Initial Environmental Examination

May 2015

GEO: Urban Services Improvement Investment Program – Tranche 5

Prepared by United Water Supply Company of Georgia LLC of the Ministry of Regional Development and Infrastructure for the Asian Development Bank

ABBREVIATIONS

ADB	-	Asian Development Bank
CA	-	Cross section area
CC	-	Civil Contractor
DC	-	Design Consultant
EA	-	Executing Agency
EIA	-	Environmental Impact Assessment
EIP	-	Environmental Impact Permit
EMP	-	Environmental Management Plan
GoG	-	Government of Georgia
GRC	-	Grievance Redress Mechanism
IA	-	Implementing Agency
IEE	-	Initial Environmental Examination
IP	-	Investment Program
IPMO	-	Investment Program Management Office
kg	-	Kilogram
km	-	Kilometre
lpcd	-	Litres per Capita per Day
M	-	Metre
MFF-IP	-	Multitranche Financing Facility Investment Program
mg/l	-	milligram per litre
mm	-	Millimetre
MoRDI	-	Ministry of Regional Development & Infrastructure of Georgia
MoE	-	Ministry of Environment and Natural Resources Protection of Georgia
PS	-	Pumping Station
UWSCG	-	United Water Supply Company of Georgia
WS		Water Supply
WWTP	-	Waste Water treatment Plant

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A. EXECUTIVE SUMMARY

1. It is proposed to improve the wastewater system in Zugdidi under the Asian Development Bank (ADB) funded Urban Services Improvement Investment Program, which is under preparation stage. This Investment Program, implemented in seven towns, will develop the water and sanitation services, which will improve quality of life and optimize the social and economic development. Ministry of Regional Development and Infrastructure (MoRDI) is the Executing Agency (EA) and United Water Supply Company of Georgia (UWSCG) is the Implementing Agency (IA) of this Program. This subproject will be implemented from 2015 to 2018. All environmental impacts associated with the works are minor and can be managed through effective implementation of an environmental management plan. Since the subproject is unlikely to have significant adverse impacts, it is classified as environment Category B, and accordingly an Initial Environmental Examination has been conducted. This is a summary of the IEE Report.

2. The Investment Program will improve water supply and sanitation (WSS) services in 7 secondary towns of Georgia. The Investment Program includes (i) infrastructure improvement to rehabilitate, improve, and expand WSS services; (ii) institutional effectiveness to improve the service utility's technical and management capabilities of the key WSS service provider, United Water Supply Company of Georgia LLC (UWSCG) to provide efficient WSS services, and develop the capacity of sector regulators to regulate tariffs, services standards, environmental protection, and drinking water quality in the long-term; and (iii) Investment Program implementation support.

3. Zugdidi, situated 346 km west of Tbilisi, the capital of Georgia and 30 km of Black sea coast, is the administrative centre of the Samegrelo-Zemo Svaneti Region. UWSCG's Zugdidi Service Centre operates the water supply and sanitation systems in Zugdidi City and a number of outlying small towns and villages. This waste water supply improvement sub-project is therefore designed for a complete revival of the system to meet the present and the projected demand of 2040. This will be achieved by: (i) construction of a new sewer system; and (ii) construction of a new wastewater treatment plant (WWTP) which is subject of this IEE.

4. Project will be implemented as according to the national as well as ADB's environmental legislative framework (SPS 2009) requirements.

5. This is the Zugdidi wastewater sub-project. It involves the rehabilitation and extension of the wastewater network and the construction of a wastewater treatment plant.

6. The project measures for the sewer network comprise the laying of 160 km new gravity pipes (DN 100 to DN 800) and 9.7 km new pressure pipes (OD 110 and OD 630). There will be 24 new wastewater pumping stations. The new network will convey the wastewater to a new wastewater treatment plant.

7. The WWTP will be constructed within the property of the existing WWTP on the Western side of Chkhoushia River. The treated sewage will be discharged into Chkhoushia River. The WWTP is designed to cover a population of 81,000 by the year 2040.The location of the future WWTP is shown below.

8. The territory,where according to the schedule WWTP construction is planned, is used by local population illegally as a municipal dump site. Visual inspection of the site revealed approximately 100 m^3 uncontrolled household and construction waste on the territory.

9. The composition of the waste is very diverse on the territory, there are non-hazardous wastes as well as dangerous wastes. Visual inspection revealed existence of approximately 5-6 m3

Asbestos containing waste, mostly - Schiffer. However, due to the fact that the waste is mixed with other types of ACM waste, their volume may be larger.

10. There are no ecologically sensitive receptors on the project surrounding territory. The nearest safe area – national park of Kolkheti is located 40 km-s away from the project zone.

11. However, based on the specifics of the project during the construction and as well as operation phase, it is required to undertake a number of mitigation measures in order to avoid expected negative impacts on the environment.In addition, the use of the required heavy construction equipment for construction purpose, particularly in narrow streets of the town, will significantly limit movement opportunity for the population.

12. During the construction phase, the main problems arise during the existing sewerage pipe rehabilitation process and installation of the new pipes. The construction activities will be implemented in Zugdidi town and will cause disturbance of the population due to noise and dust.

13. In addition, several problems that are related to noise and dust occur during the projects WWTP construction phase. There are two lodging houses and a regional anti-TB hospital located near to the site (see figure 5). The hospital is located 150-170 m from the WWTP, and the residential houses are located 290 and 246 m from it, respectively. It should be noted that the river Chkhoushi flows and a speedway runs between the hospital and project area. The said objects are a natural barrier on the way of the noise spread originated in the operation phase.

14. In terms of environmental impact, WWTP is also important during the operation phase; noise and smell is generated that is negatively reflected on the residents of the surrounding buildings and as well as counterparts. Improper disposal of sewage sludge on the Zugdidi municipal dump site may also have a negative impact on the environment.At the same time, it should be noted that as a result of the Project implementation, the impact on environment will be significantly reduced. At present, the waste and sewage waters originated on the territory of Zugdidi flow into the river Chkhoushi without any treatment and pollute it.

15. The document hereby has been developed in order to eradicate a number of mitigation measures and mentioned problems, therefore their proper and timely implementation will significantly reduce the expected negative impact.

16. UWSCG represents the project implementation agency, which in turn rents construction and consultant companies based on a tender. The team takes the full responsibility for an efficient execution of the project.

17. The overall conclusion of the IEE is that provided the mitigation and enhancement measures are implemented in full, there should be no significant negative environmental impacts as a result of location, design, construction or operation of the subproject. There should in fact be positive benefits through major improvements in quality of life and individual and public health once the scheme is in operation. Project will stimulate economic growth. Thewastewater good quality is a prerequisite for tourism development. Standard of individual and public health will improve as a result of the project. Project will generate new job opportunities.

B. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

18. This section discusses the national and local legal and institutional framework within which the environmental assessment is carried out. It also identifies project-relevant international environmental agreements to which the country is a party.

B.1 ADB Policy

19. Superseding the previous safeguard policies (the Involuntary Resettlement Policy, 1995, the Policy on Indigenous Peoples, 1998, and the Environment Policy 2002), ADB, has adopted a comprehensive Safeguard Policy Statement in 2009 (SPS, 2009). This Statement describes common objectives of ADB's safeguards, lays out policy principles, and outlines the delivery process for ADB's safeguard policy. It applies to all ADB-financed and administered projects, and their components including investment projects funded by a loan, grant or other means.

20. Aiming on promotion and sustainability of project outcomes by protecting the environment and people from projects' potential adverse impacts, the objectives of ADB's safeguards are to:

- avoid adverse impacts of projects on the environment and affected people, where possible;
- minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and
- help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

21. The objective of environmental safeguards is to ensure the environmental soundness and sustainability of projects and to support the integration of environmental considerations into the project decision-making process. All ADB funded projects are screened at initial stages of preparation and categorized according to significance of the project's potential environmental impacts. Projects are assigned to one of the following three categories:

Category A - Projects likely to have significant adverse environmental impacts, which are irreversible, diverse or unprecedented and may affect an area larger than the location subject to physical works. An Environmental Impact Assessment is required.

Category B –.Projects with adverse environmental impacts that are less significant than those of Category A projects, are site-specific, generally not irreversible, and in most cases can be mitigated more readily than for Category A projects. An Initial Environmental Examination (IEE) is required.

Category C - likely to have minimal or no adverse environmental impacts; EIA is not required.

22. The Zugdidi WW subproject has been classified as environmental assessment category B) according to the criteria laid down in the checklist for water supply projects of the ADB's Environmental Assessment and Review Framework (November 2010) that was especially prepared for the environmental assessment of the Georgia Urban Services Improvement Investment Program.

23. *ADB Review and Approval*. For Category B projects the Draft IEE report is reviewed by ADB's Operational Department (in this case Central & West Asia Department) and after addressing their comments, if any, the EA then officially submits the IEE reports to ADB. Completed reports are made available on the ADB website.

B.2 Georgian Law

B.2.1 Framework Legislation

24. The basic legal document is “The Constitution of Georgia”, which was adopted in 1995. While the Constitution of Georgia does not directly address environmental matters, it does lay down the legal framework that guarantees environmental protection and public access to information with regard to environmental conditions.

25. Article 37, Part 3 states that “any person has the right to live in a healthy environment, use the natural and cultural environment. Any person is obliged to take care of the natural and cultural environment.” Article 37 Part 5 states that “an individual has the right to obtain full, unbiased and timely information regarding his working and living environment.”

26. Article 41, Part 1 states that “a citizen of Georgia is entitled to access information on such citizen as well as official documents available in State Institutions provided it does not contain confidential information of state, professional or commercial importance, in accordance with the applicable legal rules.

27. The **Law of Georgia on Environmental Impact Permit(2007)** defines the full list of activities on the territory of Georgia subject to mandatory ecological expertise. The Law defines the legal aspects of issuing an environmental permit, undertaking the ecological expertise, informing the public and participating in the given procedures. Under the Law, the environmental permit is the authorization to realize the planned activities. Under the Law, an environmental permit is issued by the Ministry of Environmental Protection and Natural Resources of Georgia based on the review/expertise of the application of an applicant for the environmental permit. The aim of the Law is to ensure the protection of a human health, natural environment, physical assets and cultural heritage during the activity.

28. The **Law of Georgia on Environment Protection (1997)** regulates the legal relations between the state establishments and physical or legal entities in the field related to the use of territorial waters, air space, including continental shelf and special economic zones, environmental protection and natural resources on the territory of Georgia. The Law regulates the standards of the environmental protection and issues of environmental management; it describes the economic sanctions, standards and issues of environmental impact, different issues of protection of the natural eco-systems and biodiversity, and global and regional management issues. In addition to the above-mentioned, the Law considers the major principles of waste management. The law defines the ecological requirements for the waste (Article 34). According to the provision of the given Article, an entrepreneur is obliged to reduce the origination of industrial, domestic and other types of waste, ensure their treatment, utilization, placement or burying by considering the environmental, sanitary-hygienic and epidemiological standards and rules. The Law defines the requirements for the placement of toxic, radioactive and other hazardous waste and prohibits their discharge in the surface water sources.

29. The **Law of Georgia on Licenses and Permits (2005)** defines the list of activities needing licenses or permits, including so called “Environmental permit”. It also defines the requirements for the license or permit issue. The Law, together with the normative by-laws, regulates such organized activity or action, which relates to an indefinite circle of entities, is characterized by increased hazard to the human life or health, affects particularly important state or public interests or is related to the use of a state resource. The given Law regulates the field regulated by a license or permit; it gives a thorough list of licenses and permits, and establishes the rules to issue the licenses and permits, 28 makes amendments to them or abolish them. Under the Law, a state regulation of the activity or action through a license or permit is undertaken only when the given activity or action is directly

associated with the increased hazard to the human life or health or fields of state or public interests. The state regulation is undertaken only when the issuance of a license or permit is a real means to reduce the hazard in question or consider state or public interests. The aim and major principles of regulating the activity or action via licenses or permits are as follows:

- Provision and protection of human life and health;
- Safety and protection of a human's residential and cultural environment;
- Protection of state and public interests;

30. **The Law of Georgia on State Ecological Expertise (2007).** Under the given Law, the ecological expertise is a necessary measure for making decision on the issuance of environmental and/or construction permit(s). The aim of the ecological assessment is to protect the ecological balance by considering the requirements of environmental protection, rational use of natural resources and principles of sustainable development. A positive conclusion of the ecological expertise is mandatory for obtaining an environmental and/or construction permit. In addition, the holder of environmental and/or construction permit is obliged to comply with conditions specified in the ecological expertise conclusion. The process of ecological assessment is regulated by the Ministry of Environmental Protection and Natural Resources.

31. The procedure to be observed during ecological expertise, as well as the requirements on forming the expert commission is prescribed in the Provision on the Rule for Carrying out Ecological Expertise, which is approved by the Minister of Environment and Natural Resources Protection of Georgia. The full list of the activities, subject to mandatory ecological expertise for decision making on issuance of environmental permit or building permit, is specified by the Law of Georgia on Environmental Permit.

32. The state ensures protection of the environment and, correspondingly, protection of water as its main component in **The Law of Georgia on Water (1997)**. All residents of Georgia are liable to ensure the rational and sustainable use and protection of water. They have to prevent its contamination, pollution and depletion. The dumping of industrial, household and other garbage and wastes in water bodies is prohibited according to this act. The disposal of industrial, household and other effluents into water bodies is permitted on the basis of a license by the Ministry. With the objective of protecting the Black Sea and preserving its ecological system, all natural and legal persons (including foreigners) are obliged to take measures for preventing pollution of the sea with wastewater from the sources of pollution located on the land. The use of a surface water body for discharging industrial, communal-household, drainage and other wastewater is allowed only under a water use license issued on the basis of the Ministry-approved multipurpose water utilization plans and water management balance-sheet.

33. The **Law of Georgia on Cultural Heritage (2007)**. Article 14 of the Law specifies the requirements for 'large-scale' construction works. According to this Article, a decision on career treatment and ore extraction on the whole territory of Georgia, as well as on construction of an object of a special importance as it may be defined under the legislation of Georgia, is made by a body designated by the legislation of Georgia based on the positive decision of the Ministry of Culture and Monument Protection of Georgia. The basis for the conclusion is the archaeological research of the proper territory to be carried out by the entity wishing to accomplish the ground works. The entity wishing to do the ground works is obliged to submit to the Ministry the documentation about the archaeological research of the territory in question. The preliminary research should include field-research and laboratory works. In case of identifying an archaeological object on the territory to study, the conclusion of the archaeological research should contain the following information: (a) a thorough field study of the archaeological layers and objects identified on the study territory by using modern methodologies, (b) recommendations about the problem of conservation of the identified

objects and planning of the building activity on the design territory, on the basis of the archaeological research.

34. The aim of the **Law of Georgia on Public Health (2007)** is as follows: Promotion of the introduction of a good health and healthy lifestyle of the population; Creation of the environment, which is safe for a human health; Promotion of the protection of the reproductive health of a family; Prevention of infectious and non-infectious diseases. The Law defines the rights and obligations of the population and legal entities in the field of public health. Aiming at establishing the environment safe to the public health, the Ministry sets the qualitative standards for the environment safe for a human health (atmospheric air, water, soil, noise, vibration, electromagnetic radiation), including maximum permissible concentrations and rates of harmful impact. The standards are mandatory. Every person on the territory of Georgia is obliged not to carry out the activity, which causes a hazard of the infectious and non-infectious diseases to spread and helps the origination of the risks to human health; protect the sanitary and epidemiological standards; to supply the information to the public health department about all emergencies caused by the violation of the sanitary norms in the production or technological process, etc. The observance of the standards is controlled by appropriate state structures. The responsibility for the internal and external audits rests with a certified, independent laboratory.

35. **Environmental Assessment and Review Framework (November 2010, updated in November 2013 due to changes in the scope of the USIIP, EARF)**was established for the Asian Development Bank funded Georgia Urban Services Improvement Investment Program (or the Investment Program). This is prepared to adequately address the ADB Safeguard Policy Statement (2009) requirements and is to be endorsed by the Georgian government. Projects have to be assigned to Categories A, B, and C. General mitigationmeasures are listed for anticipated impacts.

B.2.2 Licenses& Approvals Required

36. Environmental assessment of various activities and development projects in Georgia is governed by the Law on Environmental Impact Permits (EIP). This Law notifies the list of the activities and projects, which are subject to ecological expertise and require Environmental Impact Permit. The Law also makes the public participation mandatory in the process of environmental assessment, ecological expertise and decision making on issuance of an environmental impact permit. Under this Law, various projects/activities have been divided into four categories based on their size, importance and potential environmental impact, and sets out permitting process for each category.

37. None of the components of the proposed water supply improvement subproject in Zugdidi are notified in the Law on EIP and therefore environmental impact permit is not required.

38. The requirements related to EIA studies and the EIA report are set forth in the Order N31 of 15 May 2013 of MoENRP.

39. The **Law of Georgia "On the Red List and Red Book" (2003)** regulates the legal relations in the field of developing the Red List and Red Book, protecting and using the endangered species, except the legal issues of the international trade with endangered wild animals and wild plants, which within the limits of the jurisdiction of Georgia are regulated by virtue of the Convention 'On the international trade with the endangered species of wild fauna and flora' concluded on March 3 of 1973 in the city of Washington. According to Article 10 of the Law, any activity, including hunting, fishing, extraction, cutting down and hay-mowing, except particular cases envisaged by the present Law, Law of Georgia 'On animal life' and legislation of Georgia, which may result in the reduction in number of the endangered species, deterioration of the breeding area or living conditions, is

prohibited. The Red List of Georgia was approved by the Presidential Decree No. 303 'On approving the Red List of Georgia' (May 2, 2006).

Table 1.Other National Environmental Legislations and Applicability

Legislation	Applicability	Remarks
Forestry Code of Georgia, 1999	Applicable to works located in forest areas	Requires permission from the Ministry of Economic and Sustainable Department (MESD). The project proponent shall submit application to the MESD, which in turn forwards it to the Forest Division of MoEPNR for its review and advise, based on which the MESD gives an approval to proceed with works in forest areas.
Law on Ambient Air Protection, 2000		It stipulates Maximum Allowable Concentration (MAC) of various pollutants in Ambient Air; however the establishment of emission standards for various sources or activities is under process, therefore at present no standards are available.
Law on System of Protected Areas, 1996	Applicable to works or activities in protected areas	Depending on the activity and type of protected area, permission for any work will be granted or denied.
Technical Regulation of Drinking Water, 2007 (Decree N 349/N), the Ministry of Labour, Health and Social Affairs of Georgia	Applicable to water supply projects	Water supply and monitoring shall comply with the technical regulation.
Rules of the Protection of the Surface Waters of Georgia from Pollution, 1996 (№130 order of the Minister of the Protection of the Environment and Natural Resources of Georgia)	Applicable to water supply projects	Source water quality shall comply with the provisions for domestic use.
Technical Regulation of Environmental Protection, 2008 (Decree N745), Minister of the Protection of the Environment and Natural Resources of Georgia	Applicable to sewerage projects	Treated effluent disposal from sewage treatment plants shall comply with the specified standards.
"Approval of Environmental Quality Standards" - approved by Minister of Health, Labour and Social Affairs [Decree number - 297n of August 16, 2001])		The Georgian standards for noise control as approved by the Decree of the Minister for Health, Labour and Social Affairs (297n of August 16, 2001) upon the 'Approval of Environmental Quality Standards'; specifying the tolerable and maximum admissible levels of noise for different zones.

40.Some of the **International Treaties and Conventions** Ratified or Signed by Georgia are provided in the list below:

- Short List of the Ratified or Signed Conventions:
- Ramsar Convention on Wetlands (1996);

- United Nations Framework Convention on Climate Change (UNFCC) (1994);
- Kyoto Protocol (1994);
- Kyoto Protocol (1999);
- Basel Convention on the Control of Transboundary Movement of Hazardous Waste and Their Disposal (1999);
- Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention) (1999);
- Convention on Biological Diversity (1994);
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (1996);
- Convention on Long-range Transboundary Air Pollutants (1999);
- Stockholm Convention on Persistent Organic Pollutants (2006);
- Convention on the Conservation of European Wildlife and Natural habitats (2008);
- The Vienna Convention for the Protection of the Ozone Layer (1995);
- Montreal Protocol on Substances that Deplete the Ozone Layer (1995).

B.2.3 Administrative Structure in Georgia

41. Ministry of Environment and Natural Resources Protection of Georgia (MoENRP). MoENRP has the overall responsibility for protection of environment in Georgia. The Department of Permits of MoENRP is responsible for reviewing EIAs and for issuance of the Environmental Permits. MoENRP is the main state body pursuing state policy in the sphere of environment. Their functions for regulating economic or development activities with regard to environmental protection include:

- Issuing permits for project development (Environmental Impact Permit)
- Setting emission limits and issuing surface water intake and discharge consents
- Responding to incidents and complaint

42. For the projects, which do not require Construction Permit, the Environmental permit is being issued by the MoENRP on the ground of State Ecological Examination. State Ecological Examination is carried out by MoENRP upon official submission of Environmental Impact Assessment (EIA) prepared by project developers.

43. For projects requiring Construction Permit, no special permit is issued by MoENRP (according to “One window principle”, only one permit shall be issued for each activity). The Construction Permit is issued by the Ministry of Economy and Sustainable Development of Georgia, but the issuance of the Permit is subject to the consent of the MoENRP in a form of Conclusion of Ecological Expertise, as well as the Ministry of Culture (Centre of Archaeological Studies, Department of Monuments protection). Consent of the MoENRP in such cases should be issued according to the same procedures (EIA, public consultations; SEE etc.) as for issuing Environmental Permit.

44. The Ministry of Economic and Sustainable Development as an administrative body issuing a permit ensures the involvement of the MoENRP as a different administrative body in the administrative proceedings initiated for the purpose of permit issuance, in accordance with Georgia’s Law on Licenses and Permits.

45. As a rule, EIA permitting conditions contains requirement for informing MoENRP regarding fulfilment of the EIA permit conditions. This basically means giving information regarding implementation of Environmental Management and Monitoring Plans.

46. The **Ministry of Culture and Monument Protection of Georgia** is responsible for the supervision of the construction activities in order to protect archaeological heritage. In case if construction is to be carried out in a historic sites or zones of cultural heritage, consent of the Ministry of Culture is also required for issuing construction permit (if such is necessary).

B.3 Compare of the National legislation and ADB Requirements

47. The above accounts of national environmental low and ADB policy indicate that the two systems are similar but then there are certain aspects in which ADB policy is more demanding or specified than the Georgian procedure. The main differences are as follows.

48. The Bank's guidelines provide a detailed description of procedures for screening, scoping and conducting EIA and explain a complete list of stages, which are not specified under the national legislation.

49. Considering ecological risk, cultural heritage, resettlement and other factors, the Bank classifies projects supported by them under categories A, B, C and FI. However in the Georgian legislation, EIA is carried out only if a developer seeks to implement projects listed in the Law on Environmental Impact Permit. This list is compatible with the category A projects of the Bank classification. According to the Georgian legislation EIA is not required in other .instances, while Asian Development Bank guidelines requires limited EIA or IEE for the B category projects, and an environmental review of projects that are not expected to produce environmental impacts (category C).

50. Georgian legislation does not specify the format of environmental management plans (EMPs) and the stage of their provision for projects requiring EIA and does not require EMPs for projects not requiring EIAs. The Asian Development Bankguidelines described the requirements for preparation of EMP for all categories of projects and provide detailed instructions on the content.

51. According to Georgian legislation MoE is responsible for monitoring of project implementation and compliance with the standards and commitments provided in the EIA, and the role of the EMP is less clearly is defined.. The PIU or "Project Proponent" is responsible for implementing "self-monitoring" programs for projects requiring EIA. In contrast ADB guidelines stress the role of EMPs, which are important for all categories of projects, and the Project Proponent (in our case – MDF) is required to ensure inclusion of a monitoring scheme and plans into EMPs. Monitoring of performance compliance against EMPs is important element of ADB requirements.

52. The national legislation also does not take into account the issue of involuntary resettlement at any stage of environmental permit issuance. The Georgian legislation considers social factors only in regard to life and health safety (e.g. if a project contains a risk of triggering landslide, or emission/discharge of harmful substances or any other anthropogenic impact). While the Bank's document establishes the responsibility of a Borrower for conducting an environmental assessment, the national legislation provides for the responsibility of a project implementing unit to prepare EIA and ensure public consultation.

53. The role of the Ministry is restricted to participation in EIA consultation and carrying out state ecological examination required for the adoption of a decision on issuing an EIA permit as established under the legislation of Georgia. Under ADB regulations ADB carry out project screening and categorization at the earliest stage of project preparation when sufficient information is available for this purpose, also according ADB's Public Communications Policy, ADB is committed to working with the borrower/client to ensure that relevant information

(whether positive or negative) about social and environmental safeguard issues is made available in a timely manner.

54. In regard with consultation: The Bank provides for consultations for A and B Category projects (at least two consultations for Category A projects) and requires a timetable of consultations from the Borrower. The national legislation until recently contained only a brief reference to this issue without providing real tools of its fulfillment. The amendments to the Governmental Decree On the Procedure and Conditions of Environmental Impact Assessment established the requirement of public consultation of the EIA, which obligates a developer (i) to ensure public consultation of EIA, (ii) publication of information, (iii) receive comments within 45 days, (iv) arrange consultation not later than 60 days from the date of publication, invite stakeholders and determine the place of consultation.

Table 2. Activities and responsibilities in EIA for national law and ADB policy

#	Action	Georgian Legislation	ADB Requirements
1	Screening	Project Proponent in consultation with MoE	Bank and Consultant hired by Project Proponent
2	Scoping	Not required. Could be conducted voluntarily by Project Proponent.	Obligatory. Bank and Consultant hired by Project Proponent
3	Draft EIA	To be prepared by Environmental Consultant.	To be prepared by Environmental Consultant.
4	Public Consultations	The EIA should be available for public review during 45 days. Publication of information in central and regional mass-media. Arrange consultation not later than 60 days from the date of publication.	At least two consultations for Category A projects – one at the scoping stage and one for the draft EIA.
5	Final EIA	Consider all comments received during public consultations, incorporate accepted remarks and explain rational when the comments are disregarded.	Consider all comments from Bank and public. Agree with the Bank on each raised point. Incorporate accepted public comments and explain rational when the comments are disregarded.
6	Management Plans	No clear guidelines on format, content and timing	Incorporate Monitoring and Management Plans in the EIA.
7	Review and Approval	MoE	Bank and separately - MoE (if the EIA is required by Georgian legislation).
8	Disclosure of	Not requested	Publication (mainly

	final EIA		electronic) of the final EIA.

B.4 Harmonization of the ADB and Georgian Legislation Requirements

55. In order to comply with the both regulations – the ADB and Georgian legislation – the content of the EIA should comprise issues required in both regulations, thus complementing each other. The EMPs should therefore be elaborated in details as required by the ADB regulations. The assessment of the stationary sources of emission (e.g. diesel generators)should be executed according to Georgian regulations: “Inventory of the Stationary Sources of Emission” and “Approval of the Emission Limits”. For the category a projects the first public consultation (requested by ADB guidelines but not by Georgian regulations) will be held at the Scoping stage. The second one will be executed according to Georgian requirements. Disclosure will be conducted as required by ADB.

C. DESCRIPTION OF THE PROJECT

C.1 Type of the Project

56. This is the Zugdidi wastewater sub-project. It involves the rehabilitation and extension of the wastewater network and the construction of a wastewater treatment plant.

C.2 Need of the Project

57. The service level of urban water supply and wastewater treatment at present is not satisfactory in Georgia. Services are not available to entire population and the serviced areas suffer from inefficient service levels. Systems are old and inefficient. The situation is not different in the project area, comprising the City of Zugdidi. This subproject is needed because the present wastewater infrastructure in Zugdid is inefficient and inadequate to the needs of the population. Untreated sewage contaminates soil and surface water. It endangers human health.

58. The general slope of the terrain in Zugdidi is from the north to the south. All existing sewers follow this direction. There are two existing wastewater treatment plants at the southern edge of Zugdidi. Both wastewater treatment plants were abandoned in the 90's. Zugdidi has an existing sewer network of approximately 55 km. The drainage area of Zugdidi is divided in two parts, of which the River Chrhousia is the natural boundary. On the western side, the existing sewer network is spread along and close to the River Chrhousia. Most parts of the western area are not served by the sewer network. There are two existing trunk sewers from DN 500 up to DN 1000 in the western area that discharge at different locations: The most western trunk sewer goes straight in western direction to an abandoned treatment plant of a likewise abandoned paper factory. The second trunk sewer follows the line of River Chrhousia and ends at the former wastewater treatment plant of Zugdidi. On the eastern side of the River Chrhousia, the existing sewer network is denser. The diameters of the existing sewers range from DN 200 to DN 600. An interception sewer of DN 800 at the southern end of Zugdidi collects the sewage and discharges at the abandoned wastewater treatment plant, close to the endpoint of the main trunk from the western part of Zugdidi.

59. The present sub-project is designed to improve the service standards of the wastewater system in Zugdidi. It is designed to collect and treat the wastewater expected in the year 2040. The development of the demand level in Zugdidi is based on the projected number of inhabitants as indicated in the following table.

Table 3. Wastewater Flow

Description	Unit	Year			
		2010	2020	2030	2040
Water supply					
Total inhabitants	**capita**	**72 244**	**75 088**	**78 016**	**81 048**
Total water demand (average)	***m³/d***	***11 828***	***14 902***	***15 463***	***16 045***
Peak factor daily demand	-	1.80	1.80	1.80	1.80
Peak factor hourly demand	-	3.00	3.00	3.00	3.00
Max. daily water demand	**m³/d**	**20 890**	**21 693**	**22 519**	**26 212**
Max. hourly water demand	**m³/h**	**1 541**	**1 925**	**1 995**	**2 068**
average hourly water demand	**m³/h**	**739**	**931**	**966**	**1 003**
Wastewater					
connection ratio		95%	95%	95%	95%
wastewater/water ratio		90%	90%	90%	90%
result wastewater flow (average)	m³/d	9 512	9 887	10 272	10 672
wastewater from industry	m³/d	450	450	450	450
peoples equivalent	PE	2 250	2 250	2 250	2 250
peak factor	h/d	16	16	16	16
result wastewater flow (average)	***m³/d***	***9 962***	***10 337***	***10 722***	***11 122***
infiltration (0,5 m³/(d*Manhole)					
No. of Manholes appr.	No.		1 000	1 000	2 000
peak factor for wastewater flow	-	3.0	3.0	3.0	3.0
daily flow (average)	**m³/d**	**9 962**	**10 337**	**10 722**	**11 122**
hourly flow (average)	**m³/h**	**415**	**431**	**447**	**463**
hourly flow (max.) dry weather	**m³/h**	**623**	**646**	**670**	**695**
hourly flow (max.), for hydraulic calc. only	**m³/h**	**1 245**	**1 313**	**1 361**	**1 432**

C.3 Location

60. This sub-project is located in Zugdidi. Zugdidi is located in the western part of the country in the Georgian historical province of Samegrelo (Mingrelia), approximately 346 km west of Tbilisi, the capital of Georgia and 30 km east of Black sea coast. The city is a capital of Samegrelo-Zemo Svaneti region, the fifth largest city of Georgia and is located on the left bank of the Enguri River. The total population of the town amounts to 69,744 (2010). The total area of Zugdidi Municipality is 16.85 km² and the altitude of the territory in Zugdidi is approximately 80 – 120 meters above sea level.

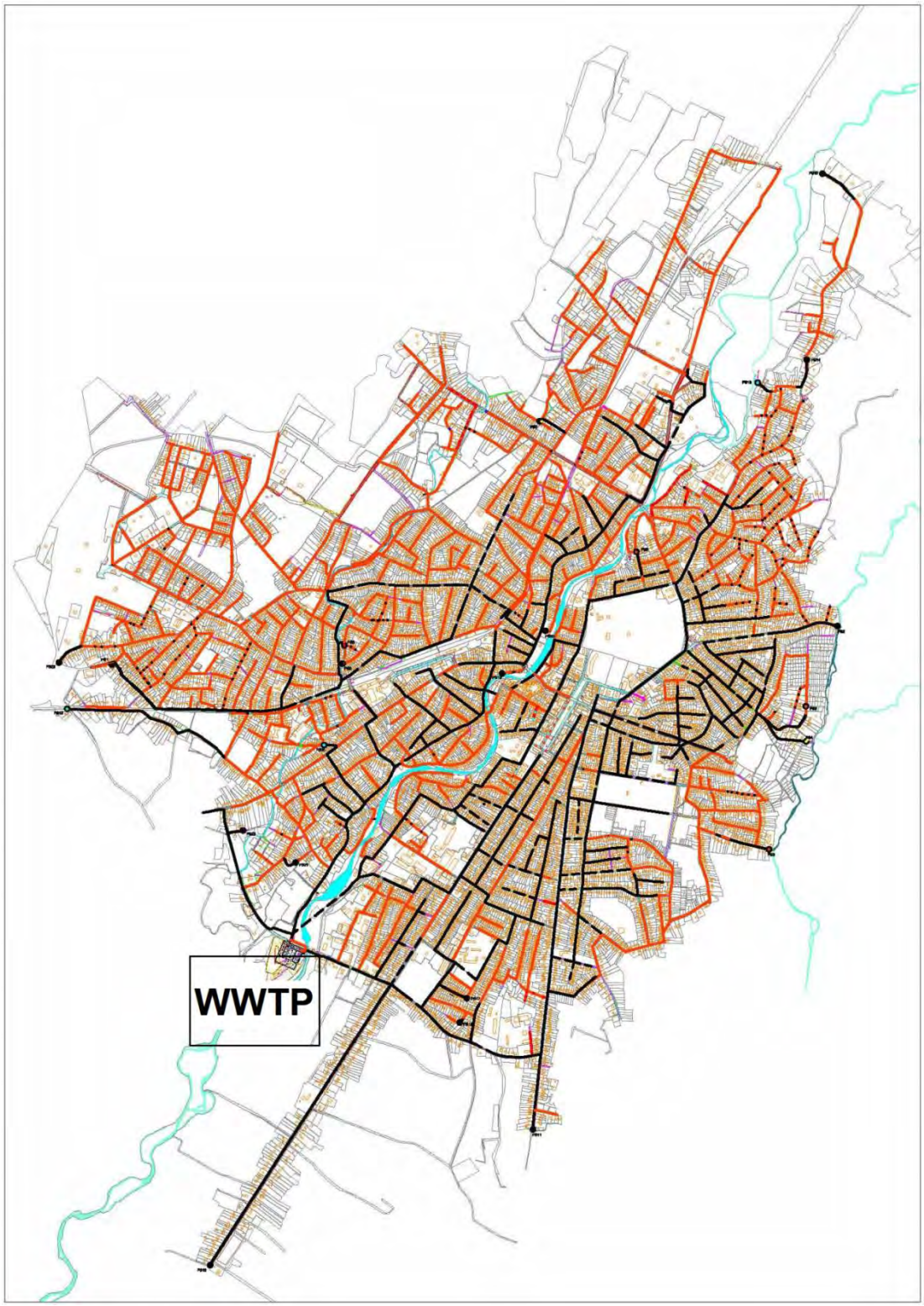
Map 1.Location of Zugdidi

61. The wastewater project measures comprise the rehabilitation and extension of the sewer network with gravity sewers and pressure lines, the construction of wastewater pumping stations as well as the construction of a new wastewater treatment plant.

62. The project measures for the sewer network comprise the laying of 160 km new gravity pipes (DN 100 to DN 800) and 9.7 km new pressure pipes (OD 110 and OD 630). There will be 24 new wastewater pumping stations. The new network will convey the wastewater to a new wastewater treatment plant.

63. The WWTP will be constructed within the property of the existing WWTP on the Western side of Chkhoushia River. The treated sewage will be discharged into Chkheushia River. The WWTP is designed to cover a population of 81,000 by the year 2040. The location of the future WWTP is shown below.The coordinates are: 42°29'27.09"N; 41°50'40.63"E.

Map 2.WWTP and main Collectors in Zugdidi



C.4 Wastewater treatment plant in Zugdidi

C.4.1 General Overview

64. The area selected for the construction of Zugdidi municipal wastewater treatment plant is located in the south-western border of the city, namely, between Chitatskaro and Ingiri villages, adjacent to Shota Khubulava St., on the right bank of Chkhoushia River, at an altitude of 77 m a.s.l. The project area is approximately 2.0 ha, and the distance from the bank of Chkhoushia Riveris 150 m.

65. Previously, there was a wastewater treatment plant of the city, which have not been operating for decades and now only reinforced - concrete construction waste is preserved from this plant. A large part of the area is covered with thorny shrubbery and municipal waste (the residents use this as an illegal landfill). The old treatment plant reservoirs existing throughout the project area are filled with atmospheric water, which is the source of the spread of pests. It should be noted that the area is not fenced and the domestic animals of the local population freely move on this area.

66. High-voltage transmission lines pass through the perimeter of the project area from both East and West side.

67. Zugdidi sewage water diversion collector is opened in the vicinity of the project area and wastewater is discharged into Ckhoushia River without treatment.

68. The project area is bordered by the road from the North. Pastures and privately owned agricultural lands are to the north of the road. A large part of this area is wet and contaminated by the construction and household waste.

69. The area is bordered by Chkhoushi River from the East side. Enterprises of various legal entities, tuberculosis hospital and a cemetery are located on the left bank of the river.The nearest residential house is about 250 meters away.

70. From the West side, the area is bordered by agricultural lands and household plots of Ingiri Village.

71. According to the results of the visual audit, signs of cultural heritage sites have not been identified in the project area and there is no high risk of late discovery of any archaeological sites as well.

72. Views of the project area are presented in Figures 1,2,3 and 4. The situational scheme is given in Figure 5.

Figure 1. Project area view from the North

Figure2. Project area view from the East

Figure3. Project area view from the South

Figure4. Project area view from the West

Figure 5. Situational scheme of the area selected for the construction of the treatment plant

C.4.2 Implementation Schedule

73. The design of the subproject completed by September 2014. The construction period will be three years.

74. The project is formulated for implementation under the proposed ADB funded Investment Program. **Table 3**shows the subproject and components selected for implementation in Zugdidi, for which, according to ADB requirements, this IEE is conducted.

C.4.3 Sub Project Components

75. This subproject focuses on the development of rehabilitation and extension of the sewer network and the construction of a new wastewater treatment plant.

Table 4.Proposed Subproject & Components Wastewater System

Infrastructure	Function	Description	Location
Sewage network	Collection and transport of sewage	Laying of gravity and pressure pipes	Zugdidi
Pumping stations	Lifting of sewage	Construction of pumping stations (civil works, electro-mechanical installations)	Zugdidi
Wastewater treatment plant	Treatment of sewage	Construction of plant (civil works and electro-mechanical installations)	South of Zugdidi, at Chkhoushia River

.
76. The new sewage network will comprise the following pipes:

Table 5.Pipe lengths and diameters

Pipe Diameter	Pipe Length
	m
DN 100	104
DN 150	2822
DN 200	15156
DN 250	561
DN 300	14241
DN 400	2605
DN 500	1878
DN 600	4591
DN 800	4881
DN 1000	768
unknown	19393
Total	67000

C.5 Construction Activities

77. There are the following main elements in waste water supply components of the subproject:

- Construction of sewer network
- Construction of pumping stations
- Construction of wastewater treatment plant

78. Construction practices of these works are described below:

*7*9. *Laying of sewer pipes.* Sewer pipes will be laid in the settled area of Zugdidi. The pipes will have diameter between DN 100 and DN 800. The network will be laid with a total length of 170 km. Trenches for new pipe sections will be dug using a backhoe digger, supplemented by manual digging. Excavated soil will be placed alongside, and the pipes will be placed in the trench. Pipes will be joined, after which excavated soil will then be replaced on beneath and sides. The trench will be refilled with excavated soil and sand and compacted. The depth of trench will be 1 m – 5 m. Minimum width of the trench will be 0.9 m.

80. *Construction of pumping stations and wastewater treatment plant.* This work will involve excavation for foundations, placing of reinforcement rods in wooden shutters and pouring of concrete in voids to form foundations, floor, walls and roof. Cement mortar plaster will be applied to walls (outside and inside), floor and roof for smooth finish. Inlet and outlet pipes and fixers/valves will be installed. Excavation for foundation will be done by backhoe digger or manually, where required. Ready-made concrete will be supplied from a concrete plant and a needle (pen) vibrator will be used for compaction of concrete around the reinforcement. The quantity waste/surplus soil generated from this activity will be insignificant and can be used within the sites to level the ground surface.

81. *Source of construction materials*. Sand and aggregates will be sourced from licensed borrow areas. There is no designated disposal site for construction waste.

82. Water needed for civil works comprises potable water and construction water. Potable water shall comply with the national quality standards and shall not compete with the needs of the local population. Construction water and water to be used for dust suppression measures may be taken from the Enguri River or from ground water. Quantity of these resources is not a critical issue.

83. *Transportation routes*. The sewage network, the pumping stations and the wastewater treatment plant are located outside settled areas and are accessible via the highway and dirt roads. For mitigation measures please refer to subsequent chapters.

C.6 Operation of New WWTP

84. For those wastewater treatment plants in the project towns with a capacity over 30,000 Population Equivalents (PE), the activated sludge technology with separate anaerobic sludge digestion is chosen. This process comprises the following treatment steps (Figure 6):

- Screens
- Aerated grit chambers
- Primary sedimentation tanks
- Aeration tanks
- Final sedimentation tanks
- Sludge thickener

- Digestion and Gas Utilisation (CHP = Combined Heat and Power Plant)
- Sludge dewatering
- Gas storage
- Gas torch

85. The first stage in the wastewater treatment plant is the screening for the removal of coarse material that would damage the subsequent equipment and reduce process effectiveness. Generally, coarse and fine screens are applied before grit removal units. For minimisation of odour nuisance, this part of the WWTP (i.e. coarse screen, inlet pumping station, fine screen) is enclosed (i.e. integrated in a building). Grit chambers are designed to remove grit consisting of sand, gravel and other heavy solid materials that have subsiding velocities or specific gravities substantially greater than organic putrescible solids.

86. A primary clarifier is used to remove the undissolved organic material from the wastewater and therefore reduces the pollution load in the following biological process steps. The removed organic material, named as primary sludge, mainly contains of readily biodegradable agents and is perfectly suited for further anaerobic digestion due to its high methane yield.

87. The second stage in the wastewater treatment plant is the activated sludge process. This process is a common treatment method and has been implement worldwide. The aeration tanks are dimensioned for the carbonaceous BOD and COD removal (removal rates up to 90 - 95%) and for nitrification. Basic system adjuncts include phosphorus removal and microbial de-nitrification.

88. After some time, the mixture of biological solids is passed from the aeration tanks into the final sedimentation tank, where some of the settled sludge is recycled to maintain the desired concentration of organisms in the reactor. The remaining sludge is removed from the system.

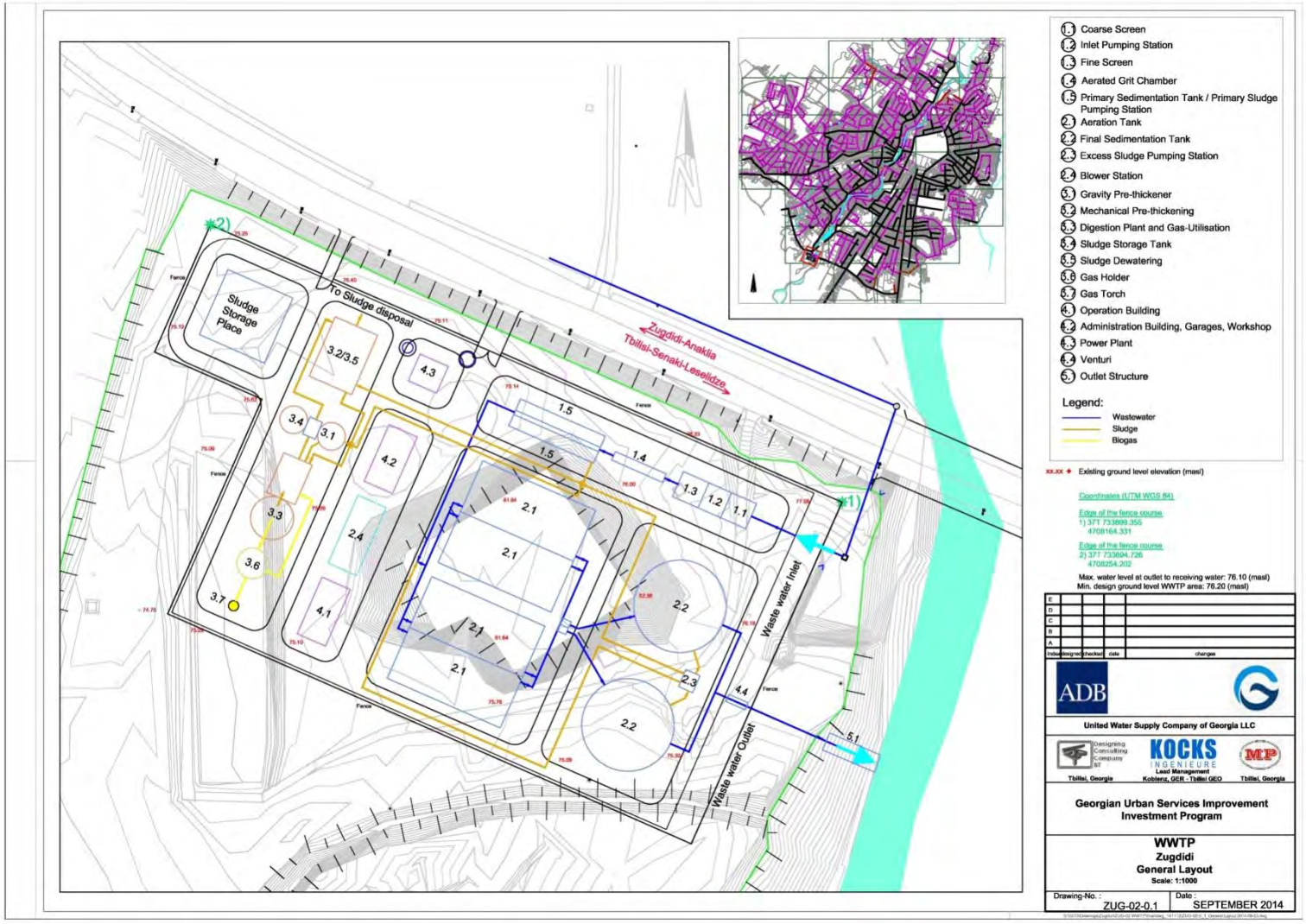
89. The final sedimentation tank will be designed under the following considerations:

- good separation of activated sludge from the reactor basin effluent
- partial consolidation of the settled solids for return to the reactor basin
- intermediate storage of activated sludge which is expelled from the aeration tank

90. The sludge treatment will have the following units:

- primary thickening of primary and excess sludge
- anaerobic stabilisation of sludge (digester)
- conditioning and dewatering of sludge

Figure 6. The new WWTP scheme



C.7 Sewage Sludge Management

91. After the sludge treatment, the sludge is stabilized, it is not digesting anymore and is has also been dewatered. The sludge quality allows its disposal on a landfill or use in agriculture.

92. There is a temporary sludge storage area at the WWTP that has sufficient volume to store the sludge for some weeks. From time to time the sludge shall be transported to the landfill of Zugdidi. A new landfill is in the project pipeline. UWSCG will provide transportation from the WWTP to the landfill.

93. Another alternative for the disposal of the sludge is its use as fertilizer in the agriculture. As there is no industry in Zugdidi the sludge quality is expected to be suitable for this usage. The WWTP is equipped with a storage place where sludge is temporarily stored and can be collected by interested farmers. UWSCG would give away the sludge for free; transportation would have to be provided by the farmers. After some weeks of operation, when UWSCG will have a better understanding of the quality and quantity of the sludge, UWSCG will announce the possibility to collect sludge from the site of the WWTP. Depending on the seasonal demand for fertilizer, the UWSCG will manage the temporary storage at the WWTP in such a way that a potential demand can be best served.

94. In view of the lack of Georgian legislation with regard to the use of sludge in agriculture, European regulations shall be considered in case the sludge will be used as fertilizer.

95. They provide that the use of sludge is prohibited:

- on grassland or forage crops if the grassland is to be grazed or the forage crops to be harvested before a certain period has elapsed (this period may not be less than three weeks);
- on fruit and vegetable crops during the growing season, with the exception of fruit trees;
- on ground intended for the cultivation of fruit and vegetable crops which are normally in direct contact with the soil and normally eaten raw, for a period of ten months preceding the harvest and during the harvest itself.

96. USA regulations related with the federal biosolids (treated sewage sludge) rule described in the EPA publication is contained in 40 CFR Part 503. Biosolids that are to be land applied must meet these strict regulations and quality standards. The Part 503 rule governing the use and disposal of biosolids contain numerical limits, for metals in biosolids, pathogen reduction standards, site restriction, crop harvesting restrictions and monitoring, record keeping and reporting requirements for land applied biosolids as well as similar requirements for biosolids that are surface disposed or incinerated. Most recently, standards have been proposed to include requirements in the Part 503 Rule that limit the concentration of dioxin and dioxin like compounds in biosolids to ensure safe land application.

D. DESCRIPTION OF THE ENVIRONMENT (BASELINE DATA)

D.1 Physical Resources

D.1.1 Atmosphere

97. The climate of Zugdidi Municipality is humid-subtropical. Usually the summer is hot and the winter warm. The average annual temperature shows +13.70C, the average temperature of August, the hottest month of the year, is +22.70C and the average temperature of January, the coldest month, is (+) 4.90C. Amount of annual rainfalls reaches 1 600 mm.

98. Table 6 shows average monthly and average annual temperatures of the city of Zugdidi. In addition, it presents the average minimum and maximum, both monthly and annual temperatures.

Table6.Average maximum and average minimum temperatures

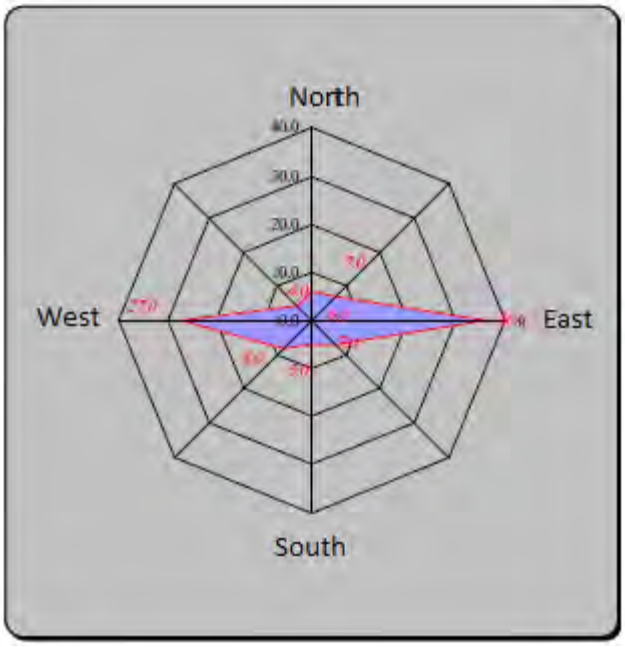
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
Average monthly and annual temperatures of atmospheric air	**4.9**	**5.5**	**8.2**	**12.3**	**17.0**	**20.3**	**22.6**	**22.7**	**19.2**	**15.1**	**10.5**	**6.7**	**13.8**
Average monthly minimal and annual temperatures	**1.1**	**1.6**	**2.7**	**7.4**	**11.5**	**15.3**	**18.0**	**18.0**	**14.1**	**10.0**	**6.1**	**2.9**	**9.1**
Average monthly maximum and annual temperatures	**9.7**	**10.4**	**13.6**	**18.3**	**23.1**	**25.6**	**27.9**	**27.8**	**25.1**	**21.6**	**16.3**	**11.9**	**19.2**

99. The climate is influenced by geographic location, complicated terrain, radiation regime and circulation processes dominated in the atmosphere. Coming breezes from the Black Sea (surface area 400 thousand km²) have significant influence, also plain and mountain winds which flow from the plain towards mountains during a day and from the mountain towards plains during a night, so called Foehns, warm dry winds which flow from mountains to the plain. Monsoon type winds are well expressed.

100. Climate in Zugdidi is marine humid subtropical, with warm winter and hot summer and clearly established monsoon winds. The direction of winds is strongly influenced by the breezes from the Black Sea (with 400 thousand sq.km of the surface area) as well as valley and mountain winds directed from the valley to mountains during the day and vice versa at night. Table 7 presents repentance of wind directions in %. As we see from the table, mainly West or East direction winds prevail.

Table 7. Repentance of wind directions in % (annual)

North	Northt-East	East	South-East	South	South-West	West	North-West	No wind
6	7	36	7	5	8	27	4	53



101. Average annual wind speed in the region is about 1.3 m/sec. Annual average number of strong (15 m/sec and higher speed) windy days is 66. Table 8 shows average monthly and annual wind speeds (m/sec).

Table8.Average monthly and annual wind speeds (m/sec)

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
1.4	1.5	2.1	1.8	1.4	1.2	1.0	0.8	0.8	0.8	1.8	1.1	1.3

102. Average rainfall in a year is 1616 mm, from this maximum inSeptember (165 mm) and minimum in May (107 mm). Average humidity 72% and number of sunny days210. Table 9 presents average monthly and annual rainfalls.

Table9.Average monthly and annual rainfalls

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
138	125	119	110	107	142	163	142	165	140	129	136	1616

103.Snowy sediments are rare, but cover of snow may occur in winter months for little time. Average height of snow is 3-9cm. Winter with much snow is rare; if it takes place snow cover reaches 78cm height.

D.1.2Ambient Air Quality

104. According to the visual audit results, no stationary sources contributing to ambient air contamination are located within the study area. The quality of the ambient air in the study area may be affected by exhaust gases produced by machinery and transportation means operating in the sites of the nearby container terminals and production facilities, as well as by the vehicles moving along the city bypass road. It is obvious that no air quality gauging stations exist in Zugdidi for years, and therefore practically no air quality data are available for the project impacted area. Baseline data for dust generation will be collected by the construction contractor before starting of the construction activities and will be monitored over the construction period, compared with this baseline data established during the pre-construction. Also as actual civil works may start 9-12 months later, the baseline data obtained immediately before starting of civil works are more appropriate for monitoring needs.Due to such situation, it was found reasonable to apply the methodology approved by the Ministry of Environment and Natural Resources of Georgia (РД 52.04,186-89). This methodology recommends application of the population-based approach for evaluating the baseline ambient air condition for the areas lacking any observation data (**Table 10**).

Table 10: Recommended baseline pollution levels by population quantities

Population ('000 persons)	Baseline pollution level, mg/m^3			
	NO_2	SO_2	CO	Dust
250-125	0.03	0.05	1.5	0.2
125-50	0.015	0.05	0.8	0.15
50-10	0.008	0.02	0.4	0.1
<10	0	0	0	0

105.The baseline pollution data required for estimating the ambient air impact were determined based on the above methodology with consideration of Zugdidi's population (>50,000), specifically:

- Nitrogen dioxide: 0.015 mg/m³;
- Sulphur dioxide: 0.05 mg/m³;
- Carbon oxide: 0.8 mg/m³;
- Dust: 0.15 mg/m³.

D.1.3 Geology

106. The project area is situated in the Central Caucasus and in Kolkheti depression. In terms of tectonic development, the major part belongs to Kolkheti tectonic depression, which is bordered with the Black Sea basin to the west and Fanavi and Samagrelo (Egrisi) ridges to the north. Poti-Askhi and Kurzu-Khikhadziri deep faults are located within this area. Erosive forms of mezo and micro relief riverine accumulative terraces are widely spread. According to seismic zoning map, Georgia is classified into Zone 6 to Zone 9 (in increasing order of seismic intensity, Map 5) and Zugdidi falls under Zone 8 (high seismic intensity zone). There has been no history of major earthquakes in Zugdidi.

107. By geomorphological viewpoint the site 'Zugdidi" is located at South-West extreme of Odishi plateau ("half plain"), at the border of Kolkheti lowland and terrace-like surface from North-East. Here high terrace step sets against marshy surface of Kolkheti lowland by steep precipice slope. Terrace step is represented by planar surface, with slight cut slope in South-West direction, with absolute elevations within 86-103m. The surface is slightly dismembered by small water conduits of local

hydrographic network, sach as: the rivers Chkhoushi, Sintsa, Jumi and others. On the mentioned surface the city Zugdidi and surrounding villages are located.

108. The studied site is located on high third terrace surface of the river Enguri; it is structured by cobbles with lean clayey filling. Their total thickness is about 40m. Fragmental materials are well treated; they are mostly close to spherical or elongated shape. According to mineral content they consist of varieties of sedimentary, magmatic and metamorphic rocks.

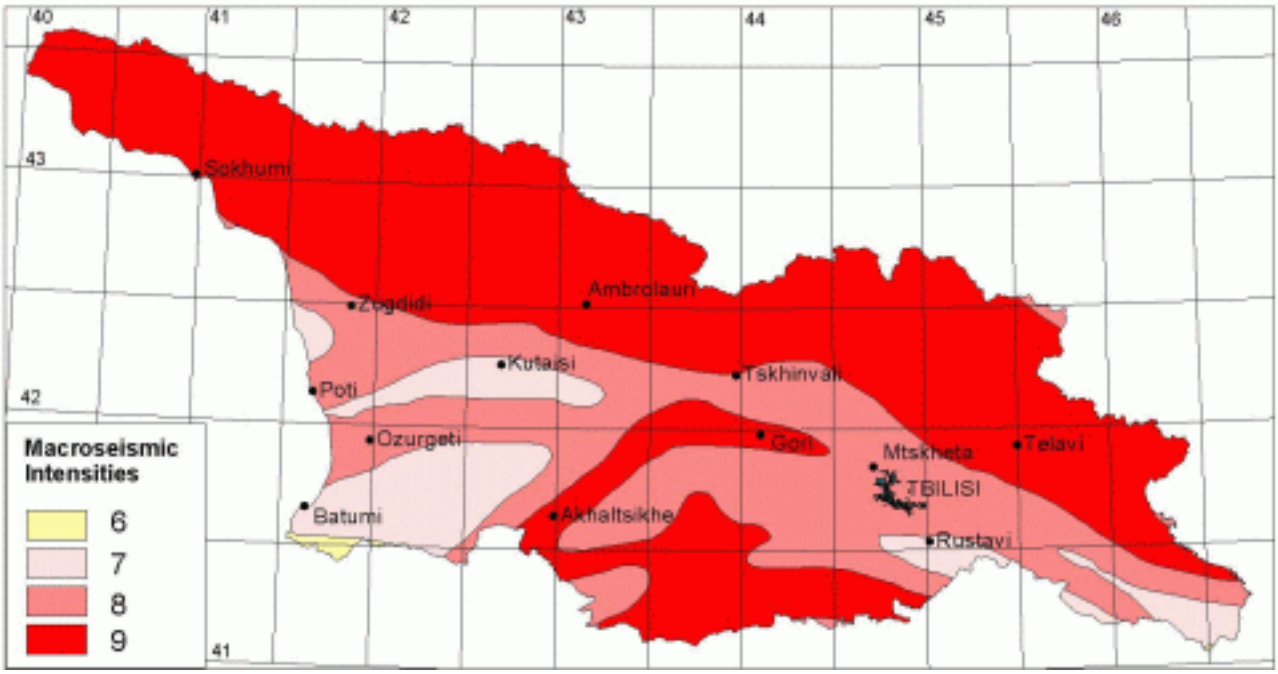
109. The investigated territory conditionally can be divided into two sites according to geological structure, geomorphologic, engineering-geological and hydrogeological conditions of the area: _ The first site is the largest and covers almost 90% of Zugdidi territory. The surface is almost plain, slightly bending to North-West which moves to slightly expressed steppy-hilly line at North-East. Absolute elevations are within 85-120m boundaries. The second site covers coast line of the river Chkhoushi and river Kuchkhobini and I over-floodplain terraces changed by antropogenic factor. Geologically it is structured by Upper Pleistocene (aQ3) and recent Quaternary deposits (aQ4) as well.

110. Natural outlets of groundwaters are not observed at the site. In alluvial deposits weak water appearance is observed at 1.5-4.0m depths, but total water containing horizon is below 5m depth. At the mentioned depth alluvial deposits are practically anhydrous.

D.1.4Seismicity

111. Zugdidi area is located in the active seismic zone. Due to this, the terminal shall be designed and constructed in compliance with the requirements stipulated in the applicable Georgian construction standard Seismic Resistant Construction (PN 01.01-09)., The area selected for construction of the project facility is located in the seismic intensity zone 8 (MSK 64 scale), which dimensionless seismic coefficient 'A' equals to 0.15.

Map 3.Seismic Zone Map of Georgia



D.1.5 Soils and fundamental landscapes

112. The Colchis Lowland occupies the largest area within the mountainous lowlands zone of the West Georgia, which is created by accumulative processes of Enguri, Khobi, Rioni, Tskhenistskali and other rivers. This lowland borders the Black Sea at the West and continues to the city of Zestaponi to the East. The zone of mountainous system is presented by river parting ridges and their branches. Water parting of Svaneti ridgeriver Enguri and Tskhenistskali, Samegrelo and Lechkhumi ridges-water partings of Enguri, Tskhenistskali and Rioni.

113. The multicomponent of soil cover of the region is connected to the large diapason of its hypsometry (50–3000 m) and to the amplitude of fluctuations of the connected climate factors (rainfalls, temperature). Plant covers are also characterized by such large scopes. In addition, the variety of soil building rocks also influence the large diapason of the spectrum of soil cover-outflowing, carbonate-noncarbonated, alluvium, delluvial soils, shales, conglomerates andsalted deposits of terrigenic character.

114. Anthropogenic factor plays a big role on the type variety of the soil. Due to the influence of this factor peatbog subtropical yellow land-Etseri was created on the Kolkheti lowland and wetland-arable soils on the places of other soils.

115. According to the classification of the region's soil districts, the project zone is located in the area of hilly-knobby frontmountaneous red and yellow soil zones, namely, on the territory of Samegrelo (Zugdidi-Martvili) humus-carbonatic and sub-region of red soils

D.1.6 Surface Water and Groundwater

116. Surface Water. Georgia is rich in water resources; there are in all 26,060 rivers with a total length of ~ 59,000 km. Besides, there are many thermal and mineral water springs, lakes and man-made water reservoirs. These however are distributed unequally, with major concentration in the western part of the country. Nearly all rivers of East Georgia flow into the Caspian Sea while and the rivers in the west join the Black Sea. The project area is located in lower reaches of the Enguri River Basin.

117. Originating from Namkvani Glacier in Greater Caucuses Range and flowing into Black Sea in the west, the Enguri is one of the biggest rivers in Georgia. It traverses a distance of 213 km, during which it is joined by a number of small and large streams/rivers. River flows through hilly region in the upper parts, before the Enguri Dam at foot hills.

118. Supply for the proposed project will be sourced from Enguri Dam, on River Enguri, just upstream of Dzvari Town. This is a hydropower dam, and is the world's highest concrete arch dam. The construction of dam was started in 1961, but became fully operational only in 1987. Enguri Hydroelectric power station generates over 40% of the total electricity supply of Georgia. the dam is exclusively used for power generation; water is released to power station located in Abkhazia via a diversion channel. Dam has seven bottom gates through which surplus water is released. Water is

also released downstream regularly to maintain minimum environmental flow however there is record of water releases from the dam either for power plant or downstream discharges.

119. The river is fed by glaciers, snow and rainfall, and experiences floods during the warm seasons and lower flow in colder periods. In July-September flow is very high, caused both by snow melting and the rainfall. As show in Figure 1, generally water level in Dam is high in July-August (summer) and minimum in March-April (winter). In the last 10 years, water level in the Dam has always been above the requirement for power plant diversion channel, except in April-May 2006, which recorded a lower level of 389.86 m. It shows that the dam holds good volume of water throughout the year.

120. The river is divided into three parts as shown in Map 4. Due to steep slopes in the upper portion, the river is deep, flow is turbulent and carries heavy loads of silt, which accumulates in Enguri Dam on the foothills near Dzvari Town. The river is wide and shallow in the lower reaches.

1.6.1 Short hydrographic Characterization of the river Chkhoushia

121. The River Chkhoushi originates at the crossing of the two rivers – the big and the small Chkhoushi, on the front part of the southern slope of Samegrelo ridge, 1.5 km south to village upper Etseri, at the heightof 198m above sea level, and it meets the Jumi river from the right side at village Dididzeni, 1 km-s away west**.**

122. The river length from the big Chkhoushi head to the project crossing point equals 28.8 km-s, total fall – 384 m, average inclination – 12%, catchment basin area – 63.5 km2. The river has 111 tributaries with total length of 194 km-s. Its main tributaries are the big Chkoushi (length of 18km-s), the little Chkhoushi (15 km-s) and Kakhati (14 km-s).

123. The river basin is located on the left side of the lower flow of the river Enguri. Its watershed benchmark varies between 300-400 m-s and 40-50 m-s.The river gorge has a trapeze shape up to Zugdidi town, and down it is shown slipshod. The width of the river's double terrace varies between 0.3-0.4 km and 1.0-1.5 km-s. Near Zugdidi, the terraces link to the lowland located alongside. The river-bed is moderately sinuous without many branches. Flow width varies between 10-35 m-s, depth between 0.3-0.6 m – 0.8-1.5 m, and the speed between 1.5 m/sc – 0.1 m/sc.The average annual water consumption of Zugdidi town is 2.22 m3.sc. maximum – 160 m3/sc.

124. The river basically is nourished by the rain and ground waters. Its water regime is characterized with the freshets that are typical to the Kolkheti lowland during the whole year. In Spring time 28% of the annual wastewater is discharged, in summer – 14-15%, in autumn – 22% and in winter 34%. No ice facts are observed on the river.

125. The river is used for village mills operation.

1.6.2 Water Consumption Maximum

126. The river Chkhoushi flow has been surveyed at Zugdidi crossing for 9 years (1946-1954). During the period maximal consumption of the surveyed water varied between 10.6 ^{m_3}/sc (1951) 60.00 ^{m_3}/sc (1948).

127. It is essentially known that in order to determine maximal water consumption volume, 30 year data is required, which doesn't exist in the river Chkhoushi case. It is unacceptable to restore the

consumption rate or make its turn longer. Therefore, maximal consumption of the river Chkhoushi at the project crossing is determined with the method that is shown in “Technical Direction Report of the River’s Maximal Flow in Case of Caucasian Conditions”

128. Based on the method, maximum expense of water for the rivers with maximum catchment basin area 400 km^2 is calculated with the following formula:

$$Q = R \cdot \left[\frac{F^{2/3} \cdot K^{1,35} \cdot \tau^{0,38} \cdot \bar{i}^{0,125}}{(L+10)^{0,44}} \right] \cdot \Pi \cdot \lambda \cdot \delta \text{ m}^3/\text{sc}$$

129. Where R refers to – regional parameter. It equals 1.35 with the west Georgian conditions.
F – catchment basin area at the project crossing km2

K – regional climate coefficient that is inserted from a special map

τ _ repeat in years;
$\bar{i}$ _balanced inclination of the river from head to the project crossing
;
L _ the river length from head to Project crossing in km-s

Π _characterising coeficient of the topsoil located in the river’s basin. It is inserted from a special map and a table.

λ _ basin forestry coeficient, that is calculated according to the formula

$$\lambda = \frac{1}{1 + 0,2 \cdot \frac{F_t}{F}}$$

130. Where F_t – basin área covered with a forest in %-s that equals to 40%, from which λ =0,93;
δ _basin shape coeficient. It is calculated according to the formula

$$\delta = 0,25 \cdot \frac{B_{\max}}{B_{sas}} + 0,75$$

where $B_{\max}$ _ basin maximum width in km-s

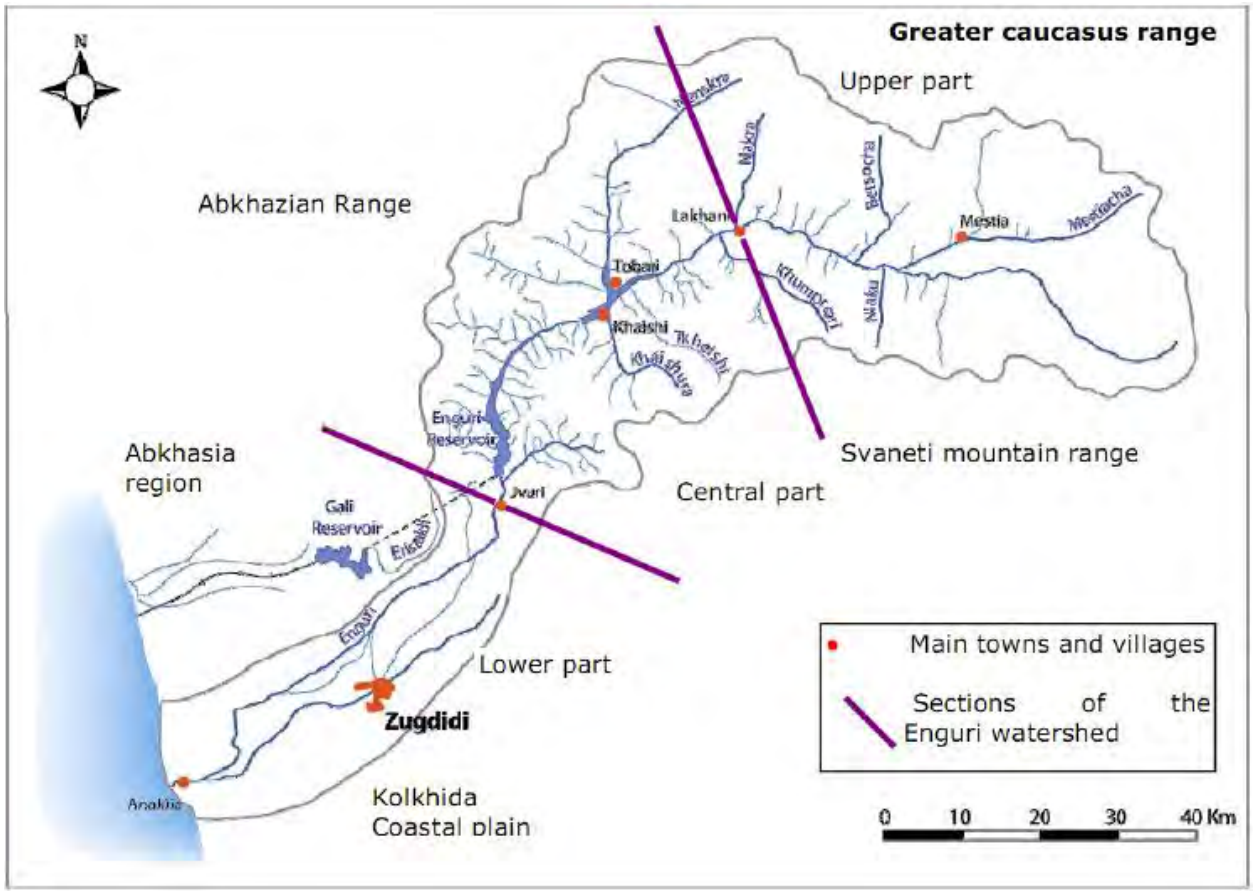
B_{sas}_ basin average width in km-s. It is calculated according to the formula $B_{sas} = \frac{F}{L}$;

131. In order to calculate maximal water expense of the river, definitions of required morphometric elements, with the defined scale 1:50000, according to the topographic map as well as calculated according to the formula above for repeats of years: 100, 50, 20 and 10, maximal expenses for the project treatment plant crossing are shown below in table #18

Table 11.Maximal water expenses of the river Chkhoushi in m 3/sc-s

Crossing	F km^2	L km	i kal	λ	δ	Π	Maximum expense			
							$\tau=100$ year	$\tau=50$ year	$\tau=20$ year	$\tau=10$ year
Project	63.5	28.8	0.012	0.93	1.18	1.19	300	230	165	125

Map 4. Enguri River Basin



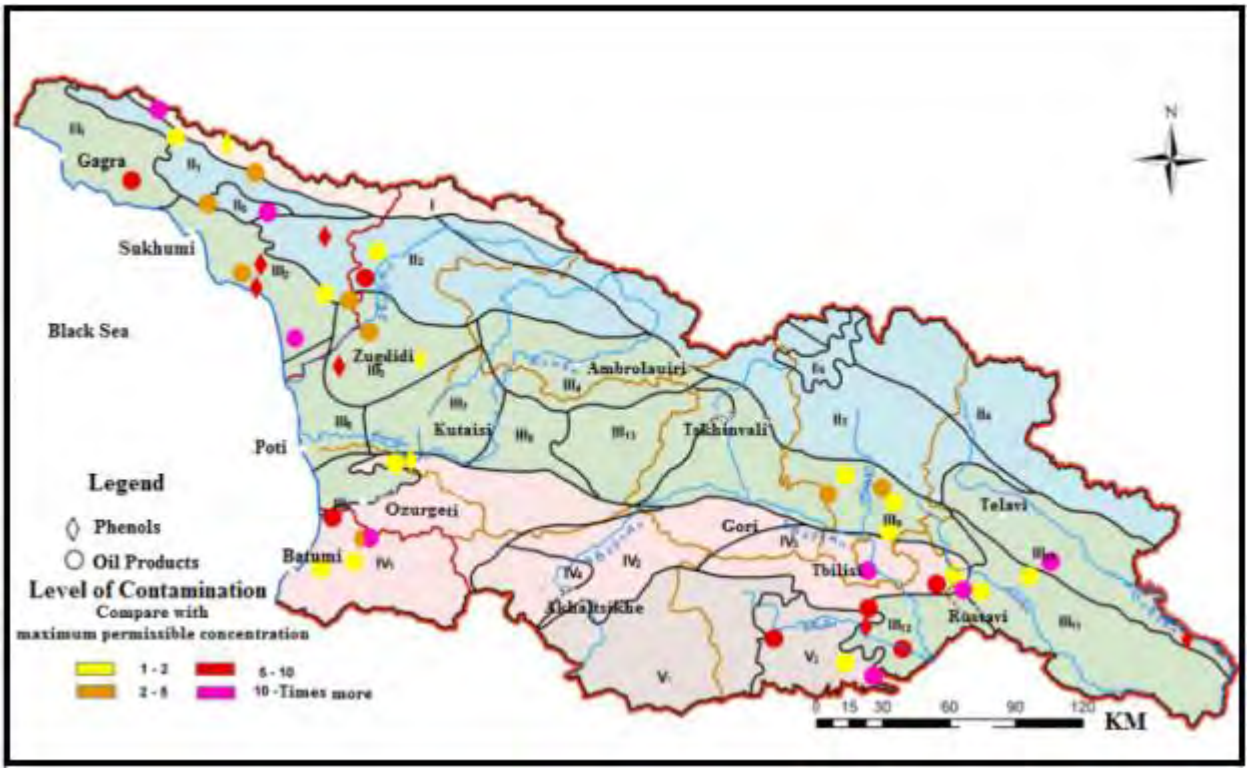
132. **Table 11.** In the frame of project on 22.10.2014 has been done a chemical analysis of water ofriverChkhoushias baseline, an analysis that is given in Annex 4.

133. Chkhoushi water sample was taken at the location of the old WWTP.

134. **Groundwater.** Based on the groundwater characteristics, Georgia is divided into five hydro-geological zones, which are further defined into sub-zones/districts. Project area, Zugdidi is in Zone – III (Artezian basin zone of Georgian belt) and in hydro-geological district- III3 (Fractured and fractured/karstic artesian basin of Samegrelo). The water in this artesian zone is abundant, and towards the coast the utilizable groundwater is limited.

135. The depth of groundwater is about 5 m and towards the coast it is between 1-2 m. Groundwater in the densely populated areas shows the presence of Nitrogen compounds - nitrates, nitrites, and ammonia, mainly due to leachates from poor sanitation systems.

Map 5. Hydro-geological Zones



D.1.7 Biological Baseline

136. Information on biological baseline of the project area is prepared on the basis of the materials given in literary sources and field survey results. Field surveys have been conducted in February, 2014.

D.1.7.1 Flora

137. As a visual audit has revealed, the project area is an illegal landfill,where the land surface is almost entirely covered by the household and construction waste. There are a lot of reinforced - concrete construction waste remained from the old treatment plant.

138. Considering this, only ruderal plants are spread throughout the project area. This plants are: Angel's trumpets (*Datura stramonium*), Henbanes (*Hyoscyamus niger),* Mugwort (*Artemisia vulgaris*), Rough cocklebur (*Xanthium strumarium)*, Thistles (*Cirsium)*, Belvedere (*Kolchia scoparia)*, Garget (*Phytolacea americana);* Liana and thorny plants are:Blackberry *(Rubus),*Greenbrier (*Smilax excelsa*), Dog rose (*Rosa canina)* and Fern (*Pteridium tauricum*).

139. In addition to the above mentioned plants, there are bushes of Nutwood *(Corulus avelana)*, Privet (*Ligustrum vulgare)*, Cherry plum *(Prunus divaricata),* Tree of heaven

(*Ailanthus altissima*) and white mulberry (*Morus alba*). They are barely visible in the areas covered by Blackberry *(Rubus)*and Greenbrier (*Smilax excelsa*). None of the big tree has been observed on the project area.

Figures 7 and 8.Vegetation of the project area

D.1.7.2 Fauna

140. None of the species of mammals have been recorded during the visual audit of the project area. As mentioned above there are a lot of reinforced - concrete construction waste on the project area. It can be used as a shelter by a bat.

141. The area is near the residential area and is strongly contaminated by household waste. Therefore, the spread of rodents and different types of sinanthropus animals is inevitable.

142. The following species of **birds** have been observed during the visual audit: Carrion crow (*Corvus corone*), Common Gull (*Larus radibundus*), Eurasian Tree Sparrow (*Passer montanus*). It is noteworthy that the banks of the river and floodplain areas will be used by water-loving birds during the active migration period.

143. The area is a favorable environment for the propagation of **reptiles** (river, dumping area, warm environment, waste of the reservoirs full of water, etc.). The following specieas are spread there: European legless lizard *(Pseudopus apodus*), grass snake (*Natrix natrix*), Green Lizard (*Lacerta media*). Lake - swampy areas are favorable for Caspian terrapin (*Clemmys caspica*).

144. Marsh frog (*Rana ridibunda*) is inhabiting in the existing waterlogged facilities.

145**. Chkhoushi River:** based on the information obtained from local residents (fishermen) the river do not stand out by ichthiophauna diversity**.** Distribution of fish in the rivers is determined by vertical zoning; In addition it depends on the width and slope of the river. Considering the landscape of the municipality and the river outflow area,four zones are separated, each of which is characterized by a particular community: Bream zone, barbel zone, grayling zone and trout zone. This river belongs to the ecosystem of bream zone.

146. The ecosystem of this zone is inhabited by freshwater fishes. According to the information obtained by local fishermen, following fish species are found in the project section:

Bream (*Estern bream*), Anemone (*Alburnoides fasciatus*), Colchis minnow, Caucasian river goby, Colchis barb and Colchis khramulya.

147. **Invertebrate animals –** favorable conditions are for the following species: Roundworms (*Nematoda*), Arachnids (*Arachnida*), oligochaete (*Oligochaeta*), Cockroaches (*Blattodea*), lepidopterans (*Lepidoptera*), flies - mosquitoes, flies (Diptera) and others.

D.1.7.3 Summarizing the Results of a Preliminary BiologicalSurvey of the Project Area

148. According to the survey results, habitats and species of flora and fauna of high conservation value are not presented in the project area. Only one protected specie may inhabit in Chkhoushi river and it is Colchis khramulya (*Capoeta sieboldi*). Though, if we consider the specifics of the planned activity, a significant impact is not expected.

149. Any signs of cultural heritage existance in the project area have not been recorded during the visual audit and the risk of late discovery of archaeological sites is minimal due to the high anthropogenic load (previously, the project area was used for operating the old teatment facility of Zugdidi).

D.1.8 Noise and Vibration

150. As determined in result of the audit, no fixed noise and vibration sources exist within the study area. Baseline data (noise and vibration) will be collected by the construction contractor before starting of the construction activities and will be monitored over the construction period, compared with this baseline data established during the pre-construction. Also as actual civil works may start 9-12 months later, the baseline data obtained immediately before starting of civil works are more appropriate for monitoring needs. The noise propagated over the area is mainly generated by the moving vehicles and the special machinery operated at the container terminal sites. For evaluating the background noise levels in the study area, instrumental measurements were carried out using noise and vibration measurement device Digital MultiMeter (this device has passed the metrological certification testing). The measurements were conducted during daylight hours (from 11:00 to 18:00), three measurements per day, and the average value was recorded as the background level. The results of noise level study are given in **Table 12.**

Table 12.Results of noise level study

Measurement point number	Measurement point description	Sound levels / Equivalent sound levels, dBA
1	Project area	48,2
2	Nearest residential zone	45,6

151. According the measurement results, the noise propagation levels within the study area do not exceed the statutory limits.

D.1.9 Natural Background Radiation

152. In Georgia, the radiation safety issues are regulated by the Laws of Georgia on Health Care, and on Nuclear and Radiation Safety, and the secondary legislation including Radiation Safety Limits (RUN-2000), and Principal Hygienic Standards Applicable to Handling Radioactive Substances and Other Ionizing Radiation Sources. In May, 2014, monitoring of the

background radiation was carried out in the study area aiming exploration of the background gamma radiation and identification of the possible non-controlled radioactive sources.

153. It should be stated that the natural radiation background in Zugdidi surrounds varies in the range of 8-15 μR/h, and remains stable during the last years. The radiation monitoring was conducted using the dosimeter RADEX intended for determining the background gamma radiation for the area.

154. The open parts of the project area were checked in detail during radiation monitoring process. The measured background gamma radiation rates for the study area varied from 7 μR/h to 15 μR/h that is within characteristic interval for Zugdidi surrounds. Neither uncontrolled radiation sources nor any radioactive contamination was revealed.

D.2 Socio-Cultural Resources

D.2.1 Demography

155. The territory of Zugdidi Municipality occupies 683 km², population number 171.6 thousand, population density-251 persons on km².The Municipality is divided into territorial units: 1 city of Zugdidi, 17 communities and 12 villages (59 inhabited localities).Big villages: Inghiri (5,8 thousand), Kakhati (5,9 thousand)and Rukhi (5,2 thousand). The table 14 shows number of population of Samegrelo-Upper Svaneti and Zugdidi for the last 10 years.

Table13.Number of population (as of January 1st)

Year	2004	2005	2006	2007	2009	2010	2011	2012	2013	2014
SamegreloUpper Svaneti	**460.4**	**471.0**	**469.8**	**467.7**	**468.0**	**474.1**	**477.1**	**479.5**	**476.9**	**476.3**
Zugdidi Municipality	166.2	172.2	172.1	171.4	171.6	175.0	176.6	178.2	177.2	177.0

156.98.2 % of population in Zugdidi are national Georgians. We meet very few representatives of other nationalities in the city, mainly they are Russians (0.9%), Abkhazians (0.1%),Ukrainians (0.1%) and other.

157. The Municipality of Zugdidi is the biggest centre after Tbilisi in the regards of internally displaced persons. Their total number in the municipality makes 43 603. Among them number of the inhabitants in orderly settlements reaches 14 632 and the other30 971 in private settlements. Number of pensioners on the territory of Zugdidi Municipality is 31,672 as of December, 2013.

D.2.2Medical Outpatient Facilities

158. As of 2012, 21 medical-outpatient facilities function on the territory of the municipality. Should be mentioned “Zugdidi Medical Centre” after Saint Luka established on the 31 Republic Medical Complex, which fully satisfies modern European standards. The blood transfusion centre also functions on the base of the same complex.

D.2.3 Training Educational Institutions

159. As of 2013, 59 schools function on theterritory of the municipality, among them 50 public, 1 basic and 8 private schools. Number of preschool institutions (kindergartens) is 56, among them9 are the private ones. There are also 2 high educational institutions in the city of Zugdidi (ZugdidiIndependent University and Shota Meskhia State Teaching Institute). Care home for orphans and disabled children also functions on the territory of the Municipality (village New Abastumani), as well as the residential school for homeless children (city of Zugdidi).

D.2.4 Agriculture

160. Agroclimatic conditions are very advantageous for the establishment of multisphered and high rentable agricultural productions, especially for the development of such spheres as walnut cultivation, maize cultivation, tea-growing, cultivation of subtropical cultures (citruses, laurel, guavasteen and other), fruit trees, monocyclic plural cerealsand vegetables.

161. The whole area of agricultural lands in Zugdidi Municipality makes 36,316 ha, among them:

- arable land - 13,110 ha
- multiyear plants - 7,419 ha
- pasture land - 6,271 ha

162. As of 2009, in the Municipality of Zugdidi were cultivated1.2 thousand ton of mandarin,25 ton of orange, 50 ton of lemon,9400 ton of nuts, 625 ton of laurel, 350 ton of kiwi fruit, 30 000 ton of maize and300 ton of tea.

163. The main export products of the agriculture are walnuts and fruits of citrusand kiwi. Especially the production of walnuts was increased as export demand on this increases year by year.

164. Several walnut reprocessing factories are presented in Zugdidi Municipality. These factories take the ready production for the export. Tea reprocessing factories function on the half base. It should be mentioned that the Georgian Tea „Gurieli“ is produced exactly in Zugdidi Municipality (village Rukhi) which also goes on export.

165. Unfortunately, factories of tinned and fruit productions do not function. These factories earlier were proceeding local raw materials. As a result of this, more people were employed in that period. Taking into consideration that big agricultural industries are not located on the territory of Municipality, farming establishments are mainly met in individual and small scales. The service agro-centres of the village and also the service centres and the level of their equipment are very essential for the development of the agriculture.

D.2.5 Motorways

166. Km motorway is registered in total on the territory of Zugdidi Municipality, from this351 km with black cover (asphalted road) and 240 km gravel road. As we see the significant part of the roads(40,6%) is gravelled and needs to be asphalted. It is nec-32 essary to mention that condition of inner roads is significantly improved compared to the recent years. The inner roads of the village were rehabilitated with the sums from central and local budgets, asphalting of Inghiri-Oktomberi-Kakhati and Kakhati-Orsanti motorways was financed by the Municipal Development Fund of Georgia, as well as asphalting the streets of the city, this process is still going on for the moment.

167. The length of motorways according to the categories:

- international significance - 25 km, completely asphalt or concrete surface
- national significance - 120 km, completely asphalt or concrete surface
- local significance (without city roads) - 276 km. Thereof 115 km with asphalt or concrete surface and 161 km with gravel surface.

168. As for the condition of inner roads of the city, total length of inner roads and streets in Zugdidi makes 170 km, among them: asphalted-91 km, gravelled–79 km. There are located approximately 80 path and auto bridges, their total length reaches app. 1600 m.

D.2.6 Waste Management and Landfill

169. The Municipality of Zugdidi has a functioning land fill on the territory of the Village Chitatskari, area- 6 ha. The land fill annually receives about 40-45 thousand m³solid and construction waste. For the moment the functioning land fill ground is almost overloaded. Environmental condition of the land fill is not satisfactory because the existence of ground waters and specificity of the soil do not give possibility to bury and punch the loaded waste. According to the above mentioned, the existing land fill does not satisfy modern requirements.

170. The construction of the new land fill complex is completed on the territory of Village Tsatskhvi. The area of the land fill is calculated up to 10 hectares together with reprocessing andrecycling.

D.2.7 Water Supply System of Zugdidi Municipality

171. On the territory of Zugdidi Municipality Water Supply is implement by three following systems: a) boreholes, b) individual wells, c) village water lines without system.

172. It should be mentioned that the length of inner water network of the city makes 120 km, which is not functioning from 1993. 60% of the population is not connected to water supply network and they getwater from4015 existingArtesian wells.

D.2.8Wastewater System

173. The total length of waste water system of Zugdidi is 67km. Annually 3,000 m³ used water flows into the waste water system. The wastewater system can not provide service for the whole city (42% of the total population is not connected to the sewerage system) and accordingly it is necessary to rehabilitate and enlarge the network. The existing system does not have waste water treatment plant.

D.2.9 Transport

174. The central highway of Georgian railway goes on the territory of Municipality.The following stations are locatedon the territory of Municipality: Khamiskuri, Tsaishi, Ingiri and Zugdidi. In addition there is a motor highway to the direction of Abkhazia on the 33 territory of Municipality (Tbilisi-Sukhumi). As of today, 32 (inside the city) and 56 (in outskirts) regular travelling routes are functioning on the territory of Zugdidi Municipality. Internal routes are daily serviced by 59 buses, among them 13 medium and 46 of small capacity. Recently opened Ltd „MunicipalTransport“ takes passengers by comfortable buses (brand „Bogdana“) and serves with cheaper prices on internal andoutskirt routes.

175. 4 bus terminals and 3 bus cashboxes function in the city. Small buses are connected with them considering the direction of the route outside the Municipality towards all big cities of Georgia.

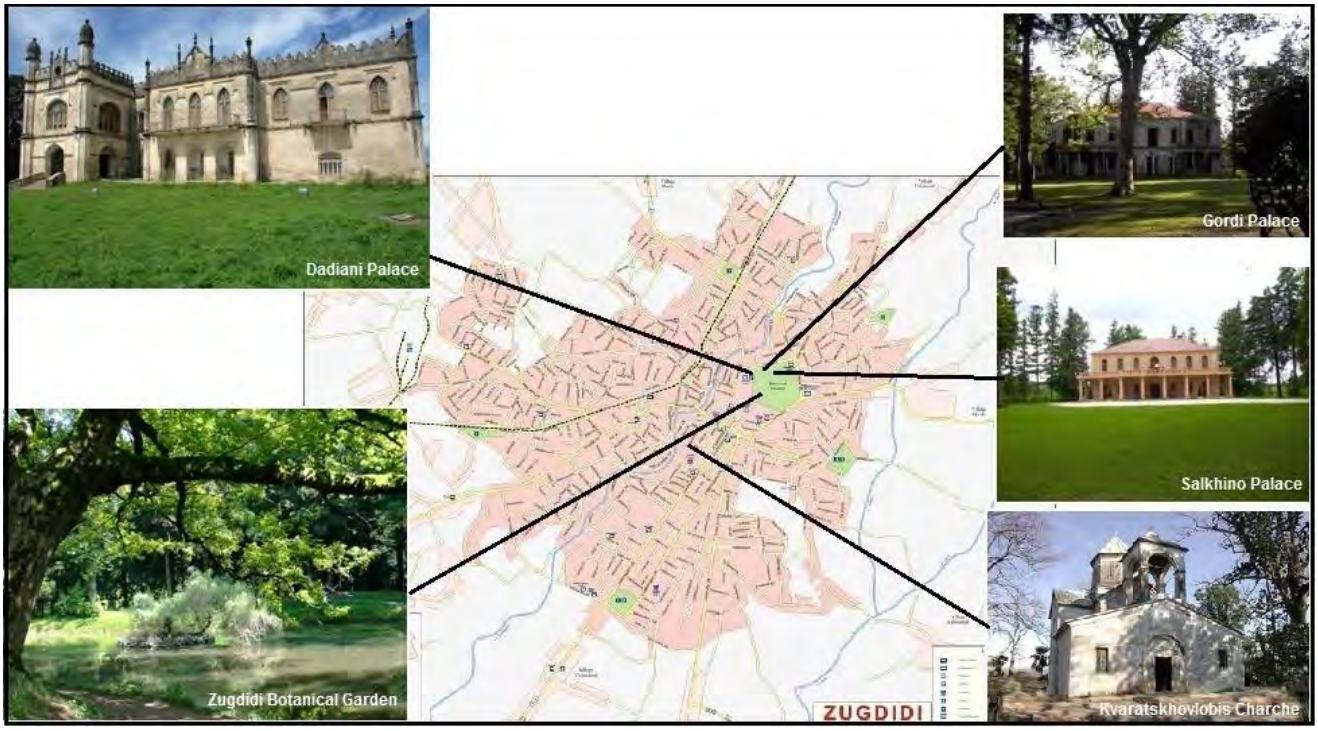
D.2.10 Cultural Heritage

176. Several buildings in Zugdidi may be attained to the cultural heritage, including:

- Zugdidi Octave church, called ‘mantskhvarkarish” with love by the population, has become a symbol of the town.
- Dadiani Palace – historical-architectural museum of Dadiani palaces is located in the palace complex (the queen’s palace, Niko’s Palace, Moon Temple and a decorative garden surrounding the palace) of Samegrelo region.
- Gordi palace
- Salkhino Palace
- Zugdidi botanical garden

177. The figure below shows that in Zugdidi town historical monuments are mostly located in the central part of the city.

Figure 9. Zugdidi -Historical Monuments Layout



D.2.11Tourism

178. The Municipality of Zugdidi is significant for the tourists because of its historical past and plenty of monuments. Archaeological materials and material cultural monuments, discovered on the territory of Zugdidi, prove that humankind permanently lives here from the Stone Age up to nowadays. The settlement of the modern city Zugdidi was established in late feudal age. Exactly in this period are mentioned Anaklia and Zugdidi among other settlements of Samegrelo as “small cities”. The first one was the harbour port and the second the residence of the Samegrelo head and the trade centre. Major development of Zugdidi starts during the period of Davit Dadiani, the last principle of Samegrelo. In the 50ies ofXIX century, in the period of Davit Dadiani, the Garden of

Zugdidi Palace was already known. Development of the industry is also connected with the name of Davit Dadiani. He made foundation for the construction of the silk factory in 1848.This factory was the first industry in Samegrelo. The thread of high quality, produced in the factory, was expensive, it was exported in Russia and the cities of Europe. Davit Dadiani also became famous by creation of cultural institutions, establishment of the library, creation of the chessfollowers club where Andreya Dadiani, the world famous chess player, was learning to play chess. Today the Dadiani Palace represents historical and architectural Museum of Zugdidi where is kept the Holy Robe of the Mother of Jesus. There are many other blessed part together with the Holy Robe of the Mother of Jesus: Arm of Saint Mariane, hand Palm ofSaint Kvirike, Part of Thigh Bone of Saint George and Part of the bone of Saint John the Baptist. Together with other distinguished elements there are kept the mask of Napoleon Bonaparte and personal things in the Zugdidi Museum. In the hall of the palace there are exhibited works of world known Georgian, Russian and Foreign painters and samples of decorative art.

E. ANTICIPATEDENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

E.1 Summary of Activities and Anticipated Impacts

179. Proposed wastewater treatment plant project will certainly produce some environmental impacts in project area. Activities to be performed within the scope of the Project were examined in 2 phases:

180. ***A. Construction Phase***

- Pre-construction activities such as contractor office set ups, necessary equipment stacksand the site preparation
- Construction of the Treatment Plant per tender drawings

181. The project area has to be cleaned up from illegally disposed waste before starting the project. The disposed waste varies up to 100 m^3 on the initially examined territory. Containing mixed waste asbestos materials represents a problem, the average quantity of which is 5-6 m^3. The waste belongs to a high risk waste and the fact requires involvement of specialists with relevant qualification and experience at the preliminary stage.

182. In addition a large number of inert wastes are generatedon the WWTP project site, at a demolishing stage of a malfunctioning old WWTP. The demolition of the infrastructural unit generates approximately 2,600 m^3 of inert waste. The originated inert waste will be removed to Zugdidi municipal landfill under the agreement with the solid waste management company.

183. Environmental effects likely to occur during the construction of the Project are noise, dust, solid and liquid wastes. Effects likely to occur during the construction phase are short term effects and they cannot deteriorate the existing conditions.

184. ***B. Operational Phase***

- Commissioning and Operation of the Wastewater Treatment Plant
- Use of treated effluent for irrigation or/and dispose of on the landfill.

185. Possible environmental effects during operational phase arise from effluent discharge, solid and hazardous wastes, sludge disposal and odor and do not include any adverse environmental effects as long as monitoring and mitigation measures, if needed, are executed.

186. This paragraph provides a brief description of anticipated site-specific impacts related to the construction phase of the sub-project “Improvement of Zugdidi waste Water Supply system”.

Table 14.Site-Specific Impacts

#	Pre-Construction Phase. Potential Impacts During Construction site preparation works Works	Risk	Sites
1	Cleaning up the site from illegally disposed waste	High Risk	WWTP project site
2	Demolishing the existing WWTP and removal of waste	High Risk	WWTP project site
	Construction Phase. Potential Impacts During Construction Works	**Risk**	**Sites**
1	Dust, noise, vibration	High Risk	During excavation of pipe trenches within the areas of town of Zugdidi.
2	Pollution of surface water during construction and rehabilitation works	Moderate Risk	Planned rehabilitation of the existing network of waste water system crosses rivers Chkhoushi and Enguri in several places.
3	Flooding	Moderate Risk	Flooding may occur during construction time; the present location is naturally ensured against flooding with an annuity of 10 years.
3	Impacts on Archaeological Sites	Low Risk	No damage to any archaeological site shall be expected. The pipe laying sites in Zugdidi is located in the areas of extensive on-going human impact.
4	Impacts on traffic	High Risk	Existing waste water system of Zugdidi is almost totally replaced by the project. For the implementation of above mentioned will be necessary to cut trenches in the streets of the city which will restrict transportation by transport means or for pedestrians as well. Special problems will be created in the narrow streets of the city.
5	Landslides, slumps, slips and other mass movements.	Moderate Risk	No large scale earthworks are planned under the Project. Despite this, the landslide processes may be triggered during construction of the pumping stations.
6	Impacts on flora and fauna	Low Risk	All Project sites are located within the area have been experiencing the severe human impacts. Therefore, no influence on flora and fauna shall be expected during implementation of the Project.
7	Pollution risk for ground waters	Moderate Risk	No major spills of fuel and lubricates at construction sites due to leakages are expected. The spills, which are likely to cause groundwater contamination may occur during fuelling construction machinery at

#	Pre-Construction Phase. Potential Impacts During Construction site preparation works Works	Risk	Sites
			the construction sites and/or construction camps.
8	Pollution risk for air quality	Moderate Risk	Air pollution may occur in the inhibited areas, including town of Zugdidi
9	Poaching by construction workers	Low Risk	Chkoushi river.
10	Hazardous Construction Wastes	Low Risk	Small quantities of hazardous wastes will be generated as a result of vehicle operations and the maintenance activities.
11	Impact on existing infrastructure	Low Risk	Electric power transmission systems, existing water supply and drainage channel systems and channels.
12	Poor sanitation and solid waste disposal in construction camps and work sites (sewerage, sanitation, waste management)	Low Risk	Camp will not be used as living facilities because it is expected that majority of the employees would be local persons. The construction camp would be equipped with a bio toilet and other necessary infrastructure.
13	Construction Related Impacts at the Quarrying Sites	Low Risk	The exploration of the borrow pits should be conducted by the licensed companies or the Contractor has to obtain its own license. However, potential impact of the increased quarrying activities on river bed and floodplain landscape, ichthyofauna and groundwater should be considered.

E.2 Pre-Construction Phase

187. Preparation of the WWTP project zone that means cleaning up from illegally disposed waste, also demolishing the existing infrastructural unit and managing the generated inertial waste. Within the scope of environment it is a very high risk containing process.

188. Within the scope of the document a “Waste ACM Management Plan” (See Annex 2) has been prepared, which contains the scheduled expected impacts and mitigation measures that have to be implemented by the contractor at the stage of cleaning the site.

189. Within the scope of the Project it is envisaged to demolish existingWWTPand to construct a new WWTP at the same place. Taking into account size of existing WWTP there is expected the production of approximately2600 m³ inert waste. The framework of the WWTP is wholly made of reinforcedconcrete. During the construction phase there is no usage of hazardous materials(asbestos containing materials, ACM, and lead-based paint, LBP). The existing construction of WWTP is solid andin order to demolish them it is necessary to use relevant technology. Two houses (250-300 m) and Ltd “Anti-TB hospital of Zugdidi” (150 m) is located nearby the WWTP site. Noise and dustare expected during the demolition process. Noise and dust are also expected duringthe transportation of inert waste. The usage of heavy machinery creates vibration indensely populated area as well.

Mitigation Measures

190. The following mitigation measures shall be implemented during the transportation of inert waste produced throughout the demolition process of existing WWTP:

- Before demolition of the building install dust and noise protective barrier (fabric or solid);
- Prohibited use of blasting equipment during the demolition process of WWTP;
- No use of heavy duty equipment is allowed;
- Prior to the commencement of any activity, the Contractor shall identify whether any machinery or planned action will cause significant vibration. If is the answer is yes, the Contractor is to undertake a condition survey of all structures within the zone of influence;
- The Contractor shall monitor vibration at the nearest vibration-sensitive receptors at the start of and during use of non-blasting equipment causing vibration. If vibration levels are monitored and found to exceed the vibration threshold according to relevant criteria, the Contractor shall modify the construction activities until compliance with the criteria has been achieved;
- Restrict demolition activities during period of the high winds or under more stabile conditions when winds could nevertheless direct dust towards adjacent communities;
- Using a water truck for dust suppression on all exposed areas as required;
- Active areas adjacent to residents should be kept damp at all times.
- Establish and enforcing vehicle speed limits to minimize dust generation;
- Using tarpaulins to cover fugitive loads (for demolition concrete materials) on haul trucks moving off-site;
- Select plant and equipment, design work practices, and limit hours of operation to minimize potential impacts as far as practicable;
- Operators of noisy equipments or any other workers in the vicinity of excessive noisy equipment are to be provided with ear protection equipment;
- Under noisy conditions, do not allow operators or other workers to be exceed the threshold that has been establish for exposure to noise;
- Schedule construction so as to minimize the multiple use of the most noisy equipments near sensitive receivers;
- Ensure that all equipments is in good repair and operated in the correct manner;
- Consult with local residents and building owners the address community concerns;
- The funds necessary for the work to be undertaken will be included in the Works contract.

191. Before the commencement of construction activities the Contractor should prepare a site-specific SEMP for demolishment works and waste disposal, which will be endorsed by the supervision consultant and approved by UWSCG before commencing the works.

E.2. 1 Developing environmental documents

192. Prior to the onset of the construction, the Construction Contractor will be obliged to develop the following environmental documents:

193. The Site - Specific Environmental Management Plan(SSEMP)must cover the following issues:

- Define boundaries
- Identify sensitive receptors & environmental values

- Specify construction activities
- Conduct risk assessment
- Assign environmental management measures
- Prepare monitoring plan
- Prepare site plans
- Prepare environmental work plan

194. At the stage of risk assessment the ADB risk assessment methods must be used:

1. Following the specifics of the work to be accomplished, the Construction Contractor must develop the Site Specific Waste Management Plan. This document must describe the methods to prepare the construction site and manage the waste originated during construction (collection, transportation, recycling/reuse and placement).
2. Following the location of the construction site, the Construction Contractor prior to the onset of the construction must develop the Site Specific Noice Management Plan. This document must give the model of the sources and distribution of the noise originated at the construction stage, and possible impact on the adjacent facilities, as well as all mitigation measures and methods to monitor them.

195. All the above-mentioned documents must be developed by the Construction Contractor and submitted to the Project Implementing Unit (PIU) for approval. The Construction Contractor will be entitled to start the construction works only after the above-said documents are approved by PIU.

E.3Air Quality

E.3.1 Noise and Dust

Construction Phase

196. Noiseand emissions of harmful substances are typical impacts of construction. Air quality will be affected during construction by emissions from vessels, equipment, and land vehicles in work activities at work locations. During the pipe replacement stage the rehabilitation works are to be carried out in Zugdidi streets. The noise and dust generated in course of excavating the trenches will cause nuisance of the local residents that will further increase during summer season assuming growth of the local population on the account of holiday makers.

197. Also, pumping stations and WWTP is located near the settled area, therefore construction process is expected to cause noise and generate dust. Figure 9 shows the noise distribution area in the project zone without considering the natural environmental conditions.
198. Modeling and assessment of the noise, caused by construction activities is based on existing information about operation of various equipments at various stage of construction.

199. Noise level in 15 m as it is considered by the Federal Highway Administration of the ministry of transport of the USA (FHWA), California Department of transportation (CADOT) and SBAG is as follows:

Table 15. Noise levels (Administration of the ministry of transport of the USA)

Noise source	Equivalent noise level dBA
Excavator	84 - 85
Bulldozer	84 - 85
Grader	91 - 92
Compressor	80 - 88
Pneumatic drilling hummers	85 - 98
Pile boring equipments	96 - 107

Table 16. Noise levels (California Department of transportation)

Noise source	Equivalent noise level dBA
Excavator	72-92
Bulldozer	83-93
Grader	80-95
Compressor	75 - 88
Pneumatic drilling hummers	82 - 98
Pile boring equipments	72-82

200. As a rule, noise caused by moving equipments is reduced at some distance. Such reduction has logarithmic properties. In case of noise caused by construction activities, noise spread pattern from the noise point is used, that can be determined as: Noise level1-Noise level2=20 log r2/r1, meaning that by doubling of distance noise is reduced by 6dBA.

Table 17: Noise levels

Distance from noise source, m	Calculation level of the noise Average value - dBa	Calculation level of the noise Maximum value - dBa
10	80	90
20	74	84
40	68	78
80	62	72
160	56	66
320	50	60

201. The existing and forecasted noise level at a distance of 80 meters from the point of use of construction equipments is not significant. In fact, after 120-130 m from the noise source, the noise level is acceptable without implementation of mitigation measures. It can be assumed according to rough calculations, that noise impact will not exceed 150 m and increase of noise level within 150 m is assessed as acceptable impact. There are a houses within 150 m radius from the new pumping stations, therefore, the contractor should implement all mitigation measures mentioned in the document**.**

202. Two houses (250-300 m) and Ltd "Anti-TB hospital of Zugdidi" (150 m) is located nearby the WWTP site. The noise level of the WWTP site may exceed the allowed level. Figure 10 shows noise emissions distribution model during construction stage.

Figure 10.Noise Emissions Distribution Model

203. It should be noted that there is a river flowing between the hospital and WWTP, and there is also a local road. Both, the river and the road will serve as noise-reducing barriers.At the same time, it should be noted that mostly monsoon east-west winds dominate in the project area promoting the dust propagation towards the hospital.

Mitigation Measures

204. Air pollution is one of the major problems both, in the Project construction and operation phases. The major reason for air pollution in the construction phase is dust and noise and it is only noise in the operation phase.

205. For the equipment of the given type, one of the major reasons for air pollution in the operation phase is objectionable odor; however, in case of the given Project, following the methods of WWTP operation, at the operation stage of the equipment, the problem of odor propagation is virtually zero.

206. In order to mitigate the impact of noise and smell both, at the stages of construction and operation, two options were considered. When developing the mitigation measures, the reduction of the noise impact was accented in the first place, because as already mentioned, the impact of smell following the technology of WWTP, is less likely within the scope of the Project. Both options envisage building a noise reflecting wall. Under the first option, the wall shall be constructed adjacent to the noise source, and as per another option, the wall shall be constructed on the territory adjacent to the sensitive receptors.

207. Option one:

208.Due to the following factors listed below approximately 100-metre-long noise attenuating wall is most advisable to install east of the project zone to mitigate the problem:

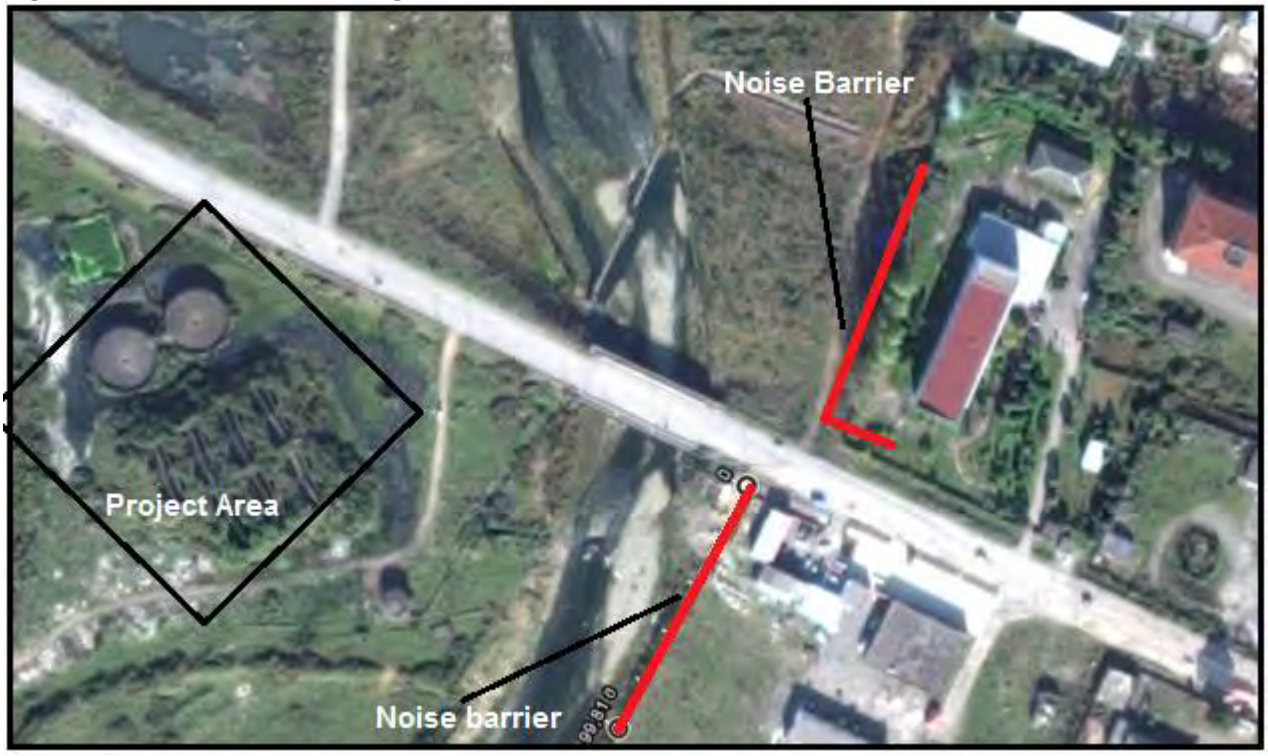
- Noise is expected to originate both, in the project construction and operation phases;
- Sensitive receptors are found 150-300 m from the project zone;
- The monsoon east-west winds dominating in the region will promote the dust and noise propagation towards the sensitive receptors.

Figure11Noise Attenuating Barrier at the source

209. Option two:

210. Option two envisages the construction of noise attenuating barrier near the major sensitive receptors adjacent to the Project site (fig. 12). In this case, the Project value will increase following the length of the noise attenuating wall. The length of the noise attenuating wall under option two is approximately 200 m.

Figure 12 - Noise Attenuating Barrier at the sensitive receptors



211. This kind of barrier must be considered both, in the construction and operation phases. In addition to the noise attenuating barrier, the following mitigation measures are absolutely necessary:

- Require adherence to engine maintenance schedules and standards to reduce airpollution.
- Use of defined, well planned haulage routes and reductions in vehicle speed where required;
- Periodically water down temporary roads on site;
- Cover trucks carrying cement, gravel, sand or other loose materials;
- Wet or cover trucks carrying stone/ sand/ gravel;
- Haul materials to and from the site in off peak traffic hours;
- Halting work during excessive winds.
- Immediately replacing defective equipment and removing it from the work site
- No truck movements in inhabited areas between 22:00 and 6:00.
- The population to be informed regarding the pending works.

212. Both of the developed options were considered together with the management of the premises located adjacent to the Project zone (the hospital and “Georgian Wine” Ltd.) (fig. 13 and 14). The representatives of both organizations, following the interests of the Company, are for realizing the mitigation measures under the second option within the scope of the Project.

Figure 13 meeting with head of hospital

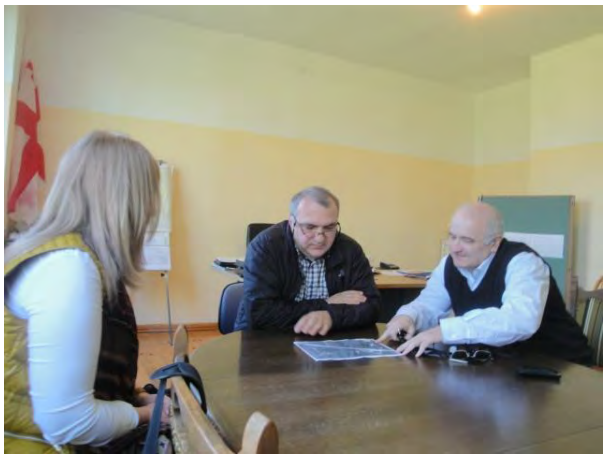


Figure 14 Meeting with Head of Ltd “Georgian Wine”

Operation Phase

213. As already mentioned, noise propagation is expected in the operation phase, as well. The major mitigation measure will be a noise attenuating barrier, which will be installed prior to thethe onset of the construction works.

214. In order to minimise the odour nuisance of the untreated wastewater the inlet part of the WWTP is enclosed (integrated in the building).

215. As one can see from the Project description, WWTP technological line is of a quite high standard (See Chapter G.6). The full mechanical and biological treatment of the sewage sludge is mainly undertaken in the closed area minimizing the unpleasant smell typical to the given type of plant.

216. The WWTP technology was not selected by considering the site specifics. The said technology was used in all similar projects realized in Georgia. Therefore, even if the project area is changed what is not a bit necessary, the WW treatment methodology will not change. Accordingly, there is no point to compare the value of the said technology to the resettlement value, because as already mentioned, the presented technology is used in all similar projects notwithstanding the site sensitivity.

217. The digested sludge is stored temporarily (see Figure 6). However, since the sludge is already digested, the odor nuisance is neglectable.

218. The temporal storage area for the sewage sludge is located 150 m west of the tuberculosis hospital. As already mentioned, during the day, dominant in the area are monsoon winds blowing from west to east. However, as mentioned in # 205, this odour of this kind of sludge is neglectable.

Mitigation Measures

219. Together with noise attenuating barrier the additionally standard approaches shall be employed to reduce the noise pollutions during maintenance works as follows:

- Periodically water down temporary roads on site;
- Immediately replacing defective equipment and removing it from the work site
- No truck movements in inhabited areas between 22:00 and 6:00.

220. Also, after the detailed design of WWTP will be developed, the construction company with relevant qualification has to define the level of noise and its spreading area at the operation stage. If it is required, additional changes have to be inserted in the design and relevant noise reducing barriers have to be arranged in order to avoid noise exceeding the allowed level for the buildings located along the WWTP. According to the Georgian Legislation, during the noise level survey, it has to be considered that the equipment will work 24/7 and one of the buildings located along is a hospital.

221. **Foul Odor Off-site Migration.** Mitigations shall include the following: (i) close monitoring of the aerobic units to ensure the conditions are not anoxic (without enough oxygen), (ii) landscaping with trees and shrubs around the facility shall be done to position them as wind breaks, and (iii) conduct of WWTP‟s annual odor audit to identify operational measures that can prevent odor problems The role of reliable power supply to the mechanical equipment is very important in ensuring adequate odor control and management. The lack of power supply will cause the lack of air input to the aerobic units. If the situation persists for an extended period of time, the resulting an oxygen (without enough oxygen) condition will generate foul odor. In order to prevent this situation, an emergency power generator is foreseen in the Tender Documents. Furthermore there are standby aggregates (as redundant technical solutions) for the mechanical equipment (e.g. pumps, blowers) in order to ensure sound WWTP-operation, and to avoid technical failures, which could lead to foul odor migration.

222. In the operation phase, in order to avoid the distribution of the unpleasant smell of the sewage sludge temporarily placed on the territory of WWTP and treated with high quality, the following measure is necessary:

- Constructed Wind Screen -. The wind screen will reducing potential odor impacts at off-site locations;
- A zone of green plantations should be arranged between the sewage sludge location and the river.

- conduct of WWTP‟s annual odor audit to identify operational measures that can prevent odor problems The role of reliable power supply to the mechanical equipment is very important in ensuring adequate odor control and management.

E.4Water Quality

E.4.1 Contaminations of Surface Water

Construction Phase

223. During implementation of the Project the risk of surface water contamination is of medium level.

224. The surface water may be contaminated due to improper placement of the excavated soil, poor management of construction camps, and improper storage of construction materials and leakage of fuel and lubricates from construction machinery.

Mitigation Measures

225. The following mitigation measures shall be implemented:

- Where works are in progress, erosion control and sedimentation facilities including sediment traps and straw bale barriers or combinations thereof will remain in place;
- Lubricants, fuels and other hydrocarbons will be stored at least 100m away from water bodies.
- Topsoil stripped material shall not be stored where natural drainage will be disrupted.
- Solid wastes will be disposed of properly (not dumped in streams).
- Guidelines will be established to minimize the wastage of water during construction operations and at campsites.
- During construction, machinery and transport will be used by the contractor, both have potential of causing contamination to underground and above ground water assets. There is need to compile temporary drainage management plan before commencement of works.
- Proper installation of temporary drainage and erosion control before works within 50m of water bodies should be done

Operational Phase

226. In general, operation of the WWTP will have large positive impact on the quality of the groundwater, the bottom sediment and the most of all on the water quality of the River Choushia; The operation of the WWTP will have positive impact on the restoration and maintaining of the aquatic fauna in the River Choushia; There are large positive impacts on the Social Environment elements: improved water supply of the downstream populated areas due to good quality of the groundwater, and improved health of the downstream population as a result of the improved quality of drinking water.

217. The operation of the wastewater treatment plant involves various processes:

- Screening
- Sedimentation
- Aeration
- Final sedimentation
- Sludge thickening

228. The wastewater treatment will generate waste, which will comprise of the following:

- Screenings from coarse and fine screen;
- Grit from aeration;
- Sludge from biological treatment.

229.As far as operation failure of WWTP is concerned, there should be provisions for zero tolerance on failures during operations. During normal operations once the processes are stabilized, one can't foresee a longer failure of operations, and the failures are largely due to failure of mechanical or electrical parts, which can be rectified very easily. And most of the instances, such failures not necessarily brings down full operation (e.g. failure of one aerator, or a pump), as there is always sufficient standby built in WWTP design. For this purpose, there has to be 100% power back-up, and sufficient spare parts to rectify any such failures within shortest possible time. The same has been included in the design of WWTP. Since WWTPis being bid out on design-build-operate basis, the operator will have responsibility to operate and maintain the WWTP to meet the discharge standards. It is also proposed to procure routine spare parts, and any additional spare parts (that bidder will propose in his bid) before commissioning of WWTP as a part of construction cost, which will be financed from the loan.

230. The operation of the wastewater treatment plant will generate treated wastewater. The treated wastewater will be discharged into Ckhaushia River near the location where at present the untreated wastewater is discharged. The quality of the surface water will significantly improve. The quality of the effluent is according to European and Georgian regulations and can be discharged into the surface water without harm. Georgian legislation requires the preparation of a Report on the Maximum Allowable Discharge into Ckhoushia River that was prepared by Gamma Scientific Laboratory, Tbilisi. The permissible concentrations were determined as shown in the table below. They are based on calculations of the concentration of effluent in the receiving water body. The calculations take into account the background concentration existing in the water object for each indicator, the category of the water object, the maximum permissible concentrations of substances in the water and their assimilation capability. The report confirms the applicability of the norms for Ckhoushia River. The design of the wastewater treatment plant is in line with these effluent quality parameters.

Table 18: Maximum Permissible Discharge

N°	Ingredients	Permissible concen-tration, Mg/l
1	Suspended solids	**30**
2	BOD_5	**25**
3	COD	**125**
4	Total Nitrogen	**15**
5	Total Phosphorus	**2**

231. The table below presents the decisive parameters for untreated wastewater (inflow WWTP), treated wastewater (outflow WWTP), Ckhoushia river, and the dilution of effluent and river water in comparison to the Georgian environmental standards. The loads were calculated for 2020 and 2040 and with an average discharge of 305 m³/s of Ckhoushia river. The environmental standards are adhered to with the exception of suspended solids that are very high in the baseline quality already.

Table 19: Dilution of effluent

Pollution load	BOD5 mg/l	COD mg/l	Suspended Solids mg/l	Total N mg/l	Total P mg/l
Inflow WWTP	400	>700	338	684	21.9
Outflow WWTP	25	125	30	15	2
Ckhaushia river baseline	35.0	87.200	26.0	44.1	1.1
Operational case: Dilution of effluent and river water in 2020	34.0	87.75	26.07	43.4	1.1
Operational case: Dilution of effluent and river water in 2040	34.7	87.8	26.08	43.3	1.1
Environmental Standards	25	125	30	15	2
Failure of operation in 2020: Dilution of untreated wastewater and river water	37.5	101	32.2	56.7	1.5

E.4.2 Methods to calculate the expected river pollution in case of the damage to the treatment facility

232. Based on the accomplished calculations, the population of Zugdidi will amount to 75.088 people by 2020, using 14.902 m^3 water daily. 90% of this amount, i.e. 13412 m^3/day will be discharged in the sewerage and flow into the river Chkhoushia after being treated at Zugdidi treatment plant what is approximately 155 liters. As for the river Chkhoushia, its average flow velocity is 22200 l/sec.

During the document preparation, the basic analysis of both, the water quality in the river Chkhoushia and discharged untreated sewage waters was done. The results of the analysis for the principal water indicators are given in Table 19.

233. In order to calculate the possible pollution of the river Chkhoushia (BODS for example) in terms of complete failure of WWTP, it is necessary:

1. To calculate the basic amount of BODS in the river. For this purpose, the river flow speed (22200 l/sec) must be multiplied by the amount of BODS per liter of water. Therefore, 22200X35=777000 mg.

2. To calculate the amount of BODS discharged to the river in case WWTP is damaged. For this purpose, the amount of the untreated water discharged to the river in 1 second (155 Liter) must be multiplied by the amount of BODS received through the analysis what equals to 155X400= 62000 mg.

3. Accordingly, the total amount of BODS will be 777000 grams + 62000 grams = 839000 gr.

4. In order to fix the average amount of BODS in 1 liter of water, the total amount of BODS after the untreated sewage water is discharged into the river (839000 gr) must be divided by the total amount of water - 22200 + 155 = 22355 l/sec. The result will be 839000:22355 = 37.5 mg/l.

234. Therefore, in case of accident, the amount of BODS in the river Chkhoushia will reach 37.5 mg/l meaning the deterioration of the basic indicator of 35.0 mg/l by 7.1%. By using the same method, we can calculate the major pollutants in the water both, at the operation stage of WWTP and in case of the plant breakdown (see table 19).

235. As already mentioned, the probability of complete breakdown of WWTP is very low and even it is the case, the calculations evidence that the level of pollution for the major components is within the admissible limits.

E.4.3 Downstream Users

236. After the project implementation Wastewater water will be discharged in the river Chkhoushi, that meets the river Enguri and at Anaklia town near Ganmukhuri boarder flows into the Black Sea.The river Chkhoushi will pass the following villages from Zugdidi to the Black Sea: October (1922 residents), Orulu (1750 residents), Didi Nedzi (435 residents), Darcheli (4932 residents), Anaklia (2522 residents) and Ganmukhuri (2691 residents). It also has to be mentioned that Anaklia represents a high-speed developing tourist zone where the population increases with 10000 because of the tourists

237. Chkhoushi water is not used for drinking purposes in any of the villages, well water is used in every village for drinking. However the river water is drunk by the domestic animals. As at today the collected wastewater of Zugdidi is discharged in the river Chkhoushia without any treatment. Local Administration representatives informed us that wastewater is directly discharged in the river and the worst side of the fact is that not only private individuals discharge the wastewater but also all big and small companies or commercial structures located in Zugdidi. As a result, high risk liquid waste is discharged in the river Chkhoushia from hospitals, policlinics, car wash, gas station and etc.

238. Based on the information mentioned above it is obvious that the project implementation is fundamental/vital for the population located at the lower side of the river Chkhoushi. It is expected to reduce the pollution level of the river significantly. The project efficiency is demonstrated at the level of modeling. In this case,. No permanent analysis of the river water was done, and therefore, we have no exact data about the present pollution of the river.

E.4.4 Contamination Underground Water

239. Groundwater table depth within the Project zone is 3-5 meter therefore potential impact arises from implementation and maintenance of contractors' yard, transport, maintenance of vehicles and handling and storage of lubricants and fuel. The required provisions for contractor's yard are described in the chapter on impacts and mitigation measures concerning quality of soils.

E.5 Soils Quality and Topsoil Management

Construction Phase

240. During construction, impacts on soils are mainly due to earthworks and the operation of the contractor's yard.

241. The works for the transmission mains comprise material excavation, pipe laying and backfill of material including compaction. Material will be stored temporary alongside the trench and refilled after pipe lying. Therefore impacts associated with earthworks for trench laying are of temporary nature. The pipes will be placed in the trench manually. A sand layer of 30 cm thickness will be laid on top of the pipe, after which the trench will be refilled with excavated material and compacted manually. The excavation is expected to generate surplus material. Surplus material will be used as embankment fill as far as possible.

242. Construction of the pumping station and WWTP, as well as performance of trenching works for installation of waste water main may lead to disturbance or loss of topsoil. Therefore the Contractor shall implement the following measures:

- The top soil of about 1 ft depth (0.3 m) shall be removed and stored separately during excavation work, and after the construction of the main trunk the same soil shall be replaced on the top, in unpaved areas;
- Subject to advance consent of the local self-governance authorities, the excess topsoil remained after construction of the new pumping station and reservoir will be used at other Project sites or handed over to the appropriate authorities.

Mitigation Measures

243.The following practices will be adopted to minimize the risk of soil contamination and topsoil loss:

- The contractors will be required to instruct and train their workforce in the storage and handling of materials and chemicals that can potentially cause soil contamination.
- Solid waste generated during construction and at campsites will be properly treated and safely disposed of only in demarcated waste disposal sites.
- Construction chemicals will be managed properly
- Clearly labelling all dangerous products,
- Fuel tanks (diesel or oil) should be placed in a concrete pool which its perimeter walls will be at least 1.0 m high with the concrete or plastered masonry wall,
- A proper floor drain should be installed on the slab of the concrete pool for safely discharging the leakages.

Operation Phase

244.During operation phase, the soil may be contaminated due to water leakage from the damage pipe. In case such damage is not detected in a due time, the area may be "bogged".

245. Soil contamination may also occur during performance of the planned or emergency repair works.

246.Operation of the WWTP will generate sludge from the treatment processes. The sludge has to be removed regularly to maintain good operational performance. The cannot simply be disposed without proper treatment since it may cause land pollution.

247. Sludge disposal. After the sludge treatment, the sludge is stabilized, it is not digesting anymore and it has also been dewatered. As there is no industry in Zugdidi, no heavy metals will be in the treated sludge. The sludge quality and consistency will allow its disposal on a landfill. Sludge quantities amount to:

- 25.7 m³/d in 2020
- 27.4 m³/d in 2040.

248. There is a temporary sludge storage area at the WWTP that has sufficient volume tostore the sludge for 30 days. From time to time the sludge shall be transported to the landfill of the town of Zugdidi. This is a certified landfill. It is regulated by the Solid Waste Management Company under the Ministry of Regional Development and Infrastructure. UWSCG will provide transportation from the WWTP to the landfill.

249. Another alternative for the disposal of the sludge is its use as fertilizer in the agriculture. As there is no industry in Zugdidi the sludge quality is expected to be suitable for this usage. The WWTP is equipped with a storage place with a volume of about 1000 m³ where sludge is temporarily stored and can be collected by interested farmers. UWSCG would give away the sludge for free; transportation would have to be provided by the farmers. After some weeks of operation, when 12UWSCG will have a better understanding of the quality and quantity of the sludge, UWSCG will an3nounce the possibility to collect sludge from the site of the WWTP. Depending on the seasonal dem15and for fertilizer, the UWSCG will manage the temporary storage at the WWTP in such a way that a potential demand can be best served.

250. Sludge and soil on which it is used must be sampled and analyzed. Sludge shall be analyzed for heavy metals every 12 months. The limit values are given in the Table 20.

Table 20. Limit Values Heavy Metals

	Limit values for concentrations of heavy metals in soils	Limit values for heavy metal concentrations in sludge	Limit values for amounts of heavy metals which may be added annually to agricultural land
	mg/kg of dry matter	mg/kg of dry matter	kg/ha/yr
Cadmium	1-3	20 – 40	0.15
Copper	50 - 140	1,000 - 1,750	12
Nickel	30 -75	300 – 400	3
Lead	50 - 300	750 – 1,200	15
Zinc	150 - 300	2,500 – 4,000	30
Mercury	1 - 1.5	16 - 25	0.1

Mitigation Measures

251.Water pressure in the pipelines must be continuously monitored during entire operation phase. In addition, the relevant mitigation measures shall be implemented during maintenance works.

252.Depending on the class of WWTP, it is required to develop a plan for disposal of sludge to the dump site. The plan has to be agreed with the Ministry of Environment and Natural Resources of Georgia and as well with the waste management company of Georgia.

E.6Biological Environment

Impacts during Construction

253.The impacts on flora and fauna during implementation of contractor's yard will be minimised through site selection and installation. The following measures need to be implemented to avoid any impacts on flora and fauna:

- Avoid tree cutting
- In unavoidable cases, plant two trees of same species for each tree that is cut for construction
- The trench shall not be kept open in the night/after working hours. This will avoid any safety risk to wild animals.

Impacts During Operation

254.Operation of the waste water supply components of the subproject will not have any significant negative impact on the biological environment.

E.7Traffic

Impacts during Construction

255.The rehabilitation of the waste water network will be mainly conducted along roads existing in the town. Although work will not require land acquisition it could still have economic impacts, if the presence of trenches, excavated material and workers discourage customers from visiting shops and other businesses, which lose income as a result. These losses however will be short in duration. Implementation of the following best construction measures will reduce the inconvenience and disturbance:

- **Traffic management**. A traffic control and operation plan will be prepared together with the local traffic management authority prior to any construction. The plan shall include provisions for diverting or scheduling construction traffic to avoid morning and afternoon peak traffic hours, regulating traffic at road crossings with an emphasis on ensuring public safety through clear signs, controls and planning in advance;
- **Information disclosure**. Residents and businesses will be informed in advance through media of the road improvement activities, given the dates and duration of expected disruption;
- **Construction sites**. Clear signs will be placed at construction sites in view of the public, warning people of potential dangers such as moving vehicles, hazardous materials, excavations etc and raising awareness on safety issues. Heavy machinery will not be used after day light and all such equipment will be returned to its overnight storage area/position before night. All sites will be made secure, discouraging access by members of the public through appropriate fencing whenever appropriate.

256..Another aspect of the work that has economic implications is the transportation of material to the site and surplus soil from the site to locations where it can be put to beneficial use as recommended. There will be truck movements carrying material. Although this is not significant, considering the narrow roads, it could disrupt traffic in the Town. Dust generated during the transport may also impede the commercial and trade activities, which are predominantly located along the main roads. The transportation of material/waste shall be implemented by the Civil Contractor in liaison with the town authorities, and the following additional precautions should be adopted to avoid effects on traffic:

- Plan transportation routes in consultation with Municipality and Police
- Schedule transportation activities by avoiding peak traffic periods.
- Use tarpaulins to cover loose material that is transported to and from the site by truck
- Control dust generation while unloading the loose material (particularly aggregate and sand) at the site by sprinkling water/unloading inside a barricaded area
- Clean wheels and undercarriage of haul trucks prior to leaving construction site

Impacts During Operation

257.As the operation and maintenance activities would be conducted within the existing facilities no impact is envisaged on economic resources. Repairs and leaks of the waste water pipes will be minor and localized. In fact, the improvements to the waste water system will bring various benefits. Availability of good infrastructure facilities will add to the quality of life, and there will be more people interested to live and visit, which will bring new investments and boost economic development.

E.8Hazardous Construction Wastes

258.Small quantities of hazardous wastes will be generated as a result of vehicle operations and the maintenance activities.

Mitigation Measures

259.There are no specific hazardous waste treatment facilities in Georgia, so the common construction practice accepted by the authorities is to dispose of these types of wastes at the municipal landfills. However, prior to disposal appropriate consultation and agreement ofMoENRP is required, and controlling will be required to obtain the necessary approvals. To ensure good practice they will also be required to store, transport and deposit all hazardous materials in secure watertight containers.

E.9Other Wastes from Construction Activities

E.9.1 Municipal Waste

260. Municipal waste may be generated on the Storage area. Mainly this is rubbish, plastic or glass bottles, glasses, waste food, etc. and a stationary waste. Waste should be collected both by the specially assigned personnel and the workshop workers on the area. The waste is placed into $0.24m^3$ plastic containers and further a local Sanitary Service takes it to landfills. The following should be taken into account:

- Generation of dust should be avoided;
- Plastic containers should be closed to prevent spread of the smell and also to avoid contact of rodents and insects with the waste.

261.The personnel involved in the handling of hazardous and non-hazardous waste will undergo specific training in:

- Waste handling
- Waste treatment; and
- Waste storage.

262.Burning of waste on any construction site is forbidden with the exception of stub and small branches from felled trees and bushes, which is better to be burned in order to avoid pest dissemination.

E.9.2 Medical Waste

263.Medical waste is generated in the Medical Care and Control Point and belongs to hazardous waste category. This waste is collected in special plastic boxes and is transferred to a contractor for farther incineration. It is recommended that the medical waste is directly transferred to a contractor from the place of its consolidation. While disposal of the medical waste the following requirements are to be met:

- Medical waste must be disposed in special plastic boxes, which can be hermetically closed.
- Medical waste for farther incineration should be transferred to a certified contractor (Batumi municipal waste operator).

E.9.3 Non-Hazardous Construction Waste

264.Non-hazardous construction waste may be generated on the Storage and construction area and will be collected by contractors workers. Waste disposed first on the sites of origin, and then moved to construction waste temporary storage facility before transferred to a contractor.

265. Disposal construction wastes both on the sites and at the temporary storage facilities the following requirements are to meet:

- Place of disposal of the waste concerned must be enclosed.
- The waste must not have access to drainage water.
- Waste must be immediately removed from the working sites.
- Waste must be placed in secondary protective basins.
- This waste can be transferred only to a certified contractor.

E.10Impacts on Archaeological Sites

266.Land clearance works, grading and excavations are associated with the risks of damaging underground archaeological remnants. However in the case of the proposed Project no archaeological monuments are expected to be touched during construction phase since pipes will run along and inside existing roads as far as technically feasible. There is a low probability for chance finds of archaeological objects. However, during construction, possibility of appearance of the new archaeological findings still should be taken into account and, therefore, special care should be taken not only at the new construction sites, but also at construction camps and storage areas.

Mitigation Measures

267. To avoid this risk, preliminary preventive studies and archaeological supervision during the earth-works is necessary. Supervisory procedures and all other necessary measures should be agreed with the Ministry of Culture when obtaining the construction permit, in accordance with the rules of the permit issuance. According to the article 14 of the Law on Cultural Heritage, Permit on conducting quarrying activities in Georgia, as well as construction of an object of a special importance as it may be defined under the legislation of Georgia, is issued by a competent authority based on the positive decision of the Ministry of Culture, Monument Protection of Georgia. The basis for the conclusion is the archaeological research of the proper territory to be carried out by the entity wishing to accomplish the ground works. The entity wishing to do the earth-works is obliged to submit the Ministry the documentation about the archaeological research of the territory in question. The preliminary research should include field-research and laboratory works.

268. Therefore steps should be taken minimize the risk. This should involve:

- Contractor should put in place a protocol for conducting any excavation work, to ensure that any chance finds are recognized and measures are taken to ensure they are protected and conserved.
- To comply with the previous condition, having excavation observed by a person with archaeological field training. Supervisory procedures and any other necessary measures shall be agreed with the Ministry of Culture;
- Stopping work immediately to allow further investigation if any finds are suspected;
- Calling in the state archaeological authority if a find is suspected, and taking any action they require ensuring its removal or protection in situ.

269.At the construction stage archaeological monitoring should be ensured by the contractor under the supervision of the Ministry of Culture, Monument Protection of Georgia. The budget necessary for the archaeological supervision and other agreed works should be fixed under the construction works appraisal.

E.11Socio-Cultural Resources

Impacts during Construction

270.There are various social-cultural resources (such as school, church, recreation and entertainment centre, etc.) in the town.No sewage pipes are planned to install adjacent to the principal historical monuments of the city (See Fig. 9). The said historical monuments are distanced from the Project sites by 50-70 m.The construction impact will include noise and dust, and interrupted access due to movement of heavy vehicles transporting material and waste. Mitigation will therefore be needed to protect socio-cultural resources and to enable usage by local people and visitors to continue throughout the construction work. This will be achieved through several of the measures recommended above (under the impacts on air quality), including:

- Limiting dust by removing waste soil quickly; by covering and watering stockpiles, and covering soil with tarpaulins when carried on trucks
- Providing wooden walkways/planks across trenches for pedestrians and metal sheets where vehicle access is required
- Increasing the workforce in to complete the work quickly

271.There is invariably of safety risks when substantial construction such as this is conducted in an urban area, and precautions will thus be needed to ensure the safety of both workers and citizens. The Contractor will be required to formulate and implement health and safety measures at construction sites, which should include such measures as:

- Following standard and safe procedures for all activities - such as provision of shoring in deeper trenches (> 2 m)
- Excluding public from the site - enclosing the construction area and provide warning and sign boards, and security personnel
- Providing adequate lighting to avoid accidents
- Ensuring that all workers are provided with and use appropriate Personal Protective Equipment - helmets, hand gloves, boots, masks, safety belts (while working at heights etc.)
- Maintaining accidents records and report regularly
- Traffic control. Irregular control of trucks by local police (radar control, safety control). Speed limits to be introduced within construction areas and on access roads.
- Yellow / orange warning tape to protect workers and pedestrians from falling into building pits, to prevent pedestrians from entering the construction site. Warning signs to prevent accidents within the construction site and on access roads

272.*Economic Benefits*. There could be some short-term socio-economic benefits from the construction work if local people gain employment in the workforce. To ensure that these benefits are directed to local people, the Contractor should be required to employ as much of his labour force as possible from the local communities in the vicinity of construction sites. Drawing of majority of workforce from local communities will avoid problems that can occur if workers are imported, including social conflicts and issues of health and sanitation due to labour camps. If temporary labour camps are to be provided, Contractor should ensure that they are maintained well with proper water

supply and sanitation facilities. In unavoidable case of sourcing labour from other areas, provide adequate housing facilities so that there are no impacts and conflict with the local people. Following measures shall be followed:

- Establish temporary labour camps in consultation with the local authority
- Construction camps shall be located away from water bodies
- No clearance of trees vegetation shall be allowed for establishment of camp
- Provide all basic amenities (water sanitation, waste collection & disposal, first aid facilities, etc.)
- Contractor shall provide fire wood and no worker shall be allowed to cut any tree
- Ensure regular and clean maintenance of the camp

E.12Construction Camps

273.The establishment of contractor's work camp may cause adverse impacts if various aspects such as liquid and solid waste management, equipment maintenance, materials' storage, and provision of safe drinking water are not addressed properly. The site for the work yard will be selected by the contractor in agreement with the Municipality, UWSCG and the supervisor.

274.To ensure that potentially resulting impacts are kept at a minimum the contractor will be required to prepare the following plans or method statements:

- Layout plan of the work camp including a description of all precautionary measures proposed to avoid potential adverse impacts on the receiving environment (surface and ground water, soils, ambient air, human settlement);
- Sewage management plan for provision of sanitary latrines and proper sewage collection and disposal system to prevent pollution of watercourses or groundwater;
- Waste management plan covering the provision of garbage bins, regular collection and disposal in a hygienic manner, as well as proposed disposal sites for various types of wastes (e.g., domestic waste, used tires, etc.) consistent with applicable national regulations; and
- Description and layout of equipment maintenance areas and lubricant and fuel storage facilities including distance from the nearest surface water body. Storage facilities for fuels and chemicals will be located at a save distance to the water body. Such facilities will be bounded and provided with impermeable lining to contain spillage and prevent soil and water contamination.
- These plans will be approved by the Engineer prior to beginning of construction activities.

275.Prior to establishment of the work camp(s) the contractor shall conduct consultations with local authorities to identify sources of potable water for the workforce that will not compete with the needs of the local population. Potable water for the workforce shall comply with the national quality standards. Construction water should be sourced from the local water supply.

E.13Construction Related Impacts at the Quarrying Sites

277. The quarries and borrow pits will be finally selected by the contractor. The exploration of the borrow pits should be conducted by the licensed companies or the Contractor has to obtain its own license. However, potential impact of the increased quarrying activities on river bed and floodplain landscape, ichthyofauna and groundwater should be considered.

Mitigation Measures

277. The exploration of the borrow pits should be conducted by the licensed companies. In case if the constructing company intend to perform quarrying activities, the company has to obtain related license. Potential impact of the increased quarrying activities on ichthyofauna, groundwater and landscape should be considered anyway. Validity of licenses for the abovementioned companies is a main mechanism to guarantee that most of impacts related to quarrying will be mitigated. License is provided by the MoENRP only on a basis of preliminary assessment (including limits and conditions for reinstatement). The Regional Services of the MoENRP and Environmental Inspectorate are in charge to control compliance of the quarrying company's performance. The role of the UWSCG within this plan should be to ensure timely and permanent involvement of the MoENRP in construction supervision.

278..The measures aimed on mitigation of the dust and emission impacts, as well as potential river contamination due to improper fuelling and vehicle operation should be the same as above described pollution prevention measures, but control on this sensitive site should be stricter. Contractor's environmental personnel shall pay attention to this site during monitoring.

E.14Existing Asbestos Pips

279.At construction stage, according to the contract is considered the installation of newpipes in the whole area of the city. During excavation works of trenches it is possibleto damage as existing sewer pipe network, also other legally or illegally water supplypipes. A large part of the existing pipes contains asbestos and asbestos dust in caseof damage may occur, and which is very dangerous for health.

Mitigation Measures

280. It is necessary to implement whole set of mitigation measures:

- Special training for the personnel of the contractor;
- Environmental specialist of the consulting company must develop a special procedure and present to the water company which will be used in the process of cutting of the trenches-in case of the connection with the existing Asbestos pipes;
- Environmental specialist of the contractor must attend the process of cutting of the trenches;
- In case of finding asbestos pipes, the excavator must stop working and cutting of the trenches must be continued by means of the blade;
- In case of the damage of Asbestos pipes the construction works must be stopped. Environmental specialist of the consulting company should be immediately informed about this and the fact should be written down by environmental specialist of the contractor; • Further works to be implemented only after issuance of the permission.

E.15Cumulative Impacts

281. Project is designed to improve environmental quality and living conditions in Zugdidi through the improvement of waste water supply system. The potential negative impacts identified on various environmental parameters, during both construction and operation, in the previous sections of this report, are localized and temporary.

282. .By nature, impacts such as on air quality and on people (due to disturbance, nuisance and safety risk of construction activity) can have cumulative impacts, as all the construction activities are conducted simultaneously. These are common impacts associated with any construction activity, and

as discussed in the earlier sections, there exists proven and easy-to-implement measures to mitigate these impacts.

283. No cumulative impacts envisaged during the operation stage.

E. 16 Climate Change Impact

Introduction

284.The Project zone is located in Odishi valley, at 110 masl, on the both banks of the river Chkhoushi (the Enguri basin).

285. The following rivers also flow across the municipality territory: Kuchkhoboni, Sintsa and Enguri. The latter is used for the electric power generation purposes.

286. As per the data of *gamgeoba*, out of natural threats, strong wind, flood, landslide and river bank washout are most common. Most frequent of them are intense rains followed by floods, washout and demolition of riverside sowings and pastures. As per the data of *gamgeoba*, for the last ten years, the natural threats have become more frequent. In particular, intense rains have become more frequent and floods and landslide have become more intense.

287. There is no hydro-weather station in the region and consequently, no information about the possible changes of climatic conditions or natural threats is provided.

288. In order to compensate, mitigate or prevent the outcomes of the natural calamities of the last ten years, mostly the bank-protecting measures are taken.

Expected risks

289. Climate change impact on water resources can basically be divided into three categories:too much water, not enough water, and degraded water quality.As already noted, as per the information of the local self-governing bodies, the intense rains have become more frequent and floods and landslide have become more intense in the Project zone. Under the Project, the Project WWTP will be quite near the river Chkhoushi bed. The fact of WWTP and riverbed located at the same altitude from the sea level is another problem.

290. The river Chkhoushi flow has been surveyed at Zugdidi crossing for 9 years (from 1946 to 1954). During the period maximal consumption of the surveyed water varied between 10.6 m^3/sc (1951) 60.00 m^3/sc (1948). It is essentially known that in order to determine maximal water consumption volume, 30 year data is required, which doesn't exist in the river Chkhoushi case. It is unacceptable to restore the consumption rate or make its turn longer. Therefore, maximal consumption of the river Chkhoushi at the project crossing is determined with the method that is shown in "Technical Direction Report of the River's Maximal Flow in Case of Caucasian Conditions" (see chapter 1.6.2).

291. Wastewater treatment plant: The WWTP is protected against flooding of ChkhoushiaRiver with a recurrence of 100 years.However, it is necessary to carry out a number of mitigation measures to avoid possible long-term effects caused by the deterioration of the situation.

Mitigation measures

292. In order to avoid the expected catastrophe, both short and long-term measures are necessary:

293. In order to avoid the outcomes of possible flooding, the following measures are necessary:

- Simultaneously with the Project realization, planning and realizing the bank-protecting measures adjacent to the Project zone designed for the 100-year maximal expenses.
- Restoration of the wind break belts in the area adjacent to the Project zone what will reduce the soil erosion potential and will help regulate the temperature regime during the high air temperatures.

294. In addition, a number of studies are necessary at the regional level to develop long-term mitigation measures, in particular:

- Evaluation of riverbed management methods to identify the most efficient methods to reduce the risks of expected catastrophes.
- Obtaining the information about the inert material obtained from the river Chkhoushi bed, fixing the facts of riverbank washout and high-risk areas, presenting the information about the obtained inert material at the license-issuing body so that the existing resource of the inert material should be re-considered and mining volume should be regulated.
- Development of the strategy to promote plant-growing, including the development and realization of the project for the irrigation system.
- Development of the strategy to restore and accommodate the forest together with the forest economy measures, what will help regulate the erosive processes and surface runoff, reduce the river bank washout and regulate the temperature regime.
- Preventing the erosion of hey-meadows and pastures. For this purpose, several different methods can be used. First of all, it is desirable to establish and protect, to the extent possible, the cattle grazing rate on concrete pastures. Besides, it is desirable to introduce the method of alternating grazing.

295. The design considerations on climate risks are presented in Appendix 3.

F. Analysis of Alternatives

F.1 Sewage system

296. The sub-project comprises the rehabilitation and extension of an existing sewer system. The location of the WWTP and, consequently, the general layout was maintained and no alternative sewer layouts were investigated.

F.2 Wastewater Treatment Plant

297. Different treatment processes of the WWTP were compared. While the construction of the new WWTP will be tendered as design-build contract and the contractor will be responsible for the detailed design of the plant, in the following, different technical options for the treatment process were compared and a rough preliminary design was presented.The new WWTP will remove the carbon compounds and also nutrients and phosphorus contained in the wastewater to the greatest possible extent. For this purpose, a number of different wastewater treatment processes applied in various WWTPs across the globe, adapted to the particular conditions of each site and wastewater quality are known. Examples are the activated sludge and biofilm process or the membrane technology.

298. The membrane technology, the bio filtration and the anaerobic process are sophisticated wastewater treatment processes that require much experience in the design and in the construction of the plants. Particularly the operation of such systems demands a highly qualified and experienced work force in order to ensure the proper treatment of the wastewater.

299. Other treatment alternatives are the activated sludge (aeration) and the biofilm process (trickling filter). These treatment methods have been successfully applied for many decades and in many countries of the world. These two processes have a good treatment performance and a high buffer capacity with regard to the wastewater quality as well as the wastewater inflow quantities. Furthermore, the treatment process is easy to operate and monitor. Most maintenance works can be carried out by the staff of the wastewater treatment plant. For these reasons, the aeration and biofilm processes were chosen for a more detailed comparison of technical options. In order to determine the most feasible option for the WWTP the following three alternatives of the aeration and biofilm process were investigated and compared in technical and financial terms:

- Aeration tank with secondary sedimentation
- Sequencing-Batch-Reactor(SBR) process
- Trickling filter (biofilm process)

300. Dimension of each alternative was based on the design criteria and the allowable effluent quality. As a result, the aeration system with the secondary sedimentation was considered the most economical solution for the WWTP Zugdidi. In the table 21 you can see the dimension of each alternative was based on the design criteria and the allowable effluent quality. As a result, the aeration system with the secondary sedimentation was considered the most economical solution for the WWTP Zugdidi.

Table 21.Design Criteria and the Allowable Effluent Quality

	Financial Aspects		Environmental Aspects		
Technology	**Investment**	**O&M-costs**	**Effluent Quality / Operability**	**Land Requirement**	**Odor**
Aeration Tank with Secondary Sedimentation	+	+	++	0	+
SBR	-	-	0	+	+
Trickling Filter	0	+	+	+	0

G. Information Disclosure, Consultation, and Participation

301. Most of the main stakeholders have already been identified and consulted during preparation of this IEE, and any others that are identified during project implementation will be brought into the process in the future. Stakeholders of this project include:

- People who live, and work near construction sites of facilities in Zugdidi
- UWSCG as implementing agency
- Other government regulatory institutions
- Municipality of Zugdidi
- NGOs and CBOs working in the affected communities;
- Other community representatives (prominent citizens, religious leaders, elders, women's groups);
- The beneficiary community in Zugdidi in general; and
- The ADB, as funding agency

302. The Public Hearing was held on November 14, 2014 in Zugdidi City Hall and commenced at 17:00. The Public Hearings was organized with representatives from the local government of Zugdidi, local population and representatives of UWSCG and Design Company Kocks.

303. By giving advertisements in advance at Zugdidi Service Centre, attendance of a wide range of related people to the meetings was encouraged. During the public hearing, citizens were informed about the activities to be carried out within the scope of the Zugdidi sub-project, The following topics were discussed during the meeting:

- project context and rationale
- expected start and end of the project
- benefits of the project to local population and to the country as a whole
- the environmental issues and mitigated measures related to the project

304. Local residents and the representatives of UWSCG held discussions about particular issues during the meeting. The Minutes of the Meeting is presented in Annex 1.

305. The additional meeting have been conducted with the Zaza Dgebuadze -Zugdidi TD Hospital - Senior Doctor, (Tel: 599570604).The hospital is located 150 meters away from the project area;

306. This IEE Report in Georgian language will be distributed to the interested public. Report will be available for review in Tbilisi (at UWSCG Head Office), and Zugdidi (at UWSCG Service Centre and the Town Hall). It will also be disclosed to public by making it available on websites of UWSCG, MoRDI and ADB, together with the IEEs prepared for the other subprojects.

H. Grievance Redress Mechanism

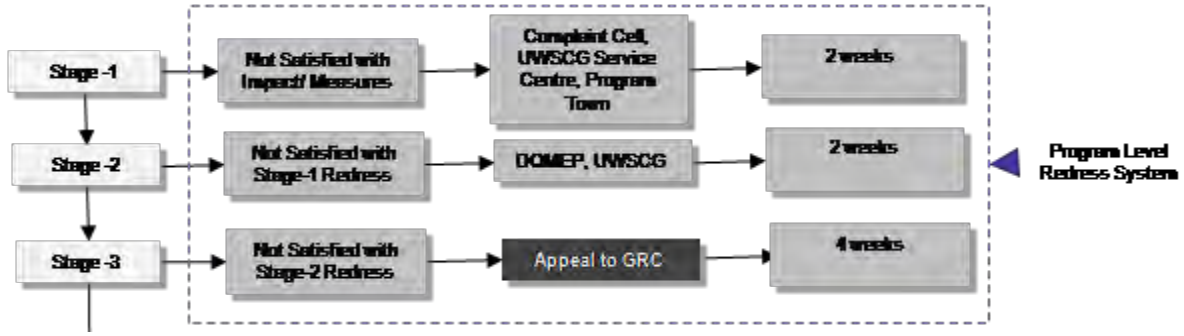
307. The contractor is obliged to implement the environmental management plan during the whole construction period and the supervising consultant will monitor these activities. The consultant will point out any deviations from the EMP and make sure that the contractor addresses all issues of the EMP in a timely and professional manner.

308. A grievance resolution mechanism will be set up to allow an AP appealing any disagreeable decision, practice or activity arising from project implementation. APs will be fully informed of their rights and of the procedures for addressing complaints whether verbally or in writing during planning and implementation of the project. Care will always be taken to prevent grievances rather than going through a redress process. This is achieved by ensuring full AP participation and consultation, and by establishing extensive communication and coordination between AP, UWSCG, and the local government. The affected population and stakeholders may send their grievances, related to the project induced environmental impacts and nuisance to UWSCG or directly to the administrative bodies responsible for the environmental protection. The MoENRP and concerned municipalities are obliged to respond on the grievances, which have been received from population or other interested parties in accordance with the Administrative Code of Georgia.

309. UWSCG on its part, in order to provide a direct channel to the affected and concerned citizens for approaching project authorities and have their grievance recorded and redressed in an appropriate time frame, will establish a Grievance Redress Mechanism. A Complaint Cell and a Grievance Redress Committee will be established for each Investment Program town at the local UWSCG service centre, which will function throughout the construction period. The procedures adopted and the responsibilities of various project agencies in grievance redress are discussed in the following paragraph. During the public consultation process, UWSCG (the IA) will inform the stakeholders about the Grievance Redress Mechanism and provide contact details of persons responsible for grievance collection and response. These details will also be made available on UWSCG website. The DREP at the head office of UWSCG will be available for the local complaint cells for establishing direct links to relevant environmental authorities.

310. The Complaint Cell at the UWSCG Service Centre in the Investment Program town will accept complaints regarding the environment safeguard issues in implementation of subprojects under the respective town. A three stage grievance redress mechanism is indicated in Fig. 12 below. The grievances received and actions taken will be included into the environmental monitoring reports submitted to ADB.

Figure 12. Grievance Redress Mechanism



(i) Complaints received (written or oral communication) by the Complaint Cell (CC) will be registered in database system, assigning complaint number with date; Complaint Cell will inform the complainant the time frame in which the corrective action will be taken.

(ii) Complaint resolution will be attempted at Ureki level with the involvement of Community leaders and informal mediators.

(iii) The Complaint Cell and the Investment Program Management Office (IPMO), which is the Investment Projects Management Department/UWSCG, will investigate the complaint to determine its validity, and assess whether the source of the problem is indeed due to subproject activities; if invalid, the Complaint Cell will intimate the complainant and may also provide advice on the appropriate agency to be approached.

(iv) If the complaint is valid, the Complaint Cell will check the environmental management plan (EMP) of the subproject whether this issue was identified and mitigation was suggested; if yes, the Complaint Cell and UWSCG IPMO will direct the civil works Contractor to take immediate actions as per the EMP.

(v) If this is an unanticipated issue, the UWSCG IPMO will to identify mitigation measures and advise the civil works Contractor accordingly and a corrective action should be taken and a Corrective Action Plan (CAP) prepared.

(vi) The Complaint Cell will review the civil works Contractor's response on corrective action and update the complainant within two weeks.

(vii) If the complainant is not satisfied with the action taken by the Contractor within two weeks from the start of corrective action as directed the Complain Cell, the grievance will be directed to the Division of Resettlement and Environment Protection of UWSCG.

(viii) The DREP will review the issue with the IPMO and relevant Service Centre and may ask for additional information or conduct site visit, and will advise the IPMO and relevant Service Centre on actions to resolve the issue.

(ix) The Service Centre will submit the interim report in a week to DREP on the status of the complaint investigation and follow-up actions, and final action taken report within two weeks of completing the action. The DREP will intimate the complainant of the same.

(x) If the complainant is still dissatisfied with the action taken or decision, he/she may approach the Grievance Redress Committee (GRC, see below) established in the town.

311. **Grievance Redress Committee (GRC)**. A GRC will be established to resolve the unresolved issues at Stage 2 and this will function throughout the construction period, and will have hearings on need-basis. GRC will have following members:

- Chairman of the GRC – Head of Department of Social Issues at Zugdidi Municipality
- UWSCG Service Centre Head
- Designated informal leader of sub-project affected community

- Female AP
- Local NGO representative

312. Considering the anticipated impacts, it is not expected that there is any likely issue which will remain unresolved in the Stage 3 of the process. In the unlikely event of dissatisfaction after Stage 3, the complainant can approach ADB with a complaint. ADB has in place a system under the ADB Accountability Mechanism, where people adversely affected by ADB-assisted projects can voice and find satisfactory solutions to their problems. An affected person can file a complaint (mail, facsimile, electronic mail, or by hand delivery) with the:

Complaints Receiving Officer, Accountability Mechanism
Asian Development Bank Headquarters
6 ADB Avenue, Mandaluyong City 1550, Philippines
Email: amcro@adb.org, Fax +63-2-636-2086

314. Complaints will also be accepted by any ADB office such as a resident mission, regional office or representative office, which will forward them unopened to the CRO.

I. Environmental Management Plan

315. EMPis addressed as a condition of the contract.

I.1 Institutional Arrangements

316. Following agencies will be involved in the Investment Program:

(i) Ministry of Regional Development and Infrastructure (MoRDI) is the Executing Agency (EA) responsible for:

- oversee progress and provide guidance on the InvestmentProgram implementation
- meet regularly until Investment Program completion
- responsible for Investment Program oversight and administration
- hold monthly meetings with UWSCG to review progress
- ensure compliance with Investment Program covenants
- submit Investment Program documents, including audit reports, to ADB on time

(ii) United Water Supply Company of Georgia (UWSCG) is the project Implementing Agency (IA), which will be responsible for:

- prepare the periodic financing request oversee Investment Program implementation and management
- oversee Investment Program accounting
- coordinate with all line ministries to ensure smooth and efficient implementation of investment program
- secure technical and environmental approvals for all civil works prior to bidding
- implement the environmental management plan for each subproject
- ensure compliance with Investment Program covenants
- comply with social safeguards requirement detailed in the PAM
- invite bids, evaluate and prepare bid evaluation reports for ADB's approval

(iii) UWSCG as responsible IA for the project recruited a Supervision Consultant (SC). The national and international team of consultants will assist UWSCG as project supervisor for the construction of Zugdidi WW project. The SC will also provide capacity building training to contractor staff for management and operation and maintenance for the Project. The SC will assist UWSCG in assuring that the project is implemented according to the specified standards. This SC assignment will include the supervising of the implementation of the environmental management plan.

(iv) All mitigation measures during construction have to be implemented by the contractor that will be monitored by the supervision consultant (SC). Implementation of EMP of this project require an experienced Environmental Management Specialist (EMS), employed by the SC, to spend a total of around 36 months for project construction period, conducting routine observations and surveys, and preparing quarterly reports.

(v) The Contractor has the following obligations:

- to employ Environmental consultant responsible for developing and implementing the construction phase EMP and for provision of corresponding information to UWSCG and SC;
- to prepare SSEMP;
- to develop, if required, a Spoil Disposal Plan and Construction Waste Disposal Plan agreed with the MoENRP and Local government;
- to prepare and update Construction Schedule;
- The SSEMP implementation costs should be included into the construction budget

I.2 Reporting

- The Contractor is responsible for the preparation of weekly environmental monitoring report that should be sent to SC.

- The Supervision Consultant is responsible for the preparation of quarterly environmental monitoring reports that should be sent to UWSCG

317. The USIIP Environmental Specialist is responsible for the preparation of bi-annual and quarterly environmental monitoring reports and will provide to ADB and MoRDI. Semi-annual environmental monitoring reports will be posted in ADB website, and available in GEO in Georgian language.

I.3 Inspection

318. The Employer will regularly inspect works undertaken by the contractor to check on the implementation of environmental management and monitoring requirements. A non-compliance notice will be issued to the contractor if the employer requires action to be taken. The contractor is required to prepare a corrective action plan which is to be implemented by a date agreed with the employer. The non-compliances will be ranked according to the following criteria:

319. **Non-compliance Level I:** A noncompliance situation not consistent with the requirements of the concession agreement, but not believed to represent an immediate or severe social or environmental risk. Repeated Level I concerns may become level II concerns if left unattended.

320. **Non-compliance Level II:** A noncompliance situation that has not yet resulted in clearly identified damage or irreversible impact, but which potential significance requires expeditious corrective action and site-specific attention to prevent severe effects.

321. **Non-compliance Level III:**A critical situation, typically including observed significant social or environmental damage or a reasonable expectation of very severe impending damage, intentional disregard of specific prohibitions is also classified as a level III concern. The failure to prepare a corrective action plan or to implement it within the required time frame will result in the owner undertaking the works and the cost, and 20% will be recovered from the final payment to the Contractor.

322. The contractor will have a system for recording and communicating any complaints received by any person employed by or contracted to the Contractor. All complaints will be communicated in writing to the Employer within one working day of their receipt.

I.4 Implementation Costs

323. The Costs for Environmental Management of the project shall mainly consist of the (i) monitoring of works by the EMS who will be employed by the SC; (ii) baseline and regular parametric measurements of noise, dust and emission (water quality testing may not be needed unless water supply sources will be affected by the construction works). All of the implementation of mitigation measures shall be part of the contractual works and obligation of the Contractor.

324. The cost for the environmental management for construction period is tentatively estimated.

Table 22: Environmental Management Cost

Item	Quantity[1]	Unit Cost	Total Cost	Remarks
Baseline Parametric Measurements	6	200 USD	1,200	To be conducted by the Contractor for noise, air emissions, dust, vibration (and water, if necessary) measurements
Monthly Parametric Measurements (at least 2 sites)	72	200 USD	14 400	Tests to be conducted by the Contractor at 2 sites x 36 months monthly monitoring
Environmental Management Specialist (SC)	36 months	2,500 USD	90 000	The costs are included in the contract signed between UWSCG and SC and no additional costs will occur.
Environmental specialist (Contractor)	36 month	1500 USD	54000	The costs will be included in the contract signed between UWSCG and Contractor.
Construction dust and noise barriers	1	100000 USD	100000	To be installed by Contractor at the WWTP construction site
Miscellaneous			259600.00	10% for above Items
Subtotal			285560.00	Total for above

[1]To be established by CS Consultant and international environmental specialist.

Table 23. Environmental Impacts and Mitigation Measures

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost
Pre-Construction				**Part of Construction Cost**
During the removal process of illegal waste from the project zone asbestos dust may be mixed with the air	• The quantity and content of the waste placed in the project zone in an uncontrolled manner is to be identified; • The degree of risk of the negative impact of the existing situation on the environment is to be identified; • A duly qualified project-implementing organization is to be identified through a tender; • A detailed „**Waste Asbestos-Containing Material Management Plan“** is to be developed; • The separation/collection, transportation and safe disposal of the AC waste is necessary; • The monitoring plan is to be developed and implemented	Construction Contractor	WWTP Construction area	
A negative impact on soil, water and air may be caused because of an incorrect management of the generated inertial waste during demolishing of the existing WWTP. Also the generated noise, dust and vibration during demolition may cause a negative impact on the surrounding buildings and population.	• Before demolition of the building install dust and noise protective barrier (fabric or solid); • Prohibited use of blasting equipment during the demolition process of WWTP; • No use of heavy duty equipment is allowed; • Prior to the commencement of any activity, the Contractor shall identify whether any machinery or planned action will cause significant vibration. If is the answer is yes, the Contractor is to undertake a condition survey of all structures within the zone of influence; • The Contractor shall monitor vibration at the nearest vibration-sensitive receptors at the start of and during use of non-blasting equipment causing vibration. If vibration levels are monitored and found to exceed the vibration threshold according to relevant criteria, the Contractor shall modify the construction activities until compliance with the criteria has been achieved; • Restrict demolition activities during period of the high winds or under more stabile conditions when winds could nevertheless direct dust towards adjacent communities; • Using a water truck for dust suppression on all exposed	Construction Contractor	WWTP Construction area	Included in Project price

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost
	areas as required; • Active areas adjacent to residents should be kept damp at all times. • Establish and enforcing vehicle speed limits to minimize dust generation; • Using tarpaulins to cover fugitive loads (for demolition concrete materials) on haul trucks moving off-site; • Select plant and equipment, design work practices, and limit hours of operation to minimize potential impacts as far as practicable; • Operators of noisy equipments or any other workers in the vicinity of excessive noisy equipment are to be provided with ear protection equipment; • Under noisy conditions, do not allow operators or other workers to be exceed the threshold that has been establish for exposure to noise; • Schedule construction so as to minimize the multiple use of the most noisy equipments near sensitive receivers; • Ensure that all equipments is in good repair and operated in the correct manner; • Consult with local residents and building owners the address community concerns; • The funds necessary for the work to be undertaken will be included in the Works contract.			
Possible removal of Terrestrial habitat. Loss of the top soil	Sites rehabilitated before contractor leaves site upon completion of construction activities. Planting and stabilization of site, including replacement of any native plant species.	Construction Contractor	Construction and labor camp, storage area. WW Pipe construction	Part of construction cost
SSEMP	Preparation of the document Before Construction start Environmental audit of SSEMP to ensure that all Environmental requests are reflected. The bidding document shall reflect all environmental mitigation measurements	SC		
Construction of noise attenuation wall		Construction Contractor		100 000.00
Construction				

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost
Ambient Air and Local Dust[2]	• Cover or damp down by water spray on the excavated mounds of soil to control dust generation; • Apply water prior to levelling or any other earth moving activity to keep the soil moist throughout the process; • Bring the material (aggregate and sand) as and when required; • Ensure speedy completion of work and proper site clearance after completion; • Damp down unsatisfied /bad condition roads to avoid dust generation while using for transport of waste/material • Use tarpaulins to cover loose material that is transported to and from the site by truck • Control dust generation while unloading the loose material (particularly aggregate and sand) at the site by sprinkling water/unloading inside barricaded area • Clean wheels and undercarriage of haul trucks prior to leaving construction site Don't allow access in the work area except workers to limit soil disturbance and prevent access by fencing	Constructor Company	Excavation areas for trenches at Zugdidi town and WWTP construction area	Part of construction cost
	The Contractor shall coordinate with local Traffic Management Department to minimize construction traffic impact in the following topics: • Temporary parking restrictions, • Pedestrian and cyclist diversion routes where construction prevents access, • Temporary traffic signals, • One way scheme, • Maintaining local residential access at all times, • General traffic diversion routes where roads are closed. • Sound barriers should be erected at schools and hospitals if the distance to the construction site is less than 50 m	Contractor	Transportation routes of construction materials	Part of construction cost

[2]Environmental Quality Norms approved by the Order #297N (16.08.2001) of the Ministry of Labour, Health and Social Protection (as amended by the Order No 38/n of the same Ministry of 24.02.2003). The quality of atmospheric air (pollution with hazardous matter) is also defined by the order of the Minister of Environment Protection and Natural Resources (#89, 23 October 2001) on approval of the rule for calculation of index of pollution of atmospheric air with hazardous pollution

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost
Noise Pollution[3]	• Approximately 100m length noise attenuation wall must be constructed at the East part of the project area. • Maintain machinery and vehicle silencer units to minimize noise • Keeps noise generating activities associated with construction activities to a minimum and within working hours. • Notify the residents of Zugdidi town close to the Project area prior to commencement of the construction phase. • Vehicles and machinery that are used intermittently should not be left idling condition for long period of time. • Equipment used on site will be quietest reasonably available. • Haul routes for construction traffic entering and leaving the site will be selected to ensure noise levels at noise sensitive receptors are kept at a minimum.	Constructor Company	Excavation areas for trenches at Zugdidi town and WWTP construction area	Part of construction cost
Impact on surface water bodies due to construction[4]	• In case of heavy rain, protect open trenches from entry of rain water by raising earthen bunds with excavated soil • Confine construction area including the material storage (sand and aggregate) so that runoff from upland areas will not enter the site • Ensure that drains are not blocked with excavated soil	Civil Contractor	Project area	Part of construction cost
Soil Contamination	• The contractors will be required to instruct and train their workforce in the storage and handling of materials and chemicals that can potentially cause soil contamination. • Solid waste generated during construction and at campsites will be properly treated and safely disposed of only in demarcated waste disposal sites. • Construction chemicals will be managed property • Clearly labelling all dangerous products, • Fuel tanks (diesel or oil) should be placed in a concrete pool which its perimeter walls will be at least 1.0 m high with the concrete or plastered masonry wall, • A proper floor drain should be installed on the slab of the concrete pool for safely discharging the leakages.	Construction Contractor	Construction site Camp	Part of construction cost

[3]The Georgian standards for noise control as approved by the Decree of the Minister for Health, Labour and Social Affairs (297n of August 16, 2001) upon the 'Approval of Environmental Quality Standards', which specify the tolerable and maximum admissible levels of noise for different zones

[4]Rules of the Protection of the Surface Waters of Georgia from Pollution

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost
	•			
Impact on Flora and Fauna	• Avoid tree cutting • In unavoidable cases, plant two trees of same species for each tree that is cut for construction • The trench shall not be kept open in the night/after working hours. This will avoid any safety risk to people, domesticated, stray or wild animals. • The Contractor shall ensure that the work site be kept clean, tidy and free of rubbish that would attract animals.		Construction sate Camp	Part of construction cost
Impact on Traffic	• Informing all residents and businesses about the nature and duration of any work well in advance so that they can make necessary preparations if necessary; • Providing wooden walkways/planks across trenches for pedestrians and metal sheets where vehicle access is required • Increasing workforce to complete the work in minimum time in these stretches • Initial situation of private properties has to be re-established after construction		Construction site Access Road	Part of construction cost
Hazardous Materials	• Comply with all national, regional and local legislation with regard to the storage, transport, use and disposal of petroleum, chemical, harmful and hazardous substances and materials. • Establish an emergency procedure for dealing with spills or releases of petroleum. • Storage of all hazardous material to be safe, tamper proof and under strict control. • Petroleum, chemical, harmful and hazardous waste throughout the site must be stored in appropriate, well maintained containers. • Any accidental chemical / fuel spills to be corrected immediately.		Construction site Storage Area	Part of construction cost
Solid Waste	• Place of disposal of the waste concerned must be enclosed. • The waste must not have access to drainage water. • Waste must be immediately removed from the working sites. • Waste must be placed in secondary protective basins. • This waste can be transferred only to a certified contractor.		Project area Storage Area	Part of construction cost

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost
	The personnel involved in the handling of hazardous and non-hazardous waste will undergo specific training in: • Waste handling • Waste treatment; and • Waste storage.		Construction camp	
Loss of top soil	• Top soil of about 1 ft depth (0.3 m) shall be removed and stored separately during excavation work, and after pipeline construction the same soil shall be replaced on the top.	Civil Contractor	Pipeline work in pasture lands, agricultural land,	Part of construction cost
Erosion due to excavation/refilling	• Ensure proper compaction of refilled soil and there shall not be any loose soil particles on the top; the material shall be refilled in layers and compacted properly layer by layer. • In the steep slopes, local grass species shall be planted on the refilled trenches.	Civil Contractor	All construction sites	Part of construction cost
Impact on air quality due to emissions from construction equipment/vehicles	• Ensure that all equipment & vehicles used for construction activity are in good condition and are well maintained • Ensure that all equipment & vehicles confirms to emission and noise norms	Civil Contractor	Zugdidi town, WWTP construction area	Part of construction cost
Socio-economic benefits from employing local people in construction work	• To the extent possible labour force should be drawn from the local community	Civil Contractor	All construction sites	Part of construction cost

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost
Impacts due to import of labour and establishment of temporary labour camps	• In unavoidable case of sourcing labour from other areas, provide adequate housing facilities so that there are no impacts and conflict with the local people: ○ Establish temporary labour camps in consultation with the local authority ○ Shall be located away from water bodies ○ No clearance of trees vegetation shall be allowed for establishment of camp ○ Provide all basic amenities (water supply and sanitation, waste collection & disposal, first aid facilities, etc.) ○ Contractor shall provide fire wood and no worker shall be allowed to cut any tree ○ Ensure regular and clean maintenance of the camp	Civil Contractor	Temporary labour camps	Part of construction cost
Safety risk – public and worker	• Follow standard and safe procedures for all activities – such as provision of shoring in deep trenches (>2 m) • Exclude public from the site – enclose construction area, provide warning and sign boards, security personnel • Provide adequate lighting to avoid accidents • Ensure that all workers are provided with and use appropriate Personal Protective Equipment - helmets, hand gloves, boots, masks, safety belts (while working at heights etc.); • Maintain accidents records and report regularly • Trench construction shall be taken up in small segments, so that work (excavation, pipe laying and refilling) in each segment is completed in a day. No trenches shall be kept open in the night/after work hours.	Civil Contractor	All construction sites	Part of construction cost
Historical, archaeological chance finds during excavation	• Contractor shall put in place a protocol for conducting any excavation work, to ensure that any chance finds are recognized and measures are taken to ensure they are protected and conserved. This should involve: ○ Having excavation observed by a person with archaeological field training; ○ Stopping work immediately to allow further investigation if any finds are suspected; ○ Calling in the state archaeological authority if a find is suspected, and taking any action they require to ensure its removal or protection in situ..	Contractor	All construction sites	Part of construction cost

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost
Cumulative impacts – repeated disturbance to roads and people	• Schedule the construction activities in harmony with the other on-going works • Schedule works before road work	Civil Contractor, SC	Works on waste water supply network in the town	Part of construction cost
Climate Change	• Restoration of the wind break belts in the area adjacent to the Project zone what will reduce the soil erosion potential and will help regulate the temperature regime during the high air temperatures; • Extend river protection works by erection double gabion walls as currently been contracted at the opposite edge of the future WWTP location; This would be the most efficient measure to avoid gushing of water in WWTP land during floods;	Contractor	Construction area	Part of construction cost
Operation Phase				
risk of accidental release of untreated wastewater at the WWTP	• As far as operation failure of WWTPis concerned, there should be provisions for zero tolerance on failures during operations. During normal operations once the processes are stabilized, one can't foresee a longer failure of operations, and the failures are largely due to failure of mechanical or electrical parts, which can be rectified very easily. And most of the instances, such failures not necessarily brings down full operation (e.g. failure of one aerator, or a pump), as there is always sufficient standby built in WWTP design. For this purpose, there has to be 100% power back-up, and sufficient spare parts to rectify any such failures within shortest possible time. The same has been included in the design of WWTP. Since WWTPis being bid out on design-build-operate basis, the operator will have responsibility to operate and maintain the WWTP to meet the discharge standards. It is also proposed to procure routine spare parts, and any additional spare parts (that bidder will propose in his bid) before commissioning of WWTP as a part of construction cost, which will be financed from the loan. • Before operation Phase will be started the “Emergency plan” Should be prepared. • provision of dual power supply; • spare parts for key components; • regular inspection and proper maintenance of the WWTP; • automated on-line, real-time monitoring of influent and effluent quality;	UWSCG	Well fields, water network	Part of operating costs

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost
Foul Odor Off-site Migration from WWTP	• close monitoring of the aerobic units to ensure the conditions are not anoxic (without enough oxygen), • landscaping with trees and shrubs around the facility shall be done to position them as wind breaks, and • conduct of WWTP‟s annual odor audit to identify operational measures that can prevent odor problems	UWSCG	WWTP	Part of operating costs
Disturbance/ nuisance/ noise due to operation activity	• Consulting company has to define the noise level and its spreading area generated at the stage of WWTP operation; • Additional changes will have to be included in the design if required and also noise reducing barriers will have to be arranged	UWSCG	pumping stations, WWTP area	Part of operation costs
land pollutioncause from sludgedispose	Plan for Sewage sludge disposal on the dump site has to be prepared before starting the operation. The plan has to be agreed with the Ministry of Environment and natural resources of Georgia and also waste management company.	UWSCG	Zugdidi Municipal Landfill	Part of operation costs

I.5 Monitoring

326. Monitoring describes (a) monitoring measures with technical details, including parameters to be measured, methods to be used, sampling locations that will signal the need for corrective actions; and (b) monitoring and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures and document the progress and results of mitigation.

327.A program of monitoring will be required to ensure that all concerned agencies take the specified action to provide the required mitigation, to assess whether the action has adequately protected the environment, and to determine whether any additional measures may be necessary. Regular monitoring of implementation measures by Civil Contractors will be conducted by the SC, on behalf of Implementing Agency. Monitoring during operation stage will be conducted by the UWSCG.

328.Most of the mitigation measures are fairly standard methods of minimizing disturbance from building in urban areas (maintaining access, planning work to minimize public inconvenience and traffic disruptions, finding uses for waste material, etc). Monitoring of such measures normally involves making observations in the course of site visits, although some require more formal checking of records and other aspects. The regular control and inspection during general construction activities in Zugdidi is needed.

Table 24: Environmental Monitoring Plan for general construction activities in Zugdidi

Item	Parameter	Frequency	Action Level	Response When Action Level Exceeded	Responsibility
Pre construction					
Tender documentation	Environmental Issues	Once before bid announcement	Environmental audit of bidding documents to ensure relevant sections of the EMP have been included	The bidding document shall reflect all environmental mitigation measurements	SC
Contract documentation with constriction contractor	Environmental Issues	Once before contract signature	Environmental audit of contract documents to ensure relevant sections of the EMP have been included	The contract document shall reflect all environmental mitigation measurements	SC
Construction					
Ambient Air	Dust	Continual	Visual assessment during the Works Impact Monitoring Compliance Monitoring	If dust levels are above acceptable visual levels, implement dust suppression techniques (wetting down area) and/or assess weather conditions and maybe temporarily cease works until conditions ease	SC
Noise	(15 minute) Noise Levels	Only as required: Periodic attended Monitoring at hourly intervals at nearest potentially sensitive receivers.	+20 dBA for short term (1 Month)	If noise action level is exceeded then review work practices and noise control procedures, including maintenance of equipment, installation of silencers, provision of noise barriers and modification of work hours.	SC
Noise	(15 minute) Noise Levels	Dally (At the nearest receptors. TB Hospital and residential buildings)	Measurement	If noise action level is exceeded then review work practices and noise control procedures,	SC
Water Quality	Quality/ Contaminant concentrates	Continue In rain weather	Guideline / licence requirements (whichever is Applicable) Impact Monitoring Compliance Monitoring	If contaminant concentrations/licence conditions are exceeded, review disposal options and decide on most applicable.	SC

				Report any accidences of licence (of applicable) to issuing authority.	
Waste Management Implications	Segregation, Storage and transport of wastes	Monthly inspection	- Visual assessment during the Works; - Field inspection, - Report of waste volumes generated. - Report and record all leakages and spills - Impact Monitoring. - Compliance Monitoring	Solid waste cycled as 0 % of movement of solids or liquid waste through the soil, rocks, water, atmosphere.	SC
Ground	Soil Monitoring and Erosion Control	Continual	Assess adequacy of sedimentation/environmental controls on-site Impact Monitoring	If controls have failed or are found inadequate, cease works immediately and repair to an acceptable standard	SC
Ecological Resources	Fauna and Flora	Continual	Minimal ecological impacts Impact Monitoring	Required to ensure the recommended mitigation measures are properly implemented.	SC
Landscape and Visual	Surface treatment of temporary structures	Once at the Completion of work	Minimum disturbance of the original landscape. Impact Monitoring	Required to ensure the recommended mitigation measures are properly implemented	SC
Operation					
WWTP quality monitoring, inflow	BOD5, COD, Nitrogen, Phosphorus	weekly	Compare with design parameters		UWSCG
WWTP quality monitoring, aeration tank	Oxygen	daily	Compare with design parameters	Adjust treatment process	UWSCG
WWTP quality monitoring, aeration tank	Sludge volume	daily	Compare with design parameters	Adjust treatment process	UWSCG
WWTP quality monitoring, aeration tank	Dry matter contents	Thrice per week	Compare with design parameters	Adjust treatment process	UWSCG
WWTP quality monitoring, aeration tank	Dry matter contents of return sludge	Weekly	Compare with design parameters	Adjust treatment process	UWSCG

WWTP quality monitoring, aeration tank	Microscopical analysis	Twice per week	Compare with design parameters	Adjust treatment process	UWSCG
WWTP quality monitoring, outflow	Temperature, pH, suspended solids	daily	compare with permission	Adjust treatment process	UWSCG
WWTP quality monitoring, outflow	BOD5, COD, NH4-N, NO3-N, Pgesamt	weekly	compare with permission	Adjust treatment process	UWSCG
WWTP quality monitoring, outflow	NO2-N	monthly	Compare with design parameters	Adjust treatment process	UWSCG
WWTP quality monitoring, outflow	Coliforms	monthly	Monitor development		UWSCG
WWTP quality monitoring, sludge treatment	temperature, pH	daily	Compare with design parameters	Adjust treatment process	UWSCG
WWTP quality monitoring, sludge treatment	dry matter contents	monthly	Compare with design parameters	Adjust treatment process	UWSCG
WWTP quality monitoring, sludge treatment	loss on ignition	monthly	Compare with design parameters	Adjust treatment process	UWSCG
WWTP quality monitoring, sludge treatment	sludge gas	daily	Compare with design parameters	Adjust treatment process	UWSCG
WWTP quality monitoring, sludge treatment	sludge production (watered, de-watered)	as required	Compare with design parameters	Adjust treatment process	UWSCG
WWTP quality monitoring	energy consumption	daily	Compare with design parameters	Adjust treatment process	UWSCG
WWTP quality monitoring	Methane	monthly	Check occurrence	Check sludge treatment installations	UWSCG
Chkhoushi river water quality monitoring	Suspended particles, BOD overall, COD, Total Nitrogen, Total Phosphorus	weekly	Sample taking, water analysis, compare with baseline data	Compare with effluent quality, adjust treatment process	UWSCG

WWTP operation	Noise	monthly	Compare with Georgian standards for noise control	Inspect installations	UWSCG
WWTP operation	Odor	monthly	Compare with normal odor levels	Inspect installations	UWSCG
Infrastructure	Breaks / Deteriorations/ Leakage	Monthly inspection	Visual Assessment Public Complaints Compliance Monitoring	If breaks/ failures occur, close isolation valves (or plug manholes)immediately and repair / replace to an acceptable standard.	Operational Unit
Chkhoushia River during failure of WWTP	O_2	Twice per day			Operational Unit

K. Conclusion and Recommendation

K.1 Recommendation

329.The environmental impacts of infrastructure elements proposed in the waste water system improvement subproject in Zugdidi have been assessed and described in the previous sections of this document. Potential negative impacts were identified in relation to design, location, construction and operation of the sub project components. Mitigation measures have been developed to reduce all negative impacts to acceptable levels.

330.Mitigation measures were discussed with engineering specialists, and some measures have already been included in the designs.

331.Regardless of these and various other actions taken during the IEE process and in developing the project, there will still be impacts on the environment when the infrastructure is built and when it is operating. Appropriate monitoring measures to guarantee the long term and sustainable operation of the waste water system are presented in a monitoring plan.

332.When operating, waste water components will have overall beneficial impacts to human health and the environment as it will provide the inhabitants of Zugdidi with a new waste water system.

333.The main beneficiaries of the improved system will be the citizens of Zugdidi, who will be provided with a new waste water system. This will improve the quality of life of people as well as raising the standards of both individual and public health as the improvements in hygiene should reduce the incidence of disease. This should lead to economic gains as people will be away from work less and will spend less on healthcare, so their incomes should increase.

334.Mitigation will be assured by a program of environmental monitoring conducted during both construction and operation to ensure that all measures are provided as intended, and to determine whether the environment is protected as envisaged.

335.The recommendation of this Environmental Assessment process is that all mitigation, enhancement and monitoring activities proposed here shall be implemented in full. This is essential to ensure that the environmental impacts are successfully mitigated; this is the responsibility of UWSCG.

K.2 Conclusion

336.The environmental impacts of the proposed waste water components have been assessed by the Initial Environmental Examination reported in this document.

337.An Environmental Management Plan (EMP) has been prepared and will be implemented during the project implementation. The EMP identifies the potential environmental impacts arising from the project along with a set of the mitigation measures to reduce the impacts to acceptable levels. It also includes the institutional arrangements for implementing the EMP to ensure its effectiveness.

338.The overall conclusion of the IEE is that provided the mitigation and enhancement measures are implemented in full, there should be no significant negative environmental impacts as a result of location, design, construction or operation of the subproject. There should in fact be positive benefits through major improvements in quality of life and individual

and public health once the scheme is in operation.. Project will stimulate economic growth. The.Waste water good quality is a prerequisite for tourism development. Standard of individual and public health will improve as a result of the project. Project will generate new job opportunities

Appendix 1

"United Water Supply Company of Georgia", LLC

Public Hearing Meeting
Construction of Sewerage System and Wastewater Treatment Plant in Zugdidi
(Tranche V)
Initial Environmental Examination
(Zugdidi City Hall; 14 November, 2014; 17:00 PM)
Minutes of Meeting

The following persons attended the meeting:

1. Ketevan Chomakhidze– "United Water Supply Company of Georgia, LLC" (UWSCG), USIIP, Environmental Specialist;
2. Alexander Mikiashvili – Representative of Design Company Kocks, Georgia
3. David Potskhveria - "United Water Supply Company of Georgia, LLC", Head of the Local Service Centre
4. Irakli Kaviladze – Expert of DC Kocks

The meeting was attended by:

1. Zugdidi Mayor - Mr. Gogokhia
2. Deputy Mayor of Zugdidi - Mr. Koba Jiqia
3. Vice-Mayor of Zugdidi – Mr. Gia Gulordava

The following local representatives of Zugdidi attended the meeting:

1. Lali Jikia – local resident
2. David Djabua - local resident
3. Lavrenti Kemularia – Local resident
4. Irakli Tsanava – Local resident
5. David Khubua - Local resident
6. David Sulikhia - Local resident
7. Djimsher Sherozia - Local resident
8. Irakli Pipa - Local resident
9. Ekaterine Kikalishvili - Local resident
10. Murtaz Bokuchava - Local resident
11. Koba Morgoshia - Local resident
12. Giorgi Bulia - Local resident
13. Boris Ghadua - Local resident
14. Teimiraz Kharabava - Local resident
15. David berulava- Local resident
16. Koba Jikia- Local resident
17. Nukri Esartia - Local resident
18. Ekaterine Todua - Local resident

The Public Hearing was held on November 14, 2014 in Zugdidi City Hall and commenced at 17:00. The Public Hearings was organized with representatives from

the local government of Zugdidi, local population and representatives of UWSCG and Design Company Kocks.

By giving advertisements in advance at Zugdidi Service Centre, attendance of a wide range of related people to the meetings was encouraged. During the public hearing, citizens were informed about the activities to be carried out within the scope of the Zugdidi sub-project, environmental effects of the project and measures to be taken against these effects. Opinions, ideas and suggestions of the local residents and related people were received during the meeting.

It should be noted that prior to the presentation, Mayor of Zugdidi expressed his attitude to the proposed sub-project and stressed the importance of rehabilitation of the sewerage system for the city. He underlined that currently only 15% of the local population is connected to sewerage network and untreated sewerage is a major environmental concern for the city.

Consultation with affected population was undertaken: to ensure their informed participation in the design, implementation and monitoring of the project measures and their impacts on the environment, as well as the efforts to minimize and the mitigate impact when avoidance is not possible; to introduce the project benefits to the local population that accrue to them as a result of project implementation; to incorporate all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.

The following topics were discussed during the meeting:

- project context and rationale
- expected start and end of the project
- benefits of the project to local population and to the country as a whole
- the environmental issues and mitigated measures related to the project

The power point presentations were held by Ketevan Chomakhidze and Alexander Mikiashvili. They presented full information for local residents and attendees about projected activities and described the project nature and estimated impacts as a result of this project implementation.

Local residents and the representatives of UWSCG held discussions about particular issues during the meeting.

The following questions were asked from the local population.

#	Questions from Local residents	Answers from UWSCG and Kocks
	How many streets will be involved in the project and will it completely cover the city?	Representatives of the UWSCG and Kocks explained the local population that project will cover the whole Zugdidi with 100% connection of the local population to the sewerage network.

	Howmuch will be the daily discharge of sewerage, and what is the capacity of the treatment facility?	It was explained that capacity of the WWTP is 11,000m^3 per 24 hours.
	IDP compact settlement will be connected to the network as well?	Yes
	What is duration and date of completion of the construction of the project?	Duration of the construction is three ywars, project will start in 2016 and finish in 2019
	Who is responsible for repair and maintenance of pipes in case of damage?	United Water Supply Company of Georgia
	Who will supervise and monitor construction and operation of the project?	UWSCG and Supervision Consultant
	Who is responsible for the restoration after completion of the rehabilitation works and who will do it?	UWSCG is responsible for the rehabilitation works while contractor will carry out restoration works
	What type of impact on environment is associated with the project?	Environmental impacts that are associated with the project are only site specific. Impacts are mostly confined to the construction stage of the project and are therefore temporary. For permanent environmental impacts during operation stage, suitable mitigation measures will be implemented.
	What will be Socio Economic Impacts of the Project?	Project will generate new job opportunities. Standard of individual and public health will improve as a result of the project. Improvements of hygiene conditions will reduce the incidence of diseases associated with poor sanitation.
	Who is implementing and sponsoring the Project?	Project is co-financed by the Asian Development Bank (ADB) and the Government of Georgia and implemented by the United Water Supply Company of Georgia (UWSCG).
	What type of impact on environment is associated with the project? And what mitigation measures will be taken?	The potential overall adverse environmental impact of the Project is moderate and the identified issues can generally be managed and the potential impacts reduced to acceptable levels through the implementation of the set of

		proposed mitigation measures during construction, operation and monitoring. Impacts mainly arise from generation of dust from soil excavation and refilling; and from the disturbance of residents and traffic. Following activities are suggested for the mitigation measures: (i) using measures to reduce/control dust generation; (ii) planning transport routes/schedules carefully; (iii) avoiding night-time construction activities. There are no health and safety risks associated with the subproject.
	What are the construction costs?	This question could not be answered and was noted for the next meeting.

Zugdidi mayor expressed his opinion, if the proposed water supply and sanitation sub-projects will interfere with projects to be implemented by the municipality in 2015,Including miner road, water supply and sanitation rehabilitation works. And asked UWSCG to provide accurate time schedule of the planned works within the proposed sub-projects.

Photos of the public hearing:

Annex 2

Waste Asbestos-Containing Material Management Plan

(Zugdidi WWTP)

Tbilisi, 2015

Definitions

Asbestos means the asbestiform varieties of: Chrysotile (serpentine); crocidolite (riebeckite); amosite (cummingtonitegrunerite); anthophyllite; tremolite; and actinolite.
Asbestos-containing material (ACM) means any material or product which contains more than 1 percent asbestos.
Asbestos-containing building material (ACBM) means surfacing ACM, thermal system insulation ACM, or miscellaneous ACM that is found in or on interior structural members or other parts of a school building.
Asbestos debris means pieces of ACBM that can be identified by color, texture, or composition, or means dust, if the dust is determined by an accredited inspector to be ACM.
Airborne Asbestos Fibers Any material that contains greater than one percent asbestos, and which can be crumbled, pulverized, or reduced to powder by hand pressure. This may also include previously non-friable material that becomes broken or damaged.

Abbreviations

ACM	Asbestos-Containing Material
ACBM	Asbestos-Containing Building Material
ADB	Asian Development Plan
GIIP	Good International Industry Practice
EHS	Environmental Health & Safety
EMP	Environmental Management Plan
EA	Executive Agency
ILO	International Labor Organization
MoE	Ministry of Environmental and Nature Resource Protection of Georgia
UWSCG	United Water Supply Company of Georgia

Content

1. Introduction

According to the project, Zugdidi Waste Water Treatment Plant construction is planned on the territory of the existing treatment plant. It is required to demolish the existing infrastructural building and dispose the construction materials that were generated after demolishing safely (refer to chapter???). In addition, the visual examination of the future treatment plant site revealed that the local population uses the surrounding territory of the existing (non-functional) waste water treatment plant as a waste field without any permission. Construction and household waste has been disposed on the project site and along the area for years without any control. As at today, according to the initial examination approximately 100 m3 waste is disposed on the territory.

Prior to commencement of the preparatory works within the scope of the project, the project area must be cleaned off the said waste, which is to be collected, transported and disposed on the nearest landfill.

The following actions are necessary to manage the waste found in the project zone:

1. The amount and content of the waste is to be identified;
2. The waste management plan is to be developed;
3. The company with relevant resources (both, human and infrastructural) is to be identified;
4. The waste is to be removed from the area and safely disposed under the prepared plan.

2. Waste content

Aiming at identifying the amount and content of the waste, a trip to the project zone was organized on November 13-14 of 2014. According to the obtained information the uncontrolled waste is disposed on the territory by private individuals. Basically, these are construction or repairing waste, also household waste. No organic waste is found in the area. This can be explained by the cattle of the nearby villages using the project zone as a drive and eating any organic remains found in the area.

Most of the waste in the said area belongs to a non-hazardous type of waste. However, even visually it can be seen that 5-6% of the total waste in the area (approximately 5-6 m^3) is asbestos-containing waste, in particular, asbestos sheeting. This type of waste belongs to the highly hazardous waste. There is also 4-5 m3 scattered glass waste that itself represents a class of dangerous waste.

It should also be noted that the asbestos-containing waste was allocated as a small fill (Figures 1 and 2), as well as asbestos-containing fractures of the sheeting mixed with different kinds of waste (Figures 1 and 2).

Figures 1 and 2: Asbestos-containing waste placed as a separate pile

Figures 3and4: Small asbestos-containing waste mixed with different kinds of waste

Following the high hazardous nature of the asbestos-containing waste, prior to collecting and removing the waste from the project area, it should be separated (isolated) from other types of waste.

The visual observation also revealed minor quantities of other waste in the project area, mostly the broken-down parts, polluted with fuel or oil materials (Figures 5 and 6). However, as already mentioned, their quantity is minor making 1% of all waste according to the preliminary data.

Figures 9 and 10: Broken-down vehicle parts


During the field works, aiming at avoiding extra hazard, the radiation background of the waste was determined. The measurements were done with device “Redex”. The radiation background all over the project area was within the norm, varying between 10 and 14 R/hr. A little increased radiation background was fixed in the small areas with clay remains making 22 R/hr (Figures 11 and 12).

Figures 11 and 12: Background radiation in the project area


3. Legislative Requirements

3.1. Georgian Legislation

The hygienic requirements, sanitary rules and standards related to asbestos and ACM (asbestos-containing materials) on the territory of Georgia are regulated by Decree No. 2004 of the Minister of Labour, Health and Social Affairs of Georgia “**The hygienic requirements for the sanitary rules and standards for asbestos and asbestos-containing materials**”.

The said law regulates packing, storing and transportation of the asbestos-containing materials, as well as collecting, storing and utilization processes of asbestos-containing industrial and municipal waste.

The maximum admissible concentrations of fibrous aerosols with diverse actions and metals in the working zone is regulated by Decree No. 262/N of September 18, 2002 of the Minister of Labour, Health and Social Affairs of Georgia.
In line with the said law, the ACMs belong to the class of highly hazardous substances.

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3.2 IFI Group Approach to Asbestos Health Risk

The WBG EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP)[5]. When one or more members of the WBG are involved in a project, the EHS Guidelines are applied as required by their respective policies and standards.

The WBG's EHS Guidelines[6] specify that the use of ACM should be avoided in new buildings and construction or as a new material in remodeling or renovation activities. Existing facilities with ACM should develop an asbestos management plan that clearly identifies the locations where the ACM is present, its condition (e.g., whether it is in friable form or has the potential to release fibers), procedures for monitoring its condition, procedures to access the locations where ACM is present to avoid damage, and training of staff who can potentially come into contact with the material to avoid damage and prevent exposure. The plan should be made available to all persons involved in operations and maintenance activities. Repair or removal and disposal of existing ACM in buildings should be performed only by specially trained personnel[7] following host country requirements or, if the country does not have its own requirements, internationally recognized procedures[8]. Decommissioning sites may also pose a risk of exposure to asbestos that should be prevented by using specially trained personnel to identify and carefully remove asbestos insulation and structural building elements before dismantling or demolition[9].

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[5] Defined as the exercise of professional skill, diligence, prudence, and foresight that would be reasonably expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally. The circumstances that skilled and experienced professionals may find when evaluating the range of pollution prevention and control techniques available to a project may include, but are not limited to, varying levels of environmental degradation and environmental assimilative capacity as well as varying levels of financial and technical feasibility

[6] http://www.ifc.org/ifcext/enviro.nsf/AttachmentsByTitle/gui_EHSGuidelines2007_GeneralEHS/$FILE/Final+-+General+EHS+Guidelines.pdf (pp. 71, 91, 94)

[7] Training of specialized personnel and the maintenance and removal methods applied should be equivalent to those required under applicable regulations in the United States and Europe (examples of North American training standards are available at: http://www.osha.gov/SLTC/asbestos/training.html)

[8] The ASTM International E1368 - Standard Practice for Visual Inspection of Asbestos Abatement Projects; E2356 - Standard Practice for Comprehensive Building Asbestos Surveys; and E2394 - Standard Practice for Maintenance, Renovation and Repair of Installed Asbestos Cement Products.

[9] http://www.ifc.org/ifcext/enviro.nsf/AttachmentsByTitle/gui_EHSGuidelines2007_GeneralEHS/$FILE/Final+ +General+EHS+Guidelines.pdf (pp. 71, 91, 94)

3.3 International Convention and Standards for Working with Asbestos

The International Labor Organization (ILO) established an Asbestos Convention (C162) in 1986 to promote national laws and regulations for the "prevention and control of, and protection of workers against, health hazards due to occupational exposure to asbestos."[10] The convention outlines aspects of best practice: Scope and Definitions, General Principles, Protective and Preventive Measures, Surveillance of the Working Environment, and Workers' Health. As of March 4, 2008, 31 countries had ratified the Convention;[11] 17 of them have banned asbestos.

Some of the ILO asbestos convention requirements:

- work clothing to be provided by employers;
- double changing rooms and wash facilities to prevent dust from going home on street clothes;
- training of workers about the health hazards to themselves and their families;
- periodic medical examinations of workers,
- periodic air monitoring of the work environment, with records retained for 30 years;
- development of a work plan prior to demolition work, to protect workers and provide for proper waste disposal; and
- protection from "retaliatory and disciplinary measures" of workers who remove themselves from work that they are justified in believing presents a serious danger to health.

5. Risk Assessment

The asbestos risk assessment process involves identifying, analyzing, evaluating, controlling and monitoring sources of asbestos within buildings or other structures. The presence of asbestos within a building is considered a hazard, but the level of risk associated with the hazard is related to the presence of airborne fibers. The identification of asbestos within a building doesn't automatically necessitate its immediate removal. Asbestos that is in a stable matrix, or effectively encapsulated or sealed, and remains in a sound condition while left undisturbed, represents low risk to health.

Asbestos becomes dangerous when the fibers are released into the air and inhaled or ingested in high concentrations over a prolonged period of time. Individuals face the risk of inhaling or ingesting airborne fibers when asbestos containing products are worn down, disturbed, or damaged.

There are some classifications to determine the risk of the ACMs, but the principal evaluation indicators are the same with all of them. The degree of risk increases as a result of the following factors:

1. High degree of the physical damage of the ACMs.
2. High probability of the future damage of the ACMs.
3. High degree of contact of the damaged ACMs with air.

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[10] www.ilo.org/ilolex

[11] http://www.ilo.org/ilolex/english/convdisp1.htm

The ACMs located in an uncontrolled manner in the project zone, besides being virtually fractured, are subject to daily impact of the following factors:

1. The project area is the driving route for the cattle of the nearby villages (the cattle is driven across the project area twice a day). The cattle use the waste in the area as a feed. Consequently, the ACMs in question are subject to further impact every day.
2. The local population permanently dispose the waste in the said area in an uncontrolled manner what is another source of damage for the ACM.

As already mentioned, the area where the ACM waste is placed, is an open area and is in direct contact with air.
Following the above-mentioned, the existing situation can be evaluated as highly risky. ACM is friable and not in a stable condition, and there is a risk to health, it must be removed by a certified asbestos removalist as soon as practicable.

Within the scope of the project, it is necessary to ensure the separation/collection, transportation and safe disposal of the AC waste by the Contractor prior to the preparatory works.

5. Waste Asbestos-Containing Material Management Plan

5.1 Project Goals and Objectives

The goal of the presented „**Waste Asbestos-Containing Material Management Plan“** is to avoid, reduce or manage any potential adverse impact on the environment and/or humans caused by the project implementation.
In order to achieve this goal, the following measures are necessary:

- The quantity and content of the waste placed in the project zone in an uncontrolled manner is to be identified;
- The degree of risk of the negative impact of the existing situation on the environment is to be identified;

- A duly qualified project-implementing organization is to be identified through a tender;
- A detailed „**Waste Asbestos-Containing Material Management Plan“** is to be developed;
- The separation/collection, transportation and safe disposal of the AC waste is necessary;
- The monitoring plan is to be developed and implemented.

5.2 Rights and Responsibilities

The companies and organizations engaged in the AC waste have the following rights and obligations:

Executive Agency (UWSCG):

- Approve AMP risk assessment and Waste ACM Management plans
- Ensure resources are allocated to enable thorough application of Debris ACM Management plan on site
- Ensure employees are made available for asbestos awareness training and asbestos removal work
- Ensure an Asbestos Removal Business Certificate is maintained for the site where applicable
- Ensure the Waste ACM Products Register is maintained for the site
- Ensure the Asbestos Exposure Register is maintained for the site
- Ensure compliance with Waste ACM Management plan

Contractors:

- Submit risk assessment and Waste ACM Management plans when performing waste separation (asbestos removal), transportation and disposal works;
- Develop a site-specific waste separation (asbestos removal) control plan prior to performing the separation works;
- Undergo site induction;
- Ensure no asbestos is removed or disturbed without prior notification to RD
- Ensure legislative requirements and appropriate procedures are complied with.
- Upon job completion ensure all products are labelled using the correct identification stickers and disposed in safe manner.
- Report immediately to RD any perceived asbestos risk

5.3 Awareness Training

5.3.1 Asbestos Separators/Removalists

Persons carrying out asbestos removal work are to be trained so they can carry out this work safely and without risk to their own health or the health of others. This training must reflect the specific type of asbestos work to be undertaken. Asbestos Separators/Removalists are to keep written records of all training provided to their asbestos removal workers and these records should be requested before awarding the contract for any site removal work.

5.3.2 Site employees

Any UWSCG employees and others who may come into contact with ACM on the site, either directly or indirectly, must be provided with adequate information and training. Depending on the circumstances the asbestos awareness training may include:

- the purpose of the training;
- the health risks of asbestos;
- the types, uses and likely occurrence of ACM at the specific construction site;
- the trainees' roles and responsibilities under the project Waste ACM Management plan;
- where each site-specific register of ACM is located and how it can be accessed;

- the timetable for removal of ACM from the particular construction site;
- the processes and procedures to be followed to prevent exposure, including exposure from any accidental release of asbestos dust into the workplace;
- where applicable, the correct use of maintenance and control measures, protective equipment and work methods to minimize the risks from asbestos, limit the exposure of workers and limit the spread of asbestos fibers outside any asbestos work area;
- control levels for asbestos; and
- the purpose of any air monitoring or health surveillance that may occur.

5.3.3 Local population

The awareness building training about the negative impact of the ACM waste on the environment should be held for the population living or working adjacent to the project zone. Depending on the circumstances the asbestos awareness training may include:

- the purpose of the training;
- the health risks of asbestos;
- the types, uses and likely occurrence of ACM at the specific construction site;
- where each site-specific register of ACM is located and how it can be accessed;
- the timetable for removal of ACM from the particular construction site;
- the processes and procedures to be followed to prevent exposure, including exposure from any accidental release of asbestos dust into the workplace;

5.4 Waste Separation

5.4.1 General requirements

Management of disaster debris and demolition waste illegal disposed must be properly separated to remove problem materials if the bulk of the debris or waste is to be managed at appropriate solid waste facilities and/or to be recycled. Careful waste separation is essential to expedite disaster clean up and removals, hold down costs, reduce waste, and protect human health. Recycling certain materials will help hold down costs. Poorly separated waste or debris may not be managed as inert waste and may be subject to further waste evaluation and disposal costs as municipal waste, asbestos waste or even hazardous waste. Problem loads may be rejected and contractors may be asked to do additional work.

Wastes should be carefully separated into categories described below and properly managed at approved recycling, processing or disposal facilities in accordance with International, national and local requirements. Keep records on the amount removed from each unit, how it is segregated and eventually managed, recycled or disposed:

Electronic waste (E-Waste) including monitors, stereos, mercury devices and fluorescent lighting equipment such as thermostats, mercury switches, fluorescent fixtures and bulbs, light ballasts and similar materials. Please package fluorescent bulbs and other fragile materials to avoid breaking.

Hazardous waste includes, but is not limited to: paints, solvents, varnishes, stains, cleaners, degreasers, spot removers and similar ignitable products; aerosol cans, and compressed gas containers or cylinders; ammunition including unused shells, lead shot, bullets, powder loading supplies, etc; oils, fuels, automotive additives, fluids (transmission , hydraulic, brake, etc.); batteries (including lead, mercury, ni-cd, etc.); acids and bases – often labeled corrosive (store acids separately from bases and do not mix!); toxics, poisons, pesticides (includes insect, rodent and weed killers); electronics (computers and screens, TVs, stereo equipment, etc.); mercury devices (switches, fluorescent lighting, mercury bulbs, thermometers, etc.); light ballasts and transformers; antifreeze; fertilizers; and other ignitable, corrosive, reactive, toxic, pcb, problem or unknown wastes. Label containers and do not mix materials.

Medications and infectious waste including pills, medicines, dressings, needles, sharps, human blood or tissue, isolation waste, pathological waste, infectious human or animal waste, etc.

Asbestos-containing material from individual all sources may include asbestos pipe wrap, boiler coatings, loose insulation, transit (older cement type siding and electrical backing), vermiculite (light, platy insulating material) and other materials APPENDIX 1. SOME ALTERNATIVES TO ASBESTOS-CONTAINING PRODUCTS). Please label all bags or containers “Asbestos Waste.” Asbestos Waste must be disposed at approved solid waste facilities.

5.4.2 Fencing the working area

The ACM found in the project area is severely damaged and the degree of damage is increasing day after day following the existing surroundings. In addition, these materials are scattered in the open area creating the most favorable conditions for asbestos dust to originate and move to certain distances.

Consequently, any additional intervention by a human further boosts the risk of origination and movement of the asbestos dust to certain distances.

For safety reasons, aiming at avoiding the distribution of the asbestos dust originated in the process of separation, the area of the waste disposal must be divided into smaller areas and bordered with approximately 2-metre-high fences in the separation process. Plastic must be used as fences, as dust is easy to remove from it.

To the extent possible, the process of separation shall be started when the number of people is minimal in the project area.

Safety marks and signals shall be provided at the locations preventing foreign people from penetrating the area.

The works are inadmissible to accomplish in windy weather to prevent the asbestos dust from spreading.

All personnel participating in the separation and packing of the ACM shall have PPE, and all workers shall be equipped with respirators.

5.5 Personal Protective Equipment (PPE)

The PPE requirements for work involving ACM at construction sites are to be based on the relevant risk assessment conducted by a suitably qualified person. Section 9.7 and Appendix C of the Code of Practice for the Safe Removal of Asbestos [NOHSC: 2002(2005)] must be consulted to determine the PPE needs, as well as AS/NZS 1715 and AS/NZS 1716 for specific respiratory protection requirements. See NOHSC: 2002 (2005)Appendix C – Guide to the selection of respiratory protection.

Protective clothing and equipment is to be worn at all times during work in the asbestos work area, prior to the final clearance inspection. Any PPE worn during asbestos disposal is to be treated as asbestos waste and disposed of in the approved waste bags. The laundering of contaminated protective clothing in workers' homes is strictly prohibited.

The employees, who are obliged to use the respirators, should be proficient of the rules of their exploitation. The training programs and labour protection guidance of the employees engaged in the operations with asbestos should cover the following questions:

(a) Surroundings when the use of respirators is necessary and the identification of such surroundings;
(b) The rules of exploitation and examination of the respirator's close attachment to one's face;
(c) The rules of the right functioning, examination and right storage of the respirator.

Prior to the removal/separation, the asbestos materials must be wetted. The removal works must be accomplished with cautious to avoid mechanical damage to the ACMs.

5.6 Packing Asbestos-Containing Materials

Asbestos waste, including contaminated PPE and cleaning materials (e.g. cleaning rags and plastic sheeting used to fencing the asbestos work area) are to be removed and disposed of into bags.

Loose asbestos waste is not to be allowed to accumulate within the asbestos work area. It must be collected and disposed of in asbestos waste bags and/or in a solid, sealable asbestos waste container, such as a bin or drum, as storage is required.

Controlled wetting of asbestos waste is to be done to reduce the possibility of dust emissions during the bagging or other containment of the waste. If asbestos waste cannot be disposed of immediately (e.g. because of volume requirements for disposal), it is to be stored in a solid waste drum, bin or container or skip and sealed and secured upon the completion of each day's work so that unauthorized access is prevented.

Waste Bags: - asbestos waste is to be collected in heavy-duty 200 μm (minimum thickness) polythene bags that are no more than 1,200 mm long and 900 mm wide. The bags are to be labeled with an appropriate warning, clearly stating that they contain asbestos and that dust creation and inhalation should be avoided.

Asbestos should be packed and marked in tough, hermetic and dust-proof bags, with the marking or annotation about the safety with the following data:

- Name of the waste;
- Address of the product manufacturing company; chemical designation or common names of all components of the asbestos-containing production;
- Percentage ratio of asbestos in the mixture;
- Information about the asbestos properties dangerous for health;
- Indications about the necessity to use the PPE (respirators, protective clothing, etc.);

The bags should be hermetically closed with a thermal welded joint or stitched thread. In case of the damage to the bags, the damaged spots should be soldered with a joint tape, placed in the impermeable bags, sealed and marked.

5.7 Waste Transportation

The routes used for removing waste from the asbestos work area are to be designated in the Asbestos Removal Control Plan before the commencement of each removal. A competent person, following discussions with the asbestos removalist, should determine the methods used to transport wastes through a building. In occupied buildings, all movements of waste bags should occur outside normal working hours.

Once the waste bags have been removed from the asbestos work area, they are to be either:

• be placed in a solid waste drum, bin or skip; or
• be removed from the site by an approved and licensed carrier.

Waste bags should not be stored at the asbestos removal site if they are not placed in an asbestos waste drum, bin or skip. Drums or bins used to store asbestos waste should be stored in a secure location when they are not in use.

5.8. Offsite Waste Disposal

Transport and final disposal of asbestos waste material shall be carried out by a competent person who carries certification as a transporter of hazardous materials in asbestos waste and in a manner that will prevent the liberation of asbestos dust to the atmosphere.

All asbestos waste material shall be buried at an approved landfill site and in a manner approved by the local and state authorities. Prior to payment of invoices RD must receive copies of waste disposal receipts, as provided by the approved landfills. All details of offsite disposal are to be included in the asbestos removal control plan.

No building materials are to be re-used or recycled unless they have undergone full successful decontamination. If this can’t be achieved then the building materials are to be treated as asbestos waste and disposed of accordingly. All waste disposals shall be recorded (date, quantity, disposal contract etc) in an appropriate register (e.g. within the sites waste management plans for disposal of regulated wastes).

The waste unloaded on the landfill should be buried under at least 25-cm-thick soil layer. Leaving asbestos-containing waste open on the landfill is inadmissible.

During the trench conservation, the final layer covering the asbestos-containing waste, should be at 2 m thick.

5.9 Asbestos Exposure Register

Contractor will maintain an asbestos exposure register that records persons that have been exposed, have potentially been exposed or have worked in close proximity to asbestos materials. Workers are to complete Form S0268 Asbestos Exposure Questionnaire and give a submit a copy to RD who will update the site register accordingly. A copy of the Form S0268 is to be kept by contractor.

6. Project Supervision and Monitoring

6.1 General Conditions

During any large asbestos removal jobs or the removal of any high-risk ACM, the RD representative is to maintain a presence at the removal site, and liaise with the appointed asbestos removal contractor, to ensure that the removal process runs according to requests of legislation and/or the **Debris Asbestos-Containing Material Management Plan** developed by the removal contractor.

It might also be decided that an appropriately qualified occupational hygienist, with experience in asbestos abatement works, shall be engaged for the duration of the removal project, depending on the size of the removal job and level of risk associated with it.

6.2 Air Monitoring

Air monitoring is being performed wherever ACM are being removed/Separated, to ensure the control measures are effective. The competent person for the asbestos removal/separation control plan is to determine all air monitoring requirements. Following the physical state of ACM and location of their placement, permanent monitoring of asbestos dust content in the air is necessary. The monitoring shall be arranged at the following locations:

- On the site of the waste separation/removal;
- On the adjacent land plots used for agricultural purposes by the population;
- At the nearby residential buildings.

A documented air-monitoring program is to be developed. The air-monitoring program is to include requirements for clearance monitoring. An air-monitoring program is recommended for the removal of non-friable ACM, as it is good occupational hygiene practice. The air monitoring is to be performed in accordance with the NOHSC Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibers [(NOHSC: 3003 (2005)].

Asbestos removal work must not commence until the air monitoring has commenced.

If an enclosure is used, air monitoring is to occur:

- Prior to any work (background monitoring);
- At least3 times daily at the boundary of the asbestos work area;
- At least once a day at the nearby residential houses and agricultural lands;
- As part of preliminary clearance monitoring, following a satisfactory visual inspection;
- During dismantling of the enclosure, and
- As part of the final clearance inspection.

If an enclosure and a decontamination unit are used, air quality must be monitored at the following locations:

- The clean side of the de contamination unit;
- The change area;
- The lunch room (where applicable);
- The laundry; and
- The surroundings of the asbestos work area including in the vicinity of the negativeare exhaust (where possible).

The results of all air monitoring are to be provided to all relevant parties as soon as possible.

Constructon contractor shall submit detaled Monitoring Plan before commencing construction activities. The following information is to be included in the asbestos removal/separation monitoring:

1. **Identification** - Details of the ACM to be removed (e.g. the location(s), whether it is friable or non-friable, type, condition and the quantity to be removed;
2. **Preparation** – (i) Consultation; (ii) Assigned responsibilities for the removal; (iii) Program of commencement and completion dates (iv) Emergency Plans; (iv) Asbestos removal boundaries, including the type and extent of isolation required and the location of any signs and barriers; (v) Control of electrical and lighting installations; (vi) Personal protective equipment (PPE) to be used, including; (vii) respiratory protective equipment (RPE); (viii) Details of air monitoring program; (ix) Waste storage and disposal program;
3. **Removal/Separation** – (i) Methods for removing the ACM (wet or dry methods); (ii) Asbestos removal equipment (spray equipment, asbestos vacuum cleaners, cutting tools, etc); (iii) Details on required enclosures, including details on their size shape structure, etc, smoke testing enclosures, and the location of negative pressure exhaust units' (iv) Details on temporary required by the asbestos removals (e.g. decontamination units), including details on water, lighting and power requirements, negative air pressure exhaust units and the locations of decontamination units; (v) Other control measures to be used to contain asbestos within the asbestos work area;
4. **Decontamination** - Detailed procedures for workplace decontamination, the decontamination of tools and equipment, personal decontamination and the decontamination of non-disposable PPE and RPE;

5. **Waste Disposal** - Methods of disposing of asbestos wastes, including details on the disposal of: (i) disposable protective clothing and equipment, and (ii) the structure(s) used to enclose the removal area;
6. **Air Monitoring** – (i) Location, types and methods, for monitoring airborne fibres and dusts; (ii) Ways of communicating monitoring results to workers;
7. **Training** – (i) Training that reflects the specific types of asbestos work to be undertaken; (ii) Keeping written records of inductions and asbestos awareness training;
8. **Health Surveillance** – (i) Details on any exposures to asbestos by workers; (ii) Details on all asbestos workers health records.

6.3 Control Levels for monitored airborne asbestos fibers

"Control levels" are airborne asbestos fiber concentrations, which, if exceeded, indicate there is a need to review current control measures or take other action. These control levels are occupational hygiene "best practice" and are not health-based standards.

The control levels shown in the table below are be used to determine the effectiveness of control measures:

Table 1. Control levels and required actions

Control Level (airborne asbestos fibres/mL)	**Control/Action**
<0.01	Continue with control measures
>0.01	Review control measures
>0.02	Stop removal work and find the cause

6.4 Clearance Inspections

Clearance to re-occupy an asbestos work area is determined by a thorough clearance inspection conducted by a competent person. All of the barriers, warning barricade tape and warning signs are to remain in place until the clearance certificate to re-occupy has been granted.

A clearance certificate is to be provided to UWSCG by the asbestos removal contractor at the completion of the work and monitoring.

The need for clearance monitoring will be assessed as part of asbestos removal control plan and for undertaking any maintenance work involving ACM. It will be undertaken by a competent person, independent of the person conducting the asbestos work, after cleaning has been completed and the area dried.
Air samples are to be taken in the asbestos work area. For jobs involving an enclosed area, this is to be done within the enclosed area, following the completion of the work but prior to the removal of the enclosure and again after the removal of the enclosure.
The removal, cleaning and clearance work will not be considered completed until an airborne fiber level of less than 0.01 fibers/mL has been achieved, as determined by the clearance monitoring.

6.5 Settled Dust Sampling

This sampling only provides an indication of cleanliness following disturbances of ACM and should not be used as an indicator of risk to health. Any settled dust sampling criteria are to be developed by discussion with a competent person undertaking a visual inspection of the area.

7. Emergency Response Procedures

7.1 Evacuation Event

An emergency associated with the potential for exposure to airborne asbestos fibers across the project area site may necessitate the need to evacuate. Site procedures for evacuation are to be conveyed to contractors and employees during the site induction. The risks associated with any asbestos removal work should be assessed and include contingencies in the case of an emergency.
Decontamination procedures can be temporarily waived in the event of an emergency requiring evacuation. This is to be based on an informal risk assessment conducted at the time.
Persons involved in asbestos removal must evacuate to the evacuation assembly point but remain downwind to ensure any fibers remaining on clothes, as a result of not decontaminating completely, do not enter the breathing space of others.
Upon arrival at the evacuation point, emergency wardens and health and safety personnel are to be notified of the status of the asbestos removal work and the assessed level of risk associated, as well as the assessed level of risk associated with asbestos removal person not undergoing the complete decontamination process.

7.2 Damage of ACM

Where damage has occurred to asbestos material the following is to be implemented:

- The site emergency contact number is to be used to report the location of the potential contamination.
- Asbestos trained workers are to respond (wearing suitable respiratory protection, gloves and disposable coveralls), assess the risks associated with the spill and secure the affected area, plant or equipment using asbestos warning tape and signs,
- Ensure fans, wind sources are controlled to prevent further spread of the contamination,
- The areas below and adjacent or above are secured and barricaded with asbestos warning tape to prevent materials dropping or passing into those areas
- Use surface soaking sprays to wet down the material and obtain a bagged sample of the suspect material, or
- Use plastic sheeting and adhesive tape to seal or encapsulate the affected area or plant,
- Use materials such as plastic drop sheets, binding material and or suitable adsorbent material to contain the water spray and run off,
- Clean up the affected areas using suitable tools (soft brushes, mops, dust pans etc.) and if necessary vacuum using HEPA filters,
- Apply sealant or repairs to the damaged areas to prevent further contamination,
- Inspect the work to ensure all suspect materials have been removed,

- All contaminated articles and clothing are to be bagged in suitable asbestos disposal bags and be disposed off as asbestos waste,
- Set up an air monitor in the work area to monitor airborne fiber concentrations and secure the work area until the results are obtained,
- Send the sample off for testing and determine if it contains asbestos,
- Undertake further asbestos removal work to make the area safe using a safe work method statement and an asbestos removal specialist;
- Provide details of the material sample results and monitoring results to the workers involved who may have been exposed,
- Undertake medical assessments of the workers involved who may have been exposed and provide copies of the assessments to the workers.
- Have the workers who were potentially exposed to uncontrolled asbestos fibers complete a Form S0268 – Asbestos Exposure Questionnaire (see Annex 2)
- Maintain records of the incident reporting, investigation and health assessments with the Asbestos Exposure Register.

8. Project Implementation Costs

In Georgia, there is no company with the required human and infrastructural resources to manage ACM. Consequently, it is necessary to select an international company through the relevant tender to separate the waste placed in the project zone, isolate ACMs from the total waste and manage them (packing, transporting and disposal) in line with the relevant requirements.

The prices quoted by the duly qualified international companies are different. The offers submitted below do not include transportation and disposal costs.

- According to RemodelGuide.com, the removal of asbestos (or asbestos abatement) calls for proper preparation of a **"containment area"** as well as careful removal of the materials. They put the cost of the average contractor at **$200 to $400 per hour**, though they also indicate that a large number of professionals will also "quote by the job" too;

- DoItYourself.com, however, states that a single, **ten foot section** of asbestos wrapped piping will cost between **$400 and $700 to be professionally removed**. The site also goes on to emphasize the need for a professional **inspection** both **before and after** the process is complete. This will come at an additional cost of **$600 to $1000**.
- It is important to also accept the fact that some asbestos contractors refuse to work "piece meal" and will insist that an **entire project**, or at least a set amount of the budget is managed in a single job. For example, here we are discussing the costs for a single ten foot section of insulated piping, but a contractor may not want to setup, inspect, and re-inspect for such a small amount of work. Instead they might insist that the homeowner have two or three sections dealt with all at the same time. This could mean that a **$1700 budget/project** is bumped into the **$3000**range instead.

As already mentioned, the waste in the project area is found along small sections (the maximum length of the section is 10 m), with the total length of 80-100 m. The approximate

time to separate and pack the ACMs along the given section is 8 days. If calculating the cost of the service to be rendered by the required rate of hourly compensation, we will see that the company asks for 8 hrs. X 8 days X 200/400 USD = 12800/25600 USD for the accomplished works.

If calculating the cost of the service to be rendered in linear meters (3.2 ft + 1 m), we will see that the company asks for 30 ft X 400/700 USD = 12000/21000 USD for the accomplished works.
As one can see, the approximate cost of the separation of the ACMs from the total waste in the project zone and packing them is 20000 USD in either case.
These amounts do not cover the transportation and living expenses of the duly qualified specialists or the equipment transportation.

The finances necessary to implement the presented „Waste Asbestos-Containing Material Management Plan“ are given in Table 2.

Table2. Project Implementation Costs

Activity	**Cost**	
Trip of the specialist and equipment transportation	12000 USD	
Holding trainings	5000 USD	
Living expenses of the specialists	2000 USD	
ACM isolation and packing	20000 USD	
ACMtransportation	500 USD	
ACMallocation	500 USD	
Transportation of other waste	100 USD	
Allocation of other waste	200 USD	
Sum	52 000.00 USD	
Contingency 10%	5 200 USD	
Total	57200.00USD	

9. Conclusion

Approximately 100 m^3 waste on the WWTP project site is placed in an uncontrolled manner. The major proportion of the waste in this area is the mass originated as a result of the construction of residential buildings. 5-6% of the said waste (6-7 m^3) is asbestos-containing materials (asbestos sheeting), being a highly risky substance for the environment.
The degree of damage of the AMCs found in the project zone in an uncontrolled manner is very high. In addition, the said remains are subject to daily impact by the cattle and population. As a result, the risk of the negative environmental impact is increased day after day.
In order to rescue the situation, it is necessary to declare an international tender before the onset of Zugdidi WWTP project to select the duly qualified company to separate, pack, transport and safely place the ACM in the project zone.

APPENDIX 3. SOME ALTERNATIVES TO ASBESTOS-CONTAINING PRODUCTS

Asbestos product	Substitute products
Asbestos-cement corrugated roofing	Fiber-cement roofing using synthetic fibers (polyvinyl alcohol, polypropylene) and vegetable/cellulose fibers (softwood kraft pulp, bamboo, sisal, coir, rattan shavings and tobacco stalks, etc.); with optional silica fume, fly ash, or rice husk ash. Microconcrete (Parry) tiles; galvanized metal sheets; clay tiles; vegetable fibers in asphalt; slate; coated metal tiles (Harveytile); aluminum roof tiles (Dekra Tile); extruded uPVC roofing sheets; recycled polypropylene and high-density polyethylene and crushed stone (Worldroof); plastic coated aluminum; plastic coated galvanized steel.
Asbestos-cement flat sheet (ceilings, facades, partitions	Fiber-cement using vegetable/cellulose fibers (see above), wastepaper, optionally synthetic fibers; gypsum ceiling boards (BHP Gypsum); polystyrene ceilings, cornices, and partitions; façade applications in polystyrene structural walls (coated with plaster); aluminum cladding (Alucabond); brick; galvanized frame with plaster-board or calcium silicate board facing; softwood frame with plasterboard or calcium silicate board facing.
Asbestos-cement pip	High pressure: Cast iron and ductile iron pipe; high-density polyethylene pipe; polyvinyl chloride pipe; steel-reinforced concrete pipe (large sizes); glass-reinforced polyester pipe. Low pressure: Cellulose-cement pipe; cellulose/PVA fiber-cement pipe; clay pipe; glass-reinforced polyester pipe; steel-reinforced concrete pipe (large diameter drainage).
Asbestos-cement water storage tanks	Cellulose-cement; polyethylene; fiberglass; steel; galvanized iron; PVA- cellulose fiber-cemen.

APPENDIX 3:DESIGN CONSIDERATIONS ON CLIMATE RISKS

Climate risks	Design questions	Design considerations
Zugdidi - wastewater		
Flooding / flash flooding, potential storm surges	Siting of project components	Network: laid underground and in groundwater (partly). No alternatives in siting. Wastewater pumping stations: installed underground and in groundwater (partly). No alternatives in siting. Wastewater treatment plant: The WWTP is located next to Chkhoushia River. No alternative in siting. WWTP needs to be located close to receiving water.
	Hydro-meteorological parameters	Network: laid underground and in groundwater (partly). All necessary protection against water intrusion is already considered. Wastewater pumping stations: installed underground and in groundwater (partly). All necessary protection against water intrusion is already considered. Wastewater treatment plant: The WWTP is protected against flooding of Chkhoushia River with a recurrence of 100 years.
Seismic	Structural design	Seismic forces are considered according to SNIP "seismic strength of construction" 0101.09.

Annex 4.Chemical analyses of water in Ckhoushia River

SCIENTIFIC-RESEARCH FIRM "G A M M A"
17[a] Guramishvili av.0124, Tbilisi, Georgia
Tel: (99532) 260-10-24, 260-10-22

CHEMICAL ANALYSIS OF WATER # 2184 Lab№1317w

Customer: Kocks Consult GmbH

			mg/l	mg-Eq
Kind of Water	Surface			
Water ID	Zugdidi r.Ckhoushia	Hardness		2.391
		Fr.Alkalinity		N.D.
		Diss O_2	-	
Region		Free CO_2	-	
Debit(m^3/day)	-	C.O.D (mg/l O)	87.200	
Pasport		Total N	44.01	
Colour	-	Total P	1.1	
Odour		BOD_5 (mg/l O)	35.0	
Taste		H_3PO_4	-	
Susp.solids(mg/l)	26.0	H_3BO_3	-	
pH	8.05	H_2S	-	
Temperature °C	-	Oils and greese	<5.0	
Dry Resid. (mg/l)	277.773			
Conductiv.(S/m)	0.04320			

Cations				Anions			
Ion	mg/l	mg-Eq	mg-Eq%	Ion	mg/l	mg-Eq	mg-Eq%
NH_4	17.000	0.9444	19.83	Cl	12.053	0.3400	6.94
*Ca	34.000	1.7000	35.69	*HCO_3	207.400	3.4000	69.42
Mg	8.400	0.6914	14.51	CO_3	N.D.	N.D.	N.D.
*Na	28.820	1.2585	26.42	SO_4	21.500	0.4479	9.15
K	6.600	0.1692	3.55	NO_2	N.D.	N.D.	N.D.
				NO_3	44.000	0.7097	14.49
Sum	94.820	4.7635	100%	Sum	284.953	4.8976	100%

<*> - above 20%; <N.D.> - not measured; <-> - Background level

mineralization (mg/l): 379.773

The work Ledearship V.Gvakharia

22.10.2014

Gamma
SCIENTIFIC RESEARCH FIRM

Customer : " Kocks Consult GmbH"

Data sampled: 16.10.2014

Results of microbiological analysis of water

	Sample name	Lab.№	Factual value, (Total Coliforms /1 L)
1.	"Zugdidi, R.Chkhoushia"	1317w	1 800 000
2.			
3.			
4.			

The work Leadership : T.Adamia

The leadership of microbiological lab: N. Sakvarelidze N.Sakvarelidze

23.10.2014

Customer: LTD "Kocsi"
Sample name: water sample "Zugdidi Sewer water sample".
Data sampled: 21.02.2014
Lab # 258w

Results of chemical and microbiological examinations

№	Determined	Results
1	Ammonia, mg/l	837
2	Nitrite, mg/l	38.0
3.	Nitrate, mg/l	95.0
4.	N (Total), mg/l	684
5.	P (Total), mg/l	21.9
6	Suspend. Solids, mg/l	335
7	COD, mg/l O_2	>700
8	Lactose-positive bacteria Colony forming unit (100ml)	$>11\cdot10^9$

The work Leadership T. Adamia

27.02.2014

SCIENTIFIC RESEARCH FIRM GAMMA 17th Cusmishvili av. 0192, Tbilisi, Georgia
Tel: +(995 32) 240 10 24 E-mail: t.adamia@gamma.ge, gamma@gamma.ge