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The Republic of Uzbekistan

Bukhara and Samarkand Sewerage Project

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

of reconstruction of treatment facilities and sewerage systems of Samarkand Phase II

FINAL DOCUMENT

Samarkand
June, 2015

ACRONYMS AND ABBREVIATIONS:

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WB World Bank
RU Republic of Uzbekistan
CM Cabinet of Ministers
GoU Government of Uzbekistan
IBRD International Bank for Reconstruction and Development
IDA International Development Association
BSSP Bukhara and Samarkand Sewerage Project
BSWSP Bukhara and Samarkand Water Supply Project (WB)
ADB Asian Development Bank
UNESCO United Nations Education Science and Culture Organization
REIA Report on Environmental Impact Assessment
DMC "Donaev Management Consulting" LLC, Uzbekistan (Consultant)
EMP Environmental Management Plan
PCU Project Coordination Unit
VK Vodokanal
WWTP Waste water treatment plant
WWPS Waste water pumping station
AIS Agency of Irrigation Systems
AMC Agency of Main Channels
CDW Collector and Drainage Waters
CIS Commonwealth of Independent States
EA Environmental Assessment
FS Feasibility Study
GWL ground water level
HGAE Hydro-Geo-Ameliorative Expedition
MAL Maximum admissible level
MAWR Ministry of Agriculture and Water Resources
MOM Manual on Operation and Maintenance
NGO Non-Governmental Organization
O&M Operation and Maintenance
OP Operational Policy (WB)
PIU Project Implementation Unit
SA Social Assessment
SEE State Ecological Expertise
ToR Terms of Reference
USD United States Dollar
UZS Uzbek Soum
VDW Vertical Drainage Well
EE Ecological Expertise
EIA Environmental Impact Assessment
PCR Cultural Resource
Uzgidromet Centre of hydrometeo service under the Cabinet of Ministers of the Republic of Uzbekistan
Goskompriroda State Committee of the Republic of Uzbekistan on Protection of Environment (Nature)
Uzkommunkhizmat Uzbek Communal Services Agency
Glavgosekspertiza Main Department of Environmental Expertise of

Goskompriroda
CAR Central Asian Region
GW Ground waters
SK Sewerage collector
WPI Water pollution index
DDT 4,4 – Dichlordiphenyltrimethylmethane-insecticide
HCCH Hexachlorocyclohexane
Gamma - HCCH Hexachlorocyclohexane, gamma-isomer-insecticide
Alpha - HCCH Hexachlorocyclohexane, alpha-isomer-insecticide
BOD Biochemical Oxygen Demand
COD Chemical Oxygen Demand
MAC Maximum admissible concentration of polluting substances
SSAM synthetic surface active material
ha hectare
km kilometer
KW Kilowatt
m Meter

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1. INTRODUCTION

1.1. General provisions

The government of Uzbekistan is actively implementing a long-term strategy on improvement of the provision of the population in rural areas and towns of the Republic with quality drinking water and improvement of sanitation conditions of treatment plants and drainage networks under the projects on the basis of preferential loans from international financial institutions and donor countries and their own efforts. In accordance with the Decree of the Cabinet of Ministers of the Republic of Uzbekistan No.405 dated 17.09.2003, a long-term program for providing the residents of 2323 rural settlements with drinking water was approved and implemented. Due to implementation of this program for the beginning of 2008, 1413 rural settlements were provided. Also, in 2006-2008, drinking water supply system with potable water was reconstructed in 2223 rural areas with 4.4 million people. In regions, where there is poor quality of groundwater and surface water, interregional water pipelines with total length of 1,954 km were laid in order to improve the water supply of clean drinking water.

There is an issue with the state of sewage collection and treatment infrastructure in the cities of the republic along with the drinking water supply of settlements and, accordingly, the negative environmental impacts of dilapidated sewer facilities on the environment and the surrounding areas, which ultimately also affects the quality of drinking water, due to contamination of rivers and groundwater. Currently, according to "Uzkommunkhizmat" Agency, only 69 of 217 cities and urban settlements have sewerage system. This system is used by 51.5% of the population of these cities. 14.1% of the population in the republic uses the services of sewage.

Table 1.1 The degree of chemical and bacteriological contamination by regions in the Republic of Uzbekistan (2010)

Region	Degree of chemical contamination	**Degree of bacteriological contamination**
Surkhandarya	*45,5%*	-
Bukhara	*30,7%*	-
Khorezm	*22,5%*	-
Tashkent city	*36,4%*	*24,1%*
Republic of Karakalpakstan	*47,2%*	*16,9%*
Tashkent	-	*16,6%*
Navoi	-	*18,3%*

In order to address existing problems and to improve the sanitary and epidemiological situation, the Government of Uzbekistan has planned implementation of priority projects for the period of 2009-2012 included by the Decree of the President of the Republic of Uzbekistan dated 12.06.2008, No. PP-890 ": On measures to further improve the provision of the rural population and cities with quality drinking water and economical use of natural gas". In particular, it provides for the implementation of the following projects to improve drinking water quality and upgrade sewage treatment infrastructure in Bukhara and Samarkand regions:

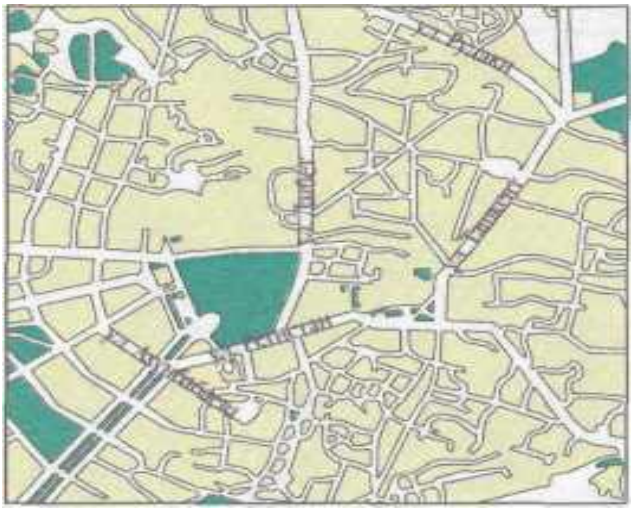
- Water supply of Bukhara and Samarkand (IBRD/IDA 2004-2009);
- Reconstruction of sewage treatment plants and sewage systems of Bukhara and Samarkand (IBRD/IDA 2010-2015);

- Improvement of drinking water supply of Alat and Karakul districts of Bukhara region (IBRD, 2010-2012);
- Modernization of Damkhodja interregional water supply with connection of regional centers and rural settlements of Samarkand, Navoi and Bukhara regions (ADB, 2009-2012);
- Reconstruction of the water supply system of regional centers of Kasan and Mubarak, as well as rural settlements adjacent to the conduit from Kitab-Shakhrisabz deposits of underground water (Soft loan of CDR for SCO countries, 2009-2012);
- Water supply of Kushrabot district of Samarkand region (Eximbank of Korea/ EDCF Fund, 2010-2012)

Very strong support for the initiatives of the Government of Uzbekistan has the World Bank and its institutions for more than 10 years of collaboration. In the medium term, Uzbekistan and the World Bank intend to create a basis for further dialogue in the development of the sector in the view of experience and completed projects. In particular, the World Bank has planned to prepare a concept for the development of water and sanitation sector until February of this year and carry out strategic activities at the end of the first quarter of 2009 with the participation of national and international stakeholders actively involved in the process of modernizing the sector.

1.2. The objective of the project

Government of the Republic of Uzbekistan and the Khokimiyat of Samarkand city has requested the World Bank loan to support the project on improvement of sewerage system in order to improve the environment and public health problems associated with inadequate wastewater treatment in the framework of a long-term program on improvement of water supply and sanitation in Samarkand.



Pic. 1.2.1 The map of Samarkand

The main objective of the project is the rehabilitation of the sewer system in order to reduce leaks and expansion of coverage of selected areas of the city by sewerage network and improving the effectiveness of treatment activities. The proposed project is aimed at **reducing the pollution of the environment:**

- Increasing the number of connections to the sewer system;
-
- Improvement of process on WWTP;
- Extension of the life of facilities and equipment by reconstruction/replacement;
- Compliance with quality standards of Uzbekistan on purified wastewater.

1.3. Summary of the project

Sewer network of the city is in desolate condition. Infrastructure is dilapidated; there is a destruction of lines, sewage leaks into the ground water, as well as frequent congestion. All this primarily is asso-

ciated with the fact that the existing wastewater treatment plants and supply networks were built 30-40 years ago, back when the Soviet Union. 15 years after independence, the whole complex of sewerage infrastructure has reached a critical level, with the result that it has led to moral and physical obsolescence of the existing components of the electromechanical equipment for sewage treatment plants. The consequence of the current state of networks is constant and the high cost of maintenance of infrastructure and the elimination of accidents in different areas, increased power consumption.

In this regard, there is a serious risk of the environmental situation in the city. In Samarkand, about two-thirds of the total volume of accumulated waste water of seeps into the ground, creating a dangerous threat to the ecology of the area and population health. All this leads to imbalance and cause environmental and social problems, prevents normal development of trade and business, creating unsanitary conditions for the local population and the many tourists visiting the historic city each year.

The project will be the second step of a phased approach of improving access and efficiency of sewer systems; it will focus on the most urgent needs of the rehabilitation and expansion of networks. The work will mainly include the expansion of sewer system to certain unserviceable areas and minor replacement of existing sewers; construction of new pumping stations, rehabilitation of several pumping stations undone during the project's phase I (due to insufficient funds); and rehabilitation of sewage treatment plants.

BSSP project will actively use the experience and achievements of the current project BSWSP. The budget for the implementation of the second phase of the project is limited by the size of the application filed to the World Bank for a loan in the amount of 48 million USD. These resources will be used mainly to:

- Reconstruction/expansion of sewerage networks (60.9 km);
- New construction of sewerage pumping stations (3 pcs)
- Rehabilitation of sewerage pumping stations (2 pcs)
- Full reconstruction of WWTP.

It is expected that **the implementation of Phase II of the Project** will require 4 years.

The Phase II project will have the following components:
Component 1: Physical rehabilitation of sewerage network in Samarkand

- Rehabilitation of existing sewerage network.
- Extension of the sewerage network in the selected areas of the city (extension of existing network by installing additional sewer lines in underserved areas of the city).

- Modernization of treatment facilities (replacement of the electromechanical equipment, modernization of the waste water treatment plant in order to reduce operating costs and energy consumption, to audit vodokanal's work for the subsequent reducing energy consumption).

Component 2. Technical assistance and training

The project will finance a limited amount of technical assistance and training of vodokanal's staff in order to continue their activities on institutional strengthening, initiated in the framework of "Bukhara and Samarkand Sewerage Project" Phase I. Technical assistance and training will focus on improving the operational efficiency of vodokanals and encourage their customer focus. In addition, Sanitation and Hygiene Program is provided.

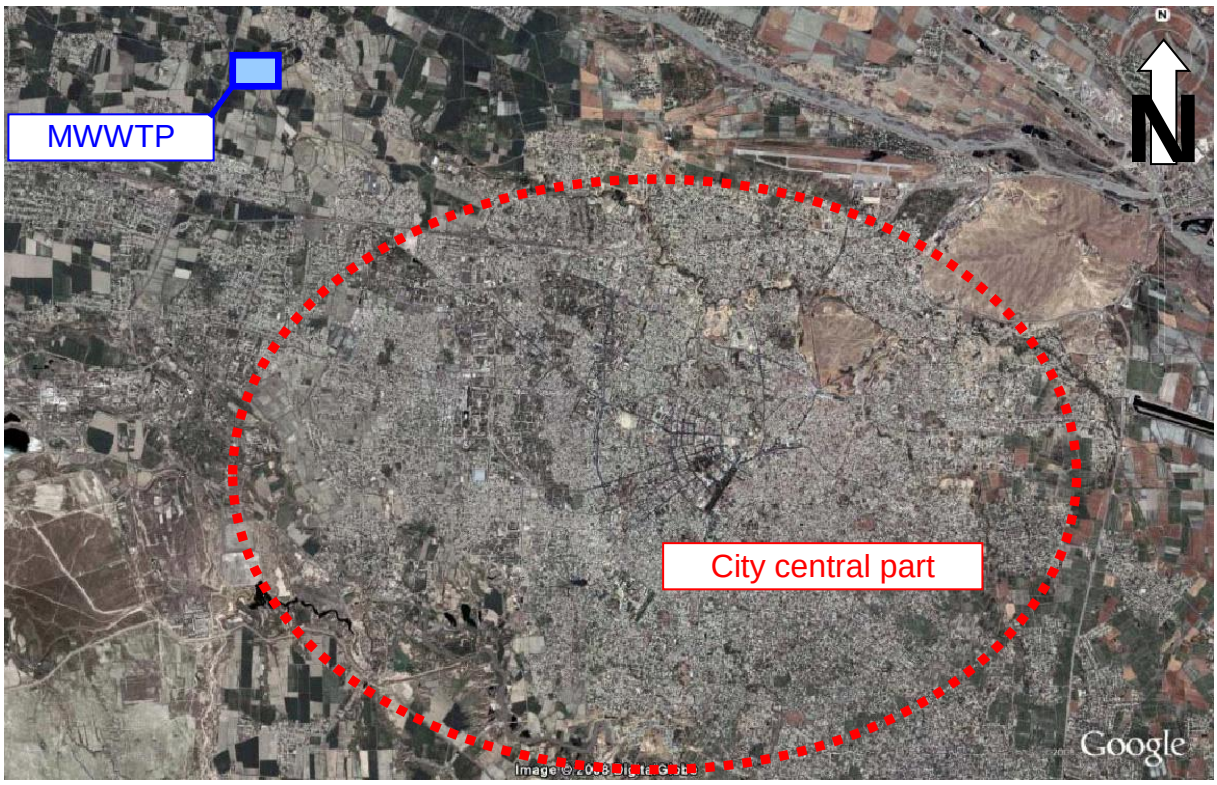
1.4. The study area

As a whole, the project area is basically defined by the city limits of Samarkand, which is the second city after Tashkent by population and by area, as well as industrial importance and is the centre of global tourism. There are work machine-building, lift-building, superphosphate, fruit-canning factories, knitting, tea-packing and sewing, shoe and furniture factories in Samarkand.

The city is located on the left bank hilly part of mid-current of Zaravshan River.

At present only about 59% of the whole Samarkand's population is connected to the central sewerage out of 500 thous. population is about 250 000 people. People not connected to the sewer network (i.e. about 205 000 people) rely on systems and facilities available on their territories such access pool toilets and septic tanks of doubtful standards. 98% of city population is connected to centralized water supply system.

Figure 1.4.1 City of Samarkand, aerial photograph



2. EVALUATION METHODOLOGY

General methods for the environmental study include specific steps to assess the impacts on the environment. The most important of these are:

- Identification of the main problems;
- Clarify the extent of the problem;
- Mitigation measures;
- Management and monitoring.

The experts made collection and inventory of the basic data on the present state of environment of Zarafshan River Basin.
The following environmental aspects have been considered:

- Water resources

- Land resources
- Environmental resources
- Social aspects
- Physical cultural heritage.

The following is a general environmental assessment of anthropogenic influence under the implementation of "Bukhara and Samarkand Water Supply Project" in Samarkand, for which Environmental Management Plan has been developed.

2.1. World Bank requirements on EA

According to the World Bank Operational Policy, as part of the environmental assessment of the project will be evaluated in terms of the impact of area and identify ways to improve project design and implementation by preventing, minimize or compensate for adverse environmental impacts and enhancing positive impacts.

According to the type of environmental analysis of the World Bank, the level of detail of environmental analysis depends on the scale and environmental impacts of the proposed works. Below are the categories selected on the basis of expert assessments:

- Category A: full environmental assessment (EA) is required;
- Category B: if you do not even need a full EA, it is necessary to conduct ecological-sky analysis and/or an EIA less detailed than the one for Category A investments;
- Category C: EA or an environmental analysis is not required

To minimize the possible negative effects the project is categorized as "B" (according to OP/BP/GP 4.01 World Bank). The project requires environmental impact assessment (EIA). Environmental assessment of Category is required due to the use of water resources of construction/reconstruction work at wastewater treatment plants and sewerage networks.

The results of this Environmental Assessment (EA) confirm that the proposed Project activities will have an overall positive impact on the environment. There will occur temporary and local disturbances in connection with construction and rehabilitation works during the project implementation, but it is expected that these impacts can be mitigated in most cases by the necessary construction security measures. Therefore, the research team EA confirms that the project is classified as Category B.

2.2. Requirements of Uzbekistan on EE

The state ecological expertise is governed by the laws of the Republic of Uzbekistan "On Environmental Protection", "On Environmental Impact Assessment", the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 491 dated 31.12.2001 "On approval of the state environmental expertise in the Republic of Uzbekistan" and other laws and regulations.

The facilities subject to state ecological expertise and category of their impact on the environment have been identified by abovementioned documents. Facilities subject to examination are assigned to four categories of environmental impact.

Activities for each category are detailed in Annex 2 of the Summary. Category 2 environmental impact (medium risk) includes item 16 "Sewage Treatment Plants with capacity from 50 to 200 thousand m^3/day that is applicable to the project (capacity of Bukhara municipal wastewater treatment

plants 100 is thousand m^3/day).

Such approach implies a sectoral assessment, preparation of measures to mitigate impacts on the environment and environmental monitoring.

Organization and assessment of environmental impacts is implemented by the enterprise or organization itself, and Glavgosekoekspertiza provides the expertise presented by EIA and gives an opinion on them in due course.

3. ORGANIZATIONAL, LEGAL AND POLITICAL FRAMEWORK FOR THE PROJECT IMPLEMENTATION

3.1. Legal regulation

3.1.1. National environmental legislation

Uzbekistan has established a legal framework for the protection of environment and nature management which is designed to protect rights and duties of citizens in Articles 50 and 55 of the Constitution of Uzbekistan. There are more than 20 laws, 50 decrees of the President and Cabinet of Ministers of the Republic of Uzbekistan and other laws and regulations.

In relation to this project, in Uzbekistan the following main legislative acts aimed at ensuring environmental protection, public health, management issues of the environmental sector, Laws of the Republic of Uzbekistan are in force at the moment:

- "On Environmental Protection" (1992) ;
- "Water and Water Use" (1993);
- "On Environmental Impact Assessment' (2000);
- "On the State Sanitary and Epidemiological Supervision in the Republic of Uzbekistan" (1992);
- "On the protection and use of cultural heritage" (2001)
- "On Specially Protected Areas" as amended (30.08.93)
- "On the Protection and Use of Flora" (December 26, 1997)
- "On the Protection and Use of Animals" (December 26, 1997)
- "On Air Protection" (December 27, 1996)
- "On Waste" dated 05.04.2002
- "On protection of population and territories from emergency situations of natural and tekhnogene character" dated 20.08.1999

The main active bylaws, regulations adopted by the Government of the Republic of Uzbekistan in the field of environmental protection:

- "On Approval of the State Ecological Expertise" (No. 491, 31.12.2001);
- "On approval of the State Environmental Monitoring" (No.49 dated 04.03.2002);
- "On giving the status of specially protected natural territories of republican significance to the zones of formation of fresh groundwater" (No. 302, 26.08.2002);
- "Regulation on water protection zones of reservoirs and other water bodies, rivers and main channels and collectors, as well as sources of drinking water and domestic water supply, medical, cultural and recreational purposes in the Republic of Uzbekistan", 04.07.92.
- "On the introduction of fees for excess emissions (discharges) of pollutants into the environment and waste disposal" 29.06.92

- "On the forecast of key macroeconomic indicators and the State Budget of the Republic of Uzbekistan for 2000", 31.12.1999
- "Procedure for the development and implementation of design standards on maximum permissible emissions of pollutants into water bodies, including drainage water" (RD 118.0027719.5-91);
- "The procedure for issuing permits for special use of water" (RD 118.0027714.6-92);
- "Instructions for determining the damage to the national economy from pollution of groundwater" (RD 118.0027714.47-95);

3.1.2. The State Environmental Policy

The following programs, strategies and action plans relating to the nature of the implementation of activities under this project were developed and implemented by Uzbek government with the support of international organizations, the direct involvement of NGOs:

- Action Program for the Protection of Environment of the Republic of Uzbekistan for 2008-2012
- The program providing the population with rural and urban quality drinking water and economical use of natural gas
- The investment program of the Republic of Uzbekistan for the period 2009-2012.

3.1.3. International agreements on environmental protection and prevention of transboundary impact

Uzbekistan ratified the basic conventions adopted in Rio de Janeiro under cooperation in the field of environmental management: Framework Convention on Climate Change, the Convention on Biological Diversity and the Convention to Combat Desertification, as well as a number of other conventions, agreements and memoranda of understanding in the field of environmental conservation and sustainable development. With regard to this project, Uzbekistan ratified a number of multilateral agreements aimed at ensuring cooperation with neighboring countries in order to reduce the effects of transboundary impacts on waters of regional significance:

- Convention on the Protection and Use of Transboundary Watercourses and International Lakes, Helsinki, March 17, 1992 (Decree of the President of Uzbekistan dated August 9, 2007 No. PP-683, entered into force - December 3, 2007);
- The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (22.12.1995);
- Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (26.05.1993);
- Convention on the Protection of the World Cultural and Natural Heritage, Paris, November 16 (23), 1972 (ratified by Decree of the Oliy Majlis of the Republic of Uzbekistan dated December 22, 1995 No. 182-I)

Within the framework of the CIS, Uzbekistan is a member of the Interstate Environmental Council on the harmonization of environmental legislation, the development of EE and development of economic instruments for environmental protection, as well as a member of the inter-state environmental funds to finance environmental protection in international and regional programs. The following major agreements have been signed:

- Agreement on cooperation in the field of ecology and natural environment, Moscow, February 8, 1992 (entered into force on February 8, 1992);
- Agreement on Cooperation in the field of environmental monitoring, Saratov, January 13, 1999

- Decision of the Heads of Central Asian states on "Key Program of concrete actions to improve the environmental and socio-economic situation in the Aral Sea basin for the period 2003-2010" was signed on 06.10.2002 in Dushanbe.

3.2 The overall national framework

In accordance with the existing administrative-territorial division of the Republic of Uzbekistan, Bukhara and Samarkand is the regional center of Bukhara and Samarkand regions, respectively.
For the purposes of this environmental assessment addresses three relevant government bodies:

- "Uzkommunkhizmat" Agency is the organizer of the project.
- Khokimiyats of regions and cities, where the proposed project is located.
- Samarkand and Bukhara regional city and regional vodokanals are the executioners of the project.
- The State Committee for Nature Protection (SCNP) is the body responsible for the environmental protection.

"Uzkommunkhizmat" Agency of Uzbekistan

"Uzkommunkhizmat" Agency of Uzbekistan (hereinafter - the Agency) is the body responsible for policy development in the utilities sector, including the coordination of organizational activities, development of standards and guidelines and technical documentation regarding the operation of sewerage networks. Activities of the Agency are governed by the Regulations approved by the Government of Uzbekistan. The Agency is the implementing organization for this project.

State power bodies in the localities (regional khokimiyats)

Khokimiyat is the executive body of state power at the level of regions, districts, cities of the country. Khokim is a leader of the executive and representative government in the territory and ensures the implementation of legislative acts, including, with respect to matters relating to the sector of water supply and sanitation. Khokim is appointed by the President of Uzbekistan and approved by the Regional Council of deputies.

State Committee of the Republic of Uzbekistan for Nature Protection

The State Committee for Nature Protection (SCNP) is the main executive body for the protection of the environment and natural resources. Committee is directly subordinated to the Oliy Majlis (bicameral parliament) of the Republic of Uzbekistan and responsible for the coordination of environmental protection and natural resources of other national government agencies at the central, regional and district levels.

Other relevant government bodies:

- **Ministry of Health of the Republic of Uzbekistan** as part of the system of state sanitary epidemiological surveillance authorized to exercise state sanitary supervision over compliance with sanitary norms, rules and hygienic standards by all organizations in the country. SSES centers provide the organization and conduct of complex sanitary and anti-epidemic measures.
- **Republican Emergency Antiepidemic Commission** is authorised to coordinate the activities of ministries and departments, khokimiyats, economic entities directed to localize outbreaks of infectious diseases. The Commission is responsible for monitoring activities for sewerage settlements, effective cleaning and disinfection of wastewater discharged into surface waters. The Commission has the right to prohibit or temporarily suspend operation of water supply, sewerage, waterworks and other public facilities.

- **The Ministry of Culture and Sports of Uzbekistan** (Central Research and Production Department for the Protection and Use of Cultural Heritage). The Ministry of Culture and Sports of Uzbekistan provides state protection of cultural heritage, by means of, among other things, issue permit for excavation, construction, reclamation, economical and other works in the locations of cultural heritage and works on conservation of cultural heritage, as well as to conduct research on the objects of cultural heritage (Article 10 of the Law of the Republic of Uzbekistan "On protection of cultural heritage").
- When carrying out work on the construction of new facilities, reconstruction of existing in Bukhara and Samarkand, it is necessary to obtain the corresponding permit and coordination of the boundaries of the object under construction with the boundaries of historical and cultural reserve determined by the Ministry of Culture and Sports of Uzbekistan on the basis of approved historical and cultural plans (Article 31).

3.3. Ecological structure

The system of state power involved in the management and regulation of the environmental sphere, defined by the Law 'On environmental protection" are as follows:

- **Legislative Chamber and the Senate of the Oliy Majlis of the Republic of Uzbekistan** (Parliament) under the joint jurisdiction in the sphere of nature protection.
- **Cabinet of Ministers of the Republic of Uzbekistan**, conducting a single environmental protection policy.
- Local state power and management authorities (khokimiyats), the definition of the main tendency of nature protection on its territory, the approval of regional (territorial) environmental programs.
- **State Committee of the Republic of Uzbekistan for Nature Protection.** (SCNP of Uzbekistan) is a specially authorized supradepartmental and coordinating body exercising state control and intersectoral management in the field of environmental protection, use and reproduction of natural resources. SCNP Uzbekistan is subordinate and accountable to the Oliy Majlis of the Republic of Uzbekistan. The system of the bodies comprises: SCNP of the Republic of Karakalpakstan, regional and Tashkent City Committee for Nature Protection, inter-district, district and city committees (inspections) on nature protection, as well as their subordinate enterprises, institutions and organizations. In dealing with international and regional issues, including pollution of transboundary rivers and reservoirs, SCNP interacts with environmental authorities of other state.

3.4. The structure of the water supply and sewerage sector

"Uzkommunkhizmat" Agency of Uzbekistan

"Uzkommunkhizmat" Agency of Uzbekistan is regulated by the Decree of the President of the Republic of Uzbekistan dated 17.08.2006, No. PP-445 "On measures to improve the activity of the "Uzkommunkhizmat" Agency of Uzbekistan and the financial restructuring of public utilities" which also determines the reformed system of governance of municipal services in the country.

Regional vodokanals

Management issues of water supply and sanitation are directly administered by economically independent entities "vodokanals" specially educated with decisions of public authorities under the territorial jurisdiction. In particular, with respect to this project, Samarkand RPSE "Suvokova" is in the form of unitary enterprise acting on the basis of operational management. Activities of vodokanal is governed by general law applicable to the regulation of business entities of different ownership forms, but this organization has the status of natural monopolies and subject to the Law "On natu-

ral monopolies". Foundation documents – the Articles of Association of vodokanals are approved by the relevant khokimiyats.

3.5 The legal framework for the participation of NGOs and the community

At present, the interaction of the state environmental NGOs carried out within the framework of cooperation and collaboration with the Environmental Forum of NGOs in Uzbekistan. Environmental Forum of NGOs of Uzbekistan (Eco-Forum) is an association of environmental and ecological-oriented NGOs and initiative groups. Its activity is aimed at consolidating the efforts of environmental organizations in solving environmental problems. The tasks of Eco-forum in the sphere of environmental activities:

- A model of joint activities in the framework of targeted programs;
- Preparation and implementation of joint projects;
- Involvement of the community and the public in the implementation of targeted programs;
- monitoring.

Eco-Forum of NGOs in Uzbekistan was registered on April of 2007 by the Ministry of Justice of the Republic of Uzbekistan and united the Republican Association of environmental NGOs functioning in the country. The main purpose of creating Eco-forum of NGOs in Uzbekistan was to unite the efforts of NGOs to increase the effectiveness of public participation in environmental protection and joint actions in solving environmental problems. In its actions to address environmental problems and promote sustainable development, Eco-Forum cooperates with governmental, international and regional organizations, NGOs and the media. Currently Eco-forum has signed the memoranda of cooperation with the SCNP of Uzbekistan and other regional organizations such as REC of Central Asia.

3.5.1. Legal regulation of the participation of NGOs

In general, the basis of the participation of citizens and public associations in the fields of nature conservation management, first of all, is laid by the Constitution of the Republic of Uzbekistan (Art. 50.55). Law of the Republic of Uzbekistan dated 09.12.1992, "On Nature Protection" in Art. 12-13 regulates the right of citizens to unite in public organizations for the protection of nature, to request and receive information on the condition of the environment and the measures taken to protect it, as well as the powers created by NGOs. Legislation in ecology and the environment provides for public participation as a) an individual citizen or group of citizens; b) by the bodies of self-government of citizens) through non-profit organizations.

Directly, the participation of non-profit environmental organizations is provided in the environmental impact assessment documentation for the construction of new and reconstruction of existing facilities for the purpose of management. In particular, Art. 27 of the Law of Uzbekistan "On Environmental Protection', as well as Art. 23 of the Law of the Republic of Uzbekistan dated 25.05.2000, "On Environmental Impact Assessment" provide an opportunity to NGOs and citizens to carry out public ecological expertise in any business that needs environmental justification by independent groups of experts on the initiative of NGOs and at the expense of their own funds or volunteer. Conducting public examination can be carried out regardless of the state ecological expertise. It is forbidden to interfere with the public environmental review. With that, it is established that the conclusion of PEA is a recommendation.

In addition, during the state ecological expertise the organization-customers are obliged to publish the announcement of the state environmental impact assessment and information on the results to the media information, in cases where the competent authorities include the construction project into the list of important objects.

3.5.2. Legal regulation of participation of self-government of citizens

In accordance with Art. 7 of the Act, institutions for self-government of citizens are not included in the system of public authorities, therefore, they are one of the forms of social organization. Law of the Republic of Uzbekistan "On institutions for self-government of citizens" dated April 14, 1999 provides opportunities for the development and implementation of local initiatives, including on environmental issues.

Meeting of citizens of the settlement, the village and the makhallas of the city of quarterly hear reports of heads of district, city and regional khokimiyats on matters within the scope of self-government; and, within their competence, the reports of heads of enterprises, institutions and organizations located in the relevant territory on the protection of the environment, development and others. In addition, meetings of citizens exercise social control over the execution of laws and other legislative acts, as well as their decisions; make decisions about the use of, on a contractual basis, enterprises and organizations located in the related territory, aimed at landscaping, gardening and sanitation; carry out activities aimed at promoting environmental protection.

4. THE CURRENT STATE OF THE ENVIRONMENT

4.1. Physical resources

Territory of the city is situated in the large inter-mountain Zaravshan depression, elongated nearly in latitudinal direction. It is limited from the north – by Nur-ota mountain ridge, from the south – by western extremity of Zaravshan mountain range, from the west - by arid deserts of Kyzylkum and Karakum, which creates the possibility of active transformation of air mass to plain territory of the city from the west. The city is located in left-bank part of the river valley which has the common slope in the south-south-east to the north-north-west. The elevation of the earth surface fluctuates in the range of 650-780 m and reaches 985 m in the northeastern periphery of the city, in local elevation Chupan-ota. Approximate elevation of the relief is less than 200m, in average 100-120m. General relief view represents the hilly plain, divided into numerous waterless valleys, rivers of natural character and erosive cuts of ancient irrigation channels. Besides, relief of the city becomes complicated by artificial poured shafts, excavations, ruins of the ancient settlement, broad development of cultural layers in the ancient populated places, particularly in the range of Afrosiab.
It is possible to distinguish three different relief zones on the city territory:
1. low mountain
2. piedmont hilly plain
3. flat plain of river-valley Zaravshan

Chupan-ota elevation represents low mountain zone, which relief is rather complex and more separated.

Piedmont hilly plain makes up the main part of city territory and occupies its southern and central parts. Its surface is separated by waterless valleys, ravines and valleys of ancient irrigation channels. Flat plain zone is in the form of comparatively narrow belt along river Zaravshan which occupies the northern and northeastern periphery of Samarkand.

The climate of the city is characterized by sun, drought and continentality. Climate situation of the region is characterized by short-term rainy spring in March-April, very dusty long-term and sultry summer from May till September, short autumn – from October till November and short-term with little snow winter and changeable snow cover. It's necessary to note that the climate of the region undergoes changes to softening as the result of prolongated cultural land development.
According to statistics of many years' observations, an average annual temperature for the last 10 years at meteorological station is 14,8^{0}C, absolute minimum - 15,2^0 C, absolute maximum +41,4^0 C. The coldest month is January where an average monthly temperature is –2,6^{0}C, the hottest month is

July where average monthly temperature is 26,6^0.

Average temperature of soil surface composes +17,8.C, the maximum temperature reaches +69.C. According to statistics of many years' observations an average annual quantity of atmospheric precipitation is 380m. The rainfall distribution is extremely irregular during the year, most part (about 84%) falls in period from November till April.

High temperature of the air stipulates low significance of relative air humidity which composes 60-74%, and in summer decreases to 43% in cool time (from October till April).

Wind conditions of the region forms under the influence of general circulation of atmosphere, complicated by peculiarity of orography. In Samarkand winds of southeastern and east-southwestern directions prevail, average annual wind velocity composes 1,9-2,0m/sec.

Thereby, analysis of physical-geographic and climate features of Samarkand location shows that high air temperature in summer, soil surface, increased wind velocity, insufficient fallouts quantity favors dust distribution to significant distances. At the same time frequent recurrence of increased velocities of the wind (2-5 m/sec) is purifying factor for scattering of gaseous discharges from low and unorganized sources.

4.2. Water resources

The city of Samarkand is located in Zaravshan River basin. City of Samarkand is located in Zaravshan river valley, which influences on condition of GW and superficial waterways, as it represents the source of feed for GW and via this river water through irrigation networks is selected and allocated.

Surface Waters

Zaravshan River origins from a glacier located in the junction of Turkestan and Zaravshan ranges on the territory of Tajikistan. The river's total length – 781 kms. River is currently fully regulated by Kattakurgan water reservoir. The Report represents environmental problem of water resources in the regions, located in Zaravshan river basin.

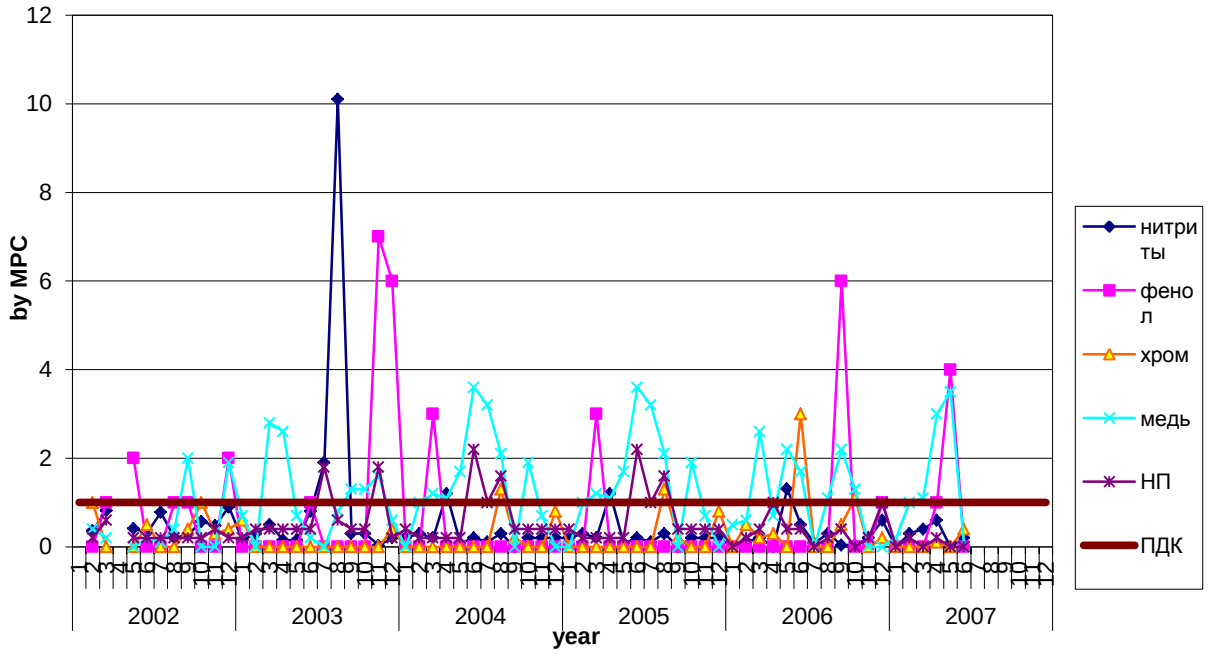
The river Zaravshan is most subject to transboundary influence. In a zone of formation of a drain of the river are located objects of mining of Republic of Tajikistan, which pollute the river by toxic metals, antimony, mercury.

In the territory of Uzbekistan the river is affected by the sewage from industry enterprises of Samarkand, Kattakurgan, Navoi and sewage from farmlands.

This impact is appeared in the fact that river water mineralization increases from its origins from 305,0 mg/dm^3 (0,3 MPC) to outfall of 1364,1 mg/dm^3 (1,4 MPC) at average index of watercourse of 658,7 mg/dm^3 (0,7 MPC). In comparison to data of the previous year river mineralization has not considerably changed.

In the territory of Uzbekistan the River of Zaravshan inflows with content of organic substances at level (according to COD) of 3,32 mgO_2/dm^3. By river current organic substances concentration steadily increases to 24,23 mgO_2/dm^3 at river station lower Navoi. At average their concentration by river comprised 10,20 mgO_2/dm^3. Drawing 4.2.1

Drawing 4.2.1 Zaravshan river water pollution rate on the entrance to Uzbekistan (Rovat-Hoja, data by Gidromet)



Near the city of Samarkand, the river is divided into two horns: the north – Akdarya and the south – Karadarya (Zaravshan). Two horns are joined close to Khatirchi settlement. The river does not reach Amu-Darya, its water is allocated for sprinkling and also disappears in sands.

Wastewater discharge after flowing out from Farkhad settlement WWTPs is effected to Akdarya river. Akdarya waterway's qualitative characteristic is presented in Table 4.2.1.

Table 4.2.1. Akdarya waterway's qualitative characteristics

Components	Substance concentration, mg/l						
	watercourse's natural background	At station above disch.point		At station below disch.point		At mixing station	
		aver.	Max.	aver.	Max.	aver.	Max.
1	2	3	4	5	6	7	8
Suspended solids	310,0	320,0	440,0	325,0	440,0	325,0	470,0
Mineral composition	410,0	420,0	540,0	400,0	510,0	410,0	540,0
BOD_5	3,7	3,0	4,17	3,2	4,2	3,0	4,2
COD	4,1	4,7	8,3	4,75	8,5	4,7	8,3
Chlorine	38,0	42,0	59,0	45,0	57,0	45,0	59,0
Sulfates	140,0	151,0	253,0	157,0	222,0	150,0	190,0
Ammonial Nitrogen	0,2	0,25	0,37	0,2	0,4	0,25	0,4
Nitrite Nitrogen	0,1	0,11	0,21	0,15	0,2	0,15	0,2
Nitrate Nitrogen	2,5	3,0	4,7	3,0	4,0	3,2	4,0
Chrome(VI))	0,005	0,003	0,0055	0,003	0,0055	0,003	0,0055
Chrome(III)	0,01	0,03	0,1	0,03	0,1	0,03	0,1

Nickel	0,002	0,0022	0,003	0,0022	0,003	0,0022	0,003
Phenols	0,0025	0,003	0,005	0,003	0,005	0,003	0,005
Iron	0,01	0,05	0,016	0,05	0,16	0,05	0,016
Copper	0,016	0,003	0,0199	0,003	0,0199	0,003	0,0199
SSAA	0,1	0,1	0,22	0,09	0,22	01,	0,22
Petrochemicals	0,10	0,15	0,45	0,15	0,45	0,15	0,45
Zinc	0,01	0,0066	0,0276	0,0066	0,0276	0,0066	0,0276
Calcium	47,0	45,0	69,5	45,0	69,5	45,0	69,5
Potassium +sodium	13,0	14,5	16,0	14,5	16,0	14,5	16,0
Odor	no odor	no odor	no odor	no odor	no odor	no odor	no odor
Transparency	9,0	7,0	5,0	7,0	5,0	7,0	5,0
Active reaction	7,0	7,0	8,2	7,0	8,2	7,0	8,2
Alkalinity	6,0	6,2	6,3	6,2	6,3	6,2	6,3
Dissolved oxygen	10,5	8,0	11,8	8,0	11,8	8,0	11,8
Oxidability	2,2	4,1	4,7	4,1	4,7	4,1	4,7

Zaravshan is a river of mixed feeding. In spring feeding is provided by precipitations such as rains and snow melting. From the end of June till August – due to melting of glaciers in mountains. In this relation two types of freshets are characteristic for the river: spring – in March and the second more intensive in June-August. Always river carries 70% of annual drain.

Zaravshan river regime within area of study is versatile due to periodical allocation of water for irrigation.

Minimal monthly average perennial river flow equal to 30 m^3/sec is observed in February and maximal indices – in June, which reached 665 m^3/sec, average by year comprise 162-202 m^3/sec. Chemical composition of river water prior to discharge of wastewater to Siab collector and after that is presented in Table 4.2.2.

Table 4.2.2. Chemical composition of Zaravshan river water (Karadarya)

Pollution index	Aver.concentration		MPC for fisherypurposed waters
	Karadarya-Akdarya apportioning point	Below Siab collector outfall	
Oxygen, mgO2/l	10,19	9,2	
BOD, mgO/l	0,58	0,92	3,0
COD, mgO/l	3,75	7,3	
Ammonial Nitrogen, mg/l	0,01	0,2	0,5
Nitrite Nitrogen, mg/l	0,007	0,076	0,02
Nitrate Nitrogen, mg/l	1,84	2,52	9,1
Iron, mg/l	0,01	0,02	0,5
Copper, mcg/l	1,3	1,3	1,0
Zinc, mcg/l	3,5	2,8	10,0
Phenol, mg/l	0,000	0,001	0,001
Petrochemicals, mg/l	0,01	0,03	0,05
SSAA, mg/l	0,00	0,01	0,1
DDT, mcg/l	0,000	0,000	0,0
alpha-HCCH, mcg/l	0,000	0,001	0,0
gamma-HCCH, mcg/l	0,000	0,001	0,0
Chrome VI, mcg/l	0,5	0,6	1,0
Fluorine, mg/l	0,15	0,22	0,75

Arsenic, mcg/l	0,9	4,4	50,0
Mineralization, mcg/l	310,9	513,7	1000,0

After water discharge from collector, pollution of Zaravshan river rapidly increased by the following indices: ammonial nitrogen, nitrites, arsenic, mineralization and smoothly by fluorine, chrome, pesticides, phenol, nitrate nitrogen, COD and increased MPC by nitrite nitrogen, pesticides are registered.

Irrigation watercourses

Considerable part of water (in 42 kms south-east to Samarkand) is collected by Dargom main irrigation channel, therefore in Chupan-ota station average annual river discharge comprises 74 m_3/sec.

In forming engineering and geological conditions of the city, special role is attached perennial irrigation channels and discharge network of artificial and natural origin.

Biggest irrigation waterways are Dargom channel and Siab discharge tract.

Average data on chemical composition of Dargom channel water is presented in Table 4.2.3.

Table 4.2.3. Chemical composition of Dargom channel water

mg/l Anions Rigidity Dense residuals	pH	**Cationes**			**Anions**				**Rigidity**	
		Ca	Mg	Na+K	HCO_3	SO_4	CO_3	*Cl*	Gener.	Perman.
310,9	7,2	48	12,6	17,1	170	62,5	15,4	8,1	3,43	0,64

As it was mentioned Dargom is a main channel. Three other small channels being main sources for Samarkand comes out of it:

1. Jar channel - length of 15,9 kms within city boundaries went through Temiryol raion. Total discharge rate - 1,5 m3/sec.
2. Bagishamal channel – length of 9,5 kms within city boundaries went through Bagishamal raion. Total discharge rate - 1.0 m3/sec.
3. Shaar channel – length of 1 1 , 3 kms within city boundaries went through Bagishamal raion. Total discharge rate 0.5 m3/sec.

Above mentioned channels were reconstructed previously excluding separate sections and in its turn providing irrigation of Samarkand. At present irrigation network is not sufficiently connected to main channels. It is explained by the fact that in many city streets such a network does not exist and it was build up by separate structures.

Currently in places where watering from main channels is not available 31 wells were built exclusively for the purpose of watering lawns, fountains.

Used waters from whole irrigation network, flowing down to relatively low parts (former dry plains) form drain flows. There is a big network of drain aryks in the city. One of biggest is Obishamat, having north-western direction and originating from Karvazar aryk. Suzangaran drain aryk joins with Obishamat.

Chashma is formed in its origins at tampered GW and further to upper stream is fed by sewer waters. Siab collector is formed through junction of several small sprinklers and springs in raion of silk-knitting factory. Siab collector is the main water-collecting tract uniting all mentioned and other drains. Siab is very deep (20-30 m) and along with aryks it is considerably fed by GW sources. Approximately 6 kms lower than crossing with railroad Siab collector forms two horns: upper Siab and lower Siab. Waters of upper Siab are fully allocated for irrigation, the lower Siab is approximately in 11 kms from the place of ramification flows into Karadarya.

Depending on conditions of origin and distribution of GW, character of water-containing rocks, four water-bearing complexes could be mentioned. Most significance is acquired by two waterbearing complexes.

In alluvial sediments of mid-quaternary and upper-quaternary as well as of modern aged, filling Zaravshan valley, single water-bearing horizon is formed. Water-containing rocks are mainly represented by pebbles with sand-gravel filler, conglomerates with thin streaks of sands and pit-run fines with total capacity of 250 meters. Strong GW flow is related to those sediments, which was mainly formed by superficial waters of rivers and irrigation channels, filtered through pebbles layer. Filtration of precipitations and irrigation waters from irrigated territories as well as inflow of GW from the side of proluvial plain play secondary role in feeding the whole water-bearing complex. Capacity of water-bearing horizon almost coincides with capacity of alluvial sediments and makes up 50-250 m.

Relative aquifuge is represented by compaction, low infiltrative sediments of upper Neocene, represented by gravelites, sandstones, siltstones and clays. Main aquifuges are clays of Miocene, occurring at depth of 1000 m. General GW flow coincides with the main stream of Zaravshan river.

With radial inclination to Siab valley and of its outlets the depth of occurrence of GW mirrors in the northern peripherals of the city (airport, "Rucheek" sanatorium and etc.) on terrace surface I and II varies from 1 to 5 and rarely more than 5 m.

GW regime fully depends on superficial waterways regime. Lowest levels are observed in low water (October-April), highest periods of freshet (May-July). Amplitude comprises 1-1.5 m. Specific yield of wells varies from 2 to 10 l/sec., rarely – 30-50 l/sec. Coefficient varies from 10 to 100 m/day. Mineral composition of GW slightly varies from Zaravshan river water composition, total mineralization of which comprises 200-500 mg/l. Waters are hydrocarbon-calcium. Total rigidity varies from 1,1 up to 30,9 mg/equiv., more common parameters of total rigidity are 4-10 mg/equiv. Shallow occurrence, good water quality and exceptional water plenty of described water-bearing complex stipulate its importance for municipal water supply and of adjacent districts. They provide for centralized water supply to Samarkand and other settlements.

Proluvial sediments of mid-quaternary age are widely represented by alternation of streaks and lenses of loess-type loamy sands, gravel sands, gruss, but rare in form of gravel. Thus, clumpy material in section often has subordinate significance.

GW are contained in all lithologic residuals, but lenses and streaks of coarse deposits with high filtration features (sands, gruss, gravel) are more plentiful with water, the capacity of which varies from 0,5 – 0,2 m in eastern part of the city up to 7,0-10,0 m – in the western part. Depth of occurrence of GW mirror varies depending on hypsometrical margins from 1 m to 35-40 m. Basic aquifuge are clay and Neocene siltstone and partly Paleozoic aged rocks (in places of junction at Chupan-Ata).

Main water source for described water complex is the underground inflows from the side of mountains. Insignificantly it is fed by precipitations infiltration. Flow of GW coincides with general surface inclination and direction to north-north-west.

Discharge is effected into alluvial sediments of Zaravshan river, into grounds of upper Pliocene age in sites represented by friable deposits. Considerable discharge is also occurs due to GW tapering via erosion cuttings into irrigation network, into ravines, forming springs or area tapering (waterlogging). More intensive discharge of GWs is observed in the upper part of Siab collector feeding the waterway. Multiple springs are observed in outfalls of Obishamat, Chashma, Siab, Jar collector.

Average amplitude of GWL comprises 0,5-1,5 m. Highest standing of GWL is observed in March-May, the lowest – in September-December.

Water profusion of grounds is different and that is explained by diversity of lithologic composition. In some horizons represented by detrital sediments without any clay dashes, specific yield comprises 10-15 l/sec. For loamy sands the specific yield varies from 0,01 to 0,2 l/sec.

GW of described complex are fresh, mineralization varies from 0,5 to 1,0 g/l. Water of hydrocarbon and calcium content predominates. Total rigidity varies from 2,0 to 6,0 mg/equiv.

Above described water complex is widely used for drinking, watering and irrigation outside the city bounds and has certain practical significance.

GWs of modern Zaravshan valley are used for water supply to Samarkand and also for population of Bukhara and Navoi regions.

In general, water intake structures are located in favorable conditions (in sense of sanitation) and have good perspectives of operation and expansion.

4.3. Land resources

Particularities of surface geology lie in outings of Paleozoic rocks in form of tectonic brachyanticline rising of Chupanata in the middle of plain of Zarafshan highland depression. It is comprised of clayslates and metomorphological sand Silurian, dolomites and chalk limestone, clays, marls and siltstone of Tertiary period. However, quaternary sediments are most widespread on the surface and all civil construction works are realized there. They are comprised of proluvial loess rocks of Tashkent complex in vast submountain plain, occupying main part of Samarkand territory. Alluvial loess rocks of Golodnaya steppe complex are spread in form of narrow discontinuous terrace surface, and on the second wide terrace there are strata of gravel-pebble sediments of Syrdarya complex, covered with sandy and clay loam mantle. The latter is located in northern periphery part of the city.

Regional particularities of modern tectonic geology of the raion are determined by the fact that it forms western periphery part of vast post platform Tien-Shan system of mountain folding or orogenic area. The city is situated within the Samarkand intermountain trough, limited by Nur-ata mountain range in the North and Turkestan mountain range prongs in the South. Tectonic movements of Samarkand depressions in Mesozoic and Paleocene periods are characterized by platform conditions of Neocene-Quaternary period with development of differential sharp movements and formation of discontinuous sharp abnormalities and strong earthquakes.
Three engineering-geological raions differing significantly from each other are distinguished by geology-genetic and lithologic factors within the studied area. First raion comprises areas of alluvial strata development in Zarafshan river valley, second one – areas of proluvial loess rocks abundance, and third raion composes outings of ledge rocks.

Dangerous geological processes are widespread on the territory of the city, such as: erosivity of permanent and temporary waterways, subsidence, boils, landslides, ravines formation.
Almost all the abovementioned processes are mainly timed to the territories of passing of ancient channels Siab, Dargom, Obishamat and their feeders Siabcha, Jar, Sheer and others. Deep erosion cuts over the valleys of these channels (15-30 meters) control low level ground waters in the city. Impoundment is observed only in narrow valleys of collector-drainage network.

Impoundment is caused by simultaneous effect of natural (ground waters, atmospheric

precipitations, infiltration of surface waters) and artificial (waters, accumulated in ditches and trenches, leakage of water transportation communications, irrigation and industrial waters discharge) factors.

In general, territory of Samarkand city is considered as well drained.
Loess rocks observe development of subsidence causing formation of wide and deep clefts, terrace-like lands, craters, landslips, appearance of cracks in the walls and basements of buildings and structures.

Special group of grounds is represented by anthropogenic sediments, abundant in the "old part" of the city; their thickness comes up to 8-21.5 m. Because of heterogeneity of composition and high porosity grounds loose quickly bearing resistance when humid; this, in its turn, results in deformation of buildings and structures. Their formation is related mainly to surface waters influence. The most dangerous is ravines formation along the channels valleys and their edges failure because of non-regulated flow of rain and irrigation waters. Considering ravines occurrence up to 20-30 m deep and more, as well as verticality of their edges, development of adjacent territories is utterly difficult and unreasonable.

During the last years hills slopes are mass cut and grounds are disposed in natural hollows as a result of construction development of the city area. This leads to damages of natural flows of surface waters and formation of impoundment zones, and as a result, appearance of surface subsidence and slopes slipping in form landslides-falls. There appear hearts of formation of landslides-falls of 100-2 000 m^3 space in the streets of the city. Houses and communications, civil objects (cemeteries, fuel stations, supermarkets, cinemas and others) come across the landslides area.

Most danger is posed by landslides in living zones. So, during 1995-1999 their activization was observed in 8 streets, and thus 15 houses entered to landslide zone. The cause of land sliding and slipping in all cases was cutting of slopes formed by loess-type sandstones during economic activity and of non-regulated superficial drains.

According to its natural features three types of soil could be outlined: soils of submountain zone, soils of terrace III of Zaravshan river and soils of low terraces of Zaravshan river.
Total are of Samarkand comprises 8729 ha including irrigated area – 1401 ha. 106 ha – perennial plantings, farmlands, collective gardens – 1991 ha, parks – 104 ha. Whole area could be classified as non-saline.

Soils of submountain plain are represented by typical and light sierozem, rock forming materials are loess-type sandstone. Soils are characterized by light humus-pressure, strong carbon-containment, low containment of colloids. Sierozems are featured by unstable microstructure. Due to considerable surface inclination, soils are often eroded.

Soils of Zaravshan river terrace III are represented mainly by old-irrigated typical sierozems, partly eroded, are of heavy or average loamy on loess-type sediments. In the result of long-term irrigation sharp combining of humus sierozem with nitrogen with gradual vanishing of carbon horizons and in conditions of good GW drain - flushing of salts, though in conditions of bad drain GW rise and secondary mineralization occur.

Natural soils in the city area are fully transformed into municipal cultural sediments.
Grounds of low terraces are mainly meadow and only within the local lowering, depending on the depth of ground waters level, there occur marsh-meadow and marsh grounds.

Marsh grounds are widespread in the lowest parts of the first and second terraces of Zaravshan

River as well as in local areas and valleys of big aryks and flows (Siab, Obishamat and others) with ground waters of up to 50 m depth. They are characterized by super clayiness, high calcareousness; humus content is 3-4%. Gley horizon is most evident as a result of substantial over humidifying.

4.4. Biological resources

City vegetation is represented by three groups of communities. On the territory of living microdistricts artificial plantings of decorative, fruit trees and bushes predominate. In private sector and in farmlands along with fruit trees, vegetables and grapes are also planted.

Typical representatives of local oasis vegetation are elm-tree, willows, mulberry, poplar, Asiatic poplar, jida, ash-tree, plane tree, walnut and some others. Currently many central streets are gardened with new types of trees such as Japanese pagoda tree, pines, junipers, chestnuts. Forest park plantings are mixed with garden and meadow cultures. Various types and sorts of garden cultures are wide spread. Special significance is attributed to fruit trees which are included to greenery in parks, streets and settlements.

Within city bounds there are makhallas with private households. Thus fauna includes those animals that live close to people, such as household animals, insects, birds and rodents. Pollution grounds and waters with faecal wastes caused by leakages, accidents and not-canalized population leads to infection of small animals, rodents and worsening of sanitary epidemic condition in the city. Solution of this problem will be covered by the Project.

In fields one can find holes of small rodents: gophers, field mice. In gardens there could be found earth rat, mice and etc. In aryks there are toads and frogs.

Among birds commonly laughing dove, sparrow, starling, rook, black crow, magpie, blackbird, white-winged woodpecker could be met. In living block of the city house animals are kept such as cows, goats, sheep and poultry.

In Zaravshan river 30 types of fish could be found predominated by carp fish. Rare and vanishing types of fish are met which are entered to the Red Book of Uzbekistan: Amu-darya shovel-nose fish, Aral barbel.
Fishery productivity of water reservoirs of the region are estimated as low.

4.5 Social Resources

The Government of the Republic of Uzbekistan and local authorities in Samarkand make great importance on improvement of ecological situation and public health, related to non-relevant to requirements sewerage system and treatment of waste waters in this historical tourist center, situated at Great Silk Road. The Government applied to the World Bank for assistance in implementation of project on sewerage, which is supposed to be continuation of currently implemented Project on water supply in Samarkand city, financed by World Bank.

The population of Samarkand is 500 000 people. There are 194 makhallas in the city. Each year 6 178 people are born and 2 376 are dead. Increase in number of population, housing construction growth cause necessity in creation of new and re-equipping of existing communication networks. At present, 100% of Samarkand population is covered with the centralized water supply system 98% and centralized sewerage system – 59%. Centralized sewerage has been functioning in Samarkand since 1952. The most inefficient condition of sewerage network is observed in the old part of the city. This part of the city has such places, where sewerage pipelines go out directly to the surface resulting in insanitation, which in its turn furthers diseases spread. However, majority of population

of new districts has sewerage. Majority of households, not having sewerage system, use cesspools.

The leakage of transported liquid through damaged sections becomes the reason of soils, ground waters pollution, increases level of groundwater occurrence, results in waterlogging of the territory, increase of soils pollution, oppression of greenery, threatening health of consumers, using water from nearby shallow wells. It also leads to accumulation of pollution and fecal malignant organisms in open drainage channels, streams, rivers and lakes, which, finally, worsens treatment of surface waters and causes diseases, related to consuming of these water resources for irrigation as well as impacts negatively on any other potential type of using of these water resources.

Majority of households expresses their dissatisfaction with the activity of Vodokanals. Their dissatisfaction is stipulated by the following main reasons: low efficiency of Vodokanals in providing quality services; passive response or its complete absence to claims for repair works; as well as "pressure" from suppliers of services to obtain unofficial payments for execution of repair works, which are to be provided to the population free of charge.

Impact of environmental factors of different nature and type (social, economic, biological, natu-ralclimate, chemical, physical, etc.) leads to development of adverse effects in populations' health. The quality of drinking water is one of these factors and is determined by: nature of water supply sources, regional particularities of ground soils and minerals, efficiency of treatment and disinfection, anthropogenic load rate, mode of water supply to population, etc.

Following GOST 950:2000 "Drinking Water" was brought into force in the Republic of Uzbekistan, establishing set of controlled indices of drinking water quality, order and rules of control of these indices conformity to established requirements during production and supply of drinking water to consumers. Following the abovementioned GOST, sanitary-epidemiologic service of the republic conducts sustainable control of drinking water quality, supplied to population both by communal and department water pipeline. According to the data of the Ministry of Public Health, during the last years the quality of drinking water in Samarkand city by microbiologic indices improves and varies from 1.91% in 1999 to 0.3% in 2004 and in the region from 10.4% in 1999 to 14.1% in 2006. Share of drinking water samples from communal water pipelines not satisfying the hygienic requirements by chemical indices made 10.4% (2006) and 18% (1997) in Samarkand region. Main aberrations from national standard are observed by mineralization rate and total hardness (chemical indices).

Hourly supply of drinking water furthers changing of its quality by microbiological indices. Besides that, accidents at water pipeline networks affect as well.

Monitoring of diseases of alimentary nature and control of food products pollution is the main activity of sanitary-epidemiologic services concerning nutrition hygiene.

For the period of 2000-2006 share of food products samples in the sphere not satisfying the hygienic norms made 6.5% - 2.5% by microbiological indices and 12.8% - 7.8% by sanitary-chemical indices. Decrease of samples not satisfying hygienic requirements is observed all over the Samarkand city.

Aberration from hygienic regulations by organoleptic indices (acidity, transparency, sediments) is 10%, as well as by content of toxic elements (lead, cadmium, zinc) – 0.2%, by caloric content of food products – 34%, by content of iodine in dietary salt – 30%, by organic dashes in beverages – 10%, by content of nitrates in crop production – 3.0%, and other indices – 12.8%.
Total mortality in the region stabilized and makes approximately 5.0 cases per 1000 people/year, infant mortality decreased from 16 (2000) to 12.6 (2004) cases per 1000/year. Population sickness rate tends to increase from 259 to 410 consultations per 1000 people/year.

4.6. Physical cultural heritage

Samarkand is one of oldest cities in Central Asia. During the Timur and Timurides period (XV-XVII centuries) mosques, mausoleums, palaces, amazing with its size, architecture and beauty of decoration were built in Samarkand. Unique monuments of oriental public architecture of the middle ages are extant and of global importance.

There are some 88 main ancient architecture monuments in the city and Samarkand region. The most ancient ones are Gur-Emir complex, Registan ensemble, Rukhabad complex, Aksaray, Bibikhanim, Ezdakh Imam, Geshratkhona, Khanaka and other mausoleums, Shakhizindan ensemble (comprising 26 objects), Ismail Bukhari (Imam Bukhari) complex, Makhdumi Agzam complex. Within the Afrosiab reserve and in central part of old city, where Registan, Gur-Emir, Bibi-Khanim, Shakhi-Zinda monuments are concentrated, certain development of monument deformation is observed by the reason of humidifying of banked grounds in monuments basements because of occurred leakages of water pipeline and sewerage networks, atmospheric precipitations, etc.

There is lacks sewerage network and ground waters observation wells network is not sufficient in the historical center of Samarkand.

4.7. Determination of the main environmental problems

The main problems in the city of Samarkand are:

- High level of groundwater in some areas;
- Poor state of the drainage network, leading to rising groundwater;
- Tensions with centralized sewerage network coverage of the population;
- Flooding of the territory;
- Contamination of soils and soil, groundwater due to unorganized wastewater dis charge without treatment;
- High seismicity in the city and subsidence.

Because of contemporary geodynamic processes there are under flooding, subsidence, erosivity, seismicity and anthropogenic process in the city.
Erosivity of constant and temporary watercourses appears intensively along the beds of temporary watercourses and ancient canals. Caving is met on all the ancient canals, and in some areas there are bluffs. The height of the edge changes from 15 to 30 m. This process is more intensive in the southwestern
part of the city along Dargom, Eski-Angor canals, but in north and north-east along canals which are the basis of erosivity of all the increasing ravines.
Ravines increase of Dargom, Siab, Obimashat, Djar, Siabcha canals happens as the result of storm sewage and irrigation (aryk) waters. The ravines in these areas (Afrosiab reserve, Dagbit street, Tashkent, Abdullaev, Nabiev, Ibn-Sino, etc.) run into loess-type rock at the depth from 10 to 20 m and 0,5-2,5 kms length. On the banks near the edge of the ravines numerous boiled craters are met with diameter 1-1,2m and 1-1,5m deep.
Because of active ravines' increase the loss of the city territories for construction happens, bridges washing away, dangerous collapse of buildings, cities and other engineer constructions.
Underflooding processes in the city have areal and line expansion, in territory I and II of the Zaravshan river terrace, where underground waters lie at the depth of 1-5m.
In the narrow zone (0,5 -1km wide) along Siabcha, Djar, Shaar collectors and ancient Siab, Obimashat, Dargom canals underflooding is often met. It is noted that anthropogenic underflooding is observed, which intensivity is slowed due to drainage of the underground waters flow by deep (10-20 m) erosive ruggedness relief. While studying of anthropogenic underflooding

process uneven subsidence was observed in different parts of the buildings located on artificial grounds as the result of their moisture by atmospheric precipitations, irrigation, water pipe and sewerage networks leakage, etc. in the foundations of the monuments Tillya-Kari, Chorsu, Gur-Emir, Registan, «Sogdiana» department store, cinema Navoi, dwelling houses along street Komarov, plant workshop «Alpamish», etc.

In the last years in the north-eastern part of the valley (Farkhad settl.), in connection with water supply ceasing to Akdarya, decrease of GWL is observed at 4-5m.

Non-floodable places take under 85% of the territory of the city, located on the high marks of proluvial, sloping, hilly and little inclined plain of average quaternary age. GWL is located lower than 10 and often at the depth of 15-35%. Low level of underground waters is controlled by thick network of ravines, carrying out the role of natural drain.

Underground waters are fresh, mineralization changes from 0,5 t 1,0 gram/liter. Waters of hydrocarbon calcic structure prevails. The total rigidity changes from 2,0 to 6,0 milligram/ eqiv.

Subsidence phenomenon on the territory of the city got the wide spread occurrence and is related to the zones of loessial rocks development of an average quaternary age.

Almost whole city is located on weak-subsidence grounds with total size of subsidence - 0,15-0,05 m by aeration zone capacity comprising 20-30 m.

Places with average subsidence of rocks have the most wide areal distribution in the southern part of the city in the range of proluvial valley located hypsometrically higher than Dargom canal and in the northern part of the city between Siab canal and contemporary Zarafshan river valley. Subsidence along the Dargom and Siab canals happened as the result of breach of integrity of sizes, formation of terrace-like surface, separated by crack of subsidence oriented in parallel to canals and ravines.

The territory of almost non subsident rocks is related to the region embedded by light clumpy loesstype loamy and clay sands.

In the range of "old part" of the city, where the capacity of anthropogenic depositions reaches 8-21 m, separate deformations are observed in the range of Afrosiab reserve and in the central part of old city, where historical monuments - Registan, Gur-Emir, Bibi-Hanim, Shahi-Zinda, etc. are concentrated. Deformations are related to humidification of sabulous- loamy rocks with large contention of construction and irrigation waste. Total area of distribution of anthropogenic depositions is 2-10 km2.

Rock slide processes in Samarqand city are related mainly to the area of ancient Dargom, Siab, Obimashat canals and their inflows created by average quaternary proluvial loess-like loamy soils, clay sands which are characterized by large porosity and low humidity. The main reason of formation of contemporary rock slides and collapses is stipulated by availability of vertical slopes along canals and their systematic humidification by discharged waters. At present time the most dangerous landslide zones are in the region of the following streets: Koshgary, Huja Choruh, Kurchatov, Bekabad, Mendeleev, Chashma- Hizir, Ahunbabaev, Tursunov, Titov.

Special group of grounds representing anthropogenic dispositions, are developed in the territory of "old city", their capacity reaches 8-21,5 m. Because of heterogeneity structure and high porosity, and due to moisture they quickly loose bearing capacity, which leads to deformation of buildings and constructions.

All listed dangerous geological processes, occurring on the territory of Samarkand are impacted by seepage from sewer networks, discharge of wastewaters onto relief .

Sharp seismicity of Samarkand area - 7- 8 according to Richter scale.

Absence of sewer system on considerable part of the territory, break-down of local treatment facilities at enterprises and or their absence, ineffective work of municipal treatment plants lead to GW pollution, soil and grounds by nitrogenous components, petrochemicals, suspended solids, organic components.

Active pollution sources of GW and of soil and earths are objects of communal and household purpose, schools, gardens, clinical institutions as well as enterprises, particularly poultry farms, milk farms, which discharge wastes to drains on area landscape without treatment. Wastewaters contain mineral insoluble, wool, forage residuals, blood, ammonial nitrogen, phosphates, organic compounds (proteins, fats, carbohydrates).

About 98% out of people living in Samarkand is connected to water supply system and only 59% out of whole population is connected to central sewerage. 205 000 people, which are unconnected to central sewerage use sanitation facilities on sites such as cesspools and septic tanks.
There is lack of count and information on removal of faecal wastes from decentralized sanitation facilities. The majority of wastewater from such facilities seeps into ground posing threats to health of those using water from small and not deep wells nearby. Considerable part of wastes discharged to sewer system are used as fertilizers or simply discharged to environment. First variant leads to operational problems in sewer system (clogs, sediments) and at WWTP (peak over-load), but other two to – environmental and sanitary and epidemiological problems.
Sewer system of Samarkand – pseudo-divided and has total length of 277 kms of sewer networks Sewer pipes are mainly made of ferro-concrete; there are also ceramic, polyethylene and cast iron pipes. Diameter of sewer pipes varies from 150 mm at secondary networks to 300-500 mm in primary networks and collectors, diameter of which comprises 800-1200 mm. 174 kms – pipes with diameter of 300-500 mm.
Transportation of wastewater is conducted by method of 'drifting' ('gravity') and also under pressure using 6 wastewater pumping stations (WWPSs) in the sewer system, two of which comprises Main WWPS and in fact consists of 2 pumping stations, called pumping station '3' and '3a' respectively. (Drawing 4.7.1). In pumping station '3a' one pump is the only one where operation is controlled automatically, all other pumps are still switched on and off manually, these two pumps are characterized by high energy consumption due to low-efficient pumps and/or old existing pumps.
As a whole, the majority of sewer system objects were built in 60-s and operating almost 40 years. As a result the system is subjected to high wear. Existing sewer system is relatively old and the sewerage is showing typical features of such a state, such as (i) exchange of wastewater with groundwater and (ii) increasing numbers of breakdowns. Most wastewater pumping stations are old as well and that has the following impacts:

- Considerable infiltration of wastewater by into the soil and groundwater, be it from on-site sanitary facilities and/or damaged sewers. Consequently there are severe environmental concerns and health risks!
- Increased O&M cost for trouble-shooting of sewer breakdowns.
- Risks to population's health.
- Low efficiency of some WWPSs.
- The electrical and mechanical equipment suffers from corrosion caused by aggressive media and age. This includes switchboards, cables, local equipotential bonding and general installations such as lighting, sockets and earthing system.
- The WWPSs are not equipped with flow meters, so all flow data is just estimates based on mostly nominal (!) flow capacities.
- Decreasing reliability of system due to poor shape and age of equipment.
- Even though efforts are made to take care of personnel protection, there still is a potential for insecure function of these protection devices against direct and indirect contact.
- Increasing problems with spare part management due to age of installed equipment.
- Buildings typically are in poor conditions.

Drawing 4.7.1. Samarkand, Main WWPS, Pumping station '3': Screens and Pumps


Ground-water table is low in some areas of Samarkand that there is no infiltration from ground-water taking place. According to water balance, it was made a conclusion that 30% of wastewater collected in municipal sewer networks disappears due to seepage into the ground, which leads to not only pollution of the environment but also to technical maintenance problems. The laying bed below the sewers tends to be washed away, sewers subside, and the system collapses. Approximately 10% of wastewater may be due to seepage of storm water to sewer pipes, causing net losses in volumes equal to 20%. To make matters worse, **storm water drainage** (which is under the responsibility of the Municipality) is not properly managed. Typically, if a system is in place, it is open culverts along the main roads. Particularly those zones, where the elevation of houses is below the bordering street surface, suffer from a lack in drainage. Subsequently storm water drainage is connected to the sewer system. This renders the separate system a 'pseudo-separate system'. That is, during rainfall, flow rate in the sewer system increases.
In Samarkand there exist 3 municipal WWTPs. One plant is called the **'Main WWTP'**, whereas the 2 smaller ones are called **'Geofizika WWTP'** and **'Farhad WWTP'**. The two latter facilities are very small as compared to the Main WWTP, and only serve small settlements nearby.

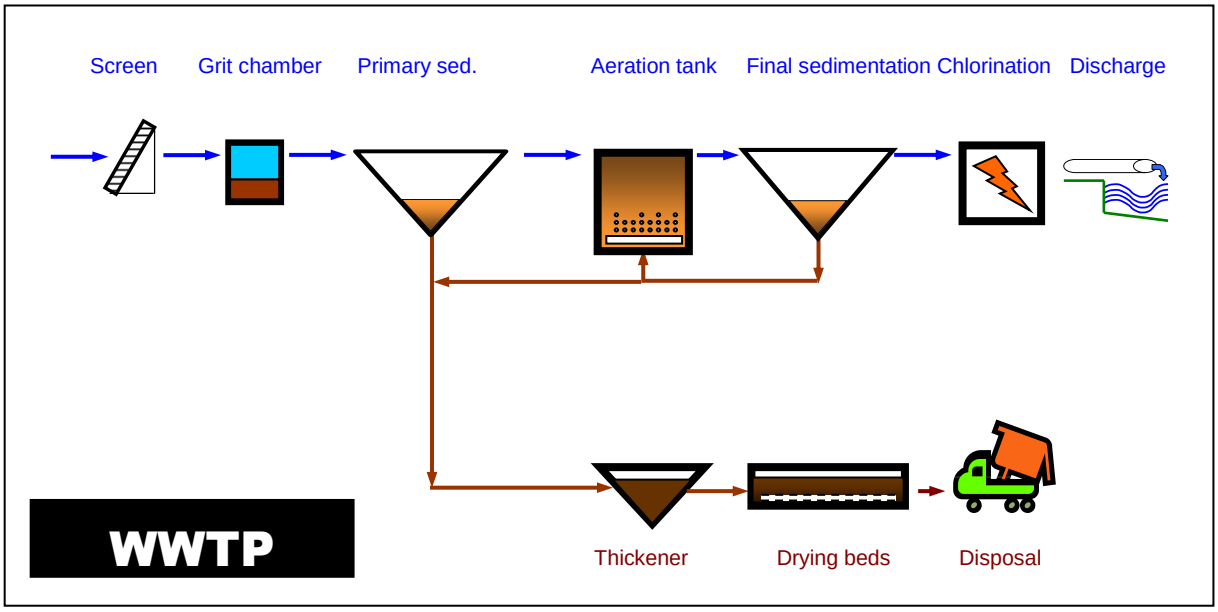
Drains from enterprises and household wastewater from population enters the municipal sewer network. Sewerage covers 55 enterprises, mainly represented by such as: motorcade department, JSC «Samarkand non», JSC «Samarkand don», elevator manufacturing plant, LLC «Samarkand LT», JSC «Samarkand konserva», JSC «8 marta», LLC «Novator», JSC «Samarkand avtomobil zavodi», JSC «Samarkand burgu asbobi», JV «Bakhmal», Khlopkoprom and etc. Total discharge volume of drains from all enterprises comprises 1135, 1 thous. m^3/year.

The main WWTP was constructed in 1964, and has been expanded and rehabilitated in several steps ever since. Buildings/structures and electro-mechanical equipment at main WWTP are in very bad physical condition and are low-efficient. Total land area of the plant is about 36 ha (Drawing 4.7.2).

Drawing 4.7.2. Aerial view of Samarkand Main WWTP

Technological process of treatment is based on a conventional activated sludge concept, featuring screen, grit chamber, primary sedimentation, aeration tanks, final sedimentation and chlorination. (Drawing 4.7.3.)

Drawing 4.7.3. The overall process flow diagram on WWTP of Samarkand



Sludge treatment is via gravity thickening and drying beds. As it was shown by preliminary analysis, the volume of available capacities is freely enough to provide treatment at present time as well as in mid-term perspective taking into account wastewater discharge volume and pollution load
There a 2 circular gravity thickeners for the thickening of primary and secondary sludge.
As a rule, following the drying process the sludge is transported by vehicles to the disposal dump.

Drawing 4.7.4. Drying beds

With expansion and improvement of WWT system, it can be expected to produce a larger quantity of sludge. There are a total of 12 drying beds with an overall land surface of about 3,6 ha (Drawing 4.7.4). Normally 7 drying beds are operated and five drying beds are not operated due to deterioration and seepage to the soil and are being reconstructed in the frames of Phase I. The operated 7 drying beds will be reconstructed and one additional drying bed will be constructed in the frames of Phase II - Additional Financing. After reconstruction works, 13 drying beds will be sufficient to accommodate the increased sludge from expansion of WWT system.
Bottom drainage in the drying bed is not done conventionally via sand beds covering the whole area, but rather via a central sand/gravel drainage ditch only. Quite obviously this drainage system is clogged, and dewatering is *de facto* taking place predominantly by evaporation. Operation of the complete plant is done manually. There areno automation systems in place.

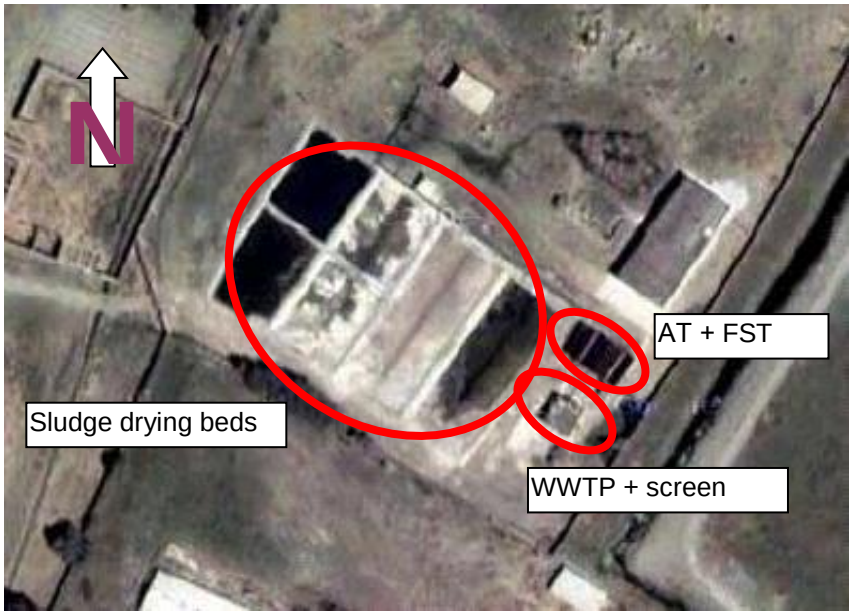
Both buildings and constructions as well as electro mechanical equipment at main WWTP is highly deteriorated and have low efficiency. The key problem represents the aeration system (to big airblowers, air allocation by air pipes with 5 mm holes, manual operation) at the stage of biological treatment, total consumption of electric energy comprises 53 KWh/h/PE_{60}/year. It is 2 twice as much as on well operated European WWTP for obtaining similar levels of wastewater quality. Standards of the Republic of Uzbekistan on wastewater treatment are satisfied according to carbon related parameters (BOD_5, COD). Standards on nutrition substances (Nitrogen and Phosphor) are often not observed and content of ammonia is of a special concern. These standards by wastewater

is similar and somehow stricter than EC standards (Directive 91/271/EEC, Directive 98/15/EEC). For observation of strict standards on NH_4-N content in treated wastewater, it is necessary to modernize the process of nitrification, i.e. NH_4-N extraction fraction should comprise not more than 90%. However, due to imperfect aeration system it is unreal to achieve such a level nowadays. Qualitative characteristic of Siab collector receiving wastewater after main WWTPs is presented in Table 4.7.1. It is evident from the table that treated wastewater insignificantly influences by selected ingredients on wastewater quality in the collector.

Table 4.7.1. Siab collector qualitative characteristics

Components	Substance concentration, mg/l		
	At station above disch.point	Treated wastewater quality	At station below disch.point
Temperature	15	19	15
Odor	mud	chlorine	mud
Color	grey	w/c	grey
Transparency	6,1	19,4	7,3
Suspended solids	127	14,8	11,3
Under ignition	21	2	20
Settling solids	1,0	0,2	0,8
pH	7,0	7,0	7,0
Dense residuals	511	455	496
Under ignition	43	38	41
Dissolved oxygen	7,3	7,3	7,3
Oxidability	2,5	3,4	2,9
BOD_5	9,7	10,2	9,9
BOD_{20}	11,6	12,6	12,0
COD	14,8	16,0	15,2
Stability	60	60	60
Ammonial Nitrogen	1,8	3,7	2,3
Nitrite Nitrogen	0,23	0,15	0,21
Nitrate Nitrogen	4,3	2,9	3,8
Total Nitrogen	5,8	6,8	6,2
Chlorine	32,0	43,8	35,9
Sulfates	102	71	95
Phosphates	0,5	0,6	0,5
Petrochemicals	0,07	0,09	0,07
Copper	n/i	n/i	n/i
Zinc	n/i	n/i	n/i
Chrome(VI)	n/i	n/i	n/i
Iron	0,07	0,09	0,08
Sulfides	n/i	n/i	n/i
SSAA	0,07	0,1	0,08
Phenols	n/i	n/i	n/i
Nickel	n/i	n/i	n/i

Geofizika WWTP was constructed in 1965 for a small nearby settlement (Drawing 4.7.5). It is located close to Samarkand airport and has been taken over by SRVK just recently. Wastewater treatment is based on the concept of extended aeration. After screening, raw wastewater is pumped directly into aeration tanks, from where it flows to final sedimentation tanks. Sludge treatment is via drying beds only. Nominal capacity of the WWTP is 1 200 m_3/day, operational capacity – 312 m_3/day.



Aeration Tank (AT) + Final Sedimentation Tank (FST) are constructed in steel above ground. There are a total of 6 drying beds with an overall land surface of about 2,400 m_2. Apart from these beds there are no other means for sludge dewatering. Work efficiency of treatment plants is presented in Table 4.7.2.

Table 4.7.2 Characteristics of treatment plants at Geofizika

Wastewater Parameters	Concentration of pollutions inflowing to treatment plants	Treatment efficiency, real	
		%	mg/l
1. Suspended solids	140	88,57	16
2. BOD_5	91	86,81	12,0
3. COD	140	86,86	18,4
4. Total nitrogen	6,8	23,53	5,2
5. Ammonial Nitrogen	10,0	60	4,0
6. Nitrate Nitrogen	1,2	-	3,2
7. Nitrite Nitrogen	0,20	40	0,12
8. Petrochemicals	0,18	50	0,09
9. Phosphates	3,0	80	0,6
10. Chlorine	53,6	14,37	45,9
11. Sulfates	98,0	27,14	71,4
12. SSAA	0,24	50	0,12
13. Settling solids	1,4	85,71	0,2
14. Dense residuals	550,	12,73	480
15. Oxidability	17,2	80,23	3,4
16. Dissolved oxygen	3,6	-	6,2

Qualitative characteristics of the collector receiving wastewater flowing from Geofizika WWTP are presented in Table 4.7.3. The table shows that untreated drains pose adverse impact on collector water quality by whole range of ingredients.

Table 4.7.3. Collector qualitative characteristics

Components	Substance concentration, mg/l						
	watercourse's natural background	At station above disch.point		At station be-low disch.point		At mixing station	
		aver.	max	aver.	max	aver.	max
1	2	3	4	5	6	7	8
Suspended solids	123,0	125,0	217,0	104,0	150,0	120,0	200,0
Under ignition	19,0	15,0	15,0	13,0	19,0	15,0	19,0
BOD5	18,0	11,4	15,0	11,6	14,0	11,6	15,0
COD	17,0	17,6	22,0	17,8	19,0	17,8	22,0
Chlorine	40,0	36,4	45,0	49,4	52,0	48,0	52,0
Sulfates	275,0	87,0	110,0	80,2	109,0	84,0	110,0
Total nitrogen	5,0	4,8	5,3	5,0	5,3	5,0	5,3
Ammonial Nitrogen	1,5	1,6	1,8	1,9	1,9	1,8	1,9
Nitrate Nitrogen	0,15	0,19	0,20	0,17	0,20	0,19	0,20
Nitrite Nitrogen	4,5	4,4	4,9	4,0	4,5	4,2	4,9
Temperature	20	19	24	19	21	19	24
Phosphates	0,5	0,5	0,7	0,6	0,7	0,7	0,6
Iron	0,1	0,08	0,1	0,08	0,1	0,1	0,1
Settling solids	1,0	0,9	1,1	0,8	1,0	1,0	1,1
Oxidability	2,4	2,8	2,8	3,0	3,0	3,0	3,0
SSAA	0,1	0,1	0,12	0,11	0,12	0,11	0,12
Petrochemicals	0,06	0,07	0,1	0,08	0,1	0,08	0,09
Dense residuals	490	510	550	490	500	500	510
Under ignition	40,0	40,0	44,0	37,0	39,0	37,0	40,0
Color	grey	Grey	Grey	Grey	Grey	Grey	Grey
Odor	No odor	faec.	faec.	faec.	faec.	faec.	faec.
Transparency	9,0	6,6	6,0	7,5	7,5	7,0	7,0
Active reaction	7,0	7,1	7,1	7,1	7,0	7,0	7,1
Alkalinity	6,0	6,2	6,3	6,2	6,3	6,2	6,3
Dissolved oxygen	8,0	7,3	8,0	7,0	7,5	7,0	7,0

Farkhad WWTP, constructed in 1983, serves a population of about 8.300 and several industrial enterprises. Nominal capacity of Farkhad WWTP is 3 500 m3/day. At present WWTPs do not operate and that leads to serious pollution of Zaravshan river and adversely impacts on Farkhad settlement population. Efficiency of wastewater treatment plants operation is presented in Table 4.7.4.

Table 4.7.4. Characteristics of treatment plants at Farkhad

Wastewater Parameters	Concentration of pollutions inflowing to treatment plants	Treatment efficiency, real	
		%	mg/l
1. Suspended solids	15	53,33	7
2. BOD_5	14	14,29	12
3. COD	20	10	18
4. Total nitrogen	-	-	-
5. Ammonial Nitrogen	6,0	36,67	3,8
6. Nitrate Nitrogen	-	-	-

7. Nitrite Nitrogen	0,041	51,22	0,02
8. Petrochemicals	0,05	-	-
9. Phosphates	0,6	33,33	0,4
10. Chlorine	21	33,33	14
11. Sulfates	68	11,76	60
12. SSAA	0,08	50	0,04
13. Settling solids	-	-	-
14. Dense residuals	362	14,92	308
15. Oxidability	-	-	-
16. Dissolved oxygen	-	-	-

The present main deficiencies at Samarkand's Main WWTP are summarized hereafter.

- Worn-out civil works,
- Worn-out electro-mechanical equipment,
- Unfavorable process boundary conditions,
- All sampling and analysis is exclusively based on grab samples, which are representative neither of influent loads nor of average effluent quality.
- Lack of data on sludge quality and quantity.
- Lack of sludge dewatering at WWTP that works efficiently all year round.
- Lack of any automation and/or online probes
- Much too high energy consumption.

Thus, analysis of current condition of environment showed that many problems of the city are related to its canalization and may be eliminated and reduced by reconstruction of sewerage system.

5. ENVIRONMENTAL ANALYSIS OF PROJECT INVESTMENTS

For improvement of unacceptable sanitary and hygienic of situation in Samarkand the Project on sewerage will be an initial step of stage-by-stage increase of population scope and efficiency of sewer system. It will be mainly directed to rehabilitate existing sewer system. The activity on expansion of sewerage networks is limited to small unconnected sites. This Project will assist to reduce: (1) O&M costs, related to identification and elimination of possible break-downs; (2) loss of wastewater; and (3) quantity of sanitary «facilities» on sites.

Project Phase I and II will provide with repair-and-renewal operations of collectors with total length 34.8 km and expansion of sewer networks with total length of 59.5 km o, which were defined by SOVK according to operational experience and represents sites mostly subjected to break-downs, presented in Table 5.1

Table 5.1. Activities on reconstruction and development of sewer system in Samarkand

#	Name of streets	Total length (km)	Phase I (km)	Phase II (km)
	Rehabilitation of sewers			
1.	From Termezskaya street along Kulolon street to Dag-bitskaya street	1,42	1,42	
2.	From Uzbekistanskaya street along M.Koshgari street to A.Temur street	0,54	0,54	
3.	Along Shohruh street from Central bank to Vozro-jdeniye street	1,12	1,12	

4.	From main building of Sam SACI along Lolazor, Narimanova, Dybenko to Uzbekistanskaya streets	2,21	2,21	
5.	From Tashkentskaya street along Kosh Hauz street to Charraga street	0,57	0,57	
6.	From Ipak yuli street along Narpayskaya street to Industrialnaya street	2,03	2,03	
7.	From Mirsharapova street along G.Karimova up to Industrialnaya street	1,1	1,1	
8.	From houses №1A,1B,1V along Uzbekistanskaya street to Registansksya street	0,62	0,62	
9.	From Navoi avenue to Sh.Rustaveli street to Titova street	0,95	0,95	
10.	From Rudakiy street to r.w. bridge along Gagarin street	0,5		0,5
11.	From houses №82,84 to Rudakiy street	0,3		0,3
12.	Along Kurchatova street to SP-3	2,07	2,07	
13.	From house №24 along Magistralnaya street (Super settlement) to pumping station	1,0		1,0
14.	Pressure line from Super pumping station	1,4	1,4	
15.	Pressure line from Farhad pumping station	2,9	2,9	
16.	From Bedil street along Tong street	0,55	0,55	
17.	Along Krenkel street	1,0	1,0	
18.	From Vozrojdeniye street along Koshgari street to Kurchatova street	0,28	0,28	
19.	Along Khodja Ahrori Vali street	1,81	1,81	
20.	Along Dukchigi street – Sam GASI	1,49	1,49	
21.	Along Termezskaya-Urganji street to school No.22	0,62	0,62	
22.	Along Termezskaya street from Sam GU avenue	0,47	0,47	
23.	Along Khorazmi street from City Court	0,8	0,8	
24.	Spitamenshoh street – deadlock 3	0,68	0,68	
25.	Djar-aryk street	0,3	0,3	
26.	From Uzbekistanskaya street along Lutfiy street to A.Temur street	1,04	1,04	
27.	Along Samarkandskaya street, from “school 56” pumping station to Djurakulova street	1,08	1,08	
28.	Tursunova street	0,48	0,48	
29.	From Gagarin street along A.Temur street to Zavodskaya street	0,67	0,67	

30.	Along Firdavsiy street (from collector 800mm to mosque “Panjab”)	1,2		1,2
31.	Along Lermontova street from collector Gagarin street	1,1		1,1
32.	Pressure line SP-3	2,5		2,5
	Total: 34.8 km	**34.8 km**	**28.2 km**	**6.6 km**
	New construction			
1.	Pumpin stations (PS-2)	Facility	Facility	
2.	Pressure line up to Jomiy street (for new PS), networks in Pendjikenstkaya street, Andijanskaya street	2,2	2,2	
3.	From crossroad Rudakiy-Dagbitskaya street along Rudakiy street and Shayboni street	1,4	1,4	
4.	From Pendjikenstkaya street along Hamza street	1,15	1,15	
5.	From Pendjikenstkaya street along Chirakchinskaya street	0,5	0,5	
6.	Gravity collector from Samarkand district administrative centre up to Dargom channel; d=500 mm.	4,0		4,0
7.	Gravity collector from mahalla Dukchigi up to Guliston mahalla; d=300 mm.	1,0		1,0
8.	Gravity collector from mahalla Dukchigi up to Haymar mahalla; d=300 mm.	1,5		1,5
9.	Hishrav gravity collector (Hojasoat - Sartepo); d=300 mm.	1,0		1,0
10.	Gravity collector Hishrav (Hishrav settlement); d=500 mm.	4,0		4,0
11.	Gravity collector settlement Arabqishloq; d=300 mm.	4,0		4,0
12.	Gravity collector Joyisoy Mahalla (from Shohizinda street up to Joyisoy mahalla) d=300mm	5,8		5,8
13.	Gravity collector Urganji mahalla (from school No.22 up to mahalla Oqmachit) d=400mm	4,0		4,0
14.	Gravity collector Navbog'chiyon mahalla (from Ahmad Yassaviy street up to mahalla Navbog'chiyon) d=300mm	4,5		4,5
15.	Pressure line Dagbitskaya-Motrid up to railway bridge; d=250 mm.	1,5		1,5
16.	Gravity collector Dagbitskaya-Motrid up to Siabcha channel d=300	2,0		2,0
17.	Gravity collector Geofozik settlement (from Geofizik settlement (A.Vohidiy street up to Gossnab) d=300mm	2,0		2,0
18.	Gravity collector from Sadriddin Ayniy street up to Mulyon street; d=300 mm.	2,0		2,0
19.	Gravity collector in A.Navoi street; d=300 mm.	0,5		0,5
20.	Gravity collector Sartepo settlement; d=300 mm.	1,0		1,0
21.	Gravity collector Kircha mahalla; d=300 mm.	4,0		4,0
22.	Gravity collector from Bedil street up to Chordara mahalla; d=300 mm.	5,0		5,0
23.	Gravity collector Abulvays mahalla (from Pendjikentskaya street up to collector SP-2; d=300 mm.)	2,0		2,0

24.	Gravity collector Zargaron street from Koshhauz street up to Dagbitskaya street; d=300 mm.	1,0		1,0
25.	Gravity collector from Tashkentskaya street up to SP-1; d=300 mm.	1,5		1,5
26.	Gravity collector from Bolgarskaya street (passage 1,2) up to S.Ayniy street; d=300 mm.	1,5		1,5
27.	Gravity collector from Andijanskaya street up to Su-zangaranskaya street; d=300 мм.	0,5		0,5
28.	Construction of pumping station in Motrid settlement	Facility		Facility
29.	Construction of pumping station "Ulugbek" (Kircha mahalla)	Facility		Facility
	Total: 59.55 km, 3 sites	**59.55 km**	**5.25 km**	**54.3 km**
	Waste Water Treatment Plants			
1.	Main Waste Water Treatment Plant (MWWTP)			
2.	WWTP Farhad			
3.	WWTP Geofizik			
	Sewerage pumping stations (PS)			
1.	PS Farhad			
2.	PS - 1			
3.	PS - 3; 3A			
4.	PS Super			
5.	PS School 56			

Repair-and-renewal operations are expected to be provided in 6 pumping stations, which are in emergency state. Renewal works on pumping stations basically include total replacement of pumping units and their installation, electric motor repair, package transformer substations replacement, control rooms and power cables, concrete frames repair. While carrying out of these works metal rejects will be formed. Metal rejects have to be gathered in a separate box and are subject to delivery to appropriate posts of recyclable materials.

For project solutions implementation on expansion/ construction of sewerage collectors the following operations will be performed:

- seizure;
- embankment and reverse seizure;
- steel erection and processing;
- sewer pipe installation.

It will remove problems at most intensive plots and will lead to environment and population health improvement.

Due to lack of financial resources, expansion of sewer networks is not the key objective of this project. Despite this fact, in Samarkand 5,3-km expansion of networks is envisaged. This will eliminate problems at most problematic sites/sections. Besides improvement of environmental situation and of population health, the Project component will also increase coverage of the sewer network and will result in additional incomes for SOVK.

Works on main WWTP, Samarkand were selected in a way they could better support to protect existing equipment and reduce electric energy consumption. During the second stage of WWTP

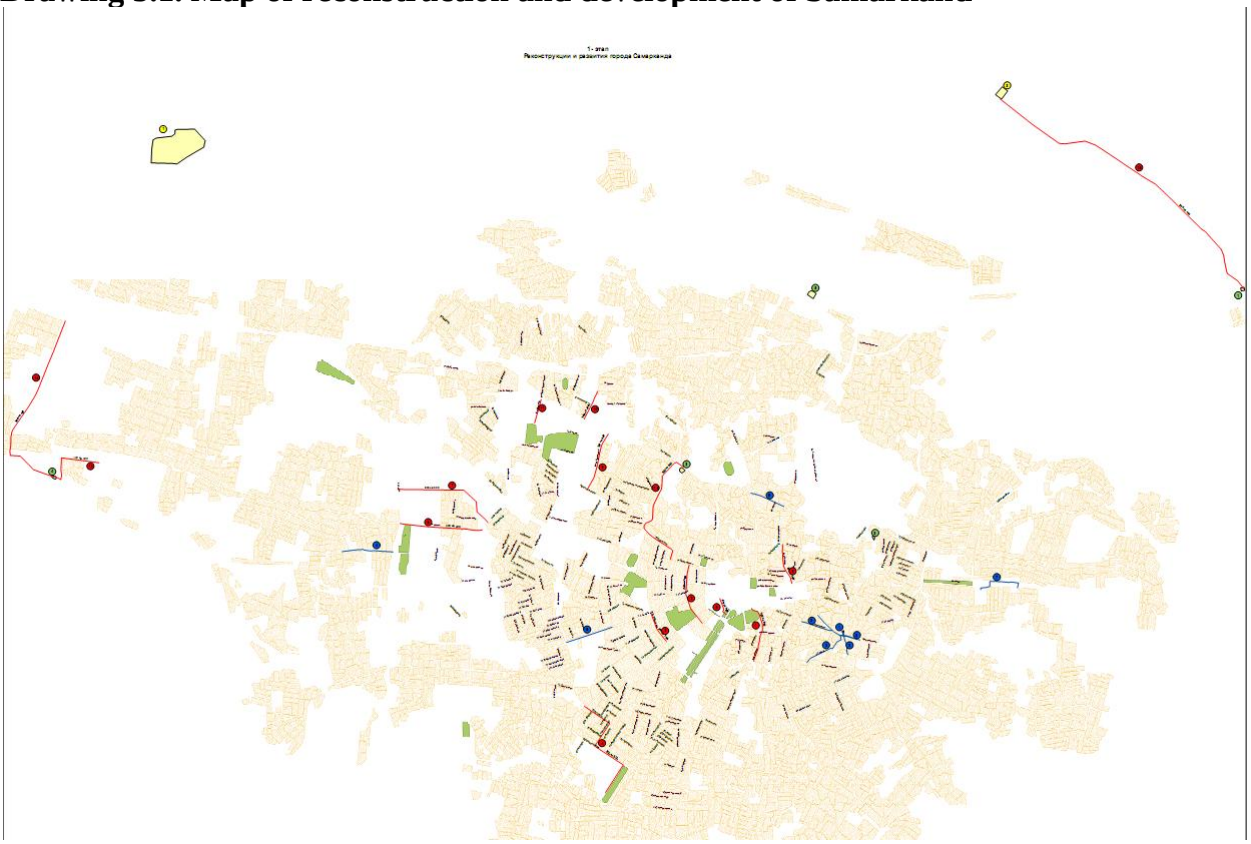
reconstruction, more conceptual aspects of main WWTP of Samarkand (such as biological wastewater treatment and sludge treatment) will be considered. They could be utilized effectively and the will not become out-dated.
Set of measures is directed to: (1) improvement of data collection (necessary for follow-up tasks on designing) and (2) preliminary mechanical treatment (for preserving next to mechanical cleaning of technological equipment on wastewater and sludge treatment):
- It is suggested to install 2 new automatic samplers and flow meters, one in the influent and another one in the effluent of Samarkand Main WWTP, Samarkand.
- New screens with small crevice. Screens have two main purposes: (1) to preserve equipment from high wear, (2) not to allow accumulating of materials that are subjected to extract during sludge sorting. At present none of these tasks is done, as already existing screens remove only little quantity of garbage.
- New aeration system: After the installation of a new aeration system it should be possible to bring the energy consumption for aeration down by 12 kWh/PE_{60}/a. The new aeration system will require the installation of: new fine bubble aerators in the ATs; online O_2- and NH_4-probes in ATs; additional smaller blowers with frequency converters; for easy automation it is recommended to assign 1 blower to 1 AT (i.e. a total of 3 blowers + 1 standby) with 3 separate air pipes between blowers and respective ATs; electronic control and automation system.

Reconstruction of Farkhad WWTP
Farkhad WWTP is not fully operational for the time being. This WWTP serves a population of about 8.300 and several industrial enterprises. Due to small size of the enterprise no separate components will be extracted in financial relations. Necessary measures will include all key elements from reconstruction of facilities to electro-mechanical equipment.
Implementation of the current project solution on Reconstruction/expansion of sewer networks, PS and WWTPs will lead to improvement of wastewater quality and in its turn it will result positively on environment conditions and city's population health

Development of institutional capacity of Samarkand Vodokanal (SOVK)
Potential of SOVK is limited due to lack of equipment and modern know-how. The project will include equipment procurement specially intended for improvement of further technical servicing of reconstructed sewerage system. First of all, it means prevention of operational problems and life span period increase of sewerage system. It will assist changing of population's attitude to sewerage service for the better. Thus, it could probably produce its results with regard to increase of population's intention to pay (higher) tariffs for sewerage services.
Particularly, modern cesspool trucks, equipment for flushing and sewerage pipes treatment, patching excavator, modern workshop and equipment for management will be procured. These physical investments will be added by a component on technical assistance (provided by and appropriate service provider) in order to use them in optimal way.

Improvement of public awareness
This component will include informational strategy development and potential increase to carry on campaign in mass media. Besides, programs on communities and civil society preparation (training) will be included. Proposed measures will include broad range of components from booklets, posters and campaigns in local schools to information distribution on radio and television.
Engineer- consultant
This component will co-finance development of Feasibility Study and further job on detail design works.

Drawing 5.1. Map of reconstruction and development of Samarkand



Legend:
Reconstruction of existing networks
New construction
Treatment plants
Sewer pumping stations (PS)

5.1 Impacts by Intervention Type (physical options)

Analysis of technical conditions of treatment facilities, pumping stations and sewerage network within the project area allowed making the following technical solutions:

· Technical condition of sewerage network provides with the necessary diversion of flows from population and industrial enterprises; the network is in unsatisfactory condition, and needs in repair;

· Reconstruction of pumping stations for regular transmission of flows to treatment facilities.

· Rehabilitation of work efficiency of treatment facilities, their modernization, replacement of parts of electro-mechanical equipment, etc.

Analysis of impacts by types of works and included to the Project is presented in Table 5.3.1.

Table 5.3.1 Summary table for the Project components

No. No.		Sewerage needs					
		O&M ex-penses		Envirionmental safe-guard measures			
		Sewerage needs	Q-TY	O&M costs	Environmental protection	No.	Sewerage needs
	WASTEWATER COLLECTION AND PUMPING OUT						
1	**Rehabilitation of existing sewers**		X			X	
2	**Rehabilitation/construction of WWTPs**	X				X	
3	**Expansion of sewer network**			X			
	MAIN WWTPs						
4	**Influent and effluent samplers**				X		X
5	**Flow measurers**				X		
6	**Fine screens**				X		
7	**Grit chambers**				X		
8	**Introduction of modern technological process**				X		X
9	**Reduction of blower energy**	X			X		X
10	**Energy reduction return sludge pump**	X					
11	**Reactors for enzymatic decomposition of anaerobic microorganisms for sludge stabilization, biogas usage**	X			X		
12	**Improvement of sludge dehydration process**				X		
13	**Reconstruction of existing structures and equipment**				X	X	X
	Geofizika WWTP, Farkhad WWTP						
14	**Rehabilitation of Geofizika WWTP**	X			X	X	X
15	**Rehabilitation of Farkhad WWTP**				X	X	X

	MATER.&TECHNICAL BASIS						
16	**Strengthening mater.&technical basis of SO VK**		X			X	

As Table 5.3.1 shows, all anticipated measures, aimed at improvement of sewerage infrastructure, will lead to improved diversion of waste waters, eliminate seepage, as a result it will lead to positive impact on environment and population healthcare, as it will eliminate untreated wastewater infiltration from sewer pipes into ground waters.
The important thing is that having prevented dilution of untreated wastewater in sewer pipes with ground waters, which infiltrate into sewer networks, it is possible to improve results of wastewater treatment. Expansion of sewer network will allow increasing a number of connections of population to the sewerage network and that will lead to reducing of unorganized wastewater discharge onto environment and decreasing adverse impacts on soils and GW. The same result is expected from rehabilitation of wastewater treatment plants and reducing of polluting substances discharge into Siab collector and further to Zaravshan river.
Obtaining of reliable data on waste waters discharge will allow conducting assessment of pollutant load, physical condition of both sewerage network and WWTP equipment. Comparison of data on waste waters discharge with the one on water supply furthers creation of water balance, revealing of ground waters infiltration into sewerage system and vice versa as well as infiltration of storm sewage. Established account of waste waters will allow reliable designing of all stages of waste waters treatment process.

5.2. Impacts by Project Location

Almost all project activities will be implemented within the city, around existing sewerage infrastructure and at treatment facilities (plants). A combination of activities (physical options) will be implemented across the most of project area.
Across the whole territory of the Project the positive impact will be basically represented by improvement of wastewater diversion, elimination of seepage and that will lead to decrease of problems with soil, ground and superficial waters pollution. In most places the negative environmental impact is of temporary or local character and related to construction works. It is expected that negative environmental impact in considerable scope can be mitigated by proper observance of safety measures during construction.
Physical infrastructure such as pipe installation, pumping stations and sewer lines repair will be built and rehabilitated according to rules and standards of construction adopted in the Republic of Uzbekistan.
There are historical monuments and cultural objects located within project area. Location of new constructions and facilities was selected in a way to minimize any breach of surrounding landscape and existing city infrastructure. It is worth mentioning that in historical centre there is no sewerage and GW observation wells network is weak.

5.3. Impacts during project implementation and mitigation measures

Rehabilitation and construction works, both on the sewage network and wastewater treatment facilities are in fact environmental protection measures, but they cause little environmental impact during implementation.

The potential impact of the project would bring to:

Improvement of public health: the project will increase the reliability of the regular removal of waste from the population, industrial enterprises and organizations, its regulatory treatment at wastewater treatment plants, will eliminate leakage of sewer networks, which helps to improve the

quality of groundwater and surface water (physical and microbiological parameters), and lead to reduce the incidence of waterborne diseases.

Water and land resources

During the construction or rehabilitation of sewerage systems, water may be contaminated with cleaning and construction of sewers and waste from construction sites. Protection measures should be taken against possible sources of pollution to prevent contamination of surface and groundwater:

- Compliance with the rules of the repair work and the use of modern technologies during the performance of works;
- Diversion of surface and drains outside construction projects;
- Development and implementation of wastewater withdrawal during reconstruction;
- Timely cleaning of construction sites from construction wastes and their disposal.

Measures on protection of all types of water resources from possible sources of contamination should be taken during the rehabilitation and construction works. Inadvertently leaked fuel and oil from the tanks at construction sites, as well as improper handling lubricants during maintenance, are the most likely sources of contamination of surface and groundwater in the project sites.

Pollution will be temporary, would have little impact on the soil and groundwater. Construction works will be carried out within a short time and dry weather conditions in Bukhara will help to reduce their impact on water facilities.

The main environmental impacts on land resources during the rehabilitation and construction is soil pollution with construction waste and lubricants as well as flooding the surrounding land with possible damage to the buildings. Relevant areas should be prepared to collect and storage of construction waste and sediment to reduce the negative environmental impact.

Soil may be susceptible to contamination by the same sources of pollution which have been mentioned in relation to water resources, namely mishandling with hard and liquid waste and improper maintenance of equipment, particularly when replacing the oil and refueling equipment.

The use of lubricants is planned limited in scope and duration and therefore its impact on the environment will be insignificant. However, the practice of construction works requires the provision of measures to prevent pollution of soil and water.

Measures on protection of soil should be involved in accordance with the rules and regulations of the Republic of Uzbekistan. During the construction of new collectors the organic topsoil suitable for further use should be removed and temporarily stored separately from the rest of earth materials. After completion of construction/renovation collectors, the organic layer of soil by backfill will be placed on top, properly sealed and restored to its original condition.

Ambient air

Temporary environmental impacts of rehabilitation and construction works on the sewerage system, the topic is related to the use of technology for repair and restoration, and includes: dust, noise at trenching, the occurrence of vibration in nearby old buildings, restricting access to the buildings, the closure of certain sections of roads and disturbance traffic on them, these effects during the restoration work on the sewer network and distribution sites will be short-lived and affected neighboring communities at different times. The impact will also be moderately to operating personnel and the environment. Measures would be taken to mitigate and control technology of repair work.

To reduce the impact on air transport should be taken to the strict observance of safety rules at major intersections, main roads and streets in the makhallas and near working facilities. The temporary or permanent traffic lights at the busiest intersections shall be installed by Contractors under the su-

pervision of PIU. During the rehabilitation / construction period will be enhanced traffic police in the communities, as well as relevant measures of prevention and safety among schoolchildren.

Suppression of dust formation during operation and transportation should be carried out by irrigation the area of working facilities and roads. All construction projects and passages should be cleaned after completion of works.

Terrestrial vegetation

Damage to trees and vegetation will be insignificant. Rehabilitation/construction works on sewer collectors usually mean that the part of the vegetation will be removed and stockpiled along the work site. They can be mitigated by appropriate measures taken, namely, the restoration of disturbed vegetation.

The management of solid and liquid waste

During the repair work construction waste will be generated at WWTP, distribution sites and sewer collectors which require strict system of collection, disposal and minimizing.

Waste from grit catchers and silt produced in the wastewater treatment process can be a source of contamination of soil and water (surface and groundwater) while it is removed. The following wastes will form during the repair work of sewer network:

- Waste of mechanical cleaning of collectors from sediment, consisting of debris, a mineral salts and organic matter;
- Excavation waste from the preparation of sites for the construction of reservoirs;
- Waste materials after repair damaged pipelines.

Use and storage of these wastes must be provided in the working draft. various types of solid waste, including timber, oil filters, plastic and cardboard boxes from the packaging equipment will be at work sites. Mitigation measures will include the provision of waste containers and containers for the collection of used oil with the further utilization them at specially designated for this purpose, places.

Excavation waste from the preparation of sites for the construction of collectors will be used for backfilling the trenches.

Waste after replacement of damaged reinforced concrete and cast iron pipes it is provided to take into Vtorchermet or recycle to the metallurgical plant.

Maintenance of equipment will be made exclusively at gas stations, used oil and other liquid pollutants are stored in specially equipped places for them. No maintenance of machinery on the job site will be permitted.

Upon completion of works all facilities must be cleaned and returned to its natural state.

Population and workers occupational health and safety

Methods of work on rehabilitated and constructed facilities can create dangerous situations for workers and the population of nearby settlements. Healthy working environment must be created in compliance with the provisions of safety. The protection of working facilities and bridges over the trench shall be provided. Traffic control, alarms and lighting shall be in accordance with local regulations. If necessary, safe bypass roads and crossings for pedestrians must be installed.

Control over the content of chlorine in the air and residual chlorine in the water is provided for safe chlorination of wastewater. The chlorination process that is used for disinfection of sewage will be carried out with the established measures of safety, protection and control of its submission.

Replacement of old sewer networks entail interruptions in receiving effluent from subscribers may damage other communications (telephone, electricity). It is required to take the necessary measures in the design of reconstruction and mandatory coordination with the relevant agencies and enterprises.

Chance finds of cultural value

There are archeological and cultural findings, because construction work on the expansion of the sewer network affects the territory of the old city. Such unanticipated discoveries of remains of an archaeological and/or historical nature, mostly are concentrations of pottery, worked stone, human and animal bones, without commercial value, but of significance to archaeologists, historians, anthropologists and paleontologists.

In general the following archaeological chance find procedures shall be adopted in project design and construction contracts:

- Notification of the relevant department of antiquities;
- Request for a representative to make a site inspection;
- Cessation of work in the vicinity of the find until the visit of a representative;
- Decision by the department of antiquities on possible salvage or excavation

The chance find procedure requires chance finds not to be disturbed until an assessment by a competent expert is made and avoidance, minimization or mitigating measures are developed. The type and level of detail of the assessment should be commensurate to the nature and scale of the project's potential adverse impact on the chance find. Consideration should be given, where feasible, to alternative siting or design of the project to avoid significant damage to the chance finds.

It is also significant to conduct pre-construction survey work, during design phase (e.g. on-site inspection, pitting, soil analysis, etc.).

In case of archaeological finds, the Plan provides for the requirement to publish special notices, termination of operations and compliance with the order of their excavation.

5.4. Long-term impact and mitigation measures

Improving of maintenance of reconstructed sewer system and wastewater treatment plants will significantly contribute to the reduction of pollution, groundwater and surface water, soil and vegetation and consequently decrease shit-morbidity, improve sanitary and epidemiological situation in the city. All of this is provided to reach by a combination of capacity building of vodokanal and physical impact.

Effective improvement of means of water treatment plant is only achieved by understanding and cooperation system operators with the local population. Involvement of the operational and maintenance staff is not as important as the involvement of high-level policy makers and budget management.

Issues affecting the management and operation will be addressed during the detailed design and execution of the project. They include:

- Improved access to connect to the public sewerage system.
- Providing regular supply of electricity for the efficient operation of the pumping stations and sewage treatment plants.

- Identifying measures that Vodocanal can take to improve interaction with customers and promoting public participation in the design, monitoring and evaluation to increase the efficiency of the system.
- Provision of input to determine the best strategy to increase rates within acceptable limits for the sustainability of the system.
- Carrying out programs to increase institutional capacity and training relevant personnel of Bukhara vodokanal.

6. ALTERNATIVE DESIGN SOLUTIONS

The project envisages the development of the existing infrastructure of the sewer system through the construction of new and reconstruction of existing sewer networks. In the construction of new and replacement of old sewer systems may be used both metal pipes and pipes made of plastic or fiberglass. Metal pipes corrode easily, not resistant to corrosive groundwater is not convenient for transportation and assembly. Plastic and fiberglass tube light, produced with different diameters and lengths, equipped with couplers and fittings; convenient for transport and assembly are not subject to corrosion, durable - their life is 50 years.

The great advantage and ease of use is the use of fiberglass pipes to upgrade water mains and sewer lines by dragging in the old pipeline. After dragging the space between the old and new pipes is filled with fast setting mortar. Update sewer pipes can be done without interrupting their work during the low flow in the area between the two wells. long-term storage of pipes in the open air is possible due to a high stability to ultraviolet light. Scratches on the external surface of pipes are allowed.

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The use of these pipes will significantly reduce the time and labor for repair work, as well as eliminate the annual overhaul, improve the environment during the reconstruction.

7. THE ANALYSIS OF POSSIBLE EMERGENCY SITUATIONS

Possible emergency situations in the city may involve a violation of the integrity of irrigation canals and drainage systems and sanitation facilities crossing the track channels. Such accidents may occur as a result of corrosion of pipes, as well as natural disasters (earthquake, etc.), while it is possible ingress of contaminants in soil, ground water, soil, land reclamation system in the collector and then to surface waters. At the same time in the field of pipe breakage will be flooding area. All this will be reflected not only in the state of vegetation, but also can cause an outbreak of infectious diseases in animals, and at a number of the resident population. Therefore, to ensure reliable operation of irrigation, sewerage and drainage pipes must be laid of the corresponding corrosion-resistant material. In the event of such accidents the population should be informed and to provide it with delivered water.

8. FORECAST OF BENEFITS AND ENVIRONMENTAL CONDITION AFTER PROJECT IMPLEMENTATION

Availability and operation of sewerage infrastructure is nature protection measure preventing pollution of environment with waste waters from population and urban industry. Reconstruction of this structure will only increase its positive impact on environment. This project impact on environment will be mainly positive and negative effects are temporary. Nature of environmental impact during the rehabilitation works and after their completion will vary.
Nature of environmental impact during the rehabilitation works and after their completion will vary. During execution of works air will be polluted by non-organic dust and combustion products from

construction and mobile machinery. Ground and soil-plant cover state will be disturbed. Impact on these components of environment will be temporary with reversible consequences. Current proposals summarize impacts and their duration. Further in text it is provided an assessment of condition of WWTPs after the project is stopped. Such summarization is required by Glavgosekspertiza.
Repair and construction of sewerage collectors, their cleaning will cause changes in sewerage collectors mode of operation, which may worse sanitary-hygienic conditions of nearby territories. Impact will be short-term with reversible consequences.
Project activity implementation will allow:

· Substantially **increase the efficiency of wastewater collection**, thereby (i) reducing wastewater losses into the ground, (ii) reducing groundwater infiltration into sewers, (iii) increasing the efficiency of wastewater treatment (less pumping + treatment of groundwater, treatment of all wastewater that enters sewage collection), (iv) improve public health.

· **Reduce energy cost for wastewater pumping**.

Installation of new modern pumps in most WWPSs could reduce energy consumption for wastewater pumping in Samarkand by about 20%. Under annual consumption of electric energy for pumping out of wastewater in amount of about 3,3 GWh/hour/annually (in 2007), the economy could comprise 0,2 * 3,3 = 0,65 GWh/hour/year.
The implementation of this 1st project stage could lead to annual energy savings of about 27.000 USD/a in the sewer system, and about 62.000 USD/a at the Main WWTP. Total electricity saving potential of the 1st project stage equals 89.000 USD/a.
Rehabilitation of sewerage brings about additional benefits, such as reduced traffic problems, shortened construction period, reduced cost for road asphalting in urban areas, etc. Rehabilitation equals replacement of sewers. Such sewer rehabilitation does not only reduce O&M cost, but also impacts favorably on the environment, since it eliminates the seepage of crude wastewater from those sewers into the ground/GW and then to small wells and surface waterways.

The rehabilitated WWTP will be capable of enhanced removal of the 2 main nutrients in wastewater, i.e. nitrogen and phosphorus. Both nutrients shall be removed by exclusively mechanical-biological means without the use of any chemicals. The dried sludge from wastewater treatment is reused as fertilizer in agriculture, particularly in cotton growing. Demand is typically much larger than supply. Initially, benefits will occur due to cleaning, rehabilitation of sewerage network and its diversion to treatment facilities. Construction of new collectors, flushing and repair of existing network, pumping stations and treatment facilities will allow timely collection of wastewaters and their treatment till standard indices by quality of sewers.

Atmospheric air

After conducting of planned works, the quality of atmospheric air will improve due to elimination of temporary sources of impacts – construction machinery and automobile transport.

Superficial and ground waters

Condition of superficial and ground waters will not change. Rehabilitation of sewer collectors will impact on GW, which are hydraulically connected with superficial drains.
In the result of rehabilitation/construction of sewerage network, structures, coverage scope of the population connected to the sewer network will increase, coefficient of efficiency of sewer collectors will also increase, and there will be a decrease of loss of drains due to guaranteed and timely drain collection and also due to their standard cleaning. All that will support to reduce discharges of wastewater into superficial and GW. Qualitative condition of waterways will change for better as they will start to receive water of better quality after effective cleaning.

Ground and soils

Due to increase of full-capacity discharge of rehabilitated network wastewater outflow will increase and ground pollution incidence will accordingly decrease.

Flora
After sewer collectors have been rehabilitated, soil pollution incidence decreases and condition of GW as well as of flora will change for better.

Fauna
Temporary disrupted cover will be rehabilitated. Decrease of impoundment, pollution of ground and ground waters will lead to improvement of condition of root system of trees and bushes and consequently greenery.

Physical cultural heritage
During rehabilitation works habitats of different animals, mainly, rodents, lizards and birds nesting in the bushes and trees, growing along the collectors and roads will be disturbed. After completion of works and rehabilitation of greenery they will return back.

Socio-economic aspects and population health
Socio-economic and living conditions of population will improve.
Rehabilitation and expansion of sewer collectors, improvement of sewer infrastructure management will lead to reducing unorganized wastewater discharge from population, it will also decrease superficial and GWs pollution and as a result it will lead to reducing of diseases incidence among population, improving of sanitary and epidemiological situation in the city.
Rehabilitation of structures and reconstruction/ construction of sewer collectors, improvement of O&M activity of VK's services will lead to changing of water regime in the territory and that will be reflected positively at whole complex of natural conditions, objects of cultural heritage and population's health.
Implementation of the current project solution will lead to improvement of city's population health due to favorable changes in socio-communal conditions.

9. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

The overall objectives of environmental management are:
- Implementation of activities to prevent or reduce any negative impacts to acceptable levels;
- Implementation of activities that contribute to environmental measures, falling out by phase with the technical and other project activities during the implementation;
- Implementation of activities to address the risks during the construction and O&M;
- Control and monitoring of significant problems during the rehabilitation/construction and operation.

To ensure its effectiveness and practicality, EMP takes into account the requirements of the World Bank, the "Uzkommunkhizmat" Agency, Samarkand RPSE "Suvokova", contractors, hydrogeologists, Territorial Committee for Nature Protection, Inspectorate for Protection of Cultural Heritage.

The plan provides for the solution of issues related to the construction and operation of the structure of sewer collectors, as well as with a description of the possible negative effects includes measures to effectively reduce the negative impact on the environment. Consolidated EMP is prepared on the basis of the experience gained during the implementation of Bukhara and Samarkand Water Supply Project (IBRD/IDA 2004-2009). Annex 1.

9.1. Mitigation measures

Temporary use of land

It is assumed that the displacement of people due to the implementation of the project will not be necessary. To minimize the impact, all Project facilities will be designed along linear structures such as roads. Construction infrastructure provided by the project will not conflict with other types of existing infrastructure, such as roads, urban infrastructure, either during construction or in the future.

Historical, cultural sites and landscapes
In the project area, there might be found historical monuments and cultural sites during construction work.
Archaeological and historic sites are vulnerable to disturbances of construction activities. The more common types of direct project impacts on cultural resources are: direct physical disturbance through construction activities such as vegetation removal and earthmoving, or building renovation; site inundation (from reservoirs, etc.); indirect construction disturbance by blasting or vibration; increased human access; blocking of traditional access; and operational impacts that include altering the amenity of a site or area by factors such as noise, vibration and reduction in scenic quality.
Permanent control over the site works of location of cultural objects of the representative of Samarkand Regional Inspectorate for Protection of Cultural Heritage is provided.
Measures to mitigate the negative environmental impacts of the Project is temporary and localized violation of construction and reconstruction. It is assumed that most of the identified measures to mitigate negative impacts on the environment should be part of normal working practice of the Builders during project implementation.
As expected, most of the costs to mitigate the negative environmental impacts of the Project will be included in the tender documents which will be prepared by Feasibility Study Group.

Impacts caused by the operation of the infrastructure project
In general, the operation of sewer collectors of the infrastructure does not imply significant risks. The project provides anticorrosion measures to mitigate the negative impact on groundwater. The project will be provided with anti-seismic measures aimed at reducing the seismic load and increase resistance to seismic impact.

To prevent adverse effects on the environment arising in the process of reconstruction and construction of sewer collectors the following are provided:

To reduce air pollution in the area of rehabilitation, excavation and transportation of the earth provides for measures to:

- dust suppression during the construction period;
- • No assumption of excess number of vehicles in the territory, in order to reduce gas pollution and dust;
- Incineration of debris and other materials.

To protect the soil and groundwater and surface water the following is planned:

- Provide construction sites with trenches to drain surface effluent and drainage water, their surface after the completion of the work is subject to be restored;
- Take appropriate measures to prevent leakage of fuel lubricants, all ground tanks of fuel and lubricants will be placed above the earth's surface and the integrity of the walls will be under constant supervision. Collection and disposal of waste oil is carried out in accordance with environmental requirements;
- Development and implementation of the plan for wastewater drainage during reconstruction, pumping or bypassing them through gravity flume;
- Timely cleaning of construction sites from construction waste and storing them only in places designated by regulatory agencies;
- Soils after excavation and other works on the site must be placed in such manner that not to impede the flow of water and be a source of contamination.

To mitigate the impact of the repair work on the ground the following is assumed:

- To carry out land reclamation after completion of works and the removal of temporary crossings, canals, trenches, structures and construction waste;
- To prevent leakage during filling and transportation of fuels and lubricants, to provide collection of fuel and lubricants, and disposal of debris;
- Organize collection of construction, as well as other waste (cut trees, paper, glass, plastic, sediments from cleaning sewer collectors, etc.) in a waterproof (cemented) site in separate containers (special containers) before recycling and send them to specialized enterprises for processing or storage.

After the completion of rehabilitation and construction works all working areas will be cleaned and greened.

For the protection of flora and fauna the use of only specified roads and temporary sites is provided. To restore the lost vegetation, the works will be carried out to restore them. Significant impact on the terrestrial fauna in the process of implementation of the project is expected.

Preventive measures, related to health of personnel operating the Project facilities, provide for strict adherence to safety rules and regulations for the operation of treatment plants and sewer infrastructure. Personnel involved in the O&M will be specially trained.

Methods of work on rehabilitated and constructed sites can create dangerous situations for workers and the population of nearby settlements. The provision of protections of working facilities and bridges over the trench will be provided. Traffic control, alarms and lighting will be fitted in accordance with local regulations. If necessary, safe bypass roads and crossings for pedestrians and vehicles will be installed.

9.2. Monitoring activities

Monitoring will be carried out in order to check whether the activities of the project established national environmental standards and procedures, the impact the project has on the environment. Monitoring will focus on the construction and rehabilitation works, pipeline cleaning, compliance schedule and plan the work. In order to ensure smooth implementation of the repair and rehabilitation operations in the contract with the contractor must provide the following clause:

- Promote new efficient materials and construction, conducting work in the construction industry.
- Provide a safe and healthy environment that facilitates work and precluding accidents.
- Commissioning of the restored objects that do not meet environmental requirements, is prohibited.
- Determine the sequence of restoration work on pipelines, taking into account local information inconvenience to a minimum.
- Identify construction techniques with the use of fencing work sites and provide catwalks through separate trenches. Maximum ensure appropriate access to places of work and residence.
- Require that the contractor to guarantee the safe replacement and installation of machinery.
- Require that the contractor used a redistribution of traffic in the work area. Traffic management, alarms and lighting must be installed in accordance with local regulations. If necessary, provide safe detours and crossings for pedestrians and vehicles.

Responsibility for the implementation of mitigation measures is with the contractor. Activities of EMP sections "A" and "B" will be carried out by SOVK during the repair work and maintenance of facilities. Coordinate these activities will be the operator, as part of the service contract. PCU at "Uzkommunkhizmat" Agency will coordinate their activities, will manage, coordinate, monitor and evaluate the impact of the project, as well as to enforce fiduciary measures. Procedure for conducting monitoring and responsible staff for its maintenance is defined in Appendix 1

The EMP section "C" measures including the establishment of water security zones; removal of water protection zones potentially environmentally - dangerous objects for-pollutants; conduct monitoring of surface, groundwater and pollution sources (which would require equipping of laboratories); increase monitoring wells for groundwater level, are the responsibility of the local authorities and specially authorized state bodies (Goskompriroda, Ministry of Agriculture, Ministry of Geology, Uzkommunkhizmat etc.).

9.3. Environmental Monitoring Plan (EMP)

Monitoring over environment condition will be organized using single scheme and taking into account requirements of nature protection.
EMP's specific objectives are the following: (i) assaying samples and collection of data on project area; (ii) collection and processing of additional data necessary for creation of analysis system and for transparent, effective information reporting which allows identifying impacts of the Project.
Environmental monitoring during Project implementation will provide for observation over:
- Quality of GW and superficial waters in sites of upper and lower parts of project area;
- Quality of air (dust, exhaust gases) close to work sites;
- Movement of transport and provision of operating safety;
- Impacts on flora and fauna;
- Monitoring of treated wastewater.

Key organizations implementing state monitoring in the Republic of Uzbekistan are the following:
- SE UzGIDROINGEO and its territorial subdivisions (monitoring over the level of GW, mineralization of GW);
- Uzgidromet under the Cabinet of Ministers (monitoring of the quality of the superficial waters of main rivers, atmospheric air, soils and meteorological monitoring);
- Goskompriroda (environmental monitoring over: fauna, flora, control over polluting substances monitoring).

Monitoring of the level of GW is conducted by Zaravshan Hydro geological station, laboratory of which fulfills measurements from wells located on the territory of the city every month. Besides GW depth measurements, sampling from these wells also conducted for identifying GW mineralization rate. Hydro geological station (HGS) conducts regular monitoring of salinization by basic ions (chlorides, sulfates, calcium, magnesium and etc.).

Environmental monitoring is conducted by the State specialized inspection of analytical control (GosSIAK) of Goskompriroda of the Republic of Uzbekistan and its branch offices. Monitoring is carried out by: fauna, flora, air quality at pollution sources, superficial waters and sources of their pollution, soils.

For assessment of Project's potential impact on environment condition it is necessary to track the level of GW occurrence and, water quality in Siab channel, river of Zaravshan, river of Akdarya and etc.

Monitoring plan consists of:
Monitoring of the level of occurrence and mineralization of GW is conducted within city boundaries regularly

and monthly. Determined ingredients: PH, suspensions, electrical conduction, salt ions (sulfates, chlorides), mineralization, hardness, biological oxygen demand (BOD), chemical oxygen demand (COD), biogenic elements (nitrates, nitrites, ammonium, phosphates and others), pesticides (DDT, α-HCCH), oil products, phenol and others.

Monitoring of water quality in Zarafshan River and (monthly sampling) will be continued by Uzgidromet at entrance to Samarkand region territory, station – upper reach of Rovat-Hoja dam and Samarkand, below Siab collector's outfall. Information on water quality will be used for assessment of impacts of project works on river water quality.

Monitoring of water quality in Akdarya river and Siab collector upper and lower drains and of treated wastewater discharged via it will be conducted by the Analytical laboratory under SOVK every ten days which will conduct also monitoring of communal and drinking water supplied to consumers in points of water intake and network entrance.
Control over technological process of wastewater treatment at treatment plants conduct 5 people who are staff of SOVK. All analyses are conducted photo-electro-colorimetric method. Identified ingredients: PH, suspended substances, salt ions (sulfates, chlorine), mineralization, rigidity, biological oxygen demand (BOD), chemical oxygen demand (COD), biogenic elements (nitrates, nitrites, ammonium, phosphates and etc.). Specific substances (iron, copper, zinc, chrome and etc.). For improvement of methods of conducting analysis of wastewater, the lab should be additional furnished with devices (polarograph with computer installation, spectrophotometer) and equipment (electronic scales, muffle furnace, water bath, laboratory dish, furniture, reagents and etc.)
Monitoring of atmospheric air (sampling every ten days) will be continued by Uzglavgidromet in Samarkand.

Experience of implementing EMP in course of the ongoing project
In the course of the Phase I, bidding documents and contracts for construction works were covering the requirements for the performance of EMP. The contractor was responsible for the development and adherence to the site-specific EMP. After approval by the Client, site-specific EMP allowed to effectively monitor and manage the environmental mitigation measures undertaken by the contractor during construction, thereby diminishing the negative impact on the environment.

9.4 Capacity Building and Training

During implementation of Sewerage Project in Samarkand city it is provided to improve capacity of VK in matters of O&M of sewer systems. Tasks to build institutional capacity will entail various policy reforms and training activities which will be financed under Component B, including:

- Upgrading the capacity of vodokanal to diagnose the state of its infrastructure and carry out preventive maintenance in an efficient and sustainable way;
- Training in different aspects of sewerage operations.
- Implementation of better communication and public awareness campaigns;
- Additional training to various environmental and social aspects.

Implementation of the above-mentioned measures will allow improvement of O&M of sewerage infrastructure, increase reliability of regular diversion of drains from population, industrial enterprises and organizations, their standard treatment at treatment facilities which will further improvement of ground and surface waters quality. In general, project area will observe improvement of environmental condition as a result of SVK capacity improvement, prevention of operation problems as well as increase of life cycle of sewerage system. All these measures will allow reducing negative impact of sewage on environment.

10. ESTIMATED COST FOR MONITORING AND EMP

Estimated Project costs and including EMP include:

№	Components	Q-ty	Investment cost	
			Phase I Mln USD	Phase II Mln USD
	I. INVESTMENT COMPONENT			
1	**Rehabilitation of existing sewers**	28,2 km	8,39	3,29
2	**Rehabilitation and construction of PS**	6 pc.	3,76	2,0
3	**Expansion of sewers**	5,25 km	3,43	17,81
4	**Rehabilitation of MWWTP**	1 total amount	4,24	16,26
5	**Rehabilitation of Farhad WWTP**	1 total amount	-	3,81
6	**Rehabilitation of Geofizik WWTP**	1 total amount	-	0,5
7	**Strengthening of SOVK mater.technical potential**	1 total amount	1,0	1,0
	Total I		**20,82**	**44,67**
	II – INSTITUTIONAL STRENGTHENING			
8	**Public Awareness**	1 total amount	0,4	0,1
	TOTAL II		**0,4**	**0,1**
	III – CONSULTANTS			
9	**Engineer-consultants**	1 total amount	2,54	2,9
10	**PIU consultants and audit**	1 total amount	0,64	1,0
	Total III		**3,18**	**3,9**
	IV CONTINGENCIES			
11	**Contingencies**	1 total amount	1,27	-
	TOTAL IV		**1,27**	**-**
	TOTAL INVESTMENT EXPENDITURES:		**25,31**	**48,67**

Estimated costs of implementing EMP include:

The costs of monitoring the work of WWTP and discharged treated effluent makes up in average 64 million sum per year, including the cost of purchasing chemicals 5.36 million sum. Predictive value of the cost of developing new techniques for chemical analysis and acquisition of chemical reagents will be about 12 million sum.

Monitoring of groundwater level requires an increase in the number of wells to monitor the status on the territory of historical and cultural monuments. Projected costs of drilling exploratory wells 5 is about 15 million sum.

Predictive value of costs *for the prevention and elimination of accidents on sewerage networks and WWTP* listed below in Table 10.1.

Table 10.1. The costs of prevention and emergency response for sewer networks and WWTP

№	Title of expenses	Q-ty	Forecast of expenses, mln UZS
2.	Purchase of vehicles for emergency works with, protection devices, required tools and diagnostic devices	3 sets	150,0
3.	Acquisition of compressor units for air injection	2 pcs	70,0
4.	Acquisition of pumping equipment with automation equipment, including installation	20 pcs	100,0
5.	Acquisition of cables of different sections	12 km	
6.	Reconstruction and replacement of pipes on the most damaged sections of the network The pressure part Gravity collectors	7,2km 12,7 km	3162,0 11740,0
7.	Overhaul of facilities at wastewater treatment plants and sewerage networks	22 units	7130,0
8.	Organization of the dispatch services at WWTP provision of automation the process of wastewater treatment.	1units	550,0
9	Monitoring the increase of the level of expertise of all personnel servicing the sewage system of the city	6 times per year	1,8
	Total overall costs:		22903,8

Expenses for the dissemination of knowledge and experience

The contribution of the Project on the sewerage of Samarkand in the conference for the dissemination of knowledge and experience, which is scheduled in the conference room on the main WWTP of Samarkand approximately estimated at 50 thousand USD.

The costs of the campaign to raise public awareness

For this purpose, approximately 30 thousand USD is required.

The cost of training personnel of *WWTP* abroad is estimated at around 50 thousand USD.

Estimated cost of the work on monitoring and EMP will be specified in the process of preparing feasibility study and work projects.

11. COORDINATION OF EIA

During the process of environmental assessment in the city of Samarkand on 14 April 2015 key stakeholder organizations and representatives of non-governmental noncommercial organizations (NGO) were invited to discuss preliminarily proposed project activities under EIA and expected environmental impacts on environment by Bukhara and Samarkand Sewerage Project.
Notwithstanding variable ideas of participants and proposals on certain issues related to rehabilitation of sewerage system, where Project would take
place and on those streets where they live but uncovered by the Project, all of them agreed that the existing sewerage system causes many social, sanitary problems for population.
Very active participation in discussing the Project at the workshop illustrates significance, which citizens of Samarkand attribute to problematic of sewerage. They asked to take into account needs of odd citizens, their demands and ability to pay while designing the project.

12. Conclusion

The ESIA for second stage of implementing BSSP in Samarkand city allowed the collection of information on the characterization of the natural and human environment of the area of influence and potential environmental impacts of the project, which obtained the following:

- Activities to be developed for the construction of the pumping station will be performed within the urban area where the effects on the environment are minimized. In the case of the treatment plants, these will be reconstructed in remote places where there are fewer settlements
- Construction of the project will involve an environmental disturbance on site in different areas of the city due to the construction/reconstruction of sewer lines, because the work involves earthmoving and excavations in operating roads, which will cause discomfort in the area, in addition to alteration of vehicular traffic and high noise levels.
- Increase of noise levels is considered the impact most likely to occur during the different stages of the project. However, it was assigned to a category of "insignificant", because it is estimated that during the performance its levels will not reach the values required to produce discomfort to the population and during construction although higher level impacts will be only temporary.

Complex assessment, conducted on nature components, showed number of problems related to condition of urban treatment facilities and sewerage systems on the territory of the city:

· Pollution of soils and grounds, ground waters because of non-arranged discharge of waste waters without treatment or low efficient treatment;

· Subsidence caused by leakages of sewerage and water pipeline networks, precipitations, leading to humidification of grounds;

· Increase of ground water level as a result of leakages of sewerage systems in case of accidents, which leads to infiltration of untreated waste water into ground waters.

· Creation of modern landslips and landslides stipulated by vertical slopes along the canals and their systematic humidification by waste waters.

· Spread of anthropogenic sediments within the "old city" leading to deformation of buildings and structures at humidification.

There are three municipal sewerage treatment facilities: main waste waters treatment plant (MWWTP), WWTP "Geophysics" and "Farkhad" in Samarkand city. WWTP "Geophysics" and "Farkhad" are much less then MWWTP and serve only small settlements.

Analysis of current condition of main waste waters treatment facilities and waste waters treatment plants "Geophysics" and "Farkhad" as well as sewerage system showed their high depreciation. WWTP "Farkhad" is currently not functioning and requires full reconstruction.
Buildings and structures, electromechanical equipment at WWTP of Samarkand city as well as sewerage pumps, flow meters, screens, grit chambers and aeration system at biological treatment stage are in very bad physical condition and have low efficiency. Electric power supply of WWTP is casual and available energy is often not sufficient for proper treatment of waste waters. As a result, treated waste waters do not meet established standards of maximum admissible discharge (MAD). Selection of samples and analysis are based solely on grab samples which do not provide information both about load of received waste waters and average quality of treated waste waters. There is no sludge dehydration at MWWTP which could operate efficiently all the year as well as data on quality and quantity of sludge and system of automatic alarm in case of receiving of waste waters with toxic concentration of pollution at WWTP.

The continuation of BSSP for Samarkand city will be the second stage of step-by-step increase of population coverage and efficiency of sewerage system. It focuses mainly on rehabilitation of

existing sewerage system and expansion of sewers. This project will allow reduction of O&M costs, related to search and elimination of accidents; waste waters losses and number of sanitary "facilities" at households.

For the present only about 59% of Samarkand is connected to sewerage system. Population of Samarkand city not connected to sewerage system use cesspools in their plots and septic tanks of doubtful standards. Cesspools are mainly made without filtration screen which enables filtration of waste waters into the ground and ground waters polluting them. The implementation of the project will allow covering population up to 80%.

Rehabilitation and construction works at both sewerage network and treatment facilities are actually nature protection measures.

Implementation of these measures on Reconstruction/expansion of sewerage networks, pumping stations and WWTP component will lead to improvement of quality of transferred waste waters, stop of leakages, elimination of infiltration of non-treated waste water from sewerage pipes into the ground/ground waters, increase of number of connections to sewerage system, which in its turn decreases unorganized waste waters discharge to environment and reduce negative impact on soils, grounds and ground waters. Rehabilitation of sewerage collectors will suspend the process of soils salinization improving greenery condition.

As for the component "Development of institutional capacity of Samarkand regional Vodokanal (SOVK)", procurement of modern cesspool trucks, equipment for washing and cleaning of sewerage pipes, excavator for quick repair, modern workshop and maintenance equipment are considered by the project, which will improve further O&M of reconstructed sewerage system. These measures will allow reducing of negative impact of sewerage wastes on environment.

Component "Increase of public awareness" will provide development of informational strategy and increase of potential to conduct mass media campaign and implement program on communities and civil society preparation. Proposed measures will include broad range of components from booklets, posters and campaigns in local schools to information distribution on radio and television.

Assessment of emergencies showed that disturbance of sewerage collectors and facilities integrity, route crossing channels because of pipes corrosion as well as natural disasters may lead to pollution of grounds, ground waters, soils, collector of ameliorative system and then surface water flows as well as impoundment of the territory in places of pipes break. This in its turn will reflect not only on greenery condition but may cause episodes of infection diseases both at animals and near living population. In order to reduce environment impact of such emergency situations it is necessary to lay pipes of appropriate anticorrosion material.

In order to reduce possible negative consequences of project impact on environment, mitigation measures plan for the period of works conduction, ecological monitoring and environment condition management plans were developed under EIA project.

Most of the positive impacts observed arise from the operation of the wastewater treatment plant and from complementary systems with direct benefits on the health of the population as it ensures proper treatment and disposal of wastewater produced by the inhabitants of the south of the city. These include:

- Improvement of sanitation of the population of the city of Samarkand through the reduction of pollution of waters of Zerafshan River. Likewise, the balance of the ecosystem will be recovered through the recovery of quality of the landscape and preservation of flora and fauna species.

- Decrease in cases of gastrointestinal, parasitic, and skin diseases, allowing a reduction in the costs of healthcare for the population benefiting from the project.
- Recovery of the quality of the landscape and preservation of flora and fauna species would be reflected in an increase of tourism and recreational activities, leading to increase family income and improve the quality of life of the population of Samarkand

As the urban population of the city of Samarkand grows, so does the volume of wastewater and organic wastes that pollute the environment, so it is imperative to take essential measures to counteract environmental pollution to: prevent diseases and protect the health of the population, prevent nuisances to population, maintain clean water for bathrooms and other recreational processes, maintain clean water used for propagation and survival of fish and other aquatic species, keep water for potential touristic, industrial, and agricultural uses, prevent siltation of navigational channels
With the increasing population, laws and regulations governing pollution and wastewater disposal are becoming increasingly essential. Only by means of these legal procedures and strict adherence can be guaranteed to the entire population a clean, comfortable, and healthy environment.

ANNEXES:

ANNEX 1. ENVIRONMENTAL MANAGEMENT PLAN

Stage	Problem	Mitigation measures	Responsible organizations	Monitoring	Responsible organizations on monitoring of work performance (in order of participation)
A. Repair and rehabilitation /construction works	**Environment**				
Repair and rehabilitation of pumping stations, treatment plants, equipment, distribution units and pipelines	***1. Water resources***				
	1.1. Change of reception mode of waste waters into the sewer system and wastewater treatment plants	Development of reception mode of waste water and withdrawing it into the sewer system for the implementation period	Contractor	Current technical control and supervision of repair and rehabilitation works	Consultant, SOVK, PCU, local agency on supervision over the repair and rehabilitation works, Inspectorate for Protection of Cultural Heritage, local environmental protection, geology.
	1.2. Water pollution (surface or ground) by fallout from treatment plants, pipe cleaning and distribution centers.	• Development of components of the project works; • Introduction of new effective materials and designs, technologies of work; • Observance of repair standards and regulations; • Storage of residues/waste only in permitted areas.	Contractor	Current technical control and supervision over repair and rehabilitation works	Consultant, SOVK, PCU, local agency on supervision over the repair and rehabilitation works, Inspectorate for Protection of Cultural Heritage, local environmental protection, geology.
	1.3. Water pollution from construction sites	• Provision of drainage in surface and drainage flow from the work sites; • Timely cleaning them from con-	Contractor	Periodically in the progress of the repair and rehabilitation works	Consultant, SOVK, PCU, local agency on supervision over the repair and rehabilitation works, Inspectorate

Stage	Problem	Mitigation measures	Responsible organizations	Monitoring	Responsible organizations on monitoring of work performance (in order of participation)
		struction waste; • Conducting of rehabilitation work in disturbed areas.			for Protection of Cultural Heritage, local environmental protection, geology.
	2. Land resources				
	2.1. Soil pollution by construction waste and residue	• Organization of timely collection of repair and rehabilitation wastes, sludge from cleaning, shipping and storing them at designated locations. Disposal of sludge as a fertilizer for cotton.	Contractor	Periodically in the progress of the repair and rehabilitation works	Consultant, SOVK, PCU, local agency on supervision over the repair and rehabilitation works, local bodies of SES, local environmental protection.
	2.2. Leakage of fuel and lubricants	• Containers for fuels and lubricants shall be filled in accordance with established norms; • Avoid discharges of used oil to the relief; • Observe the rules of filling and transportation.	Contractor, working mechanisms	Current control during repair and rehabilitation works	Consultant, SOVK, PCU, local agency on supervision over the repair and rehabilitation works, local bodies of SES, local environmental protection.
	2.3. Outbreak of sewer pipes and flooding of adjacent land	Urgent rehabilitation works of pipes and reclamation.	Contractor	Periodically in the progress of the repair and rehabilitation works	Consultant, SOVK, PCU, local agency on supervision over the repair and rehabilitation works, local bodies of SES, local environmental protection.
	3. Ambient air				
	3.1. Dusting from excavation	Watering roads, repair work sites and related covering for transport during transporting waste	Contractor, drivers of corresponding cars.	Periodically in the progress of the repair and rehabilitation works	Consultant, SOVK, PCU, local agency on supervision over the repair and rehabilitation works, local bodies of SES, local environmental protection.
	3.2. Pollution from pop-gases from the	Supervision of physical states of machines. Observance of refuel-	Contractor, drivers of corre-	Periodically in the progress of the	Consultant, SOVK, PCU, local agency on supervision

Stage	Problem	Mitigation measures	Responsible organizations	Monitoring	Responsible organizations on monitoring of work performance (in order of participation)
	working aggregates and vehicles	ing regulations.	sponding cars.	repair and rehabilitation works	over the repair and rehabilitation works, local bodies of SES, local environmental protection.
	3.3. Noise, vibration from working machines	Compliance with the requirements of operation.	Contractors	Periodically in the progress of the repair and rehabilitation works	Consultant, SOVK, PCU, local agency on supervision over the repair and rehabilitation works, local bodies of SES, local environmental protection.
	4. Flora				
	Damaging trees and vegetation	All destroyed vegetation is subject to be restored. Ornamental trees damaged during the repair works will be replaced.	Contractor	After the completion of works	Consultant, SOVK, PCU, local agency on supervision over the repair and rehabilitation works, local environmental protection.
	5. Physical cultural heritage				
	Chance finds of cultural significance	Notify of the relevant department of antiquities and request for a representative to make site inspection; When found stop working, informing of interested organizations, extract them according to the established rules;	Contractor	Constantly, due to the extraction	Consultant of the project, SOVK, PCU, Regional Inspectorate for Protection of Cultural Heritage.
	Impacts on cultural resources at project sites	Pre-construction survey for cultural heritage at any locations where this is likely to be an issue	Contractor; PCU	Survey before works commence	Consultant of the project, SOVK, PCU, Regional Inspectorate for Protection of Cultural Heritage
	Flooding the territory	Eliminating leaks and accidents	Contractor	Periodically in the	Consultant of the project,

Stage	Problem	Mitigation measures	Responsible organizations	Monitoring	Responsible organizations on monitoring of work performance (in order of participation)
	and negative impacts on the cultural heritage	on sewer collector		progress of the repair and rehabilitation works	SOVK, PCU, Regional Inspectorate for Protection of Cultural Heritage
	6. Socio-economic aspects				
	Safe and healthy working conditions, excluding accidents	Ensuring safety regulations, occupational safety and health through proper selection and technically sound dimensions of workplaces and their organization	Contractor	Constantly	Consultant, SOVK, PCU, local agency on supervision over the repair and rehabilitation works.
B. Operation and Maintenance	***Environment***				
Treatment facilities for wastewaters	Contamination of soil and water by sludge	Strictly regulated collection and disposal of sediments to established places, their disposal.	The workers of treatment plant, SOVK.	Regularly, on a fixed schedule.	Consultant, local staff of SOVK, local environmental protection, SES
Sewage leakage during transportation.	Flooding, pollution of water and soil.	Timely detection of faults on the network, eliminating leaks in the short time, monitoring the observance of wastewater discharge.	Local personnel of SOVK	Periodic monitoring	Consultant, local staff of SOVK, local environmental protection, SES
Sludge management	Pollution from improper sludge disposal	investigation/plan for sludge disposal before rehabilitation works commence	PCU	Periodic monitoring	Consultant, local staff of SOVK, local environmental protection, SES
Operation of treatment facilities of wastewater and sewer networks	Pollution of water resources, soils, environmental degradation and health	• Timely develop environmental and other criteria governing the maximum permitted load on the environment; • Observe the reset mode of treated wastewater and establishing their quality standards, protection of water facilities from pollution; • Conduct technological, forest	Local personnel of SOVK	Periodic monitoring the collection of treated wastewater Periodic control of conditions of wastewater discharge by agencies for the Conserva-	Consultant, local staff of SOVK, local environmental protection, SES.

Stage	Problem	Mitigation measures	Responsible organizations	Monitoring	Responsible organizations on monitoring of work performance (in order of participation)
		reclamation, hydrotechnical, sanitary and technical measures in agreement with the state control; Reset the municipal and domestic, drainage and other wastewater with permit of nature conservation agencies in the prescribed manner; • Observe the sanitary zone of protection for WWTP; • Implement non-waste and low-waste technology, reduce generation of production and domestic waste, disinfection their decontamination, treatment, follow the rules of their sorting, storage, burial and recycling.		tion of Nature co-observance conditions of wastewater discharge	
	Socio-economic aspects				
Operation of treatment facilities of wastewater and sewer networks	Condition of safety methods and labor health.	Develop integrated programs to improve the condition of safety and health for staff	Local personnel of SOVK	Periodic monitoring	Consultant, local staff of SOVK, SES.
Disinfection of treated wastewater	Health risks of the personnel	Operation disinfection of the equipment with respect to the established norms.	Local personnel of SOVK	Ten-day control	Consultant, local staff of SOVK, SES bodies.

ANNEX 2 MINUTES OF PUBLIC CONSULTATION

«Тасдиқлайман»
Самарқанд шаҳар ҳокими ўринбосари
_____Абдуллаев У.

Таклиф қилинаётган Халқаро тараққиёт Уюшмаси иштирокидаги «Бухоро ва Самарқанд шахарларида оқовани тозалаш иншоотларини ва оқова тизимини қайта таъмирлаш» инвестиция лойиҳасининг II-боскичи асосидаги кучиришнинг рамкавий сиёсати ва атроф-муҳитга таъсир қилишни баҳолаш хисоботи буйича йиғилиш

ҚАРОРИ

14 апрель 2015 йил — Самарканд шахри

Раислик этувчи — Абдуллаев У. – Самарканд шаҳар ҳокими ўринбосари

Қатнашдилар: Таджиев К.Н. – Самарқанд вилоят «Сувоқова» ишлаб чиқариш Давлат корхонаси директори
Ахмедов Р.Э. - Самарқанд вилоят «Сувокова» ишлаб чиқариш Давлат корхонаси директори ўринбосари, Исаев С.З. – ЛМГ Самарканд бўлими бошлиғи, Ширкатлар уюшмаси бошлиғи, Ободонлаштириш бошқармаси бошлиғи, Архитектура бошқармаси, Кадастр бошқармаси, Ёнгиндан сақлаш бошкармаси, Махалла жамғармаси, Электр тармоқлари корхонаси ва мутасадди ташкилотлар вакиллари. (рўйхат бўйича)

КУН ТАРТИБИ:

1. Таклиф қилинаётган Халқаро тараққиёт уюшмаси иштирокидаги «Бухоро ва Самарқанд шахарларида оқовани тозалаш иншоотларини ва оқова тизимини қайта таъмирлаш» инвестиция Лойиҳасининг II-босқичи асосида кўчиришнинг рамкавий сиёсати ва атроф-муҳитга таъсир қилишни баҳолаш хисоботи.

У. Абдуллаев, К. Таджиев, Р. Ахмедов, С. Исаев

Раислик этувчи кун тартибидаги масалалар буйича йиғилишни очди.

Хурматли йиғилиш катнашчилари!

«Бугунги йиғилиш кун тартибида таклиф қилинаётган Халқаро тараққиёт Уюшмаси (Жахон Банки) иштирокидаги «Бухоро ва Самарқанд шахарларида оқовани тозалаш иншоотларини ва оқова тизимини қайта таъмирлаш» инвестиция лойиҳасининг II-боскичи асосидаги амалга ошириладиган чора-тадбирлар, Лойиҳанинг атроф мухитга таъсири, аҳолининг лойиҳага нисбатан муносабати ва Лойиҳани амалга ошириш даврида бўладиган кўчиришнинг рамкавий сиёсати кўриб чиқилади.»

Самарқанд вилоят «Сувоқова» ИЧДК директори К.Таджиев йиғилишни давом эттириб, йиғилиш қатнашчиларини таклиф қилинаётган Халқаро тараққиёт Уюшмаси иштирокидаги «Бухоро ва Самарқанд шахарларида оқовани тозалаш иншоотларини ва оқова тизимини қайта таъмирлаш» инвестиция лойиҳасининг II-босқичи асосий мақсадини ва Лойиҳани амалга ошириш чора-тадбирлари тўғрисида таништириб чикди. Лойиҳани асосий мақсади атроф мухитни ҳимоя қилиш, аҳолини соғлигини сақлаш ва уни фаровонлигини ошириш ва ижтимоий ҳимояни кучайтириш. Бу борада Ўзбекистон Хукумати ҳамда Жахон банки хамкорлигида аҳолига хизмат кўрсатиш сифатини ошириш бўйича йирик инвестицияларнинг ажратилиши ва ушбу мақсадларни амалга оширишда ушбу лойиҳанинг ўрни хусусида фикр юритилар экан, мазкур лойиҳани атроф муҳитга таъсир доирасини камайтириш масалалари ҳам бирламчи вазифа қилиб олинди.

Бундан ташқари лойиҳани амалга ошириш давомида бўладиган кўчиришнинг рамкавий сиёсати ишлаб чиқиш тўғрисида музокаралар олиб борилди. Йиғилиш сўнгида иштирокчилар томонидан керакли таклиф мулоҳазалар ўрганилиб чиқилди, йиғилиш

ҚАРОР ҚИЛАДИ

1. Самарқанд вилоят «Сувокова» ИЧДК директори К.Таджиевга лойиҳани амалга ошириш даврида кўрсатиб ўтилсинки Лойихани бажариш учун ширкат хўжалик раислари ободонлаштириш бошқармаси бошлиғи ва бошқа ташкилотлар рахбарлари Ўзбекистон Республикаси Қонунида кўрсатилган қоидаларга қатъий амал қилсинлар.
2. Самарқанд шахар бош меъмори, шахар кадастр бўлими бошлиғи, Лойиҳани амалга ошириш учун техник хужжатларни йиғишда масъул этиб тайинлансин. Самарканд вилоят «Сувокова» ИЧДК ҳар ой ахборот бериб борсин.
3. Қарорнинг бажарилишини назорат қилишни Ободонлаштириш доимий комиссияси зиммасига юклатилсин.

Йиғилиш баённини ёзиб борди: Б.Раббимов

Unofficial translation into English

"Approved by"
Deputy Khokim of Samarkand city
Signed **A. Abdullaev**
(round seal)

MINUTES

Of Meeting on proposed Resettlement Policy Framework and Environmental Impact Assessment Report on the basis of Bukhara and Samarkand Sewerage Project with participation of International Development Association

April 14, 2015 **Samarkand city**

Chairperson Abdullaev U – Deputy Khokim of Bukhara city

In attendance K. Tadjiev – Director of Samarkand Regional Production State Enterprise "Suvokova" Ahmedov R.E. – Deputy Director of Samarkand Regional State Production Enterprise "Suvokova", S.Z. Isaev - Head of PCU Samarkand Branch, the Heads of the Association of Partnertships, Head of the Department of Accomplishments, Department of Architecture, Inventory Department, Fire Protection Department, Fund of Makhalla, Electricity Supply Enterprise and representatives of authorized agencies (listed).

AGENDA:

1. Proposed Resettlement Policy Framework and Environmental Impact Assessment Report on the basis of Bukhara and Samarkand Sewerage Project with participation of International Development Association

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U.Abdullaev, K.Tadjiev, R. Ahmedov, S. Isaev

The Chairperson opened the meeting of the issues on the agenda.

Dear attendees of the meeting!

"On the basis of Bukhara and Samarkand Sewerage Project with participation of International Development Association, the Agenda of today's meeting will review proposed works, measures, the impact of the Project on environment, the attitude of the population to the project and Resettlement Policy Framework which will be carried out during the implementation of the Project".

The director of Samarkand RPSE "Suvokova" continued the meeting and introduced the attendees to the main proposed objective of the Bukhara and Samarkand Sewerage Project with participation of International Development Association and activities for the implementation of the Project. The main objective of the Project is to improve living conditions of the population, provide uninterrupted operation of sewerage system in the city and improve environmental condition. While discussing the allocation of huge investments on improvement of public services in collaboration with the Government of Uzbekistan and the World Bank and the role of the project in accomplishing of these tasks, the solutions for reducing the impact of the project on the environment were assumed as a priority task.

In addition, the issues of working out the resettlement policy framework which will be carried out during project implementation were negotiated. Necessary proposals and considerations were reviewed by the meeting attendees at the end of the meeting. The meeting

DECIDED

1. To remind the director of Samarkand RPSE "Suvokova" - K.Tadjiev during the implementation of the project that the chairmen of partnerships, Head of Accomplishment Department and the heads of other organizations are to observe the regulations stated in the Law of the Republic of Uzbekistan for Project implementation.
2. To appoint the Principal Architect of Samarkand city and the Head of Cadastre Department to be responsible for collecting technical documents for Project implementation.
3. Samarkand RPSE "Suvokova" is to submit monthly reports on this matter.
4. To impose the control over the execution of the decision on Permanent Commission for Accomplishment works

Recorded by: B.Rabbimov

Minutes of Public Consultations under "Bukhara and Samarkand Sewerage Project" Phase-2, held on April 14, 2015 in Khokimiyat of Samarkand city

In the frameworks of State program for infrastructure modernization of the Republic of Uzbekistan (strategy for 2010-2020 for development of water supply and sewerage systems), it is conducted a full-scale restructuring of public utilities by improving infrastructure and providing with state-of-the-art equipment, upgrading the personnel qualification and introduction of new reforms of financing and management. In the frameworks of "Bukhara and Samarkand Sewerage Project" the World Bank rendered support to water utilities.

In the frames of the Cooperation Strategy between the Government of the Republic of Uzbekistan and the World Bank, it is envisaged to allocate huge investments for increase of the quality of public services in Samarkand. In this regard, it is planned to implement Phase-II "Bukhara and Samarkand Sewerage Project", which will be financed by the World Bank and the Government of the Republic of Uzbekistan, evaluated at the value of over 57 mln USD, of which IDA credit – 48 mln USD. Investments in the frames of the second phase envisage the continuing of fulfillment of project tasks and goals foreseen under phase I, i.e. addressing the issues related to the improvement of the standards and quality of sanitation in Samarkand.

Public consultations as part of the Environmental assessment and draft framework resettlement policy

In accordance with the WB safeguard policy and environmental legislation of RUz, public consultation is one of the important aspects of EA procedure. Conducting public consultations allows solving two issues simultaneously: to identify main environmental problems and disclose familiarize the public with the results of the preliminary environmental assessment, receive comments under proposed actions for the decrease of environmental impact.

Public Consultation under "Bukhara and Samarkand Sewerage Project" were conducted on April 14, 2015 at 16.00 in conference hall of Samarkand city Khokimiyat.

250 attendees took part in public consultations consisting of representatives of Khokimiyat (delegates), Sanitary-epidemiology services, State committee for protection of Nature, Samarkand city residents and other beneficiaries. The session was opened with introductory speech of Samarkand city Khokim and director of Samarkand RPE "Suvokova", who briefly described the tasks of "Bukhara and Samarkand Sewerage Project" and the goals of conducted public consultations. Further specialists of Samarkand RPE "Suvokova" demonstrated presentation, which disclosed the main project objectives.

After the presentation the public consultation participants made several specific questions and proposals. The questions were answered by the Khokim of Samarkand city and director of Samarkand RPE "Suvokova".

#	Questions and proposals, made by session participants	Answers of project representatives
1	**B.Usmanov – Chairman of Homeowner's Association of Samarkand** "Is it foreseen construction of new sewer networks in Samarkand? What is the length of envisaged new networks"	"Yes, it is foreseen. It is planned to construct new sewer networks with the length 50.0 km by the Project"
2	**U. Abdullaev – Deputy Khokim of Samarkand city** He proposed to establish a Working group in Samarkand city Khokimiyat for addressing project implementation issues.	"Samarkand city Khokim's proposal was supported".
3	**Sh. Shamsiev – Director of "Mustaqil advokatura" lawyer firm** "He questioned about possible cases of buildings demolishing and forced resettlement in the frames of the project"	"Regional vodokanal representative confirmed that demolition of the buildings and forced resettlement will not be undertaken and the project will not impact households vicinities"
4	**S. Dadaev – Deputy director of Samarkand regional branch of JSC "Uzyulovchitrans"** "Will the road coating be rehabilitated after construction works for rehabilitation/new construction of networks and installation of pipes"	"The project envisages the rehabilitation of damaged roads in the course of project implementation".
5	**S. Boymatov – Chief sanitation doctor of Samarkand city** "What is the level of equipping of RPE "Suvokova" laboratory for waste water analysis"? Do they have contemporary laboratory equipment?"	"In the frames of Project's Phase I it was purchased required laboratory equipment. Waste water analysis is conducted in line with the acting sanitary norms and rules of the Republic of Uzbekistan."
7	**L.Abdullayeva – Chief doctor of 6-clynic of Samarkand** "Is it expected a significant improve-	"Yes, the quality of treated waste waters will

	ment of waste water quality and will the level of diseases decrease after project implementation”	improve. It is expected upgrade of sanitary conditions and decrease of the level of diseases among the population of Samarkand. Improvement of sanitary conditions will also secure the development of business and tourism in the city”.
8	**F.Toshev – Director of “Zarafshon” newspaper editorial** Is it planned public awareness for Samarkand residents about envisaged construction works and expected project outcomes?	In the frames of the project it is envisaged component for public awareness. In the course of project implementation it is planned a public awareness program for Samarkand residents with the help of national newspaper, radio and TV.

ANNEX 3. REFERENCES:

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2. The Law of the Republic of Uzbekistan "On nature protection".
3. The Law of the Republic of Uzbekistan "On Specially Protected Areas with amendments and additions dated 30.08.93"
4. The Decision of the Cabinet of Ministers "Provisions on the water protection zones of reservoirs and other water bodies, rivers and main canals and collectors, as well as sources of drinking water and domestic water supply, medical, cultural and recreational purposes in the Republic of Uzbekistan", 07.04.92.
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