

Introductory Document to the Article 5 Report under the Water Policy Framework Regulations, 2004

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**INTRODUCTORY DOCUMENT
TO THE ARTICLE 5 REPORT
UNDER THE
WATER FRAMEWORK POLICY REGULATIONS, 2004**

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1. Introduction

The Water Policy Framework Regulations (L.N. 194 of 2004) under regulation 5 require that an analysis of the characteristics of the Maltese Water Catchment District is carried out. The Regulations necessitate that this analysis be accompanied by a review of the impact of human activity on the status of surface waters and groundwater as well as with an economical analysis of water use within the water catchment district. The technical specifications for the carrying out of this investigation are spelt out in Annexes II and III to the Regulations.

The Regulations define the Malta Resources Authority as the competent authority in as far as inland water is concerned; provided that the Malta Environment and Planning Authority be responsible for surface waters found in areas protected by scheduling declarations under the Development Planning Act or otherwise protected under the Environment Protection Act or the Filfla Nature Reserve Act, and for surface waters found in areas hosting protected species under the Environment Protection Act or other areas of ecological and scientific importance according to the provisions of the Development Planning Act or the Environment Protection Act. This and subsequent reports will thereby focus on the identification and characterisation of the groundwater bodies in the Maltese River Basin District.

Annex II to the Regulations outlines the requirements for the characterisation of groundwater bodies within the water catchment district. For groundwater bodies the Regulations demand a step-wise approach which entails an ‘initial characterisation’ or an appraisal of the risk that each groundwater body has of failing to achieve the environmental objectives of the Regulations. The groundwater bodies thus determined to be ‘at risk’ have to be ‘further characterised’ such that the extent of the risks identified during the ‘initial characterisation’ is carefully determined. The Regulations require also that an in-depth analysis on the potential impact of human activity is carried out for those groundwater bodies identified to be ‘at risk’ of failing to achieve their objectives.

1.1 Initial Characterisation

The Regulations require the Malta Resources Authority to carry out an ‘initial characterisation’ of all groundwater bodies in order to assess their uses and the degree to which they are at risk of failing to meet the environmental objectives outlined under Regulation 4. This investigation should be based on existing hydrological, geological, pedological, land-use, discharge, abstraction and other data and should identify and outline:

- the location and boundaries of all the groundwater bodies within the water catchment district;
- the pressures to which the groundwater bodies are likely to be subject including:
 - diffuse sources of pollution,
 - point sources of pollution,

- abstraction,
- artificial recharge;
- the general characteristics of the overlying geological formations and strata in the catchment area from which the groundwater body receives its recharge,
- those groundwater bodies for which there are directly dependent surface water ecosystems or terrestrial ecosystems.

1.2 Further Characterisation

The Authority is also required to carry out a ‘further characterisation’ of those groundwater bodies or group of bodies which based on the results of the ‘initial characterisation’ have been identified as being ‘at risk’ in order to establish a more precise assessment of the significance of such risk. The Regulations further outline that the ‘Programme of Measures’ required under Regulation 11 should be based on the results obtained during this investigation. The technical requirements outlined in the Annex specify that this ‘further characterisation’ should include relevant information on the impact of human activity and, where relevant, information on:

- the characteristics of the geological formations sustaining the groundwater body including the extent and type of these formations,
- the hydrogeological characteristics of the groundwater body including hydraulic conductivity, porosity and confinement,
- the characteristics of the superficial deposits and soils in the catchment area from which the groundwater body receives its recharge, including the thickness, porosity, hydraulic conductivity, and absorptive properties of the deposits and soils,
- the stratification characteristics of the groundwater within the groundwater body,
- an inventory of associated surface systems, including terrestrial ecosystems and bodies of surface water with which the groundwater is dynamically linked,
- estimates of the direction and rates of exchange of water between the groundwater body and associated surface systems,
- the long term annual average rate of overall recharge,
- the natural and current chemical composition of the groundwater, including specification of the contributions from human activity.

1.3 Review of the impact of human activity on groundwater bodies

A further specific requirement of the Regulation target those bodies of groundwater which following the results of the ‘initial characterisation’ process have been identified as being at risk of failing to meet the environmental objectives set for each groundwater body under Regulation 4. This review requires that the following information, where relevant, be collected and maintained for each groundwater body:

- (a) the location of points in the groundwater body used for the abstraction of water with the exception of:

- points for the abstraction of water providing less than an average of 10m³ per day, or
- points for the abstraction of water intended for human consumption providing less than an average of 10m³ per day or serving less than 50 persons,
- (b) the annual average rates of abstraction from such points,
- (c) the chemical composition of water abstracted from the groundwater body,
- (d) the location of points in the groundwater body into which water is directly discharged,
- (e) the rates of discharge at such points,
- (f) the chemical composition of discharges to the groundwater body, and
- (g) land use in the catchment or catchments from which the groundwater body receives its recharge, including pollutant inputs and anthropogenic alterations to the recharge characteristics such as rainwater and run-off diversion through land sealing, artificial recharge, damming or drainage.

1.4 Identification of groundwater bodies for which lower objectives are to be specified

Finally, the Regulation require the Authority to identify those bodies of groundwater for which lower objectives are to be specified under Regulation 4;

- (i) as a result of the consideration of the effects of the status of the body on:
 - (a) surface water and associated terrestrial eco-systems
 - (b) water regulation, flood protection and land drainage
 - (c) human development; and
- (ii) where, as a result of the impact of human activity, as determined in accordance with sub-regulation 5.1, the body of groundwater is so polluted that achieving good groundwater status is infeasible or disproportionately expensive.

2. The Environmental Objectives of the Regulations

The environmental objectives of the Water Policy Framework Regulations are the core of this legislation providing for a long-term sustainable water management on the basis of a high level of protection of the aquatic environment. The objectives are specified in Annex 4 of the Regulations and include the following elements:

- No deterioration of status for surface and groundwater and the protection, enhancement and restoration of all water bodies;
- Achievement of good status by 2015 – for groundwater this implies the achievement of good chemical and good quantitative status;
- Prevention and limitation of input of pollutants in groundwaters;
- Reversal of any significant, upward trend of pollutants in groundwaters;
- Achievement of standards and objectives set for protected areas in other National and Community legislation.

The normative definitions for the environmental objectives are described in the Regulations in great detail in Annex V. However, the development of specific numerical criteria is described only as regards the process. The development for such criteria is still ongoing and for groundwaters, the European Commission has proposed a ‘Groundwater Directive’ which is still under discussion with the aim of presentation in early 2005. This proposal suggests criteria for ‘good groundwater chemical status’ for few substances only (nitrates, pesticides). In addition, Member States are requested to set national standards on the basis of a number of criteria and report them to the Commission with the aim to identify whether a further harmonisation of standards across Europe is necessary and feasible taking into account of the different groundwater typologies.

3. Identification of Groundwater Bodies

3.1 Background

The Water Framework Policy Regulations cover all waters, including inland waters (surface water and groundwater) and transitional and coastal waters up to one sea mile from the territorial baseline of the country, independent of the size and characteristics.

This totality of waters is, for the purpose of the implementation of the Regulations, attributed to geographical or administrative units, in particular the '**water catchment**', the '**water catchment district**', and the '**water body**'. Whereas the water catchment is the geographical area related to the hydrological system, the water catchment district must be designated as the 'main unit for management of water catchments'.

The success of the implementation of the Regulations in achieving their Environmental Objectives will be mainly measured by the status of 'water bodies'. With regard to groundwater, 'groundwater bodies' are therefore the units that will be used for reporting and assessing compliance with the principal objectives of the Regulations.

The 'groundwater body' should therefore be a coherent sub-unit in the water catchment district to which the environmental objectives of the Regulations are to apply. Hence, the main purpose of identifying these bodies is to enable their quantitative and qualitative status to be accurately described and compared to the environmental objectives.

3.2 Defining Bodies of Groundwater

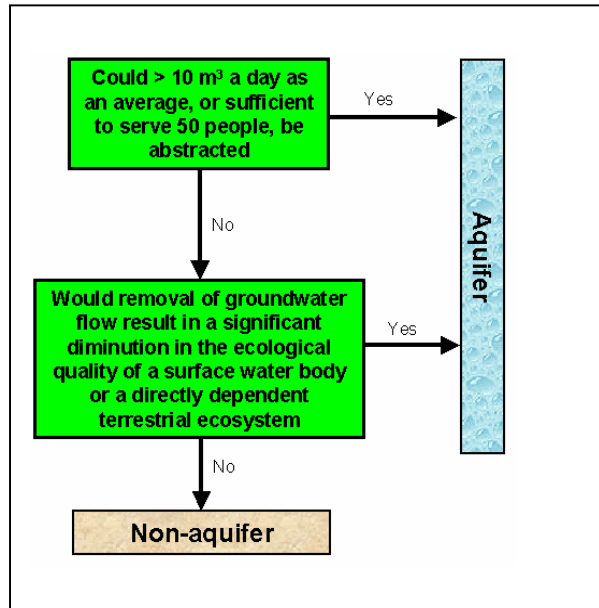
The application of the term body of groundwater must be understood in the context of the hierarchy of relevant definitions provided under Article 2 of the Regulations.

- Regulation 2.2: '**Groundwater**' means all water, which is below the surface of the ground in the saturated zone and in direct contact with the ground or subsoil.
- Regulation 2.11: '**Aquifer**' means a subsurface layer or layers of rock or other geological strata of sufficient porosity and permeability to allow either a significant flow of groundwater or the abstraction of significant quantities of groundwater.
- Regulation 2.12: '**Body of groundwater**' means a distinct volume of groundwater within an aquifer or aquifers.

As a consequence of the hierarchy of definitions, the identification of bodies of groundwater requires a general interpretation of the term aquifer, in respect to what constitutes a significant flow of groundwater and what volume of abstraction would qualify as a significant quantity.

Guidance to the Regulations define 'significant flow' and 'abstraction of significant quantities of groundwater' as:

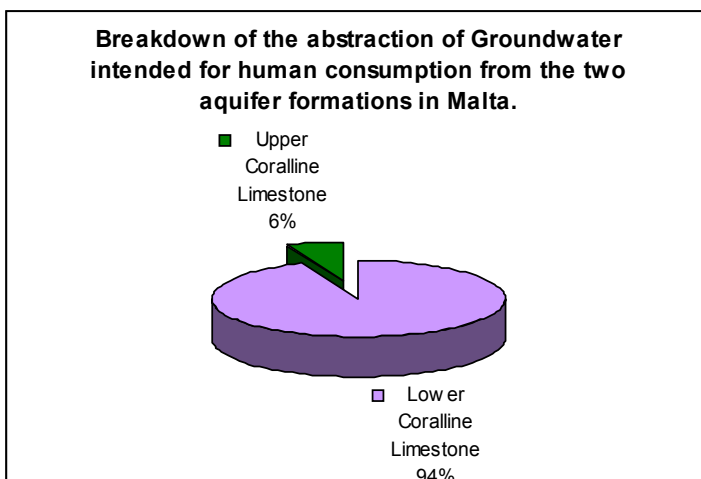
1. The significance of groundwater flow should be understood in the context of the purpose and provisions of the Regulations. Accordingly, a significant flow of groundwater is one that, where it from reaching an associated surface water body or a directly dependent terrestrial ecosystem, would result in a significant diminution in the ecological or chemical quality of that surface water body or significant damage to the directly dependent terrestrial ecosystems.



2. Regulation 7 requires the identification of all groundwater bodies used, or intended to be used, for the abstraction of more than 10m³ of drinking water a day as an average. By implication, this volume could be regarded as a significant quantity of groundwater. Geological strata capable of permitting such levels of abstraction (even only locally) would therefore qualify as aquifers.

The same Guidance indicates that if either of the criteria described in 1 and 2 above are satisfied, the geological strata should be regarded as an aquifer.

The Maltese Islands are mainly composed of two porous and fissured limestones: the Upper Coralline Limestone and the Globigerina-Lower Coralline Limestone formations, separated by a relatively thin layer of clayey and marly material, the Blue Clay formation, which is sometimes overlain by the Greensand formation.



The Upper and Lower Coralline Limestone formations are considered to function as aquifer rocks; with the Globigerina Limestone functioning only locally as an aquifer where highly fractured. The Blue Clay and the Greensand formations are normally impermeable and underly the Upper Coralline Limestone.

Around 16 million m³ of groundwater were abstracted during the year 2003 from the Upper and Lower Coralline Limestone aquifers, blended with Reverse Osmosis water and subsequently supplied as drinking water by the Water Services Corporation – the public water utility in the Maltese islands. 15 million m³ of this groundwater are abstracted from the Lower Coralline Limestone aquifers with the remaining 1 million m³ being supplied from the Upper Coralline Limestone aquifers.

3.3 Delineation of bodies of groundwater

The delineation of bodies of groundwater must enable an appropriate description of the quantitative and qualitative status of groundwater such that the relevant objectives of the Regulations can be achieved. The starting point for identifying the geographical boundaries of a groundwater body should be geological boundaries to flow, unless the description of status and the effective achievement of the environmental objectives for groundwater require sub-division into smaller groundwater bodies. Guidance to the Regulations recommends that sub-divisions of aquifers that cannot be based on geological boundaries should be based initially on groundwater highs, or where necessary, on groundwater flow lines.

From a structural point of view, the island of Malta can be divided into two parts: the northern and the central/southern regions; the limit being marked by the sealing Pwales Fault. In the major part of the island, south of the Pwales fault, the Upper Coralline Limestone and the Globigerina/Lower Coralline Limestone aquifers are stacked vertically. The Lower Coralline Limestone aquifer is in direct contact with sea-water and due to the density contrast of freshwater and saltwater a Ghyben-Herzberg system is developed: a freshwater lens floating on saltwater with a thickness approximately 36 times more below sea level than the height of the freshwater surface above sea level. The Upper Coralline Limestone aquifer in these regions is perched above the Blue Clay aquiclude formation and is divided into two hydrologically separate blocks due to faulting, namely the Rabat-Dingli and the Mgarr-Wardija Plateaus.

The northern part of the island is divided by a NE-SW fault system into a succession of horst and graben like structures; the graben being occupied by rather flat valleys separated by ridges. This structure with parallel compartments separated by faults leads to the point that the resulting aquifer blocks are considered as independent from one another from a hydrogeological point of view. Hydrologically separate Upper Coralline Limestone aquifer blocks are therefore developed in the Pwales Valley, Mizieħ, Mellieħa Ridge, Mellieħa Bay and Marfa Ridge regions.

In the island of Gozo, the Lower Coralline Limestone aquifer sustains another Ghyben-Herzberg system displaced over the whole island except for a small region around the harbour of Mgarr in the south-eastern part of the island, where the Blue Clay formation occurs at sea-level due to faulting. The Upper Coralline Limestone outcrops in geographically separate areas, namely at Ghajnsielem, Nadur, Xaghra, Zebbug and Victoria/Kercem giving rise to separate aquifer blocks. A number of minor very small

outcrops of the Upper Coralline Limestone occur such as those at Ghar Ilma and Gordan which sustain very limited groundwater bodies.

The initial delineation of bodies of groundwater in the Maltese Islands will be strictly based on geological boundaries. Sixteen groundwater bodies corresponding to the sixteen hydrologically separate aquifer blocks described above have been identified, as indicated in the table below.

Groundwater Body Code	Groundwater Body Name	Spatial Extent Km2
MT001	Malta Main Mean Seal Level	216.6
MT002	Rabat-Dingli Perched	22.6
MT003	Mgarr-Wardija Perched	13.7
MT005	Pwales Coastal	2.8
MT006	Mizieb Mean Sea Level	5.2
MT008	Mellieha Perched	4.5
MT009	Mellieha Coastal	2.9
MT010	Marfa Coastal	5.5
MT011	Mqabba-Zurrieq Perched	3.4
MT012	Comino Mean Sea Level	2.7
MT013	Gozo Mean Sea Level	65.8
MT014	Ghansielem Perched	2.7
MT015	Nadur Perched	5.0
MT016	Xaghra Perched	3.0
MR017	Zebbug Perched	0.4
MT018	Victoria-Kercem Perched	1.5

Table: Preliminary Delineation of Bodies of Groundwater in the Maltese Islands

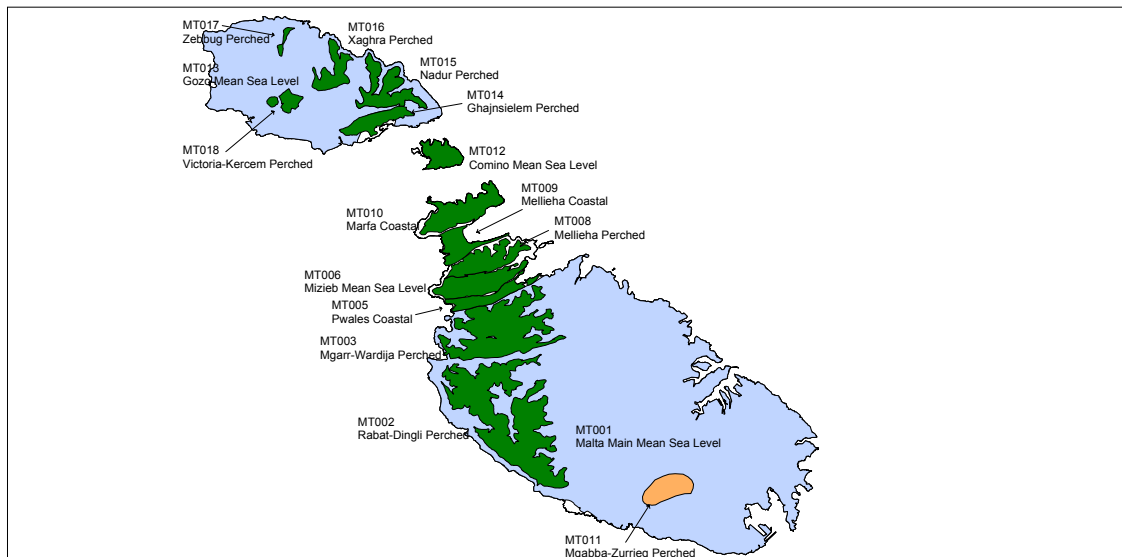


Figure: Preliminary Identification of Bodies of Groundwater within the Maltese Water Catchment District.

The identification of groundwater bodies is an iterative and on-going process. This preliminary identification of water bodies is only the first step and where, subject to the results of the initial and further characterisation processes, it is deemed necessary to further subdivide the aquifer blocks identified, groundwater body identification will be verified and refined.