Citizen's observations (public monitoring) manual for environmental inspectors

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FOREWORD

Present publication includes materials and practical experience in the field of environmental monitoring as a tool of public environmental control. This manual could be useful for public inspectors to study background status of environment before planned activities and following study of consequences for human being life and health from completed activities as well as environmental security (post-expert control).

This manual allows:

- *getting skills how to assess the level of environment impact;*
- *determining parameters of environment quality;*
- *understanding mechanisms of public participation in environment impact management; and*
- *using all acquitted knowledge in practice*

Materials and techniques of "Independent Environmental Expertise" Public Association, "EcoPartner" LLC and the Finnish Environment Institute (SYKE) have been used for preparation of present Manual.

Herewith the Authors of present publication express hope that presented information will help all stakeholders to increase their capacity for protection and promotion of public environmental interests.

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Introduction

Environment status of the Central Asian region is affected by number of various factors such as enough large amount of population, operating mining industry, agriculture and farming.

Agriculture activity in region and its sustainable indicators of growth directly depend on favorable environment condition of considered territory.

For improving and keeping of proper environment condition it is very important to decrease negative impacts on ecosystems. That is why study of pollution sources and identification of their character helps to find ways for improving of environmental situation.

The most common types of pollution sources

For the Central Asian region where population is about 55 million people the most serious problem is anthropogenic eutrophication of surface waters (increasing of biological productivity of water objects in the result of nutrients content increasing due to anthropogenic activity) and contamination of territories due to operation of industrial enterprises.

The main reasons of environment pollution:

- contamination of territories by agriculture activity (mineral fertilizers and farming organic wastes);

- contamination of land resources and water objects by wastewaters (untreated domestic, industrial and storm drains, tailings with mining wastes).

Phosphates, nitrates, oil products, heavy metals and other pollutants are inflowing into the water sources together with wastewaters. Abundant amount of nitrogen and phosphorus compounds causes eutrophication of waters and weediness of shoreline that is the reason of water quality decreasing and death of water fauna, and consequently to biodiversity decreasing.

The dangerous sources of chemical pollution, besides uncontrolled industrial emissions and discharges are unauthorized waste dumps.

One of the key roles in terms of environment protection is environment legislation system that is in the process of development and improvement. The main purpose of environmental legislation is ensuring of safe environment for life and health, environment protection, sustainable nature management. However, even in case of perfect legislation availability it is impossible to achieve its main target without its proper fulfillment. Unfortunately, currently non-adherence or violation of environmental legislation is a systematic.

Among guaranties of environment legislation fulfillment, an environmental control takes a leading position.

Environmental control

An environmental control is one of the most effective tools for ensuring of proper adherence of normative and legal requirements in the field of environment protection. Actually, it is impossible to assess effectiveness of environment legislation without environmental control.

The objects of environment control are:

- environment condition;

- fulfillment of obligatory norms related to environment protection and environmental safety ensuring;

- adherence of environmental legislation.

Actually, environmental control is one of the environment protection management functions and tool for ensuring of sustainable nature management and environmental security.

1.2. Types of environmental control

Depending on entities responsible for control and its scope there are following types of environmental control: *state, institutional, industrial and public (citizens' observations)*.

In this manual we consider a public environmental control. The public environmental control is implemented by civil representatives in order to protect environment and health, sustainable nature management by the means of warning, identification or prevention of violations. Objects and methods of such control are determined directly by citizens, local self-government authorities or NGOs implementing public control.

Speaking about differences and relations of the state and public environmental control, it is necessary to mention that in comparison with the state control, there is no such component in public control as application of state enforcement measures to the violators who do not observe requirements of environmental legislation. The civil representatives could only prevent violation or occurrence of negative consequences of any activity, or collect and summarize related information and hand over such information to the responsible state authority for following application of preventive or punitive measures, and also require response measures from the corresponding state authorities.

Definition of public environmental control in the legislation of the Kyrgyz Republic is not clear enough. For example, in some normative-legal acts the traditional definition of public control is limited by activities of specially authorized public inspectors only, or there are few other limits by subjects which have right to implement such control (for example, only registered public associations based on their charters).

According to our opinion, currently, public environmental control should be considered in wider scope – e.g., as a guarantee for implementation of citizens rights to:

- environment that is safe for life and health;
- participation in management and environmentally significant decision-making in accordance with principles of UN ECE Convention on the access to environmental information and public participation in environmental decision making (Aarhus Convention).

Thus, one of the main tools of public environmental control is organization and implementation of environmental monitoring, which presupposes control of environment changes under influence of both nature and anthropogenic factors.

The target of public monitoring (civil observations) is formation of positive environment world outlook and citizens responsibility of population by involvement of local self-government authorities, nature protection enthusiast and members of environmental public organizations into monitoring.

Tasks:

- Joining of efforts of citizens representatives and specialists from the state environmental authorities toward settlement of environment protection issues;
- Systematic study of environment condition for identification of positive and negative consequences of economic activity in the area where public monitoring participants live;
- Creation of conditions for interinstitutional collaboration and partnership in the process of public monitoring (citizens observations) carrying out;
- Receiving of objective and important information about environment status and informing of decision-makers;
- Protection of public environmental interests;

The activities stages of public groups (groups of citizens' representatives) responsible for environment status study

Firstly, for conservation of natural ecosystems and increasing of environment quality it is necessary to decrease anthropogenic load in the process of nature management.

A lot of above-mentioned measures could be implemented only by the state authorities, environment institutes and other entities and organizations. But the role of citizens' representatives in terms of problem identification is the essential and primary component.

Activity of public groups (groups of citizens' representatives) related to observing of environment status, taking into account collaboration with all stakeholders could be implemented based on the following scheme:

- discussion of reasons for investigation, determination of tasks, planning of investigation schedule and assignment of roles within the group;

- selection of site or territory of investigation, primary study including the simplest observations – walking expedition and visual assessment of the site, 1:500 or 1:1000 site mapping, narrative description of the site (territory), photo shooting of the most indicative natural and anthropogenic objects.

- identification of key geographic characteristics of investigated object;

- collection of "historical" information about the site (territory), information about possible pollution sources, including by interviewing of local population and representatives of local administration.

- determination of parameters that should be studied, selection of investigation methods;

- detailed study of water, soil, and air quality according to the techniques in Annex 1;

- results analysis, conclusions about status of the site (territory) or object.

- submission of investigation results to the local authorities, state environment authorities, bodies of environmental supervision/monitoring, addressing to another experts for clarification of situation;

- dialog with persons/organizations responsible for decision-making related to activities required for improvement of situation;

- communication with mass-media, distribution of information about identified problem and decisions required among all possible information channels;

- awareness raising of population, support of local citizens activities toward decreasing of anthropogenic load to the site (territory) or object;

- control and monitoring of decisions and activities for elimination of identified problems.

Environment monitoring: methods and tools

Initial inspection

The general assessment of whole studied territory is important with the first inspection – inspection of waters, soil cover, facilities used for economic activities, etc.

Initial inspection allows making primary conclusions about studied object.

Under the initial inspection it is recommended to implement following works:

1. To mark on map the key sites where works will be implemented further;

2. To asses environmental status of key sites:

- Availability of garbage on the territory or water surface (normal condition – no any wastes; disturbed – presence of domestic wastes; degraded – presence of domestic and construction wastes).

- Status of soil cover (normal condition – no visual disturbances; disturbed – visually identified polluted or damaged sites; degraded – natural landscape degraded).

- condition of grass cover (normal – no visual disturbances; disturbed – signs of trampling, parching; degraded – development of erosion processes).

- status of tree and shrubbery vegetation (normal – no visual disturbances; disturbed – broken brunches, diseases; degraded – vegetation loss, numerous trunk damages).

3. To mark location of potentially dangerous objects and possible sources of pollution on map-scheme.

Environment quality indicators

Composition of natural water, soil, air depends on physical environmental conditions, biological and microbiological processes, anthropogenic activities near inspected site.

For inspections by the groups of citizens' representatives it is recommended to select those indicators, which could be identified under field conditions or by simple laboratorial measurements. It is recommended to start from the simplest observations and measurements.

In the process of investigation planning, initially it is necessary to make analysis of tools available (equipment, reagents, instruments), and that what you are able to determine by tools available.

Investigation methods are presented in Annex # 1.

Activities of public groups (groups of civil society representatives) on environmental monitoring

Initial inspection on the selected site is performed after identification of problem, set of tasks and assignment of roles within the group.

In the framework of initial inspection that includes visual assessment of the site it is reasonable to make photos and prepare documents (narrative describing) about current status of inspected site. **Photo shooting** could be the basis for site mapping that will be important document under development of action plan on improvement of sanitary state of the site.

Sketch map 1:500 or 1:1000 is necessary for demonstration of such details as channels, roads, vegetation, large stones, constructions, etc.

Topographic base for sketch map of site could be e.g., the copy of urban area development plan that should be available in architecture-planning departments of local administration. In the process of sketch map development by own force the easiest way to do it is using of exploratory survey (eye survey) of the site.

Sketch map will be the basis for following environmental monitoring of flora, fauna, soil, water, air, etc. and environmentally rescannable decision making toward improvement of situation.

The next step is **identification of polluters in environment - soil, water, air -** by methods available in Annex 1.

In case of problem determination, deviation of any indexes from normal values, it is very important to find out the source of such deviation. Besides that, it is good to trace changes of determined parameters in time and spatial dynamics. For example, some deviations could be caused by accident discharge/emission or they could be systematic and long term.

Simultaneously with environmental monitoring, or even before, it is necessary to collect data about presupposed **pollution sources** and study the site (territory) history. If you know about any anthropogenic objects you can plan monitoring more effectively taking into account prospective influence of known anthropogenic objects on the inspected site. Data collection should included description of objects and indication of them on sketch map.

In the process of surface water quality monitoring biodiversity indexes could help for searching of hidden pollution sources.

Information about economic activity objects, i.e. prospective polluters is the basis for decision making in terms of environment management. Such information allow understanding the reasons, character, periodicity of sire pollution and developing action plan toward improvement of environment and prevention of its further contamination.

Information study

Long-term anthropogenic pollution causes changing not only of environment but also of ecosystem.

It is important to know about the history of the site (territory). One of the information collection methods is interviewing of local population about the status of the site in the past: what kind of flora and fauna existed, the level and quality of water, how local citizens used the site before, were there any industrial activities or no, etc. These data can help to make comparison analysis of ecosystems status against the current situation.

Environmental authorities also could help with collection of such information. First of all it could be authorities responsible for environmental control.

From local inspection to public monitoring (civil observations)

If group of citizens representatives made a decision to undertake environmental monitoring of the site that has important meaning it is necessary to asses own capacity for receiving of complete and truly picture about site status taking into account geography and time changes. Systematic environmental monitoring allows receiving of such picture. The monitoring basis should be observation points system where you can measure available parameters on the seasonal basis. Such measurements will allow comparing results obtained within environmental monitoring, taking into account seasonal and annual changes.

Combination of collected data about past and current environment status, including your own observations will serve as a basis for development of measures toward improvement of situation,

ensuring of ecosystem wellbeing, increasing of recreation and economic values of the site for population benefits.

Where should you address for settlement of problems identified?

If in the course of inspection it was detected that pollution source is enterprise located near the site (territory), that enterprise owners are responsible for elimination of violations. The representatives of local society or the person responsible for inspection have the right to address to the corresponding local authorities for taking of measures:

- administration of local settlement
- environment protection authorities
- sanitary and epidemiological services
- environmental and technical security authorities, etc.

In order to submit your application for consideration, and specific measures to be taken for settlement of problem it is necessary to be properly prepared, the problem should be clearly identified, required documents should be collected. Also it is necessary to inform about all facts and conditions, your opinion related to possible consequences and optimal decision;

It is necessary to prepare official letter and attach copies of all materials describing the situation. The important component for justification of problem is submission of documented results of your investigations (sketch map, investigation protocols, and data on water, sol and air quality). It is useful to make citations to related national legislation emphasizing the items and articles directly linked to the case;

The letter and all submitted materials should be registered by organization where they are submitted.

Publications and distribution of investigation results

It is important that as many as possible people know about the value, status, problems of the investigated territory and possible decisions. For distribution of information about the results of your studies it is necessary to collaborate with journalists. You could tell journalists about results obtained, organize informational campaigns, public discussions with stakeholders and round tables, prepare press-releases.

Publication of information in Internet

Publication of results obtained based on public representatives' groups investigations as well as scientific data about environment status, interactive maps could help with settlement of existing problem.

Such data bases could be created by public organizations and served as information exchange platforms among groups involved into environment monitoring. Also they could be useful for involvement of new participants and attraction of attention from the side of the state authorities to the problem.

Participation in promotion of sustainable nature management

For effective participation in the management of sites affected by anthropogenic influence, the public representatives should work simultaneously ate different levels: local, national and regional. Establishment of effective partnership relationships is important element for integrated environment management.

For NGO it is important to know not only specific of region, but also to be prepared to involve all stakeholders into partnership, to engage local expertise and experience; permanently to make efforts for increasing of civil representatives awareness and to support local population.

Therefore, before planning and implementation of activities in present region it is important to understand the interest of local stakeholders and establish trustful relationships with them.

Interaction with the local highest officials and other persons who could affect the public opinion can help with achievement of understanding of environment protection, environmentally important decision-making and fulfillment of measures toward improvement of environmental status by all stakeholders.

The civil representatives (the public) cannot always implement decisions and fulfill measures that have been determined, but the can be the leverage for positive changes, initiators of cooperation establishment, the leaders of information campaigns and involvement of all interested parties.

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The Finnish Environment Institute (SYKE) is a national research and development centre of the environmental administration in Finland, established in 1995. SYKE is organized in six Centres, each focusing on major environmental themes, such as water resources, sustainable production and consumption, biodiversity, environmental policy and marine research.

SYKE's Freshwater Centre supports water protection and water resources management by multidisciplinary research and by expert services. These include collecting information and development of assessment tools and sustainable solutions. Typical issues are related to water supply, wastewater treatment especially in scarcely populated areas, agricultural and forest based nutrient loading, lake restoration, flood protection, hydraulic construction, and utilization of water resources. The Freshwater Centre is also responsible for the monitoring and assessment of the quantitative variations of water resources, the status of surface and ground water bodies and various biological variables.

SYKE's Laboratory Centre develops and produces a variety of environmental analyses and tests. The Centre fulfils SYKE's function as the national reference laboratory in the environmental field under the Environmental Protection Act. Its duties include arrangements for reference measurements, standardization of methods, training and expert support for the authorities and other parties within the environmental field. It also acts as the national aquatic chemistry calibration laboratory and manages the certification system of environmental sampling personnel.

NGO "Independent ecological expertise" has been performing its activity since 1998.

The main mission of NGO is defense of citizens' rights and rights of present and future generations for favorable environment.

The main areas of activities are improvement of environmental policy and legislation, public environmental expertise, promotion of public participation in decision-making at the national and international levels, strengthening of law enforcement practice related to protection of public environmental interests. NGO is involved into protection of the civil environmental rights (representation in the court, consulting). It has significant experience in research- analytical activity and informational campaigns. The Public association "Independent ecological expertise" is the member of International POPs Elimination Network (IPEN).

Detailed information about NGO's activity is available at www.eco-expertise.org.

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"EcoPartner" Company has been performing its activity in Kyrgyzstan since 2007.

EcoPartner is leading consulting company working in the market of Kyrgyzstan, Tajikistan, and the Russian Federation. Guiding by international standards, it provides its customers with the wider service spectrum in the field of law, economy, ecology, mediation and formation of systematic approach to the managing decision-making in business sector.

Company renders its service by single-window system. The staff consists of high qualified specialists in the field of legal consulting, protection of customers' rights in the courts, financial, tax and environmental consulting, environmental monitoring and also negotiation processes.

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International POPs Elimination Network (IPEN)

Established in 1998, IPEN is registered as a public interest, non-profit organization in Sweden and is comprised of hundreds of Participating Organizations in over 100 countries, primarily developing and transition countries. IPEN brings together leading environmental and public health groups around the world to establish and implement safe chemicals policies and practices that protect human health and the environment

www.ipen.org

Annex # 1

To the Citizen's observations (public monitoring)

Manual for Environmental Inspectors

Water and soil sampling, air pollution and radiation measurements

1. General provisions

1.1. The present Public Monitoring Manual for Environmental Inspectors (hereinafter referred to as Manual) has been prepared for strengthening of knowledge and capacity increasing of individuals who are interested in and have reasons to implement public monitoring (civil observations), as well as for determination of order and sequence for investigations, and rules for water (excluding drinking), soil, sediments, air, industrial emissions and discharges sampling, radiation measurements in populated settlements and other sites.

1.2. The Manual's tasks are teaching of civil representatives and provision of it with observation, accounting, assessment, forecasting, informing, control and management tools in the field of environmental monitoring on the territory of the Kyrgyz Republic.

1.3. The Manual has been prepared in accordance with environmental legislation of the Kyrgyz Republic, taking into account international practice.

1.4. Accredited research laboratories involved into environmental public monitoring activities should use accredited methods in the process of sampling.

1.5. Detailed sampling procedure and measurements are available in standards and normative – documents that establish requirements to performed activities and applied in the Kyrgyz Republic (Annex A).

2. Purpose and scope of application

2.1. The Manual establish sequence of activities in the framework of public monitoring and requirements to the procedures and methods of sampling/measurements, sampling/measuring safety rules, and requirements and safety rules during samples transportation and storage.

2.2. The Manual is designed and suitable for teaching of NGOs and civil representatives involving into environmental monitoring. It also can be used as methodological guideline for Environmental Impact Assessment and by environmental inspectors who examine business entities.

2.3. The Manual's rules for sampling/measuring are applied to:

2.3.1. Waste waters of enterprises, small-scale industrial sites, workshops, installations, treatment facilities, recycling water supply and sewage systems containing polluting agents in dissolved and suspended form;

2.3.2. Surface waters affected by anthropogenic activities;

2.3.2. Emissions by authorized and unauthorized emission sources, industrial enterprisers, manufactures and workshops;

2.3.3. Areas and sites with polluted soil;

2.3.4. Bottom sediments;

2.3.5. Determination of radiation emissions from anthropogenic and natural sources.

2.4. Environmental Public monitoring (Civil observations) is implemented for:

2.4.1. Obtainment and distributing of information associated with specific problem;

2.4.2. Investigation of environment quality for taking of correction measures under determination of short-term changes;

2.4.3. Investigation of environment quality for development of study Programme under determination of long-term changes;

2.4.4. Determination of composition and properties of waste waters, emissions and content of polluters in soil based on parameters stipulated in standards and normative documents, presented in Annex 1;

2.4.5. Identification of water, soil and air pollution sources;

2.4.6. Determination of environment radiation background (populate areas, enterprisers) based on parameters stipulated in standards and normative documents, presented in Annex 1;

2.4.7. Identification of radiation sources.

2.5. The manual also could be used for:

2.5.1. Development of environment observation programmes in order to receive reliable data about natural conditions and limits for planned anthropogenic activities under Environment Impact Assessment;

2.5.2. Development of programme for supervision over environmental monitoring in the process of construction, operation and liquidation of enterprise;

2.5.3. Development of programme for supervision over waste water treatment facilities and waste waters discharges into municipal sewage systems and environment;

2.5.4. Development of programme for supervision over water quality based on physical, chemical and hydrobiological indicators;

2.5.5. Development of programme for supervision over air quality around existing and newly developed populated areas;

2.5.6. Development of programme for supervision over emissions from industrial and other enterprisers;

2.5.7. Development of programme for supervision over general and local pollution of soils in the area of industrial, agricultural, economical and transportation pollution sources;

2.5.8. Development of soul quality assessment programme;

2.5.9. Development of programme for supervision over fertile soil layer, presupposed for earth mulching of low-yielding areas;

2.5.10. Development of programme for supervision over anthropogenic and natural radiation sources for ensuring of population safety;

2.5.11. Development of programme for supervision over the level of radiation safety principles, normative requirements, including observance of established limits under normal operation of enterprises;

2.5.12. Development of optimization programme for protection and decision-making about interventions in case of radiation accidents, areas and building pollution by radionuclides and also on the territories and in the facilities with increased level of natural radiation;

2.5.13. Development of programme for ensuring of radiation safety in the process of radioactive industrial wastes utilization.

3. Definitions

3.1. The following definitions and wordings are used in present Manual:

Emissions, discharges of harmful substances – outflow/outcome into outside environment (air, water, land) of pollutants from any pollution source;

The State Standard (GOST) – normative-technical document that establish the set of norms, rules, requirements to the standardization object and that is obligatory for all state authorities and economic entities.

Identification of samples/measurements – identification marking of collected samples and measurements.

Identification marking – recognizing, identification numbers and marks for determination of location and samples types of studied elements.

Sample preservation - prevention of changes in qualitative and quantitative composition of samples for the period starting from sampling completion and ending by analyses starting.

Sampler container – permanent or replaceable component of sampler. Replaceable container could be used as vessel for sample storage.

Local soul contamination - pollution of soil on the limited areas caused by point pollution sources: waste dumps, farms, chemicals storage facilities, industrial enterprisers, etc..

Environmental monitoring – observations over environment parameters, assessment of its quality and forecasting of expected changes;

Microbe contamination – contamination of collected and analyzed samples by microbes. It could be source of diagnostic errors.

WCN – water control norms used for sampling of waste waters for analyses;

Unhomogeneous soil cover- soil cover containing less than 70 % of area with similar soil properties;

Total soil contamination – contamination caused by chemical crop protection agents, organic and non-organic fertilizers, irrigation by waste waters, and also other pollution distributed around vast territories.

Homogeneous soil cover - soil cover containing not less than 70 % of area with similar soil properties;

Maximal allowable concentration (**MAC**) – concentration of chemical elements and their compounds in environment that under long-term influence on human does not cause abnormal changes or diseases, diagnosed by the modern methods of examination at any life cycles of current and future generation.

Absorption equipment (sorbent tubes) – containers for completion of instrument (aspirator) for catching of harmful substances in air in the process of sampling for following analysis in Laboratory.

Water sample – water volume collected in accordance with sampling procedure from supervised object in amount enough for laboratory analyses and preparation of analytical samples.

Sampling site – site for collection of samples located on the investigated area characterized by comparable conditions;

Sampler – instrument for sampling;

Water discharge — water volume flowing through cross section of streambed per time unit;

Waste water properties - characteristic of waste waters based on parameters different from analyzed pollutants;

Waste water composition - characteristic of waste waters, including the list of pollutants and their composition;

Combined sample – mix from not less than two point samples;

Stationary air observation point –facility for specialists especially equipped by instruments required for uninterrupted long-term registration of air pollutants concentrations, samplers and instruments for meteorological parameters measurements according to developed programme (GOST 17.2.1.03-84);

Thermo-insulating container (thermo container) – container for storage and transportation of samples providing their protection from effect of high and low environment temperatures.

Point sample – material collected from the same horizon or the same layer of sol profile that is typical for this horizon or layer

4. General rules for sampling and measurements

4.1. Sampling and measurements

4.1.1. The programme is identified based on determined tasks, depending on investigated object and it should comply with requirements set up in standards and normative documents, presented in Annex 1.

4.1.2. Sampling and measurements procedures determine following:

1) Type of measurements and samples;
2) Samples size;
3) Used containers/vessels;
4) Samples preservation methods

4.1.3. Procedures should be used related to each contamination parameter, as well as identification and documentation of samples or measurements.

4.1.4. Collected samples and results obtained based on measured parameters should as much as possible represent main characteristics of investigated area as of the current moment or for definite time slot.

4.1.5. Sampling, samples storage and transportation methods should ensure stability of their composition during time between their sampling and samples analyses.

4.1.6. Detailed sampling/measurement plan should be prepared before sampling or measurements. The required degree of its detail depends on sampling (measurement) purpose and identified tasks of investigation. Under determination of sampling (measurement) goals it is necessary clearly identify the purpose of data that should be obtained finally. Data quality is determined by preciseness and reliability.

4.2. Sampling and measurement plan

4.2.1. Introduction:

1) Indication of sampling and measurement reasons;
2) Indication of sampling and measurements tasks/goals;

4.2.2. Reconnaissance survey of investigated area:

1) Determination of the size and probable/possible pollution scale of investigated area. At that it is necessary to cover the complete investigated area by sampling pints;
2) Indication of measurements and sampling points number;
3) Characteristic of the site (sampling point or measurement), including sampling point location, landscape type and characteristic of activities performed on the investigated area;
4) Determination of the source for probable/presupposed pollution.

4.2.3. Characteristic of controlled facility (if available) where sampling and measurements are performed:

1) Review of controlled facility: characteristic of environmental safety requirements and norms adherence in the past and its current obligations in accordance with design documentation that received positive opinion (conclusion) from the state environmental expertise, conditions of license and/or permissions obtained;
2) Collection and study of existing claims and complaints related to activity violating environmental safety normsи.

4.3. Measurements and sampling programme

4.3.1. Description of sampling and measurements:

1) Indication of site:
2) Duration;
3) Periodicity;
4) Treatment and preparation;
5) The list of controlled parameters;
6) Documentation of situation before sampling and after measurements completion. Description of content, sampling and measurement methods in sample registration forms.
7) Indication of sample volumes required for laboratory analyses in accordance with method and sampling purpose.

4.3.2. Characteristic of samplers and measuring equipment:

1) Name and characteristic of measuring equipment (instruments) and samplers;
2) Name and characteristic of consumables for sampling and measurements with indication of their required amount;
3) Name of registration materials with indication of their required number and type.

4.3.3. Packaging and transportation:

4) Characteristic of vessels/containers and packing material for each sample type;
5) Characteristic of transportation types: person responsible for transportation, vehicle;
6) Sample transportation terms: it is necessary to indicate if samples are transported to laboratory directly or initially they are stored;
7) Characteristic of samples storage conditions.

4.3.4. Coordination:

1) Determination of coordination mechanism: coordinator (group leader) is responsible for sampling and measurement process, group safety and, if necessary, for engagement of other experts;
2) Characteristic of external contacts: coordinator (group leader) is responsible for communication with involved persons.

4.3.5. Safety:

1) Characteristic of investigated area: determination of possible orographic and other territorial risks and corresponding safety measures to be undertaken;
2) Characteristic of measurements and sampling: time, type and method; identification of possible risks ad corresponding safety measures to be undertaken;
3) Equipment operation: identification of possible risks and corresponding safety measures to be undertaken;
4) Characteristic of substance from which the sample to be taken: identification of possible polluters and corresponding safety measures to be undertaken;
5) Characteristic of measurand: identification of possible effects and corresponding safety measures to be undertaken;
6) Characteristic of individual protection means and other protection materials;
7) Determination of responsibility scope: to indicate person, responsible for safety rules adherence. Such person could be sampling coordinator (group leader) or safety officer. All recommendations (orders) related to safety rules should be fulfilled immediately.

4.3.6. Group structure:

Characteristic of sampling and measuring group structure - (full names, positions or functional duties).

4.4. Requirements to the sampling and measurement specialists

4.4.1. For obtainment of reasonable results from laboratory analyses of samples collected, and measured parameters it is necessary to establish sampling and measuring groups from qualified specialists and ensure proper fulfillment of requirements of present Manual;

4.4.2. It is recommended that sampling is performed by persons not younger than 18 ages after safety briefing;

4.4.3. Sampling at industrial sites or in case of disputes occurrence when the proof of pollution is needed, the sampling or measurements should be carried out under presence of stakeholders.

4.5. Identification and sample/measurements documentation

4.5.1. The goal of sample (measurement) documentation is ensuring of integrity and identity of sample (measurement). A sample (measurement) should have single identification marking in the process of all following actions.

4.5.2. The following should be documented:

1) Identification of object where sampling or measurements take place;
2) General location (e.g. location of enterprise);
3) Specific location of sampling point in the process of measurements;
4) Characteristic of area and related observations;
5) Date and time of sampling or measurement;
6) Sample (measurement) characteristic;
7) Content of vessel/container (specific collected material);
8) Name of measured substance;
9) Name of measured component;
10) Reason of sampling and measurement;
11) Quantitative characteristics of collected samples (volume, quantity, weight);
12) Identification (measurements or samples numbers) of corresponding samples (measurements), in case of availability;
13) Measurement and sampling methods;
14) Sample type (combined, point, etc.);
15) Used instruments and equipment;
16) Preliminary cleaning of equipment and its disinfection between use;
17) Sample storage and transportation;
18) Main container/vessel, lid type and preliminary cleaning;
19) Packing;
20) Preservation type (if necessary);
21) Type of delivery to Laboratory (including date and time);
22) Technical comments and photos;
23) Other information

4.5.3. Complete and clear notes are the key component of documentation of officially collected samples and measurements done. A goal is possibility to follow origin of sample and measurement, ensure sample integrity starting from sampling to results submission as a proof in case of proceedings.

4.5.4. Sampling documentation should be done in accordance with Sampling Protocol (Annex B).

4.6. Equipment for measurements and sampling

4.6.1. A laboratory can submit information about types and volumes/sizes of samples required for analyses of definite pollutants, storage methods and time, as well as instruct how to transport samples properly.

4.6.2. Before site-visit all equipment required for sampling and measurements and safety protection means should be assembled, cleaned and checked in order to be sure that al them in operation condition. All energy sources (batteries, accumulators) required for work should b also checked and charged if needed.

4.6.3. Before site-visit it is required to complete all preparations. Preparations include marking, preparation and completion of forms and laboratory requests. Equipment for sampling and field measurements, in cases of requirement (information is available in equipment passport/certificate), should be calibrated.

4.6.4. In order to prevent cross-contamination samplers should be cleaned. The samplers and protection clothes should be cleaned immediately after use and stored separately. Laboratory responsible for samples analyses should give cleaning instruction. Some laboratories can provide cleaned containers/vessels by themselves.

4.6.5. If it is impossible to clean equipment or it is already worn out, such equipment should be replaced. Service terms of equipment is limited and it should be updated on the permanent basis (e.g., tube gas filters, indicator tubes for gas, etc.). Other measurement means, such as pH meters should be calibrated on the periodical basis. It is necessary to care about availability of administrative system ensuring timely taking f corresponding measures.

4.6.7. Sampling persons should be aware about requirements to the sampler utilization. Damaged or contaminated equipment that is impossible to use more should be properly cleaned, sealed and delivered to laboratory for disposal.

4.6.8. Broken glass bottles and other vessels should be wrapped by several layers of paper before put them into pocket. If broken glass is dirty it should be placed in the special disposal area for dangerous wastes.

4.6.9. If glass or steel samplers could are used repeatedly they should be disinfected after each use.

4.7. Measurements and sampling reporting

4.7.1. A report should contain the summary information about measurements and sampling results. Additionally to information documented in the process of sampling or measuring it is necessary to take into account following:

1) Values of sampling or measuring results;
2) Legislation requirements;
3) Verification and conclusion about legislation requirements fulfillment (compliance or overlimits of MAC).

4.8. Sample storage and transportation

4.8.1. Sample volume/size is determined by amount of materials required for proper Laboratory analysis and necessity to ensure sample representativeness, including additional samples required for quality control (e.g. duplicate measurements). Taking into account these requirements, sample size should be minimal in order to decrease the part of unused sample and mitigate its prospective influence on human and/or environment.

4.8.2. After sampling and sample documentation it is necessary to store them in safe place before their delivery to the Laboratory. Sample(s) is forwarded to Laboratory together with support documents in accordance with item 4.5.2.

4.8.3. Independently on how the sample is transported to Laboratory, it is necessary to observe the set of requirements:

1) For prevention of sample contamination or loss, the glass vessels/containers should never packed together;
2) Sample marking should be clearly visual through plastic bag;
3) Support documents should be attached to the samples protected by plastic covers.

4.8.4. Laboratories' managers or assigned person should be informed about sample transportation, transportation type and expected time of sample delivery.

4.9. Safety rules in the process of sampling and measurements

4.9.1. The safety rules should be obligatory observed in the sampling process. From one side it is necessary to use proper instruments in order to prevent sample contamination, from another side for ensure of safety rules during sampling.

4.9.2. In the process of sampling or measurements it is recommended to foresee possible risks of accidents, to think over how it is possible to prevent such accidents and in case of their occurrence how to minimize the risk to a human being and an environment.

4.9.3. To get inside limited space during sampling or measuring is possible only if specialist is prepared to do it and he/she has individual protection means and proper equipment, such as respirators and life secure equipment.

4.9.4. The limited areas should be checked against availability of enough amount of oxygen and absence of toxic and explosive gases. Availability of two persons is required. While one of the persons is getting inside another one is waiting for him outside.

4.9.5. A coordinator (team leader) is responsible for him/herself and other team members during the sampling and measurements in the framework of investigation.

4.9.6. In case of chemical pouring on clothes or directly to the skin it is necessary to take off clothes and carefully wash affected part of skin by pure water. It is recommended to have spare clothes in case of such accidents. The following treatment of clothes should be organized in accordance with waste management rules.

4.9.7. In case of protection clothes and gloves contamination by dangerous and toxic chemicals, it is necessary to treat it in accordance with dangerous waste management rules.

4.9.8. It is necessary to study protection equipment user's manual and be sure in its protection properties.

4.9.9. It is necessary to have reserve of clean water and dry hand cleaning means. The hands should be washed immediately (initially with gloves) after sampling.

4.9.10. A group should be equipped with first aid kit and communication means. I case of difficult mining conditions, the special safety system should be available also (rope, climbing harness, quick links, ect.).

4.9.11. An individual protection means should be used in case of works associated with treatment of damaged equipment and wastes containing dangerous chemicals; leakages in accordance with safety rules.

4.9.12. It is prohibited:

1) To suck samples by moth;
2) To touch mouth and eyes by hands in the process of sampling;

3) To smoke and use open fire during sampling and measuring;
4) To mix substances that could react or their reaction is uncertain.

5. Water sampling rules

5.1. Sampling tasks

5.1.1. Collected sample should as much as possible represent main components of chemical composition of investigated water object currently or for definite time slot. Sampling types, samples preservation and storage types should ensure stability of chemical composition between sampling and samples measurements.

5.1.2. Sampling programme (investigation tasks, sampling location, sample type, sampling duration and periodicity, samplers, samples storage and transportation to laboratory) is determined by established tasks depending on investigated object and should comply with requirements stipulated in GOST 51592-2000, Water Control Norms (WCN) 33-5.3.01-85, GOST 17.1.5.05-85.

5.1.3. There are following main tasks of water objects investigation:

1) Obtainment and distributing of information associated with specific problem;
2) Investigation of water quality for taking of correction measures under determination of short-term changes;
3) Investigation of water quality for development of study Programme under determination of long-term changes;
4) Determination of composition and properties of waters based on parameters stipulated in standards and normative documents, presented in Annex 1;
5) Identification of water pollution sources

5.2. Sampling point

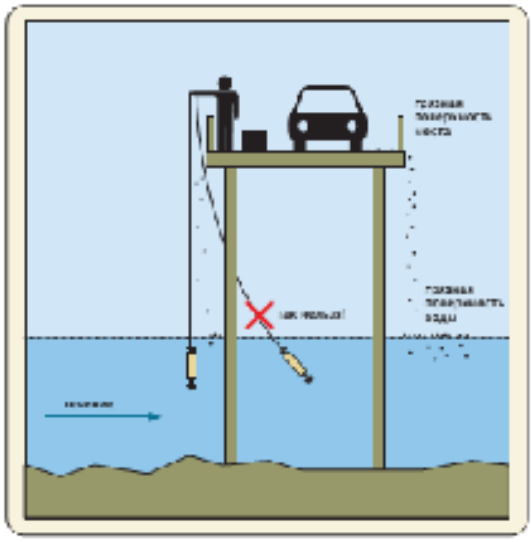
5.2.1. Sampling point is selected depending on investigation task, water object type, location of prospective pollution source and its technical specifications.

5.2.2. Waste waters samples should be taken in turbulent, well-mixed streams on the linear parts of drainage facilities out of affect zones of affluent.

5.2.3. Waste waters samples discharged to environment should be taken before place of discharge.

5.2.4 Surface water sampling should be made:

1) Upstream from location of prospective pollution source of the studied water object with 200 – 500 m intervals;
2) Near location of prospective pollution source of the studied water object;
3) Downstream from any other probable water object pollution sources with 200 – 500 m intervals;
4) From prospecting holes if necessary.



Water sampling from bridge

At that it is necessary to take into account distance to complete mixing in big and small rivers based on following table:

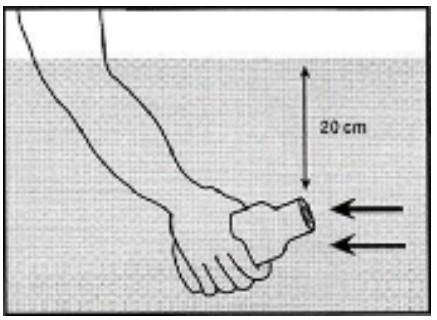
Average width, m	Mean depth, m	Estimated distance for complete mixing, km
5	1	0.08-0.7
	2	0.05-0.3
	3	0.03-0.2
10	1	0.3-2.7
	2	0.2-1.4
	3	0.1-0.9
	4	0.08-0.7
	5	0.07-0.5
20	1	1.3-11.0
	3	0.4-4.0
	5	0.3-2.0
	7	0.2-1.5
50	1	8.0-70.0
	3	3.0-20.0
	5	2.0-14.0
	10	0.8-7.0
	20	0.4-3.0

5.3. Sample types

5.3.1. The sample type is determined by investigation purpose and type of water stream. There are point and combined samples.

5.3.2. A point sample characterizes water composition as of now in present place and helps asses water quality against MAC. The point sample is taken one time collecting required water volume.

5.3.3. A combined sample characterizes mean water composition for definite time slot with specific volume. The combined sample is mix of point samples taken simultaneously from different sampling points (averaging by volume) or from the same sampling point in definite time intervals (averaging by time). Sampling of combined samples is used in order to obtain averaged data on water composition.



Особенности отбора проб и потока

5.3.4. There are an average-shift sample, an average-daily sample and an average-proportional combined sample in cases of mass analyses. The average-shift or the average-daily sample is prepared by mixing of equal by volume samples taken in equal time slots. The average-proportional sample is prepared by mixing of water volumes in proportion to consumption values collected in equal time slots.

5.3.5. Averaging cannot be done for samples presupposed for determination of substances, composition of which could be changed under air affect or during short-term time intervals (pH, dissolved gases), and also oil products and oil samples, etc.

5.3.6. Sample type should comply with task identified and be in accordance with following table:

Identified investigation task	Sample type

Study of water composition through time or distribution of polluters across the section or per volume	Only point samples
Study of water composition	Combined samples (in stream – through time, in vessel – per volume).
Control over observance of norms established in the form of concentrations	Point samples
Control over observance of norms established in the form of discharges mass units (e.g. g/hour)	Sample averaged for one hour
Study of concentration or mass for definite time slot (shift, 24 hours)	Averaged-shift or averaged daily sample
Control over average annual norm	Combined samples for acceptable period or point samples with following averaging of results

In accordance with table, only point samples should be collected for the study of water composition changes through time or distribution of pollutants across the section or per volume. Combined samples could be collected for water composition study (in stream – through time, in vessel – per volume).

The point samples are collected in order to control observance of norms established in the form of concentration. In case the norm is established in discharges mass units (e.g. g/hour) it is necessary to collect sample averaged for 60 minutes.

The averaged-shift or averaged daily sample is collected correspondingly if norm has been established in average concentration or mass for definite time slot (shift, 24 hours).

Combined samples for acceptable period or point samples with following averaging of results are collected in case of average annual norm.

In all cases it is necessary to ensure conditions providing stability of composition and properties during collection of combined sample.

5.4. Periodicity and duration of sampling

5.4.1. Sampling periodicity is determined by investigation purpose, type of water object and location of prospective pollutants.

5.4.2. Sampling duration should be determined taking into account flow rate, determined water composition and investigation goals (GOST 51592-2000, WATER CONTROL NORMS (WCN) 33-5.3.01-85, GOST 17.1.5.05-85, GOST 17.1.3.08-82.).

5.4.3. Established sampling periodicity can be reconsidered taking into account data obtained. Sampling periodicity should be increased in case of special conditions occurrence: launch and repair of treatment facilities, collectors discharging, accidents, etc..

5.4.4. For confirmation of changes in environment and finding out of deviations in course of Laboratory performance caused by negligence or used analyses methods, the duplicate samples could be collected. Duplicate sample is the second sample that is collected together with the first sample from the same site and characterizes one part of environment site.

5.4.5. Duplicate samples can be forwarded simultaneously to two or more laboratories; or to one laboratory as separate sample with separate identification number for finding out of laboratory analytical error.

5.4.6. In case of water object study with large amount of samples it is recommended to collect by one duplicate sample per each ten samples; under sampling duration (between the first and the last samples) more than 8 hours, the number of samples-duplicates should be not less than two.

5.4.7. Established MAC and Safe Reference Impact Level of chemicals in water objects for drinking and recreation purposes, concentrations are available in Hygienic Norms 2.1.5.1316-03.

5.5. Samplers

5.5.1. Samplers ensuring stability of water chemical composition should be used for water sampling.

5.5.2. During the sampling for analyses easily subjected to changes, e.g. samples containing gases, oxidized iron, etc., it is necessary to avoid mixing of analyzed sample with air. In this case the bottle should be with a header. The header is rubber plug with two glass tubes: one tube is ended near bottle bottom, another one – near plug. Filling of bottle is performed through the first tube with overfilling equal to triple volume of bottle. In case of special plug absence, sampling should be under water surface and bottle lid should be installed in water under surface.

5.5.3. The sampler and vessels (bottles) types for samples are selected taking into account flow rate, determined water composition and investigation purpose as well as general requirements set forth in GOST 17.1.5.04-81.

5.5.4. The glass, porcelain and plastic bottles that are chemical-resistant against studied waters should be used as samplers' vessels (bottles). The bottles capacity should ensure volumes required for all planned analyses.

5.5.5. The glass or plastic bottles with tightly screw caps should be used for samples storage. The cork and rubber plugs are allowable for use if sample does not contain mercury, argentum, ozone, organic compounds and does not presupposed for BOD, COD and POPs analyses.

5.5.6. The vessels (bottles) used for analyses should be clean and disinfected.

5.5.7. The vessels (bottles) used for sampling and samples storage should be clearly marked ensuring accurate identification sample number.

5.5.8. After sampling it is necessary to be sure that marking on the storage bottles is correct and sample number is similar to number indicated in documents.

5.6. Sampling technique

5.6.1. Sampling should be done in nitrile or latex gloves without talc in order to decrease sample contamination risk. New gloves should be used for each sample. After sampling, used gloves should be collected in the separate pocket in order to exclude sample contamination by repeatedly used gloves.

5.6.2. Bottle for sample should be opened, horizontally put into water (at the ~ 15 cm depth), bottle neck should be turned up the stream. Water collected to the bottle should not contact with hands, including hands in gloves.

5.6.3. all bottles should be filled little bit lower than bottle shoulder (~ 80% of bottle volume) in order to keep air space in case of water frozen in winter time (excluding muddy water and total suspended solids that cannot be frozen). The bottles filled completely without air should not be frozen (oil hydrocarbons, BOD, VOC, pH and detergents).

5.6.4. Before bottle filling-in it is necessary to check requirements for sample preservation, storage and transportation (item 5.7).

5.6.5. In case of sampling on the sites with toxic substances, cancerogene accidents, the sampling should be proceeded as hazardous waste management process. Samples themselves should be indicated in support documents and transported as hazardous wastes.

5.6.6. Coordinates of sampling point should be registered with assistance of GPS instrument - global positioning system. In the process of sampling map preparation it is necessary to take into account coordinates system affixed with map, errors and deviations of instruments used for coordinates identification. Sampling point could also be marked by visual identification point – pillars, pennon or paint excluding environment pollution.

5.6.7. Each sample in technical documents should have the following information:

1) Identification number of bottle (vessel);
2) Name of water object;
3) Sampling point;
4) Sampling time and date;
5) Sampling method and used instruments (sampler type);
6) What components will be determined from sample taken;
7) Sample type (point, combined);
8) Sampling duration;
9) Information about sample preservation and ensuring of its safety;
10) Positions, full names and signature(s) of person(s) performed sampling;
11) Positions, full names and signature(s) of person(s) involved into sampling and samples preparation.

5.7. Sample preservation, storage and transportation

5.7.1. For extension of sample storage length depending on investigation goals and parameters determined the following actions could be done: preservation, cooling, filtration.
5.7.2. If parameters determined from sample cannot be preserved by the same method that such samples should be taken into separate bottles and preserved separately correspondingly.
5.7.3. Water samples transportation is performed by any allowable transportation means, ensuring sample preservation and prompt delivery.
5.7.4. Collected samples should be transported to laboratory in thermo containers preventing overheating or overcooling of the samples. Temperature inside container should be at the level from + 3 up to +4° C.
5.7.5. In the process of transportation it is necessary to be sure that the lids are closed tightly. Glass bottles should be wrapped by fabric in order to prevent their damages or loss. Sample wrapping should not affect the sample composition and determined parameters.
5.7.6. Sample transportation should be within terms allowing excluding changes of samples compositions before laboratory analyses.
5.7.7. The specific parameters for content of preserving agents are set forth in WATER CONTROL NORMS (WCN) 33-5.3.01-85.

5.8. Safety rules for sampling

5.8.1. Sampling is allowed to be performed by persons not younger than 18. Sampling personnel should complete safety briefing.
5.8.2. In case of sampling from strong stream rivers or deep reservoirs (collectors, sinkers, etc.) sampling personnel should use life vests and safety rope.
5.8.3. In case of sampling from surface waters it is necessary to collect sample from safe part of river bank or wade to the middle of stream if it is safe.
5.8.4. In the process of sampling, sampling personnel should use special overall: rubber or geological boots, waders (if necessary), gloves.

5.8.5. Organization of work order, selection of place and operation of equipment should be planned with consideration of safety rules.
5.8.6. Responsibility for sampling, samples preparation and transportation to laboratory, as well as safety rules observance is undertaken by team leader.
5.8.7. Adherence of all requirements set forth in present Manual is obligatory.

6. The rules for air sampling and measurements

6.1. Sampling and measurement tasks

6.1.1. Collected sample should as much as possible represent main parameters of air pollution of investigated site currently or for definite time slot. Sampling types, samples preservation and storage types should ensure stability of chemical composition between sampling and samples measurements.

6.1.2. Sampling or measurements programme (sampling location, sample type, sampling duration and periodicity, sample preparation and the list of parameters identified) is determined by established tasks.

6.1.3. There are following main tasks of air sampling and measurements:

1) Obtainment and distributing of information associated with pollution level observations;

2) Assessment of pollution level and its changes affecting by economic activities or meteorological conditions;

4) Forecasting of expected air quality changes for long-term period

6.2. Sampling or measurement point

6.2.1. Representativeness of observations over air pollution status depends on correctness of observation point location on the studied area. I the process of observation point location selection (air sampling point), first of all it is necessary to identify what kind of information it is expected to receive: air pollution level specific for this district or concentration of impurities in the specific point affecting by emissions of industrial enterprise, large auto road, etc..

6.2.2. Observation point should be located on the area that is not affected by specific emission sources. Due to significant air mixing, the level of pollution in the area of observation point location will be determined based on all emission sources located on the observed territory. Secondly, the observation point could be located in the area of maximal concentrations of impurities from emissions of studied pollution source and infrastructure arrangement (schools, park, etc.) of populated settlement and also public gathering place.

6.2.3. There are three types of observation points installed for air sampling and air pollution measurements: stationary, enroute, mobile (under plume site).

6.2.4. Each observation point independently on type should be located on the opened, aerated site with dust-resistant cover: asphalt, hard ground, grassplot. If the observation point is located on closed site (near high buildings, on the narrow streets, under tree crowns or near the small emission source) that it will characterize pollution level for specific area and will both decrease real pollution level due to neutralization of gases by plants or increase it due to improper aeration and accumulation of substances near buildings.

6.2.5. The enroute observation point is designed for regular air sampling or measurements when it is impossible (unreasonable) to install stationary observation point or when it is necessary to study air pollution level in more details in some areas.

6.2.6. The mobile (under plume site) observation point is designed for air sampling or measurements under smoke (gas) plume in order to identify such source of industrial emissions.

6.2.7. Stationary observation points are fitted by special pavilions which are installed on preliminary selected sites. Observations on enroute points are implemented with assistance of mobile laboratory that is equipped by required instruments. The enroute observation points are also installed on preliminary selected sites. One vehicle cover 4-5 observation points during one work day. The rout should be the same in order to ensure determination of impurities within permanent terms. Observations on under plume site are implemented with assistance of vehicle equipped with required instruments, samplers and measuring devices. The under plume sites are

points located on the in fixed intervals from pollution source. They are moved according to direction of emissions source plume.
6.2.8. In the process of under plume observations, the sampling or measurements point is selected taking into account expected maximal concentrations of impurities at the distances of 0,5; 1; 2; 3, ..., 10 km from the boundary of sanitary and protection zone and specific pollution source from downwind side from it. Outside the sanitary and protection zone, the total number of observation points is determined taking into account significance of source and technical capacity of measurements.

6.3. Samples and measurements types

6.3.1. The type of collected sample and terms are determined by investigation goals and identified parameters. There are point, combined and daily samples.
6.3.2. The duration of point sampling is 20 - 30 min.
6.3.3. For combined sample one absorber or filter collects few (3-8) point samples in equal intervals for 24 hours.
6.3.4. The sampling for daily sample is implemented interruptedly on one absorber or filter for 24 hours.

6.4. Periodicity and duration of sampling or measuring

6.4.1. Periodicity or duration of sampling is established taking into account operation mode of studied object and/or its potential effect, determined pollution component and investigation goals (Operation document 52.04.186-89, GOST P 50820-95, GOST 17.2.4.06-90).
6.4.2. Established periodicity of sampling or measurements could be reconsidered taking into account data obtained. During occurrence of specific conditions - launching and repair of treatment facilities, accidents, etc. – the sampling periodicity should be increased.
6.4.3. The observations in accordance with complete programme are implemented daily by uninterrupted registration of data with assistance of automated instruments or discretely in equal intervals not less than 4 times under condition of obligatory sampling at 1 am, 7 am, 13 pm, 19 pm local time.
6.4.4. Fulfilling short programme, observations implemented in order to get information about single concentrations daily at 7 am, 13 pm, 19 pm local time.
6.4.5. Observations according to the short programme are implemented in order to get information only about single concentrations daily at 7 am and 13 pm local time. Observations according to the short programme are allowed under air temperature lower - 45 °C and on the sites where average monthly concentrations lower than 1/20 of maximal single MAC or lower the smallest limit of impurities measurement diapason of used method.
6.4.6. The daily sampling or measurement programme is designed for obtainment of information about average daily concentration. Differently from complete programme, such observations are implemented by 24-hour sampling and do not allow receiving point concentration values excluding measurements. All observation programmes allow getting average monthly, average annual and average concentrations for longer periods.
6.4.7. Air sampling or measurement under plume should be implemented when the highest impurities concentrations are presupposed associated with specific of emissions regime and meteorological conditions affecting impurities distribution.
6.4.8. Measurements or sampling duration under determination of point concentrations is 20-30 minutes.
6.4.9. Measurements or sampling duration for determination of daily concentrations in case of combined observations is 20 - 30 minutes under discontinuing sampling - 24 hours in equal intervals.

6.4.10. Control over adherence of MAC is implemented under discontinuing or sequence sampling, or measurements within 15 minutes in any sampling point of work zone in case of detection limit achievement for determined parameter. If detection limit of analysis method allow taking few air samples for 15 minutes that it is necessary to determine mean value based on the results of samples taken for indicated time slot. If such method does not allow determining of parameter at the level of 0,5 MAC for 15 minutes it is allowed increasing duration up to 30 minutes.
6.4.11. Established separated MAC for maximal single and daily concentrations of impurities are set forth in Operational Document 52.04.186-89, Hygienic norms 2.2.5.1313—03.

6.5. Technique and instruments for measurements and samplers

6.5.1. Air sampling is implemented by special equipment for air sampling or/and gas analyzer for discontinuing determination of impurities concentrations (measurements).
6.5.2. Sampling or measurements under determination of ground level impurity concentration in air is carried out at the elevation of 1,5 - 3,5 from ground surface .
6.5.3. In case of automatic gas analyzer use, the determination of impurities in air does not require laboratory analysis due to impurities concentration is determining interruptedly and automatically by instrument itself. Instrument data should be registered by observer.
6.5.4. In case of special equipment use, sampling is implemented by aspiration of definite air volume through impinge filled with liquid or solid sorbent for catching of substances or through aerosol filter detained air particles. Determined impurity from large air volume is concentrated in small volume of sorbent or on filter. Sampling parameters, such as air consumption and aspiration duration through impinge, or impinge and filter types are various for different parameters and installed depending on parameter to be identified. Then impurities concentrations in air are determined by laboratory methods.
6.5.5. Simultaneously with sampling or measurements, the wind velocity and direction. Air temperature, atmosphere pressure are measured and weather conditions are registered permanently simultaneously with sampling and other measurements.
6.5.6. In case of specific equipment use, filters are removed and put into the special pockets immediately after sampling; impinges are closed by plugs (especially thoroughly it should be done for nitrogen oxides and ammonia) and installed into the container for transportation to the laboratory. Samples for determination of sulfur dioxide, carbon sulfur and carbon hydrogen should be preserved from light both in the process of sampling and in the process of storage and transportation. In case of air temperature above 25 °C samples for sulfur dioxide and carbon sulfur should be put into thermo container immediately after sampling.
6.5.7. Specific requirements to the sampling methods, samplers and measurements methods, required reagents for each polluter are set forth in normative and technical documentation developed.
6.5.8. Sampling point location coordinates should be identified by GPS and registered. In the process of sampling points or measurements points mapping it is necessary to take into account coordinate systems affixed with map, errors and deviations of instrument for coordinated determination. Sampling (measurement) point could also be marked by visual identification point – pillars, pennon or paint excluding environment pollution.
6.5.9. Each sample in technical documents should have the following information:

1) Identification number of sample;
2) Name of studied object;
3) Sampling point;
4) Sampling time and date;
5) Sampling method (type of impinge/gas analyzer, air flow velocity, sampling duration);
6) What components will be determined from sample taken;
7) Sample type (point, combined, daily);
8) Measurement results (in case of automatic gas analyzer use)
9) Positions, full names and signature(s) of person(s) performed sampling;

10) Positions, full names and signature(s) of person(s) involved into sampling and samples preparation.

6.6. Sample storage and transportation

6.6.1. Collected samples should be transported to laboratory in thermo containers preventing overheating or overcooling of the samples. Specific sample storage and transportation conditions are set forth in normative and technical documents and operational documents 52.04.186-89, GOST P 50820-95, GOST 17.2.4.06-90.

6.6.2. In the process of transportation it is necessary to be sure that the impinges are closed tightly by plugs (especially carefully should be closed samples for determination of nitrogen oxides and ammonia). Samples for determination of sulfur dioxide, carbon sulfur and carbon hydrogen should be preserved from light both in the process of sampling and in the process of storage and transportation. Sample containers should be wrapped by fabric in order to prevent their damages or loss. Sample wrapping should not affect the sample composition and determined parameters.

6.6.3. Air sample transportation should be implemented by any allowed vehicle providing sample protection and prompt delivery to a Laboratory.

6.6.4. The specific parameters for content of preserving agents are set forth in

6.7. Safety rules for sampling

6.7.1. Sampling is allowed to be performed by persons not younger than 18. Sampling personnel should complete safety briefing and passed through special examination.

6.7.2. Organization of work order, selection of place and operation of equipment should be planned with consideration of safety rules.

6.7.3. Responsibility for sampling, samples preparation and transportation to laboratory, as well as safety rules observance is undertaken by team leader.

6.7.4. Adherence of all requirements set forth in present Manual is obligatory.

7. Soil sampling rules

7.1. Sampling tasks

7.1.1. Soil sampling of natural and damaged soil cover is implemented for chemical, bacteriological and helminthologic analyses.
7.1.2. There are following main tasks of soil studies:

1) Obtainment and distributing of information associated with specific problem;
2) Control over general and local soil pollution in the areas affected by industrial, agricultural, economical and transportation pollution sources;
3) Soil quality assessment;
4) Control over fertile soil level presupposed for earth mulching of low-yielding areas

7.1.3. Soil sampling is implemented in accordance with international standard including general requirements to soil samples GOST 17.4.3.01-83.
7.1.4. This standard is not applied for control of pollution caused by unauthorized discharges, breakthrough of tailing storage facilities and other accidents.

7.2. Sampling point

7.2.1. Sampling is carried out taking into account vertical structure, inhomogeneity of soil cover, terrain and climate of area, as well as considering specifics of pollutants or organisms.
7.2.2. Sampling is performed on sampling sites preventing risk of analyses distortion due to environment influence. If necessary to obtain comparable results, sample should be taken from contaminated and uncontaminated soil under similar natural conditions.
7.2.3. In case of general soil contamination, sampling sites are mapped according to coordinate grid, indication their numbers and coordinates. Sampling sites on the studied territory presupposed contaminated evenly should be mapped according to coordinate grid with equal distances between lines. Sampling sites on the studied territory presupposed contaminated unevenly should be mapped according to coordinate grid with unequal distances between lines. Distance between lines of grid is determined taking into account distance from prospective pollution source and dominated wind direction. In mountains conditions with uneven terrain it also necessary to take into account slope and alimentation zone. Sampling should be done from hollow toward pollutants drift.
7.2.4. In case of soil pollution by pathogenic microorganisms and viruses containing in solid or liquid wastes of populated areas or breeding farms, sampling sites should be mapped on coordinate grid taking into account distribution of such elements across the studied territory.
7.2.5. In case of local soil contamination for determination of sampling sites, the system concentric circles, located in the differential intervals from pollution sources is used with indication of circle number and azimuth of sampling site. Direction of main pollutants distribution is indicated as segment the size of which depends on degree of contamination distribution.
7.2.6. Samples are taken across the profile from soil horizons or layers ensure that in each case the sample represents part of soil typical for genetic horizons or layers of present soil type.
7.2.7. In case of study agriculture soil contaminated by pathogenic organisms and viruses, the samples are taken from ploughing horizon at the depth from 0 up to 5 cm and from 5 up to 20 cm.
7.2.8. Depending on study goal, the size of sampling site, number and types of samples should comply with following table:

Study goal	The size of sampling site, hectares		Samples QTY
	Even topsoil	Uneven topsoil	
Chemicals content in soil	1-5	0,5 - 1	Not less than one combined sample
Soil structure and physical properties	1-5	0,5 - 1	3 - 5 point samples per one soil horizon
Pathogenic organisms and viruses	0,1 - 0,5	0,1	10 combined samples consisting of 3 pint samples each

In case of horizon thickness more than 40 cm, separately should be taken not less than 2 samples from different depths. The mass of combined sample should be not less than 1 kg.

The samples for identification of pathogenic organisms and viruses should be taken in accordance with aseptics rules, excluding secondary microbial contamination.

7.3. Sample types

7.3.1. Point sample – material collected from the same horizon or the same layer of sol profile that is typical for this horizon or layer
7.3.2. Combined sample – mix from not less than two point samples
7.3.3. Background samples should be located in areas far from already contaminated zones and in areas representing basis level and natural conditions. Background soil sampling should be carried out in order to measure changes inside definite background zone. This means that several sites should be selected and tested.

7.4. Sampling periodicity

7.4.1. Sampling periodicity is defined by investigation purpose, objet territory and location of prospective pollution sources.
7.4.2. Sampling for chemical, bacteriological and helminthological analyses should be implemented not less than 1 time per year. For control over heavy metals contamination sampling should be implemented not less than 1 time per 3 years. Established sampling periodicity can be reconsidered based on data obtained.
7.4.3. Under study of soil contamination dynamics, sampling should be done seasonally during one year.
7.4.4. Under study of self-cleaning dynamics, sampling should be done weekly during the first month, and then monthly during the vegetation period until completion of active self-cleaning phase.
7.4.5. For confirmation of changes in environment and finding out of weak Lab performance due to negligence or used analyses methods, it is possible to take duplicate samples.

7.4.6. The duplicate sample is the second sample taken from the same place (where the first sample was taken). Also it is possible to divide one sample on two parts. The duplicate sample characterizes one site of the investigated area.
7.4.7. Duplicate samples can be forwarded simultaneously to two or more laboratories; or to one laboratory as separate sample with separate identification number for finding out of laboratory analytical error. It is recommended to take one duplicate sample per each ten samples.

7.5. Sampling technique, sampler

7.5.1. Sampling should be done in nitrile or latex gloves without talc in order to decrease sample contamination risk. New gloves should be used for each sample. After sampling, used gloves should be collected in the separate pocket in order to exclude sample contamination by repeatedly used gloves.
7.5.2. The point samples are taken on the sampling site from one or several layers or horizons by envelope method along the diagonal, or by any other method in such way that each sample represents part of soil typical for similar horizons or layers of this soil type. It is necessary to remove vegetation and topsoil by preliminary washed shovel or scoop made from stainless steel, then loose required amount of soil from the sampling zone. Sampling zone could vary depending on site terrain. Samples could be sorted under field conditions in order to remove bedrock fragments with size more than 2 cm (excluding samples for particles size analyses).

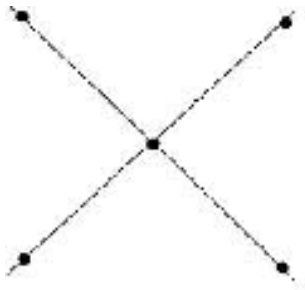


Схема метода «конверта»

7.5.3. The sample should be placed into special container with tightly closed lid or special packet. It is necessary to use Laboratory glass containers or plastic packet with zip (clasp).
7.5.4. Container or packet with sample should be marked for clear identification of taken sample number.
7.5.5. Collected soil samples should be placed into thermo container for following transportation.
7.5.6. Coordinates of sampling point should be registered with assistance of GPS instrument - global positioning system. In the process of sampling map preparation it is necessary to take into account coordinates system affixed with map, errors and deviations of instruments used for coordinates identification. Sampling point could also be marked by visual identification point – pillars, pennon or paint excluding environment pollution.
7.5.7. Each sample in technical documents should have the following information:

1) Identification number of container (packet with sample);
2) Name of water object;
3) Sampling point;
4) Terrain description;
5) Soil type;
6) Visual properties of sampling site;
7) Sampling time and date;
8) Sample type (point, combined);
9) Information about sample preservation and ensuring of its safety;
10) Positions, full names and signature(s) of person(s) performed sampling;
11) Positions, full names and signature(s) of person(s) involved into sampling and samples preparation.

7.5.8. Procedure of field equipment (samplers) decontaminating should be made after each sample collected as follows:

1) Significant and visual polluters should be removed by brush;
2) Samplers should be washed by non-phosphate detergent solution and then washed by distilled/deionized water and drayed;
3) Once more washing by distilled/deionized water.

7.5.9. A distilled/deionized water usually provided by commercial providers or laboratories could be used for decontamination of sampler if it was tested in Laboratory against absence of anolytes. Water from tap or untreated water suitable for drinking purposes is not proper alternative.

7.6. Containers for sample storage

7.6.1. The packing, transportation and storage of samples are performed depending on the purpose and method of analysis.
7.6.2. The samples collected for chemical analysis should be packed, transported and stored in containers made from chemically neutral materials.
7.6.3. The samples presupposed for volatile chemicals should be placed into glass bottles with tightly closed plugs.
7.6.4. The samples collected for analyses of physical soil properties should keep soil structure.
7.6.5. The samples analyzed for availability of pathogenic organisms and viruses should be packed, transported and kept in sterilized containers.

7.7. Sample storage and transportation

7.7.1. The samples should be marked or have label with indication of identification number.
7.7.2. Collected samples are placed into thermo container. Temperature inside thermo container should be kept at the level from + 3 up to + 4 ° C.
7.7.3. Sample transportation should be made within period preventing changes in sample composition before Laboratory analyses.
7.7.4. For biological testing and also for determination of metabolizable chemical agents, the samples should be analyzed within 5 hours after sampling.

7.8. Safety rules for sampling

7.8.1. Sampling is allowed to be performed by persons not younger than 18. Sampling personnel should complete safety briefing and passed through special examination.
7.8.2. In the process of sampling, sampling personnel should use special overall: rubber or geological boots, waders (if necessary), gloves.
7.8.3. Organization of work order, selection of place and operation of equipment should be planned with consideration of safety rules.
7.8.4. Responsibility for sampling, samples preparation and transportation to laboratory, as well as safety rules observance is undertaken by team leader.
7.8.5. Adherence of all requirements set forth in present Manual is obligatory.

8. Rules of radiation measurements

8.1. Background radiation measurements

8.1.1. Radiation control is the most important part of radiation security ensuring. Its purposes are following:

1) Determination of radiation safety rules and norms requirements observance, including non-exceedance of established doses and allowable levels under normal operation;
2) Obtainment of required information and decision making related to interventions in case of radiation accidents, area and facilities contamination and on the territories and buildings with increased level of nature radiation.

8.1.2. The specific list of types and scope of control is included into radiation site design.

8.1.3. The radiation control is implemented based on Radiation safety Law of the Kyrgyz Republic and Sanitation Rules and Norms (SanPiN) 2.6.1.2523-09, Norms of Radiation safety (normative operation document) -99/2009»

8.1.4. The purpose of measures and activities described in present manual is radiometric investigations for determination of gamma-background. They are not applicable for accidents when radiation dose increases allowable level and special equipment is required.

8.2. Investigation tasks

8.2.1. The radiometric gamma-surveillance investigations take one of the leading places in the process of radiation control.

8.2.2. The radiometric investigations are implemented for study of expositional dose of area and its capacity in order to identify the dose of external and internal radiation of population.

8.2.3. The most available method is foot radiometric survey.

8.2.4. The task of present radiometric survey is:

1) Determination of sites with 3 times increased radiation in comparison with background typical for observed area;
2) Identification of sites with radiation contamination of anthropogenic origin within supervised zone;
3) Detalization of abnormal sites;
4) Determination of works scope related to liquidation or deactivation of sites with radiation contamination.

8.3. Investigation site

8.3.1. Selection of works scope depends on complexity of nature conditions and anthropogenic uncertainty of territory, economic and social significance (population density, character of economic development, availability of utilities, etc.).

8.3.2. In populated areas the radiometric observation net is 100*100 or 200*200 m. It is determined by dose power on the territory and inside buildings (it is necessary to make measurements, at least in 20% of all buildings). Not less than 5 measurements across the site and 2-3 measurements inside buildings should be considered. In the area of populated sites (2.5 km zone) the measurements network could be 2 times rare.

8.3.3. The following components are subjected to radiation control:

1) Radiation characteristics of radiation sources, air emissions, liquid and solid radiation wastes;
2) Radiation factors created by technological process a working places and environment;

3) Radiation contamination factors on the polluted territories and in the buildings with increased level of nature radiation;
4) The radiation levels of personnel and population caused by all radiation sources.

8.4. Периодичность и продолжительность проведения измерений

8.4.1. Sampling periodicity is determined by operation mode of object and investigation purpose (SanPiN 2.6.1.2523-09)

5.4.3. Established sampling periodicity can be reconsidered taking into account data obtained. Sampling periodicity should be increased in case of special conditions occurrence: launch and repair of treatment facilities, accidents, etc..

8.5. Measurements technique and samplers

8.5.1. Portative radiometers СРП-68-01, СРП-88, dosimeter – radiometer «ДКС-96» or instruments with the similar or better technical specifications could be used as operation instruments.
8.5.2. Before work start all instruments should be adjusted at the initial energy threshold registration level in related laboratories and passed through state calibration (one time per year or in case of detection air replacement). It is prohibited to work with instrument after expiration of calibration validity term.
8.5.3. Before radiometric gamma-surveillance, radiometers should be set up on optimal mode according to the operation instruction.
8.5.4. Radiometer sensitivity should be set up based on control source in accordance with passport data.
8.5.5. In the process of foot surveying natural gamma radiation background should be made at 1 meter elevation from surface across 5*5 m site, not less than 5 measurements (across the envelope). Measuring time in the fixed point is not less than 5 second. Measurements should be averaged and mean value should be registered. The velocity of foot surveying should not exceed 2.0 km/h. The point fixed measurements are used for large scale investigations on the separate sites.
8.5.6. Coordinates of sampling point should be registered with assistance of GPS instrument - global positioning system. In the process of sampling map preparation it is necessary to take into account coordinates system affixed with map, errors and deviations of instruments used for coordinates identification. Sampling point could also be marked by visual identification point – pillars, pennon or paint excluding environment pollution.
8.5.7. Each sample in technical documents should have the following information:
1) Identification number (order number);
2) Name of studied object;
3) Sampling point;
4) Sampling time and date;
5) Measurement method (instrument);
6) Instrument measurements results;
7) Positions, full names and signature(s) of person(s) performed measurement;
8) Positions, full names and signature(s) of person(s) involved into measurements;
9) Instrument results

8.6. Safety rules for sampling

8.6.1. Measuring is allowed to be performed by persons not younger than 18 after completion of safety briefing.
8.6.2. In the areas with increased radiation background the special protection cloth and adherence of all radiation safety requirements are obligatory.

8.6.3. Organization of work order, selection of place and operation of equipment should be planned with consideration of safety rules.
8.6.4. Responsibility for measurements and safety rules observance is undertaken by team leader.
8.6.5. Adherence of all requirements set forth in present Manual is obligatory.

9. Reporting rules

9.1. Requirements for information format

9.1.1. The means of data presentation as well as the possibilities of data use, firstly depend on audience.

9.1.2. It is necessary clearly identify the set of people which could be interested in the results of monitoring implemented. As a rule, results should be submitted to decision-makers, environmentalists and wide public. In the process of informing it is necessary take into account that the wider audience received information the bigger difference in the level of awareness and degree of results conceive —from environmental experts to decision-makers, from academic society dealing with global challenges to housewives interested in local environment conditions.

9.1.3. It is necessary to prepare different kind of informational materials (several level of complexity and specification) addressing the needs of different audience types. For the wider coverage and better conceive of information by all stakeholders 3-4 different kinds (complexity, completeness, etc.) of informational materials are required.

9.2. Report preparation

9.2.1. Firstly, the scientific-technical report is prepared. Report should include the purpose of your work, specific tasks, the investigation process, results obtained (if there are a lot of results it is better to present them as annexes to the report), expert opinion, substantiated interpretation of results, conclusions and recommendations. Scientific and technical report is usually oriented to the narrow sphere of specialists. It is necessary to take into account that the report should be understandable. It is not allowed to overload it with extra specific terminology. In case of specific terminology used, it is necessary to explain the meaning.

9.2.2. The following report structure is recommended:

- Introduction including the core of the studied problem, purpose and main tasks
- Annotation, where the main results of works set forth (Annotation could be basis for preparation of information materials for wide public)
- Review of known and available data and analysis of situation, including summary tables
- Description of used sampling and analyses methods
- Detailed results interpretation
- Conclusions and recommendations
- Annexes with actual materials, including sampling and lab results protocols

9.3. Wide public informing

9.3.1. After preparation of scientific and research report it is necessary to start to prepare information materials for wider audience. For successful use of such information materials it is necessary to prepare special “annotation” report or digest completely reflecting all key aspects of investigation. The annotation of scientific and research report could be used as its basis added and extended by required information from other chapters of report prepared.

9.3.2. Information materials should include important information required for decision-making. Conclusions should be presented in full scale. All significant details also should be included into

such materials (at least in the form of notification). Official material is recommended to be presented completely in the form of summary tables or diagrams/charts for data visualization. If it is impossible to use large table materials it is necessary to indicate specific parameters (not only mean values, but also extreme).

9.3.3. The ways of information distribution:

Newspaper article

Mass-circulation magazine

Specialized magazine

Report note with attachment of report to the state administrative or control authorities

TV news item

Article in electronic information publication or specialized electronic portal for specialists

Internet forums

Youtube

Etc.

Annex A

To the Citizen's observations (public monitoring)

Manual for Environmental Inspectors

Water and soil sampling,

air pollution and radiation measurements

THE LIST OF REFERENCE DOCUMENTATION SET OUT THE REQUIREMENT TO THE WORKS PERFORMED

#	Standard (GOST) number	GOST name
1	2	3
1.	GOST ГОСТ 17.1.3.08-82	Nature protection. Hydrosphere. Procedures for quality control of marine waters
2.	GOST 17.1.3.07-82	Nature protection. Hydrosphere. Procedures for quality control of water in reservoirs and stream flows
3.	GOST 17.1.4.01-80	Nature protection. Hydrosphere. General requirements for methods of determination petroleum products content in natural and waste waters
4.	GOST 17.1.5.04-81	Nature protection. Hydrosphere. Apparatus and mechanisms for selection, initial treatment and storing samples of natural waters. General specifications
5.	GOST 17.1.5.05-85	Nature protection. Hydrosphere. General requirements for surface and sea waters, ice and atmospheric precipitation sampling

6.	GOST 17.2.1.01-76	Nature protection. Atmosphere. Classification of effluents according to composition
7.	GOST 17.2.1.03-84	Nature protection. Atmosphere. Terms and definitions. For air pollution control
8.	GOST 17.2.2.03-87	Nature protection. Atmosphere. Rates and methods of measuring carbon monoxide and hydrocarbons content in exhaust gases of petrol-engine vehicles. Safety requirements
9.	GOST 17.2.3.01-86	Nature protection. Atmosphere. Air quality control regulations for populated areas
10.	GOST 17.2.4.06-90	Nature protection. Atmosphere. Methods for determination of velocity and flow rate of gas-and-dust streams from stationary sources of pollution
11.	GOST 17.4.1.02-83	Nature protection. Soils. Classification of chemicals for pollution control
12.	GOST 17.4.3.01-83	Nature protection. Soils. General requirements for sampling
13.	GOST 17.4.4.02-84	Nature protection. Nature protection. Soils. Methods for sampling and preparation of soils for chemical, bacteriological, helmintological analysis
14.	GOST P 51592 – 2000 GOST 31861-2012	Water. General requirements for sampling
15.	GOST P 50820-95	Scrubber and duster equipment. Methods for determination of dust load of gas-and-dust streams
16.	GOST 28168 - 89	Soils. Sampling
17.	WATER CONTROL NORMS (WCN) 33-5.3.01-85	Waste waters sampling instruction

Annex B

To the Citizen's observations (public monitoring)

Manual for Environmental Inspectors

Water and soil sampling,

air pollution and radiation measurements

SAMPLING PROTOCOL

_____

Name of organization sending the samples

Sampling protocol #

Study of _____

(components to be analyzed)

Dated «____» _____ 20___

Name of studied object, address _____

Sampling time _____

Delivery time_ _____

Transportation and storage conditions

_____

Study purpose

_____

Additional information

_____

Packing type

_____

Scientific and research documentation for sampling method

_____

Scientific and research documentation for preservation method

_____

№	Sample name	QTY	Sampling point/site description

Sampling person _____

Person(s) involved into sampling _____

_____

_____