quality' concept is a fit-for-purpose target and should comply with certain conditions to serve their expected use. These conditions are the Data Controls to be defined in accordance with each parameter characteristics.

6. It is necessary to understand the 'data quality' as the fulfilment of all its attributes with the ultimate purpose of data resources generation. With regards to the ecosystem-based management, the above attributes are relevant in processes such as the IMAP implementation. Particularly, it is important that the environmental data are managed such as to ensure completeness, timeliness and validity, beyond the accuracy (and precision), which is normally misunderstood as the sole parameter which provides 'quality' to the data. To this regard, the concept of fit-for-purpose data, such as in environmental data, should comply with the above attributes to be of utility.

7. Furthermore, it should be highlighted that the data generation from a scientific perspective by means of experimental, monitoring and instrumental techniques is a dynamic process changing over time. This fact shapes the whole data quality system in practice to manage marine environmental databases and therefore, databases updates and verifications need to be continuously performed.

8. The achievement of these basic attributes guarantees the 'data quality' and should be considered during all the planning process of the data generation, from data collection and reporting, through data storage up to the data usage by interested parties.

2. Background on MED POL Program Databases and next steps

9. The building of databases for the collection and use of the monitoring data and pollution load data by the Contracting Parties was seen as a necessity very early within the MED POL Programme established by the Barcelona Convention in the Mediterranean Sea. Therefore, MED POL developed a fit-for-purpose database in a pioneering effort to harmonize the Mediterranean data reported to the Secretariat to support with robust evidences the necessary policy measures and actions to be implemented (i.e. marine data and national data). Therefore, the MED POL Program also established the founding of the reporting on national baselines budget (NBB), as well as the Marine Monitoring Networks in the Mediterranean related to chemical pollution (by ecosystem compartments), eutrophication and bathing water quality along their quality control system.

10. The Monitoring MED POL Database (ca. Microsoft Access SQL database software) was created and included some components and modules, such as plotting and mapping, trend analysis, a remote access module, to mention few; in an all-in-one approach. The database was delivered to the Secretariat and has been running until these days, even though information and communication technologies have changed very rapidly, and a number of flaws have been also observed after almost 20 years. Therefore, under the latest programmes of work of UN Environment/MAP, it has been agreed the building of an IMAP Info System, which will update the current MED POL Database system, which is expected to be launched as a pilot system (to be tested) in the current biennium.

11. As mentioned above, the Secretariat has initiated the development of a new data management structure for an improved data management fit-for-purpose to the requirements of the IMAP (i.e. the Barcelona Convention marine measurement system), which will include the transfer of the current MED POL monitoring database and reported datasets by the Contracting Parties to the Secretariat. This task will be undertaken by INFO/RAC in close consultations with the Secretariat.

12. In 2018, the initial back-and-forth process of defining the structure of the data (e.g. Data Dictionaries and Data Standards) begun and it should further include a complete set of Data Controls, in a similar manner as the MED POL database is controlled, whilst ensuring the compatibility between the databases as well as the users both quick and easy adaptation.

3. Data quality organizational levels

13. In order to guarantee the ‘data quality’ of the UNEP/MAP IMAP Database, and similarly for the established MED POL Database, the relevant steps and roles in terms of database quality management and responsibilities should be defined (i.e. from the sample collection until the use of the final validated data) to ensure that the quality chain is strictly followed by the Contracting Parties.

14. There are basically three groups of stakeholders within the data management system, namely, the Contracting Parties Designated National Laboratories, the ministry or delegated national agency with the responsibility to report monitoring data to the MED POL on behalf of respective National MED POL Focal Point, which corresponds to a primary, secondary and tertiary levels in the data quality chain.

15. Each level has a different degree of responsibility to fulfil the ‘data quality’ attributes to ensure the usefulness of the monitoring data from national and regional scales within the IMAP (ca. MED POL). Table 1, below, describes the roles, levels and main responsibilities of the stakeholders related to the attributes for the ‘data quality’ achievement.

16. The roles and responsibilities described (Table 1) should be the main attributes to be fulfilled at the different organizational levels to obtain relevant environmental information for policy-makers. The ultimate goal of the marine monitoring programmes is to serve the policy (ca. political processes)

to implement governance mechanisms in order to protect the environment and provided environmental services.

17. Three organizational levels of responsibilities, defined terms of 'data quality' management and data flows, help to provide the basis for a common understanding of the 'data quality' requirements and serve to the establishment of the 'data quality' categories for the data submitted to the MED POL Secretariat under the Barcelona Convention.

Table 1. Description of the main stakeholders within the 'data quality' process that are responsible for generation of the marine monitoring data for the MED POL (ca. IMAP)

Agent	Role	Level	Responsibilities	Main attributes to be fulfilled
National Laboratories (*or alternatively research institutes, agencies, etc. for each CP with the responsibility to effectively produce and report data*)	Generator (science-based)	Primary	To ensure consistent measurements and accurate (and precise) analytical data complying with international standards in terms of scientific/analytical QA and within its specific field (ca. chemistry, biology, biochemistry, etc.).	Consistency Accuracy
MED POL Focal Point	User/Transporter (national policy-oriented)	Secondary	To ensure the timely submission of the data and metadata required under one or more programs under Barcelona Convention Protocols, Action Plans and Strategies in the Mediterranean region	Completeness Timeliness
MED POL/ Barcelona Convention Secretariat	Final User/Receiver (Mediterranean regional and sub-regional policy-oriented)	Tertiary	To ensure monitoring data and relevant information is received and validated under the MED POL Programme and IMAP to perform regional and sub-regional environmental assessments	Accessibility Validity

4. Common processes and data flows for Data Quality Assurance (QA) in marine monitoring databases

4.1. Primary level (National Laboratories)

18. In marine monitoring activities the data flows for the integral quality assurance relies on different quality assured processes undertaken basically at the primary level (i.e. by National Laboratories), which should consider a number of different technical steps, such as data cleansing, standardization, laboratory data quality and control (QA/QC), to mention a few, within each monitoring process (see Table 2), in addition to the secondary and tertiary levels which should also be fulfilled to deliver an integral data quality management system in IMAP marine monitoring activities.

19. Each process should be quality assured (i.e. technically check performed); namely, sample collection, sample processing, sample determinations and data reporting. Thus, these are required to be performed and fully registered for each marine monitoring project by technical managers and/or involved staff.

20. However, it should be noted that the first level is the responsible stakeholder originating the data flows up to the last level of reporting by the Contracting Parties to the Barcelona Convention Secretariat (i.e. second and third levels). Therefore, the quality assurance within this first level requires high technical expertise referred to EO5 and EO9 within IMAP to deliver the expected QA (ca. data quality).

21. If marine monitoring activities at the first level are not performed solely by a single organization (i.e. sample collection, processing, analysis and reporting), the data flows might be separated, and additional integration will be necessary, such as the 'data quality' registry integration. Table 2 describes some general activities related to QA requirements for each of the monitoring processes.

Table 2. Total Quality Assurance (Monitoring QA) (Monitoring QA) at the primary organizational level (i.e. national laboratories) for each monitoring process under IMAP EO5 and EO9.

QA flows versus monitoring processes	QA Requirements	Internal QA	External QA	Reporting/Registry QA
1.Sample collection	Protocols/Data Registry 1	YES	NO*	NO*
2.Sample processing	Protocols/Data Registry 2	YES	YES (i.e. IAEA/MEDPOL proficiency test)	YES (i.e. Laboratory Accreditation)
3.Analytical determinations	Protocols/Data Registry 3	YES	YES (i.e. IAEA/MEDPOL proficiency test)	YES (i.e. Laboratory Accreditation)
4.Reporting	Templates for Data Registry 1 + 2 + 3 (e.g. MED POL data format reporting)	(not applicable)	(not applicable)	YES

** Methodologies for Sample Collection are not externally QA, nor accredited, in general.

22. From Table 2, it could be observed that the fulfilment of the 'data quality' at the first level undertaken by National Laboratories requires a proper design of functions (as well as time and staff resources allocation) to ensure a smooth flow of the monitoring process, which starts with the sample collection and ends with the data reporting in the appropriate format. The monitoring towards

reporting process can take from months to years to be completed, and therefore, the information registration under reporting QA should be imperative.

23. Unfortunately, some of these steps merit more attention than normally given to them, such as to the Reporting/Registry QA for all the processes in monitoring activities. That means summarizing the process undertaken and reporting the results (as per format template) for each, as well as any incidences that could have occurred, particularly missing metadata to take immediately corrective actions. In practice the Reporting QA in each process should be exquisitely guaranteed and submitted to the responsible person in the first level (e.g. laboratory manager), normally in charge of sending the report to the national authorities (level 2) as well, whilst guaranteeing the traceability of the datasets.

24. The protocols to perform Data Registries 1, 2 and 3 (and/or Data Registries themselves) need to be further prepared along with new IMAP Metadata Templates for the IMAP (Pilot) Info System Metadata templates aligned with the Data Standards and Data Dictionaries presented in document UNEP/MED WG. 463/9. The aim is to ensure that data quality checked and assured are reported to the next level, especially when operations are performed by different persons and/or different periods of time (see Table 2, Monitoring processes 1, 2, 3 and 4).

25. Another important insight into the data flows for QA in marine pollution monitoring is to ensure, as much as possible, that the generated data at each process is quality assured by two or more persons, which might not have participated in the process (e.g. sampling, processing, analysis and reporting). This means that if solely a person participated in the sample processing and analytical determinations he/she should not be the solely the person performing the reporting/registry QA for the entire process. This is applicable to all the processes including the final reporting (Process 4, Table 2) which should be checked by a second staff member. In brief, the person(s) that does the operations could not be the same that perform the quality assurance (QA) for a given process and data reporting.

4.2. Secondary (Contracting Parties)

26. At the secondary level, the national MED POL Focal Points should ensure the performance of the first level observing two main elements, namely, Completeness and Timeliness of datasets to be fulfilled. Both attributes are necessary for internal national purposes, as well as for the contribution to the database quality of submitted pollution monitoring data to the Secretariat.

27. Based on MED POL and other Regional Seas Programme, Table 3 presents a number of principles to guide the Contracting Parties to enable the execution and reporting under marine pollution monitoring programmes.

Table 3. The principles to guide the Contracting Parties in enabling execution of their reporting obligations under marine pollution monitoring programme.

Principle 1	*Only reliable information can provide the basis for effective and economic environmental policy and management regarding the Convention area*
Principle 2	*Environmental information is the product of a chain of activities, constituting program design, execution, evaluation and reporting, and that each activity has to meet certain quality requirements*
Principle 3	*Quality assurance requirements shall be set for each of these activities*
Principle 4	*Suitable resources should become available nationally (e.g. ships, laboratories, trained staff, etc.) to achieve this goal*
Principle 5	*Commitment to follow available protocols and guidelines to ensure full procedures for quality assurance and quality management systems*

4.3. Tertiary level (the Secretariat)

28. The Secretariat observes the basic principles at the secondary level and this should be sufficient to ensure completed and timely data sets submissions by the MED POL Focal Points.

29. At the level of the Secretariat, the main attributes to be fulfilled should be the data validity and accessibility by the Contracting Parties at national, regional and sub-regional levels. In fact, the MED POL monitoring database includes functional modules for data validation and data flagging, according to single parameter characteristics. The same approach should be incorporated into the IMAP Info System under preparation by INFO/RAC.

5. Proposed QA schemes for EO5 and EO9 and Data Controls

30. Despite Table 2 is meant to be detailed, generic QA schemes exist for any Common Indicator to be measured and reported at the primary level. To that extent, QA can be adapted for each Common Indicator within EO5 and EO9 with the purpose of establishing a common understanding for QA reporting. Tables 4a and 4b describes both the QA Schemes and QA Categories for each Common Indicator according to its specificities and overall 'data quality' needs to be reported by the Contracting Parties to the Secretariat under IMAP. Level 1 of QA/QC in Table 4a provides the scheme for data quality assurance, whilst Level 2 provides the scheme for QA of data assessment.

31. Therefore, the new categorization of the datasets received by the Secretariat should be agreed; but importantly, should allow performing the data validation from the reported data by the Contracting Parties from both scientific and policy points of view (i.e. considering the full attributes associated with 'data quality' at levels 1 and 2).

32. The above proposal responds to the experience gathered by the Secretariat, in collaboration with the Marine Environmental Studies Laboratory (MESL)of IAEA, and it should serve as a new framework to build a stronger quality flagging scheme within the INFO/RAC IMAP Info System with enough flexibility to accommodate the situations observed after 20 years of MED POL reporting activities.

33. There is a need for an urgent Mediterranean IMAP database quality management system capable to both incorporate and synthesize the marine environmental information generated in the Mediterranean region in a more dynamic way, as well as to visualize related assessment findings; that is incorporating different sources of data including scientific literature but strictly conserving a QA scheme that will allow to track the data sources and evaluate the uncertainty in the environmental assessments (i.e. different products with different levels of uncertainty).

34. The IMAP QA database should serve better for national quality improvements in the short term by clarifying the 'data quality' objectives and the processes to deliver quality data in the Mediterranean in a harmonized way.

35. The Data Controls (i.e. algorithms such as minimum and maximum values allowed for a parameter for example) within Database Quality Management needs to be built-in the IMAP Info System to improve the current scheme of the MED POL database as well, which is mainly based in format requirements. The 'flagging quality' scheme based on the Database QA and Reporting Procedures will help to develop an accurate assessment with known source uncertainty, as well as boost the national capabilities and resources to fit the requirements.

36. The finalization of this phase should be performed once the Data Standards and Data Dictionaries will be agreed. Nevertheless, the templates template using the actual parameters (i.e. MED POL) in the process to be transposed to the IMAP (Pilot) Info System, is presented in Appendix I for Common Indicator 17.

Table 4a. Proposed Quality Assurance (QA) Schemes for Common Indicators under IMAP EO5 and EO9.

Common Indicator	LEVEL 1: QA/QC Data	LEVEL 2: QA of data assessment	National requirements/Remarks
CI13 (EO5)	Monitoring and reporting QA/QC	Transfer/Reporting QA level by CP	Proficiency testing/ Laboratory accreditation
CI14 (EO5)	Monitoring and reporting QA/QC)	Transfer/Reporting QA level by CP	Proficiency testing/ Laboratory accreditation
CI17 (EO9)	Monitoring and reporting QA/QC	Transfer/Reporting QA level by CP	Proficiency testing/ Laboratory accreditation
CI18 (EO9)	Monitoring and reporting QA/QC	Transfer/Reporting QA level by CP	Proficiency testing/ Laboratory accreditation
CI19 (EO9)	Transfer/Reporting QA level by CP	-	The observation method (e.g. ships, satellite) should be reported (as a proof of Monitoring QA)
CI20 (EO9)	Monitoring and reporting QA/QC	Transfer/Reporting QA level by CP	Laboratory accreditation/Proficiency testing (e.g. typically Public Health Laboratories)
CI21 (EO9)	Monitoring and reporting QA/QC	Transfer/Reporting QA level by CP	Laboratory accreditation/Proficiency testing (e.g. typically Public Health Laboratories)

Table 4b. Proposed categories for flagging datasets submitted to the Secretariat for EO5 and EO9

Category A. Laboratories/CPs reporting successful Proficiency testing (z-score<2) and/or accreditation for the chemical or parameter analysed; metadata completed and timely submitted (max2 years delay).
Category B. Laboratories/CPs reporting Proficiency testing for the chemical or parameter analysed (2<z<3) and/or accreditation; metadata completed and timely submitted (max2 years delay).
Category C. Laboratories/CPs with no participation in Proficiency testing (for the last 2 years); metadata completed and timely submitted. It also could include scientific literature with full QA reported.
Category D. Laboratories/CPs with no participation in Proficiency testing (for the latest 5 years); metadata completed but not timely submitted. It also includes scientific literature without QA specifically reported.
Category E. Laboratories/CPs with gross reporting errors, although might be completed and timely submitted.

6. References

MEDPOL DATABASE, User Manual. IMS METU, 2003

Annex I
Example on Data Controls for CI17 for trace metals in biota

As an example of Data Controls, the table below corresponding to the MED POL Metadata template for heavy metals in biota, includes two final columns to be filled with detailed content once the IMAP (Pilot) Info System Metadata templates will be built (see footnote) for the Contracting Parties.

	Fields	Description	Format	Units	A*	B*
1	SAMPLE_ID	Individual sample code given to each sample by the laboratory				
2	YEAR	Monitoring Year	NUM (4)			X
3	COUNTRY	Country Code (MED POL Codes)	CHAR (3)		X	
4	AREA	Area Code	CHAR (6)		X	
5	STATION	Station Code	CHAR (6)		X	
6	STATION_TYPE	for Hot Spots (H), Coastal (C), Reference (R)	CHAR (2)		X	
7	SAMP_DATE	Date of Sampling (dd/mm/yy)	DATE		X	
8	LON_DEG	Longitude in degrees	NUM (2)	Degree	X	
9	LON_MIN	Longitude minute, seconds (In case of GPS application use this field for minutes and seconds in decimals, otherwise use only for minutes)	NUM (5,2)	Minute	X	
10	LON_SEC	Longitude seconds (Use this field only when GPS is not used for positioning)	NUM (2)	Second	X	
11	LON_HEMIS	Longitude hemisphere (codes: W=west, E=east)	CHAR (1)		X	
12	LAT_DEG	Latitude degree	NUM (2)	Degree	X	
13	LAT_MIN	Latitude minute, seconds (In case of GPS application use this field for minutes and seconds in decimals, otherwise use only for minutes)	NUM (2,2)	Minute	X	
14	LAT_SEC	Latitude seconds (Use this field only when GPS is not used for positioning)	NUM (2)	Second	X	
15	BOT_DEPTH	Bottom depth of the sampling station	NUM (5,1)	meters	X	X
16	SAM_DEPTH	Sampling depth	NUM (5,1)	meters	X	X

	Fields	Description	Format	Units	A*	B*
17	SAM_TEMP	Temperature at the sampling station and depth	NUM (5,2)	ºC	X	X
18	SAM_SALIN	Salinity at the sampling station and depth (indicate exact unit)	NUM (5,2)	mS	X	X
19	SAM_DO	Dissolved oxygen at the sampling station and depth	NUM (5,2)	mg/L	X	X
20	SPECY	Selected Specie for analysis (MED POL codes)	CHAR (2)		X	
21	TISSUE	Selected Tissue for analysis (MED POL codes)	CHAR (2)		X	
22	SAM_NO	Sample no. (1,...n) ("n" as used in trend objectives of the programme)	NUM (2)			
23	NS	Number of specimens (=number of pooled organisms in a sample)	NUM (2)		X	X
24	LENGTH_AVG	Average length of specimens in a pool (Important: Use "fork length" for fish and "shell length" for mussels)	NUM (7,2)	cm	X	
25	LENGTH_STD	Standard deviation of average length of specimens in a pool	NUM (6,2)	cm	X	
26	LENGTH_UNIT	Unit given for length of organisms	CHAR (5)	"cm"	X	
27	WEIGHT_AVG	Average weight of specimens in a pool	NUM (8,1)	g	X	X
28	WEIGHT_STD	Standard deviation of average weight of specimens in a pool	NUM (7,1)	g	X	
29	WEIGHT_UNIT	Unit given for weight of organisms	CHAR (5)	"g"	X	
30	EOM	Extractable Organic Matter	NUM (5,2)	mg/g	X	X
31	EOM_UNIT	Extractable Organic Matter	CHAR (5)	"mg/g"	X	
32	DW / FW	Ratio of dry weight to fresh weight (dried to constant temperature)	NUM (5,2)		X	X
33	INST_CODE_TM	Trace Metal Institute code (Country code+institute no. given in the MEDPOL Phase III Agreement)	CHAR (5)			

	Fields	Description	Format	Units	A*	B*
34	ANALY_DATE_TM	TM Analysis Date (dd/mm/yy)	DATE		X	
35	ANALY_METH_TM	TM Analysis method (MED POL codes)	CHAR (5)			
36	FW_DW	Mention if concentrations are based on fresh or dry weight (code as "**F**" for fresh weight and "**D**" for dry weight	CHAR (1)		X	X
37	AS_CONC	Arsenic concentration	NUM (7,3)	µg/kg	X	X
38	AS_BDL	enter **BDL** if As conc. is below detection limit or level of determination	CHAR (3)		X	
39	AS_DL	Detection limit value	NUM (7,3)	µg/kg	X	
40	AS_UNIT	Unit for As_conc	CHAR (5)		X	
41	CD_CONC	Cadmium Concentration	NUM (7,3)	µg/kg	X	X
42	CD_BDL	Enter BDL if Cd conc. is below detection limit or level of determination	CHAR (3)		X	
43	CD_DL	Detection limit value	NUM (7,3)	µg/kg	X	
44	CD_UNIT	Unit for Cd_conc	CHAR (5)		X	
45	CR_CONC	Chromium Concentration	NUM (7,3)	µg/kg	X	X
46	CR_BDL	enter BDL if Cr conc. Is below detection limit or level of determination	CHAR (3)		X	
47	CR_DL	Detection limit value	NUM (7,3)	µg/kg	X	
48	CR_UNIT	Unit for Cr_conc	CHAR (5)		X	
49	CU_CONC	Cupper concentration	NUM (7,3)	µg/kg	X	X
50	CU_BDL	Enter BDL if Cu conc. Is below the detection limit or level of determination	CHAR (3)		X	

	Fields	Description	Format	Units	A*	B*
51	CU_DL	Detection limit value	NUM (7,3)	µg/kg	X	
52	CU_UNIT	Unit for Cu_conc	CHAR (5)		X	
53	HGT_CONC	Total Hg concentration	NUM (7,3)	µg/kg	X	X
54	HGT_BDL	enter BDL if HgT conc. is below detection limit or level of determination	CHAR (3)		X	
55	HGT_DL	Detection limit value	NUM (7,3)	µg/kg	X	
56	HGT_UNIT	Unit for Hgt_conc	CHAR (5)		X	
57	PB_CONC	Lead Concentration	NUM (7,3)	µg/kg	X	X
58	PB_BDL	enter BDL if Pb conc. Is below detection limit or level of determination	CHAR (2)		X	
59	PB_DL	Detection limit value	NUM (7,3)	µg/kg	X	
60	PB_UNIT	Unit for Pb_conc	CHAR (5)		X	
61	ZN_CONC	Zinc concentration	NUM (7,3)	µg/kg	X	X
62	ZN_BDL	Enter **BDL** if Zn conc. Is below the detection limit or level of determination	CHAR (3)		X	
63	ZN_DL	Detection limit value	NUM (7,3)	µg/kg	X	
64	ZN_UNIT	Unit for Zn_conc	CHAR (5)		X	
	Other Trace Metals	**to be included by the laboratories depending on the country agreements**				

A= Exact specifications, otherwise a range or alternative cumulative option should be established
B= Data control requirement (e.g. LOD, LOQ, valid concentration range, etc.)