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Creating the Digital Map of the Resource Potential of Groundwater of the Angara-Yenisei Industrial Cluster Water Supply Facilities

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The works performed under the state contract "Groundwater search for potable water supply of the Angara-Yenisei industrial cluster facilities of the Siberian Federal District" solve the set of tasks of the Lower Angara region.
At this stage, informational and hydrogeological basis is created for the studied territory. In the future, the development of the digital cartographic model of the Angara-Yenisei cluster can be used as a tool for the effective functioning of the public administration system of subsoil use.

Keywords: digital model, resource potential of groundwater, territorial agglomerations, water supply of the industrial cluster facilities, efficient state management of subsoil use, regional prospecting and estimation hydrogeological works, federal project.

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Research area: economics.

The commissioning of the Boguchansky hydroelectric power plant (HPP) and the creation of the Boguchansky reservoir has stimulated the subsequent economic development of the area surrounding the Lower Angara Region as a whole. In the Lower Angara Region, new industrial centres are formed at the federal level: non-ferrous metal plants, as well as enterprises associated with harvesting and processing of timber, gas processing, mining and processing of solid minerals. The Boguchansky area is a key node in the project on the formation of the Angara-Yenisei industrial cluster proposed by the regional government. The construction of the Boguchansky aluminum factory and timber processing complex (TPC) is currently being completed. The high-priority infrastructure facilities, such as the bridge crossing near Yarki village and Karabula-Yarki railroad, had been built. The construction of the Kuyumba -Tayshet pipeline system has been started. The construction of the Boguchansky gas processing complex on the right bank of the Angara river is being scheduled. The Angarsk settlement is becoming

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an actual supply base for oil and gas fields of the Angara Region and the south of Evenkia.

According to the territorial planning scheme of the Lower Angara Region industrial area (approved by the Krasnoyarsk Territory Government Resolution N°209-p dated May 18, 2012), the current population of the Lower Angara Region area is 217,500 people. The population is projected to reach about 248,800 people by 2018, during the first stage of the Angara-Yenisei cluster establishment. The planned number of inhabitants by the estimated project deadline in 2030, will be about 252,400 people.

In recent years, special survey and assessment works have identified the groundwater fields and areas on the left bank of the Boguchansky industrial unit. These groundwater fields and areas provide high-priority drinking water supplies in the amount of 15 thousand m^3/day. Domestic and technological water supply is provided to the Boguchansky aluminum factory and to the construction workers' settlement in Taiga. In 90 current water intakes of the Boguchansky district, the assessment of groundwater resources of drinking quality is being implemented and placed on the state balance.

A prerequisite for planning such complex territorial agglomerations is a clear understanding of the feasibility concerning the water supply of construction facilities. Certainly, the issues of drinking and technical water supply for new facilities should be decided in advance: before starting the facilities' design.

In connection with the industrial construction, new centres with urban-type settlements will be built mainly on the right bank of the Angara River.

Taking into account such fundamental factors as:

-large vulnerability of surface water in terms of the possibility of contamination;

- changes in the level of the Angara,

create the need for a search of groundwater clusters for large drinking water systems.

The Angara River level has changed after filling the Boguchansky Reservoir. It has already led to the failure of surface and infiltration water intakes located in the coastal zone.

Within the territorial limits, there are areas with very difficult conditions of water supply for watery rocks. Also, the depth level and mineralization of groundwater are playing a significant role for the localization of the resource areas.

In this situation, it is necessary to analyze and outline the prospects of the water supply for existing and planned settlements.

Information and hydrogeological base is created on the stage of the regional survey and assessment work. Works are carried out by the request of the Ministry of Natural Resources in accordance with the state contract "The search for groundwater for drinking purposes for the facilities of the Angara-Yenisei industrial cluster of the Siberian Federal District". In the course of the works the following tasks are being solved:

- Justification of the search criteria, indicating the existence of the feasibility for localization of the groundwater resource potential for domestic and drinking needs of generated industrial units.
- Assessment of groundwater resources of free water exchange zone of the Angara-Yenisei cluster territory. Intranasal and long-term variability of the flow and its spatial distribution throughout the basic water-bearing complexes.
- Zoning scheme under the terms of the Angara-Yenisei cluster water supply area will be determined by the results of hydrogeological mapping, as well as the assessment of the groundwater flow and forecast of the groundwater buttress.
- Justification of the choice of areas of resource potential localization, and areas of

exploration wells emplacement, for effective damming of the productive aquifers.

- Formation of the information base that would allow to develop the hydrogeological models of areas of the resource potential localization, as well as the development of methodology for assessing the prognostic groundwater resources and reserves.
- Testing of the numerical modeling method of the hydrogeological conditions in the fracture-karst arrays for local areas, in order to determine the productivity potential of water intakes and forecast the conditions of industrial groundwater withdrawal from productive aquifers.
- Numerical hydrogeological modeling of the forecasting of industrial conditions of groundwater withdrawal from the productive aquifers.
- Assessment of forecast resources and groundwater reserves of C2 category, based on the results of carried out works, analytical calculations and modeling for the Angara-Yenisei cluster, within the edge portions of the Ob-Irtysh and Angara-Lena artesian basin and Yenisei hydrogeological folded area.

Creation of a digital cartographic model of the Angara-Yenisei cluster region based on maps of scale 1: 500 000 and 1: 200 000.

Search works on the project have been carried out in 2014-2016 covering the Angara River valley in the downstream of the Boguchanskaya HPP, as well as the Yenisei River valley, in the area of the Arrow to Yeniseysk.

Drilling, experimental filtration and geophysical work at previously unexplored areas carried out during 2014-2015, allowed to specify the geological structure of the section to the depth of 100 meters. Also, the filtration parameters of water-bearing horizons and complexes has been obtained, which allows to plan further detailed work on selected sites.

Development of the hydrological database for the Angara-Yenisei cluster territory, and digital cards sets construction, allow to make the preliminary zoning of the territory and assess its resource potential.

The geographic information system (GIS) ArcGis. is selected for the creation and management of digital mock-ups of the Angara-Yenisei cluster sets of maps. The SHAPE-file format is used as the base format.

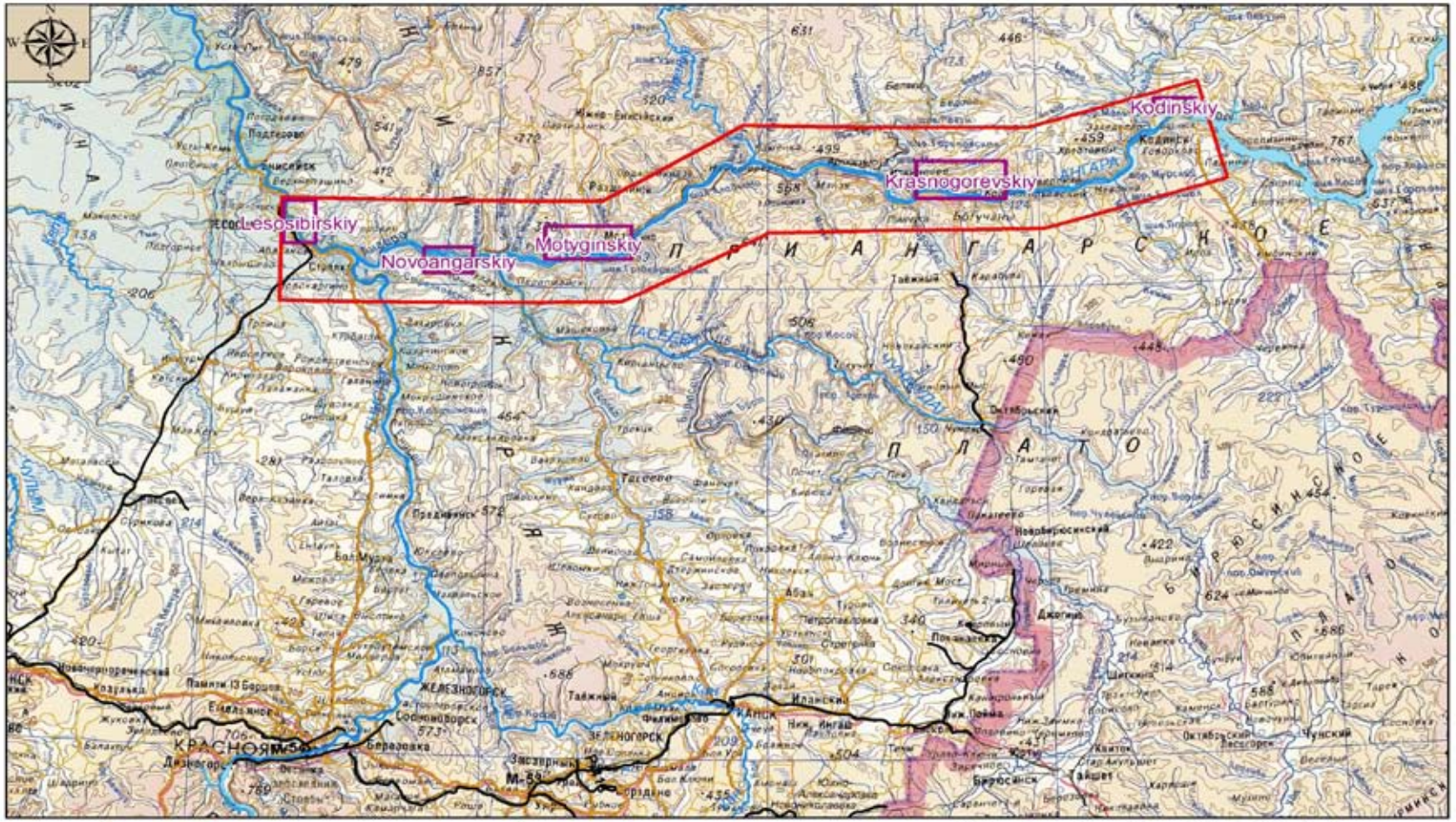
The thematic layers of digital mock-ups of the set of maps are currently being developed:

- Geological map of indigenous deposits;
- Geological map of Quaternary deposits;
- Geomorphological map
- Hydrogeological map;
- Map of groundwater protection of major aquifers and complexes from technogenic pollution;
- Resource potential map;
- Total hydrogeological zoning map;
- Hydrochemical map;
- Hydrogeological map;
- Map of using drinking and mineral underground waters.

The obtained materials make it possible to determine the supply of the population and industrial facilities with groundwater for drinking and technical purposes. There will be an information basis for drawing up the plans for the multipurpose use and protection of water resources, as well as for setting survey and assessment work.

Assessment of the groundwater resource potential is essential for the effective functioning of the state subsoil management system for exploring, mining and monitoring of the groundwater.

As the main goal of the federal project, the regional stage of the hydrogeological territorial research will ensure the successful launch of the main facilities of the Angara-Yenisei industrial cluster in a timely manner.



The area of the prospect evaluation survey

References

The scheme of territorial planning of the Russian Federation in the federal transportation approved by the RF Government No. 384-r (2013).

The report "Exploration of underground water for drinking water supply of the Boguchanskaya industrial zone of the Krasnoyarsk Krai" (2009).

The report "Exploration and evaluation work to identify promising sites of fresh groundwater for drinking water supply in Kodinsk" (2007).

Создание цифровой модели карты ресурсного потенциала подземных вод для водоснабжения объектов Ангаро-Енисейского промышленного кластера

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Работы по государственному контракту «Поиски подземных вод для хозяйственно-питьевого водоснабжения объектов Ангаро-Енисейского промышленного кластера Сибирского федерального округа» решают комплекс задач для территории Нижнего Приангарья. На данном этапе создается информационная гидрогеологическая основа для исследуемой территории. В дальнейшем развитие цифровой картографической модели Ангаро-Енисейского кластера может быть использовано как инструмент для эффективного функционирования системы государственного управления недропользованием.

Ключевые слова: цифровая модель, ресурсный потенциал подземных вод, территориальные агломерации, водоснабжение объектов промышленного кластера, эффективное государственное управление недропользованием, региональные поисково-оценочные гидрогеологические работы, федеральный проект.

Научная специальность: 08.00.00 – экономические науки.