

Pursuant to Article 22, Paragraph 3 of the Law on Mineral Raw Materials (“Official Gazette of the Republic of Macedonia” No.24/7), the Minister of Economy has adopted the following:

## **RULEBOOK**

### **FOR THE CONTENT OF THE GEOLOGICAL DOCUMENTATION FOR CONDUCTING DETAILED GEOLOGICAL EXPLORATIONS**

#### **I- GENERAL PROVISIONS**

##### **Article 1**

This rulebook shall prescribe the content of the geological documentation for performing detailed geological explorations.

##### **Article 2**

The geological documentation for performing detailed geological explorations according to Article 22 Paragraph 3 of the Law on Mineral Raw Materials is made in electronic and paper form and the same consists of:

1. Detailed geological explorations project;
2. Detailed geological explorations performance report
3. A study on detailed geological exploration performed

#### **II PROJECT FOR CONDUCTING DETAILED GEOLOGICAL EXPLORATIONS**

##### **Article 3**

The Project for conducting detailed geological explorations shall consist of:

- 1) General data for the project;
- 2) Textual part;
- 3) Graphic documentation;

##### **Article 4**

The general data for the project for performing detailed geological explorations shall consist of:

- 1) Name of the project and the firm, i.e. other legal entity who prepared the project, signature of the main draftsman on the left and the authorized representative of the firm on the right side of the document, time and place of the elaboration of the project;
- 2) List of collaborators that participated in project's production and their signatures and
- 3) An evidence that the person and the firm that made the project- the chief draftsman and the firm meet the conditions provided by law.

The textual part of the project for conducting detailed geological explorations shall consist of:

- 1) List i.e. project's content;
- 2) Project task;
- 3) Introduction;
- 4) General data for the explored area;
- 5) A review of the former explorations with results from the explorations and a conclusion for the extent to which the terrain has been explored and that it is a subject of the permission for the detailed geological explorations;
- 6) Project resolutions for the process of performing detailed geological explorations;
- 7) Subject and description of the technical conditions for exploration works performance;
- 8) Dynamic of exploration works performance;
- 9) Exploration's costs calculation;
- 10) Economic explanation of the project;
- 11) Measures for protection during work and protection form fire during performance of the exploration works
- 12) Measures for protection of the living environment and
- 13) List of literature and fund's documentation.

## **Article 6**

The project's task shall consist of:

- Borders of the exploration area;

- The issues that need to be solved with project's realization;
- Goal and purpose of the explorations;
- Conditions for exploration and
- The expected results.

The introduction shall consist of:

- Reasons for project's production;
- Participants in project's production;
- Conditions under which the project has been produced and
- time of project's production;

### **Article 8**

**The general data for the exploration area shall consist of:**

- Geographic position of the exploration area with a title on the paper or the section geological maps from eventually the past basic geological explorations of the research area;
- Morphological and hydrogeological characteristic of the exploration area which is subject to the permission for detailed geological researches;
- Climate conditions;
- Traffic connections;
- Population of the exploration area and
- Data for the historical monuments and other facilities which are protected.

### **Article 9**

The review of the previously conducted researches with the results from the explorations and a conclusion for the extent of the exploration of the terrain which is subject to the permission for detailed geological explorations consists of:

- History of explorations;
- Review of the so far applied exploration methods;
- Sites that have been explored;
- Volume and density of the explorations for each of the applied methods.

On basis of the obtained data from the previously made explorations it is being exposed:

- A critical review of the applied exploration methodology, the exploration extent and the validity of the available dataset for the explorations performed;
- A short overview of the geological, metallogenic, minerogenic, coal-bearing or gas-condition ,hydrogeological and engineering-geological characteristics of the exploration area and
- Indicators of the geologically-economic assessment for the prosperity of the exploration area as a whole or in some of its parts in relation to the site of mineral raw materials and an assessment for the eligibility in relation to the building of facilities.

#### **Article 10**

Project resolutions for the process of performing detailed geological explorations are made for all kinds of exploration works and consist of the concept and methodology of explorations for introduction and establishment of:

- 1) The geological characteristics of the exploration area;
- 2) Metallogenic and minerogenic, i.e. engineering-geological characteristics of the exploration area and
- 3) Classification and categorization of the mineral resources supplies.

#### **Article 11**

Concept and methodological solutions for exploration of the geological characteristics of the exploration area are given for introduction and establishment of:

- 1) The genetic and lithostatigraphic types of magmatic, sediment and metamorphic rocks and
- 2) The structure of separate lithostratigraphic types of rocks and the exploration area as a whole.

#### **Article 12**

The conceptual and methodological resolutions of the exploration of metallogenic and minerogenic, gas-condition characteristics of the exploration area are presented because of introduction and establishment of:

- 1) Perceptivity of the area in regard of the opportunity for discovering sites of mineral raw materials on the exploration area;
- 2) The opportunity for discovering the mineral raw materials sites in the borders of the separate exploration area;
- 3) Genesis and factors of control of the spatial misplacing of the sites of mineral sources (magmatic, structural, lithological etc.)
- 4) Sites' characteristics, i.e. ore bodies on which basis they are divided in groups and subgroups;
- 5) Size and complexity of the shape of the ore bodies and sites;
- 6) Affiliating of certain genetic types, i.e. ore formations;
- 7) Mineral composition and its characteristics;
- 8) Character of distribution of the useful and harmful components and
- 9) Occupation of the post-ore tectonic movements.

### **Article 13**

The conceptual and methodological solutions for exploration of the hydrogeological characteristics of the exploration area, are presented because of introduction and establishment of:

- 1) Perspectivity of the area in regard of the opportunity for discovering of groundwater on the exploration area;
- 2) Spatial position of the aquiferous environment where is found the groundwater site;
- 3) Hydrogeological parameters and characteristics of the aquiferous environment , and closed and semi-closed aquifers and their elevation ;
- 4) Characteristics of the groundwater regime which defines their usefulness;
- 5) The groundwater reserves and conditions for their exploitation and
- 6) Conditions for groundwater contamination.

### **Article 14**

The conceptual and methodological solutions of the engineering-geological characteristics of the exploration area are presented for introduction and establishment of:

- 1) Engineering-geological characteristics of the terrain;

- 2) Engineering- geological and technical properties of the rock masses;
- 3) Egsodynamic processes and occurrences, causes for their formation, dynamics of development and improvement opportunity;
- 4) Engineering-geological classification of terrain in regard to stability of the terrain, load, seismic micro-partitioning and eligibility for construction;
- 5) Engineering-geological conditions for facility's construction (settlements, roads, railways, dams, accumulation, airports, tunnels ,bridges etc.) and
- 6) Occurrence and sites of geologically construction materials;
- 7) Influence of the contemporary geological or engineering-geological processes upon the living environment.

The conceptual and methodological solutions for the explorations for classification and categorization of the mineral resources supplies of the exploration area are presented because of introduction to:

- 1) The site's conditions, dip, spreading, size (volume, shape and site's composition i.e. ore bodies, all useful and harmful mineral ingredients, their mutual relationship and spacious misplacing.
- 2) The chemical composition, physic-chemical , physic –mechanical and technological properties of the mineral raw materials as well as the opportunity for their application;
- 3) Egsodynamic processes and emerges, cause for their formation, dynamics of development and improvement possibility;
- 4) Engineering-geological classification of terrain in regard of stability of the terrain, load, seismic micro-partitioning and eligibility for constructions etc.;
- 5) Engineering-geological conditions for facilities constructing (settlements, roads, railways, dams, accumulations, airports tunnels, bridges etc.)
- 6) Occurrence and geological building materials sites;
- 7) Influence of the contemporary geological and engineering-geological processes on the living environment.

The conceptual and methodological solutions of the explorations for classification and categorization of the mineral raw materials reserves of the exploration area are presented for introduction to:

- 1) Site's conditions, dip, speeding, size, shape and site's building i.e. other mining bodies which are useful and harmful mineral ingredients and their mutual relation and spacious misplacing;
- 2) Chemical composition, physic-chemical, physic –mechanical and technological properties of the mineral resources as well as the opportunity for their application;
- 3) Tectonic, geo-technical (engineering-geological, engineering-hydrogeological, geo-mechanical) and other parameters which define the terms for performance of the exploitation works and
- 4) The geological genetic, technically-exploitation, technological, regional, market and social-economic factors and naturally valuable indicators on which basis the classification and categorization of the mineral resources supplies is being made.

#### **Article 16**

The conceptual and methodological solutions for the explorations for classification and categorization of the groundwater reserves, are presented because of introduction and establishment of:

- 1) The geological structure of the site;
- 2) Spatial position and aquiferous environment parameters;
- 3) Aquiferous environment yield and partitioning in relation to the degree of yield;
- 4) Quality and regime of the groundwater;
- 5) Exploitation opportunities of the site and certain perspective areas and
- 6) Hydrogeological and hydro technical conditions of groundwater cover and conditions for their sanitary protection.

#### **Article 17**

The subject and description of the technical conditions for performance of the exploration works consists of:

- 1) The most economical and rational variations of exploration concepts;
- 2) Precisely determined quantity of works with defined micro-locations of each exploration work on the exploration area;

- 3) Important constructive characteristic of each exploration work (descriptive and graphic);
- 4) Detailed description of the technical conditions for production of each exploration work and
- 5) Local conditions for realization of the envisaged explorations (transport conditions, energy supply, water supply, accommodation and other conditions).

### **Article 18**

The dynamic of exploration works performance contains the real perceived time of total duration of the envisaged exploration works according to the stage of performance.

If it is a matter of project with long-term explorations must be presented the dynamic of the explored works separately for each year, i.e. exploration stage.

The dynamic of performance of the exploration works shall be written in a graph in A3 format, where shall be inscribed the type of works according to stages and time period of their performance with an appropriate explanation.

The graphic plan shall be given attached- Form 1 which is a composite part of this Rulebook.

### **Article 19**

The calculation of the exploration costs shall consist of projected individual prices according to the type of working stage for every exploration work and a cumulative price for the total work envisaged according to the project for detailed geological explorations.

The costs' calculation shall be made on basis of the existing market prices at the time of project production.

### **Article 20**

The economic explanation of the project shall consist of comparative analyses of the exploration costs and the economic effects that can be achieved by proper use of the exploration results.



The economic explanation of Paragraph 1 of this Article serves for fining the exploration's validation.

### **Article 21**

The measures for protection during work, protection from fire and protection of the living environment is a composite part of the project for detailed geologic explorations.

A list i.e. the project's content comprises titles of parts contained in the project with a mark of the page number.

The title's numeration in the project shall be given with Roman numbers for the independent units -parts of the project and with Arabic numbers in the frames of independent units-parts of the project.

### **Article 23**

The literature's list and fund's documentation shall consist:

- 1) Ordinal number of the used material;
- 2) Surname and name of the author and project's organization title;
- 3) Work's title and year of publishing, i.e. production;
- 4) Contractor's title, i.e. enterprises' title, i.e. other legal entity in which fund shall be found the used documentation;

### **Article 24**

The graphic documentation of the project for basic geological explorations shall consist of:

- 1) Well-arranged geographic map in a scale of 1:100 000 with inscribed borders of the area explored from the permission for detailed geologic explorations;
- 2) Well –arranged geologic map in a scale of 1:100 000 with inscribed borders of the exploration are of the permission for detailed geologic explorations.
- 3) Depending on the exploration's type the project shall also contain:
  - A well-arranged hydrogeological, engineering-geologic map and another kind of map in a scale of 1:100000 with inscribed borders of the exploration area;

- Geologic, hydrogeological, engineering-geologic map and another kind of map on the wider area of the exploration area in scale of 1:25 000 with inscribed envisaged exploration works and
- Forecasts, geological, hydrogeological, engineering-geological profiles in the scale of 1:25000;
- 4) Geological plans and profiles in the scale of 1:5000 for the underground mining rooms with inscribed projected exploration work and forecast results and
- 5) Synthesized graphic overview of the formerly performed geological, hydrogeological and engineering-geological explorations in the appropriate scale.

### **III- DETAILED GEOLOGICAL EXPLORATIONS REPORT**

#### **Article 25**

The detailed geological exploration report shall be made in written, and the same shall be made depending on the type of mineral raw material and the exploration's and the subject of exploration established with the permission for detailed geological explorations with the following content:

- 1) Introduction;
- 2) Envisaged and performed exploration works and an overview of the obtained results and
- 3) Graphic presentation

#### **Article 26**

The introduction shall consist of:

- 1) General data for the exploration area;
- 2) Exploration's goal;
- 3) Time of exploration's performance.

#### **Article 27**

The projected, performed exploration works and the overview of the obtained results shall contain:

1. A description of the projected exploration and examination works with the project for detailed geological explorations according to type and volume;
2. A description of the exploration and examination works performed;
3. The mode of data procession and an overview of the obtained results from the detailed geological explorations with suggested recommendations.

#### **Article 28**

The graphic presentations, as a composite part of the detailed geological explorations report, are:

1. Topographic map in a scale of 1:25 000 or 1:50 000 with inscribed borders on the allowed area for conducting detailed geological explorations and
2. A positional map of the forecasted and performed exploration works in a scale of 1:100 000 or 1:5 000.

If the textual presentation in the report needs some situations to be clarified or presented more precisely, the same can contain appropriate sketches and pictures.

#### **IV- DETAILED GEOLOGICAL EXPLORATIONS STUDY**

##### **Article 29**

A composite part of the detailed geological explorations study are the Studies for detailed hydrogeological and engineering-geological explorations

##### **A. Content of the detailed geological explorations study**

The study is about the results from the detailed geological explorations (further in the text: the study) consists of:

- 1) General data for the study;
- 2) Textual part of the study;
- 3) Graphic documentation;
- 4) Documentation material;

##### **Article 31**

##### **General data for the study**

The general data for the study consist of:

- 1) Study and firm's title, i.e. other legal entity ,i.e. other legal entity that made the study, a signature by study's author on the left side and a signature of the authorized person of the firm on the right side, place and year of study's production;
- 2) A list of collaborations in the study's production with their handwritten signatures;
- 3) An evidence that the firm, i.e. other legal entity has been registered in the "Central registry of the Republic of Macedonia" for study's production for the geological exploration results and
- 4) An evidence that the study in regard to the professional education and working experience meets all requirements prescribed by law.

### **Article 32**

#### **Textual part of the study**

The textual part of the study shall consist of:

- 1) Introduction
- 2) Goal and mode of exploration
- 3) Geological characteristics of the exploration area;
- 4) Type and description of the exploration works;
- 5) Quality examination;
- 6) Reserves' overview
- 7) Technical and economical mark.

### **Article 33**

#### **Introduction**

The introduction shall consist of:

- 1) General data for the exploration area;
- 2) Time when the explorations are performed;
- 3) Morphological-hydrogeological and climate characteristics of the area;
- 4) An overview of the previous explorations with a short review of the exploration results and the explorations' extent and
- 5) Geological characteristics on the wider area.

## **Article 34**

### **Goal and mode of exploration**

The goal and mode of the exploration shall consist of:

- 1) Exploration's issue which is solved on basis of the project;
- 2) Goal and use of the explorations and
- 3) Conditions and mode of exploration.

## **Article 35**

### **Geological characteristic of the exploration area**

The geological characteristics of the exploration area shall consist of:

- 1) Geological composition and tectonics;
- 2) Site's genesis;
- 3) Hydrogeological characteristics;
- 4) Engineering-geological characteristics;

## **Article 36**

### **Type and description of the exploration works**

The type and description of the exploration works shall consist of:

- Conceptual and methodological solutions in the exploration of the metallogenic, minerogenic, coal-bearing, oil-bearing characteristics of the exploration area;
- Conceptual and methodological solutions of the geological characteristics explorations of the exploration area;
- Conceptual and methodological solutions of the explorations on the hydro-geological explorations of the exploration area;
- Conceptual and methodological solutions of the explorations on the engineering-geological characteristics on the exploration area
- Conceptual and methodological solutions of the exploration for classification and categorization of the mineral raw materials reserves of the exploration area;
- Conceptual and methodological solutions of the explorations for classification and categorization of the groundwater reserves;

- Detailed elaboration of the conceptual and methodological solutions for certain types of explorations is given in the part for geological exploration project's production;
- Methods of exploration and
- Description of the exploration rights.

### **Article 37**

#### **Examination of quality**

The examination of quality shall consist of:

- testing methods;
- Laboratory and technological examinations results and
- An assessment of the results from the quality examination.

### **Article 38**

#### **An overview of reserves**

The supplies overview consist of:

- Methods for calculation of reserves and an overview of the calculation procedure;
- An overview of the mineral raw materials reserves;
- An overview of the groundwater reserves;
- A table sheet presentation of the geological reserves.

### **Article 39**

#### **Technical-economical assessment**

The technical –economical mark shall consist of:

- Geological, generic, technical-exploitation, technological, regional, market, ecological and social-economic factors;
- Natural and valuable indicators;
- Geological-economic assessment of the exploration results;

### **Article 40**

#### **Graphic documentation**

The graphic documentation shall consists of:

- 1) A well-arranged geological map in a scale of 1:100 000 with inscribed borders of the exploitation area;
- 2) Geological, hydrogeological or engineering-geological map on the wider area of the exploration area in a scale of 1:25 000 (100 000);
- 3) Geological, hydrogeological or engineering-geological map of the exploration area with inscribed exploration works in a scale of 1:25 000;

#### **Article 41**

##### **Documentation material**

The documentation material shall contain:

- 1) The results of the chemical, mineralogical, sediment -logical and other explorations important for the exploration area;
- 2) Results from the hydrogeological, engineering-geological, geo-mechanical, geophysical and other explorations and
- 3) The results from the semi-industrial and industrial explorations on mineral resource, the results from the observation and testing of water facilities and geological processes.

#### **Article 42**

B. Detailed hydrogeological explorations study (further in the texts: the study) shall consist of:

- general data for the study;
- textual part of the study;
- graphic documentation;
- documentation material;

#### **Article 43**

##### **General data**

The general data for the study shall comprise:

- Name of the project and the firm, i.e. other legal entity who prepared the project, signature of the main draftsman on the left and the authorized

representative of the firm on the right side of the document, time and place of the elaboration of the project;

- A list of collaborators in the study's production with their handwritten signatures;
- An evidence that the firm, i.e. the other legal entity has been registered in "the Central Registry of the Republic of Macedonia" for production of the study for the hydrogeological exploration's results and
- An evidence that the author of the study in respect of the professional education and working experience meets all requirements prescribes by law.

#### **Article 44**

##### **Textual part of the study**

Textual part of the study shall consists of:

1. Introduction;
2. Applied methodology of exploration;
  - Former level of finding ;
  - Newly performed explorations and estimations;
  - Fact -graphic presentation of the exploration;
  - Hydrogeological exploration extent;
3. Geomorphological characteristics of terrain ;
4. Hydro-metrological characteristics;
5. Hydrographic and hydrological characteristics;
6. Geological composition;
  - Lithological composition presentation;
  - Tectonics;
7. Hydrogeological characteristics of the terrain;
  - Hydrogeological function of the lithological;
  - Hydrogeological emerge;
8. Hydrogeological characteristics of aquifers;
  - Types of subterranean water;
  - conditions for formation of aquifer;
  - sub-artesian and artesian pressures and subterranean water levels;
  - dimensions, borders and position of the aquifer zones;



- definition of the hydrogeological parameters;
- dynamics of the subterranean water;
- Review to the chemical and physical properties of the groundwater (quality);
- 9. Groundwater reserves;
- A calculation of dynamic, static and exploitation reserves of groundwater;
- Degree of exploration;
- 10. Balance of reserves;
- A selection of hydrogeological facilities location (wells, drainages etc.);
- Characteristics of the hydrogeological facilities (coordinates, spot heights, deepness, composition, methodology of performance, issues etc.);
- 11. Analyses of data of the testing or testing-exploitation drainage of groundwater;
- 12. Groundwater protection;
- 13. Conclusions and recommendations;

#### **Article 45**

#### **Graphic part of the study**

The graphic part of the documentation shall consist of:

- 1) Hydrogeological maps in an appropriate scale
  - Water occurrences map;
  - River mouth's map
  - Water quality map;
  - Filtration characteristics of the aquifer zones map;
  - Reserves map;
  - Hydro-isotope, isotope, isopachyte maps etc;
  - Precipitation and temperature's map;

-other maps (karstification, volume of cleavage, drainage network etc. :)

The hydrogeological maps present the following elements:

- Legend and size;
- Coordinates scale;

- All of the old and newly performed exploration works from the geological and hydrogeological aspect;
  - Geological composition of terrain's surface;
  - Geomorphological data;
  - Hydrographic data;
  - All water occurrences (surface occurrences of groundwater, artesian water effusion etc.);
  - Hydrogeological partition of terrain according to the hydrogeological function of the present lithological members and their mutual relationship;
  - Well's characteristics with a presentation of the hydroisohips, general and specific local movement directions of groundwater and
  - Place of testing takings for water's chemical analyses etc.
- 2) Hydrogeological profiles in an appropriate scale
- The profiles present the separated well zones of the number indicators for their filtration characteristics, groundwater levels, potentiometric levels, pressures size on the bedrock en each isolator layer, directions of motion, examination places for water permeability, taking samples for analyses etc.
- 3) Hydrogeological block-diagrams, pillars etc. in an appropriate scale
- 4) The documentation material shall consist of:
- Terrain journals reports
  - Laboratory examinations reports;
  - Cadastral paper for springs, wells, depths, speleology occurrences;
  - Draining tests data;
  - Testing data with tracers methods;
  - Level graphs;
  - Measurement of yield and pressure;
  - Chemical analyses results;
  - Contamination results;
  - Photo documentation etc.

#### **Article 46**

#### C. Detailed engineering-geological explorations study

The detailed engineering-geological explorations study (further in the text: study) shall consist of:

- General data for the study;
- Textual part of the study;
- Graphic documentation and
- Documentation material.

#### **Article 47**

##### **General data for the study**

The general data for the study shall comprise:

- Study and firm's title, i.e. other legal entity that made the study, a signature by the study's author on the left side and a signature of the authorized person in the firm on the right side, place and year of study's production;
- A list of collaborators in the study's production with their handwritten signature;
- An evidence that the firm, i.e. the other legal entity has been registered in the court register for study's production for the hydrogeological results and
- An evidence that the study in respect of professional training and working experience meets all requirements prescribed by law.

#### **Article 48**

##### **Textual part of the study**

The textual part of the study consists of:

1. Introduction;
2. Position and physic-geographic characteristic of the explored terrain;
3. Applied exploration methodology;
  - level of previous findings;
  - newly performed explorations and estimations;
4. Facto-graphic presentation during the exploration;
5. Engineering-geological explorations extent;
6. Geo-morphological characteristic of the terrain;

7. Geological composition:

- Lithological composition presentation;

-Tectonics;

8. Basic hydrogeological characteristics;

9. engineering-geological characteristics;

-Engineering-geological classification of the rock masses;

- Criteria for separation of the engineering-geological units;

-hydrogeological occurrence;

- A review of the spatial and mutual relationship of the rock masses;

-Heterogeneity;

-Discontinuity;

-Anisotropy;

- A review of the voltage condition on the terrain;

- Analyses of the laboratory examinations results;

- Extrapolation of the results of the testing body of a massif;

-Modern geological and engineering-geological occurrences and processes;

-Physical-mechanical characteristics of the soil materials;

-Data analyses;

- Influence of the engineering-geological (geo-mechanical characteristics) on the technology for projection and performance;

10. Engineering-geological modeling according to parameters necessary for projection (lithogenic composition, water porosity, deformability, hardness of descending etc.).

11. Estimation of the engineering-geological opportunities (geo-technical) for construction (depending on the problem, conditions for urbanization, traffic

infrastructure, construction of hydro technical facilities, underground facilities etc. are defined);

12. Forecast of requirements for environmental protection;

13. Conclusions and recommendations;

## **Article 49**

### **Graphic part of the study**

The graphic part of the documentation consists of:

1. Engineering-geological maps in an appropriate scale;

- Geographic sketch
- Geologic map on the wider area;
- Geomorphological map on the wider area;
- Hydrogeological map on the wider area;
- Seismic map;
- Detailed engineering-geological map in an appropriate scale;
  - Engineering-geological partition map;
  - Other maps (stability maps, inclination maps, load's maps, terrain's endangerment, map of thickness of quarter coverage, crack's degree map etc.)
  - The following elements are presented on the maps:
    - legend and size;
    - coordinate scale;
    - All old and newly performed exploration works from geological and engineering-geological aspect;
    - Geological composition of the terrain's area;
    - Geomorphological data;
    - Hydrographic data;
    - All water occurrences (surface occurrences of groundwater, artesian effusion etc.) and
    - Places of taking samples for laboratory analyses of water etc.

2) Engineering-geological profiles in an appropriate scale

The profiles present the separated engineering-geological units with number indicators as geological cross –sections and models and geo-technical models, physical-mechanical and structural data, groundwater levels, piezometer levels , pressures volume on podina on each isloation layer, directions of movement, places for examination of water porosity , taking samples for analyses ect.

3) Documentation material shall contains:

- Terrain journals reports;
- Pillars of exploration cracks;
- laboratory examinations reports;
- diagrams of granule-metric turns;
- Diagrams of plasticity;
- Diagrams of hardness of shear;
- Diagrams of compressibility;
- Diagrams of optimal congestion;
- Cadastral papers for landslide, falling rocks, cracking extent, wells, holes, speleological occurrences;
- Data for the terrain measurements of motions, erosions etc.
- Level graphs;
- Measurements of opulence and pressures;
- Chemical analyses results;
- Contamination results;
- Photo documentation etc.

## **V- FINAL PROVISIONS**

### **Article 50**

This rulebook enters into force the day after its publication in the “Official Gazette of the Republic of Macedonia”.

On basis of Article 9, Paragraph 4 of the Law on Mineral Raw Materials (“Official Gazette of the Republic of Macedonia” No. 24/07), the Minister of Economy has adopted the following:

## **Rulebook**

### **FOR THE CONTENT AND MODE OF PRODUCTION OF THE GEOLOGICAL DOCUMENTATION FOR BASIC GEOLOGICAL EXPLORATIONS**

#### **I- GENERAL PROVISIONS**

##### **Article 1**

This rulebook shall prescribe the content and mode of performance of the geological documentation for basic geological explorations.

##### **Article 2**

The geological documentation for basic geological explorations according to Article 9, Paragraph 1 of the Law on Mineral Raw Materials is made in electronic and paper form and the same consists of:

1. Basic geological explorations project;
2. Basic geological explorations study;
3. Basic geological explorations report and
4. Geological maps with interpreters.

#### **II- PROJECT FOR PERFORMING BASIC GEOLOGICAL EXPLORATION**

##### **Article 3**

###### **Project for Performing Basic Geological Exploration**

The Project for Performing Basic Geological exploration shall consist of:

- 1) General project data;
- 2) Textual part, and
- 3) Graphic documentation

##### **Article 4**

###### **General Project Data on Performing Basic Geological Exploration**

In the field of general data on performing basic geological exploration the project shall consist of:

- 1) Name of the project and the firm, i.e. other legal entity who prepared the project, signature of the main draftsman on the left and the authorized representative of the firm on the right side of the document, time and place of the elaboration of the project;
- 2) List of collaborators in the performance of the projects signed by them;
- 3) Evidence that the firm, i.e. other legal entity who elaborated the project, has been registered in the "Central Registry of the Republic of Macedonia" for the projecting in the area of the geological examinations;
- 4) Evidence that the main draftsman meets the conditions provided by law in terms of the professional training and work experience.

## **Article 5**

### **Textual Part of the Project for Performing Basic Geological Explorations**

The textual part of the project for performing basic geological explorations shall consist of:

- 1) Content of the project;
- 2) Project task;
- 3) Introduction;
- 4) General data on the exploration area;
- 5) Review of formerly performed explorations with their results and conclusion on the level of field exploration;
- 6) Project solutions on the process of geological explorations;
- 7) Subject containing description of the technical conditions for the performance of the exploration works;
- 8) Dynamics of the exploration works;
- 9) Calculation of the exploration costs;
- 10) Economic explanation of the project;
- 11) Measures for protection at work and protection against fire when performing the exploration works;



12) Environment protection measures, and

13) List of used literature and fund documentation.

## **Article 6**

### **Project task**

The project task shall consist of:

- borders of the explored area;
- issues which should be dealt during the realization of the project;
- objective and purpose of the explorations;
- exploration conditions, and
- expected results.

## **Article 7**

### **Introduction**

The introduction shall contain:

- reasons for the preparation of the project;
- participants in the preparation of the project;
- conditions under which the project has been prepared, and
- time of preparation of the project.

## **Article 8**

### **General Data on the Exploration Area**

The general data on the explored area shall consist of:

- geographical position of the exploration area including the name of the page or section where the exploration area is;
- morphological and hydrogeological characteristics of the exploration area;
- climate conditions;
- traffic connections;
- density of population in the exploration area, and
- data on the historical monuments and other facilities protected by the country.

## **Article 9**

### **Review of the Former Explorations**

The review of the former explorations shall consist of:

- history of explorations;
- review of the applied exploration methods;
- explored sites;
- volume and density of the explorations for each of the applied methods. On the basis of the data from the former explorations, the following shall be provided:

- Critical review of the applied exploration methodology,
- Short review of the geological, metallogenic, minerogenic, carbon-bearing or oil-bearing, hydrogeological and engineering-geological characteristics of the exploration area;
- Indicators of the geological and economical assessment of the prospects of the exploration area as a whole and in certain parts of it in terms of the mineral raw materials sites (energy, metallic, nonmetallic, construction materials, groundwater – drinking, mineral and thermal waters), or assessment of the suitability in terms of construction of facilities.

## **Article 10**

### **Project Solutions on the Process of Geological Explorations**

The project solutions of the process of geological explorations shall be given for all types of exploration works and shall contain concept and methodology of the exploration for introduction and determination:

- 1) Geological characteristics of the exploration area;
- 2) Metallogenic or minerogenic, carbon-bearing or oil-bearing, geothermal or hydrogeological, engineering-geological characteristics of the exploration area, and
- 3) Classification and categorization of the reserves of mineral raw materials.

## **Article 11**

### **Subject Containing Description of the Technical Conditions for the Performance of the Exploration Works**

The conceptual and methodological solutions for exploration of the geological characteristics of the exploration area shall be given for the purposes of introduction and determination of:

- 1) Genetic and lithostratigraphic types of the magmatic, sediment and metamorphic rocks, and
- 2) Structural composition of certain lithostratigraphic types of rocks and the exploration area as a whole.

## **Article 12**

### **Conceptual and Methodological Solutions of Exploration of the Metallogenic, Minerogenic, Coal-bearing or Oil-bearing Characteristics**

The conceptual and methodological solutions of the exploration of the metallogenic or minerogenic, coal-bearing or oil-bearing characteristics of the exploration area shall be provided for the purposes of introduction and determination of:

- 1) Perspective area in terms of the possibility for detecting mineral raw materials sites in the exploration area;
- 2) Possibility for detecting mineral raw materials sites within the borders of the separated exploration area;
- 3) Genesis and control factor of the spatial distribution of the mineral raw materials sites (magmatic, structural, lithological, etc.);
- 4) Characteristics of the site, i.e. ore bodies on the basis of which they are divided into groups and subgroups;
- 5) Size and complexity of the form (morphological characteristics of the ore bodies and sites);
- 6) Belonging to certain genetic types, i.e. ore formations;
- 7) Mineralogical composition and its characteristics;

- 8) Nature of distribution of the useful and harmful components, and
- 9) Coverage with post-ore tectonic movements.

### **Article 13**

#### **Conceptual and Methodological Solutions for Hydrogeological Explorations**

The conceptual and methodological solutions for exploration of the hydrogeological characteristics of the exploration area shall be provided for the purposes of introduction and determination of:

- 1) The perspective of the area in terms of the possibility for discovering groundwater in the exploration area;
- 2) The spatial position of the water-bearing area where the groundwater site is located;
- 3) Hydrogeological parameters and characteristics of the water-bearing area, and the elevated fault block of the confined and unconfined aquifers;
- 4) Characteristics of the groundwater regime determining their usability
- 5) Reserves of groundwater and conditions for their exploitation, and
- 6) Conditions for pollution of the groundwater.

### **Article 14**

#### **Conceptual and Methodological Solutions of the Exploration of the Engineering-Geological Explorations**

The conceptual and methodological solutions for exploration of the engineering-geological characteristics of the exploration area shall be provided for the purposes of introduction and determination of:

- 1) Engineering-geological characteristics of the field;
- 2) Engineering-geological and technical properties of the rock masses;
- 3) Egsodynamic processes and occurrence, reason for their appearance, development dynamic and possibility for reparation;
- 4) Engineering-geological classification of the field in terms of field stability, load capacity, seismic micro-partitioning and eligibility for construction, etc.;

- 5) Engineering-geological conditions for construction of facilities (settlements, roads, rails, dams, accumulations, airports, tunnels, bridges, etc.);
- 6) Appearance and sites of geological construction materials, and
- 7) Effect of the modern geological or engineering-geological processes on the environment.

### **Article 15**

#### **Conceptual and Methodological Solutions of the Explorations for Classification and Categorization of the Mineral Raw Materials Reserves**

Conceptual and methodological solutions of the explorations for classification and categorization of the mineral raw materials reserves of the exploration area shall be provided for the purposes of the introduction with:

- 1) The conditions of the sites, dip, extension, size, form and composition of the sites, i.e. ore bodies, all useful and harmful mineral substances, their mutual relationship and spatial distribution;
- 2) The chemical composition, physical and chemical, physical and mechanical and technological properties of the mineral raw materials, as well as the opportunity for their application;
- 3) The tectonic, geotechnical (engineering-geological, hydrogeological, geomechanical) and other parameters (gas condition) determining the conditions of performing the exploitation works, and
- 4) The geological, genetic, technical-exploitation, technological, regional, market and social-economic factors and natural valuable indicators on the basis of which classification and categorization of the mineral raw materials reserves is being made.

### **Article 16**

#### **Conceptual and Methodological Solutions of the Explorations for Classification and Categorization of the Groundwaters Reserves**

Conceptual and Methodological Solutions of the Explorations for Classification and Categorization of the Groundwater Reserves shall be provided for the purposes of introduction and determination of:

- 1) The geological composition of the site;
- 2) The spatial position and parameters of the water-bearing area;
- 3) The yield of the aquiferous area and partitioning in terms of the yield level;
- 4) The quality and regime of the groundwater;
- 5) The exploitation possibilities of the sites and certain perspective area;
- 6) The hydrogeological and hydro -technical conditions of occupying the groundwater and conditions for their sanitary protection.

#### **Article 17**

#### **Subject Containing Description and the Technical Conditions for the Performance of the Exploration Works**

The subject containing description and the technical conditions for the performance of the exploration shall consist of:

- 1) The most economical and rational variant conceptions of the explorations;
- 2) Precisely determined amount of works with defined micro-location of every exploration work of the exploration are;
- 3) Important constructive characteristics of every exploration work (descriptive and graphic);
- 4) Detailed description of the technical conditions for performance of every exploration work, and
- 5) Local conditions for realization of the planned explorations (transport possibilities, energy supplies, water supplies, accommodation and other conditions).

## **Article 18**

### **Dynamic of the Exploration Works**

The dynamic of the performance of the exploration works shall contain the real foreseen time of total duration of the planned exploration works according to the performance positions.

If it is a project with long-term explorations, the dynamics of the exploration works shall be provided according to years, i.e. exploration phases.

The dynamic plan shall be provided as a graph of the A3 format containing the type of the works according to positions and the timeline for their performance.

The graphic appearance of the dynamic plan shall be provided in Form 1. Dynamic Plan.

## **Article 19**

### **Calculation of the Exploration Costs**

The calculation of the exploration costs shall consist of single prices by the type of work position for each exploration work and cumulative prices for the entire work provided for in the project for performing basic geological explorations.

The calculation of the costs shall be on the basis of the existing prices at the time of the project preparation, exploration or estimated price at the time of negotiation.

## **Article 20**

### **Economic Explanation of the Project**

The economic explanation of the project shall consist of comparative analysis of the exploration costs and the economic effects which can be met by proper use of the exploration results.

The economic explanation from paragraph 1 of this Article shall serve to review the justification of the exploration.

## **Article 21**

### **Protection Measures**

The measures for protection at work, protection against fire and environmental protection which the exploration contractor is obliged to conduct in order to protect the health and life of the people and property shall be mandatory attachment to the project for geological exploration.

## **Article 22**

### **Content of the Project for Exploration**

The content of the project for exploration shall include titles of chapters contained in the project bearing the number of the page.

The numbering of the project titles shall be in Roman numerals for the independent units – project parts, and Arabic numerals within the independent units – project parts, but it cannot be higher than the fourth level, for example (1. 1. 1. 1).

## **Article 23**

### **List of Used Literature and Fund Documentation**

The List of Used Literature and Fund Documentation shall consist of:

- 1) Ordinal number of the used material;
- 2) Surname and name of the author, and name of the project organization;
- 3) Title of the paper and year of its publishing, i.e. elaboration;
- 4) Name of the contractor, i.e. company, i.e. other legal entity in the fund of which the used documentation is put.

## **Article 24**

### **Graphic Documentation**

The Project for Performing Basic Geological explorations shall contain:

- 1) Well-arranged geographical map at a scale of 1 : 100 000 with the boundaries of the exploration area;
- 2) Well-arranged geological map at a scale of 1 : 100 000 with the boundaries of the exploration area;

In terms of the type of the explorations the project shall also contain:

- 3) Well-arranged hydrogeological, engineering-geological and other type of maps at scale of 1 : 100 000 with borders of the exploration area;



- 4) Geological, hydrogeological, engineering-geological and other type of maps of the broader area of the exploration area at a scale of 1 : 25 000 with planned exploration works included;
- 5) Predictive geological, hydrogeological, engineering-geological profiles at a scale of 1 : 25 000;
- 6) geological plans and profiles at scale of 1: 5 000 for underground mining facilities with planned explorations works and predicted results included, and
- 7) Synthesized graphic presentation of previously performed geological, hydrogeological and engineering-geological exploration in adequate ratio.

### **III – STUDY FOR BASIC GEOLOGICAL EXPLORATIONS**

#### **Article 25**

The studies for the basic hydrogeological and engineering-geological explorations shall be component part of the Study for Basic Geological Explorations.

#### **Article 26**

##### **A. Content of the Study for Basic Geological Explorations**

The Study for the Results of the Geological Explorations (hereinafter referred to as: Study) shall consist of:

- 1) General Study data;
- 2) Textual part of the Study;
- 3) Graphic documentation;
- 4) Documentation material.

#### **Article 27**

##### **General Study Data**

The general Study data shall include:

- 1) Title of the Study and name of the firm, i.e. legal entity who prepared the Study, signature of the author of the Study put on the left side of the document and signature of the authorized person of the firm put on the right side of the document, place and year of the preparation of the Study;

- 2) List of collaborators in the preparation of the Study signed by them;
- 3) Evidence that the firm, i.e. other legal entity has been registered in the "Central Registry of the Republic of Macedonia" for the preparation of a Study for the results of geological explorations, and;
- 4) Evidence that the author of the Study meets the conditions provided by law in terms of the professional training and work experience.

## **Article 28**

### **Textual part of the Study**

The textual part of the Study shall consist of:

- 1) Introduction;
- 2) Objective and manner of exploration;
- 3) Geological characteristics of the exploration area;
- 4) Type and description of the exploration works;
- 5) Quality examination;
- 6) Draft recommendations for further explorations.

## **Article 29**

### **Introduction**

The introduction shall contain:

- 1) General data on the explored space;
- 2) Period during which the explorations have been performed;
- 3) Morphological, hydrological and climatic characteristics of the area;
- 4) Review of the former explorations with short review of the exploration results and level of exploration, and
- 5) Geological characteristics of the broader area.

## **Article 30**

### **Objective and Manner of Exploration**

The goal and mode of the exploration shall consist of:

- 1) Issues of the exploration which will be solved on the basis of the project;
- 2) Objective and purpose of the explorations, and

- 3) Conditions and mode of exploration

### **Article 31**

#### **Geological Characteristics of the Exploration Area**

The geological characteristics of the exploration area shall consist of:

- 1) The geological composition and tectonics;
- 2) The genesis of the site;
- 3) The hydrogeological characteristics, and
- 4) The engineering-geological characteristics.

### **Article 32**

#### **Type and Description of the Exploration Works**

The type and description of the exploration works shall consist of:

- 1) Conceptual and methodological solutions in the exploration of the metallogenic, minerogenic, coal-bearing and oil-bearing characteristics of the exploration area;
- 2) Conceptual and methodological solutions of the explorations of the geological characteristics of the exploration area;
- 3) Conceptual and methodological solutions of the explorations of the hydrogeological characteristics of the exploration area;
- 4) Conceptual and methodological solutions of the explorations of the engineering-geological characteristics of the exploration area;
- 5) Conceptual and methodological solutions of the explorations for classification and categorization of the mineral raw materials reserves in the exploration area;
- 6) Conceptual and methodological solutions of the explorations for classification and categorization of the groundwater reserves;
  - 7) The detailed plan of the conceptual and methodological solutions for certain types of exploration shall be provided in the part for preparation of the project for geological explorations;
  - 8) Exploration methods, and
  - 9) Description of the exploration works.

## **Article 33**

### **Quality Examinations**

The quality examinations shall consist of:

- 1) Testing methods;
- 2) Results of the laboratory and technological examinations, and
- 3) Assessment of the quality examinations results.

## **Article 34**

### **Draft Recommendations for Further Explorations**

This part shall provide the results of the performed basic geological explorations with recommendations and directions for conditions for performing further detailed geological exploration.

## **Article 35**

### **B. Content of the Study for Basic Hydrogeological Explorations**

The Study for the Results of the Hydrogeological explorations (hereinafter referred to as: Study) shall consist of:

- 1) General Study data;
- 2) Textual part of the Study;
- 3) Graphic documentation, and
- 4) Documentation material.

## **Article 36**

### **General Study Data**

The general Study data shall include:

- 1) Title of the Study and name of the firm, i.e. legal entity who prepared the Study, signature of the author of the Study put on the left side of the document and signature of the authorized person of the firm put on the right side of the document, place and year of the preparation of the Study;
- 2) List of collaborators in the preparation of the Study signed by them;

- 3) Evidence that the firm, i.e. other legal entity has been registered in the "Central Registry of the Republic of Macedonia" for the preparation of a Study for the results of hydrogeological explorations, and;
- 4) Evidence that the author of the Study meets the conditions provided by law in terms of the professional training and work experience.

### **Article 37**

#### **Textual part of the Study**

The textual part of the Study shall consist of:

1. Introduction;
2. Applied exploration methodology;
  - level of previous findings;
  - newly conducted exploration and examinations;
  - factographic presentation of the development of the exploration;
  - level of hydrogeological exploration;
3. Geomorphological characteristics of the field;
4. Hydro meteorological properties;
5. Hydrographic and hydrological characteristics;
6. Geological composition;
  - Former geological explorations;
  - Presentation of the lithological composition;
  - Tectonics;
7. Hydrogeological characteristics of the field;
  - former hydrogeological explorations;
  - types of groundwater;
  - conditions for the formation aquifers;
  - sub-artesian and artesian pressures and levels of groundwater;
  - dimensions, borders and position of the aquifer zones;
  - determination of the hydrogeological parameters;
  - review of the chemical and physical properties of the groundwater (quality);
  - hydrogeological partitioning of the field;

- hydrogeological function of the lithological members;
8. Conclusions and recommendations.

### **Article 38**

#### **A. Content of the Study for Basic Engineering-geological Explorations**

The Study for the Results of the Basic Engineering-geological Explorations (hereinafter referred to as: Study) shall consist of:

- 1) General Study data;
- 2) Textual part of the Study;
- 3) Graphic documentation;
- 4) Documentation material.

### **Article 39**

#### **General Study Data**

The general Study data shall include:

- 1) Title of the Study and name of the firm, i.e. legal entity who prepared the Study, signature of the author of the Study put on the left side of the document and signature of the authorized person of the firm put on the right side of the document, place and year of the preparation of the Study;
- 2) List of collaborators in the preparation of the Study signed by them;
- 3) Evidence that the firm, i.e. other legal entity has been registered in the "Central Registry of the Republic of Macedonia" for the preparation of a Study for the results of hydrogeological explorations, and;
- 4) Evidence that the author of the Study meets the conditions provided by law in terms of the professional training and work experience.

#### **Article 40**

##### **Textual part of the Study**

The textual part of the Study shall consists of:

1. Introduction;
2. Position and physical and geographical characteristics of the exploration area;
3. Applied exploration methodology;
  - level of previous findings;
  - newly conducted exploration and examinations;
  - factographic presentation of the development of the exploration;
  - level of engineering-geological exploration;
4. Geomorphological characteristics of the field;
5. Geological composition;
  - presentation of the lithological composition;
  - tectonics;
6. Basic hydrogeological characteristics,
7. Engineering-geological characteristics of the field;
  - engineering-geological classification of the rock masses;
  - criteria for separation of the engineering-geological units;
  - hydrogeological occurrences;
  - review of the spatial and mutual relations of the rock masses;
  - heterogeneity;
  - discontinuity;

- anisotropy;
  - reference to the voltage condition within the field;
  - analysis of the results of the laboratory examinations;
  - extrapolation of the results of a test body of a massif;
  - modern geological and engineering geological occurrences and processes;
  - physical and mechanical characteristics of the soil materials;
  - data analysis;
  - effect of the engineering-geological (geomechanical characteristics) on the technology of planning and performing;
8. conclusions and recommendations.

#### **Article 41**

##### **Graphic Documentation Component of the Study of the Basic Geological, Hydrogeological and Engineering-Geological Explorations**

The graphic documentation shall contain

- 1) Well-arranged geological map at a scale of 1 : 100 000 with the boundaries of the exploration area;
- 2) Geological, hydrogeological or engineering-geological map of the broader area of the exploration area at a scale of 1: 25 000 (100 000);
- 3) Geological, hydrogeological or engineering-geological map of the exploration area with exploration works included at a scale of 1: 25 000, and
- 4) Geological, hydrogeological or engineering-geological profiles at a scale of 1 : 25 000 or 1 : 10 000.

#### **Article 42**

##### **Documentation Material**

Depending on the type of the explorations, the documentation material shall contain:

- 1) Results of the chemical, mineralogical, sedimentological and other explorations significant for the exploration area, and
- 2) Results of the hydrogeological, engineering-geological, geomechanical, geophysical and other explorations.



## **IV – REPORT ON THE BASIC GEOLOGICAL EXPLORATIONS**

### **Article 43**

#### **Report On the Basic Geological Explorations**

The Report on the Performed Basic Geological Explorations shall be provided in written form by the following content:

- 1) Introduction,
- 2) Planned and conducted exploration works and presentation of the obtained results, and
- 3) Graphic attachments

### **Article 44**

The introduction shall contain:

- 1) General data on the explored space;
- 2) Goal of the exploration, and
- 3) Period during which the explorations have been performed.

The planned and conducted exploration works and the presentation of the obtained results shall contain:

1. Description of the planned exploration and examination works with the project for performing basic geological explorations by type and volume;
2. Description of the performed exploration and examination works, and
3. Mode of data processing and presentation of the results obtained from the performed detailed geological explorations with draft recommendations.

### **Article 46**

As composite part of the report on basic geological explorations, the graphical representations shall be:

1. Well-arranged geological, hydrogeological or engineering-geological map at a scale of 1: 100 000 with the exploration area included, and
2. Situation map of planned and conducted exploration works at a scale of 1: 10 000 or 1: 5 000.

If there is a need for certain situations to be more precisely explained in the text presentation of the report, it can be accompanied by adequate profiles, sketches, pictures, etc.

## **V – GEOLOGICAL MAPS WITH INTERPRETERS**

### **Article 47**

#### **Geological Maps with Interpreters**

The basic geological map shall consist of one basic map and a number of additional maps, geological profiles and columns, interpreters, tabular and photographic attachments of the interpreter and documentation.

The components of the Basic Geological Map shall be distributed into following groups:

- basic map sheet,
- mandatory additional maps,
- optional additional maps,
- interpreters with attachments, and
- documentation.

### **Article 48**

#### **Basic Geological Map**

The sheet of the Basic Map shall be a cartographic sheet of paper with dimensions 89,0 x 63,0 cm., which includes the following components:

- basic map 1 : 100 000;
- geological column;
- geological profiles, and
- position map.

### **Article 49**

#### **Mandatory Additional Maps**

Mandatory additional maps shall be:

- tectonic geological maps 1 : 200 000;
- geological partitioning map 1 : 200 000, and
- ore occurrences map 1 : 200 000.

### **Article 50**

#### **Optional Additional Maps**

Optional additional maps shall be:

- metallogenic maps 1 : 200 000, and

- lithofacies maps 1 : 200 000.

## **Article 51**

### **Interpreter of the Basic Geological Map**

The Interpreter of the Basic Geological Map shall be a textual part which needs to cover the following contents:

#### 1. Introduction

Provides brief data on the sheet, who mapped it and when, who worked on certain issues (sedimentological, paleontological, petrological etc.).

#### 2. Geographic review

This chapter shall provide short description of the geographical position of the field included in the geographical map sheet and its main orthographic and hydrographic characteristics. This chapter must be accompanied with well-arranged geographic map at a scale of 1 : 1. 000 000 with included boundaries of the sheet being explored and the main settlements.

#### 3. Review of the so far explorations

This chapter shall chronologically provide all the former explorations with short presentation of the solved problems and results of these explorations.

#### 4. Presentation of the general geological composition of the field

This chapter shall provide short summary of the entire geological composition which also represents a summary of the entire interpreter. Newly found data and unsolved problems shall be provided at the end of the presentation of the geological composition. This chapter shall be regularly accompanied by a well-arranged geological map in a scale of 1 : 200. 000.

#### 5. Presentation of the mapped units

6. The mapped units shall be given according to the age, starting from the oldest to the newest. The igneous rocks shall be described by the age they belong to. The description of the mapped units shall describe in details their compositions, spatial position, etc.

## 7. Tectonics

This chapter should provide general image of the tectonic partitioning, the biggest sections, genesis and time ratio of the deformations. Tectonic map at a scale of 1 : 200. 000 shall regularly provided as addition to the description of the tectonic structure.

## 8. Oar occurrence

This chapter shall provide review of the mineral raw materials of the given sheet as mineral occurrence and basins. In addition to this chapter, well-arranged map of the mineral raw materials at a scale of 1 : 200.000 shall be regularly provided.

## 9. History of creation of the mapped area

This chapter shall provide chronological representation of the sedimentation, magmatism, metamorphism, tectonics and creation of the mineral raw materials with all the accompanying occurrences.

Author's original of the Basic Map (prepared at the same scale as the final map 1 : 100 000, as well as at the scale of the working field map 1 : 25 000 or basic maps 1 : 50 000 and working field map 1 : 10 000.

## **Article 52**

### **Hydrogeological Maps with Interpreters**

The basic hydrogeological map shall consist of one basic map and a number of additional maps, hydrogeological profiles and columns, Interpreter, tabular and photographic attachments to the Interpreter and documentation.

The components of the Basic Hydrogeological Map shall be distributed into following groups:

- basic map sheet,
- mandatory additional maps,
- optional additional maps,
- Interpreter with attachments, and
- documentation.

## **Article 53**

### **Basic Map Sheet**

The Basic Map Sheet shall be a cartographic sheet of paper with dimensions 89,0 x 63,0 cm., which includes the following components:

- basic map 1 : 100 000;
- hydrogeological column;
- hydrogeological profiles, and
- position map.

### **Article 54**

#### **Mandatory Additional Maps**

Mandatory additional maps shall be:

- water facilities map 1 : 100 000;
- map of drainage basins and observation network 1 : 300 00 (1 : 500 000);
- water quality map 1 : 300 000;
- map of aquifers in danger of pollution 1 : 300 000, and
- map of precipitation and air temperature 1: 300 000.

### **Article 55**

#### **Optional Additional Maps**

Optional additional maps shall be:

1. map of underground effusion 1 : 100 000, it should contain:
  - coefficient of infiltration and specific infiltration in the plain areas;
  - coefficient of the underground effusion and specifically underground effusion of the forest (non-karst) area;
  - coefficient of effusion and specific effusion of the non-karst areas;
  - observation stations on the basis of whose data the given parameters have been determined;
  - watersheds of the drainage basins areas for which the given parameters have been determined by observation, calculation or by using only analogy, and
  - topographic data as on the topographic map.
2. the other optional maps should contain data on:
  - the hydrogeological characteristics of the porous environment;

- thermo-mineral and hydrochemical properties;
- hydrogeological data important for the water economy;
- geographic or geologic data, and
- type (method and depth of the exploration) and locations of the geophysical exploration works, level of field exploration

## **Article 56**

### **Interpreter for Basic Hydrogeological Map**

The Interpreter shall be a textual part of the Basic Hydrogeological Map which shall be prepared according to the following content and graphical presentation:

Content of the Interpreter:

1. introduction;
2. exploration works;
  - 2.1. former explorations;
  - 2.2. new explorations;
  - 2.3. level of hydrogeological exploration of the field;
3. geographical indications;
  - 3.1. geographic position;
  - 3.2. land relief;
  - 3.3. climate;
  - 3.4. vegetation cover;
  - 3.5. surface waters;
4. geological map;
  - 4.1. stratigraphy;
  - 4.2. tectonics;
5. geomorphological indications;
  - 5.1. geomorphological processes;
  - 5.2. major geomorphological occurrences;
6. basic hydrogeological indications;
  - 6.1. hydrogeological partitioning;
  - 6.2. hydrogeological indications of separate areas;

- hydrogeological properties of the rocks;
  - hydrogeological function of the field (for karst fields);
  - hydrogeological characteristics of major aquifers;
7. reserves of drinking groundwaters;
- 7.1. level of familiarity with the reserves;
  - 7.2. static reserves;
  - 7.3. dynamic reserves;
  - 7.4. exploitation reserves;
8. Thermal and mineral waters;
9. Hydrogeology and water economy issues;
- 9.1. water supply;
  - 9.2. quality of the groundwater and surface waters for drinking and irrigation;
  - 9.3. balance of the reserves of drinking groundwater;
  - 9.4. hydro -technical constructions;
  - 9.5. groundwater protection;
  - 9.6. groundwater defense, and
10. Conclusions and recommendations.

The attachments to the Interpreter shall be:

1. Various sketches, profiles, diagrams, and photographs possibly;
2. Mandatory attachments;
  - Monthly precipitation values;
  - Level graphs of groundwater;
  - Yield diagrams;
  - Water analysis, i.e. forms, tables, diagrams, etc.;
  - Position map of the works carried out within the frames of BHM, and
  - Hydrogeological cadastre.

### **Article 57**

#### **Documentation**

The documentation of the Basic Hydrogeological Map shall consist of the following written and drawn materials:

1. Projects and documents of performance;
  - project task;

- project with programs for additional exploration works;
  - annual reports;
  - final report.
2. Notes and field materials;
- notes for the review bases and expert literature;
  - field journal;
  - field base map.
3. Report on additional explorations;
- field explorations;
  - laboratory examinations, and
  - cabinet study works.
4. Documentation of the Hydrogeological Cadastre of Macedonia, and
- basic cadastre sheets;
  - special cadastre sheets, and
  - cadastre maps.
5. Author's original of the Basic Map (prepared at the same scale as the final map 1 : 100 000, as well as at the scale of the working field map 1 : 25 000.

### **Article 58**

#### **Basic Engineering-geological Map with Interpreter**

The basic engineering-geological map shall consist of one basic map at a scale of 1:100.000 and additional maps, engineering-geological profiles and columns, Interpreters, tabular and photographic attachments to the Interpreter and documentation.

The components of the Basic Hydrogeological Map shall be distributed into following groups:

- basic map sheet,
- additional maps,
- Interpreter with attachments, and
- documentation.
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### **Article 59**

#### **Basic Engineering-geological Map**



The Basic Engineering-geological Map shall contain the following elements:

- engineering-geological units separated according to the engineering-geological properties,
- distribution borders of the engineering-geological units,
- engineering-geological occurrences on the field,
- hydrogeological occurrences important for the engineering-geological aspect,
- geomorphological occurrences, and
- field seismicity.

#### **Article 60**

##### **Interpreter for the Basic Hydrogeological Maps**

It should cover the following contents:

1. Introduction;
2. Physical and geographical features of the field;
3. Review of the so far explorations;
4. Presentation of the field geology;
5. Geomorphological characteristics of the field;
6. Hydrogeological characteristics of the field;
7. Engineering-geological characteristics of the field; - engineering-geological characteristics of the rock and rock masses; - engineering-geological processes and occurrences;
8. Findings of geological construction materials;
9. Field seismicity; 10. conclusion

#### **VI – STUDY FOR ASSESSMENT OF THE EFFECT ON THE ENVIRONMENT**

##### **Article 61**

The content of the Study for Assessment of the Effect on the Environment shall be prescribed in accordance to the Law on Environment.

#### **VII – FINAL PROVISIONS**

##### **Article 62**

This Rulebook shall enter into force on the following day after its publication in the “Official Gazette of the Republic of Macedonia”.