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## **THE HARMONIZED WATER QUALITY MONITORING PROGRAM IN THE SELENGA RIVER BASIN**

**Preparers: Mongolian Institute of Meteorology and Hydrology; Central  
Laboratory of Environment of Mongolia**





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## **1. Background information**

The basin of Lake Baikal is one of the most outstanding ecosystems previously untouched by any significant impacts of economic activity. Preservation and maintaining of the natural condition of the Selenga river ecosystem (a part of Lake Baikal's ecosystem) serve not only the national interests of the Russian Federation and Mongolia, but the entire world community.

The surface waters condition and pollution monitoring system in the territory of Russia and Mongolia should be orientated towards strengthening of transboundary cooperation, acquisition of universal and commensurable information. Alongside with the information on the condition of other environmental media it will serve as a basis for the support of executive decision making for the integrated water resource management in the basins of Lake Baikal and Lake Khubsugul to provide sustainable functioning and protection of the unique ecosystems under the conditions of economic development of the states concerned.

The harmonized water quality monitoring program in the Selenga river basin is aimed at the drawing together of the monitoring systems in Russia and Mongolia, exposure and fixing of discrepancies and disagreements in the course of its organization and maintenance.

**The harmonization principles** of the surface waters condition and pollution monitoring reside in:

- the systematic character of observations;
- coherence of their schedule and the characteristic phases of the hydrological regime of water bodies;
- water examination by universal or commensurable methods;
- formation of an observation program based on a universal scheme, which includes the mandatory data for all observation sites and characteristic of waters on a given site. These definable data should be determined on the basis of information about wastewater composition in the observation site area and preliminary examination of a water body;
- the use of certified, sensitive and selective measurement methodologies;
- maintaining of a constant internal measurement quality control and recurrent outside control (interlaboratory comparative testing of water composition measurement methodologies).

**The use of the aforementioned principles by all Russian and Mongolian participants of the monitoring in their work will allow obtaining of reliable and commensurable information for monitoring and assessment of the condition of the transboundary water objects.**

## **2. Monitoring systems in the Selenga river basin in the territories of Russia and Mongolia**

Nowadays state-maintained monitoring of the condition and pollution of the ground surface waters (GSW) in the Selenga river basin in the territory of Russia is carried out on 26 monitoring observation sites (5 on the river and 16 on its

tributaries), which Russia suggests to include into the Harmonized Water Quality Monitoring Program in the basin.

The detailed characteristics of the provisions is given in Annex A.

Programs of pollution content monitoring on the Russian national monitoring network sites (NMN) on the Selenga river and its tributaries include the list of 34-43 indices presented in Annex B.

In accordance with the authorized categories, on-site observations should be carried out on certain types of programs within the time frame of water sampling.

At present the sampling frequency requirement is violated due to the climatic conditions (for example, through freezing of rivers at cripples), or because of absence of watercraft, or funds for their purchase or rental, and shortage of funds for the purchase of fuel, oil and lubricants. Another reason is the remoteness of some sites from the laboratories where samples are analyzed, shortage of professional chemists and observers on sites, etc.).

Besides the pollutants some mandatory indices are measured on the monitoring points. They are **water temperature, pH value, suspended solids, color of water, transparency, odor, dissolved oxygen, carbon dioxide, silicium, calcium ions, sulphate, chloride and hydrocarbonate ions and water hardness. The following indices are determined by calculation: dissolved oxygen saturation percentage, sum of ions, sodium and potassium ion sum, mineral nitrogen sum, magnesium ion concentration.**

Out of 26 monitoring points controlled waste water disposal exists only on 6 sites (see Annex A). The main polluters in these areas are the enterprises of the housing and utility services and shipping (the Selenga river, Ulan-Ude), mining and drainage waters of the defunct Dzhida tungsten and molybdenum plant (the Modonkul' river, Zakamensk), Central Heating and Power Plant (CHPP) and aircraft plant (the Uda river, Ulan-Ude). In other areas without controlled waste water disposal the main pollution is a result of unauthorized disposal and land runoff from the adjacent territories. In the recent 10 years there were no cases of gross and extremely gross pollution on the monitoring points.

A subsystem of monitoring of the transboundary surface waters includes both the monitoring observation of the state monitoring system of the Federal Service of Russia on Hydrometeorology and Monitoring of the Environment (RHM) on the Selenga river and its tributaries Chikoi, Menza and Kiran and the sites on the left bank tributaries of the Selenga, the Zheltura and Kyakhtinka rivers. The works there are carried out in accordance with the agreement between the governments of the Russian Federation and Mongolia on the protection and use of transboundary waters signed on 11 February 1995.

The transboundary water bodies' quality monitoring in the Mongolian territory is carried out in 13 sites agreed upon earlier. Additionally there are 6 stations in the Selenga river basin. Chemical analysis of the transboundary waters is conducted in cooperation with the Central Laboratory on Environment and Weights and Measures (CLEWM) in 5 more regional laboratories.

There is no monitoring of hydrochemical indices on the rivers Menza and Chikoi in Mongolia. In 2011 the Mongolian side conducted a single sampling and analysis of water on the river Kiran.

At their end, Mongolia conducts monitoring on the transboundary sites on the rivers Selenga, Zheltura and Kyakhtinka.

The characteristics of the transboundary sites, proposed for the inclusion into the Harmonized Monitoring Program in addition to the sites of the monitoring observation of the RHM (see Annex A) in the Selenga river basin by the Russian and Mongolian parties is presented in Tab. 1.

**Table 1. Transboundary monitoring points in the territories of Russia and Mongolia**

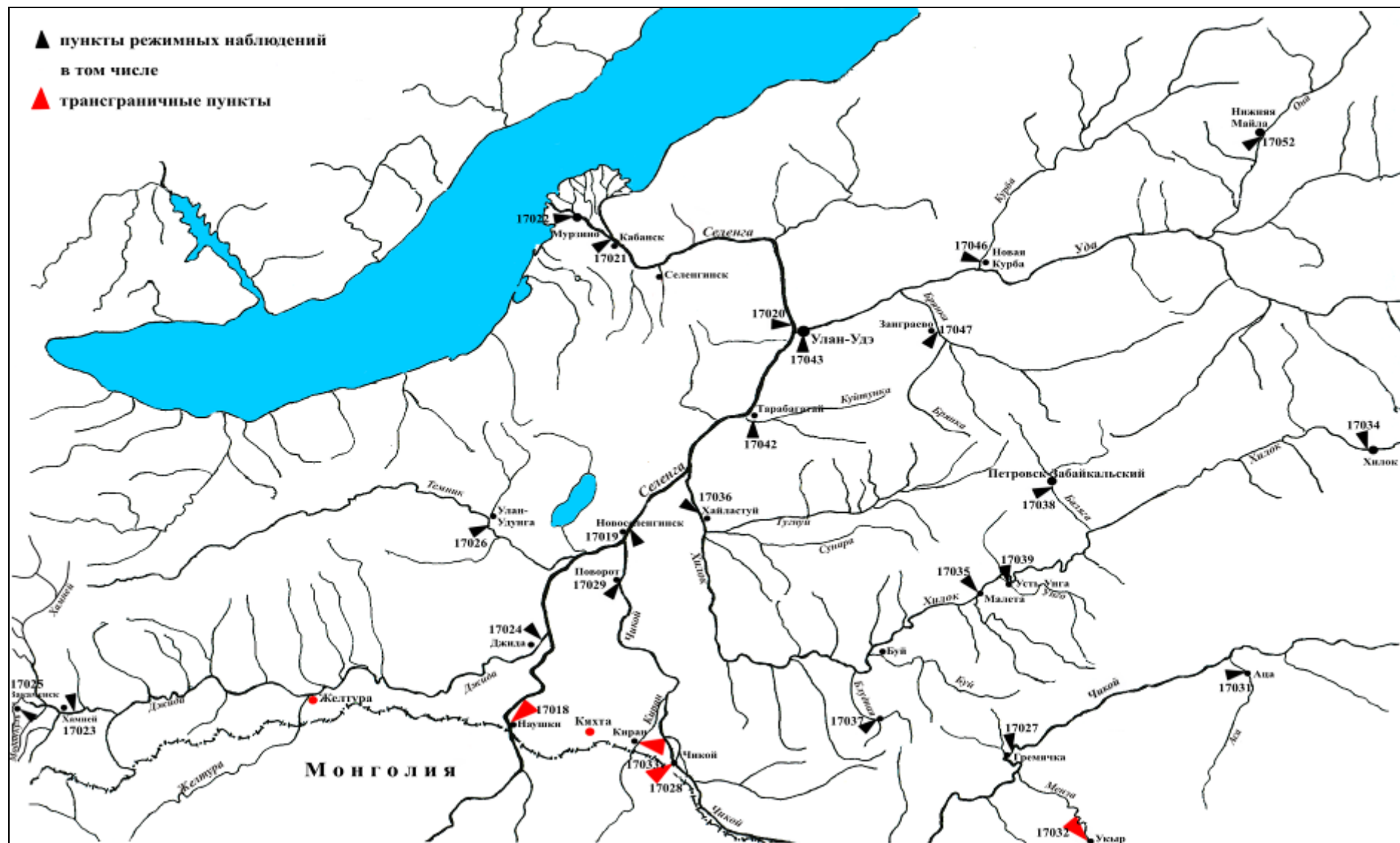
| State    | Monitoring point                                  | Cross section   | Year of opening of a monitoring point | Distance from the cross section to the border in km | Distance from a gauging station (GS) | Periodicity of observations, samples per year |
|----------|---|---|---------------------------------------|---|--------------------------------------|---|
| Russia   | The Selenga river, Naushki settlement             | 1.5 km west-southwest from the settlement, stream gauging                           | 1970                                  | 0.1   | In the cross section GS-1, Naushki   | 7.9   |
| Mongolia | The Selenga (Selenge) river, town of Sukhe-Bator  | 7 km northwest of Sukhe-Bator   |                                       | 0.05  |                                      | 12  |
| Russia   | The Kyakhtinka river, town of Kyakhta*            | On the southern outskirts of Kyakhta  | 1999                                  | 0.1   | GS is missing                        | 4   |
| Mongolia | The Kyakhtinka (Khiagt) river, town of Altanbulag | On the western margins of the Mongolian-Russian border crossing point in Altanbulag |                                       | 0.05  |                                      | 6   |
| Russia   | The Zheltura river, Zheltura                      | Zheltura village  | 2000                                  | 15  | In the cross section GS              | 4   |

| State  | Monitoring point                 | Cross section                                     | Year of opening of a monitoring point | Distance from the cross section to the border in km | Distance from a gauging station (GS)          | Periodicity of observations, samples per year |
|--|----------------------------------|---|---------------------------------------|---|---|---|
|  | village                          |   |                                       |   |   |   |
| Mongolia   | The Zheltura (Zelter) river      | On the northeastern outskirts of Zelter sum       |                                       | 0   |   | 4   |
| Russia   | The Chikoi river, Chikoi village | 2 km east of the village, stream gauging          | 1968                                  | 3.0 on the straight to the state border             | In the cross section GS-2, the Chikoi tannery | 8.7   |
| Russia   | The Kiran river, Kiran village   | 3 km from the state border, 17.5 upstream from GS | 1964                                  | 3.0   | 17.5 upstream from GS-1, Ust'-Kiran           | 4   |
| Russia   | The Menza river, Ukyr village    | 0.4 km upstream from the village, stream gauging  | 1986                                  | 30.0  | In the cross section GS-2, Ukyr               | 5   |
| * - the point is not included into the network of the national monitoring points |                                  |   |                                       |   |   |   |

Except for the monitoring point on the river Kyakhtinka where the controlled waste water disposal of Kyakhta-3 town is carried out, on all above-listed points there is no controlled waste water disposal. Water pollution here may be a result of pollution influx from the surface runoff, unauthorized discharges of household waste waters, accidental pollution, cross-border transfer of pollutants and so on.

Fig. 1 shows the location diagram of all monitoring points in the Selenga river basin in the territory of the Russian Federation.

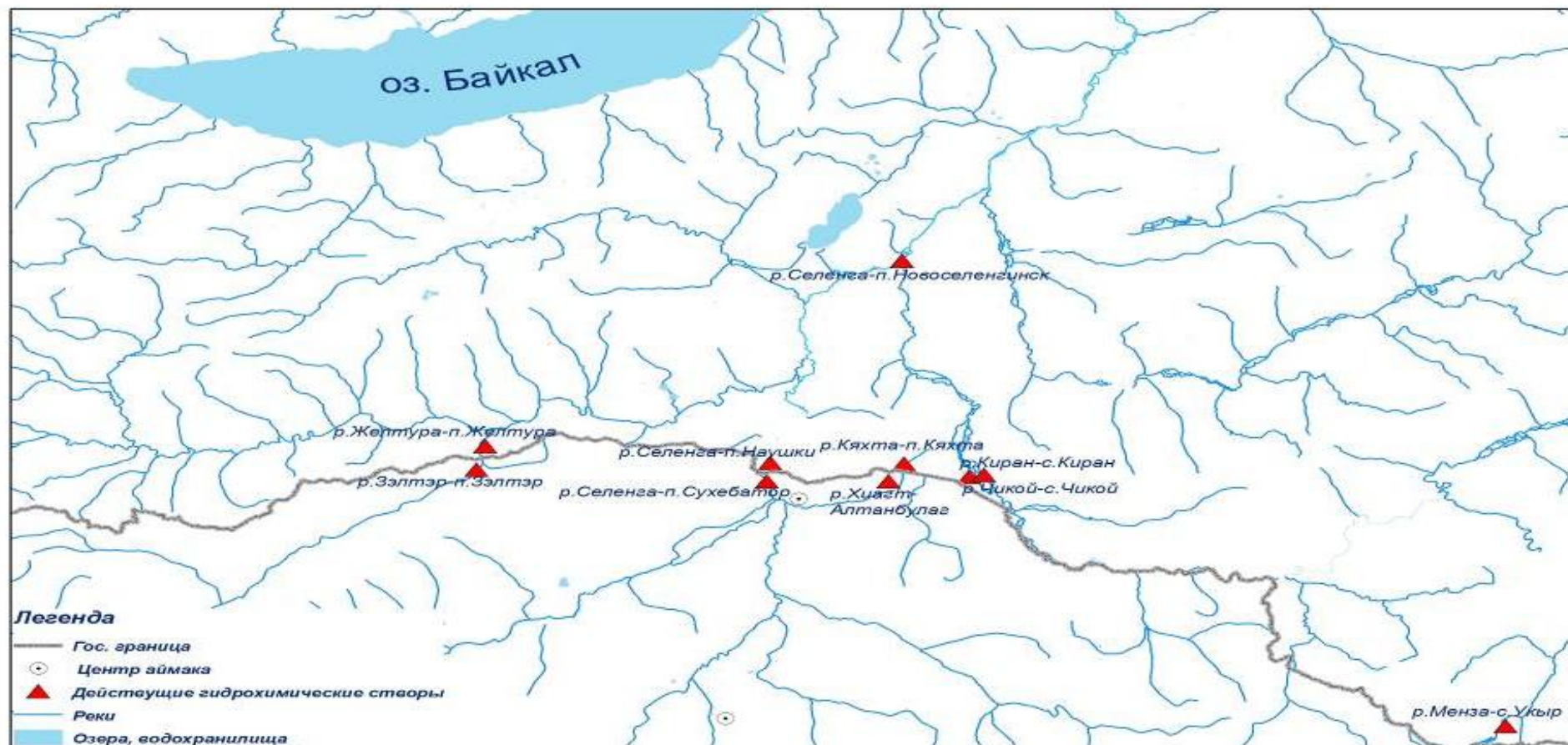
Fig. 2 shows the location diagram of the transboundary monitoring points in the Selenga river basin in the territory of Russia and Mongolia.



Legend: black triangle – monitoring observation points, including (red triangle) transboundary points



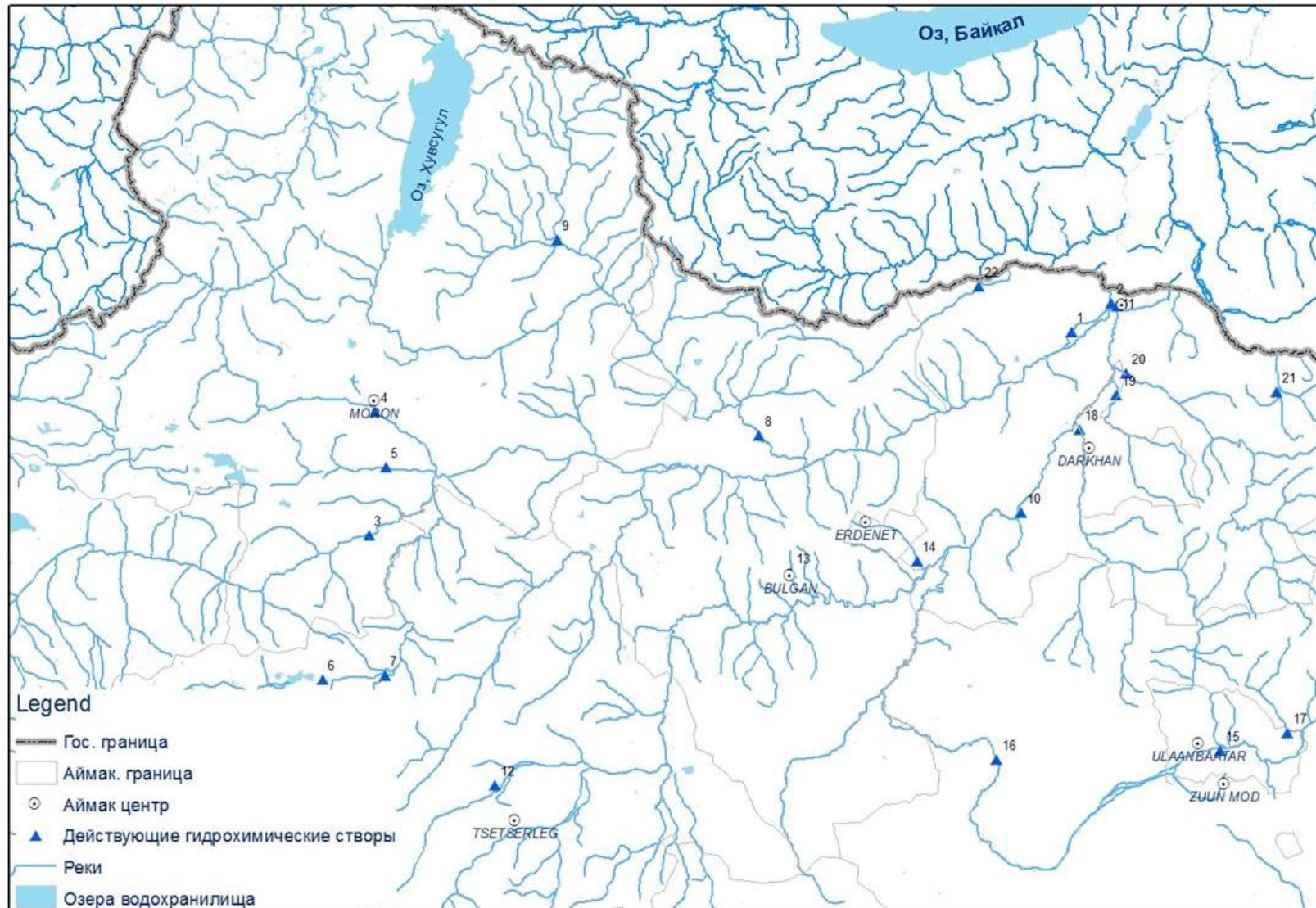
Figure 1. Location diagram of the monitoring points in the Selenga river basin in the territory of the Russian Federation.



Legend:

-State border; -Aimag center; -Functioning hydrochemical cross sections; -Rivers; -Lakes, reservoirs

Figure 2. Location diagram of the monitoring points in the Selenga river basin



*Legend:  
State border; Aimags border; Aimags center; Functioning hydrochemical cross sections; Rivers; Lakes, reservoirs*

Figure 3. Location scheme of the monitoring points in the Selenga river basin in the Mongolian territory

### **3. Suggestions to harmonize monitoring programs in the Selenga river basin**

Harmonization of the monitoring programs in Russia and Mongolia should be carried out according to:

1. Periodicity of observations;
2. Analysis methodologies used, regulating the requirements for sampling and preliminary preparation of water samples for analysis, time of their delivery to a laboratory, time and conditions of their storage;
3. List of determined indices;
4. Quality control of the analytical measurements.

As it follows from Tab. 1 the periodicity of sampling in Russia and Mongolia are somehow different.

Regarding the periodicity of observations we recommend that in accordance with the transboundary surface waters monitoring points **it is reasonable to conduct monitoring of the typical pollutants from 9 to 12 times a year** on these points. In the period of the main phases of the hydrological regime of water courses the indices should be determined in accordance with the full list.

Annex B presents lists of indices determined in the water samples and the analysis methodologies used:

- in Russia and Mongolia on commensurable methodologies, which do not require any further harmonization (Tab. B. 1);
- by the Russian and Mongolian sides using the non-commensurable analysis methodologies and in need of harmonization;
- indices, currently determined by the Russian side alone with the indication of the analysis methodologies used, which are proposed for implementation by the Mongolian side to expand the list of indices in the course of implementation of the Harmonized Monitoring Program (Tab. B.3).

For the expansion of the indices list during the implementation of the Harmonized Monitoring Program in the Selenga river basin the Mongolian side needs the following devices:

1. Membrane filter with pore diameter of 0.45  $\mu\text{m}$
2. Systems of microwave treatment of samples
3. Atomic absorption spectrophotometer with electrothermal and flame atomization
4. Mercury analyzer based on the method of atomic absorption of cool vapor
5. Gas chromatograph for the testing for organochlorine pesticides and other organic substances

Based on the detailed tables of Annex B a consolidated list of indices proposed for the inclusion into the Harmonized Monitoring Program of the Selenga river basin was prepared (Tab. 2).

Nowadays only the Russian side determines magnesium, aluminum, total chrome, total phosphorus, anionic synthetic surface active agents, alpha- and gamma HCH and 4,4'-dichlorodiphenyltrichlorethane. These indices are also

proposed for inclusion into the Harmonized Monitoring Program of the Selenga river basin.

The results of determining 15 indices by commensurable methodologies (Tab. 2) may currently be used by both sides for the assessment of pollution of the Selenga river basin. For the 15 indices determined by non-commensurable methodologies as well as 8 indices, whose monitoring is not carried out in Mongolia, new methodologies and devices should be introduced by the Mongolian side according to the action plan in part 5.

**Table 2. The consolidated list of indices for the inclusion into the Harmonized Monitoring Program of the Selenga river basin.**

| List of indices determined by the Russian and Mongolian sides using commensurable methodologies that do not require harmonization |                                      |  | List of indices determined by the Russian and Mongolian sides using non-commensurable methodologies requiring harmonization |                      |
|---|--------------------------------------|--|---|----------------------|
| No.   | Name of an indicator                 | Note   | No.   | Name of an indicator |
| 1   | Temperature                          |  | 1   | Chlorides            |
| 2   | Specific conductance                 |  | 2   | Hydrocarbonates      |
| 3   | pH value                             |  | 3   | Ammonium nitrogen    |
| 4   | Suspended solids                     |  | 4   | Total dissolved iron |
| 5   | Dissolved oxygen                     |  | 5   | COD                  |
| 6   | Sulphates                            |  | 6   | Petrochemicals       |
| 7   | Calcium                              |  | 7   | Chrome (VI)          |
| 8   | Magnesium                            | Limited commensurability (at hardness over 0.5 mM/cubic dm <sup>1</sup> )  | 8   | Zinc                 |
| 9   | Hardness                             |  | 9   | Cadmium              |
| 10  | Sodium and potassium ion sum         |  | 10  | Nickel               |
| 11  | Nitrate nitrogen                     | Limited commensurability (at nitrate nitrogen concentration of over 0.5 мг/кубический дм)<br>Ограничено сопоставимы (при концентрации азота нитратного более 0,5 мг/кубический дм) | 11  | Lead                 |
| 12  | Nitrite nitrogen                     |  | 12  | Copper               |
| 13  | Phosphates (expressed as phosphorus) |  | 13  | Cobalt               |
| 14  | Silicium                             |  | 14  | Mercury              |

|  |                  |  |    |           |
|--|------------------|--|----|-----------|
| 15   | БПК <sub>5</sub> | Limited<br>commeasurability<br>(comparison is possible<br>during the analysis of<br>polluted waters) | 15 | Fluorides |
| <sup>1</sup> - mol/cubic decimeter AEC – amount of equivalent substance or milliequivalent/cubic decimeter |                  |  |    |           |

In such a way 11 indices presented on the left side of Table 2, particularly **temperature, specific conductance, pH value, suspended solids, dissolved oxygen, sulphates, calcium, sodium and potassium ion sum, nitrite nitrogen and phosphates expressed as phosphorus** do not require further intercalibration and may now be included into the Harmonized Monitoring Program.

Four more indicators: **magnesium, hardness, nitrate nitrogen and BOD in 5 days** may be used under limited conditions, first of all, in the course of polluted waters analysis.

For the harmonization of the rest of indicators carrying out of joint measures listed in the action plan is required.

After the implementation of the Action Plan in 28 observation points in Russia and 6 observation points in Mongolia the testing of 38 indicators will be carried out through the commensurable methodologies that provide the acquisition of reliable information about the Selenga river basin water quality.

The harmonization of the monitoring program should be started with the implementation of new, more sensitive and selective certified testing methodologies for detection of **ammonium nitrogen, nitrites, total iron, chlorides (2013), nitrates, COD, petrochemicals, anionic synthetic surface active agents (2014), heavy metals (2015), organochlorine pesticides (2016)**.

**In the connection with the growing economic potential of mining and tourism and recreation industries in Lake Baikal and Lake Khubsugul basins, in case new industrial facilities or mines are launched, it will be necessary to consider expansion of the monitoring programs. This especially concerns the inclusion of testing for dangerous contaminants in water bodies in these programs.**

**Methodologies developed in the Hydrochemical Institute under the label RD 52.24 and proposed for the implementation during the monitoring of the transboundary water bodies may be passed over to the specialists from Mongolian hydrochemical laboratories free of charge.**

#### **4. Quality control of analytical measurements**

In order to provide the system of quality control of the analytical measurements and increase the reliability of results in the water pollution monitoring laboratories of Russia and Mongolia the approaches towards creation and implementation of quality control systems should be similar.

The proposed system of information quality guarantees and control is provided due to:

- correct selection of priority indicators of water composition entitled to testing;
- selection of a representative water sample;
- adherence to specifications of sample preparation and analysis specified by measurement methodologies, executed according to GOST (national standard) 8.563 or in accordance with other regulatory documents;
- use of **certified** measurement procedure (MP) of the composition of water;
- **internal measurement quality control**, including sampling selection quality, operative control of the analysis procedure and analysis results stability control (assessment of the total aggregate of the analysis results during a controlled period);
- participation in the inter-laboratory comparative testing of measurement procedure (external measurement quality control).

**The control of compatibility of analysis results obtained by the Russian and Mongolian laboratories should be carried out by:**

- organizing of joint water sampling and their analysis by methods used by each side followed by a comparison of obtained results with due regard to measurement errors;
- carrying out of a special experiment – dissemination of control samples prepared in Russia by the Hydrochemical Institute for the external control of measurements.

**5. Action plan for the implementation of the Harmonized Water Quality Monitoring Program in the Selenga river basin**

For the implementation of the Harmonized Monitoring Program in the Selenga river basin in Mongolia and Russia the following Action Plan was worked out.

**Table 3: Action plan of the Harmonized Water Quality Monitoring Program in the Selenga river basin**

| No                     | Name of event  | Providers   | Completion schedule |
|------------------------|--|---|---------------------|
| <b>Events of 2013*</b> |  |   |                     |
| 1                      | Carrying out of inter-laboratory comparative tests (ILCT) initiated by the Hydrochemical Institute and coordinated with the Mongolian side:<br>- preparation and distribution among the laboratories of control samples containing copper, lead and zinc ions due to periodical excess of the MPC for these chemical elements in the transboundary monitoring cross section. | Federal State Budgetary Institution “State Hydrochemical Institute” – coordinator of activities; Federal State Budgetary Institution “Zabaikal’skaya Territorial Administration for Hydrometeorology” | May-June 2013       |

| <b>No</b> | <b>Name of event</b>   | <b>Providers</b>  | <b>Completion schedule</b>                        |
|-----------|--|---|---|
|           |  | and Central Laboratory on Environment and Weights and Measures of Mongolia  |   |
| 2         | Carrying out of control samples' analysis and submission of the results to the coordinator Federal State Budgetary Institution "State Hydrochemical Institute" for the processing of data obtained.                        | Federal State Budgetary Institution "Zabaikal'skaya Territorial Administration for Hydrometeorology, Central Laboratory on Environment and Weights and Measures of Mongolia and Federal State Budgetary Institution "State Hydrochemical Institute" | July-August 2013                                  |
| 3         | Processing of the analysis results of the control samples for the inter-laboratory comparative tests obtained in the laboratories of Russia and Mongolia and their submission to the providers                             | Federal State Budgetary Institution "State Hydrochemical Institute"   | September 2013                                    |
| 4         | Sampling of water in 2013 in the agreed-upon cross-sections for carrying out of the inter-laboratory comparative tests based on the divided water samples taken from the transboundary water bodies of Russia and Mongolia | Federal State Budgetary Institution "Zabaikal'skaya Territorial Administration for Hydrometeorology" and Central Laboratory on Environment and Weights and Measures of Mongolia and Institute of Hydrometeorology and Environment of Mongolia       | Agreed upon at the meeting of the joint workgroup |

| No                     | Name of event  | Providers  | Completion schedule           |
|------------------------|--|--|-------------------------------|
| 5                      | Organization and carrying out of an internship of the specialists from the Central Laboratory on Environment and Weights and Measures (CLEWM) of Mongolia (2 persons) on the methodology issues of the surface water analysis and measurement quality control in order to introduce more selective and sensitive methods of the detection of ammonium, iron, chloride, nitrate, COD, petrochemicals and anionic synthetic surface active agents developed by the Federal State Budgetary Institution "State Hydrochemical Institute" and compliant to the international standards for the harmonization of methodological support. | Federal State Budgetary Institution "State Hydrochemical Institute" and Central Laboratory on Environment and Weights and Measures of Mongolia   | June-July 2013, Rostov-on-Don |
| 6                      | Introduction by the Mongolian side of new testing methodologies for nitrite, ammonium nitrogen, chlorides and iron detection.  | Central Laboratory on Environment and Weights and Measures of Mongolia<br>ЦЛЮСМ<br>МОНГОЛИИ  | Сентябрь-October 2013         |
| 7                      | Wrapping up of the 2013 activities and making a decision about further cooperation.  | Federal State Budgetary Institution "State Hydrochemical Institute," Federal State Budgetary Institution "Zabaikal'skaya Territorial Administration for Hydrometeorology" and Central Laboratory on Environment and Weights and Measures of Mongolia and Institute of Hydrometeorology and Environment of Mongolia | November 2013, Ulan-Ude       |
| <b>Events of 2014*</b> |  |  |                               |
| 8                      | Introduction by the Mongolian side of the new testing methodologies for the detection of COD,  | Central Laboratory on Environment  | January-March 2014            |



| No | Name of event   | Providers   | Completion schedule |
|----|---|---|---------------------|
|    | nitrates, petrochemicals and anionic synthetic surface active agents  | and Weights and Measures of Mongolia  |                     |
| 9  | Delivery of the atomic absorption spectrophotometer with electrothermal and flame atomization to the Central Laboratory on Environment and Weights and Measures of Mongolia and Federal State Budgetary Institution “Zabaikal’skaya Territorial Administration for Hydrometeorology                         | With financial support from UNOPS<br><br>With financial support from Rosgidromet  | 2013-2014           |
| 10 | Delivery of the system of microwave treatment of water samples and benthic deposits for the detection of total metals to the Central Laboratory on Environment and Weights and Measures of Mongolia and Federal State Budgetary Institution “Zabaikal’skaya Territorial Administration for Hydrometeorology | With financial support from UNOPS<br><br>With financial support from Rosgidromet  | 2014                |
| 11 | Introduction of the atomic absorption detection of the dissolved forms of metals (Ni, Cd, Pb, Cu, Co, Zn, Al) on the transboundary points (within 6 months from the delivery of the atomic absorption spectrophotometer with electrothermal atomization).   | Federal State Budgetary Institution “Zabaikal’skaya Territorial Administration for Hydrometeorology ” and Central Laboratory on Environment and Weights and Measures of Mongolia  | 2014                |
| 12 | Carrying out of the inter-laboratory comparative tests proposed by the Federal State Budgetary Institution “State Hydrochemical Institute” and coordination with the Mongolian side on:<br>- Control solutions containing ammonium nitrogen, nitrate nitrogen, petrochemicals, COD.                         | Federal State Budgetary Institution “State Hydrochemical Institute” – coordinator of activities; Federal State Budgetary Institution “Zabaikal’skaya Territorial Administration for Hydrometeorology” and Central Laboratory on Environment and | May-June 2014       |

| No                     | Name of event  | Providers  | Completion schedule |
|------------------------|--|--|---------------------|
|                        |  | Weights and Measures of Mongolia   |                     |
| <b>Events of 2015*</b> |  |  |                     |
| 13                     | Implementation of the atomic absorption detection of suspended forms of metals or total metals (Ni, Cd, Pb, Cu, Co, Zn, Al) on the transboundary points (within 6 months from the delivery of the system of microwave treatment of samples) and in benthic deposits.                                       | Federal State Budgetary Institution "Zabaikal'skaya Territorial Administration for Hydrometeorology" and Central Laboratory on Environment and Weights and Measures of Mongolia  | 2015                |
| 14                     | Carrying out of the inter-laboratory comparative tests (ILCT) proposed by the Federal State Budgetary Institution "State Hydrochemical Institute" and agreed upon by the Mongolian side on:<br>- control solutions containing Ni, Cd and Mn ions.  | Federal State Budgetary Institution "State Hydrochemical Institute" – coordinator of activities; Federal State Budgetary Institution "Zabaikal'skaya Territorial Administration for Hydrometeorology" and Central Laboratory on Environment and Weights and Measures of Mongolia | May-June 2015       |
| 15                     | Purchase of a specialized highly sensitive mercury analyzer based on the method of atomic absorption of cool vapor for the Central Laboratory on Environment and Weights and Measures of Mongolia and Federal State Budgetary Institution "Zabaikal'skaya Territorial Administration for Hydrometeorology" | With financial support from UNOPS<br><br>With financial support from Rosgidromet   | 2015                |
| 16                     | Introduction of mercury detection using the new  | Federal State  | 2015                |

| No | Name of event  | Providers   | Completion schedule                               |
|----|--|---|---|
|    | mercury analyzer (within 6 months after the delivery) by both sides  | Budgetary Institution “Zabaikal’skaya Territorial Administration for Hydrometeorology ” and Central Laboratory on Environment and Weights and Measures of Mongolia  |   |
| 17 | Sampling of water in 2015 in the agreed-upon cross-sections for carrying out of the inter-laboratory comparative tests based on the divided water samples taken from the transboundary water bodies of Russia and Mongolia | Federal State Budgetary Institution “Zabaikal’skaya Territorial Administration for Hydrometeorology ” and Central Laboratory on Environment and Weights and Measures of Mongolia  | Agreed upon at the meeting of the joint workgroup |
| 18 | Wrapping up of the 2015 activities and making a decision about the results of the activities of the Harmonized Monitoring Program in the Selenga river basin and its development prospects                                 | Federal State Budgetary Institution “State Hydrochemical Institute,” Federal State Budgetary Institution “Zabaikal’skaya Territorial Administration for Hydrometeorology ” and Central Laboratory on Environment and Weights and Measures of Mongolia and Institute of Hydrometeorology and Environment of Mongolia | October – November 2015, Ulan-Ude                 |

| No                     | Name of event   | Providers  | Completion schedule                               |
|------------------------|---|--|---|
| <b>Events of 2016*</b> |   |  |   |
| 19                     | Delivery of the gas chromatograph for the testing for organochlorine pesticides and other organic substances in the Central Laboratory on Environment and Weights and Measures of Mongolia and Federal State Budgetary Institution “Zabaikal’skaya Territorial Administration for Hydrometeorology” | With financial support from UNOPS<br><br>With financial support from Rosgidromet   | 2016  |
| 20                     | Introduction of the methodology for the detection of organochlorine pesticides  | Institute of Hydrometeorology and Environment of Mongolia  | 2016  |
| 21                     | Sampling of water in 2016 in the agreed-upon cross-sections for carrying out of the inter-laboratory comparative tests based on the divided water samples taken from the transboundary water bodies of Russia and Mongolia  | Federal State Budgetary Institution “Zabaikal’skaya Territorial Administration for Hydrometeorology” and Central Laboratory on Environment and Weights and Measures of Mongolia  | Agreed upon at the meeting of the joint workgroup |
| 22                     | Carrying out of the inter-laboratory comparative tests (ILCT) proposed by the Federal State Budgetary Institution “State Hydrochemical Institute” and agreed upon by the Mongolian side on:<br>- control solutions containing mercury and aluminum ions   | Federal State Budgetary Institution “State Hydrochemical Institute” – coordinator of activities; Federal State Budgetary Institution “Zabaikal’skaya Territorial Administration for Hydrometeorology” and Central Laboratory on Environment and Weights and Measures of Mongolia | Май-июнь 2016 г.                                  |

| <b>No</b>  | <b>Name of event</b>   | <b>Providers</b>  | <b>Completion schedule</b>       |
|--|--|---|----------------------------------|
| 23   | Wrapping up of the 2016 activities and making a decision about the results of the activities of the Harmonized Monitoring Program in the Selenga river basin and its development prospects | Federal State Budgetary Institution “State Hydrochemical Institute,” Federal State Budgetary Institution “Zabaikal’skaya Territorial Administration for Hydrometeorology ” and Central Laboratory on Environment and Weights and Measures of Mongolia and Institute of Hydrometeorology and Environment of Mongolia | October- November 2016, Ulan-Ude |
| *) Funding issues for the implementation of the Action Plan will be discussed in UNOPS |  |   |                                  |

## Annex A

**Table A.1: The characteristics of the functioning monitoring points of the National Monitoring System of the pollution of the Selenga River and its tributaries in the Russian territory.**

| No. subpt | Monitoring point and its number in the Administration for Hydrometeorological Monitoring | Monitoring cross section location   | Point category | Year of point launch | Location of verticals, sections of river breadth from the left bank | Coordinate number of vertical       | Distance from the estuary, km | Statement of purpose of the monitoring point launch   |
|-----------|--|---|----------------|----------------------|---|-------------------------------------|-------------------------------|---|
| 1         | 2  | 3   | 4              | 5                    | 6   | 7                                   | 8                             | 9   |
| 1         | The Selenga river, Naushki settlement, 17018   | 1.5 km west-southwest from the settlement, stream gauging   | 3              | 1970                 | 0.5   | 502010600                           | 402.0                         | Acquisition of information about river water quality in the area of state border with Mongolia  |
| 2         | The Selenga river, p. Селенга, Novoselenginsk settlement, 17019                          | 1.6 km downstream from the settlement, stream gauging   | 3              | 1970                 | 0.1   | 510010630                           | 273.0                         | Acquisition of information about large category river water quality near a settlement   |
| 3         | The Selenga river, Ulan-Ude, 17020   | <p>1. 2 km upstream from Ulan-Ude.</p> <p>2. 1km downstream from the city, 0.5 km downstream from the waste water disposal of the city waste treatment facilities.</p> <p>3. 22.5 km downstream from the city, stream gauging</p> | 2              | 1967                 | 0.5<br>0.5<br>0.5   | 515110731<br>515010732<br>520010720 | 163.0<br>148.5<br>127.0       | Acquisition of information about large category river water quality near a settlement with controlled waste water disposal and in the breeding and wintering area of commercially valuable fish |
| 4         | The Selenga river, village of Kabansk, 17021   | 1. 23.5 km upstream from the village, 3 km upstream from waste water disposal of the municipal waste treatment facility of the  | 2              | 1968                 | 0.5<br>0.5  | 520010640<br>520010641              | 67.0<br>63.2                  | Acquisition of information about river water quality near a settlement with controlled waste water disposal. Special monitoring: in the chemical substances suffusion monitoring                |

|  |  |   |  |  |     |           |      |  |
|--|--|---|--|--|-----|-----------|------|--|
|  |  | settlement of Selenginsk.<br>2. 19.7 km upstream from the village 0.8 km downstream from waste water disposal of the Selenginsk municipal waste treatment facility<br>3. 0.5 km downstream from the village, stream gauging |  |  | 0.5 | 520010642 | 43.0 | subsystem and in the national subsystem of GTOS/water. |
|--|--|---|--|--|-----|-----------|------|--|

*Annex 1 cont-d*

| 1  | 2   | 3  | 4 | 5    | 6          | 7                      | 8          | 9  |
|----|---|--|---|------|------------|------------------------|------------|--|
| 5  | The Selenga river, village of Murzino, 17022    | 0.4 km downstream from the village, stream gauging                                   | 3 | 1970 | 0.3        | 521010620              | 25.0       | Acquisition of information about the water quality on the main-stream station of the main tributary of Lake Baikal   |
| 6  | The Dzhida river, village of Khamnei, 17023     | 4 km upstream from the village, stream gauging                                       | 4 | 1970 | 0.5        | 502010350              | 318.0      | Acquisition of information about a medium category river water quality. Special monitoring: on the background monitoring point and in the national subsystem of GTOS/water |
| 7  | The Dzhida river, Dzhida railway station, 17024 | 3.5 km south-southwest from the railway station, stream gauging                      | 4 | 1963 | 0.1        | 503010600              | 21.0       | Acquisition of information about water quality on the main-stream station of a medium category river   |
| 8  | The Modonkul' river, town of Zakamensk, 17025   | 1. 2 km upstream from the town, stream gauging<br>2. 1.3 km downstream from the town | 4 | 1976 | 0.5<br>0.5 | 502010310<br>502010311 | 1.0<br>1.0 | Acquisition of information about river water quality near a settlement with controlled waste water disposal.   |
| 9  | The Temnik river, ulus Ulan-Udunga, 17026       | 1 km southwest from the ulus, stream gauging   | 4 | 1974 | 0.1        | 510010550              | 59.0       | Background monitoring point for the acquisition of information about a medium category river water quality.  |
| 10 | The Chikoi river, village of                    | 0.2 km downstream from the village, stream gauging                                   | 4 | 1962 | 0.5        | 501010830              | 385.0      | Acquisition of information about the water quality of a medium category  |

|    |  |   |   |      |     |           |       |   |
|----|--|---|---|------|-----|-----------|-------|---|
|    | Gremyachka,<br>17027                             |   |   |      |     |           |       | water course in the breeding and wintering area of commercially valuable fish   |
| 11 | The Chikoi river,<br>village of Chikoi,<br>17028 | 2 km east of the village,<br>stream gauging | 3 | 1968 | 0.1 | 501010650 | 130.0 | Acquisition of information about the water quality of a medium category river in the area near the state border with Mongolia |



Annex 1 cont-d

| 1  | 2  | 3  | 4 | 5    | 6          | 7                      | 8              | 9   |
|----|--|--|---|------|------------|------------------------|----------------|---|
| 12 | The Chikoi river, Povorot village, 17029   | 0.5 km upstream from the village, stream gauging   | 3 | 1969 | 0.5        | 505010630              | 22.0           | Acquisition of information about river water quality on the main-stream station of a medium category river            |
| 13 | The Asa river, Atsa village, 17031         | 4 km upstream from the village, stream gauging   | 4 | 1963 | 0.5        | 502010930              | 17.0           | Acquisition of information about river water quality on the background monitoring point                               |
| 14 | The Mensa river, village of Ukyr, 17032    | 0.4 km upstream from the village, stream gauging   | 4 | 1986 | 0.5        | 492010850              | 182.0          | Acquisition of information about river water quality at the crossing of the state boundary with Mongolia by the river |
| 15 | The Kiran river, village of Kiran, 17033   | 3 km from the state border, 17.5 km upstream from the GS   | 4 | 1964 | 0.5        | 52010641               | 20.0           | Acquisition of information about river water quality at the crossing of the state boundary with Mongolia by the river |
| 16 | The Khilok river, town of Khilok, 17034    | 1. 0.2 km upstream from the town, 0.8 km upstream from the stream gauging<br>2. 0.2 km downstream from the town, 3.5 km downstream from waste water disposal of the waste treatment facility of Khilok railway station | 3 | 1965 | 0.5<br>0.5 | 512011020<br>512011021 | 522.8<br>517.0 | Acquisition of information about river water quality near a settlement with controlled waste water disposal.          |
| 17 | The Khilok river, village of Maleta, 17035 | 0.5 km upstream from the village, 0.5 km upstream from the stream gauging  | 4 | 1960 | 0.5        | 505010820              | 250.5          | Acquisition of information about the water quality of a medium category river in the middle reaches                   |

|    |  |   |   |      |     |           |      |  |
|----|--|---|---|------|-----|-----------|------|--|
| 18 | The Khilok river, Khailastui hunters' lodge, 17036 | At the level of the hunters' lodge, stream gauging        | 3 | 1963 | 0.5 | 511010650 | 22.0 | Acquisition of information about river water quality on the main-stream station of a medium category river |
| 19 | The Bludnaya river, village of Engorok, 17037      | 0.5 km upstream from the village, 0.7 km upstream from GS | 4 | 1973 | 0.5 | 505011020 | 95.7 | Acquisition of information about river water quality on the background monitoring point                    |

*End of Annex 1*

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| 1  | 2   | 3   | 4 | 5    | 6          | 7                      | 8            | 9  |
|----|---|---|---|------|------------|------------------------|--------------|--|
| 20 | The Balyaga river, town of Petrovsk-Zabaikal'skii 17038 | 1. 0.5 km upstream from the town<br>2. 0.5 km downstream from the town  | 3 | 1976 | 0.5<br>0.5 | 511010850<br>511010853 | 51.5<br>35.0 | Acquisition of information about river water quality near a settlement with controlled waste water disposal.       |
| 21 | The Ungo river, village of Ust'-Ungo, 17039             | 1.5 km upstream from the village, stream gauging  | 4 | 1964 | 0.5        | 505010830              | 8.2          | Acquisition of information about the water quality in the estuary of a medium category water course                |
| 22 | The Kuitunka river, village of Tarbagatai, 17042        | 0.2 km upstream from the village, stream gauging км выше села, гидроствор   | 4 | 1963 | 0.5        | 512010720              | 12.0         | Acquisition of information about the water quality in the estuary area of a polluted tributary                     |
| 23 | The Uda river, Ulan-Ude, 17043                          | 1. 1 km upstream from the city, 7.9 km upstream from GS<br>2. Within the city limits, 3.6 km downstream from the GS | 3 | 1965 | 0.8<br>0.8 | 515010734<br>515010735 | 13.0<br>1.5  | Acquisition of information about the river water quality in the area of controlled industrial waste water disposal |
| 24 | The Ona river, village of Nizhnyaya Maila, 17052        | Within the village limits, stream gauging   | 4 | 1988 | 0.8        | 523011000              | 66.0         | Acquisition of information about the river water quality of a medium category river                                |
| 25 | The Kurba river, village of Novaya Kurba,               | 3 km upstream from the village, stream gauging  | 4 | 1964 | 0.1        | 520010830              | 4.7          | Acquisition of information about the water quality of a medium category river on the main-stream station           |

|    |   |  |   |      |     |           |      |   |
|----|---|--|---|------|-----|-----------|------|---|
|    | 17046   |  |   |      |     |           |      |   |
| 26 | The Bryanka river, Zaigraevo railway station, 17047 | 0.2 km upstream from the railway station, stream gauging | 4 | 1986 | 0.5 | 515010811 | 37.1 | Acquisition of information about the water quality of a medium category river |

**Table A.2: The characteristics of the functioning water quality monitoring points on the Selenga River and its tributaries in the Mongolian territory**

| No. subpt | River, monitoring point and its number in the National Agency for Hydrometeorology, Hydrology and Environmental Monitoring of Mongolia | Monitoring cross section location   | Year of point launch | Location of vertical from the bank, m | Coordinate number of vertical | Distance from the estuary, km | Statement of purpose of the monitoring point launch                           |
|-----------|--|---|----------------------|---------------------------------------|-------------------------------|-------------------------------|---|
| 1         | 2  | 3   | 4                    | 5                                     | 6                             | 7                             | 8   |
| 1         | The Selenga river, Dzunburen point, 20321  | 1.5 km west-southwest from the settlement, stream gauging                                   | 1964                 | 0.3                                   | 500610548                     | 503                           | Control over river water quality near the settlement                          |
| 2         | The Selenga river, Sukhe-Bator point, 20322  | 11 km from the state border, stream gauging   | 1980                 | 0.3                                   | 501510608                     | 470                           | Control over river water quality in an area near the state border with Russia |
| 3         | The Ider river, Dzurkh point, 20108  | 0.8 km downstream from the settlement, stream gauging                                       | 1958                 | 0.5                                   | 485610010                     | 80                            | Control over river water quality near the settlement                          |
| 4         | The Delgermuren river, Muren point 20103   | 8 km south-southwest from the town of Muren, cross section 400 meters downstream from waste | 1942                 | 0.5                                   | 493510009                     | 66                            | Control over river water quality near the settlement                          |

|          |   | water disposal   |          |          |           |          |   |
|----------|---|--|----------|----------|-----------|----------|---|
| 5        | The Bugsii river, Tomurbulag point, 20105   | 1.5 km upstream from the settlement, stream gauging        | 1963     | 0.5      | 491810016 | 35       | Control over river water quality near the settlement  |
| 6        | The Suman river, Tariat point, 20958        | Within the settlement boundaries                           | 1962     | 0.5      | 48099953  | 48       | Control over river water quality near the settlement  |
| 7        | The Chuluut river, Undur-Ulaan point, 20959 | 0.2 km downstream from the concrete bridge, stream gauging | 1961     | 0.5      | 481210021 | 72       | Control over river water quality in the vicinity of the gauging station   |
| 8        | The Eg-Gol river, Khantai point, 20217      | 0.2 km downstream from the settlement, stream gauging      | 1958     | 0.5      | 493310316 | 48       | Control over river water quality near the settlement  |
| 9        | The Uri river, Tsagaan-Uri point, 20107     | 2 km from the village, stream gauging                      | 1962     | 0.5      | 503310134 | 64       | Control over river water quality near the settlement  |
| 10       | The Orkhon river, Orkhon bagh point, 20323  | 0.4 km upstream from the village, stream gauging           | 1970     | 0.5      | 490910523 | 223      | Control over river water quality near the settlement  |
| <b>1</b> | <b>2</b>                                    | <b>3</b>   | <b>5</b> | <b>6</b> | <b>7</b>  | <b>8</b> | <b>9</b>  |
| 11       | The Orkhon river, Sukhebaatar point, 20324  | 3 km from the state border                                 | 1973     | 0.5      | 501410611 | 25       | Control over river water quality near the settlement  |
| 12       | The Khoittamir river, Ikhtamir point, 20955 | 2 km downstream from the settlement, stream gauging        | 1959     | 0.5      | 473910117 | 136      | Control over river water quality near the settlement  |
| 13       | The Zuunturuu river, Bulgan point, 20219    | Within the town limits of Bulgan                           | 1991     | 0.8      | 485010333 | 20.5     | Control over river water quality near the settlement  |
| 14       | The Khangal river, Zhargalant point, 216101 | 6 km southwest downstream from the village                 | 1997     | 0.5      | 485410433 | 32.8     | Acquisition of information about the river water quality near a settlement with controlled waste water disposal |
| 15       | The Tuul river, Ulaanbaatar point, 20430    | Within the city limits of Ulaanbaatar                      | 1942     | 0.5      | 475310656 | 547      | Acquisition of information about the river water quality near a settlement with controlled waste water disposal |
| 16       | The Tuul river, Lun point, 20433            | 0.5 km upstream from the town                              | 1997     | 0.5      | 475110511 | 351      | Control over river water quality near the settlement  |

|    |   |   |      |     |           |      |  |
|----|---|---|------|-----|-----------|------|--|
| 17 | The Terelzh river,<br>Terelzh station,<br>20431 | 1.5 km upstream from the<br>village, stream gauging         | 1969 | 0.8 | 475810728 | 14   | Control over river water quality near the<br>settlement  |
| 18 | The Kharaa river,<br>Darkhan point, 20743       | 1 km upstream from the<br>city, 7.9. km upstream from<br>GS | 1989 | 0.5 | 493510552 | 12   | Acquisition of information about the river water<br>quality in the area with controlled industrial<br>waste water disposal |
| 19 | The Sharyn Gol river,<br>Zhims station, 20744   | Within the village limits,<br>stream gauging                | 1996 | 0.8 | 494610610 | 6    | Control over river water quality near the<br>settlement  |
| 20 | The Iro river,<br>Dulaankhaan point,<br>20328   | Stream gauging  | 1981 | 0.5 | 495310615 | 5    | Control over river water quality near the<br>settlement  |
| 21 | The Khuder river,<br>Khuder point, 20326        | 3 km upstream from the<br>village, stream gauging           | 1981 | 0.8 | 494610728 | 38   | Control over river water quality near the<br>settlement  |
| 22 | The Zheltura river,<br>Zheltura point, 203146   | 0.2 km upstream from GS,<br>stream gauging                  | 2003 | 0.8 | 502110503 | 15,6 | Control over river water quality near the<br>settlement  |

## Annex B

**Table B.1: Program of measurement of pollutant content on the National Monitoring System monitoring points on the Selenga river and its tributaries in the Russian territory in 2012**

| No<br>·<br>sub<br>pt | Monitoring<br>point                          | Cross section number | Vertical | Monitoring point category | Type of measurement program with sampling frequency  | Measured pollutants   |   |                              |                |                    |                  |                |                       |   |            |                |              |                   |        |         |          |       |      |           |                   |               |
|----------------------|--|----------------------|----------|---------------------------|--|-----------------------|---|------------------------------|----------------|--------------------|------------------|----------------|-----------------------|---|------------|----------------|--------------|-------------------|--------|---------|----------|-------|------|-----------|-------------------|---------------|
|                      |  |                      |          |                           |  | COD, BOD <sub>5</sub> | NH <sub>4</sub> , NO <sub>2</sub> , NO <sub>3</sub> | Phosphates, total phosphorus | Polyphosphates | Organic phosphorus | Volatile phenols | Petrochemicals | Resins and asphaltene | Anionic synthetic surface active agents | Total iron | Cu, Zn, Cd, Pb | Total chrome | Hexavalent chrome | Mn, Ni | Mercury | Aluminum | V, Co | Fats | Fluorides | Hydrogen sulphide | α, γ-HCH, DDT |
| 1                    | 2  | 3                    | 4        | 5                         | 6  | 7                     | 8   | 9                            | 10             | 11                 | 12               | 13             | 14                    | 15                                      | 16         | 17             | 18           | 19                | 20     | 21      | 22       | 23    | 24   | 25        | 26                | 27            |
| 1                    | The Selenga river, Naushki settlement        | 1                    | 0,5      | 3                         | Reduced program # 3 (RP # 3) <sup>1)</sup> : 9 times<br>Mandatory program (MP) <sup>2)</sup> : 7 times | 9                     | 7   | 7                            | 7              | -                  | 9                | 9              | 9                     | 7                                       | 7          | 9              | -            | -                 | -      | 9       | -        | -     | -    | 9         | -                 | 6             |
| 2                    | The Selenga river, Novoselenginsk settlement | 1                    | 0,1      | 3                         | RP # 3: 9 times<br>MP: 7 times   | 9                     | 7   | 7                            | -              | -                  | 9                | 9              | -                     | 7                                       | 7          | 9              | -            | -                 | -      | -       | -        | -     | -    | -         | -                 | -             |
| 3                    | The Selenga river, Ulan-Ude                  | 1                    | 0,5      | 2                         | RP # 1 <sup>3)</sup> : 36 times  | 36                    | 7   | 7                            | -              | -                  | 36               | 36             | 12                    | 12                                      | 7          | 12             | -            | 7                 | 7      | 7       | 7        | -     | 12   | 7         | -                 | -             |
|                      |  | 2                    | 0,5      |                           | RP # 3: 12 times   | 36                    | 7   | 7                            | -              | -                  | 36               | 36             | 12                    | 12                                      | 7          | 12             | -            | 7                 | 7      | 7       | 7        | -     | 12   | 7         | -                 | -             |
|                      |  | 3                    | 0,5      |                           | MP: 7 times same   | 12                    | 7   | 7                            | -              | -                  | 12               | 12             | 12                    | 12                                      | 7          | 12             | -            | 7                 | 7      | 7       | 7        | 7     | -    | 12        | 7                 | -             |
|                      |  |                      |          |                           | RP # 3: 12 times   |                       |   |                              |                |                    |                  |                |                       |   |            |                |              |                   |        |         |          |       |      |           |                   |               |
|                      |  |                      |          |                           | MP: 7 times  |                       |   |                              |                |                    |                  |                |                       |   |            |                |              |                   |        |         |          |       |      |           |                   |               |

| No .<br>sub<br>pt | Monitoring<br>point                      | Cross section number | Vertical | Monitoring point category | Type of measurement program with sampling frequency | Measured pollutants   |   |                              |                |                    |                  |                |                        |   |            |                |              |                   |        |         |          |       |      |           |                   |               |
|-------------------|--|----------------------|----------|---------------------------|---|-----------------------|---|------------------------------|----------------|--------------------|------------------|----------------|------------------------|---|------------|----------------|--------------|-------------------|--------|---------|----------|-------|------|-----------|-------------------|---------------|
|                   |  |                      |          |                           |   | COD, BOD <sub>5</sub> | NH <sub>4</sub> , NO <sub>2</sub> , NO <sub>3</sub> | Phosphates, total phosphorus | Polyphosphates | Organic phosphorus | Volatile phenols | Petrochemicals | Resins and asphaltenes | Anionic synthetic surface active agents | Total iron | Cu, Zn, Cd, Pb | Total chrome | Hexavalent chrome | Mn, Ni | Mercury | Aluminum | V, Co | Fats | Fluorides | Hydrogen sulphide | α, γ-HCH, DDT |
| 4                 | The Selenga river, village of Kabansk    | 1                    | 0,5      | 2                         | RP # 3: 12 times                                    | 12                    | 12  | 7                            | -              | -                  | 12               | 12             | 12                     | 7                                       | 7          | 12             | -            | -                 | -      | -       | -        | -     | 12   | -         | 12                | -             |
|                   |  | 2                    | 0,5      |                           | MP: 7 times   | 8                     | 8   | 5                            | -              | -                  | 8                | 8              | 8                      | 5                                       | 5          | 8              | -            | -                 | -      | -       | -        | -     | 8    | -         | 8                 | -             |
|                   |  | 3                    | 0,5      |                           | RP # 3: 8 times<br>MP: 5 times                      | 12                    | 12  | 7                            | 7              | 7                  | 12               | 12             | 12                     | 7                                       | 7          | 12             | -            | -                 | -      | -       | -        | -     | -    | 12        | -                 | 12            |
| 5                 | The Selenga river, village of Murzino    | 1                    | 0,3      | 3                         | RP # 3: 9 times<br>MP: 7 times                      | 9                     | 9   | 9                            | -              | -                  | 9                | 9              | 9                      | 9                                       | 9          | 9              | -            | -                 | -      | -       | -        | -     | -    | -         | -                 | -             |
| 6                 | The Dzhida river, village of Khamnei     | 1                    | 0,5      | 4                         | MP: 5 times   | 5                     | 5   | 5                            | -              | -                  | 5                | 5              | -                      | 5                                       | 5          | 5              | -            | -                 | -      | -       | -        | -     | -    | -         | -                 | -             |
| 7                 | The Dzhida river, Dzhida railway station | 1                    | 0,1      | 4                         | MP: 5 times   | 5                     | 5   | 5                            | -              | -                  | 5                | 5              | 5                      | 5                                       | 5          | 5              | -            | -                 | -      | -       | -        | -     | -    | -         | -                 | -             |
| 8                 | The Modonkul' river, town of Zakamensk   | 1                    | 0,5      | 4                         | MP: 5 times   | 5                     | 5   | 5                            | -              | -                  | 5                | 5              | -                      | 5                                       | 5          | 5              | -            | -                 | -      | -       | -        | -     | -    | 5         | -                 | -             |
|                   |  | 2                    | 0,5      |                           |   | 5                     | 5   | 5                            | -              | -                  | 5                | 5              | -                      | 5                                       | 5          | 5              | 5            | -                 | -      | -       | -        | -     | -    | -         | 5                 | -             |
| 9                 | The Temnik river, Ulan-Udunga settlement | 1                    | 0,1      | 4                         | MP: 4 times   | 4                     | 4   | 4                            | -              | -                  | 4                | 4              | -                      | 4                                       | 4          | 4              | -            | -                 | -      | -       | -        | -     | -    | -         | -                 | -             |
| 10                | The Chikoi river, Gremyachka             | 1                    | 0,5      | 4                         | MP: 4 times   | 4                     | 4   | 4                            | -              | -                  | 4                | 4              | -                      | 4                                       | 4          | 4              | 4            | -                 | 4      | -       | -        | 4     | -    | -         | -                 | 3             |

| No<br>sub<br>pt | Monitoring<br>point                         | Cross section number | Vertical   | Monitoring point category | Type of measurement program with sampling frequency | Measured pollutants   |   |                              |                |                    |                  |                |                        |   |            |                |              |                   |        |         |          |        |        |           |                   |               |        |        |        |        |        |        |        |        |        |        |   |   |  |
|-----------------|---|----------------------|------------|---------------------------|---|-----------------------|---|------------------------------|----------------|--------------------|------------------|----------------|------------------------|---|------------|----------------|--------------|-------------------|--------|---------|----------|--------|--------|-----------|-------------------|---------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---|---|--|
|                 |   |                      |            |                           |   | COD, BOD <sub>5</sub> | NH <sub>4</sub> , NO <sub>2</sub> , NO <sub>3</sub> | Phosphates, total phosphorus | Polyphosphates | Organic phosphorus | Volatile phenols | Petrochemicals | Resins and asphaltenes | Anionic synthetic surface active agents | Total iron | Cu, Zn, Cd, Pb | Total chrome | Hexavalent chrome | Mn, Ni | Mercury | Aluminum | V, Co  | Fats   | Fluorides | Hydrogen sulphide | α, γ-HCH, DDT |        |        |        |        |        |        |        |        |        |        |   |   |  |
|                 | village                                     |                      |            |                           |   |                       |   |                              |                |                    |                  |                |                        |   |            |                |              |                   |        |         |          |        |        |           |                   |               |        |        |        |        |        |        |        |        |        |        |   |   |  |
| 11              | The Chikoi river, Chikoi settlement         | 1                    | 0,1        | 3                         | RP # 3: 8 times<br>MP: 7 times                      | 8                     | 8   | 8                            | -              | -                  | 8                | 8              | 8                      | 8                                       | 8          | 8              | -            | -                 | -      | -       | -        | -      | -      | -         | -                 | -             | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | - | 3 |  |
| 12              | The Chikoi river, Povorot village           | 1                    | 0,5        | 3                         | RP # 3: 8 times<br>MP: 7 times                      | 8                     | 8   | 8                            | -              | -                  | 8                | 8              | -                      | 8                                       | 8          | 8              | -            | -                 | -      | -       | -        | -      | -      | -         | -                 | -             | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | - | - |  |
| 13              | The Asa river, Atsa village                 | 1                    | 0,5        | 4                         | MP: 4 times   | 4                     | 4   | 4                            | -              | -                  | 4                | 4              | -                      | 4                                       | 4          | 4              | 4            | -                 | 4      | -       | -        | 4      | -      | -         | 4                 | -             | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | - | - |  |
| 14              | The Menza river, Ukyr village               | 1                    | 0,5        | 4                         | MP: 5 times   | 5                     | 5   | 5                            | -              | -                  | 5                | 5              | 5                      | 5                                       | 5          | 5              | 5            | -                 | 5      | -       | -        | 5      | -      | -         | 5                 | -             | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | 3 |   |  |
| 15              | The Kiran river, Kiran village              | 1                    | 0,5        | 4                         | MP: 4 times   | 4                     | 4   | 4                            | -              | -                  | 4                | 4              | 4                      | 4                                       | 4          | 4              | -            | -                 | -      | -       | -        | -      | -      | -         | -                 | -             | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | 3 |   |  |
| 16              | The Khilok river, town of Khilok            | 1<br>2               | 0,5<br>0,5 | 3                         | MP: 5 times<br>same                                 | 5<br>5                | 5<br>5  | 5<br>5                       | -<br>-         | -<br>-             | 5<br>5           | 5<br>5         | -<br>-                 | 5<br>5                                  | 5<br>5     | 5<br>5         | 5<br>5       | -<br>-            | 5<br>5 | -<br>-  | -<br>-   | 5<br>5 | -<br>- | -<br>-    | 5<br>5            | -<br>-        | -<br>- | -<br>- | -<br>- | -<br>- | -<br>- | -<br>- | -<br>- | -<br>- | -<br>- | 4<br>- |   |   |  |
| 17              | The Khilok river, Maleta village            | 1                    | 0,5        | 4                         | MP: 5 times   | 5                     | 5   | 5                            | -              | -                  | 5                | 5              | -                      | 5                                       | 5          | 5              | 5            | -                 | 5      | -       | -        | 5      | -      | -         | 5                 | -             | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | - |   |  |
| 18              | The Khilok river, Khailastui hunters' lodge | 1                    | 0,5        | 3                         | MP: 7 times   | 7                     | 7   | 7                            | -              | -                  | 7                | 7              | -                      | 7                                       | 7          | 7              | -            | -                 | -      | -       | -        | -      | -      | -         | -                 | -             | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | - |   |  |
| 19              | The Bludnaya                                | 1                    | 0,5        | 4                         | MP: 4 times   | 4                     | 4   | 4                            | -              | -                  | 4                | 4              | -                      | 4                                       | 4          | 4              | 4            | -                 | 4      | -       | -        | 4      | -      | -         | 4                 | -             | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | - |   |  |



| No<br>sub<br>pt | Monitoring<br>point   | Cross section number | Vertical | Monitoring point category | Type of<br>measurement<br>program with<br>sampling<br>frequency | Measured pollutants   |   |                                 |                |                       |                  |                |                           |  |            |                |              |                      |        |         |          |       |      |           |                   |               |   |
|-----------------|---|----------------------|----------|---------------------------|---|-----------------------|---|---------------------------------|----------------|-----------------------|------------------|----------------|---------------------------|--|------------|----------------|--------------|----------------------|--------|---------|----------|-------|------|-----------|-------------------|---------------|---|
|                 |   |                      |          |                           |   | COD, BOD <sub>5</sub> | NH <sub>4</sub> , NO <sub>2</sub> , NO <sub>3</sub> | Phosphates, total<br>phosphorus | Polyphosphates | Organic<br>phosphorus | Volatile phenols | Petrochemicals | Resins and<br>asphaltenes | Anionic synthetic<br>surface active agents | Total iron | Cu, Zn, Cd, Pb | Total chrome | Hexavalent<br>chrome | Mn, Ni | Mercury | Aluminum | V, Co | Fats | Fluorides | Hydrogen sulphide | α, γ-HCH, DDT |   |
|                 | river, Engorok<br>village                                   |                      |          |                           |   |                       |   |                                 |                |                       |                  |                |                           |  |            |                |              |                      |        |         |          |       |      |           |                   |               |   |
| 20              | The Balyaga<br>river, town of<br>Petrovsk-<br>Zabaikal'skii | 1                    | 0,5      | 3                         | MP: 5 times   | 5                     | 5   | 5                               | -              | -                     | 5                | 5              | -                         | 5  | 5          | 5              | 5            | -                    | 5      | -       | -        | 5     | -    | -         | -                 | -             | - |
|                 |   | 2                    | 0,5      |                           |   | 5                     | 5   | 5                               | -              | -                     | 5                | 5              | -                         | 5  | 5          | 5              | 5            | -                    | 5      | -       | -        | 5     | -    | -         | -                 | -             | - |
| 21              | The Ungo<br>river, Ust'-<br>Ungo village                    | 1                    | 0,5      | 4                         | MP: 4 times   | 4                     | 4   | 4                               | -              | -                     | 4                | 4              | -                         | 4  | 4          | 4              | 4            | -                    | 4      | -       | -        | 4     | -    | -         | -                 | -             | 3 |
| 22              | The Kuitunka<br>river,<br>Tarbagatai<br>village             | 1                    | 0,5      | 4                         | MP: 4 times   | 4                     | 4   | 4                               | -              | -                     | 4                | 4              | -                         | 4  | 4          | 4              | -            | -                    | -      | -       | -        | -     | -    | -         | -                 | -             | - |
| 23              | The Uda river,<br>Ulan-Ude                                  | 1                    | 0,8      | 3                         | RP # 3: 12<br>times   | 12                    | 7   | 7                               | -              | -                     | 12               | 12             | 12                        | 7  | 7          | 12             | -            | 7                    | 7      | -       | 7        | -     | 12   | 7         | -                 | -             |   |
|                 |   | 2                    | 0,8      |                           | MP: 7 times<br>То же  | 12                    | 7   | 7                               | -              | -                     | 12               | 12             | 12                        | 7  | 7          | 12             | -            | 7                    | 7      | -       | 7        | -     | 12   | 7         | -                 | -             |   |
| 24              | The Ona river,<br>Nizhnyaya<br>Maila village                | 1                    | 0,8      | 4                         | MP : 4 times  | 4                     | 4   | 4                               | -              | -                     | 4                | 4              | -                         | 4  | 4          | 4              | -            | -                    | -      | -       | -        | -     | -    | -         | -                 | -             |   |
| 25              | The Kurba<br>river, Novaya<br>Kurba village                 | 1                    | 0,1      | 4                         | MP: 4 times   | 4                     | 4   | 4                               | -              | -                     | 4                | 4              | -                         | 4  | 4          | 4              | -            | -                    | -      | -       | -        | -     | -    | -         | -                 | -             |   |
| 26              | The Bryanka<br>river,                                       | 1                    | 0,5      | 4                         | MP: 4 times   | 4                     | 4   | 4                               | -              | -                     | 4                | 4              | -                         | 4  | 4          | 4              | -            | -                    | -      | -       | -        | -     | -    | -         | -                 | -             |   |

| No<br>sub<br>pt | Monitoring<br>point       | Cross section number | Vertical | Monitoring point category | Type of measurement program with sampling frequency | Measured pollutants   |   |                              |                |                    |                  |                |                        |   |            |                |              |                   |        |         |          |       |      |           |                   |               |  |  |  |  |  |  |
|-----------------|---------------------------|----------------------|----------|---------------------------|---|-----------------------|---|------------------------------|----------------|--------------------|------------------|----------------|------------------------|---|------------|----------------|--------------|-------------------|--------|---------|----------|-------|------|-----------|-------------------|---------------|--|--|--|--|--|--|
|                 |                           |                      |          |                           |   | COD, BOD <sub>5</sub> | NH <sub>4</sub> , NO <sub>2</sub> , NO <sub>3</sub> | Phosphates, total phosphorus | Polyphosphates | Organic phosphorus | Volatile phenols | Petrochemicals | Resins and asphaltenes | Anionic synthetic surface active agents | Total iron | Cu, Zn, Cd, Pb | Total chrome | Hexavalent chrome | Mn, Ni | Mercury | Aluminum | V, Co | Fats | Fluorides | Hydrogen sulphide | α, γ-HCH, DDT |  |  |  |  |  |  |
|                 | Zaigraevo railway station |                      |          |                           |   |                       |   |                              |                |                    |                  |                |                        |   |            |                |              |                   |        |         |          |       |      |           |                   |               |  |  |  |  |  |  |

1) – RP # 3 is a reduced measurement program according to which all characteristic pollutants for a monitoring point are measured on a monthly basis. Also measured are temperature, electric conductivity, dissolved oxygen, COD, BOD<sub>5</sub> and hydrological indices;

2) – MP is a mandatory program according to which all indices for a monitoring point are determined;

3) – RP # 1 is a reduced program according to which such indices as temperature, electric conductivity, dissolved oxygen and hydrological indices as well as 2-3 pollutants typical of a certain point are measured.

**Table B. 2. Program of measurement of pollutant content on the monitoring points on the Selenga river and its tributaries in the Mongolian territory in 2012**

| No. subpt | Monitoring point                     | Cross section number | Vertical | Type of measurement program with sampling frequency | Measured substances   |                       |   |            |                  |                |   |              |            |                |           |        |              |    |
|-----------|--------------------------------------|----------------------|----------|---|---|-----------------------|---|------------|------------------|----------------|---|--------------|------------|----------------|-----------|--------|--------------|----|
|           |                                      |                      |          |   | Water temperature, pH, electric conductivity, permanganate demand, suspended solids | O <sub>2</sub> , BOD5 | NH <sub>4</sub> , NO <sub>2</sub> , NO <sub>3</sub> | Phosphates | Volatile phenols | Petrochemicals | Anionic synthetic surface active agents | Chrome (VI), | Total iron | Cu, Zn, Cd, Pb | Fluorides | Mn, Ni | Mercury (Hg) |    |
| 1         | 2                                    | 3                    | 4        | 5   | 6   | 7                     | 8   | 9          | 10               | 11             | 12                                      | 13           | 14         | 15             | 16        | 17     | 18           | 19 |
| 1         | The Selenga river, Dzunburen point   | 1                    | 0.3      | MP: 12 times  | 12  |                       | 12  | 12         |                  |                |   |              | 12         |                | 12        |        |              |    |
| 2         | The Selenga river, Sukhebator point  | 1                    | 0.3      | MP: 12-24 times                                     | 24  | 24                    | 12  | 12         |                  | 2              |   | 12           | 24         |                | 24        |        |              |    |
| 3         | The Ider river, Dzurkh point         | 1                    | 0.5      | MP: 9 times   | 9   |                       | 9   | 9          |                  |                |   |              | 9          |                | 9         |        |              |    |
| 4         | The Delgermuren river, Muren point   | 1                    | 0.5      | MP: 12 times  | 12  | 12                    | 12  | 12         |                  | 2              |   | 6            | 12         |                | 12        |        |              |    |
| 5         | The Bugsii river, Tomurbulag point   | 1                    | 0.5      | MP: 4 times   | 4   |                       | 4   | 4          |                  |                |   |              | 4          |                | 4         |        |              |    |
| 6         | The Suman river, Tariat point        | 1                    | 0.5      | MP: 5 times   | 5   |                       | 5   | 5          |                  |                |   |              | 5          |                | 5         |        |              |    |
| 7         | The Chuluut river, Undur-Ulaan point | 1                    | 0.5      | MP: 5 times   | 5   |                       | 5   | 5          |                  |                |   |              | 5          |                | 5         |        |              |    |
| 8         | The Eg-Gol river, Khantai point      | 1                    | 0.5      | MP: 5 times   | 5   |                       | 5   | 5          |                  |                |   |              | 5          |                | 5         |        |              |    |
| 9         | The Uri river, Tsagaan-Uri point     | 1                    | 0.5      | MP: 5 times   | 5   |                       | 5   | 5          |                  |                |   |              | 5          |                | 5         |        |              |    |

| No. subpt | Monitoring point                     | Cross section number | Vertical | Type of measurement program with sampling frequency | Measured substances   |                       |   |            |                  |                |   |              |            |                |           |        |              |    |
|-----------|--------------------------------------|----------------------|----------|---|---|-----------------------|---|------------|------------------|----------------|---|--------------|------------|----------------|-----------|--------|--------------|----|
|           |                                      |                      |          |   | Water temperature, pH, electric conductivity, permanganate demand, suspended solids | O <sub>2</sub> , BOD5 | NH <sub>4</sub> , NO <sub>2</sub> , NO <sub>3</sub> | Phosphates | Volatile phenols | Petrochemicals | Anionic synthetic surface active agents | Chrome (VI), | Total iron | Cu, Zn, Cd, Pb | Fluorides | Mn, Ni | Mercury (Hg) |    |
| 1         | 2                                    | 3                    | 4        | 5   | 6   | 7                     | 8   | 9          | 10               | 11             | 12                                      | 13           | 14         | 15             | 16        | 17     | 18           | 19 |
| 10        | The Orkhon river, Orkhon bagh point  | 1                    | 0.5      | MP: 5 times   | 5   |                       | 5   | 5          |                  |                |   |              | 5          |                | 5         |        |              |    |
| 11        | The Orkhon river, Sukhebaatar point  | 1                    | 0.5      | MP: 12 times  | 12  | 12                    | 12  | 12         |                  | 2              |   | 6            | 12         |                | 12        |        |              |    |
| 12        | The Khoittamir river, Ikhtamir point | 1                    | 0.5      | MP: 6 times   | 6   |                       | 6   | 6          |                  |                |   |              | 6          |                | 6         |        |              |    |
| 13        | The Zunturuu, Bulgan point           | 1                    | 0.8      | MP: 6 times   | 6   |                       | 6   | 6          |                  |                |   |              | 6          |                | 6         |        |              |    |
| 14        | The Khangal river, Erdenet point     | 1                    | 0.5      | MP: 12 times  | 24  | 24                    | 12  | 12         |                  | 2              |   | 6            | 24         |                | 24        |        |              |    |
| 14        | The Khangal river, Zhargalant point  | 1                    | 0.5      | MP: 6 times   | 6   | 6                     | 6   | 6          |                  |                |   |              | 6          |                | 6         |        |              |    |
| 15        | The Tuul river, Ulaanbaatar point    | 1                    | 0,5      | MP: 9 times   | 9   | 9                     | 9   | 9          |                  | 6              |   | 6            | 9          | 6              | 9         | 6      | 6            |    |
| 16        | The Tuul river, Lun point            | 1                    | 0,5      | MP: 6 times   | 6   |                       | 6   | 6          |                  |                |   |              | 6          | 6              | 6         | 6      | 6            |    |
| 17        | The Terelzh river, Terelzh station   | 1                    | 0,8      | MP: 5 times   | 5   | 5                     | 5   | 5          |                  |                |   | 5            | 5          | 2              | 5         | 2      | 2            |    |
| 18        | The Kharaa river, Darkhan point      | 1                    | 0,5      | MP: 12 times  | 12  | 12                    | 12  | 12         |                  | 7              |   | 7            | 12         |                | 12        |        |              |    |
| 19        | The Sharyn Gol river, Zhims          | 1                    | 0.8      | MP: 8 times   | 8   | 8                     | 8   | 8          |                  |                |   | 6            | 8          |                | 8         |        |              |    |

| No. subpt | Monitoring point                   | Cross section number | Vertical | Type of measurement program with sampling frequency | Measured substances   |                       |   |            |                  |                |   |              |            |                |           |        |              |    |
|-----------|------------------------------------|----------------------|----------|---|---|-----------------------|---|------------|------------------|----------------|---|--------------|------------|----------------|-----------|--------|--------------|----|
|           |                                    |                      |          |   | Water temperature, pH, electric conductivity, permanganate demand, suspended solids | O <sub>2</sub> , BOD5 | NH <sub>4</sub> , NO <sub>2</sub> , NO <sub>3</sub> | Phosphates | Volatile phenols | Petrochemicals | Anionic synthetic surface active agents | Chrome (VI), | Total iron | Cu, Zn, Cd, Pb | Fluorides | Mn, Ni | Mercury (Hg) |    |
| 1         | 2                                  | 3                    | 4        | 5   | 6   | 7                     | 8   | 9          | 10               | 11             | 12                                      | 13           | 14         | 15             | 16        | 17     | 18           | 19 |
|           | station                            |                      |          |   |   |                       |   |            |                  |                |   |              |            |                |           |        |              |    |
| 20        | The Iro river, Dulaankhaan point   | 1                    | 0.5      | MP: 9 times   | 9   |                       | 9   | 9          |                  |                |   |              | 9          |                | 9         |        |              |    |
| 21        | The Khuder river, Khuder point     | 1                    | 0.5      | MP: 4 times   | 4   |                       | 4   | 4          |                  |                |   |              | 4          |                | 4         |        |              |    |
| 22        | The Zheltura river, Zheltura point | 1                    | 0.8      | MP: 4 times   | 4   |                       | 4   | 4          |                  |                |   |              | 4          |                | 4         |        |              |    |

## Annex B

**Table B. 1: List of indices measured in the water samples by the Russian and Mongolian sides using commensurable analysis methodologies**

| Measured indicator             | Methodologies used and their characteristics   |   |   |                                  | Note                     |
|--------------------------------|--|---|---|----------------------------------|--------------------------|
|                                | In Russia  |   | In Mongolia   |                                  |                          |
|                                | Methodologies used (cipher, measurement method principle)  | Minimum detectable concentration        | Methodologies used (cipher, measurement method principle)   | Minimum detectable concentration |                          |
| Temperature                    | RD 52.24.496-2005, temperature, transparency and odor of the surface waters. Measurement method  | 0 °C                                    |   | 0 °C                             |                          |
| Specific electric conductivity | RD 52.24.495-2005, pH value and specific electric conductivity of waters. Methodology of measurement by the electrometric method           | 0.005mS/cm                              | MNS ISO 4889:99<br>Methodology of measurement by the conductometric method                          | No data available                |                          |
| pH value                       | RD 52.24.495-2005 pH value and the specific electric conductivity of waters. Methodology of measurement by the electrometric method        | 4 pH units                              | MNS ISO 10523:2001<br>Methodology of measurement by the electrometric method                        | 3-10                             | -                        |
| Suspended solids               | RD 52.24.468-2005 Suspended solids and total content of impurities in water. Methodology of measurement by the gravimetric method          | 5 mg/cubic dm                           | MNS ISO 11923:2001<br>Methodology of measurement by the gravimetric method                          | 2 mg/cubic dm                    |                          |
| Dissolved oxygen               | RD 52.24.419-2005 Mass concentration of dissolved oxygen in water. Methodology of measurement by the iodometry method                      | 1 mg/cubic dm                           | MNS (ISO) 4816:99<br>Methodology of measurement by the iodometry method                             | 0.05 mg/cubic dm*                | -                        |
| Sulphates                      | RD 52.24.405-2005 Mass concentration of sulphates in waters. Methodology of measurement by the turbidimetric method                        | 2 mg/cubic dm                           | MNS 6271:2010<br>Methodology of measurement by the turbidimetric method                             | 0.5 mg/cubic dm*                 | -                        |
| Calcium                        | RD 52.24.403-2007 Methodology of measurement of mass concentration of calcium in water by the titrimetric method of analysis with Trilon B | 1 mg/cubic dm                           | MNS (ISO) 2572:99<br>Methodology of measurement by the titrimetric method of analysis with Trilon B | 0.5 mg/cubic dm                  | -                        |
| Magnesium                      | RD 52.24.395-2007 Hardness of water. Methodology of measurement by the titrimetric method of analysis with Trilon B                        | -                                       | Calculation method  | -                                | Limited commensurability |
| Hardness of water              | RD 52.24.395-2007 Hardness of water. Methodology of measurement by the titrimetric method of analysis with Trilon B                        | 0,06<br>ммоль/дм <sup>3</sup><br>КВЭ ** | MNS ISO 6059:2001<br>Methodology of measurement by the titrimetric method of analysis               | 0.5 mg-eq/cubic dm               |                          |

| Measured indicator                   | Methodologies used and their characteristics  |                                  |   |                                  | Note   |
|--------------------------------------|---|----------------------------------|---|----------------------------------|--|
|                                      | In Russia   |                                  | In Mongolia   |                                  |  |
|                                      | Methodologies used (cipher, measurement method principle)   | Minimum detectable concentration | Methodologies used (cipher, measurement method principle)   | Minimum detectable concentration |  |
|                                      |   |                                  | with Trilon B   |                                  |  |
| Sum of sodium and potassium ions     | RD 52.24.514-2002 Methodology of calculation of the total molar (mass) concentrations of sodium and potassium ions, the total mass concentration of ions in the water                               |                                  | Calculation method  |                                  | -  |
| Nitrate nitrogen                     | RD 52.24.380 – 2006 Mass concentration of nitrates in waters. Methodology of measurement by the photometric method with Griess reagent after reduction in the cadmium reduction gear                | 0.01 mg/cubic dm                 | MNS 4217:1994 Methodology of measurement by the photometric method with sodium salicylate           | 0.1 mg/cubic dm                  | Limited commensurability (commensurable with nitrate nitrogen concentration of over 0.5 mg/cubic dm) |
| Nitrite nitrogen                     | RD 52.24.381- 2006 Mass concentration of nitrites in waters. Methodology of measurement by the photometric method with Griess reagent.  | 0.01 mg/cubic dm                 | MNS 4431:2005 Methodology of measurement by the photometric method with Griess reagent.             | 0.007 mg/cubic dm                | -  |
| Phosphates (expressed as phosphorus) | RD 52.24.382-2005 Mass concentration of phosphates and polyphosphates in waters. Methodology of measurement by the photometric method   | 0.01 mg/cubic dm                 | MNS ISO 6878:2001 Methodology of measurement by the photometric method with ammonium orthomolybdate | 0.005 mg/cubic dm                | -  |
| Silicium                             | RD 52.24.432-2005 Mass concentration of silicates in the surface waters of the land. Methodology of measurement by the photometric method in the form of blue (reduced) form of molybdosilicic acid | 0.1 mg/cubic dm                  | MNS ISO 3535:1983 Methodology of measurement by the photometric method with molybdosilicic acid     | 0.02 mg/cubic dm                 | -  |
|                                      | RD 52.24.433-2005 Mass concentration of silicates in the surface waters of the land. Methodology of measurement by the photometric method in the form of yellow form of molybdosilicic acid         | 0.5 mg/cubic dm                  |   |                                  | -  |
| BOD <sub>5</sub>                     | RD 52.24.420-2006 BOD in waters. Methodology of measurement by the light and dark bottle  | 1.0 mg/cubic dm                  | MNS ISO 5815:2001 Methodology of measurement by   | 3 мг/дм <sup>3</sup>             | Limited commensurability   |

| Measured indicator   | Methodologies used and their characteristics              |                                  |   |                                  | Note  |
|--|---|----------------------------------|---|----------------------------------|---|
|  | In Russia   |                                  | In Mongolia   |                                  |   |
|  | Methodologies used (cipher, measurement method principle) | Minimum detectable concentration | Methodologies used (cipher, measurement method principle) | Minimum detectable concentration |   |
|  | method.   |                                  | the light and dark bottle method.                         |                                  | (comparison is possible during the analysis of polluted waters) |
| Note –<br>* - detection limit<br>** - mol/cubic dm molar equivalent or mg-eq/cubic |   |                                  |   |                                  |   |

**Table B. 2: List of indices measured in the water samples by the Russian and Mongolian sides using non-commeasurable analysis methodologies**

| Measured indicator | Methodologies used and their characteristics  |                                  |   |                                  | Note   |
|--------------------|---|----------------------------------|---|----------------------------------|--|
|                    | In Russia   |                                  | In Mongolia   |                                  |  |
|                    | Methodologies used (cipher, measurement method principle)   | Minimum detectable concentration | Methodologies used (cipher, measurement method principle)                               | Minimum detectable concentration |  |
| Chlorides          | RD 52.24.402-2011 Mass concentration of chlorides in waters. Methodology of measurement by the mercurymetric method   | 1 mg/cubic dm                    | MNS 3976-87 Methodology of measurement by the mercurymetric method                      | 10 mg/cubic dm                   | Non-commeasurable (the concentration of chlorides for the observed water bodies is mostly lower than 10 mg/cubic dm) |
| Hydrocarbonates    | RD 52.24.493-2006 Mass concentration of hydrocarbonates and water alkalinity value of the surface waters of the land and treated effluents. Methodology of measurements by the titrimetric method | 10 mg/cubic dm                   | MNS 4425-97 Methodology of measurements by the potentiometric method                    | 0.5 mg/l                         | Insufficient information   |
| Ammonium nitrogen  | RD 52.24.383-2005 Mass concentration of ammonia and ammonia ions in the surface waters of the land. Methodology of  | 0.02 mg/cubic dm                 | MNS 4428-97 Methodology of measurement by the photometric method with Nessler's reagent | 0.05 mg/cubic dm                 | Non-commeasurable, measurement with Nessler's reagent is   |



| Measured indicator   | Methodologies used and their characteristics   |                                  |  |                                  | Note  |
|----------------------|--|----------------------------------|--|----------------------------------|---|
|                      | In Russia  |                                  | In Mongolia  |                                  |   |
|                      | Methodologies used (cipher, measurement method principle)  | Minimum detectable concentration | Methodologies used (cipher, measurement method principle)  | Minimum detectable concentration |   |
|                      | measurement by the photometric method in the form of indophenol blue   |                                  |  |                                  | insensitive and non-selective   |
| Total dissolved iron | RD 52.24.377-2008 Mass concentration of Al, Be, V, Fe, Cd, Co, Mn, Cu, Mo, Ni, Pb, Ag, Cr and Zn in waters. Methodology of measurement by the atomic absorption method with direct electrothermal atomization of samples | 0.01 mg/cubic dm                 | MNS 4430:2005<br>Methodology of measurement by the photometric method with rhodanide                 | 0.05 mg/cubic dm                 | Non-commeasurable, measurement with rhodanide is insensitive and insufficiently selective |
|                      | RD 52.24.358-2006 Mass concentration of total iron in waters. Methodology of measurement by the photometric method with 1.10-phenanthroline  | 0.02 mg/cubic dm                 |  |                                  |   |
| COD                  | RD 52.24.421-2007 Methodology of measurement of COD in waters  | 4.0 mg/cubic dm                  | MNS ISO 6060:2001<br>Methodology of measurement by the titrimetric method                            | 30 mg/dm                         | Non-commeasurable in sensibility  |
| Petrochemicals       | RD 52.24.454-2006 Mass concentration of petroleum components in waters. Methodology of measurement by the IR-photometric and luminescent methods using thin layer chromatography   | 0.05 mg/cubic dm                 | MNS 17.1.5.15-80<br>Methodology of measurement of petroleum components in waters                     | -                                | Insufficient information  |
| Chrome (VI)          | RD 52.24.446-2008 Mass concentration of chrome (VI) in waters. Methodology of measurement by the photometric method with diphenylcarbazine   | 1 µg/cubic dm                    | MNS ISO 11083:2001<br>Methodology of measurement by the photometric method with diphenylcarbazine    | 0.05 mg/cubic dm                 | Non-commeasurable, detection according to ISO 11083 is insensitive                        |
| Zinc                 | RD 52.24.377-2008 (see title above)  | 2 µg/cubic dm                    | MNS ISO 4421:99<br>Methodology of measurement by the atomic absorption method with flame atomization | 0.05 mg/cubic dm                 | Non-commeasurable in sensibility  |
|                      | MU 08-47/163 Natural water, drinking water, technologically pure, purified effluent. Methodology of measurement of mass concentration of Cd, Pb, Zn and Cu by the method of stripped voltammetry.                        | 0.5 µg/cubic dm                  |  |                                  |   |
| Nickel               | RD 52.24.377-2008 (see title above)  | 5 µg/cubic dm                    | MNS ISO 4421:99<br>Methodology of measurement by   | 0.1 mg/cubic dm                  | Non-commeasurable in sensibility  |
|                      | PND F 14.1:2:4.202-03 Methodology of   | 10 µg/cubic                      |  |                                  |   |

| Measured indicator | Methodologies used and their characteristics  |                                  |   |                                  | Note                             |
|--------------------|---|----------------------------------|---|----------------------------------|----------------------------------|
|                    | In Russia   |                                  | In Mongolia   |                                  |                                  |
|                    | Methodologies used (cipher, measurement method principle)   | Minimum detectable concentration | Methodologies used (cipher, measurement method principle)                           | Minimum detectable concentration |                                  |
|                    | measurement of mass concentration of Ni in natural, drinking and waste water samples by the photometric method using "Fluorat 2" fluid analyzer.  | dm                               | the atomic absorption method with flame atomization                                 |                                  |                                  |
| Cadmium            | RD 52.24.377-2008 (see title above)   | 0.1 µg/cubic dm                  |   | 0.02 mg/cubic dm                 |                                  |
|                    | MU 08-47/163 (see title above)  | 0.2 µg/cubic dm                  |   |                                  |                                  |
| Lead               | RD 52.24.377-2008 (see title above)   | 2 µg/cubic dm                    |   | 0.2 mg/cubic dm                  |                                  |
|                    | MU 08-47/163 (see title above)  | 0.2 µg/cubic dm                  |   |                                  |                                  |
| Copper             | RD52.24.377-2008 (see title above)  | 1.0 µg/cubic dm                  |   | 0.05 mg/cubic dm                 |                                  |
|                    | MU 08-47/163 (see title above)  | 0.5 µg/cubic dm                  |   |                                  |                                  |
| Cobalt             | RD 52.24.377-2008 (see title above)   | 2 µg/cubic dm                    | 0.1 mg/cubic dm   |                                  |                                  |
| Mercury            | MU 08-47/162 Natural water, drinking water, purified effluent. Voltammetric method of measurement of mercury mass concentration                   | 0.04 µg/cubic dm                 | MNS 6184:2010 Methodology of measurement by the cool vapor atomic absorption method | 1 µg/cubic dm                    | Non-commeasurable in sensibility |
| Fluorides          | RD 52.24.360-2008 Mass concentration of fluorides in waters. Methodology of measurement by the potentiometric method with ionoselective electrode | 0.19 µg/cubic dm                 | MNS ISO 10359-1:2002  | 0,02 мг/дм <sup>3</sup>          | Non-commeasurable in sensibility |

**Table B. 3: List of indices measured in water samples by the Russian side only and analysis methodologies used**

| Measured indicator                      | Methodologies used (cipher, measurement method principle)   | Minimum detectable concentration |
|---|---|----------------------------------|
| Manganese                               | PND F 14.1:2:4.188-02 Measurement methodology of mass concentration of manganese in natural, drinking and waste water samples by the photometric method using “Fluorat-02” fluid analyzer.  | 10 µg/cubic dm                   |
| Aluminium                               | PND F 14.1:2:4.181-02. 02 Measurement methodology of mass concentration of aluminum in natural, drinking and waste water samples by the photometric method using “Fluorat-02” fluid analyzer.   | 10 µg/cubic dm                   |
| Total chrome                            | RD 52.24.377-2008 (see title above)   | 1 µg/cubic dm                    |
| Total phosphorus                        | RD 52.24.387-2006 Mass concentration of total phosphorus in waters. Measurement methodology by the photometric method after persulphate oxidation   | 0.02 mg/cubic dm                 |
| Anionic synthetic surface active agents | RD 52.24.368-2006 Mass concentration of anionic synthetic surface active agents in waters. Methodology of measurement by the extraction-photometric method.   | 0.01 mg/cubic dm                 |
| Alpha-, gamma-HCH                       | RD 52.24.412-2009 Mass concentration of HCB, alpha-, beta- and gamma-HCH, dicophol, dihydroheptachlor, 4,4'- dichlorodiphenyltrichloroethane, 4,4'- dichlorodiphenyldichloroethylene, 4,4'- dichlorodipenyldichloroethan and trifluraline in waters. Methodology of measurement by the gas chromatographic method | 0.002 µg/cubic dm                |
| 4,4'-dichlorodiphenyltrichloroethane    |   | 0,02 µg/cubic dm                 |