

**Report on the TACIS Project  
«Caspian Water Quality Monitoring and Action Plan for Areas of Pollution  
Concern»  
(Kazakhstan)**

Astana, 2008

<b>Contents</b>		pg.
	Introduction	3
1.	The structure of the monitoring system in Kazakhstan	4
2.	Existing structure of water quality monitoring	8
3.	Ecological standards	14
4.	Laboratories, observation and floating facilities	17
5.	Methodological and informational support	25
6.	The status of the sea water by hydro-chemical indicators	31
7.	The status of the sea water by hydro-chemical indicators	39
	Appendices	41-64

## **Introduction**

Caspian Sea plays an exceptional role for Kazakhstan, not only because of its oil and gas reserves, prospects for the expansion of transport opportunities and unique biological resources, but due to the exclusive historical and cultural importance of the Caspian for the country. The Government of Kazakhstan therefore attributes all the issues related to Caspian sea to strategic issues and includes them in many government and sectoral programs.

At the same time, in recent years environmental situation in the Kazakh sector of the Caspian Sea remains to be complex. It is very important therefore for Kazakhstan to conduct studies which would eventually improve the environmental condition of this water body including through the improvement of monitoring system.

In order to develop trusted approaches to the improvement of the system of marine environment pollution observation it is necessary to previously analyze the current situation. It is for this reason that this report encompasses information on the existing present-day normative legal acts of Kazakhstan regarding environmental monitoring, the analysis of the monitoring laboratories status, their equipment status, measurement and testing methods, as well as brief overview of the sea research ships. In addition, the report contains a brief overview of the status of the sea water pollution and the “hot spots”.

The objective of such generalized report is to analyze the current status of the system of monitoring of pollution in the Kazakhstan sector of Caspian Sea so as to develop, jointly with international experts, the most efficient ways to improve the Caspian water pollution observation system. This is a very topical issue for Kazakhstan in the light of large scale activities on oil production planned to be carried out in the nearest future in the Kazakhstan sector of the sea.

## **1. The structure of the environmental monitoring system in Kazakhstan**

Legislative framework for the protection of the environment in Kazakhstan, including in the Kazakhstan sector of the Caspian Sea, is the Environmental Code of Republic of Kazakhstan (RK) which came into force at the end of 2006. The Code represents a set of most of the laws and normative legal acts related to the protection of the country's environment/ It provides regulation of sources of pollution through the use of the comprehensive system of permits, standards and payments.

It should be particularly mentioned that the Environmental Code includes a special section concerning the requirements to economic activities/ industrial operations in the natural reserve area of the northern part of the Caspian Sea.

With regard to the status of environmental and natural resources monitoring, there are a number of independent departmental structures and services in Kazakhstan.

Thus, monitoring is implemented by the territorial subdivisions of:

- Ministry of Environmental Protection (MEP);
- Ministry of Agriculture (MOA) incorporating the Forestry and Hunting Committee, Fisheries Committee and Water Resources Committee;
- State Agency for the Management of Land Resources;
- State Sanitary-Epidemiological Service under the Ministry of Public Health;
- Committee for Geology and Protection of Deposits under the Ministry of Energy and Mineral Resources;
- Ministry of Emergencies.

In addition, economic entities perform industrial monitoring.

In order to combine the efforts of different ministries and departments the Single State System of Environmental and Natural Resources Monitoring (SSSENRM, or shortly SSSM) was developed in Kazakhstan. By the Resolution of the Government of Republic of Kazakhstan of June 27, 2001, №885 the Rules for the Organization and Introduction of SSSM (hereinafter – the Rules) were approved. The functions of methodological governance, as well as ensuring and coordination of the SSSM operation at the republican level are assigned to the Ministry of Environmental Protection (MEP).

The Rules set the concept, tasks and objectives and functions of SSSM, as well as its structure, meaning and the procedure for the implementation of monitoring and sources of finance.

SSSM is a multi-purpose information system that includes monitoring of the state of the environment and natural resources, as well as the analysis of data related to the condition of the environment and natural resources to ensure environmental

security, conservation, reproduction and rational management of natural resources in Republic of Kazakhstan.

The purpose of the SSSM is provision of informational support to the decision making process in administrative and economic issues, and control over the use of natural resources, information of the population on the status of the environment and the impacts of environmental factors on the health status of the population.

The SSSM objectives include:

- obtaining (with the required degree of efficiency), systematization, processing and dissemination of the objective information on the state of the environment and its components, man-made sources of pollution and the factors affecting the environment;
- evaluation, determination of dynamics and forecasting changes of the environment, natural resources and human health;
- elaboration of recommendations (options for managerial/administrative decisions) aimed towards the improvement or conservation of the state of the environment and reduction of adverse impacts of human/anthropogenic activities.
- determination of cause-and-effect relations between the health status of the population and the impacts of environmental factors;
- formation of the monitoring data base;
- evaluation of the efficiency of administrative/managerial decisions and measures taken to ensure environmental security, conservation, reproduction rational management of natural resources, ensuring sanitary-epidemiological safety of the population;
- informational and methodological support of the participants of monitoring process and the public for their efficient interaction.

This system is not yet duly organized until now and has not achieved the required level of efficiency.

The subjects of the state environmental monitoring system in the provinces (oblasts) are:

- the oblast public or other bodies and organizations authorized to organize and perform environmental monitoring of separate sub-systems in the oblast territory;
- industrial, agricultural and other organizations, independent entrepreneurs – users of natural resources.

The bodies authorized to organize and conduct monitoring in different areas (sub-systems) are:

- Oblast (provincial) Territorial Boards for Environmental Protection ;
- Hydro-Meteorological Centers (Kazgidromet) the Oblast;
- Oblast (provincial) State Sanitary and Epidemiological Surveillance Boards;
- Oblast Public Health Boards;

- Oblast Committees for Land Resource Management;
  - Basin Water Management Boards;
  - Territorial Boards for the Management of Protection and Use of Natural Deposits
  - Territorial Forestry and Hunting Boards;
  - Oblast Territorial Boards of the MOA of Republic of Kazakhstan;
  - Oblast Boards of Emergencies;
- and other bodies and organizations authorized to conduct environmental monitoring in accordance with the respective area of activity and competence.

Since not all the above listed organizations bear direct relation to water pollution monitoring, following is the description of the main functions of some of them within the scope of implementation of this project.

***Oblast Territorial Boards for Environmental Protection (TBEPs)***

TBEPs – territorial board of environmental protection under the MEP are special authorized public bodies exercising, independently and in collaboration with other public bodies, the functions of environmental protection control and management in the territories of respective oblasts (provinces).

It is necessary, within the scope of this project, to mention their function regarding ensuring of environmental monitoring, establishment of ecological standards, issuance of permits for discharges, emissions, placement of waste in the environment, as well as coordination, upon the presentation by special authorized bodies, of limits and permits for the right of possession and use of water and land resources and conducting state environmental expert assessment, etc.

Industrial enterprises are liable to submit to the territorial boards for environmental protection (TBEPs ) for the approval thereof of annual programs of action on environmental protection and rational use of natural resources that encompass information on annual environmental stress in terms of atmospheric air and water pollution and waste disposal/placement of waste/.

Based on these programs the enterprises develop and implement their own monitoring programs and submit them for the approval by TBEPs. The program covers pollutants by ingredients, as well as periodicity and sampling spots for sea water or atmospheric air sampling –analytical control schedules. Sea water quality is usually monitored for complete chemical analysis of sea water and oil products. On the basis of these programs the enterprises conduct environmental pollution monitoring. The monitoring program contains the description of place where monitoring was conducted, its frequency, methods and equipment used. The results of the internal monitoring conducted by an enterprise are reported to the Ministry of Environmental Protection (MEP) (with periodicity varying from once a month to once a year depending on the size of an enterprise). Annual monitoring results

are submitted to MEP. In accordance with the adopted Environmental Code the public now has access to the results of monitoring conducted by enterprises.

In order to ensure observance of legislation, MEP conducts inspections that allow checking the presence of permits for discharges polluting the environment, documents and registration of monitoring conducted by enterprises. In accordance with the Environmental Code 5 types of inspection may be conducted инспекций (routine, casual/off-schedule/, check-up, patrol and joint inspections). At that, permitted and factual emissions/discharges are compared and corresponding payments fixed on the basis thereof.

### ***Hydro-Meteorological Centers (HMCs)***

Hydro-meteorological centers within the structure of the Republican State Enterprise (RSE) “Kazgidromet” perform methodological guidance of the network of hydro-meteorological observation posts located in the area of the HMC activity, conduct environmental monitoring on the territorial level. It is important to point out that they are responsible for monitoring of the status of on-land surface waters, including the quality of surface waters.

There exists a strict differentiation of monitoring activities between the MEP and Kazgidromet units. Thus, MEP is responsible for the monitoring of sources of discharges, while Kazgidromet conducts monitoring of the environment.

***Oblast Boards for Sanitary and Epidemiological Surveillance*** exercise control over the sanitary-epidemiological situation and surveillance of the observance by enterprises, institutions, organizations, officials and citizens of sanitary rules and standards, hygienic standards and sanitary legislation.

***Basin Water Management Boards*** (hereinafter BWMBs) are public bodies for the management of use and protection of water resources subordinate to the Water Resources Committee of the Ministry of Agriculture. In respect of protection of water resources the role of BWMBs is usually limited to setting water protection areas and zones. BWMBs are not involved in water quality monitoring and accordingly have no monitoring laboratories and staff.

### ***Territorial Boards of Geology and Deposits Management***

Public bodies of territorial board for the protection and management of natural deposits belong to the Committee of Geology and Protection of Deposits under the Ministry of Energy and Mineral Resources. One should mention one of the functions of this is Board pertaining to the organization of monitoring and protection of ground waters.

On the whole it is worth mentioning that at present there is no realistic/practicable/structural, methodological, metrological and informational approach to conducting environmental monitoring. Specialized agencies conduct uncoordinated monitoring

activities, but there is no reliable data base. Often times therefore there is lack of comprehensive information for making effective administrative/managerial decisions.

The existing monitoring systems and services are subordinate to the departments, dissociated in the view of methodology and organization, and practically there is no coordination of activities between them.

Levels of monitoring: Republican, territorial (administrative territory), local (industrial).

At present on the republican level operational monitoring levels are hydro-meteorological monitoring and monitoring of atmospheric air, surface waters and bottom sediment carried out by Kazgidromet.

Territorial and local levels of monitoring are underdeveloped. Users of natural resources conduct industrial monitoring on account of their own funds, within the limits of nature use facilities under their jurisdiction, based on the programs for obtaining data on spatial and temporal diffusion of pollution in the environmental mediums approved by the authorized body. Due to the concernment of users of natural resources there is no guarantee of reliability and objectivity of industrial monitoring. Therefore, perhaps it is necessary to organize universal повсеместный full-scale monitoring throughout the country.

Users of natural resource exercising special use of natural resources are obliged to conduct industrial monitoring. Many enterprises conclude industrial monitoring contracts with certified (accredited) laboratories.

With a view to further improve environmental monitoring system there is a need, in addition to the existing normative legal acts, in the elaboration and approval of additional normative legal acts on the evaluation of damage inflicted to the ecosystem of the Caspian Sea when conducting all kind of works (method for estimation of damage in case of oil product spills, MPC for oil products and revision of other ingredients in bottom sediment).

## **2. Existing structures of water monitoring system**

The main Kazakhstan's nature protection body is the Ministry of Environment Protection (MEP). The number of staff of the central apparatus of the Ministry is 111, and that of the Committee for Nature Protection Supervision is 37.

Environmental protection system at local levels includes environmental protection agencies at the oblast (province) level which are the departments of natural resources management and control of akimats (mayor's offices). Total number of staff employed in these departments is 1500, i.e. about 80 per town or province. These structures are a part of akimats, but in respect of technical issues they are subordinate to MEP. Basic objectives of these departments are collection of

pollution dues, control over industrial discharges and management of the provincial (oblast) nature protection programs.

Part of the Ministry of Emergencies (ME) is the marine inspection service, or “State Inspectorate and Supervision of Safe Exploitation of Offshore Oil Deposits” (hereinafter “Service”). The head office of this organization is based in Atyrau with its branch in Aktau. The Service is responsible for the enforcement of two legal instruments: Rules of Marine (Shippings) Safety and Technical Rules for the Construction of the Offshore Oil Facilities. It is empowered to conduct, at any time, inspections of oil exploration, production and pipe installation, etc., works carried out by offshore and coastal organizations.

Ministry of Agriculture (MA) bears responsibility for the issuance of permits for the use of natural resources, including water.

Kazgidromet (Kazakhstan Hydrometeorology) is one of the state servicing organizations subordinate to MEP, but is independent from the Ministry in terms of finance. The number of staff in Kazgidromet is about 100. Kazgidromet is not engaged in the collection of samples and environmental analysis, which is the Ministry’s control and enforcement function. Environmental monitoring is carried out totally independently from the monitoring of industrial emissions and discharges.

According to the Decree of the Government of Republic of Kazakhstan (RK) of March 2, 1999, one of the major objectives the Republican State Enterprise Kazgidromet (RSE Kazgidromet) is conducting regular hydro-meteorological observations and environmental monitoring. The Kazgidromet Charter was approved on August 1, 2003. Environmental monitoring within Kazgidromet is performed by the RK Centre for Environmental Monitoring. Its main objectives are:

- regular operating observations (sampling and analysis/testing of samples) across the stationary network of the status of pollution of major environmental components (air, atmospheric precipitation, snow cover, surface waters and marine water, soil) by composition, frequency and volume of indicators subjected to regulation; and radiation monitoring;
- organization of observations/control of the level of pollution of trans-boundary watercourses at cross-sections located in borderland territories;
- collection, processing and analysis of information on the status of environmental pollution in Republic of Kazakhstan;
- assessment of the current status of pollution of the main watercourses of Kazakhstan by biogenic agents;
- formation and introduction of single informational environmental monitoring system.

In practice Kazgidromet’s interaction with MEP is realized as follows. MEP produces annually Requirements Specifications for RSE Kazgidromet for implementation of activities under the Program 008 “Conducting observations of

the status of the environment”. In accordance with the Requirements Specifications these activities are implemented within the framework of environmental surveillance program. In 2007 environmental monitoring was conducted (including in the Caspian coastal area) on the following activities:

- establishment of environmental monitoring in the territory of the special economic zone “Aktau Sea Port»;
- establishment of environmental monitoring of the Kazakhstan section of the Caspian Sea.

The quality and completeness of the Kazgidromet’s measurements is tested by means of internal control. The head Republican laboratory supplies oblast (provincial) laboratories with state standard patterns against which reliability of data analysis results is checked. External independent audit is non-existent. Separate laboratories (Kazgidromet’s and TBEP’s) conduct joint episodic expeditionary visits to the sites, followed by chemical tests made by each laboratory separately and comparison of the results obtained. Once in three years assessment of the laboratory measurement procedures (attestation/certification) is conducted and certificate is granted based on the results of assessment. Starting from 2007 laboratories, in accordance with the Environmental Code, conduct accreditation. Completeness of measurements is controlled internally on the basis of internal inspections; external/independent/ control is not conducted/non-existent/.

Following chemical tests, initial data, in the processed format, are sent to the Environmental Information Department of the Environmental Monitoring Centre (EMC). The data obtained are entered into the *AZOIZA* program/software/, where statistical processing of the results is performed. To operate this software product all data are entered manually. It is even more so inconvenient in that it’s non-dynamic and fails to take account of demands of the times. Currently introduction of a software product providing electronic input of data and wider range of calculations is in process. The product is part of a *Single State Monitoring System* (SSMS) which development and introduction is envisaged in the Environmental Code. The data are further analyzed and included in monthly and decade bulletins and annual and semi-annual reports. Such information is compiled separately for each the above mentioned activities carried out under Program 008. Annually the year-book “Annual data on surface waters quality” (State Water Cadastre of RK) is published, which contains information on the status of water bodies for the previous year. All these data are forwarded to the Department of Sustainable Development, Science, Analysis and Education, MEP, and “*IAIQ (Information Analytical Centre) MEP*” for placement of all information on the MEP site. All information is also disseminated depending on the requests received.

In case if the excesses of the established limits of pollution or high or extremely high level of pollution is detected, this information is sent, without fail, to the Nature Protection Control Committee, TBEPs of provinces where such excess is

detected, as well as to the Department of Environmental Problems. Meteorological forecasters in separate oblast (province) centers draw the forecasts of unfavorable meteorological conditions conducive to air pollution (Almaty, Ust-Kamenogorsk, Shipment, Aktobe, Taraz) which allow warning of the onset of conditions resulting in higher levels of pollution. These data are channeled, in accordance with the established scheme, to the surveillance institutions – TBEP, SES (Sanitary Epidemiological Station), Urban Traffic Inspectorate (UTI), MOE (Ministry of Emergencies).

Environmental monitoring is currently being introduced in the Caspian region. At present observations of pollution of the atmospheric air and atmospheric precipitation, surface and sea waters, soils and bottom sediments and radiation status are conducted.

Meteorological observation network in the Caspian region (Atyrau and Mangystau oblasts) includes 20 meteorological stations, of which 6 are international (*info*) exchange stations. Observations of total ozone content and electromagnetic transmission probing /radios sounding/ are also conducted at the meteorological station Atyrau.

Hydrologic operations are implemented at the following hydro-posts: Ural river – village Mahambet, Ural river – Atyrau city, Emba river – village Akmechet, Volga river delta, channel Kigach – village Kotyaevka and channel Sharonovka – village Ganushkino. The rules and requirements for conducting hydro-meteorological observations in the territory of Republic of Kazakhstan are set in the Instructions for hydro-meteorological stations and posts issued in 2002-2003.

Normative document regulating operation of the Kazgidromet network institutions at the Caspian Sea is the “Guidelines for hydrological operations at the coastal stations and posts” agreed at the State Standardization Board (Gosstandart) of Republic of Kazakhstan in 1998.

Observations of atmospheric air pollution are conducted at the stationary posts of Atyrau and Aktau cities, as well as at the route posts in the territory of FEZ (free economic zone) “Sea port Aktau” (check post in the FEZ territory).

Observation of chemical composition of atmospheric precipitation and snow cover is performed from the beginning of the year by means of monthly sampling of precipitation at meteorological stations: in Atyrau – Pershnoy, in Aktau – FEZ and Fort Shevchenko. Precipitation sample testing is performed in the EMC laboratory of the RSE “Kazgidromet”, with samples being tested for 10 indicators: cations: ammonium, sodium, potassium, calcium, magnesium; anions - sulphates, chlorides, nitrates; acidity (pH value) and specific electric conductivity. In addition, if the sample volume so allows, testing is conducted for heavy metals content.

Sampling of the surface waters is performed at control section lines on the Ural river and its tributaries, as well as the Volga river channels Kigach and Sharonovka assigned to the hydrological posts. Water sampling is performed in parallel with the hydrological observations and determination of physical properties (temperature, color, clarity, and odor). In the surface water samples concentration of suspended substances is determined, as well as main/chief ions, biogenic agents and pollutants, such as oil products, phenols, metal compounds, hydrogen ion exponent (pH) and chemical and biochemical oxygen consumption for the 5-day period.

Observations of the condition of the sea water and bottom sediment are performed at the costal stations (coastal waters of the Ural river, Tengiz), stations located at the ancient strip pits of the Kazakhstan section of the Caspian Sea, control posts in the area of activity (water area) of a special economic zone “Sea Port Aktau”. In accordance with the list of pollutants discharged into the sea the content of oil products, main/chief ions, nitric compounds, phosphates, iron, heavy metals, as well as the physical condition of water are determined.

Soil sampling for tests for the contents of oil products and heavy metals is conducted in the cities of Aktau and Atyrau, as well as at the large oil-field of the region and the territory of FEZ “Sea Port Aktau”.

According to the budget-funded Program 008 “Conducting observations of the status of the environment in the Kazakhstan section of the Caspian Sea”, observation posts were established to observe the status of the sea waters and bottom sediment at the following coastal stations and stations at the ancient strip pits of the Caspian Sea in Atyrau and Mangystau oblasts (provinces).

***Atyrau oblast:***

Coastal stations – coastal waters of Ural river – 7 stations, Tengiz– 5 stations. The schedule of hydro-chemical observation provides quarterly sampling (total of 48 samples);

- stations at the ancient strip pits – strip pit Shalygy – Kulaly – 7 stations, additional strip pit A – 5 stations, additional strip pit B – 4 stations. The schedule of hydro-chemical observation provides quarterly sampling (total of 64 samples).

The program of observation of the sea water status covers the following mandatory hydro-chemical indicators: pH, suspended substances, dissolved oxygen, dry residue (mineralization), BOD<sub>5</sub> (Biological Oxygen Demand), main/chief ions of the mineral content, phosphates, ammonium, nitrites, nitrates, total iron, SSAS (Synthetic Surface Active Substances), oil products, phenols, heavy metals (Cd, Pb, Zn, Cu, Hg, Cr, Ni, As, Mn).

The program of observation of the status of bottom sediment in the aforementioned posts covers the following indicators: heavy metals (Cd, Pb, Zn, Cu, Hg, Cr, Ni, As, Mn), oil products.

The schedule for conducting observations of the status of bottom sediment is established as follows: for coastal stations – twice a year (24 samples), for ancient strip pit stations – twice a year (32 samples).

***Mangystau oblast:***

Coastal stations – Kalamkas, Fetisovo, Fort Shevchenko. The schedule of hydro-chemical observation provides quarterly sampling (total of 12 samples);

- ancient strip pit stations – strip pit Mangyshlak – Chechen island – 3 stations, strip pit Peschany – Derbent – 3 stations, strip pit Kenderly – Divichi B – 3 stations. The schedule of hydro-chemical observation provides quarterly sampling (total of 36 samples).

The program of observation of the sea waters status in the Mangystau region covers the following mandatory hydro-chemical indicators: pH, suspended substances, dissolved oxygen, dry residue (mineralization), BOD<sub>5</sub>, main (chief) ions of the mineral content phosphates, ammonium, nitrites, nitrates, total iron, SSAS, oil products, phenols, heavy metals (Cd, Pb, Zn, Cu, Hg, Cr, Ni, As, Mn).

The program of observation of the bottom sediment in the stated posts covers the following indicators: heavy metals (Cd, Pb, Zn, Cu, Hg, Cr, Ni, As, Mn), oil products.

The schedule of observation of the bottom sediment is established as follows: for coastal stations – twice a year (6 samples), for ancient strip pit stations – twice a year (18 samples).

Basic water quality criteria by chemical indicators are the values of maximum permissible concentrations (MPCs) of pollutants for water bodies of the fisheries, domestic and public /cultural and welfare/ water consumption sectors.

The level of surface waters pollution is assessed based on the value of complex water pollution index (WPI) used for the comparison and detection of dynamics of water quality in Republic of Kazakhstan.

### 3. Ecological standards

The following environmental control indices are established in Kazakhstan:

- water pollution index (WPI);
- maximum permissible concentration (MPC);
- maximum permissible discharge (MPD);
- since 2007 – maximum permissible adverse effect (MPAD) on the surface water bodies (developed in accordance with the Water Code of RK).

The only one of these indices regulated by the state standards framework of Republic of Kazakhstan is the MPC index for watercourses and water bodies depending on specific destination (fisheries, domestic, drinking or recreational).

MPD (depending on the line of activity of an economic entity) for enterprises is established by RK MEP territorial boards, except for the first category enterprises, for which establishment of MPD is the prerogative of the Ministry.

Of such indicators as drinking and irrigation quality, the water pollution index (WPI) is the only one that is being measured on a regular basis in Kazakhstan (RSE “Kazgidromet” – for complex evaluation of the surface waters pollution).

The WPI is determined on the basis of “Methodological recommendations on formalized complex evaluation of the surface and sea waters quality” approved by State Hydro-Meteorology Committee of the USSR in 1988.

The indicators “drinking water quality” and “irrigation water quality” are assessed only by special request of individual water users and water consumers.

The operating sampling and sample processing standards include the following:

- GOST (State Standard) 17. 1.5.05 –85 “Nature protection. Hydrosphere. General requirements for sampling of surface and sea waters, ice and atmospheric precipitation”;
- GOST 17. 1.5. 01- 80 “Nature protection. Hydrosphere. General requirements for sampling of bottom sediment of water bodies for pollution testing”;
- RK Standard GOST P 51592 – 2003 “Water. General sampling requirements”;
- Instruction on sampling in surveillance of soil contamination by oil and oil products. Basic requirements. Order of the Ministry of Environmental Protection of RK №65-П of 22.02.06. GOST 17.4.3.01083 “Nature protection. Soils. General sampling requirements»
- Methodological guidelines for the organization and procedure of analytical control of water bodies pollution. Basic requirements. Order of MEP RK №66-П of 22.02.06г. Sampling and sample conservation for the purpose of chemical testing. ST RK GOST P 51592-2003 “General requirements for water sampling».

- RRD (Republican Regulative Document) 211.3.01.06-97 ОНД-90. Regulation on control of the atmospheric air pollution.

Water quality standards are also placed in Appendix 4.

In accordance with the Law of Republic of Kazakhstan “On ensuring uniformity of measurements” methods of conducting measurements (MCM) of content of the components in the objects analyzed (where the procedure for preparation of samples for testing, conducting measurement of the determinate component, computation of concentrations and control of accuracy of measurement are established) shall be certified from the standpoint of metrology and put on the register of the state system for ensuring uniformity of measurements of Republic of Kazakhstan. Each determinate component is provided with separate MCM.

On the whole, quotas for emissions in the environment are established by the authorized body in the field of environmental protection for the 1-2 class hazards and by the territorial board for environmental protection (TBEP) for the 3-4-5 class hazards.

The competence of the authorized body covers management of the register of nature users and sources of environmental pollution and their accounting, including sewage waters. On the basis of monitoring and inspection observations, in case of revelation of violations of environment protection legislation that are fixed in a Prescription Report, the ruling is passed of imposition of an administrative penalty; administrative penalties are imposed on officials and legal entities, and computation of environmental damage is produced to the legal entity.

In conducting control over the observation of environmental legislation by the nature users of RK, public inspectors are governed by article 114 of the Environmental Code “Areas of state environmental control” depending on the specific activities of the given enterprise.

For the purpose of control of reliability of measurements made by nature users by means of their own, the Ministry of Environmental Protection shall need to check for the presence of certification for conducting calibration of measuring devices and the certificate of entry in the State Register of RK, as well as the period of validity of certificates.

Discharge of any waters to the Caspian Sea, except for those meeting clarity standards, is forbidden. The compliance of the standard-wise clear waters discharged in the outfall and inlet channels (for example, by “MAEK-Kazatomprom” Partnership Ltd) with the established criteria of quality of the environment is controlled by the MEP’s laboratory through the weekly water sampling for the pollutants content test, as well as monthly analysis of reports of enterprises.

In pursuance of the Order №72-П of 27.04.2007 the Protocol of Interaction in information sharing and control of accuracy of measurements of environmental pollution between MEP and Kazgidromet was put into action. Simultaneous and joint measurements of atmospheric air samples and other measurements are performed.

#### **4. Laboratories, observation and floating facilities**

##### ***Major analytical laboratories***

On the Kazakhstan sector of the Caspian coast laboratories are available with “Kazgidromet” and Territorial Boards for Environmental Protection under the Department of Nature Management of the Atyrau oblast akimat –SUE (State Utility Enterprise) “Analytical environmental protection laboratory”.

The best equipped and staffed with highly qualified personal is the SUE “Analytical environmental protection laboratory”. The laboratory is certified (certificate of accreditation № kz 7100000.06.10.00790 of October 1 октября 2005). The laboratory is prepared for accreditation on the basis of ISO 17025. More detailed description of testing methods and standards used by the laboratory are shown below.

In 2007 the laboratory took part in:

- the program of inter-laboratory comparative testing organized within the framework of budget-funded program № 013 “Improvement of standardization, metrology and certification system” of February 28, 2007, arranged by the Centre of Laboratory Support of Environmental, Hydro-chemical and Engineering-geological Research “Ecohydroanalytic” (certificate № 009-2007).

- comparative testing of water conducted within the Project “Adjip KSO” by CHEMEX Company for the content of the following ingredients: in the water - BOD, ХПК, metals, phenols, ASAS (Anionic Surface Active Substances) ammonium ions, nitrates, nitrites, phosphates; in the soil – pH, exchangeable calcium, exchangeable magnesium, mobile (labile/loose) form of phosphorus, copper, zinc, chlorides, sulfates and oil products, mercury, zinc, chromium, cadmium, lead, copper.

For the purpose of checking the quality of results of testing/measurements/internal check-ups shall be carried out in the laboratory aimed at the evaluation of correctness, accuracy and precision (convergence) of testing (measurement) results. The accuracy of testing/measurement/ of results is obtained by means of:

- involvement of highly qualified personnel;
- accurate/efficient/ and competent application of testing/measurement techniques;
- use of measuring devices of the required class of accuracy and required resolution capacity.

The accuracy of testing and detection of possible errors shall be ensured by means of application of state (interstate) standard patterns/assays/ and conducting tests for precision (convergence) and repeatability of results.

Acceptance of assays (samples) coming for testing together with the sampling statement shall be performed in accordance with the “Instruction for sampling and

movement of samples (assays)". At the time of acceptance of samples by the authorized person assigned by the order, identification of samples for compliance with the data indicated in the sampling statement shall be carried out. Samples are registered afterwards in the sample log.

Testing of samples (assays) in the laboratory is carried out based on the stated field of accreditation and in accordance with the requirements set in the normative documents for testing methods and by the date specified with the customer.

Primary results obtained and calculations made during testing shall be entered in the operating logs by the specialists conducting tests.

Final results of testing are entered in the results log on the basis of which the person responsible for the preparation of a report draws a testing report. The testing report shall be signed by the head of the laboratory and a person responsible for drawing a report (head of division) and registered in the report issuance log. In the event of absence of the head of the laboratory, the registration procedure and issuance of the test reports shall be performed by the head of division.

Two copies of a report shall be drawn, of which one shall be kept in the laboratory (hard copy and electronic archives), and another one shall be handed over to the customer, with the indication of date and signature of receipt in the test report issuance log.

### ***Kazgidromet laboratories.***

Each oblast Hydro-Meteorological Centre has a laboratory for testing air and water quality (complex laboratories). The Republican laboratory, in addition to these two tests, carries out testing of soils and radiation status – gamma-radiation and beta-activity.

Despite significant efforts made by the government in recent years to rehabilitate the full-power operation of Kazgidromet, it failed to compensate in full the consequences of scaling under financing that started in mid 80s of the last century. The process of macro-economic transformations which started as far back as under the USSR regime at the time of "perestroika" (restructuring) and continued until mid 1990s when Kazakhstan obtained independence, was of negative impact on the development of hydro-meteorology service. For many years financing of national hydrometeorology service was made based on the "residual" principle which was not even conducive to maintain the level of the service development that was reached in mid 1980-s. Practically all the equipment currently used by almost all laboratories for conducting environmental monitoring including auxiliary (aid) equipment (devices for sampling, sample conservation, storage and transportation, evaporating and drying apparatuses, compressor and refrigerating aggregates, dozing devices, laboratory furniture, forced ventilation installations for laboratory premises, personnel protection facilities/equipment/ etc.) is morally

outdated and need urgent replacement as it has completely worked out /exhausted its resource.

There is a need in further expansion of the use of mobile observation facilities to monitor environmental pollution and effectively respond to emergencies related to environmental pollution, as well as remote/satellite observation facilities.

There is a need for substantial revision of normative-legal framework and methodical support to ensure environmental monitoring activities in the light of the law of RK “On technical regulation”.

At that, during 2004-2006 large quantity of equipment of high technical level was supplied within the framework of improvement of the monitoring system in the Kazakhstan section of the Caspian region, but for some objective and technical reasons it was not introduced into practice. At the same time the urgent issue is the one of adequacy of proficiency level of the personnel to master the operation of these devices as they are of high-end technology and require high level skills and experience which can be obtained over a long period of practical work. Therefore the need arises in continual advanced training of specialists to improve the quality of sample testing operations. There is always a problem of the lack of personnel, both of medium and senior engineering level, due to low salaries. In mastering equipment of foreign manufacture difficulties arise because of the language problems.

Kazgidromet’s laboratories have no experience of participation in QC/QA programs. None of the laboratories conducted works for obtaining quality certification 17025.

At the same time it should be mentioned that despite all difficulties and problems, the volume of financing in 2004-2005 was gradually increasing and technical re-equipment of laboratories was effected, with special focus placed on Caspian riparian area.

### ***Observation and testing/analysis/ facilities***

In SUE “Analytical environmental protection laboratory” various type equipment is used for surface water sampling (bathometers, bottle sampling devices etc.) which provide conservation of chemical composition of tested water and secure exclusion of any contingency factors during sampling (ingress of mechanical dirt/admixtures/, insufficient emptying of sampling device), as well as prevention from contamination due to corrosion and sorption on the walls of the sampling device. When sampling water having easily variable composition (dissolved oxygen, hydrogen sulfide etc.), it is necessary to avoid contact with air. In such cases a bottle with the nozzle shall be used which prevents from ingress of air into the vessel. In the lack of possibility to test the sample within the terms established

for the respective test, its storage shall be provided. In this case conservation and/or cooling of a sample is effected in accordance with ST RK GOST (P) 51592-2003. For sample conservation the agent used shall be added directly into the sample after it is taken or into an empty container before sampling. Samples shall be transported in a tare securing there conservation.

Bottom sediment, soil. To control pollution by substances that spread on the surface – oil products, heavy metals, etc. – spot samples shall be taken in a layer-by-layer manner from the depth 0-5 and 5-20cm, of a mass not more that 200g each. Spot samples of soil intended for specification of heavy metals shall be taken by means of an instrument which does not contain metals and placed in plastic containers. Samples intended for specification of volatile substances shall be immediately placed in glass tare which shall be filled up to the top. During transportation and storage of soil samples measures shall be taken to prevent from the possibility of secondary contamination. In case of need in the storage of soil samples for a period longer than 1 month, conservation and storage in refrigerator shall be provided.

***Applicable international standards.***

Laboratories apply testing methods provided by the existing international and domestic state standards in force, sampling techniques registered in the ГЦИ Register of Republic of Kazakhstan and accepted for use in Republic of Kazakhstan in accordance with the stated field of accreditation.

Assays (samples) during the entire period of testing (analysis) shall be kept in the premises providing their safety and meeting storage requirements (refrigerators, thermostats).

Appendix 1 shows sampling techniques and conservation of major water pollutants used in this laboratory, Appendix 2 shows the list of tests conducted by the laboratory and Appendix 3 contains the List of normative documents applied for testing.

*The TBEP of Mangystau oblast* was supplied with laboratory devices and equipment for the stationary and mobile laboratory mounted on the motor vehicle GAZ 3308.

Total value of the equipment supplied amounts to 61.148.179 tenge.

Part of devices and equipment (total value of 38.649.850 tenge) is not used in the laboratory for the following reasons:

1. Gas analyzers Ankat 7664-09, 7654 –03, 7654 -07 7664 M in the amount of 4 units for definition of CO, CO<sub>2</sub>, H<sub>2</sub>S, NO, NO<sub>2</sub> concentrations are designed for use in the working area.

The lower limit of measuring SO<sub>2</sub>, H<sub>2</sub>S content, mercaptans on the gas analyzer GMS come to 0,4 –10 ppm; 0,2 5 ppm 0,25- 6 ppm, accordingly, i.e. in excess of MPC and therefore it can not be used for Work.

2. Cromato-mass- spectrometer Turbo Mass USA – training of specialists was not conducted, there are no MCM which underwent the procedure of (record) registration/filing in the register/, calibration was not performed, calibration facilities are not available.

3. As a result of faults committed during the starting up and adjustment procedure the roentgen fluorescent spectrometer Spectroscan Max is non operational.

4. *At present the TBEP laboratories have no possibility to conduct testing of water and soil samples for oil products content. The ICN-25 (IKH-025) apparatus, following the tests that were conducted on it, was delivered on October 30, 2006, to the supplier for repairs or replacement of the apparatus. The supplier undertook to replace the equipment and deliver it on May 15, 2007, but it still failed to deliver it to TBEP until now.*

Within the framework of the budget-funded Program 001 “Ensuring operation of the authorized environmental protection body”, sub-program 009 “Logistic support/equipment supplies to public bodies”, specification 411, the TBEP was supplied with laboratory equipment and devices for stationary and mobile laboratories.

The lack of possibility to specify the contents of oil products results in reduced efficiency of the laboratory’s operation and the TBEP’s operational efficiency on the whole, since, based on the testing results, estimates of environmental damage are produced and administrative penalties imposed for the pollution of the environment by oil products.

At present the mobile laboratory mounted on the motor vehicle GAZ 3308 with the van is operational.

1. The vehicle is registered with the State Traffic Inspectorate and state number plates are obtained.

2. Mounting of devices and equipment on the vehicle was performed (gas analyzers CB-320, P-310, FG-2, Elan-CO, atmospheric air aspirators PU –3Э, “Inspector-3E”, atmospheric air aspirator 2E”, gas analyzer of the motor transport exhaust gases “GIAM-027», sampling probe “Atmosphere”, meteorological soil sampling kit– a bore set 01.HSO and other auxiliary facilities).

3. Attestation was conducted and Certificate (№ 8 of September 9, 2006) was obtained “On evaluation of the status of measurements by laboratories conducting analytical control of natural (sea) waters, soil, motor transport exhaust gases and atmospheric air», Mangistaumetroservice” Partnership Ltd.

At present, despite the availability of the chemical laboratory equipped with modern devices and equipment for stationary and mobile laboratory, the operation of the laboratory is still not yet duly organized/set going/. The causes for this are the lack of skilled personnel and turnover of staff (for the past 2-3 years the staff has completely changed, except for 2 workers).

To ensure normal operation of the laboratory and the use of the equipment according to its true destination, it is necessary to take a technician - equipment operator on the staff.

Currently TBEP has chromat-mass spectrometer Turbo Mass, and recently starting-up and adjustment works were carried out. This apparatus allows to specify vast range of pollutants and accordingly take measures towards stabilization and improvement of environmental status in the region, including the Caspian. This apparatus should be operated and maintained by the highly qualified personnel (tester and automatic machinery specialists, physicists, chemists) with adequate salaries. In view of the lack of specialists there is a risk that the equipment will remain unused. The issue of training personnel to operate such a state-of-the-art equipment as gas chromatograph “Claruss-500”, chromat-mass spectrometer Turbo Mass, etc., remains to be very pressing.

***The Atyrau oblast TBEP and the Hydro-Meteorological was*** also supplied with equipment and devices for analytical laboratories, but they are not used in full measure due to the lack of highly qualified personnel on staff in these organizations.

### ***Floating facilities***

The Atyrau TBEP has a ship. It is consigned for the analytical environmental control of the Kazakhstan sector of the Caspian Sea: conducting operative and scheduled analytical studies of atmospheric air, sea water and bottom sediment pollutions, sampling and specification of hydro-chemical and hydro-biological condition of water, atmospheric air and soil.

Navigation area for this vessel is limited in accordance with the Russian Maritime Shipping Register (with the authorized removal from refuge for 50 miles or the distance between the refuges up to 100 miles); for radio communication: navigation in marine sectors A1, A2, A3 in accordance with GMDSS is provided. The vessel is self-propelled, steel, one-deck, twin-rotor/dual-drive/ sea craft, with engine-room in the stern, deck-cabin in the midship body, and redundant free-board.

Major characteristics:

- overall length – 25.0 m
- extreme breadth – 6.3 m
- free board in the midship – 2.9 m
- draft – 1.9 m
- gross tonnage – 116 t
- net tonnage – 34 t
- dead-weight tonnage– 18.6 t

Overall displacement: 117.2 t at the draft 1.855m in the sea water of 1.025 t/cm density. Displacement of empty vessel: 101.1 t at the draft 1.723 m in the sea water of 1.025 t/c.m. density.

Move speed at the draft 1.87m in deep water – 12.64 knots. The vessel has a good descending capacity on the surge and low space-flooding characteristic.

Endurance of a ship is 24 hours. Endurance of navigation by fuel and fresh water storage factors is 5 days.

Storage facilities for sea stores are provided as follows:

- diesel fuel tanks of a 16.31 c.m. capacity (4 main store tanks – 13.5 c.m.)
- fresh water tank of a 2.84 c.m. capacity

To store foodstuffs suspended kitchen cabinet is provided in the food re-heating area, a cabinet above the preparation table and refrigerator of a 207litres capacity.

The crew is composed of three members including:

- captain – 1 person.
- mechanic-navigator - 1 person.
- head seaman – 1 person.

Special personnel – laboratory assistants – researchers - 3 persons.

There are two cabins for the crew:

- double-berth cabin for the captain (one reserve berth)
- four-berth cabin for the rest of crew members and special personnel.

There is a saloon provided on the vessel for meals and leisure.

There are a wash-shower room, toilet, clothing drying room, as well as food re-heating room for the crew provided on the vessel.

Fire safety of the vessel is secured by means of structural fire protection system, water fire fighting system installed throughout the body of the vessel, the system of carbon-dioxide fire extinguishers in the engine room, on the engine mufflers and gas exhaustions of the boiler; and by individual fire-extinguishing means.

Stainless steel tank is provided fore storing fresh water reserves. Lighting of the premises is in compliance with sanitary standards. Leaving space and office accommodation heating is provided during cold periods. There is also the system of collection and delivery of polluted waters to the receiver, as well as the system of household waste collection and drawing provided on the vessel.

For the equipment of cabins marine-vessel furniture is mainly used made of three-layered boards /baffle plates faced with plastic in imitation of valuable sorts of wood.

Electric power system of the vessel provides the 380/220V alternating current network and the 24V direct current network.

Radio facilities are provided on the vessel, which meet the requirements of the Global Maritime Communication Network used in disasters and to ensure safety, as well as modern navigation facilities.

The vessel is equipped with the environmental monitoring facilities.

In Atyrau and Aktau cities sea crafts are available which allow conducting observations in coastal areas only. They are well enough equipped, but not designed for going out to the high seas. For the current year the purchase of the sea craft for Mangystau territorial environmental protection board is planned.

The vessels that are good enough for conducting monitoring of pollution of the Caspian waters are available with the Kazakhstan Agency of Applied Ecology (KAAE).

## **5. Methodological and informational support**

Within the structure of Kazgidromet methodological support of the state environmental monitoring laboratories and coordination of their activities is provided by the division of methodological support of environmental monitoring of the Environmental Monitoring Center of Republic of Kazakhstan (EMC RK).

The process of methodological support of environmental monitoring is implemented by the division by means of:

- coordination and organization of work of the observation and chemical analysis services of environmental monitoring on the uniform metrological and methodological basis;

- studies and dissemination of global experience of conducting environmental monitoring, its introduction into practical operation of regional observation and chemical analysis services;

- provision of essential/required/ consultative and practical assistance to the network chemical analysis units in their effort to improve operation in the field of environmental monitoring, organization of their operation, mastering up-to-date methods of testing of the content of pollutants in the environment;

- establishment of informational data base on the existing measuring facilities, normative-methodological documentation required for the conducting of environmental monitoring;

- organization of work on training and refresher training /professional development/ of specialists of the observation and chemical analysis services of the network units, organization of seminars, conferences on the issues of conducting environmental pollution;

- conducting of works required for filing of measurement facilities and methods of conducting measurements (MCM) used in the environmental monitoring on the Register of the state system of ensuring uniformity of measurements in Republic of Kazakhstan;

- examining the needs of chemical analytical services of the environmental monitoring system in the state-of-the-art measuring facilities, equipment,

preparation of proposals and formulation of requests for the acquisition of such facilities and equipment;

- participation in the development of normative documents on the organization and conducting environmental monitoring, standardization in the field of ecology;

- conducting inspections of the observation and chemical analytical services of the network units in respect of:

- compliance with the GOST and other normative requirements in the implementation of analytical works, operation of measuring facilities and equipment;

- correctness of application of MCM (methods of conducting measurements) of content of the components in the analyzed mediums, sampling for the purpose of monitoring of the condition of the atmospheric air, surface waters, soils;

- reliability of analytical environmental monitoring data.

Ecological inspectorates are structural units of TBEPs, which, when controlling the observance of ecological standards by the nature users, interact with the analytical control services (laboratories) that are also part of the TBEPs.

Methodological support of the above services is carried out by the division of metrological analytical control of the Nature Protection Control Committee of the RK Ministry of Environmental Protection.

Major drawbacks of the existing methodological support include the following:

- the lack, within the MEP, of a service (for example, Republican Ecological Analytical Centre of MEP), which would coordinate all ecological laboratories of the Republic, (state-owned and those under the nature users, etc., regardless of the patterns of ownership) on methodical and metrological issues and ensure the uniform approach to the monitoring and control of environmental pollution in the territory of Republic of Kazakhstan, including in the Caspian region.

- monopoly of the Committee for Technical Regulation and Metrology in establishing high prices for the services of metrological attestation and filing the MCM and measuring facilities in the State Register of RK, conducting (record) registration of international standards and national standards of CIS countries.

- the lack of research institute (for example, Water Protection Research Institute) which would, *inter alia*, engage in methodological aspects of observation and control of pollution of water bodies of Republic of Kazakhstan.

There is a need in harmonization and unification of methodological approaches (sampling techniques, their analysis, calculation of determinate parameters of pollution, evaluation of the quality of the objects analyzed, etc.) to the organization and conducting of ecological monitoring.

Such approach is reflected in the normative-legal framework on the issues of organization of environmental monitoring system in Republic of Kazakhstan. Thus, according to the “Rules of organization and introduction of Single State System of Environmental and Natural Resources Monitoring” (SSSENRM) approved by the Governmental Resolution of June 27, 2001, № 885, one of the SSSENRM objectives is “ensuring single *and* metrological basis for environmental and natural resources monitoring carried out by the central executive bodies, their territorial subdivisions, enterprises, institutions, organizations irrespective of the patterns of ownership”.

In addition, it is indicated in article 138 of Ecological Code of Republic of Kazakhstan approved by the Presidential Decree №212-III of January 9, 2007, that one of the SSSENRM principles is ensuring its functioning on the basis of single organizational, methodological, metrological and informational approach.

Proposals on the improvement of methodological support may include the following.

*Organization of Ecological Analytical (Eco-Analytical) Centre of the Ministry of Nature protection of Republic of Kazakhstan*

The operation of this Centre should cover the following areas of activity:

*I. Establishment of the single methodological and metrological framework for environmental monitoring conducted by the laboratories of the environmental protection system in Republic of Kazakhstan irrespective of the patterns of ownership.*

In accordance with the normative document of Gosstandart (State Standardization Committee) of Republic of Kazakhstan 50.2.4-2002 “Model Regulations on metrological Service of state authorities, natural persons and legal entities”, metrological service should be established within the Centre headed by the Chief Metrologist of MEP. The main functions of this Service should be:

- determination of major areas of activities to ensure single methodological and metrological framework of environmental monitoring on the Republican level;
- introduction of the Register for the methods of conducting measurements (MCM Register) used in eco-analytical works in the territory of Republic of Kazakhstan;
- conducting, within the Gosstandart bodies of RK, of (record/accounting/) registration of national standards of foreign states and international ISO standards;
- implementation of metrological surveillance of chemical analytical services of the Ministry;
- participation in the development of national standards in the area of environmental monitoring and analytical control, attestation of methods of conducting measurements (MCM) of the components content in the sources of pollution and the environment ;
- introduction into the routine practice of the ministerial laboratories of modern measurement instrumentation used in environmental monitoring and

control to ensure enhancement of efficiency of instrumental laboratory methods, widening the range of determinate environmental indicators that meet international standards;

## *II. Legal and methodological support for environmental monitoring and control.*

*This should be done through the:*

- development and provision of legal and methodical documentation (guidelines, instructions, other documents) to the analytical services of the Ministry, environmental laboratories, institutions and natural resource users on contract basis);
- establishment of an informational base of regulatory and methodical documentation on environmental monitoring and analytical control;
- preparing in an orderly manner of the proposals on improvement of the legal and methodical framework in the area of environmental monitoring and analytical control;
- arrangement and conduction of seminars and conferences on the issues of monitoring of environmental quality control and analysis, arrangement of the advanced training for the chemists of the system of MEP and the environmental services of natural resource users.

## *III. Analytical work*

For this purpose, it is recommended to establish in the Eco-Analytical Center the analytical department and equip it with the latest technologies and equipment (the chromat spectrometer, the inductive plasma spectrometer, etc.).

The main functions of this department should include:

- analysis of highly toxic pollutants;
- expansion of the range of harmful substances identification in the pollution sources (emissions, discharges, industrial and domestic wastes) and in the environment (water, air, land);
- arbitrated analysis of the content of components in pollution sources and in environment;
- metrological certification of the measuring conduction methods (MCM) for determination of components content in the environment and the sources of pollution;
- introduction into practice of modern methods of laboratory analysis of environmental pollution; provision of assistance to the territorial services in the development of new methods for the analysis of environment and pollution sources;
- assessment of the environment quality in the event of emergencies, environmental disasters and their aftermath.

To conduct its activity in the above mentioned areas the Republican Eco-Analytical Center must be accredited by the State Standard Agency and perform the work in accordance with the respective legislation.

There should be performed the definite work for the procedure of recognition in the Republic of Kazakhstan of the regulatory documents referred to the quality assessment and monitoring of the surface water (including the seawater) developed in the member countries of the Interstate Council for Standardization, Metrology and Certification and the Interstate Council for Hydrometeorology.

Today, when assessing the quality of water bodies of fishery significance (including the Caspian Sea), the Republic of Kazakhstan applies the "Synthesized list of maximum permissible concentrations (MPC) and tentatively safe levels of harmful substances impact for the water of fishery significance" issued by the USSR Fishery Ministry in 1990, as well as the Amendments issued by "Glavrybvod" (Fish Industry Authority) in 1990-1991. This list is a part of legal

document "Rules for protection of surface waters of the Republic of Kazakhstan" approved by the Ministry of Ecology and Biological Resources in 1994.

Over the last 17 years, the Committee of Fish Industry did not revise the MPC norms for the water of fishery significance. The document lacks the MPC for a number of harmful substances, such as heptyl, phosphate, mercury, chromium trivalent, chromium, etc.

This document should be revised due to the necessity of implementation of obligations arising from international agreements on sustainable use and protection of transboundary rivers.

The "Kazgidromet" as a body of the National Hydro-Meteorological Service is the member of the CIS Interstate Council of Hydrometeorology.

The activity of this Council includes such directions as the interaction of national services of the countries in the field of science-based methodical work on environmental monitoring, establishment of a single methodological base of eco-monitoring, harmonization and unification of methods of the state-of-environment assessment, including the monitoring of surface water bodies. The uniform methodology of assessment of the water bodies is a very important factor, as the Republic of Kazakhstan has the joint Programs with neighbor countries for the protection of the Caspian Sea from pollution, the Agreements on joint use and protection of transboundary water bodies, due to which the parties should work by a uniform standard base.

The Republic of Kazakhstan is a member of the Interstate Council for Standardization, Metrology and Certification. The members of this Council have signed the "Agreement on conduction of a coherent policy in standardization, metrology and certification" and adopted the interstate document (rules for interstate metrology) 44 - 2001 "Procedure of recognition of the measuring methods", which sets out the procedure for recognition of the measurement performance techniques developed in the member countries.

These rules concern the MCM applied in the areas of the state metrological supervision coverage. According to Article 23 of the law of RK "On provision of measurement unity", this area includes the measurements used to control the state of environment.

### *Information Resources*

The State-of-Environment Bulletin is posted each month at the website of MEP. The database of the environmental monitoring is available in Kazgidromet. The data are stored partly in an electronic form and in hard copies. The data are provided upon request only. There is no free exchange of data. Now, a single system of public monitoring is being established, in which the free exchange of information between the agencies supplying the data to this database is anticipated. Within the framework of regional cooperation the hydro-chemical information is provided upon request only. There is no permanent exchange.

## **6. The state-of-seawater hydro-chemical indicators**

The state-of-seawater analysis has been done on the basis of observations implemented in June of 2006 at the Northern Caspian fields: stations Kashagan-Vostochny, Pribreznoe, oil well Tadjigali and settlement Damba.

At the coastal station Kashagan-Vostochny the pH value of the seawater is 7.8.

Dissolved oxygen makes 9.15 mg/l, total water mineralization - 7.77 g/l. Chlorides dominate with 42%, while total sodium and potassium account for 24% and sulfate - 22%.

Concentration of nitrogen compound and phosphate is within the norm. The content of ammonium is 0.45 mg/l, nitrate - 0.42 mg/l, nitrite - 0.002 mg/l and phosphates - 0.030 mg per liter.

Pollutants content is within the norm. Content of oil products makes 0.031 mg/l, surfactants - 0.079 mg/l, phenols do not exceed 0.0005 mg/l.

Among metals, the maximum permissible concentration excess has been found for iron (3.8 MPC) and iron divalent (1.4 MPC), with the values 0.38 mg/l and 0.14 mg/l accordingly. All other heavy metals are within the norm. Mercury, lead, cadmium and nickel have not been found.

At the station Kashagan-Vostochny the MPC excess has been identified for two indicators: iron - 3.8 MPC and iron divalent - 1.4 MPC (Table 1).

At the field Pribreznoe the pH value for the seawater is within 7.5 - 9.1. Dissolved oxygen makes 8.75 - 9.39 mg/l, total water mineralization - 7.8 g/l on average. Chlorides dominate with 43%, total sodium and potassium is 24% and sulfate - 22%.

Among the nitrogen compounds, the ammonium shows the MPC excess from 1 to 1.28 MPC. Concentration of nitrite, nitrate and phosphate is within the norm. The mean content of nitrate makes 0.4 mg/l, nitrite - 0.0015 mg/l and phosphates - 0.024 mg per liter.

Concentration of pollutants does not exceed the permissible content. The average content of oil products is 0.035 mg/l, surfactants - 0.07 mg/l, and phenols do not exceed 0.0005 mg/l.

As for the metals, the MPC excess has been found for iron - 3.1 to 6.3 MPC and iron divalent - between 1 and 2.5 MPC, which is on average 0.42 mg/l and 0.15 mg/l accordingly. All other heavy metals are within the norm. Mercury, lead, cadmium and nickel have not been found.

At the field Pribreznoe the MPC exceeds by three indicators: ammonia nitrogen - 1.12 MPC, iron - 4.23 MPC and iron divalent - MPC 1.5 (Table 1).

In the southwest part, at the well №1 "Tadjigali" the pH value of the seawater is within 8.1 - 8.8. Dissolved oxygen shows 8.97 - 9.12 mg/l, total mineralization of water is 8.35 g/l on average.

Chlorides dominate with 41%, while sulfates account for 25%, total sodium and potassium - 23%.

Among the nitrogen compounds the ammonium shows the excess of MPC as 1.06. Nitrites, nitrates and phosphates are within the norm. The mean content of nitrate is 0.41 mg/l, nitrite - 0.003 mg/l and phosphates - 0.028 mg per liter.

Concentration of pollutants does not exceed MPC. The mean content of oil products equals 0.031 mg/l, surfactants - 0.082 mg/l, phenols - 0.0005 mg/l.

As for the metals, the maximum permissible concentration excess has been identified for iron - from 3.1 to 4.9 MPC, iron divalent - from 1.2 to 2.1 MPC, which on average is 0.4 mg/l and 0.17 mg/l accordingly. All other heavy metals do not exceed the norm. Mercury, lead, cadmium and nickel have not been identified.

In the southwest part, at the well № 1 "Tadjigali" the excess of maximum permissible concentration stands for three indicators: ammonia nitrogen - 1.02 MPC, iron - 4 MPC and iron divalent - 1.65 MPC (Table 1).

At the southern tip SW шалыги the pH value of seawater is 9.1. Dissolved oxygen is 9.15 mg/l, total mineralization of water - 5.86 g/l.

Chlorides in the seawater dominate with 42%, sulfates account for 23%, total sodium and potassium - 22%.

Concentration of nitrogen and phosphate compounds is within the norm. The content of ammonium is 0.44 mg/l, nitrate - 0.42 mg/l, nitrite - 0.003 mg/l and phosphates - 0.033 mg per liter.

Content of pollutants does not exceed the maximum permissible concentration. The average oil products content is 0.029 mg/l, surfactants - 0.063 mg/l, and

phenols do not exceed the mark of 0.0005 mg/l.

Among the metals, the maximum permissible concentration excess has been found for iron - 4 MPC and iron divalent - 1.2 MPC, with the mean values as 0.4 mg/l and 0.12 mg/l accordingly. All other heavy metals are within the MPC. There are no mercury and chromium.

At the southern tip of SW шалыги two indicators showed the excess of maximum permissible concentration: iron - 4 MPC and iron divalent - 1.2 MPC (Table 1).

At the entrance of the Ural-Caspian shipping canal the pH value of the seawater is 8.9. Dissolved oxygen is 8.54 mg/l, total mineralization of water - 0.49 g/l.

As for the nitrogen compounds the MPC excess has been identified for nitrates - 1.25 MPC, with a value as 0.025 mg per liter. The content of ammonium, nitrate and phosphate is within the norm. The ammonium content is 0.17 mg/l, nitrate - 0.19 mg/l and phosphate - 0.062 mg per liter.

Among the pollutants, the excess of MPC has been noticed for oil products (1.52 MPC), with a value as 0.076 mg per liter. Concentration of phenol and surfactants is within MPC. Average content of surfactants is 0.058 mg/l and phenols - 0.0007 mg per liter.

Among the metals the maximum permissible concentration excess has been identified for iron - 2.6 MPC, with a value as 0.26 mg/l. All other metals are within the norm. Mercury and chromium have not been found.

At the entrance of the Ural-Caspian shipping canal the maximum permissible concentration is excessive by three indicators: iron - 2.6 MPC, oil products - 1.52 MPC and nitrite nitrogen - 1.25 MPC (Table 1).

In the region of Damba settlement the pH value of the seawater equals 8.0. Dissolved oxygen is 8.75 mg/l, total mineralization of water - 0.56 g/l.

Concentration of nitrogen and phosphate compounds is within the norm. The content of ammonium is 0.17 mg/l, nitrate - 0.14 mg/l, nitrite - 0.012 mg/l and phosphates - 0.097 mg per liter.

Content of pollutants does not exceed the maximum permissible concentration. Content of oil products in the water is 0.049 mg/l, surfactants - 0.067 mg/l and phenols - 0.0005 mg per liter.

The maximum permissible concentration excess has been identified for such metals as iron - 2.6 MPC with a value as 0.26 mg/l and copper - 1.04 MPC with a value as 0.0052 mg per liter. All other metals are within the norm. Mercury and chromium are not available.

In the area of Damba settlement the maximum permissible concentration excess has been found for two indicators: iron - 2.6 MPC and copper - MPC 1.04 (Table 1).

In June of 2006, the observations over the seawater were performed at the coastal stations of the Northern Caspian region (delta and the seaside part of the Ural River).

At the delta part of the Ural River the pH value is within the range from 7.4 to 8.1. The mean content of dissolved oxygen equals 8.1 mg/l; BOD5 values vary from 2.2 to 2.5 mg O2/l.

By main ions the content of hydro-carbonates varies within 159-165 mg/l, chlorides - 92,4-96 mg/l, sulfate - 96,1-101,0 mg/l, magnesium - 37,2-38,4 mg/l, calcium - 28,0-30,0 mg/l, sodium and potassium - 63,0-65,3 mg/l.

As for the nitrogen compounds the excess of MPC has been identified for nitrite - up to 3 MPC, with 0.06 mg/l average concentration of nitrite in water. The content of ammonium, nitrate and phosphate is within the norm, with average concentration of ammonia in the water as 0.12 mg/l, nitrate - 0.14 mg/l and phosphate - 0.10 mg/l.

Concentration of pollutants is within the norm where the average value for oil products makes 0.30 mg/l, phenols - 0.0007 mg/l and surfactants - 0.071 mg per liter.

The maximum permissible concentration excess has been identified for such

metals as iron – up to 8 MPC, divalent iron – 1.6 MPC and copper - 1.4 MPC. No mercury has been determined. Such metals as manganese, zinc, lead, chromium, cadmium and nickel are within the norm.

The seawater contamination by indicators exceeding the MPC is shown in Table 2. The average water pollution index (WPI) is 3.1 (4th class quality, "polluted").

At the seaside of the Ural River the pH value equals 8.4. The average dissolved oxygen content is 7.3 mg/l; BOD<sub>5</sub> value - 2.9 mg O<sub>2</sub>/l.

The content of major ions is within the norm, the concentration of hydro-carbonates in water is 153 mg/l, chlorides - 98.7 mg/l, sulfate - 86.5 mg/l, calcium - 24.0 mg/l, sodium and potassium - 62.6 mg/l, magnesium - 38.4 mg per liter.

The nitrogen compounds show MPC excess for nitrite (2.5 MPC), with an average concentration of nitrite in the water as 0.05 mg/l. The content of ammonium, nitrate and phosphate is within the norm, with average concentration of ammonium in the water as 0.16 mg/l, nitrate - 0.14 mg/l and phosphate - 0.085 mg per liter.

Concentration of pollutants meets the norm, with the average value of oil products in the water as 0.026 mg/l, surfactants - 0.079 mg/l and phenol - 0.0005 mg per liter.

The maximum permissible concentration excess has been noticed for such metals as iron - up to 7.6 MPC, divalent iron - 1.4 MPC and copper - 1.32 MPC. No mercury has been identified, while the contents of manganese, zinc, lead, chromium, cadmium and nickel respond to the norm.

Pollution of the seawater exceeds MPC by separate indicators shown in Table 2.

The average value of WPI is 2.97 (4th class quality, "polluted").

At the Ural River, near the settlement Mahambet the pH value equals 8.2. The average dissolved oxygen content is 8.97 mg/l, BOD<sub>5</sub> - 2.1 mg O<sub>2</sub> /l.

The content of major ions is normal, the concentration of hydro-carbonates in water is 153 mg/l, chlorides - 96.0 mg/l, sulfate - 76.8 mg/l, calcium - 30.0 mg/l, sodium and potassium - 58.4 mg/l, magnesium - 33.6 mg per liter.

Among the nitrogen compounds, the MPC excess has been identified for nitrite (3.3 MPC), with an average concentration of nitrite in water as 0.066 mg per liter.

The content of ammonium, nitrate and phosphate is within the norm; the average concentration of ammonium in the water is 0.07 mg/l, nitrate - 0.12 mg/l and phosphate - 0.086 mg per liter.

Concentration of pollutants meets the norm; the average content of oil products in water is 0.03 mg/l, surfactants - 0.064 mg/l and phenol - 0.0007 mg per liter.

Among the metals, the excess of maximum permissible concentration has been found for iron - up to 5.9 MPC, divalent iron - 2.3 MPC, manganese - 1.29 MPC and copper - 5.2 MPC. No mercury has been detected, while the content of zinc, lead, chromium, cadmium and nickel responds to the norm.

The average value of WPI is 3.01 (4th class quality, "polluted") (Table 2).

The seawater state of Q2 and first half year of 2006 at the Middle Caspian coastal stations

The observation of the state of seawater in Q2 of 2006 was arranged at the coastal stations of the Middle Caspian region (Kalamkas, Fort-Shevchenko, and Fetisovo). According to the results, at the coastal stations the pH value of the seawater is 7.72-7.98. Dissolved oxygen is 8.93-10.19 mg/l. The BOD<sub>5</sub> value is 0.7-1.2 mg O<sub>2</sub> per liter.

Nitrogen and phosphate compounds are within the norm. The average content of nitrate is 0.6 mg/l, nitrite - 0.0063 mg/l and phosphates - 0.13 mg/l. Ammonium nitrogen has not been identified.

Out of the contaminants, the maximum permissible concentration excess is noticed for oil products as 1.3 MPC, with average value of 0.056 mg/l. Phenols and surfactants have not been found.

Among the metals, the maximum permissible concentration is excessive for manganese from 2 to 6 MPC, with average value of 0.2 mg/l. There are no mercury, cadmium, zinc and lead. Copper is within the norm (Table 3).

The maximum permissible concentration is excessive by two indicators: oil products - 1.13 MPC and manganese - 4 MPC. The value of WPI is 1.13, which corresponds to 3d class quality of water - "moderately polluted".

According to the first half year observations at the coastal stations in the Middle Caspian region, the maximum permissible concentration is excessive by two indicators: oil products – 1.18 MPC and manganese - 3.33 MPC. The value of WPI is 1.15, which corresponds to 3d class water quality "moderately polluted".

*The state of bottom sediments of the sea at the Middle Caspian coastal stations in spring of 2006*

During the observations there were taken samples from the sea bottom sediments at the Middle Caspian coastal stations (Fort - Shevchenko Fetisovka, Kalamkas) to identify the content of chlorine, oil products and heavy metals (copper, manganese and chromium (VI)). The number of samples (1500 g), the method of sampling corresponded to the respective GOST.

The maximum permissible concentration for the metals concerned is as follows:

- copper - 3 mg/kg of soil
- manganese - 1500 mg/kg of soil
- hexavalent chromium - 0.05 mg/kg of soil.

The sediment samples selected at Fort-Shevchenko showed:

- no oil products
- chlorine - 0.15 mg/kg,
- copper - 2.01 mg/kg (<MPC),
- manganese - 0.2 mg/kg (<MPC),
- hexavalent chromium - 0.03 mg/kg (<MPC),
- no mercury and cadmium.

The sediment samples selected at Fetisovka showed:

- oil products - 0.022%
- chlorine total - 0.08 mg/kg,
- copper - 2.34 mg/kg (<MPC),
- manganese - 0.1 mg/kg (<MPC),
- hexavalent chromium - 0.02 mg/kg (<MPC),
- no mercury and cadmium.

The sediment samples selected at Kalamkas showed:

- oil products - 0.032%
- chlorine total - 0.05 mg/kg,
- copper - 2.12 mg/kg (<MPC),
- no manganese,
- hexavalent chromium - 0.02 mg/kg (<MPC),
- no mercury and cadmium.

The state of the sea bottom sediments at the Northern Caspian fields in Q2 of 2006 during the observations there were taken the bottom samples at the Northern Caspian fields (Kashagan-Vostochny, Pribreznoe, Tadjigali). The analysis was done for the content of oil products and heavy metals (cadmium, lead, copper, nickel, zinc). The number of samples (1500 g), the method of sampling corresponded to the respective GOST.

The maximum permissible concentration for the metals concerned is as follows:

- copper - 3 mg/kg of soil
- cadmium - 0.5 mg/kg of soil
- lead - 32 mg/kg of soil.

- nickel - 4.0 mg/kg of soil
- zinc - 23 mg/kg of soil.

The sediment samples selected at Kashagan-Vostochny showed:

- oil products - 0097 g/kg;
- cadmium - 0.1788 mg/kg (<MPC),
- lead - 1.7715 mg/kg (<MPC),
- copper - 1.6967 mg/kg (<MPC),
- nickel - 1.7715 mg/kg (<MPC),
- zinc - 2.6121 mg/l (<MPC).

The sediment samples selected at Pribreznoe showed:

- oil products - from 0079 to 0282 g/kg;
- cadmium - in some cases the excess of MPC (1.3 MPC) was found, the mean value is 0.25 mg/kg (<MPC),
- lead - from 1.8535 to 3.2631 mg/kg (<MPC),
- copper - in some cases the excess of MPC (1.2 MPC) was found, the mean value is 2.92 mg/kg (<MPC),
- nickel – the excess of MPC (1.27 MPC) was identified, with the mean value of 5.08 mg/kg,
- zinc - from 4.3609 to 8.8594 mg/l (<MPC).

The sediment samples selected at the South-West Tadjigali wells (№ 1 and № 4) showed:

- oil products - from 0049 to 0075 g/kg;
- cadmium - from 0.0316 to 0.0466 mg/kg (<MPC),
- lead - from 2.0061 to 2.0339 mg/kg (<MPC),
- copper - from 2.8701 to 2.9873 mg/kg (<MPC),
- nickel – the excess of MPC (1.67 MPC) was identified, with the mean value of 6.70 mg/kg,
- zinc - from 6.8363 to 7.0362 mg/l (<MPC).

## 7. "Hot Spots"

As the water of rivers entering the Caspian Sea is shallow and their flow has a big influence, the Northern Caspian coast of Kazakhstan has got the special, most sensitive to external impacts natural conditions. Therefore, the impact of pollutants on the ecosystem here is much stronger than in the other parts of the sea.

Meanwhile, the rapid development of the economy here has urged on occurrence of a large number of environmental problems, some of which may cause destabilization in the region. These may be the following problems.

### *The problem of the sedimentation tank "Tuhlaya Balka"*

The sedimentation tank "Tuhlaya Balka" in Atyrau is one of potential pollution sources for the Caspian Sea. By present time, the filtration fields of this tank have accumulated around 50-70 million m<sup>3</sup> of highly contaminated liquid waste. This wastewater contains high concentrations of chlorides, ammonium salts, sulfates and heavy metals (copper, zinc, chromium, etc.). The concentration of oil products in wastewater reaches up to 200 MPC, phenol - from 20 to 80 MPC. As the Caspian Sea water level rose, it closely approached (up to 10 km) to the tank. During the surge the distance between the tank and the sea reduces to 3-4 km. In

case of ingress of the tank water to the Caspian Sea the serious adverse environmental consequences are possible.

#### *The problem of submerged old vessels*

One of the major problems in the region is the problem of cleaning the Bautino bay from submerged vessels, the number of which has reached 53.

The risk of submerged vessels from an environmental point of view is in the corrosion of metallic shells. According to the analysis of samples taken in the bay the MPC of iron is 5-6 times higher of the norm. Moreover, the availability of abandoned rusty ships induces the unauthorized waste disposal at the near area. These ships increase also the risk of spilling of toxic drilling effluents coming on the barges to the port of Bautino from offshore oilfields. Although this risk is mitigated by good knowledge and experience of those who by means of local tugboats lead the barges to the berths, it is probable that the wind can drift barges towards the submerged vessels. Risk increases highly when the barges maneuver at night, as there is no lighting on the submerged old vessels.

#### *The problems related to the oil contaminated areas*

Oil-based pollution is especially dangerous in the north of the Caspian Sea because of the very low level of water - 0.94% of total volume, with 27.7% of the sea area, an average depth of 6.2 meters, i.e. if one ton of oil enters the water in different parts of the sea, at the Northern Caspian area the impact per unit of the water volume will be approximately 100 times stronger than at the other parts of the sea. The results of hydro-chemical studies point to a risk of contamination of the Northern Caspian area with phenols (up to 18 MPC), and the level of pollution of seawater with the oil in areas adjacent to the Mangystau region is 10-13 MPC.

#### *The problem of the flooded oil wells*

Over the recent 15-20 years the Caspian Sea level has risen by more than two meters. This led to inundation of large parts of the coastal areas, including those with the oil wells drilled as long ago as the 1960s-1980s without taking into consideration of the properties of seawater adverse for the metal of bead and casing head. In the course of time, the wells have become the major source of the sea pollution, and the serious incidents have already taken place. That was the winter of 2001 and 2003.

Taking into account the seriousness of the situation, Government of Kazakhstan, commencing from 2002, defines in the Republican Budget the annual allocation of funds for the gradual abandonment of these wells. Today, there is already the approved inventory of the oil wells subject to abandonment. First, the most dangerous such wells being a real threat for the environment will be eliminated. In total, there will be abandoned 153 oil wells, of which 85 wells are in the zone of flooding by the Caspian Sea.

#### *Pollution of the sea when transporting the oil*

When transporting the oil by tankers, the pollution of the sea starts just at the ports of loading. Permanent pollution, for instance, of the Aktau port waters happens when filling the tankers that have arrived from the polluted ports of Azerbaijan. The so-called "mourning" line of oil on board of an empty tanker spills over the water area at the time of submerging. The average for the year, nearly 2 tons spill when filling the tankers with the oil. On January 6, 2006, at the berth № 8 of the Aktau port, the oil spill made about 1 ton when filling the tanker "Lenkoran" (home port - Baku).

The oil-based pollution of seaports adversely influences the environment and the human health. For instance, the drinking water in the city of Aktau comes from desalting facilities, which take seawater from two canals, one of which is located near the seaport. According to the data of the Mangystau SES, after the

reconstruction and expansion of the port towards this canal the quantity of phenol in the latter has grown 40 times. Phenols are carcinogenic chemicals and therefore harmful even at very low concentrations. To collect them the municipal services must finance the construction of a unit for biological further treatment of the desalted water. However, it will be more difficult to control the risk for the tourists, as well as the flora and fauna.

However, the biggest danger is connected with oil spills resulting from accidents at oil tankers and oil pipelines. When the accidents happen in the sea, all living species coming into contact with oil die and the situation becomes unpredictable, catastrophic. The marine accidents involving the coast strip cause the most devastating environmental consequences. Such accidents have already taken place.

#### *The transfer of pollutants by river waters*

The rivers bring to the Caspian Sea at least 40 km<sup>3</sup> of polluted water containing over 17 thousand tons of oil products, about 400 tons of phenol, up to 2-3 thousand tons of copper and other heavy metals.

Pollutants come to the Ural River from surface flows of the rivers of Russian Federation, as well as from the Aktyubinsk and West Kazakhstan regions of Kazakhstan.

At the Russian Federation territory the Ural River is polluted with industrial effluents from the petrochemical industry enterprises such as Orsk Refinery, South-Ural Nickel Production Enterprise, Orsk-Khalilovsk Iron and Steel Works, Orenburg Refinery etc.

Significant contamination comes to the Ural River from the river Ilek to which the Aktyubinsk Chromium Compounds Plant and other enterprises discharge their wastewater containing chromium, boron and other compounds.

## Annexes

### Annex 1

#### *Sampling methods and conservation of major water pollutants*

Name of determinable characteristics	Regulatory documents concerning the testing methods	Method of conservation and period of storage
1	2	3
Chemical Oxygen Demand (COD)	ENDF (environmental normative document of federation) 14.1:2:4.190-03 The method of detecting COD by photometric method using “Flyuorat-02” liquid analyzer	Acidification with sulfuric acid to pH 2, cooling to 2-5°C and storing in a dark place, 5 days
Anionic surfactants	ENDF 14.1:2:4.158-2000 The method for measuring the mass concentration of surfactants in natural, drinking and waste water using fluorometric method with “Flyuorat-02” liquid analyzer	Chloroform, cooling to 2-5°C and storing in a dark place, 48 hours
Dissolved compounds	GOST 26449.1-85 Gravimetric method for determination of solid residues.	N/A, 24 hours
Suspended admixtures	IND (inherent normative document) 323-0000 Gravimetric method for determination of suspended substances in industrial and domestic wastewater.	N/A, 24 hours
Biochemical oxygen demand (BOD5)	MCM № AO 02-2004 Determination of chemical and biochemical oxygen demand in municipal wastewater, in water basins up and down the flow of treated waters	N/A, cooling to 2-5°C and storing in a dark place, 24 hours
Oil products	ENDF 14.1:2:4.128-98 The method for measuring the mass concentration of oil products in samples of natural, drinking and waste water using fluorometric method with “Flyuorat-02” liquid analyzer	Hexane, 24 hours

Phenols	ENDF 14.1:2:4.182-02 The method for measuring the mass concentration of phenols in samples of natural, drinking and waste water using fluorometric method with "Flyuorat-02" liquid analyzer	Alkalization pH 11, 24 hours
Heavy metals	ISO 8288-88 M 01-29-2006 Method for measuring the mass concentration of manganese, cobalt, copper, iron, cadmium, lead, nickel in samples of natural and waste water by atomic absorption method using electro-thermal atomization with ABS "MGA-915"	Acidification with sulfuric acid to pH 2, cooling to 2-5°C and storing in a dark place, 1 month
Ammonia and ammonium ions Nitrates	ISO 5664:1984 ENDF 14.1:2:4.157-99 The method for measuring the mass concentration of chloride ions, ion-nitrite, sulfate ions, nitrate ions, fluoride ions, phosphate ions in samples of drinking, natural and waste water using the "Kapel" capillary electrophoresis system	Acidification with sulfuric acid to pH2, cooling to 2-5°C and storing in a dark place, 24 hours
Nitrites	ENDF 14.1:2:4.157-99 The method for measuring the mass concentration of chloride ions, ion-nitrite, sulfate ions, nitrate ions, fluoride ions, phosphate ions in samples of drinking, natural and waste water using the "Kapel" capillary electrophoresis	N/A, cooling to 2-5°C and storing in a dark place, 24 hours

**LIST OF LABORATORY TESTS**

Names of tests and (or) determinable characteristics (parameters)	Regulatory documents concerning the testing methods
1	2
Natural water (surface, underground) 1 Sampling	GOST 17.1.1.02-77 GOST 17.1.3.08-82 GOST 17.1.5.05-85 Standard of RK GOST P 51592-2003
2 Physical properties:	
- pH value (pH), oxidation-recovery potential (Eh)	GOST 26449.1-85
3 Content of harmful substances:	
- insoluble substances	GOST 26449.1-85
- solid residue	GOST 26449.1-85, п. 3.1
- dissolved oxygen	ISO 5813:1983 (№ 022/10067)
- oxidability permanganate	GOST 26449.1-85
- biochemical oxygen demand (BOD <sub>5</sub> )	MCM № AO 02-2004
- ammonia and ammonium ions (salt ammonium)	ISO 5664:1984 (№ 022/10065) Method M 01-31-2002 (№ KZ.07.00.00397-2005)
- nitrate (as NO <sub>3</sub> )	ENDF 14.1:2:4.157-99
- nitrite (as NO <sub>2</sub> )	ENDF 14.1:2:4.157-99
- chlorides	GOST 26449.1-85, п. 9.2 ENDF14.1:2:4.157-99
- sulfates	Standard of RK 1015-2000 ENDF14.1:2:4.157-99
- general stiffness	ISO 6059:1984 (№ 022/10071)
- calcium	Method M 01-31-2002 (№ KZ.07.00.00397-2005)
- magnesium	Method M 01-31-2002 (№ KZ.07.00.00397-2005)
- carbonates	GOST 26449.1-85, п. 7.2
- hydrogen carbonate	GOST 26449.1-85, п. 7.2
- hydrogen sulfide	GOST 26449.3-85
- fluoride ions	ENDF 14.1:2:4.157-99
- general phosphorus	GOST 26449.1-85, п. 14.2
- phosphate-ions	ENDF 14.1:2:4.157-99
- iron, general	GOST 26449.1-85, п. 16.1
- copper	ISO 8288:1986 (№ 022/10082)

	Method M 01-29-98 (№ KZ 07.00.00159-2003)
- lead	ISO 8288:1986 (№ 022/10082) Method M 01-29-98 (№ KZ 07.00.00159-2003)
- cadmium	ISO 8288:1986 (№ 022/10082) Method M 01-29-98 (№ KZ 07.00.00159-2003)
- manganese	Method M 01-29-98 (№ KZ 07.00.00159-2003)
- cobalt	ISO 8288:1986 (№ 022/10082) Method M 01-29-98 (№ KZ 07.00.00159-2003)
- dissolved iron	Method M 01-29-98 (№ KZ 07.00.00159-2003)
- nickel	ISO 8288:1986 (№ 022/10082) Method M 01-29-98 (№ KZ 07.00.00159-2003)
- zinc	ISO 8288:1986 (№ 022/10082) Method M 01-37-2000 (№ KZ 07.00.00160-2003)
- chromium	Method M 01-37-2000 (№ KZ 07.00.00160-2003)
- aluminum	Method M 01-37-2000 (№ KZ 07.00.00160-2003)
- mercury	ENDF 14.1:2:4.160-2000 (№ KZ 07.00.00246-2003)
- lithium	Method M 01-31-2002 (№ KZ.07.00.00397-2005)
- strontium	Method M 01-31-2002 (№ KZ.07.00.00397-2005)
- barium	Method M 01-31-2002 (№ KZ.07.00.00397-2005)
- potassium	Method M 01-31-2002 (№ KZ.07.00.00397-2005)
- sodium	Method M 01-31-2002 (№ KZ.07.00.00397-2005)
- phenol	Method M 01-07-2001 (№ KZ 07.00.00117-2002)
- oil products	GOST 17.1.4.01-80 ENDF 14.1:2:4.128-98 (№ KZ.07.00.00179-2003)
- anionic surfactants	ENDF 14.1:2:4.158-2000 (№ KZ.07.00.00404-2005)

- arsenic	GOST 4152-89
- boron	ENDF 14.1:2:4.36-95 (№ KZ.07.00.00402-2005)

**LIST OF  
REGULATORY DOCUMENTS APPLIED WHEN TESTING**

Regulatory document code	Regulatory document name	Date and place of approval, № of decree (order) of the organization that approved the document, the date of effectiveness
1	2	3
GOST 17.1.1.02-77	Nature protection. Hydrosphere. Classification of water bodies	04.02.77 USSR State Committee on Standards Decree № 299 from 01.07.78
GOST 17.1.1.03-86	Nature protection. Hydrosphere. Classification of water using	25.06.86 USSR State Committee on Standards Decree № 1778 from 01.07.78
GOST 17.1.1.04-80	Nature protection. Hydrosphere. Classification of ground waters by purposes of water use	31.03.80 USSR State Committee on Standards Decree № 1452 from 01.07.81
GOST 17.1.3.06-82	Nature protection. Hydrosphere. General requirements for groundwater protection	25.03.82 USSR State Committee on Standards Decree № 1244 from 01.01.83
GOST 17.1.3.07-82	Nature protection. Hydrosphere. Regulations on water quality control of ponds and streams	19.03.82 USSR State Committee on Standards Decree № 1115 from 01.01.83
GOST 17.1.3.08-82	Nature protection. Hydrosphere. Rules for quality control of marine waters	19.03.82 USSR State Committee on Standards. Decree № 1116 from 01.01.83
GOST 17.1.5.05-85	Nature protection. Hydrosphere. General requirements for sampling	25.03.85 USSR State Committee on Standards

	of surface and marine waters, ice and precipitation	Decree № 774 from 01.07.86
GOST 17.1.4.01-80	Nature protection. Hydrosphere. General requirements for the methods of identifying the petroleum products in natural and waste water.	30.12.80 USSR State Committee on Standards Decree № 6083 of from 01.01.83
GOST 30813-2002	Water and water conditioning. Terms and definitions	30.05.2002 MFC for Standardization, Metrology and Certification Protocol № 21 from 01.01.2004
GOST 3351-74	Methods for identification of taste, smell, color and turbidity	24.05.74 State Committee on Standards of the USSR Council of Ministers Decree № 1309 from 01.07.75
GOST 26449.1-85	Stationary distillation and desalination units. The methods of chemical analysis and analysis of saline water	26.02.86 USSR State Committee on Standards Decree № 405 from 01.01.87
GOST 26449.3-85	Stationary distillation and desalination installations. The methods of chemical analysis of saline water and of distillate on gas content	15.11.85 USSR State Committee on Standards Decree № 3612 from 01.01.87
GOST 4011-72	Drinking water. Methods of identification of total concentration of iron.	09.10.72 State Committee of Standards of the USSR Council of Ministers Decree № 1855 from 01.01.74
GOST 4151-72	Drinking water. Method of identification of the overall hardness	09.10.72 State Committee of Standards of the USSR Council of Ministers Decree № 1855 from 01.01.74
GOST 18826-73	Drinking water. Method of identification of the content	25.05.73 State Committee of

	of nitrate	Standards of the USSR Council of Ministers Decree № 1313 from 01.01.74
GOST 4245-72	Drinking water. Method of identification of the content of chlorides	09.10.72. USSR State Committee on Standards Decree № 233 from 01.01.74
GOST 4152-89	Drinking water. Method of identifying the mass concentration of arsenic	27.11.89 USSR State Committee for Management of Quality and Standards Decree № 3474 from 01.01.91
GOST 4388-72	Drinking water. Methods of identifying the mass concentration of copper	09.10.72 State Committee of Standards of the USSR Council of Ministers Decree № 1855 from 01.01.74
GOST 4389-72	Drinking water Method of identifying the content of sulfates	28.11.72 State Committee of Standards of the USSR Council of Ministers Decree № 2145 from 01.01.74
GOST 18164-72	Drinking water. Method of identifying the content of solid residue	09.09.72 State Committee of Standards of the USSR Council of Ministers Decree № 1855 from 01.01.74
GOST 18309-72	Drinking water. Method of identifying the content of polyphosphates	28.12.72 State Committee of Standards of the USSR Council of Ministers Decree № 2356 from 01.01.74
GOST 4192-82	Drinking water. Methods of identifying the mineral nitrogenous substances	25.01.82 USSR State Committee on Standards, Decree № 233 from 01.01.83
GOST 24481-80	Drinking water. Sampling	29.12.80

		USSR State Committee on Standards Decree № 6043 from 01.01.82
GOST 2761-84	Central sources of drinking water supply. Hygienic, technical requirements and the rules of choice	27.11.84 USSR State Committee on Standards Decree № 4013 from 01.01.86
GOST 17.2.1.04-77	Nature protection. Atmosphere. Sources and meteorological factors of pollution, industrial emissions	28.06.77 USSR State Committee on Standards Decree № 1611 from 01.07.78
GOST 17.2.3.02-78	Nature protection. Atmosphere. The rules for establishing allowable emissions by industry	24.08.78 USSR State Committee on Standards Decree № 2329 from 01.01.80
GOST 17.2.1.01-76	Classification of emissions by content	31.03.76 USSR State Committee on Standards Decree № 725 from 01.01.77
GOST 17.2.4.06-90	Nature protection. Atmosphere. Methods of identifying speed and emission of gas-dust flows discharged from stationary sources of pollution	03.07.90 USSR State Committee for Nature Protection Decree № 27 from 01.01.91
GOST 17.2.4.07-90	Nature protection. Atmosphere. Methods of identifying pressure and temperature of gas-dust flows, discharged from stationary sources of pollution	10.12.90 USSR State Committee for Nature Protection Decree № 46 from 01.07.91
GOST 17.2.3.01-86	Nature protection. Atmosphere. Rules for air quality control at human settlements	10.11.86 USSR State Committee on Standards Decree № 3359 from 01.01.87
GOST 17.2.3.02-78	Nature protection. Atmosphere.	24.08.78 USSR State Committee on

	The rules for establishing allowable emissions by industrial enterprises	Standards Decree № 2329 from 01.01.80
GOST 17.2.6.02-85	Nature protection. Atmosphere. Automatic gas analyzer for control of atmospheric pollution	18.12.85 USSR State Committee on Standards Decree № 4144 from 01.01.87
GOST 17.2.4.05-83	Nature protection. Atmosphere. Gravimetric method of detecting suspended particles of dust	20.12.83 USSR State Committee on Standards Decree № 6356 from 01.01.85
GOST 17.4.3.01-83	Nature protection. Soils. General requirements for sampling	21.12.83 USSR State Committee on Standards Decree № 6393 from 01.07.84
GOST 17.4.4.02-84	Nature protection. Soils. Methods for selecting and preparing samples for chemical, bacteriological, helminthological analysis	19.12.84 USSR State Committee on Standards Decree № 4731 from 01.01.86
GOST 26483-85	Nature protection. Soils. Preparation of salt extract and detecting its pH by CRIAS (central research institute of agrochemical service) method	26.03.85 USSR State Committee on Standards Decree № 820 from 01.07.86
GOST 17.1.5.01-80	Nature protection. Hydrosphere. General requirements for sampling sediments of water bodies for the analysis of pollution	24.06.80 USSR State Committee on Standards Decree № 3009 from 01.01.82
GOST 28268-89	Soils. Methods of detecting moisture, maximum hygroscopic moisture and moisture of sustainable wilting of plants	27.09.89 USSR State Committee on Standards Decree № 2924 from 01.06.90
GOST 26428-85	Soils. Methods of identification of calcium and magnesium in a water extract	08.02.85 USSR State Committee on Standards Decree № 283 from 01.01.86

GOST 26425-85	Soils. Methods of identification of chloride ion in a water extract	08.02.85 USSR State Committee on Standards Decree № 283 from 01.01.86
GOST 26426-85	Soils. Methods of identification sulfate ion in a water extract	08.02.85 USSR State Committee on Standards Decree № 283 from 01.01.86
GOST 26424-85	Soils. Method of identifying the carbonate and bicarbonate ions in a water extract	08.02.85. USSR State Committee on Standards Decree № 283 from 01.01.86
GOST 26423-85	Soils. Methods of identifying the specific electrical conductivity, pH and solid residue of water extract	08.02.85 USSR State Committee on Standards Decree № 283 from 01.01.86
GOST 26213-84	Soils. Identification of humus using Tyurin method in CRIAS modification	18.06.84 USSR State Committee on Standards Decree № 1957 from 01.07.85
GOST 26261-84	Soils. Methods of identifying gross phosphorus and gross potassium	21.08.84 USSR State Committee on Standards Decree № 2939 from 01.07.85
GOST 26205-84	Soils. Identification of mobile forms of phosphorus и potassium using Machigin method in CRIAS modification	18.06.84 State Committee on Standards Decree № 1955 from 01.07.85
GOST 26107-84	Soils. Methods of identifying total nitrogen	02.03.84 USSR State Committee on Standards Decree № 661 from 01.01.85
GOST 26488-85	Soils. Identification of nitrates using CRIAS method	26.03.85 USSR State Committee on Standards Decree № 821

		from 01.07.86
GOST 26489-85	Soils. Identification of exchangeable ammonium using CRIAS method	26.03.85 USSR State Committee on Standards Decree № 821 from 01.07.86
GOST 26490-85	Soils. Identification of moving sulfur using CRIAS method	26.03.85 USSR State Committee on Standards Decree № 821 from 01.07.86
GOST 28168-89	Soils. Sampling	26.06.89 USSR State Committee on Standards Decree № 2004 from 01.04.90
GOST P 50820-95 (№ 022/10141)	Gas cleaning and dust collecting equipment. Methods of identifying the dustiness of a gas-dust flow	27.09.95 State Standard Agency (Gosstandart) of Russia Decree № 489 Registration under № 022/10141 in the Committee for Standardization, Metrology and Certification of the Ministry of Industry and Trade of the Republic of Kazakhstan
GOST P 50686-94 (№ 022/10296)	Soils. Identification of mobile compounds of zinc using Krupsky and Alexandrov method in CRIAS modification	23.06.94 State Standard Agency (Gosstandart) of Russia Decree № 179 Registration № 022/10296 in the Committee for Standardization, Metrology and Certification of the Ministry of Industry and Trade of the Republic of Kazakhstan
GOST P 50687-94 (№ 022/10297)	Soils. Identification of mobile compounds of cobalt using Peyve and Rinkis method in CRIAS modification	23.06.94 State Standard Agency (Gosstandart) of Russia Decree № 179 Registration under №

		022/10297 in the Committee for Standardization, Metrology and Certification of the Ministry of Industry and Trade of the Republic of Kazakhstan
GOST P 50683-94 (№ 022/10294)	Soils. Identification of mobile compounds of copper and cobalt using Krupsky and Alexandrov method in CRIAS modification	23.06.94 State Standard Agency (Gosstandart) of Russia Decree № 179 Registration under № 022/10294 in the Committee for Standardization, Metrology and Certification of the Ministry of Industry and Trade of the Republic of Kazakhstan
Standard of Republic of Kazakhstan GOST P 51592-2003	Water. General requirements for sampling	07.11.2002 Committee for Standardization, Metrology and Certification of the Ministry of Industry and Trade of the Republic of Kazakhstan Decree № 380 from 07.11.2003
Standard of Republic of Kazakhstan 1015-2000	Water. Gravimetric method of identifying the content of sulfates in natural, sewage waters	15.11.2000 Committee for Standardization, Metrology and Certification of the Ministry of Industry and Trade of the Republic of Kazakhstan Decree № 80 from 01.07.2001
Standard of Republic of Kazakhstan GOST P 51232-2003	Drinking water. General requirements for the organization and methods of quality control	07.11.2003 Committee for Standardization, Metrology and Certification of the Ministry of Industry and Trade of the Republic of Kazakhstan

		Order № 380 from 01.01.2005
Standard of Republic of Kazakhstan GOST P 51593-2003	Drinking water. Sampling	07.11.2003 Committee for Standardization, Metrology and Certification of the Ministry of Industry and Trade of the Republic of Kazakhstan Order № 380 from 01.01.2005
Standard of Republic of Kazakhstan GOST P 51210-2003	Drinking water. Method of identifying the content of boron	07.11.2003 Committee for Standardization, Metrology and Certification of the Ministry of Industry and Trade of the Republic of Kazakhstan Order № 380 from 01.01.2005
Standard of Republic of Kazakhstan GOST P 51212-2003	Drinking water. Methods of identifying the total mercury content by flameless atomic absorption spectrometry	07.11.2003 Approved by the Committee on Standardization, Metrology and Certification of the Republic of Kazakhstan Order № 380 from 01.01.2005
ISO 8288-86 (№ 022/10082)	Water quality. Identification of the content of cobalt, nickel, copper, zinc, cadmium and lead. Flaming atomic absorption spectrometric methods	Registration under № 022/10082 of 25.12.2001 in the Committee for Standardization, Metrology and Certification of the Ministry of Industry and Trade of the Republic of Kazakhstan
ISO 5664:1984 (№ 022/10065)	Water quality. Identification of ammonium. The method of distillation and titration	Registration under № 022/10065 of 25.12.2000 in the Committee for Standardization, Metrology and Certification of the Ministry of Industry and Trade of the Republic of Kazakhstan

ISO 6059:1984 (№ 022/10068)	Water quality. Identification of the total content of calcium and magnesium using complexometric method	Registration under № 022/10068 of 25.12.2001 in the Committee for Standardization, Metrology and Certification of the Ministry of Industry and Trade of the Republic of Kazakhstan
ISO 5813:1983 (№ 022/10067)	Water quality. Identification of dissolved oxygen. Iodometric method	Registration under № 022/10067 of 25.12.2001 in the Committee for Standardization, Metrology and Certification of the Ministry of Industry and Trade of the Republic of Kazakhstan
Sanitary Regulations and Norms № 3.02.003-04	Sanitary and epidemiologic requirements for the protection of surface water from pollution	28.06.2004 Ministry of Health of the Republic of Kazakhstan Order № 506 from March 2005
Sanitary Regulations and Norms № 3.02.002-04	Sanitary and epidemiologic requirements for water quality of centralized drinking water supply systems	28.06.2004 Ministry of Health of the Republic of Kazakhstan Order № 506 from August 2005
Sanitary Regulations and Norms № 3.01.054.97	Sanitary regulations and norms for the protection of coastal waters, seas in places of water use by the population of cities	19.08.97 Ministry of Health of the Republic of Kazakhstan Order № 40
СП 2.6.1.758-99 (HPБ-99)	Radiation Safety Standards	09.12.99 Chief State Sanitary Physician of the Republic of Kazakhstan Decree № 10 from 01.01.2000
ГН 3.02.036-99 (2.1.6.695-98)	Maximum permissible concentration (MPC) of pollutants in the atmospheric air of human settlements	02.06.99 Chief State Sanitary Physician of the Republic of Kazakhstan Decree № 7 from 15.06.99
Joint Order of the	On approval of MPC of	30.01.2004.

Ministry of Health of the Republic of Kazakhstan dated 30.01.2004 № 99 and the Ministry of Environment Protection of the Republic of Kazakhstan dated 27.01.2004 № 21-П	harmful substances, harmful microorganisms and other biological pollutants of soils	Ministry of Health of the Republic of Kazakhstan Order № 99 of 27.01.2004 Ministry of Environment Protection of the Republic of Kazakhstan Order № 21-П
ПД 52.04.186-89 (№ 022/10399)	Guidance on control of the pollution of the atmosphere	01.06.89 Vice Chairman of the USSR Goskomgidromet on 16.05.89 Chief State Sanitary Physician of the USSR from 01.07.91 Registration under № 022/10399 of 01.08.2004 in the Committee for Standardization, Metrology and Certification of the Ministry of Industry and Trade of the Republic of Kazakhstan
ПНД 1.01.03-94	Rules for protecting the surface waters of the Republic of Kazakhstan	14.06.94. Scientific and Technical Council of the Ministry of Ecological Bio-resources of the Republic of Kazakhstan Protocol № 13 Agreed with the Ministry of Health of the Republic of Kazakhstan on 08.12.93
ПНД 211.1.06.01-96	Time criterion for deciding the decrease the exposure of the population from natural sources of ionizing radiation (KPR 96)	10.09.96 Chief Sanitary Physician of Republic of Kazakhstan and First Deputy Minister of Ecology and Bioresources from 10.09.96
Method M 01-03-2001 (№ KZ.07.00.00121-2002)	Methods for measuring the mass concentration of iron in samples of natural, drinking and waste water	20.03.2001 The Ural Research Institute of Metrology (UNIIM) Certificate

	using "Flyuorat-02" liquid analyzer	№ 01.06.047/2001 Registered in Gosstandart PГII «KazInMetr» on 20.06.2002 under № KZ.07.00.00121- 2002
Method M 01-37-2000 (№ KZ 07.00.00160- 2003)	Methods for measuring the mass concentration of zinc, chromium, aluminum, beryllium, molybdenum, strontium in samples of waste water by atomic absorption method with electro-thermal by using the atomic absorption spectrometer «MGA-915»	24.01.2001 The Ural Research Institute of Metrology (UNIIM) Certificate № 01.05.007/2001 Registered in Gosstandart PГII «KazInMetr» on 06.01.2003. under № KZ 07.00.00160- 2003
Method M 01-29-98 (№ KZ 07.00.00159- 2003)	Methods for measuring the mass concentration of manganese, cobalt, copper, iron, cadmium, lead, nickel in samples of natural and waste water by atomic absorption method with electro-thermal atomic absorption spectrometer «MGA-915»	24.01.2001 The Ural Research Institute of Metrology (UNIIM) Certificate №01.05.006/2001 3 Registered in Gosstandart PГII «KazInMetr» on 06.01.2003 under № KZ 07.00.00159- 2003
Method M 01-31-2002 (№ KZ.07.00.00397- 2005)	Methods for measuring the mass cation concentrations of potassium, sodium, lithium, magnesium, calcium, ammonium, strontium, barium in samples of drinking, natural and waste waters using "Kapel" capillary electrophoresis system	28.01.2002 The Ural Research Institute of Metrology Registration № 224.01.14.008/2002
Method M 03-06-2000 (№ KZ 07.00.00247- 2003)	Methods for measuring the mass concentration of mercury vapor in the air, the air of residential and industrial premises by atomic absorption method with the Zeeman correction using non-selective	All-Union Research Institute of Metrology named after D.I. Mendeleev Certificate № 2420/56-2000 Registered in Gosstandart PГII «KazInMetr» on

	absorption mercury analyzer "RA-915 +"	11.12.2003 under № KZ.07.00.00247- 2003
Method M 02-01-95 (№ KZ 07.00.00191- 2003)	Methods for measuring the mass concentration of phenol in the air of working zone and atmospheric air of human settlements using "Flyuorat-02" liquid analyzer	10.03.2000 All-Union Research Institute of Metrology named after D.I. Mendeleyev» Certificate № 2420/300-00 Registered in Gosstandart PTI «KazInMetr» on 25.02.2003 under № KZ.07.00.00191- 2003
Method M 03-05-99 (№ KZ.07.00.00245- 2003)	Methods for measuring the mass concentration of total mercury content in samples of soils and grounds using mercury analyzer «RA- 915+» with RP-91C device	10.03.2000 All-Union Research Institute of Metrology named after D.I. Mendeleyev» Certificate № 2420/25-2000 Registered in Gosstandart PTI «KazInMetr» on 11.12.2003 under № KZ.07.00.00245- 2003
Method M 01-07-2001 (№ KZ.07.00.00117- 2002)	Methods for measuring the mass concentration of phenols in samples of natural, drinking and sewage waters using "Flyuorat-02" liquid analyzer	20.03.2001 The Ural Research Institute of Metrology (UNIIM) Certificate № 01.06.042/2001 Registered in Gosstandart PTI «KazInMetr» on 20.06.2002 under № KZ.07.00.00117- 2002
Method M 02-09-99 (№ KZ 07.00.00161- 2003)	Methods for measuring the mass concentration of metals in atmospheric air by atomic absorption method using electrometric atomization with the atomic	22.12.99 All-Union Research Institute of Metrology named after D.I. Mendeleyev» Certificate № 2420/91-99

	absorption spectrometer «MGA-915»	Registered in Gosstandart БКФ РГП «KazInMetr» on 06.01.2003 under № KZ.07.00.00161- 2003
Method	Methods for gravimetric determination of suspended substances in industrial and domestic sewage waters	24.12.91 Deputy Director on Scientific Work of “Kazmehonobr” Institute Registered by Almaty Branch of РГП «Kaz.ЦСМ» of Gosstandart on 18.08.99 under № 06-94-99
Method	Methods of photometric determination of nitrates using sodium salicylate	05.01.93 Deputy Director General of SSPAIE (state scientific production association of industrial ecology) «Kazmehonobr » Registered in «Almaty ЦСМ» of Gosstandart on 15.07.99 under № 06-81-99
Method	Method of photocolorimetric determination of ammonium nitrogen using Nessler reagent	05.01.93 Deputy Director General on Scientific Work of ГНПОПЭ «Kazmehonobr» Registered by Kazmainstandart on 17.05.93 under № 06-2
Method	Method of photocolorimetric determination of nitrite using Griss reagent	18.01.93 Deputy Director General on Scientific Work of ГНПОПЭ «Kazmehonobr» Registered in «Almaty ЦСМ» of Gosstandart on 17.05.93 under № 06-75-99
Method MCM № AO 02-2004	Identification of chemical and biochemical oxygen demand in urban sewage waters and water bodies upper and lower of the point	10.01.2005 «KazInMetr» Certificate № 83

	of discharge of treated sewage waters	
ENDF14.1:2:4.158-2000 (№ KZ.07.00.00404-2005)	Method for measuring the mass concentration of anion surfactants in samples of natural, drinking and sewage waters by fluorometric method using "Flyuorat-02" liquid analyzer	01.03.2004 The Ural Research Institute of Metrology (UNIIM) Certificate № 154/98 Registered in Gosstandart PFTI «KazInMetr» under № KZ.07.00.00404-2005
ENDF 14.1:2:4.128-98 (№ KZ.07.00.00179-2003)	Method for measuring the mass concentration of oil products in samples of natural, drinking and sewage waters by fluorometric method using «Flyuorat-02» liquid analyzer	21.11.1997 The Ural Research Institute of Metrology (UNIIM) Certificate № 224.01.06.152/2002 Registered in Gosstandart PFTI «KazInMetr» on 25.02.2003 under № KZ.07.00.00179-2003
ENDF 14.1:2:4.160-2000 (№ KZ.07.00.00246-2003)	Method for measuring the mass concentration of total mercury in samples of natural, drinking and sewage waters by method «cold steam» using mercury analyzer «RA-915+» with RP-91 appliance	20.01.99 All-Union Research Institute named after D.I. Mendeleev» Certificate № 2420/02-99 Registered in Gosstandart PFTI «KazInMetr» on 11.12.2003 under № KZ.07.00.00246-2003
ENDF 14.1:2:4.157-99	Method for measuring the mass concentration of chloride ions, ion-nitrite, sulfate ions, nitrate ions, fluoride ions, phosphate ions in samples of drinking, natural and waste water with application of "Kapel" capillary electrophoresis system	01.03.2004 Russian Federation State Committee for Standardization and Metrology Certificate № 224.01.17.057/ 2004 Registration in FCC of RK (Contract with PFTI «KazInMetr» № 503 of 04.07.2005)
ENDF 14.1:2:4.36-95 (№ KZ.07.00.00402-2005)	Method for measuring the mass concentration of boron in samples of natural,	09.02.2005 The Ural Research Institute of Metrology (UNIIM)

	drinking and sewage waters using «Flyuorat-02» liquid analyzer	Certificate № 224.01.04.037/2005 Registered in Gosstandart РГП «KazInMetr» under № KZ.07.00.00402-2005
ENDF 16.1.21-98 (№ KZ.07.00.00194-2003)	Method for measuring the mass concentration of oil products in samples of soils using «Flyuorat-02» liquid analyzer	The Ural Research Institute of Metrology (UNIIM) Certificate № 224.03.06.153/2002 Registered in Gosstandart РГП «KazInMetr» on 25.02.2003 under № KZ.07.00.00194-2003
ENDF 14.1:2:4.190-03 (№ KZ.07.00.00181-2003)	Method of identification of bi-chromate oxidability (COD) in samples of natural, drinking and sewage waters by photometric method using «Flyuorat-02» liquid analyzer	29.07.2002 The Ural Research Institute of Metrology (UNIIM) Registered with Gosstandart РГП «KazInMetr» under № KZ.07.00.00181-2003
Method № KZ.07.00.00303-2004	Method for measuring the activity of beta-emitting radio nuclides in countable samples using Progress software	05.05.96 Head of MCIR SSMC «ВНИИФТРИ» of Gosstandart of Russia Registered in Gosstandart РГП «KazInMetr» on 26.08.2004 y. under № KZ.07.00.00303-2004
Method № KZ.07.00.00304-2004	Method for measuring the activity of gamma-emitting radio nuclides in countable samples using Progress software	07.05.96 Head of MCIR SSMC «ВНИИФТРИ» of Gosstandart of Russia Registered in Gosstandart РГП «KazInMetr» on 26.08.2004 under № KZ.07.00.00304-2004
Regulatory Document 52.18.289-90	Methodical instructions. The method for measuring the mass fraction of the mobile forms of metals	USSR State Committee for Hydrometeorology Certificate № 2-96 from 01.06.91

	(copper, lead, zinc, nickel, cadmium, cobalt, chromium, manganese) in samples of soil using atomic absorption analysis	Validity is not restricted
Instruction of the Ministry of Ecology and Bioresources for sampling of sewage and surface waters for purposes of chemical analysis, Almaty, 1994	Instructive document for the sampling of surface and sewage waters for the purposes of chemical analysis.	28.11.94 Ministry of Ecology and Bioresources of the Republic of Kazakhstan from 01.12.94

**Water Quality Standards (MPC)**

Parameter	Measuring unit	Fishery and water inhabitants	Water for bathing and resorts	Drinking water	Irrigation water	Using in production*
Dust	Celsius	Summer-background +3, Winter-background +5	18	-	-	
Suspended substances	mg/l	background +0,25	4-10	1,5	<3000	
pH	-	6,5-8,5	6,5-8,5	6-9	6-8,5	
Dissolved oxygen	mg/l	No less than 6,0	In summer 8, in winter 11-12	-	-	
Lucidity	m	>2	1-2	-	-	
Chlorophyll	ug/l	-	-	-	-	
Nitrites:						
Ammonia NH <sub>4</sub> -N	mg/l	0,5	0,5	0,5	-	
Nitrate NO <sub>3</sub> -N	mg/l	40;N-9,1	45,0	45,0	-	
Nitrate NO <sub>2</sub> -N	mg/l	0,08;N-0,02	3,3	3,3	-	
Total N	mg/l	-	-	-	Permissible. 80-120	
Orthophosphate PO <sub>4</sub> -P	mg/l	-	-	3,5	-	
Total P	mg/l	-	-	-	Permissible. 20-30	
Organic substances:						
COD	mg/l	-	-	-	-	
BOD	mg/l	5 mg O <sub>2</sub> /l	1,1-1,9 mg O <sub>2</sub> /l	3 mg O <sub>2</sub> /l	40,0	
inorganic pollutants:						
Cyanides	mg/l	0,05	0,05	0,07	10,0	

Metals						
Al	ug/l	0,04	-	0,5	5,0	
Cd	ug/l	0,005	0,001	0,001	0,01	
Cr <sup>6+</sup>	ug/l	0,001	0,05	0,05	0,1	
Cr <sup>2+</sup>	ug/l	0,001	1,0	1,0	0,2	
Fe	ug/l	0,1	0,3	0,3	0,5	
Hg	ug/l	0,0001	0,0005	0,0005	-	
Mn	ug/l	0,01	0,1	0,1	0,2	
Ni	ug/l	0,01	0,1	0,1	0,2	
Pb	ug/l	0,1	0,1	0,1	5,0	
Zn <sup>2+</sup>	ug/l	0,01	1,0	1,0	2,0	
organic pollutants:						
Oil (hydrocarbons)	mg/l	0,05	0,3	0,3	0,3	
Phenols	mg/l	0,001	0,001	0,001	40,0	
Pesticides	ug/l	no	no	no	-	
Detergents	mg/l	no	no	No	30,0	
microbiological index:						
E. coli	Quantity per 100 ml	-	-	No	-	
Other important pollutants:						
Total organic carbon						
Other metals (As, Co, Cs, Se, Sr, etc.):						
As	mg/l	0,05	0,05	0,01	0,1	
Co <sup>2+</sup>	mg/l	0,01	0,01	-	0,05	
B <sup>3+</sup>	mg/l	0,017	0,5	0,3	-	

**List of mandatory ingredients  
subject to control and of measurement methods used by the "Kazgydromet"  
chemical-analytical services in the environmental monitoring (water  
resources)**

Analyzed Object	Determinable parameter	Method of measurement	Information on availability of registration in the register of the measurement unity state system of the Republic of Kazakhstan
Surface water	pH	GOST 26449.1 - 85 Stationary distillation and desalination facilities. The methods of chemical analysis of salty water	--
	Ammonia nitrogen	GOST 26449.1-85 Stationary distillation and desalination facilities. The methods of chemical analysis of salty water. Titration method to identify ammonium nitrogen	--
	COD	Regulation 204.2.08-91 SPA «Rosvodokanal» Method for identification of Chemical Oxygen Demand (COD) in urban sewage and in water of water bodies upper and lower of the discharge of treated effluents.	Not included
	BOD <sub>5</sub>	Regulation 204.2.07-91 SPA "Rosvodokanal" Method for identification of biochemical oxygen consumption (BOD) in urban sewage and in water of water bodies upper and lower of the discharge of treated effluents	Not included
	Suspended substances	GOST 26449.1-85 Stationary distillation and desalination facilities. The methods of chemical analysis of salty water Gravimetric method of determination	Included in document of Gosstandart of the Republic of Kazakhstan "Standardization Regulatory Acts of the Republic of Kazakhstan. Index 2004" To be certified annually
	Carbonate and hydro-	GOST 26449.1-85 Stationary distillation and desalination facilities.	--

	carbonates	The methods of chemical analysis of salty water Titration method of identification	
	Hardness	GOST 26449.1-85 Stationary distillation and desalination facilities. The methods of chemical analysis of salty water Complex-metric method to identify the total hardness	--<<-
	Nitrates	GOST 26449.2-85 Stationary distillation and desalination facilities. The methods of chemical analysis of salty water Photo-colorimetric method to identify nitrates using the Griss reagents  GOST 26449.2-85 Stationary distillation and desalination facilities. Methods for chemical analysis of distillate. Potentio-metric method to identify nitrates	--<<-  --<<-
	Nitrites	GOST 26449.2-85 Stationary distillation and desalination facilities. Methods for chemical analysis of distillate.  ENDF 14.1:2:4.26-95 The method for measuring the mass concentrations of nitrite ions in samples of natural, drinking and wastewater using "Flyuorat-02" analyzer	Included in document of Gosstandart of the Republic of Kazakhstan "Standardization Regulatory Acts of the Republic of Kazakhstan. Index 2004"  To be certified annually  Included into State Register of the Republic of Kazakhstan Reg.№ KZ.07.00. 00122-2002 of 20.06.02
	Dissolved oxygen	GOST 26449.3-85 Stationary distillation and desalination facilities. Methods for chemical analysis of salty water and distillate to identify the content of gas. Methods of oxygen identification.  Regulation 204.2.11-91 NPO "Rosvodokanal" Method for	Included in document of Gosstandart of the Republic of Kazakhstan "Regulation on the standardization of the Republic of Kazakhstan. Index 2004"  To be certified annually

		determination of dissolved oxygen in urban sewage and water reservoirs upper and lower of the point of discharge of treated wastewater.	Not included
	Sulfates	GOST 26449-1-85 Stationary distillation and desalination facilities. Methods for chemical analysis of salty water. Methods of sulfates identification.  Standard of RK 1015-2000 Waters. Gravimetric method to identify the content of sulfates in natural and waste waters.	Included in document of Gosstandart of the Republic of Kazakhstan "Regulations on the standardization of the Republic of Kazakhstan. Index 2004"  To be certified annually  -«-
	Hydrogen sulfide and sulfides	GOST 26449-3-85 Stationary distillation and desalination facilities. Methods for chemical analysis of salty water and distillate to identify the gas content. Titration method for identification of hydrogen sulfide.	-«-
	Dry residue	GOST 26449-1-85 Stationary distillation and desalination facilities. Methods for chemical analysis of salty water. Methods of the solid residue identification.  GOST 26449-2-85 Stationary distillation and desalination facilities. Methods for chemical analysis of distillate	-«-  -«-
	Boron	Standard of RK 1016-2000 Method to identify mass concentration of boron	-«-
	Iron	GOST 26449-1-85 Stationary distillation and desalination facilities. Methods for chemical analysis of salty water. Methods to identify iron.	-«-
	Calcium	GOST 26449-1-85 Stationary distillation and desalination facilities. Methods for chemical analysis of salty water. Methods of calcium identification.  GOST 26449.4-85 Stationary distillation and desalination facilities.	-«-

		<p>Methods of chemical analysis when desalting the water.</p> <p>Methods of calcium identification. Regulation 52.24.55-88</p>	
	Copper	<p>GOST 26449-1-85 Stationary distillation and desalination facilities. Methods for chemical analysis of salty water. Extraction - photometric method of copper identification.</p> <p>GOST 26449.2-85 Stationary distillation and desalination facilities. Methods for chemical analysis of distillate.</p> <p>MCM of mass concentration of copper in samples of natural, drinking and sewage waters using "Flyuorat-02" liquid analyzer</p>	<p>Included in document of Gosstandart of the Republic of Kazakhstan "Standardization Regulatory Act of the Republic of Kazakhstan. Index 2004"</p> <p>To be certified annually</p> <p style="text-align: center;">-«-</p> <p>Included into State Register of the Republic of Kazakhstan Reg.№ K Z.07.00 00184-2003 of 25.02.03</p>
	manganese	<p>M-01-27-2001</p> <p>Method for measuring the mass concentration of manganese in samples of natural, drinking and sewage water using "Flyuorat-02" analyzer</p>	<p>Included into State Register of the Republic of Kazakhstan Reg.№ KZ. 07.00. 00124 –2002 of 20.06.02</p>
	Oil products	<p>GOST 26449.1-85 Stationary distillation and desalination facilities. Methods for chemical analysis of salty water. Gravimetric method of oil products identification</p> <p>ENDF 14.1:2:4.128-98 MCM of mass concentrations of petroleum products in samples of natural, drinking and sewage water by fluorometric method using "Flyuorat-02" liquid analyzer</p>	<p>Included in document of Gosstandart of the Republic of Kazakhstan "Standardization Regulatory Acts of the Republic of Kazakhstan. Index 2004"</p> <p>To be certified annually</p> <p>Included into State Register of the Republic of Kazakhstan Reg. № KZ. 07. 00. 00090- 2002 of 01.04.02.</p>

	Nickel	GOST 26449.1-85 Stationary distillation and desalination facilities. Methods for chemical analysis of salty water. Photocolorimetric method of detecting nickel	Included in document of Gosstandart of the Republic of Kazakhstan "Standardization Regulatory Acts of the Republic of Kazakhstan. Index 2004"  To be certified annually
	Phenols	GOST 26449.1-85 Stationary distillation and desalination facilities. Methods for chemical analysis of salty water. Extraction-photometric method of detecting phenols ENDF 14.1:2:4.34-95  MCM of mass concentrations of phenols in samples of drinking, natural and waste waters using "Flyuorat-02" analyzer	Included in document of Gosstandart of the Republic of Kazakhstan "Standardization Regulatory Acts of the Republic of Kazakhstan. Index 2004"  To be certified annually  Included into State Register of the Republic of Kazakhstan Reg.№ KZ. 07.00 00014-2000 of 22.12.00
	Chlorides	GOST 26449.1-85 Stationary distillation and desalination facilities. Methods for chemical analysis of salty water. Titrimetric methods of chlorides identification	Included in document of Gosstandart of the Republic of Kazakhstan "Regulation on standardization of the Republic of Kazakhstan. Index 2004" To be certified annually
	surfactants	M 01-03-98 Quantitative analysis of waters. Methods for measuring the mass concentration of polymers of anion surfactants in samples of natural, drinking and sewage water by fluorometric method using "Flyuorat-02" analyzer	Included into State Register of the Republic of Kazakhstan Reg.№ KZ. 07.00 00016-2000 of 22.12.00
	Chromium (V I)	Regulation 204.2.04-89 MCM of mass concentrations of chromium (VI) in urban sewage waters	Not certified