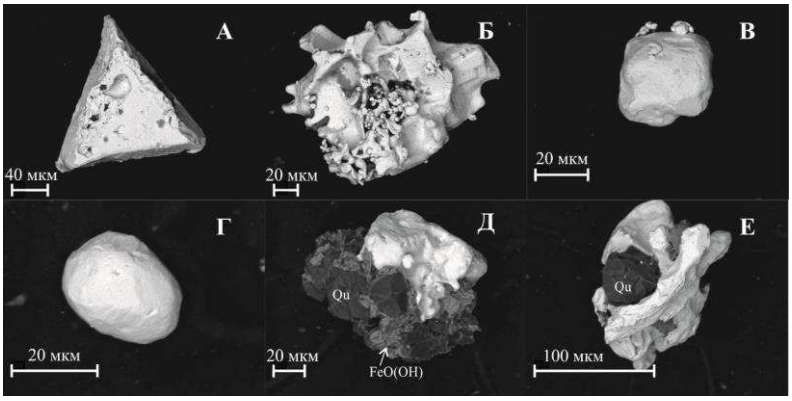

Fig. Bitmaps of main morphological types of gold nuggets of gold jasperoids of ore field Baybura (section Baybura), received by scanning electron microscope Jeol-100C. Authors: Titov A.T., Kirillov M., Kuzmina O.N.

Studying the composition of native gold produced in polished drafts by microprobe analysis on microprobe MS- 46 "Cameca". The obtained values of analysis of gold particles lie in a fairly narrow range of 920-950 ‰, with average values of 934-935 ‰, that indicating the similarity of the samples of native gold in sampling, unity and monochronal its source. The impurity elements in gold are silver (5, 9-7, 03 mass %) and high values of mercury (0.2 to 0.7 mass %). The low content of mercury for this type of mineralization is probably depends on the carbonate environment. The amount of copper does not exceed the detection limit.

The main criteria for the search the gold-bearing jasperoids are: 1) the development of volcanic and terrigenous-carbonate strata of island type (arkalyk suite, C_1v_{2-3}); 2) the presence of small gold-bearing intrusions and dikes plagiogranite-granodiorite composition Qunush complex C_3 and (or) negative gravity anomalies and positive anomalies of the magnetic field, indicating unopened granitoid bodies; 3) increased fracturing and brecciation of host rocks associated with hydrothermal-metasomatic changes, sometimes with beresitization; 4) high content of gold in the brown iron from the oxidation zone (up to 1-33,5 g / t); 5) morphology and specific composition of free high fineness gold (920-980 ‰), containing mercury (0.2 - 0.7 mass %) , which is typical for gold-sulphide deposits of Carlin type .

Deposits of gold – jasperoid type of East Kazakhstan on conditions of formation and composition of ores have shared similarities with industrial gold deposits of Karlin's type (Radtke A.S., 1985) known in the United States, Russia, Uzbekistan, China and other regions. It is increase the prospects of Kazakh territory to open similar fields.

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GEOCHEMICAL CONDITIONS OF NATURAL WATER ON THE LEFT BANK OF THE RIVER TOM WITHIN TOMSK AREA

O.O. Levina
Scientific advisors associate professor E.Yu. Pasechnik, senior teacher A.V. Baranova
National Research Tomsk Polytechnic University, Tomsk, Russia

Nowadays the left bank of the river Tom within the Tomsk bounds is being actively developed. Cottage settlements, summer houses and a new highway are being constructed on this area. However, there are numerous water objects and ground water intake which supplies the whole city with drinking water. Therefore ecological and geochemical research of natural water of this territory is a pressing challenge. In 2012-2013 the ground and surface water of the left bank of the Tom near Tomsk was explored (Fig.1). The chemical analysis is made in the accredited laboratory REC "Water" of TPU.

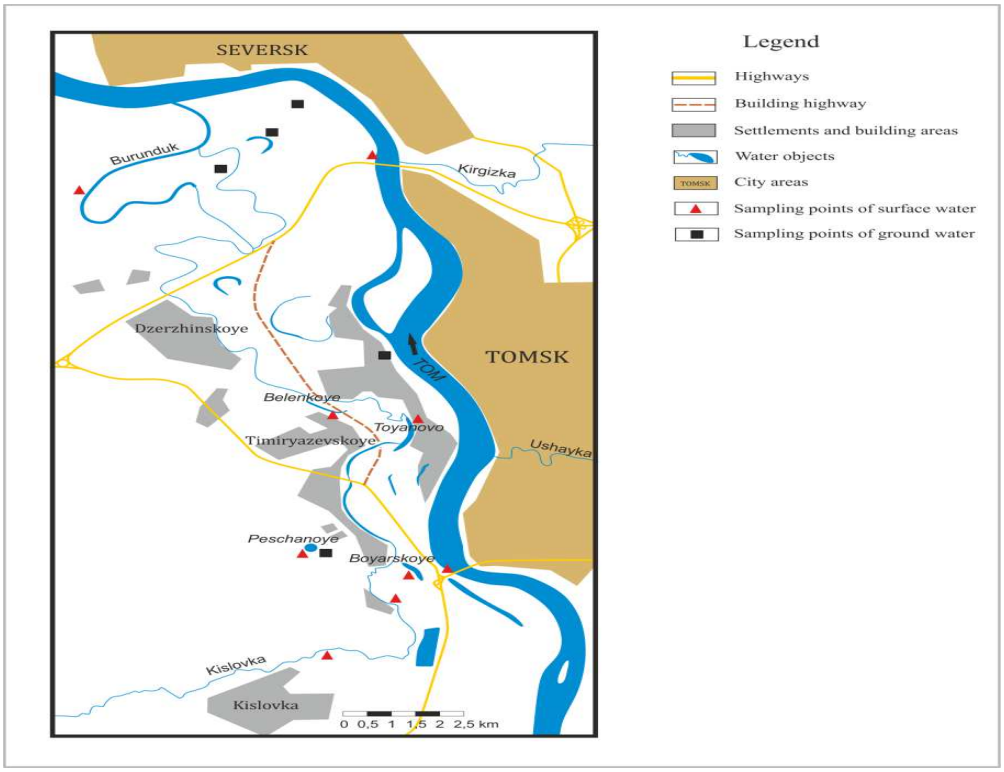

Fig. Water sampling map

Ground water sampling of was taken from wells at various depths. The first three samples are taken on the Tom-Burunduk interstream several kilometers from “Novy Bridge” across the Tom. It is where a cottage settlement is planned to be built.

The first well, 30 m depth, is located on the left bank of the Tom approximately 300-400 m from water line. It is a flowing artesian well, aquifer is most likely dated to quaternary deposits. The average chemical composition of the water is presented in the form of Kurlov's formula (Table 1). Well No. 2, 48 m depth, is located in the forest area, near the horseshoe lake. Groundwater recharge is carried out from the quaternary aquifer. Well No. 3, 96 m depth, was drilled in 2012 to supply a cottage. It is located 300 m from the river Sukhaya (tributary of the Burunduk). The fourth sample is taken from a well which supplies the lake Peschanoye, in Timiryazevo's settlement. It’s 50 m depth. The well was drilled in 1980th to fill the lake with the water pumped from the paleogene deposits. The fifth sample is water from a well, 15 m depth, located in the settlement Nizhny Sklad, near the coastal dam.

Table 1

Average chemical composition of water from wells

Name of wells	Chemical composition in the form of Kurlov's formula
Well No.1	$M0{,}29\ \frac{HCO_3 93}{Ca41Na32Mg25}\ T\ 5{,}3\ pH\ 6{,}8\ TH\ 2{,}4\ Fe\ 4$
Well No.2	$M0{,}44\ \frac{Cl57HCO_3 43}{Na55Ca25Mg18}\ T\ 5{,}7\ pH\ 8{,}3\ TH\ 2{,}8$
Well No.3	$M0{,}95\ \frac{Cl91}{Ca36Mg33Na29}\ T\ 6{,}5\ pH\ 6{,}8\ TH\ 11{,}6\ Fe\ 16{,}9\ Mn\ 0{,}61$
Well «lake Peschanoye»	$M0{,}24\ \frac{HCO_3 99}{Ca57Mg27Na15}\ T\ 5{,}8\ pH\ 7{,}7\ TH\ 2{,}5$
Well «Nizhny Sklad»	$M0{,}22\ \frac{HCO_3 72SO_4 14Cl14}{Ca61Mg29}\ T\ 4{,}8\ pH\ 6{,}9\ TH\ 2{,}8\ Fe\ 1{,}5$

Note: *M* – mineralization, g/l; *T* – temperature, °C; TH – total hardness, mg-eq/l; Fe – concentration of total iron, mg/l; Mn – concentration of manganese, mg/l.

While comparing the chemical analysis data for not centralized water supply [1, 3] it was determined that the first sample contains total iron in the amount which exceeds more than13 times the maximum permissible concentration (MPC). The silicon content is twice higher than MPC, and an excess of manganese (1.3 times) was fixed in October, 2012.

In well No.2 chemical oxygen demand (COD) exceeds the standard more than two times, iron concentration is 2.7-2.8 times higher and bromine is 2.4 times higher than maximum concentration limit, there was also an insignificant excess of Mn (1.08 times) in 2012.

Water quality in well No.3 does not meet the sanitary-hygienic requirements in the following components: COD (8.7-9.4 times excess), Cl^-(more than 1. 5 times), total hardness (1.1 times), magnesium (1.3-1.4 times), total iron (more than 56 times), Mn (4.4-7.8 times), silicon (almost twice). In 2013 the concentration of petrochemicals exceeds the standard by 1.5 times, bromine – more than 13 times and the BOD_5 strength (biochemical oxygen demand-5 day test) – 1.2 times.

The water from the well near the lake Peschanoye doesn't satisfy the sanitary requirements in iron and silicon. In 2013, a small excess of petrochemicals (1.02 times) was recorded.

The water from the well in the Nizhny Sklad's settlement has only 5 MPCs of iron. The other contents of this sample stay within the limits.

Surface water samples were taken from four lakes of the left bank of the river Tom (Belenkoye, Boyarskoye, Peschanoye, Toyanovo) and rivers: Tom, Kislovka, Burunduk.

Having obtained the results of the chemical analysis of samples and according to document RD 52.24.643-2002, we carried out a complex evaluation of the river and lake samples contamination considering 11 components (BOD_5, COD, Cl^-, SO_4^{2-}, NO_3^-, NO_2^-, NH_4^+, total iron, petrochemicals, Cu, Zn for each year of research. We consider MPC for recreational water as a standard [1, 4]. The estimation was also made for 11 substances (O_2, Cl^-, SO_4^{2-}, PO_4^{3-}., NO_3^-, NO_2^-, NH_4^+, total iron, petrochemicals, Cu, Zn), but in that case we took MPC for water usage in fishery as a standard[2]. The results of the estimations are shown in Table 2.

Table 2

Class and quality of surface water

Water objects	Class and Quality of water			
	with MPC for recreational water		with MPC in water using for fishery	
	2012	2013	2012	2013
r.Tom	-	1 – conditionally pure	3 «a» – polluted*	2 – poorly polluted
r.Kislovka	2 – poorly polluted		4 «a» – dirty	3 «b» – very polluted
r.Burunduk	2 – poorly polluted		4 «a» – dirty	3 «a» – polluted
l.Belenkoye	1 – conditionally pure	2 – poorly polluted	3 «a» – polluted	3 «b» – very polluted
l.Boyarskoye	1 – conditionally pure		2 – poorly polluted	3 «a» – polluted
l.Peschanoye	1 – conditionally pure		2 – poorly polluted	3 «a» – polluted
l.Toyanovo	2 – poorly polluted		4 «a» – dirty	3 «b» – very polluted

* – according to the data of Department of Natural Resources & Environment Protection in Tomsk Oblast [5].

Though the water contamination in the majority of the researched objects is not critical, the samples do not meet the chemical standards for some indicators. The ground water from the researched wells, which are more protected from human influence, often falls short of sanitary-hygienic standards for non-centralized water supply in the following components: Fe, Si and Mn, which is typical for the area. The surface water also does not meet the requirements in some substances, mostly total iron, manganese, which is common for the region. The concentrations of petrochemicals, heavy metals and other substances are increasing. Systematic water quality impairment is observed in the lakes Belenkoye, Boyarskoye and Peschanoye. The lake Toyanovo is less affected by these changes, due to the fact that it is a flowing water reservoir and the main part of the substances, which are beyond the MPC, is connected with the water flowing of the swamps and inflowing the river Kislovka.

Therefore the increasing anthropogenic load on this territory can lead to further degradation of fragile ecosystems as the content of some substances (petrochemicals, phosphates, ammonium ion, heavy metals and others) has increased recently, which can be connected with human economic activities near water objects and an eutrophication of reservoirs.

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