

**REPUBLIC OF BULGARIA**  
**MINISTRY OF HEALTH**

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**BALNEOLOGICAL EVALUATION**

**No. 77**

**08.03.2018**

This balneological evaluation certifies that the mineral water obtained from the water extraction facility

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***Drilling No. P-177 x***

***mineral water deposit Region „North-Eastern Bulgaria” - groundwater from the Malm-Valange aquifer with temperature higher than 20 °C – Varna district, Dobrich district, Shumen district – exclusive state property”*** has the following:

**A. Geological and hydrological characteristics:**

**Location**

The water extraction facility drilling № P-177x is located in the Tabiyata area, city of Balchik, Balchik municipality, Dobrich district.

**Forming medium of mineral water**

The mineral water is formed in the crack-karst water pressure system in the Malm-Valange aquifer and in the crack-porous water pressure system of the middle Eocene aquifer in the Varna monoclin. The Malm-Valange carbonate aquifer, in which the aquifer of the same name is developed, is made up of cracked and cavernous limestone, dolomite limestone and dolomites. The thickness of the carbonate complex is about 750 meters. The aquatic horizon is developed in karst limestones, dolomites and dolomitized limestones.

**Nurturing the deposit**

Mineral water is of atmospheric and filtration origin. The nurturing of the Malm-Valange aquifer is mainly carried out within the boundaries of the North-Bulgarian archway in the region of Razgrad in the coronal part of the north-Bulgarian archway lifting, where the Malm-Valange is revealed on the surface or lying in a quaternary cover at the expense of atmospheric precipitation. To the east and southeast of the nutrition area, the aquifer is plunged to a great depth, the water temperatures in the aquifer are gradually rising, and cold groundwater turns into mineral water.

The drainage of the mineral waters is done by the Devnenski and Zlatinski springs and underwater in the Black Sea.

**Collector of mineral water**

The collector of the mineral water are cracked and karst limestones, dolomite limestones and dolomites on the Malm-Valange aquifer and limestones, sands and sandstones of the middle Eocene aquifer.

### **Operational water source of mineral water in the deposit**

Drilling No. P-177x was built in 2006 with a depth of 1228 m.

Drilling No. P-177x has revealed the following geological section:

- from 0.00 to 3.00 m - rotor;
- from 3.00 to 4.00 m - soil layer and sandy clay, quaternary; aQh;
- from 4.00 to 231.00 m - rotation of limestones, marls and clays, neogen Ni;
- from 231.00 to 575.00 m - plastic nonwoven clays, oligocene 01;
- from 575.00 to 635.00 m - marls, gray-green, unevenly sandy: upper eosin E<sub>3</sub>;
- from 635.00 to 693.00 m - nummulitic limestone from 635.00 m to 651.00 m, fine quartz sands and sandstones in alternation; lower-middle eosin E<sub>2</sub>;
- from 693.00 to 767.00 m - limestones, white sugar, chalk like: upper chalk K<sub>2</sub>;
- from 767.00 to 1228.00 m - limestones, gray, strong, crystalline, dolomites, dolomite limestone, uneven cracked and karsted, Valange J<sub>3</sub>-K<sub>1</sub><sup>v</sup>.

The construction of drilling No. P-177x is as follows:

- from 0.00 to 4.00 m - besieged with a steel column  $\varnothing$  530 mm, tentatively cemented to the mouth;
- from 0.00 to 250.00 m - besieged with a steel column  $\varnothing$  324 mm, tentatively cemented to the mouth;
- from 230.00 to 755.00 m - besieged with steel column  $\varnothing$  219 mm, cemented behind the tubing;
- from 755.00 to 1228.00 m - drilled with  $\varnothing$  190 mm, open pit.

### **Exploitation resources**

By virtue of Order No. PA-472 dated 28.05.2013 of the Minister of Environment and Water there are well-established operational resources for "North-eastern Bulgaria" region - groundwater from the Malm-Valange aquifer - Varna district, Dobrich district and Shumen district - exclusive state property, as follows:

Water object	Exploitation resources of mineral water			Temperature	Exploitation resources of hydrothermal energy		
	Q <sub>ep1</sub> (l/sec)	Q <sub>ep2</sub> (l/sec)	Q <sub>ep3</sub> (l/sec)	T (°C)	Q <sub>kp</sub> (l/sec)	AT(°C)	G <sub>eke</sub> (kJ/s)
Malm-Valange aquifer - Varna district, Dobrich district and Shumen district - exclusive state property	1507.2	1004.8	-	20.2-55.0	2512.0	25	263.132
	2512.00						

And technical possible flow rate:

Water extraction facility	Technically possible flow rate	Quote	Permissible decrease S additional	Permissible elevation of dynamic water level	Permissible depth at water level	Temperature	Exploration resources of hydrothermal energy		
							Q	AT	G
Drilling No. P-177 x Balchik	Q (l/sec)	m	m	m	m	T (°C)	(l/sec)	(t°C)	(kJ/s)
	12.20	-	1.90	To elevation + 17.30		27.00	12.20	-	-

### **Captation**

Above drilling № P-177x a massive captation building with a locked door is built up.

### **Sanitary-security zone**

By Order of the Ministry of Environment and Water No. PA-235/26.03.2009/ Ministry of Health № PA-09-77/18.02.2009, the sanitary-security zones around drilling № P-177x, city of

Balchik, Balchik municipality, Dobrich district were designated. Area 1 of the sanitary-security zone is fenced and marked.

### **B. Composition:**

<b>1. Anions</b>	<b>mg/l</b>	<b>eq%</b>	<b>2. Cations</b>	<b>mg/l</b>	<b>eq%</b>
F <sup>-</sup>	0.31	0.212	NH <sub>4</sub> <sup>+</sup>	<0.05	0.000
Cl <sup>-</sup>	39.71	14.581	Li <sup>+</sup>	<0.05	0.000
SO <sub>4</sub> <sup>2-</sup>	33.33	9.032	Na <sup>+</sup>	49.50	27.779
SO <sub>3</sub> <sup>2-</sup>	<6.00	0.000	K <sup>+</sup>	4.36	1.439
HCO <sub>3</sub> <sup>-</sup>	356.96	76.174	Ca <sup>2+</sup>	53.77	34.617
NSiO <sub>3</sub> <sup>-</sup>	-	-	Mg <sup>2+</sup>	34.05	36.157
NO <sub>3</sub> <sup>-</sup>	<1.00	0.000	Fe-total (β <sup>+</sup> )	0.04	0.009
NO <sub>2</sub> <sup>-</sup>	<0.05	0.000	Mn <sup>2+</sup>	<0.02	0.000
<b>Amount:</b>	<b>430.31</b>	<b>~100.00</b>	<b>Amount:</b>	<b>141.72</b>	<b>~100.00</b>
Dry residue at 180 °C		379 mg/l	NSiO <sub>3</sub>		20.05 mg/l
Dry residue at 260 °C		346 mg/l	Total mineralization		592 mg/l
Conductivity at 25 °C		695 mS/cm	Carbon dioxide		0.016 mg/l
pH		7.38	Hydrogen sulphide		3.93 mg/l
			Flow rate		12.20 l/s
			Temperature		27°C

Appearance: The water is clear, colorless, without sediment and odor.

### **3. Microelements (mg/l)**

Aluminium	0.03	Selenium	<0.010
Arsenic	<0.010	Mercury	<0.001
Antimony	<0.005	Zinc	0.039
Cadmium	<0.003	Barium	0.255
Chrome	<0.005	Boron	0.217
Copper	<0.050	Cyanide	<0.010
Nickel	<0.005	Silver	<0.050
Lead	<0.010		

The data are in accordance with Test Protocols No. 220 dated 14.10.2017 of the Specialized Mineral Water Analysis Laboratory at NSBFTR EAD, city of Sofia, Water Control Protocol No 64-Ж2-KB dated 26.09.2017 of Regional Health Inspection Dobrich.

### **4. Radiological indicators**

Total α-activity	0.114 ± 0.027 Bq/l	Natural uranium	< 0.0020 mg/l
Total β-activity	0.162 ± 0.017 Bq/l	Radon – 222	0.98±0.20 Bq/l
Radium -226	0.090 ± 0.025 Bq/l	Total indicative doze	0.020 ± mSv/year

Data are based on Radiological Indicators Control Protocols No. W 027a and No. W 027 b dated 26.01.2018 of Control Body from type A at National Center for Radiobiology and Radiation Protection.

### **5. Microbiological parameters**

Total number of viable microorganisms at 20 ± 2 °C for 72 hours	0 E-coli/cm <sup>3</sup>	Escherichia	0/250cm <sup>3</sup>
Total number of colonies of viable microorganisms at 37 ± 1°C for 24 hours	0 E-coli/cm <sup>3</sup>	Fecal streptococci	(Enterococci) 0/250cm <sup>3</sup>
		Sporeforming cultitreduting anaerobic bacteria	0/50cm <sup>3</sup>

Coliforms

0/250cm<sup>3</sup>

Pseudomonas aeruginosis 0/250 cm<sup>3</sup>

The data are in accordance with Test Report No. 841 -1-KB dated 26.09.2017 of the Control Type A at the Regional Health Inspection Dobrich.

### **Conclusion:**

The total mineralization of the mineral water from drilling № P-177x, city of Balchik, Balchik Municipality, Dobrich region, mineral water deposit Region "North-eastern Bulgaria" - underground water of Malm-Valange aquifer with a temperature higher than 20°C – Varna district, Dobrich district, Shumen district - exclusive state property, is 592 mg/l. It is characterized as hypothermal, mineralized, hydro-carbonated sodium-calcium-magnesium water without sanitary-chemical and microbiological signs of contamination. The contents of the investigated microcomponents and radiological indicators are in the limits of the mineral waters. The water has a stable physico-chemical composition and properties and meets the requirements of Ordinance No. 14 on the Resort Resources, Resort areas and Resorts (SG 79/1987, last amended SG No. 70/2004).

### **C. Features:**

**The healing and prophylactic properties of water** are determined by its low mineralization and the presence of hydrocarbon, calcium, sodium and magnesium ions, and metasilicic acid in colloidal state. Spa treatments through drinking of this type of water have an effect mainly on the gastrointestinal tract, the gallbladder and liver system, and the renal and excretory systems. Water helps a mild reduction in gastric juice hyperacidity and stimulates kinetics of bile ducts and potentiates diuresis. Water has an anti-inflammatory and detox effect.

**When used for drinking balneotherapy and balneoprophylaxis** (after appropriate tempering to 35-37 °C) it has beneficial effects in the following diseases: gastrointestinal (chronic gastritis and gastroduodenitis, enterocolitis, ulcerative disease, etc.): gall- cholangitis, chronic cholecystitis, cholangitis, cholangiohepatitis, chronic hepatitis, biliary dyskinesias, etc.); renal and urological (chronic pyelonephritis and cystitis, nephrolithiasis, urolithiasis, conditions after lithotripsy, etc.); metabolic (gout, obesity, diabetes, etc.).

*The use of mineral water for drinking balneotherapy and balneoprophylaxis is by medical appointment, subject to strictly determined methodologies and dosages (amount of water accepted, temperature and route of administration, duration of the medical-prophylactic course).*

**When used for outdoor balneotherapy and balneoprophylaxis** (after appropriate tempering up to 33-35 °C), the following diseases are beneficial: the locomotory system (degenerative and inflammatory diseases), joint diseases - arthritis, spondyloarthritis, arthrosis, rheumatoid arthritis, ankylosing spondyloarthritis, etc.): the peripheral nervous system (discopathies – radiculitis, plexitis and etc.), orthopedic and traumatological disorders (for movement at posttraumatic and postoperative conditions); skin diseases (chronic non-specific dermatitis, atopic dermatitis, etc.): gynaecological diseases (chronic non-specific adnexitis, etc.)

Contraindications for outdoor balneotherapy: specific diseases: oncological diseases, infectious diseases; acute diseases and decompensated function of organs and systems: Chronic ischemic heart disease - rhythm disorders; epilepsy.

Mineral water can be used for hygienic and sports-recreational purposes after appropriate tempering.

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