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UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF GEOLOGY, GEOPHYSICS AND ENVIRONMENTAL PROTECTION
CHAIR OF HYDROGEOLOGY AND ENGINEERING GEOLOGY
HYDROGEOCHEMICAL LABORATORY
Al. Mickiewicza 30, 30-059 Kraków, pavilion A-0
tel.: (12) 617-24-28, Secretariat KHGI (12) 617-24-04, fax: (12) 617-24-27

Kraków, 12 July 2016

STUDY NO. 135

Extended physicochemical analysis of underground water from the Artesian source no. 39 in Kołobrzeg

Date of collection: 22 June 2016
Sample code: 438H
Place of collection: Artesian source no. 39 in Kołobrzeg
Water sample collected by: collected and delivered by the Client

1. General analysis

Parameter	Measurements in field	Laboratory measurements
External appearance	transparent	
Colour [mg Pt/dm^3]		<9.4
Obscurity [mg SiO_2/dm^3]		0
Smell	no smell	
Taste	no special taste	
pH	7.4	7.46
Redox Eh potential [mV]		290
Specific conductivity Υ_{25} [mS/cm]		1.06
Water temperature [°C]		
General hardness H_0 [mg $CaCO_3/dm^3$]		165.1
Carbonate hardness H_w [mg $CaCO_3/dm^3$]		165.1
Non-carbonate hardness H_n [mg $CaCO_3/dm^3$]		0.0
Oxidisability $ChZT_{mo}$ [mg O_2/dm^3]		0.8
Total organic carbon TOC [mg C/dm^3]		<1.0

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STUDY NO. 135

2. DETAILED ANALYSIS - dissociated mineral components

Quality indicator	mg/dm^3	mval/dm^3	%mval
Cations			
Sodium Na^+	135 +/- 5	5.870	62.285
Potassium K^+	6.2 +/- 0.8	0.158	1.679
Lithium Li^+	0.045 +/- 0.010	0.006	0.068
Ammonium NH_4^+	0.68	0.038	0.401
Beryllium Be^{2+}	<0.0005	0.000	0.000
Calcium Ca^{2+}	48.7 +/- 1.6	2.430	25.790
Magnesium Mg^{2+}	10.6 +/- 2.0	0.872	9.251
Barium Ba^{2+}	0.0411 +/- 0.0000	0.001	0.006
Strontium Sr^{2+}	0.81 +/- 0.05	0.018	0.196
Iron Fe^{2+}	0.74 +/- 0.00	0.027	0.282
Manganese Mn^{2+}	0.029 +/- 0.000	0.001	0.011
Silver Ag^+	0.006	0.000	0.001
Zinc Zn^{2+}	0.03	0.001	0.010
Copper Cu^{2+}	0.008 +/- 0.000	0.000	0.000
Nickel Ni^{2+}	0.021 +/- 0.002	0.001	0.008
Cobalt Co^{2+}	0.0005 +/- 0.0000	0.000	0.000
Lead Pb^{2+}	0.0057	0.000	0.000
Mercury Hg^{2+}	0.0002	0.000	0.000
Cadmium Kd^{2+}	0.0004	0.000	0.000
Selenium Se^{2+}	<0.01	0.000	0.000
Antimony Sb^{3+}	0.0005	0.000	0.000
Aluminium Al^{3+}	<0.005	0.000	0.000
Chromium Cr^{3+}	0.010 +/- 0.000	0.000	0.000
Molybdenum Mo^{6+}	0.0093 +/- 0.0000	0.001	0.006
Vanadium V^{5+}	0.001 +/- 0.000	0.000	0.000
Zircon Zr^{4+}	< 0.0020	0.000	0.000
Titanium Ti^{4+}	0.02 +/- 0.00	0.000	0.000
Arsenic As^{3+}	0.003 +/- 0.000	0.000	0.000
Thallium Tl^{4+}	0.0022	0.000	0.000
Tungsten W^{6+}	0.0058 +/- 0.0000	0.000	0.000
Total cations:	**203.0**	**9.424**	**100.0**
Anions			
Fluorides F	0.225	0.012	0.122
Chlorides Cl	175	4.923	50.622
Bromides Br	1.0	0.013	0.132
Iodides I	0.06	0.001	0.005
Sulphates SO_4	12 +/- 28	0.246	2.531
Bicarbonates HCO_3	276.4	4.531	46.588
Carbontes CO_3^{2+}	< 0.5	0.000	0.000
Nitrites NO_2	< 0.003	0.000	0.000
Nitrates NO_3	< 0.1	0.000	0.000
Cyanides CN	< 0.002	0.000	0.000
Phosphates PO_4^{3+}	< 0.0061	0.000	0.000
Total anions:	**465.3**	**9.726**	**100.0**
Total analysis:	**668.3**		

Characteristics of the analysis:

$B = \Sigma rK - \Sigma rA / \Sigma rK + \Sigma rA \times 100\%$

B = -1.58%

STUDY NO. 135

3. Undissociated mineral components

Silicic acid H_2SiO_3 [mg/dm^3]	11.64 (Silica SiO_2 - 8.95 mg/dm^3)
Metaboric acid HBO_2 [mg/dm^3]	1.83 (Borium B - 0.45 mg/dm^3)
Total solid components [mg/dm^3]	681.8

4. Gaseous components

5. Organic substances*:

Surfactants (anionic) [mg/dm^3]	<0.02
Phenols [mg/dm^3]	<0.002
Chlorophenols [mg/dm^3]	<0.0002

Polycyclic aromatic hydrocarbons:

Benzopyrene (a) [ng/dm^3]	<5
Benzofluoranthene (b) [ng/dm^3]	<5
Benzofluoeanthene (k) [ng/dm^3]	<5
Benzoperylene (g, h, i) [ng/dm^3]	<1
Indenopyrene (1,2,3-cd) [ng/dm^3]	<1

Total: <17 ng/dm^3 = 0 ng/dm^3 (according to Commission Directive 2009/90/EC)

Dibenzoantracene (a, h) [ng/dm^3]	<5

Pesticides:

4,4-DDT [ng/dm^3]	<1
4,4-DDE [ng/dm^3]	<1
4,4-DDD [ng/dm^3]	<1

Total DDT and its metabolites: <3.0 ng/dm^3 = 0 ng/dm^3 (according to Commission Directive 2009/90/EC)

Aldrin [ng/dm^3]	<1
Dieldrin [ng/dm^3]	<1
Endrin [ng/dm^3]	<1
Heptachlor [ng/dm^3]	<1
Lindane gamma HCH [ng/dm^3]	<1
Metoxychlor [ng/dm^3]	<1

* tests performed by the Provincial Environmental Protection Institute - PCA Accreditation Certificate no. AB 176

Characteristics:
0.07% moderately mineralized water (according to the criteria specified in the Regulation of the Minister of Health - Journal of Laws of 2011, No. 85, item 466), with the chloride-bicarbonate-sodium-calcium character.

Conclusion:
Water sample collected from Artesian source no. 39 in Kołobrzeg, collected for the purpose of determining its chemical composition on 22 June 2016, contains 0.68 g/dm^3 of solid components. Among anions, the dominant role is played by chloride ion Cl - 50.6% mval and bicarbonate ion HCO_3 - 46.6% mval. Among cations, the dominant role is played by: sodium ion Na - 62.3% mval and calcium Ca^{+2} - 25.8% mval.
On this basis, the examined water was classified as 0.07% moderately mineralized water (according to the criteria specified in the Regulation of the Minister of Health - Journal of Laws of 2011, No. 85, item 466 and Journal of Laws of 2006, No. 80, item 565) of the chloride-bicarbonate-sodium-calcium character (Cl-HCO_3-Na-Ca).

Attachments:
1. Report on tests 135/2016 (KHGI Lab)
2. Report on tests no. /2016 (WIOŚ Lab)

LABORATORY MANAGER
[signature illegible]
prof. dr hab. inż. Jadwiga Szczepańska-Plewa

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STANISŁAW STASZIC
UNIVERSITY OF SCIENCE AND TECHNOLOGY IN KRAKÓW

Faculty of Geology, Geophysics and Environmental Protection

Administrative Office

Kraków, 21 July 2016

Report on measurement of natural radioactivity of water samples

Measurements were taken of total alpha and beta radioactivity, concentration of isotopes of radon (^{222}Rn), radium (^{226}Ra and ^{228}Ra) and uranium (^{238}U and ^{234}U) in a sample of mineral water provided by JANTAR WODY MINERALNE SP. Z O.O., ul. Żurawia 24, 78-100 KOŁOBRZEG. The measurements were made at the University of Science and Technology in Kraków with the use of an alpha/beta spectometer with liquid scintilator "**WALLAC GUARDIAN 1414 LIQUID SCINTILLATION COUNTER**" and alpha spectometer "**CANBERRA Model 7401**", with semiconductor detector of the PIPS type.

Results of measurements

Sample	**Date of collection**	**^{222}Rn (Bq/dm^3)**	**Total activity of radionuclides α and β [mBq/dm^3]**		**Concentration of radium isotopes [mBq/dm^3]**		**Concentration of uranium isotopes [mBq/dm^3]**	
			α	**β**	**^{226}Ra**	**^{228}Ra**	**^{238}U**	**^{234}U**
Jantar (W-39)	5 Jul 16	6.0+/-1.5	</= 50	</=100	5.0+/-2.0	</=30	</=0.5	</=0.5

Uncertainty of marking at the level of confidence 0.95 (two standard deviations).

From the radiological point of view, the examined water meets the criteria specified in the Regulation of the Minister of Health of 29 April 2004 regarding natural mineral waters, natural spring waters and table waters (Journal of Laws no. 276, item 2738).

Measurement performed by
[signature illegible]
Dr hab. inż. Nhuyen Dinh Chau

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Kraków, 13 September 2016

OPINION
concerning the chemical condition of underground water from the Artesian source no. 39 in Kołobrzeg

The opinion was prepared on the basis of report no. 135/2016 on the tests performed by the Hydrogeochemical Laboratory (PCA accreditation certificate no. 1050) of the Chair of Hydrogeology and Engineering Geology of the University of Science and Technology in Kraków, at the request of the Jantar Wody Mineralne company in Kołobrzeg, ul. Żurawia 2.

Characteristics of the underground water:

0.07% moderately mineralized water (according to the criteria specified in the Regulation of the Minister of Health - Journal of Laws of 2011, No. 85, item 466), with the chloride-bicarbonate-sodium-calcium character (Cl-HCO_3-Na-Ca). The sum of solid components in the underground water amounts to 0.68 g/dm^3, and its reaction is slightly alkaline (pH=7.46).

According to the guidelines contained in Attachment no. 1 to the Regulation of the Minister of Health of 31 March 2011 regarding natural mineral waters, natural spring waters and table waters - Journal of Laws of 2011, no. 85, item 466, no exceeding of maximum levels of concentrations of potentially toxic components of natural origin was identified in the water (table 1).

Table 1. Concentrations of potentially toxic components marked in underground water from source no. 39 in Kołobrzeg, with regard to the Regulation of the Minister of Health - Journal of Laws of 2011, No. 85, item 466

No.	Component	Maximum levels [mg/dm^3] according to the Regulation of the Minister of Health - Journal of Laws of 2011, No. 85, item 466	Concentration in the analysed water sample [mg/dm^3]
1.	Antimony	0.0050	0.0005
2.	Total arsenic	0.010	0.003
3.	Barium	1.0	0.0411
4.	Boron	5.0	0.45
5.	Cadmium	0.003	0.0004
6.	Chromium	0.050	0.010
7.	Copper	1.0	0.008

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8.	Cyanides	0.070	<0.002
9.	Fluorides	5.0	0.225
10.	Lead	0.010	0.0057
11.	Manganese	0.50	0.029
12.	Mercury	0.0010	0.0002
13.	Nickel	0.020	0.021
14.	Nitrates	50.0/10.0 [1)]	<0.1
15.	Nitrites	0,1	<0.003
16.	Selenium	0.010	<0.01

[1)] The 10.0 [mg/dm^3] level refers to natural mineral waters obtained in the territory of the Republic of Poland.

Concentration of potentially toxic components in the analysed underground water is by 1-2 times lower than the highest permitted concentration specified in the Regulation of the Minister of Health of 31 March 2011 (Journal of Laws of 2011, No. 85, item 466).

Also, no exceeding was identified of the maximum permitted concentrations for the chemical components determined for drinking water, as specified in the Regulation of the Minister of Justice of 13 November 2015 regarding the quality of water designated for consumption by humans - Journal of Laws of 2015, item 1989 (table 2).

No.	**Component**	**Maximum levels [mg/dm^3] according to the Regulation of the Minister of Health - Journal of Laws of 2015, item 1989**	**Concentration in the analysed water sample [mg/dm^3]**
1.	Antimony	0.0050	0.0005
2.	Arsenic	0.010	0.003
3.	Nitrates	50	<0.1
4.	Nitrites	0.50	<0.003
5.	Benzopyrene (a)	0.000010	<0.000005
6.	Barium	1.0	0.045
7.	Chromium	0.050	0.010
8.	Cyanides	0.050	<0.002
9.	Fluorides	1.5	0.225
10.	Cadmium	0.005	0.0004
11.	Copper	2.0	0.008
13.	Nickel	0.020	0.021
14.	Lead	0.010	0.0057
15.	Σ Pesticides	0.00050	<0.000003
16.	Mercury	0.0010	0.0002
16.	Selenium	0.010	<0.01
17.	Σ Polycyclic aromatic hydrocarbons	0.00010	<0.000017
14.	Manganese	0.50	0.029

15.	Aluminium	0.200	<0.005
16.	Ammonium ion	0.50	0.68
17.	Chlorides	250	175
18.	Manganese	0.050	0.029
19.	pH	6.5-9.5	7.46
20.	Conductivity [mS/cm]	2.5	1.06
21.	Sulphates	250	12
22.	Sodium	200	135
23.	Oxidisability with $KMnO_4$	5.0	0.8
24.	Iron	0.200	0.74
25.	Magnesium	30-125	10.6
26.	Silver	0.010	0.006
27.	Total hardness	60-500	165.1

Concentrations of specific organic substances, such as: benzopyrene (a), pesticides and polycyclic aromatic carbohydrates in the analysed underground water are lower than the DL marking threshold declared for those components by the laboratory and by 1-2 times lower than the threshold values determined for the water designed for consumption by people.

Conclusion:

Underground water sample collected from Artesian source no. 39 in Kołobrzeg, collected for the purpose of determining its chemical composition on 22 June 2016, contains 0.68 g/dm^3 of solid components, and its reaction is slightly alkaline (pH = 7.46). Among anions, the dominant role is played by chloride ion Cl - 50.6% mval and bicarbonate ion HCO_3 - 46.6% mval. Among cations, the dominant role is played by: sodium ion Na - 62.3% mval and calcium Ca^{+2} - 25.8% mval.

On this basis, the examined water was classified as 0.07% moderately mineralized water (according to the criteria specified in the Regulation of the Minister of Health - Journal of Laws of 2011, No. 85, item 466 and Journal of Laws of 2006, No. 80, item 565) of the chloride-bicarbonate-sodium-calcium character (Cl-HCO_3-Na-Ca).

The underground water from Artesian source no. 39 in Kołobrzeg meets the quality criteria specified in the binding Regulations of the Minister of Health for mineral waters, spring waters and table waters (Journal of Laws of 2011, No. 85, item 466) and waters designated for consumption of people (Journal of Laws of 2015, item 1989).

Taking into account the concentrations of physicochemical elements in the analysed underground water (Report 135/2016), its chemical condition was also evaluated according to the criteria specified in the Regulation of the Minister of the Environment - Journal of Laws of 2016, item 85. The underground water from source no. 39 in Kołobrzeg was classified as the highest class of quality: Class I - water of a very good quality.

LABORATORY MANAGER
[signature illegible]
prof. dr hab. inż. Jadwiga Szczepańska-Plewa

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CERTIFICATE

Granted to the following organization:

"JANTAR"
WODY MINERALNE Sp. z o.o.

ul. Żurawia 24
78-100 Kołobrzeg

The Management System Certification Office of Polski Rejestr Statków S.A., Al. Gen. Józefa Hallera 126, 80-416 Gdańsk, certifies that the Quality Management System of the aforementioned organization was evaluated and it was found to be compliant with the following requirements:

ISO 22000:2005

The scope of certification:
PRODUCTION OF MODERATELY MINERALIZED SPRING WATER

First issue of the Certificate: **19 May 2008**

This Certificate is valid until: **18 May 2020**

Certificate No.: NC-1734

[signature illegible]
Jacek Papiński

[Graphic sign.]
Polish Accreditation Centre
Management System Certification
AC014
FSMS

Gdańsk, 19 May 2017

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Medical University in Łódź

Clinic of Nephrology, Hypertensiology and Kidney Transplantology
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Łódź, 17 January 2017

Opinion regarding the Jantar Champion water

I received the Jantar Champion water as a gift from the Jantar Wody Mineralne company in Kołobrzeg during hot days of the end of the summer. The Jantar water was drunk for several subsequent weeks by the employees of the clinic and our students, patients and their visiting families. The employees of the clinic, including myself, also consumed the water during our physical exercises, including jogging on medium distance. In our mutual opinion the water was characterized by very good taste and excellently quenched our thirst.

As a doctor who on a daily basis treats renal diseases and problems with water and electrolyte balance, as well as a scientist who conducts a research activity in this area, I can emphasize the important properties of the physical-chemical composition of the Jantar water, including, in particular, its alkaline reaction (pH 7.4), as well as moderate, but higher than in other waters in Poland, sodium contents of 7.3 mmol/l. The alkaline reaction of the Jantar water is a great advantage, in particular for people who perform physical exercise, whether professionally or for leisure. During physical exercise, in particular if it is intense, the metabolism is accelerated and the muscles release acids. That is why consumption at such times of water which contains higher quantities of carbohydrates is very beneficial and may contribute to the resistance of the system and its ability to endure long-lasting effort. The good properties of alkaline waters are also useful in many diseases of the digestive system, in particular of the stomach. Also, the contents of 7.3 mmol/l of sodium in the Jantar water determines its usefulness for hydration during long-term and intensive physical exercise connected with sweating, because it helps to reduce the loss of sodium such exercise may cause. The Jantar water, thanks to its balanced contents of the key minerals may also be easily combined with isotonic drinks which are so popular among people practicing sports for leisure and professionally and which contain easily-absorbed carbohydrates. Thanks to moderate contents of sodium, potassium and magnesium, the consumption of the Jantar water may also be recommended to people suffering from arterial hypertension and people from the group of risk of development of hypertension and diebetes.

Prof. dr hab. med. Michał Nowicki

[Stamp:]
Prof dr hab. n. med. Michał Nowicki
specialist of internal diseases, nephrology and hypertensiology
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