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
BOD	-	Biochemical Oxygen Demand
CA	-	Cross section area
CC	-	Contractor
COD	-	Chemical Oxygen Demand
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
MoE	-	Ministry of Environment and Nature Resources Protection of Georgia
MPD	-	Maximum Permissible Discharge
PS	-	Pumping Station
SC	-	Supervision Consultant
UWSCG	-	United Water Supply Company of Georgia
WS	-	Water Supply
WWTP	-	Waste Water treatment Plant

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EXECUTIVE SUMMARY

1. It is proposed to improve the wastewater system in Mestia under the Asian Development Bank (ADB) funded Urban Services Improvement Investment Program, which is under preparation stage. This Investment Program 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 is already implemented for its major part which relates to the sewerage collection system which is under Taking over stage and near to operational stage. Depending on final selection of treatment, the implementation could be 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. This sub-project is located in Mestia. Mestia is an important cultural and tourism centre in Georgia. The service levels of sanitation system are low with partial coverage, high system losses. With the government initiative to develop Mestia as a major tourist destination, the water demand is likely to grow significantly.

4. Situated in the Caucasus, Mestia is surrounded by Greater Caucasus and Svaneti-Abkhazia Ranges. The elevation of the subproject area ranges between 1,400-3,600 m above the mean sea level, and forms upper part of the Enguri River Basin. The town is developed near the confluence of the Mukhura and Mestiachala rivers, tributaries of the Enguri. There are farmhouses and fields around the foothills and in the bottom of the valleys but the majority of the district E is covered with forests. The region which lies below 1,800 m MSL is covered by mixed and coniferous forests; and from 1,800 meters to about 3,000 m consists of alpine meadows and grasslands, above which lie the zone of snows and glaciers.

5. Mestia is located in the north-western part of the country in the Caucasus Mountains, approximately 224 km in the northeast of Tbilisi, the capital of Georgia and 93 km in the northeast of Zugdidi. It is situated at the confluence of Mestiachala and Mulakhula rivers and is surrounded by Zuruldi ridge from the South, Mount Tskhakvzagara from the North, Banguriani Mountain range from the East. The total population of the town amounts to 2,855 (2010). The population is mostly Svans, a cultural subgroup of the Georgians. The total area of the Mestia Municipality is 3,044 km² and the average altitude of the town is 1,450 meters

6. The construction of a sewer system - Construction of Pressure Collectors, Pumping Stations and WWTP in Mestia - will improve essentially the environmental situation in Mestia.

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

8. However, due to the specifics of the project as at the construction also at operational phase, it is necessary to develop a number of mitigation measures to avoid possible negative impact on the environment.

9. Most of the predicted impacts are associated with the construction process. Impacts mainly arise from the generation of dust from soil excavation and refilling; increase of silt load in the river; loss of top soil in pasture lands, removal of trees. These are common impacts of construction, and following methods are suggested for their mitigation: (i) Utilizing surplus soil for beneficial purposes; (ii) Measures to reduce/control dust generation (cover/damp down by water spray; consolidation of top soil, cover during transport etc); (iii) Providing prior public information; (iv) conducting no construction in the river bed in fish breeding season and with minimum interference with the water quality; (v) restoring the top soil after construction, (vi) avoiding tree cutting through location alignment changes, and (vii) to avoid safety hazards construction site will be secured at critical segments.

10. There are no health and safety risks associated with operation of the WWTP, as the WWTP will be fenced. There will be no access for unauthorized persons. No major waste generation except sludge is anticipated. The sludge will be disposed in the temporary sludge storage area at the WWTP. After the sludge treatment, the sludge is stabilised, it is not digesting anymore and it has also been dewatered. WWTP has sufficient volume to store the sludge for 30 days in summer 2040 and 75 days in summer 2020. After that the sludge will be disposed on a Municipal landfill. From time to time the sludge shall be transported to the landfill. Another alternative for the disposal of the sludge could be its use as fertilizer in the agriculture, but this needs prior testing for heavy metals to be sure that legal standards are met.

11. To ensure that all the mitigation measures as suggested are implemented, the Division of Resettlement and Environmental Protection (DREP) of UWSCG will oversee and be responsible for implementation of mitigation and monitoring measures. Provided the mitigation and enhancement measures are implemented in full, there should be no significant negative environmental impacts as a result 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.

12. In present document has been developed a number of mitigation measures to eliminate above mentioned problems, relevantly their proper and timely implementation will significantly reduce the potential negative impact.

13. Project implementation body is UWSCG, which in turn based on the bid hires construction and consulting companies. The team takes full responsibility for the effective implementation of the project.

14. 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 wastewater 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.

1. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

15. 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.

A. ADB Policy

16. 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.

17. 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.

18. 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.

19. The 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 Environmental Assessment and Review Framework (up-dated in November 2013) that was especially prepared for the environmental assessment of the Georgia Urban Services Improvement Investment Program and approved by ADB.

20. *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. Georgian Law

Framework Legislation

21. 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.

22. 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."

23. 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.

24. 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.

25. 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.

26. **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, makes amendments to them or abolishes 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;

27. 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.

28. 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.

29. 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. Currently the new law on Water is under preparation by the MoENRP and its initial draft version has already been distributed to various stakeholders including line ministries. All received comments on draft law has been reflected in the documents and in the near future it will be submitted to the Parliament of Georgia for its adoption.

30. 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.

31. 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.

32. 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 mitigation measures are listed for anticipated impacts.

Licenses & Approvals Required

33. Environmental assessments 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.

34. 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.

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

36. 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

37. 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).

Administrative Structure in Georgia

38. 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

39. 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.

40. 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.

41. 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.

42. 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.

43. 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).

Comparison of the National Legislation and ADB Requirements

44. 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.

45. 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.

46. 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).

47. 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 Banks guidelines require EMPs for all categories of projects and provides detailed instructions on the content.

48. 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.

49. 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.

50. 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.

51. 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 fulfilment. 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	**At least two consultations for Category A projects – one at the scoping stage and one for the draft EIA.**

		date of publication.	
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 final EIA**	**Not requested**	**Publication (mainly electronic) of the final EIA.**

Harmonization of ADB and Georgian Legislation Requirements

52. 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.

2. DESCRIPTION OF PROJECT

C. Type of the Project

53. This is the Mestia wastewater sub-project. It involves the installation of two sewerage pumping stations and related pressure collectors and the construction of a wastewater treatment plant.

D. Need of the Project

54. As discussed earlier, the service level of waste water treatment at present are not satisfactory in Georgia. The situation is no different in Mestia. Untreated sewage infiltrates into the Mestiachiala river course at the end of the sewerage collectors. This sub-project is needed because the present waste water collection system (network) in Mestia is operational and efficient but there is no treatment of the effluent at the disposal sites where the collectors are discharging into the river. No central adequate treatment plant exist at any of the outfalls. Untreated sewage contaminates in turn surface water. It endangers human health of the local population and tourists. Therefore the project of completing the sewerage system by a treatment facility is needed.

55. The Feasibility Study conducted in 2014 by EPTISA has resulted in the following recommendation to complete the sewerage system that was installed under USIIP between 2012 and 2014: the supply and installation of two sewerage pumps and associated pressure collectors for conveying waste waters to the WWTP site, and the construction of an activated sludge WWTP to achieve EU and Georgian standards requirements. This will avoid discharging untreated effluent improving thus river water quality, and the operation costs would be affordable for the UWSCG.

56. The present sub-project is designed to improve the service standards of waste water treatment and discharge.

57. The wastewater flow for the hydraulic calculation of the designed sewer network depends on the water demand. A wastewater/ water consumption ratio of 90 % is used for the dimensioning of pipes. As the wastewater flow is not constant during the day, a peak factor of 3.0 is applied for the hydraulic calculation. According to the mentioned Detailed Design Report, the parameters used for estimating flow are described in Sect. 4 of this report.

E. Location

58. Mestia is located in the north-western part of the country in the Caucasus Mountains, approximately 224 km in the northeast of Tbilisi, the capital of Georgia and 93 km in the northeast of Zugdidi. It is situated at the confluence of Mestiachala and Mulakhula rivers and is surrounded by Zuruldi ridge from the South, Mount Tskhakvzagara from the North, Banguriani Mountain range from the East. The total population of the town amounts to 2,855 (2010). The population is mostly Svans, a cultural subgroup of the Georgians. The total area of the Mestia Municipality is 3,044 km² and the average altitude of the town is 1,450 meters.

59. Mestia Town, the administrative centre of Svaneti Region, in north-eastern part of Georgia, bordering Russia. Geographically, is located at 43°2'20.95"N 42°42'55.05"E (43.039152° 42.715291°), about 430 km northwest of Tbilisi. Regional location of Mestia is shown in **Fig 1**.

Fig. 1: Location of Mestia

60. The works of the sewerage collection system (network) was completed in November 2014 and the system was taking over stage by UWSCG in Dec. 2014. The new sewerage network in Mestia comprises corrugated HDPE pipes (47 km of pipes with diameter of DN200 and DN250 as well as sewerage manholes (1208 nos.). About 900 household service connection pipes and shafts are installed at the customer level. Commissioning / start of operation of the 4 main collectors (and related network) is effective since Dec. 2014. The sewerage system is divided in four catchment areas with independent discharges to Mestiachala and Mulkhra Rivers:

- The first one is located at the north-eastern part of the town.
- The second one is a small area located at the central part.
- The third one is located at the south-west part of the town which outfall is located close to the proposed site for the WWTP
- The fourth is a small catchment area located at the southern part of the town, close to the proposed location for the WWTP

F. Implementation Schedule

61. The installation of the pumping stations and pressure collectors to convey sewerage to the location of future WWTP will be executed over a period of 6 months. The construction of a sludge aeration type of WWTP will take 24 additional months, and could be financed and executed under tranche 5 of USIIP (expected construction from 2016 to 2018)

Fig. 2: Layout of new sewerage network

G. Sub Project Components

62. This subproject focuses on the installation of sewerage pressure collectors and pumping stations as well as the construction of WWTP.

Table 3: Proposed Subproject & Components Wastewater System

Infrastructure	Function	Description	Status
Wastewater pump station and pressure collectors	Transfer of wastewater from current outfalls to the WWTP	Installation of 2 pumping stations and 2 pressure collectors (ca. 3.0 kilometres of HDPE corrugated pipelines)	Design completed and available at UWSCG level
Wastewater treatment plant	Pre-treatment, physical treatment and secondary (biological) treatment of sewage	Construction of an activated sludge plant (civil works and electro-mechanical installations), incl. (aeration tanks, final sedimentation tanks, sludge storage tank, sludge dewatering and Emergency sludge storage place	Feasibility study (EPTISA, 2014) and preliminary design (KOCKS, 2010, as part of contract MES-03)

Wastewater Treatment Plant

63. There are at the moment no central wastewater treatment facilities in Mestia. The untreated sewerage from the newly built sewerage networks under Contract MES-02 is currently discharged at 4 outfalls.

64. A new wastewater treatment plant was preliminary designed by the Detailed Design Consultant (KOCKS) in 2010 under Contract MES-03. It will be located on public land in the south-west of Mestia, near the current Outfall No 3. The site is directly at Mestiachala River.

Fig. 3: Location of future WWTP

65. The WWTP will be designed according to Georgian and European Standards. The application of these standards will result in a very robust treatment process, so that all required effluent criteria can be met even in case of shock loads.

66. All tanks will be constructed as compact concrete structures, so the space requirements will be much reduced compared with more nature orientated technologies like ponds or constructed wetlands. This compact design also results in a significant reduction of odour emissions.

67. Like for all WWTPs in the project towns with a capacity over 30,000 PE, for Mestia the activated sludge technology with a separate anaerobic sludge digestion is proposed. This process basically includes the following treatment steps:

- Screens
- Aerated grit chambers
- Activated sludge tanks (aeration tanks)
- Final sedimentation tanks
- Sludge storage tank
- Sludge dewatering
- Emergency sludge storage place

68. The activated sludge process is a common treatment method and has been implemented worldwide. The aeration tanks are dimensioned in such a way that the sludge is stabilised during the treatment process. Therefore no additional process steps are necessary for the separate stabilisation of the sludge. This approach al-lows for a simple and easy operation of the plant. Besides the easy operation, the relatively small demand for land - compared to the sludge digestion - is another argument for the activated sludge process. Furthermore the gas yield from sludge digestion of a small WWTP is very low and does not justify the high investment costs. The extended aeration will be performed in an activated sludge tank with circulating flow and fine air bubbles aerators. This process depends on equipment with long life times and allows for an easy operation with comparatively low investment costs.

69. The biological treatment is a sensitive process. Particularly in plants designed for a low number of Population Equivalents and their widely varying pollution loads, every additional negative impact on the biology has to be avoided. The use of an aerated grit chamber with its high grit removal rate will prevent the entry and de-posit of grit. After a specific period of time, the mixture of biological solids is passed from the activated sludge tank into the final sedimentation tank, where some of the settled

sludge is recycled to maintain the desired concentration of organisms in the aeration tanks. The remaining sludge is removed from the system.

70. *Sludge treatment*: The sludge treatment will comprise an excess sludge pumping station, a sludge thickener, a thickened sludge pumping station and a mechanical sludge dewatering plant. The excess sludge pumping station will be located next to the return-sludge pumping station. The excess sludge will be pumped to the sludge thickener. Two pumps will be installed (including one stand-by):

- N° of pumps (including 1 stand-by) 2
- Daily operation time 10 h/d
- Capacity per pump approx. 9 m^3/h
- Static head approx. 10 m
- Specific excess sludge production in aeration tanks 1.104 kg SS/kg BOD5
- BOD5 load 591 kg/d
- Excess sludge production 653 kg/d
- Dry-solids content 0.73 %
- Sludge volume 89 m^3/d

71. *Sludge Thickener*: Excess sludge drawn from the treatment stage will be thickened in a circular gravity pre-thickening tank equipped with rotating picket-fence type sludge rakes which will assist the liquid/ solid separation. The sludge thickener will be constructed south of the mechanical sludge dewatering plant. The supernatant liquor will be conveyed with the other turbid process waters towards the WWTP inlet. A thickened sludge pumping station will transfer the thickened sludge to the mechanical sludge dewatering plant. The summary of principal design data are:

- Treatment stage excess-sludge solids 653 kg/d
- Solids concentration before thickening 0.73 %
- Solids concentration after thickening 2.00 %
- Sludge volume before thickening 89 m^3/d
- Sludge volume after thickening 33 m^3/d

72. *Emergency sludge storage place:* For the emergency temporary storage of the stabilized and dewatered sludge, an emergency sludge storage place will be foreseen. The requested storage time will be 30 days.

73. *Sludge disposal:* After the sludge treatment, the sludge is stabilised, it is not digesting anymore and is has also been dewatered. The sludge quality allows its disposal on a landfill or use in agriculture. There is a temporary sludge storage area at the WWTP that has sufficient volume to store the sludge for 30 days in summer 2040 and 75 days in summer 2020. From time to time the sludge shall be transported to the landfill. Principally, the sludge can also be used as fertilizer in agriculture. In that case the pH value of the soil and the level of heavy metals in the sludge must be analysed in order to determine the optimum apportioning of sludge on the fields.

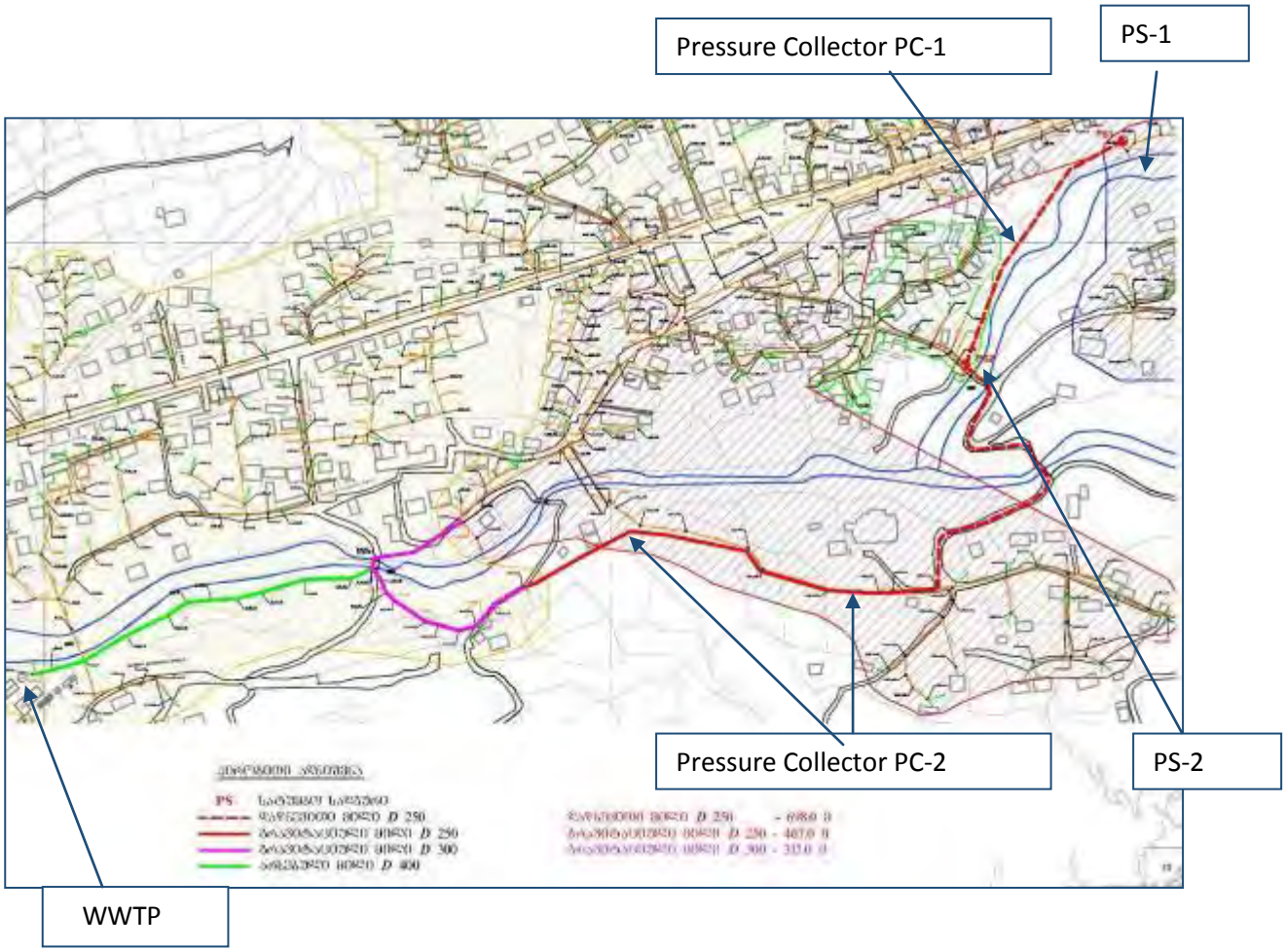
H. Construction Activities

74. There are 2 main components of this subproject:

- construction of 2 pumping stations (PS) and pressure collectors (PC);
- construction of wastewater treatment plant

75. The location map of the above components is shown below:

Fig. 4: Sewage network, pumping stations (PS) and WWTP in for Mestia



76. Construction practices of these works are described below:

77. *Laying of Sewer Pressure Collectors.* Sewer pressure pipes will be laid in the settled area of Mestia. The pipes will have diameter between DN 200 and DN 300, with a combined length of ca. 3.0 km. Trenches for the new collectors 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 – 2.5 m. Minimum width of the trench will be 0.9 m.

78. *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.

79. Earthwork for construction of WWTP will consist of site clearing, trench excavation, grading, embankment filling and backfilling of excavation trench after built in of structures. Excavated soil will be placed alongside. Surplus soil will be used for other construction activities. Base of foundation will be gravel and sand.

80. The treatment installations and equipment will be designed according to the standards of the German DWA (German Association for Water, Wastewater and Waste). All tanks will be constructed as compact concrete structures, reducing the requirements for space in comparison with more nature oriented technologies as ponds or constructed wetlands. Main construction materials used for the various components of the WWTP are concrete and steel. Area of influence during construction comprises the construction site exhibiting an area of approximately 2 ha, the borrow areas required for material extraction and the haulage routes. Impacts arising within these areas during construction activities are described in the chapter impacts and mitigation measures.

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.

I. Operation of Improved Wastewater System

84. The wastewater system will require repair and maintenance activities like cleaning inspection. Repair work will be conducted in the same way the pipe was laid.

85. The WWTP will require inspection and maintenance activities like physical and chemical analyses and disposal of stabilized sludge and compacted waste on a waste disposal site.

3. IMPACTS ON THE PHYSICAL & BIOLOGICAL ENVIRONMENT

J. Introduction

86. Mestia is situated in Samegrelo-Zemo Svaneti Region of Northeast Georgia, about 430 km from Tbilisi. It borders Russia in the north. Geographically located at 42°42'6" and North latitude 43°4'30", Mestia is a hill town, developed near the confluence of Mestiachala and Mukhura Rivers. Altitude ranges from 1,200 m to 3,000 m above the mean sea level (MSL), with town centre at 1,450 m above the MSL.

87. The following sections evaluate the impacts on physical and biological environment due to the proposed project. Each subsection first describes the baseline profile followed by impact identification and assessment during construction and operation. Mitigation measures are also discussed in conjunction with the impacts.

K. Topography, Geology & Soils

Baseline Conditions

88. *Topography*. Despite its small area, Georgia presents one of the most varied topographies within its geographical boundaries. Georgia lies mostly in the Caucasus Mountains, and its northern boundary is partly defined by the Greater Caucasus range. The Lesser Caucasus range runs parallel to the Turkish and Armenian borders and the Surami and Imereti ranges connect the Greater Caucasus and the Lesser Caucasus, create natural barriers in the region. Greater Caucasus Range borders Mestia Municipality in the NorthEast; Svaneti-Abkhazia range in the west and Svaneti Ridge in the South. Elevation of the municipal territory ranges from 1,400 m to 3,600 m above mean sea level, and forms upper part of Enguri River Basin.

89. *Geology.* Project area structurally belongs to central Caucasus unit. This section morphologically represents high-mountainous, locked depression (Zemo Svaneti depression), surrounded by southern slopes of Caucasus's main Ridge and Svaneti Ridge. Zemo Svaneti depression area tectonically belongs to Mestia-Tianeti and Chkhalta-Laili shelled zones of the Caucasus folded system. These tectonic areas are characterized by mid- Jurassic Period slates, and upper Jurassic and lower Cretaceous Period carbonate flysch and mid Jurassic volcanogenic sedimentary rocks. All these rocks are tectonically intensively dislocated and have produced many significant folded structures. According to seismic zoning map, Georgia is classified into Zone 6 to Zone 9 (in increasing order of seismic intensity, Map 4) and Mestia falls under Zone 9 (very high seismic intensity zone). There has been no history of major earthquakes in Mestia, however, a powerful earthquake (7.0 magnitude) occurred in 1991 in neighbouring Racha province. Much of the damage associated with this earthquake was caused by landslides.

Fig. 5: Seismic Zones of Georgia

90. *Soil*. The underlying rock strata as presented above under the conditions of relevant relief and with the surface inclination less than 450 are covered from with the Quaternary slope, alluvial and glacier deposits. The Pleistocene glacier deposits are quite significantly spread in and around Mestia. Mestiachala River and its tributaries and upper line of the gorges are structured with these deposits. Almost all the settlements in and nearby project area are located on the upper morainal sediments. The same type of glacial sediments are widely maintained on the slopes of the rivers/gorges at 50-500 m relative height from the current riverbed where several stages of Pleistocene freezing stages are observable. The depth of soil in the project area ranges from 1.5-2 m, below which the hard stratum lies. Forest Chernozem soils are present in the hilly zone. Mountain-meadow soils are developed above 1600 m MSL.

Impacts During Construction

91. During the construction, impacts on topography and geology are mainly to due to invasive nature of excavation activities.

92. Excavation works for reservoir and water treatment plant will be minor and confined to the project site, and therefore not expected to have any impacts on topography, soil and geology.

93. Since the project is located in very high seismic intensity zone, appropriate precautions have to be included in the structural design of facilities.

94. Apply design and construction norms of Zone-9 (MSK-64 scale) according to Government of Georgia "Construction in Seismological Regions"

95. Construction work for WWTP is not expected to generate significant quantities of surplus material. The surplus soil from foundation work will be utilized at the same site for raising the ground level and embankment building. This will require:

- Utilizing surplus soil for beneficial purposes such as in construction or to raise the ground-level of low lying sites

96. The excavation and refilling works will disturb the soil characters at the sites. The excavation will lead to disturbance and loss of fertile top soil. Therefore the Contractor should implement the following measures:

97. Top soil (if any) of about 1 ft. depth (0.3 m) shall be removed and stored separately during excavation work. Depth for foundations for treatment plant component needs to be determined with the detailed design being further developed. According to the geotechnical investigations that were conducted for the site of the WWTP alluvial material prevail, represented by boulders, cobbles and gravel, with sand and silty sand filling. Depth of foundations for the WWTP will most probably be very shallow and only minor amounts of excavated material will result.

98. Along construction site of the WWTP there is active erosion ongoing alongside the river bank at a section of about 100 – 130 m. To protect WWTP site against future erosion processes suitable protection measures (dykes, bank protection walls, gabions) need to be designed for construction.

99. The excavation work will also tend to loosen the top soil, which may lead to soil erosion due to winds and rains. As project area is situated in a hilly region, the risk of erosion is comparatively high. Removal of vegetation and tree cover will also lead to erosion. Therefore the contractor should:

- No trees shall be removed on the slopes; clearing of shrub, bushes and grass shall be limited to actual construction area only; no clearance is allowed for activities such as material/waste storage, concrete mixing, etc.
- In the slopes, local grass species shall be planted

100. *Source of construction materials.* Due to Initial Environmental Examination conducted for the wastewater supply components of the subproject in Mestia sand is sourced from River Mestiachala and aggregate is sourced from licensed crushers. In case that material demand exceeds supply it needs to be transported.

101. *Contractor's yard.* 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.

102. 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 Mestiachala River. Storage facilities for fuels and chemicals will be located at a distance to Mestiachala River. 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.

103. 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 may be taken from Mestiachala River.

Impacts During Operation

104. Regular operation of WWTP will be within the constructed facilities and therefore no major impacts envisaged. Some of possible impacts are as follows:

105. 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".

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

L. Surface Water and Groundwater

Baseline Conditions

107. *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. These two basins are separated by Likhi Ridge. The project area, Mestia, is situated in the upper reaches of Enguri River Basin. Mestiachala and Mukhura, two of four main tributaries of Enguri River, flow through Mestia Town.

108. Originating in Greater Caucuses Range and flowing into Black Sea in the west, Enguri is one of the biggest rivers in Georgia (Map 5). It traverses a distance of 201 km, during which it is joined by 232 small and large streams/rivers. River flows mostly through hilly region, except last leg of for about 80 km. Due to steep slopes, river is deep, flow

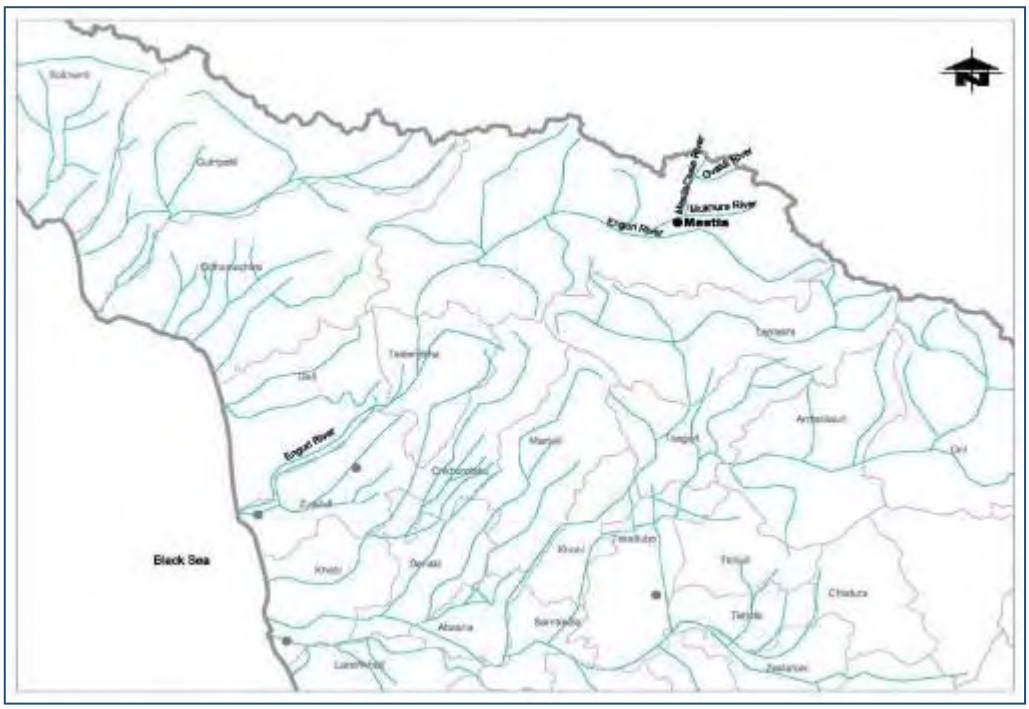
is turbulent and carries heavy loads of silt, which accumulates in Enguri Dam on the foothills near Dzvari Town. Water flow after the dam is low.

109. Mestia Town is developed in the upper reaches of Enguri River Basin, near the confluence of Mukhura and Mestiachala, two important tributaries of River Enguri. While the rivers flow through valley/gorge and low lands, town is mostly developed on hill slopes. Both the rivers originate in Glaciers in Causes Ranges, while Mukura originates in eastern upper region of Mestia, Mestiachala originates in the northern side. The combined river, Mukhura, flows down further and meets Enguri at 20 km south-west of the town.

110. Mestiachala originates from Chalaadi Glacier and flow is supplemented by snow and rainfall. It experiences floods during the warm seasons and low flow in colder periods. In July-September flow is very high, caused both by snow melting and the rainfall. Water quality is very good, except turbidity due to erosion from upper hilly areas.

111. Gvaldi River originates from Mukrvam Glacier in the Caucuses Range in the northeastern upper reaches of Mestia Town. Gvaldi is a small river, and traverse a distance of about 8 km before it joins Mestiachala just upstream of Mestia Town River is glacier fed, and therefore experiences high flow during the warm seasons and low flow in colder periods.

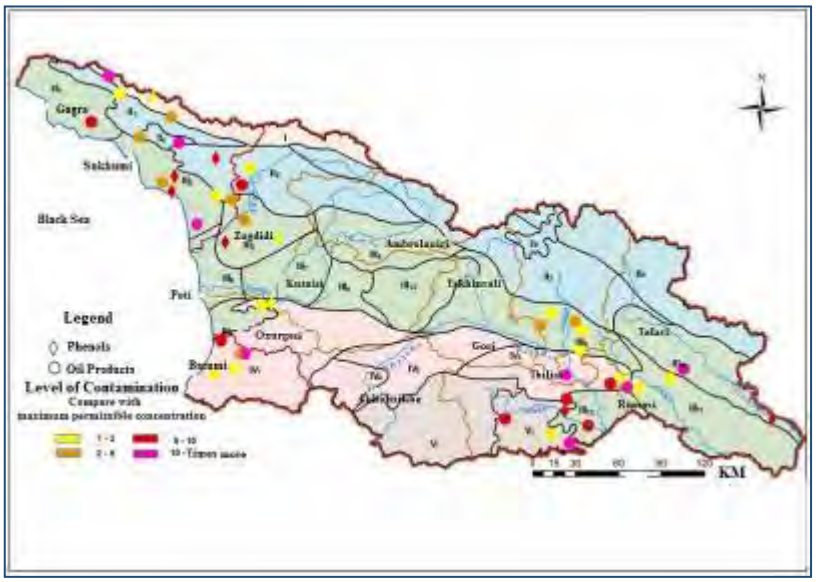
Fig. 6: River Network in Western Georgia



112. *Groundwater*. Based on the groundwater characteristics, Georgia is divided into five hydro-geological zones, which are further defined into sub-zones/districts. Project area, Mestia, is in Zone – II (Zone of pressurized groundwater systems of south slope of the main Caucuses) and in hydro-geological district- III12 (Svatanian crack pressurized water systems). Water bearing strata is of contemporary alluvial deposits characterized by free groundwater table declined along the general flow of the rivers. The water table depths vary from 2.0 m to 5.0 m. At some locations near the riverbeds

and groves, groundwater is very shallow depths (0.3 m). The aquifer is characterized by rich water resources, with groundwater springs yielding between 0.1-3.5 l/s. The aquifer is mainly fed from rivers and precipitation. Despite the aquifer is rich with water, its practical water use is limited. No information on groundwater quality is available.

Fig. 7: Hydro-geological Zones



Impacts and Mitigation Measures during Construction

113. Construction of the new WWTP will involve encroachment of approximately 3.0 ha of land, most of which will be sealed. This results in reduced water infiltration rates and reduced rates of ground water regeneration. In total an area of 0.7 ha will be sealed.

114. Potential impact also 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 topography, geology and soils.

Impacts and Mitigation Measures during Operation

115. With the water supply improvement subproject being implemented within USIIP, water supply will be increased further. The increase in water supply will increase the sewage generation.

116. Without any proper sewage collection, treatment and disposal system, the increased sewage will have negative impacts on receiving water bodies It is therefore necessary that:

- Sewage system must be connected to a WWTP, which can treat the sewage to European standards and dispose safely
- The above measure will be implemented along with the water supply system improvement

117. Impacts during operation phase of the WWTP refer to discharge of treated water into Mestiachala River which will result in positive impact, since situation will improve as compared to present situation and to the disposal of waste and sewage sludge.

118. An improved water supply system will cause an increased waste water flow. Waste water will be collected in a sewage system and treated in a modern WWTP. During operation stage no effects on surface water and ground water is envisaged. Basically water quality of Mestiachala River will be improved essentially due to long-term and sustainable waste water treatment. The effluent criteria for the WWTP are summarized in the **Table 4**:

Table 4: Effluent Criteria for Future WWTP in Mestia

	Parameters	EU effluent standard	Effluent standard according to Georgian law	Proposed effluent criteria consultant
Discharge	BOD5	25 mg/l O2 (without nitrification)	25 mg/l O2 (without nitrification)	25 mg/l
	COD	90 mg/l	125 mg/l	90 mg/l
	Suspended Solids	35 mg/l	30 mg/l	30 mg/l
Additional Standards for Discharge into sensitive Water Bodies	Total - N	15 mg/l N (10,000 to 100,000 PE)	15 mg/l N (10,000 to 100,000 PE)	15 mg/l N (10,000 to 100,000 PE)
		10 mg/l N (> 100,000 PE)	10 mg/l N (> 100,000 PE)	10 mg/l N (> 100,000 PE)
	Total - P	2 mg/l P (10,000 to 100,000 PE)	2 mg/l P (10,000 to 100,000 PE)	2 mg/l P (10,000 to 100,000 PE)
		1 mg/l P (> 100,000 PE)	1 mg/l P (> 100,000 PE)	1 mg/l P (> 100,000 PE)

119. The WWTP will be designed for up to 30,000 PE. The design standards will be adapted to European and Georgian regulations. The effluents of the future WWTP will discharge via recipients (Mestiachala River, Enguri River) into the Black Sea. Basically the Black Sea should be considered as a sensitive water body since the water exchange with the connecting Mediterranean Sea and the Atlantic Ocean is very low and eutrophication especially of coastal waters cannot be excluded. Construction of the waste water network and treatment of waste water will improve extensively the water quality of Mestiachala River compared to the existing situation.

120. During the operation of WWTP the following wastes should be disposed on a waste disposal site:

- Compacted waste collected from the screen and from the grit chamber
- Sand and gravel from the grit chamber
- Compacted and dewatered sludge from the sedimentation tank

121. It is required that sludge should be used in such a way that the quality of surface and groundwater is not impaired. As it is unlikely that the sludge contain any heavy metals, land disposal is also an option.

M. Climate & Air Quality

Baseline Profile

122. *Air Quality.* Ambient air quality monitoring is conducted at only seven locations in Georgia. As there are no major air polluting sources like industries, none of these are located in Mestia, although traffic is less, roads in town are in very bad condition, and vehicle movement tends to produce a lot of dust.

123. *Climate*. Situated in the Caucuses Range in the Zemo-Svaneti depression, climate of Mestia is humid and surrounded by mountains, it is influenced mostly by air masses coming from the Black Sea throughout the year. Long winters and short summers are characteristic of this region. Normally winter starts in the beginning of October and lasts till June. Summer is from June to September.

124. Average annual temperature in Mestia is +5.8^{o}C. Temperature of the coldest months (January, February, March and December) fluctuates from -1.4^{o}C to 2.7^{o}C (December) to 4.9^{o}C to 5^{o}C (January and February). The temperature during the warmest months (July, August and September) is in the range of 10.3^{o}C to 13.1^{o}C. Absolute minimum temperature is -35^{o}C, absolute maximum 35^{o}C, while average minimum temperature is -0.3^{o}C, and average maximum is +12.9^{o}C.

125. Relative humidity is generally low in colder months (lowest 23%), and for the hottest months 45%. Annual average rainfall is 970 mm. The rainfall increases with the elevation as one move upwards on hills. Average annual precipitation days are 168, while snowy days are 160. Average annual wind speed is 0.9 m/s; in winters it ranges from 0.2 m/s to 1.4 m/s while in summer it ranges from 0.8 m/s to 2.0 m/s.

Impacts during Construction

126. The activities that could cause impact on ambient air quality are (i) dust generation from construction activity and (ii) air emission from construction equipment (like excavators, crane) and material and waste transport vehicles.

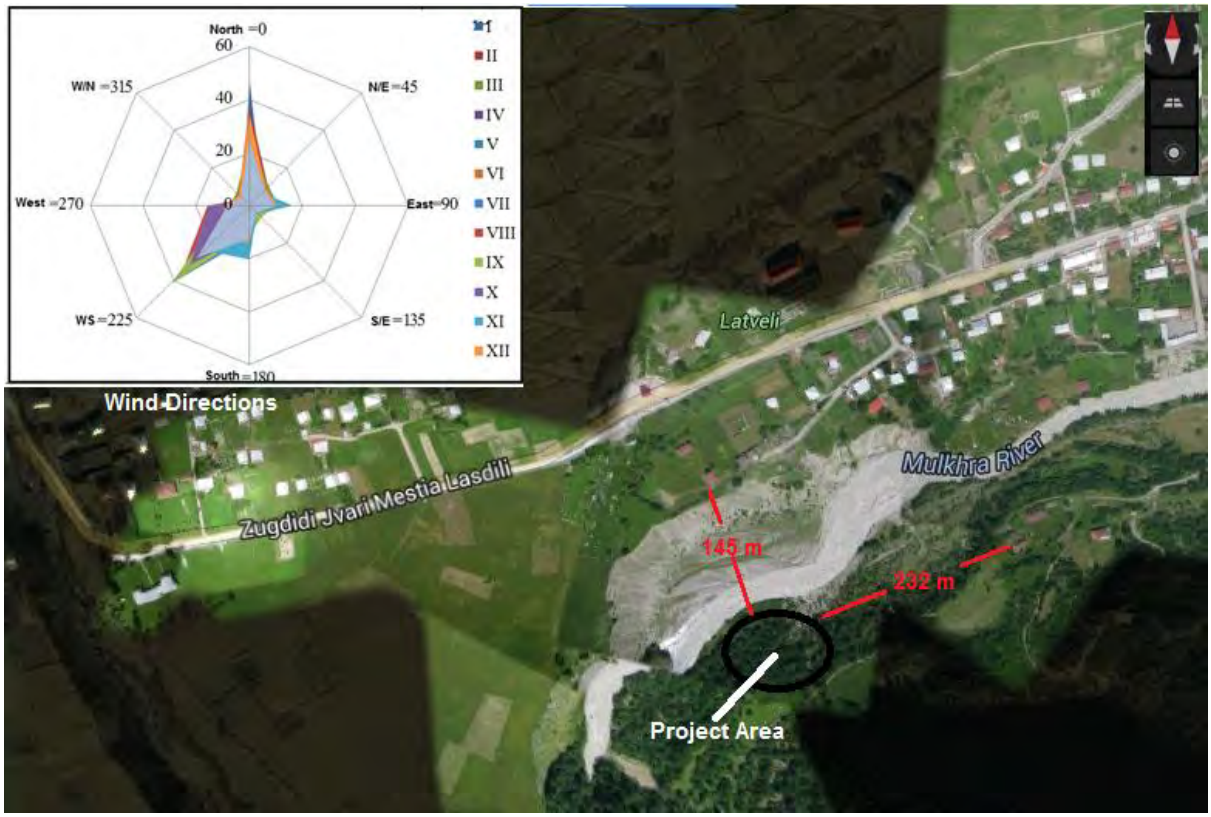
127. There is a lot of potential for the creation of dust, from the excavation of dry soil and its storage, and levelling on the ground. Also Mestia is a tourist place and there are trekking routes near the project sites. Action will therefore be needed to reduce impacts on air quality at both the construction and disposal sites, by controlling dust and reducing the amount of material to be dumped.

128. As it is shown on the map below neares residential houses are locatoed 145 m north from the WWTP. Several houses are located also on 235m east from WWTP. According to the data provided by hydrological Station of Mestia, sub-project area is largely dominated by the north winds, which creates additional parried in terms of distribution of dust and noise during the construction phase.

129. On the other hand, between the buildings located on the north side and WWTP location flows river Mestiachala. The river bed is quite wide, and is about 100 meters.

Like any mountain river Mestiachala one flows fast and noisy. This will act as a natural barrier to eliminate the spread of noise above the permissible norm across the river.

Fig. 8: Residential houses located in the project zone



Contractor shall perform the following mitigation measures:

- Bring the material (aggregate and sand) as and when required;
- Ensure speedy completion of work and proper site clearance after completion
- Use tarpaulins to cover loose material that is transported to and from the site by truck
- 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

130. Various types of equipment and vehicles would be required for the construction activity. The exhaust emissions from these may degrade the ambient air quality. Considering the scale of work and use of equipment, impact will be insignificant, and will be beyond the scope of this project. However, to enhance the subproject benefits, the Contractor should implement the following:

- Ensure that all equipment & vehicles used for construction activity are in good condition and are well maintained
- Ensure that all equipment & vehicles confirm to emission and noise norms

Impacts during Operation

131. Even lower the risk of noise distribution at the operation stage of WWTP. According to the technical design all the machines with sound will be installed in a closed space.

Impacts during Construction

132. The activities that could cause impact on ambient air quality are (i) dust generation from construction activity and (ii) air emission from construction equipment (like excavators, crane) and material and waste transport vehicles.

133. There is a lot of potential for the creation of dust, from the excavation of dry soil and its storage, and levelling on the ground. Also Mestia is a tourist place and there are trekking routes near the project sites. Action will therefore be needed to reduce impacts on air quality at both the construction and disposal sites, by controlling dust and reducing the amount of material to be dumped. The Contractor should therefore be required to:

- Bring the material (aggregate and sand) as and when required;
- Ensure speedy completion of work and proper site clearance after completion
- Use tarpaulins to cover loose material that is transported to and from the site by truck
- 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

134. Various types of equipment and vehicles would be required for the construction activity. The exhaust emissions from these may degrade the ambient air quality. Considering the scale of work and use of equipment, impact will be insignificant, and will be beyond the scope of this project. However, to enhance the subproject benefits, the Contractor should implement the following:

- Ensure that all equipment & vehicles used for construction activity are in good condition and are well maintained
- Ensure that all equipment & vehicles confirm to emission and noise norms

Impacts during Operation

135. Impacts on air quality during operation of WWTP can be caused by the foul odour emissions mainly from components that are the inflow, the screens and the aerated grit chambers. As mitigation measures, like “conduction of WWTP’s annual odor audit to identify operational measures that can prevent odor problems” are already envisaged these components will be covered.

N. Biological Environment

Baseline Profile

136. About 40 percent of total geographical area of the country accounts for forests. Average density of forests is 163 m2 per ha. 97 percent of forests situated on mountain, the rest 3% are low-lying and flood plain forests in Kolhida Region and in the Western Georgia.

137. *Flora.* No information/data available on the extent of forest areas in Mestia. However except habilitation and agricultural lands on foot hills and flat land parcels on hills (which are converted long back as pastures), entire area is covered with various type of forests. The region which lies below 1,800 m MSL is covered by mixed and coniferous forests. The forest zone is made up of tree species such as spruce, fir, beech, oak, and hornbeam. Other species that are less common but may still be found in some areas include chestnut, birch, maple, pine and box. The zone which extends from 1,800 meters to about 3,000 m consists of alpine meadows and grasslands. Eternal snows and glaciers take over in areas that are over 3,000 meters above sea level. Overall, the region is covered with coniferous forest lower ranges, above which lies alpine belt in mid-range above which lies the zone of eternal snow and glaciers. Main tree species in the area are spruce, fir, beech, oak, and hornbeam. Species include Campanula latifolia (Bell flower family), Helleborus caucasicus (Caucasian Hellebore), and Umbelliferae (Apiaceae) – Parsley Family. Common wild animals in the forests around Mestia include hare, wolf, fox, and bear.

138. *Fauna*. Svaneti wild life is very diverse. Rodents are abundant. Caucasian endemic – Prometheomys satunin occurs in the alpine and sub-alpine meadows; snow vole is found in rocky areas of sub-alpine meadow (also in lower zones). Many voles are distributed within Okrugo sub-alpine and alpine meadow. Svaneti forest-meadows are rich with predators, of which brown bear is frequent. Caucasian wolf, Jackal, Trans-Caucasian fox, Caucasian boar, Lynx, Western Caucasian tur and Caucasian white throated marten are also present. Avifauna in the area include: Caucasian grouse, Caucasian snowcock, kite, goshawk, greater spotted eagle, cinereous vulture, griffon vulture, golden eagle and Eurasian griffon vulture from 1500 m till 3500 m above the sea level.

139. *Protected Areas.* There are 14 Strict Nature Reserves, 8 National Parks, 12 Managed Nature Reserves, 14 Natural Monuments and 2 Protected Landscapes in Georgia. These protected areas cover about 7 % of the country's territory. About 75 % of Protected Areas are covered by forests. Primary function of the Protected Areas is protection of natural heritage of the country. None of these protected areas are located in the region.

140. Future WWTP site is fallow land dominated by grasses (Poaceae) with spontaneous woody vegetation. Photos of the site are shown below.

Fig. 9: Pictures of proposed WWTP site (Dec. 2014)

View from last manhole

View proposed WWTP site from above

Impacts during Construction

141. During the construction, impacts on flora and fauna are due to site clearance activities and implementation of contractor's yard.

142. The following measures shall therefore be implemented:

- Construction works in the river bed shall not be conducted between November and March during breeding season of trout.

143. Following measures needs to be implemented to avoid any impacts on flora and fauna:

- Avoid tree cutting by local and small change of layout plan/alignment
- In unavoidable cases, plant two trees of same specie for each tree that is cut for construction
- Bushes and grasses shall be cleared only in actual construction area; all other preparatory works (material storage) shall be conducted on barren lands where there is no vegetation.
- Use excavated soil for refilling the pipeline trench; avoid sand layer on the top of the pipe in inaccessible areas to avoid importing material and related disturbances
- 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. This will avoid any safety risk to wild animals

144. Site clearance activities for the WWTP will involve the loss of approximately 3 ha of spontaneous vegetation, mainly grass and shrub vegetation. In total 3 ha of grass and shrub vegetation will be lost, of which 2.3 ha are temporary losses due to construction activities (construction site, material storage and contractor's yard) and 0.7 ha are total losses. Because of spatial dimensions of WWTP as described above impacts on movement of wildlife are expected to be only minor. There is no human impact

foreseen as the site as not inhabited and no agricultural activities are taken place on this site which is a public site.

Impacts during Operation

145. The operation and maintenance activities would be conducted within the facilities, and therefore no impacts envisaged on biological environment. Certain measures suggested in previous sections to ensure minimum downstream flow, will avoid any impacts on downstream users.

146. Impacts during operation phase of the WWTP refer to discharge of treated water into Mestiachala River which will result in positive impact, since situation for aquatic fauna and flora will improve as compared to the present situation.

147. An additional impact during operation phase refers to the disposal of waste and sewage sludge. Sludge needs to be brought to waste disposal site.

4. IMPACTS ON THE SOCIOECONOMIC ENVIRONMENT

O. Economic Resources

Baseline Profile

148. *Land use.* Predominant land use in Mestia is under agriculture/pasture followed by inhabited areas. Hills slopes are covered with forests. Agriculture and agricultural related activates (animal husbandry for meat and milk products) is the main economy of the region. Potato and corn are the important crops in the area. Owning to extreme weather conditions, cultivation is limited to summers months. There are no industries.

149. *Mining.* The region is known for mineral resources like gold, silver, lead, zinc, copper, cobalt, molybdenum, barite, arsenic, wolfram and marble, which are almost untapped. The region has mineral and thermal water springs. The region also has a large potential for building stone material (decorative facing stones, marble, lime stone, barite etc). However, most of these minerals at present are untapped, the present activity is limited to mining for construction materials (sand, gravel and aggregate).

150. *Roads & transport.* Nestled in the main Caucuses mountain region, Mestia is connected by road with the rest of Georgia. This road passes, mainly along the banks of Enguri River, through highlands, mountains and has steep slopes. Landslides during rains are not uncommon and often lead to road closure. This road is presently under improvement. Internal roads in Mestia are not well developed. Except the main roads, all other roads are narrow and un-surfaced. Public transport facilities are available and connect to all areas.

151. *Urban Services*. UWSCG provides water supply and sewerage services in the town. There are at the moment no central wastewater treatment facilities in Mestia. The untreated sewerage from the newly built sewerage networks under Contract MES-02 is currently discharged at 4 outfalls. WWTP will be located on public land in the south-west of Mestia, near the current Outfall No 3. The site is directly at Mestiachala River.

152. *Power Supply.* After the independence, Government of Georgia has made efforts to improve the power supply through new generating sources. Hydropower is the

predominant source (88%), while rest is from gas based thermal power stations. Mestia gets uninterrupted good quality electricity supply from Enguri Hydropower Station.

Impacts During Construction

153. For location of the WWTP the government has identified an area of approximately 2.4 ha.

154. The pressure collector of PS-1 will be laid in an earth road in public drain. The pressure collector of PS-2 will be laid within the shoulder (foot path of the main carriage road) of the road from museum down to the new bridge (new concrete road). No road cutting or reinstatement are required and right of way is already secured for the sewerage collectors.

155. As the future WWTP is planned on fallow land located to the southwest of the city of Mestia. No negative economic impacts are expected to occur. However implementation of the following best construction measures will reduce the inconvenience and disturbance:

- 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

156. 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. The volume of surplus soil generated from the construction work is limited, which will generate truck trips (assuming a smaller truck, 5 m^3 capacity, due to narrow roads) – spread unevenly with more trips during initial stages. In addition there will be truck movements carrying material. Although this is not significant, considering the narrow roads, it could disrupt traffic in the Town. The transportation of material/waste shall be implemented by the 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

157. At the construction phase the existing access road will be explored as there is no room to do another access road to WWTP. Access road needs graveling over 600 m. No major environmental issues for this current access road are envisaged.

The power source will be taken from the city main transformer (close to service center) where power line is available and special transformer will be installed for power supply at WWTP location. No environmental issue either with the installation of power line from city main transformer along the same access road, for ca. 900 m.

Impacts during Operation

158. As the operation and maintenance activities would be conducted within the existing facilities no impact is envisaged on economic resources. The improvements to the wastewater system will bring various benefits to the town. 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.

P. Socio-Cultural Resources

Baseline Profile

159. *Demography.* The present population of Mestia is 2,855, and floating population (tourists) is about 3,500. Contrary to overall growth rate of Georgia, which had declined during the last two decades, population of Mestia has increased though marginally. This is mainly attributed to decline in out-migration due to revival of tourism related economy. With the government focusing on development of Mestia as all-weather tourist destination with tourism related facilities and infrastructure, the tourist population is likely to increase to 20,000 by 2040 (Source: Government Estimates).

160. *Population Composition.* Almost entire population in Mestia is ethnic Georgians. Georgian is the main language, while most can speak Russian few can also speak English. There is no population which can be categorized as indigenous in the project area. About 98% of Mestia population is literate.

Table 5: Population of Project Area

Year		Population		CAGR
	Town	Tourist	Total	
2002	2,575	-	2,575	-
2011	2,855	3,500	6,355	-
2020	**3,480**	**6,375**	**9,855**	**4.72%**
2030	4,347	11,847	16,194	5.03%
2040	**5,299**	**20,000**	**25,299**	**3.73%**

161. *Education & health facilities.* There are three schools (primary and secondary) and two kindergartens in Mestia. For higher education, people mainly depend larger urban centres of Kutaisi and Tbilisi. Basic health facilities are available; there are two hospitals and a polyclinic in the town to serve the population.

162. *History & Culture.* Historically and ethnographically, Mestia has always been regarded a chief community of Zemo, or Upper Svaneti province. Despite its small size, the town has been an important centre of Georgian culture for centuries and contains a number of medieval monuments. The town is dominated by stone defensive towers (Svan towers). Mestia is also a centre of mountaineering tourism and alpinism. Early reference to Svans, an ethnic sub-group of Georgians of south-eastern slopes of the main Caucasus ridge, dates back to 3rd century BC. Archaeologists/historians found evidence of life in the region belonging Stone Age (Neolith). Svans adopted Christianity in 523 AD. Svans have played significant role in the life of the old and new kingdoms of Georgia. Their contribution during the reign of David the Builder and Queen Tamar in modern Georgia needs a special mention. Swans are known for ages as fierce fighters and protectors of Georgia. Following are the important places of historical importance in Mestia:

- *Swan Towers*. There are a number of ancient Swan Towers in Mestia. An ancient dwelling, believed to be established in 14th century, comprising Machubi' (dwelling house with large hall), summer terrace-type structure 'Guband' and adjoining multi-storey tower (Swan-tower) built by large stone quadrants, is located in Lanchavli. Legend has it that these towers are evidence for the volatile situation in the region, which lead to construction of these defensive structures.
- *Svaneti History and Ethnography Museum*. This museum was established in 1936 by ethnographer Egnate Gabliani and houses very important samples of the Christian culture. The cultural and material monuments kept in the museum are characterized with widespread chronology from the archaeological artefacts from 3 BC to modern age.

163. *Tourism*. Besides being an important cultural and historical centre, Mestia is known for its natural beauty, and notable for its glaciers and picturesque summits. Low and medium range hills mostly covered with mixed and coniferous forests. High hills are characterized by alpine meadows and grasslands, above which lie the zone of eternal snows and glaciers. With the Government of Georgia's focus on all-weather tourism development in Mestia, various initiatives such as development of ski lift and ski slopes, which are already underway, is likely to boost tourism inflow from present 3,500 to 20,000. Infrastructure works like improvement of roads (both internal and external) are being implemented in the town.

Impacts during Construction

164. There are various social-cultural resources (such as schools, hospitals, churches and tourism spots) in the town. The construction impact will include noise and dust, due to movement of trucks 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

165. There is invariably a safety risk 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:

- 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

166. Svaneti Region, including Mestia, is an important centre of Georgian history and culture. So there is a risk that any work involving ground disturbance could uncover and damage archaeological and historical remains. 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. This should involve:
  - Having excavation observed by a person with archaeological field training; o 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.

167. 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.

- To the extent possible labour force must be drawn from the local community
- 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
  - 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

Impacts during Operation

168. As the operation and maintenance activities would be conducted within the facilities, no impacts on socio-cultural resources envisaged.

169. Laboratory should be able to monitor the WWTP influent and effluent quality

170. The new WWTP, pumping stations and pressure collectors will bring numerous benefits when it is operating. The main beneficiaries will be the citizens of Mestia, who will be provided with a constant sewage treatment facility. This will improve the quality of life of people as well as raise standards of both individual and public health as the improvements in hygiene should reduce the incidence of disease associated with poor sanitation. 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. Improvement in infrastructure will bring more economic opportunities. Availability of good infrastructure will boost the tourism economy.

171. The new WWTP would require additional workforce – both skilled and unskilled, for operation and maintenance, and therefore creates new employment opportunities for approximately 15 local people.

Q. Noise, Dust and Vibration

Baseline Profile

172. Baseline data (noise, dust, 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. .

Impacts during Construction

173. Construction activities are likely to generate noise and vibration from usage of equipment and haulage of construction materials/waste. This project however does not involve high noise/vibration generating activities like. Use of equipment is

somehow limited and some excavation activities will be conducted manually. As the site is located away from the town, no noise impacts envisaged. Appropriate personal protection equipment however needs to be provided for workers at the site. Following measures therefore shall be implemented:

- Provide prior information to the local people about the work
- Provide personal protection equipment like ear plugs to the workers at the noisy working site

174. Another important activity is haulage of construction material and waste to and from site. Following measures shall be included to avoid nuisance due to haulage of material and waste:

- Schedule material and waste haulage activities in consultation with local authorities
- Educate drivers: limit speed between 20-25 km/ph. and avoid use of horn in the town
- Earmark parking place for construction equipment and vehicles when idling; no parking shall be allowed on the roads, that may disturb the traffic movement

175. As for the construction vibration is considered, none of the activities in the subproject has potential to generate significant vibration, and there are no sensitive structures in the proximity of the site. Therefore there are no likely impacts.

Impacts during Operation

176. The noise emission components of the WWTP are the blower, the pumps and the overflow weirs. As a mitigation measure the blower and the pumps will be covered. Overflow weirs are constructed in a manner that covering is also possible if required.

R. Cumulative Impacts

177. Project is designed to improve environmental quality and living conditions in Mestia through the improvement of waste water 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. There are common impacts associated with any construction activities and as discussed in earlier sections there exist proven and easy to implement measures to mitigate these impacts.

178. No cumulative impacts envisaged during the operation stage.

S. Climate Change Impact

Introduction

179. Mestia is located in 128 km northeast of the regional capital of Zugdidi. Annual precipitation ranges between 1000 and 3200 mm. The region is characterized by very heavy snowfall in the winter and avalanches are a frequent occurrence. The potential

risk of flood and flash flooding exist due to heavy rains as well as exceptional melting of glaciers feeding Mestiachialariver.

180. As per the data of gamgeoba, out of natural threats, flood, landslide and river bank washout and erosion are most common for Mestia Municipality. 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 not become more frequent.

181. There is a recently established a meteorological station in the administrative unit of Mestia, although monitoring of surface water is not carried out there so far. Accordingly, there is no precise information about changes of surface and groundwater hydrologic parameters. According to public opinion, in the last 10-20 years, the river flow has decreased, while according to the members of the local self-government, in comparison with previous years, the flow of the river during floods and flood frequency has not changed, as the rivers flood period have not changed as well. Government officials believe that the glaciers are also reduced in size.

182. The expected changes in climatic conditions and its dangers have not been evaluated for Mestia so far. However, based on the general trend, we may think that climate change could exacerbate in future, such events as wash out the river banks, erosion, landslides and others.

183. Mitigation measures

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

- Development of the strategy to promote forest restoration and plant-growing along with forestry department, that will promote regulation of surplus run-off and erosion processes, It will contribute to the regulation of surface runoff and erosion processes, reduce washing out of the river banks, as well as contribute to the regulation of the temperature
- Development of a flood management plan to avoid flooding of WWTP area
- The plan should be based on an integrated approach covering all relevant aspects of water management, land use, agriculture and nature conservation. In the development of a flood management plan, decision makers, as well as stakeholders and civil society should be involved.
- 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 Mestiachala 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.
- Extending 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.

Current gabions placed by Local Government

Gabion walls to be erected in future to protect WWTP slide

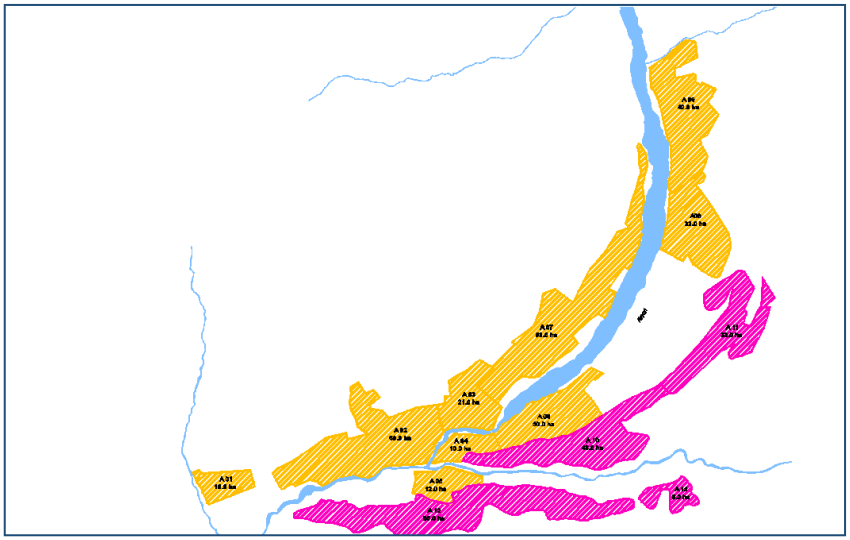
185. Design considerations on climate risks see in **Annex 2**

5. ESTIMATION OF FLOW & POLLUTION LOADS

T. Design criteria and population development

186. The service area of the WWTP Mestia is based on the municipal land use plan as presented below.

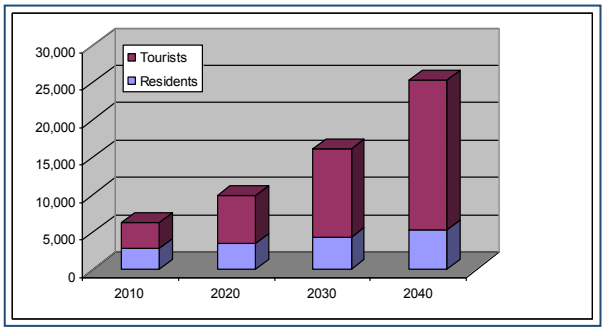
Fig. 10: Service area WWTP Mestia



187. The detailed design report for Mestia Networks elaborated by the Design Consultant (KOCKS - BT - Municipal Project) show the following figures regarding population development:

	Population Development			
Year	**2010**	**2020**	**2030**	**2040**
Residents	*2855*	*3480*	*4347*	*5299*
Tourists	*3500*	*6375*	*11847*	*20000*
Total	**6355**	**9855**	**16194**	**25299**

Fig. 10: Population development 2010 – 2040



188. Regarding water demand the Detailed Design Consultant contains the main design parameters for the water supply system of Mestia for the years 2010, 2020, 2030 and 2040.

Table 6: Water demand 2015 – 2040

Description	unit	Year			
		2015	2020	2030	2040
Water Supply					
Inhabitants (permanent stay)	**capita**	**3.168**	**3.480**	**4.347**	**5.299**
specific water demand (according UWSCG)	l/(c*d)	140	140	140	140
Minor commercial/institutional demand add.	%	10%	10%	10%	10%
Large consumers (industry) add.	%	0%	0%	0%	0%
Real losses (leakage, existing network) add.	%	25%	25%	25%	25%
Transmission losses add.	%	2%	2%	2%	2%
Apparent losses	%	0%	0%	0%	0%
Technical demand for water treatment add.	%	8%	8%	8%	8%
Total specific water demand	***l/(c*d)***	***203***	***203***	***203***	***203***
Subtotal daily water demand (inhabitants)	*m^3/d*	*643*	*706*	*882*	*1076*
Tourists (non-permanent stay)	**capita**	**4.938**	**6.375**	**11.847**	**20.000**
specific water demand (according UWSCG)	l/(c*d)	170	170	170	170
Minor commercial/institutional demand add.	%	10%	10%	10%	10%
Large consumers (industry) add.	%	0%	0%	0%	0%
Real losses (leakage, existing network) add.	%	25%	25%	25%	25%
Transmission losses add.	%	2%	2%	2%	2%
Technical demand for water treatment add.	%	8%	8%	8%	8%
Total specific water demand	***l/(c*d)***	***247***	***247***	***247***	***247***
Subtotal daily water demand (tourists)	*m^3/d*	*1.217*	*1.571*	*2.920*	*4.930*
Total water demand (average)	***m^3/d***	***1.860***	***2.278***	***3.803***	***6.006***
Peak factor daily demand	-	2,00	2,00	1,90	1,50
Peak factor hourly demand	-	4,50	4,50	4,00	3,50
Max, Daily water demand	***m^3/d***	**2.822**	**3.456**	**5.481**	**6.834**
	l/s	33	40	63	79
Max, Hourly water demand	***m^3/h***	297	324	481	664
	l/s	83	90	134	185
average hourly water demand	***m^3/h***	116	142	238	375
max, specific water demand inhabitants	l/(c*d)	336	336	319	252
max, specific water demand tourists	l/(c*d)	408	408	388	306

U. Flow and pollution load projections

189. The wastewater flow for the hydraulic calculation of the designed sewer network depends on the water demand. A wastewater/ water consumption ratio of 90 % is used for the dimensioning of pipes. As the wastewater flow is not constant during the day, a peak factor of 3.0 is applied for the hydraulic calculation. According to the mentioned Detailed Design Report, the parameters used for estimating flow are the following.

190. For estimating wastewater flows, the following criteria have been considered:

Domestic water demand	**140**	**[l/(cap*d)]**
Tourists wáter dimand	**170**	[l/(cap*d)]
Institutional demand	**10**	%
Large consumers	**0**	%

Technical demand	**8**	%
Wastewater consumption ratio	**90**	%
Connection ratio	**95**	%

191. Specifically for the sewerage system the flows are shown in the table below:

Table 7: Wastewater Flow

Description	Unit	Year			
Wastewater (separate sewer system)		**2015**	**2020**	**2030**	**2040**
Connection ratio		95%	95%	95%	95%
Wastewater/water consumption ratio		90%	90%	90%	90%
Wastewater flow population (average)	m^3/d	1.295	1.585	2.646	4.179
Wastewater from industry	m^3/d	0	0	0	0
Total wastewater flow (average)	**m^3/d**	**1.295**	**1.585**	**2.646**	**4.179**
Infiltration rate	%	25%	25%	25%	25%
Infiltration	m^3/d	324	396	662	1.045
Peak factor for wastewater flow	-	3	3	3	3
Daily flow (average)	m^3/d	1.295	1.585	2.646	4.179
Max daily flow	m^3/d	2.681	3.283	5.207	6.492
Hourly flow (average)	m^3/h	54	66	110	174
Hourly flow (max.) dry weather	m^3/h	81	99	165	298
Hourly flow (max.), for hydraulic calc. only	m^3/h	162	198	331	564
	l/s	45	55	92	157

192. The results can be seen on the following table, taken from the design report:

Table 8: Wastewater Flow 2010 – 2040

Description	unit	Year			
		2015	**2020**	**2030**	**2040**
Wastewater (separate sewer system)connection ratio		95%	95%	95%	95%
Wastewater/water consumption ratio		90%	90%	90%	90%
result wastewater flow (average)	m3/d	1.295	1.585	2.646	4.179
wastewater from industry	m3/d	0	0	0	0
peoples equivalent	PE	0	0	0	0
peak factor	h/d	16	16	16	14
result wastewater flow (average)	m3/d	1.295	1.585	2.646	4.179
infiltration (0,5 m3/(d*Manhole)					
No. Of Manholes appr.	No.	500	1000	1000	1000
peak factor for wastewater flow	-	3,0	3,0	3,0	3,0
daily flow (average)	m3/d	1.295	1.585	2.646	4.179
Max. daily flow (incl. peak factor for daily water demand)	m3/d	2.681	3.283	5.207	6.492
hourly flow (average)	m3/h	54	66	110	174
hourly flow (max.) dry weather	m3/h	81	99	165	298

hourly flow (max.), for hydraulic calc. only	m3/h	162	198	331	564
BOD5 - load of raw dom. wastewater	g/(c*d)	60	60	60	60
BOD5 - pollution load from households/hotels	kg/d	486	591	972	1.518
BOD5 - pollution load from industry	kg/d	0	0	0	0
total BOD5 - load	**kg/d**	**486**	**591**	**972**	**1.518**
average BOD5 - concentration	mg/l	376	373	367	363
SS - load of raw dom. wastewater	g/(c*d)	70	70	70	70
SS - pollution load from households/hotels	kg/d	567	690	1.134	1.771
SS - pollution load from industry	kg/d	0	0	0	0
total SS - load	kg/d	567	690	1.134	1.771
average SS - concentration	mg/l	438	435	428	424
TKN - load of raw dom. wastewater	g/(c*d)	11	11	11	11
TKN - pollution load from households/hotels	kg/d	89	108	178	278
TKN - pollution load from industry	kg/d	0	0	0	0
total TKN - load	**kg/d**	**89**	**108**	**178**	**278**
average TKN - concentration	mg/l	69	68	67	67
P - load of raw dom. wastewater	g/(c*d)	1,8	1,8	1,8	1,8
P - pollution load from households/hotels	kg/d	15	18	29	46
P - pollution load from industry	kg/d	0	0	0	0
total P - load	**kg/d**	**15**	**18**	**29**	**46**
average P - concentration	mg/l	11	11	11	11

V. Location of closest users

193. We have carried out an estimation of the number of households connected to each one of the catchment areas by assigning them to the closest sewer pipe, as per the limits of the catchment areas.

194. The estimated number of households by catchment according this estimation is the following:

Catchment Area	Est. No of households	%
Area 1	412	49%
Area 2	30	4%
Area 3	386	46%
Area 4	10	1%
Total	838	

195. Using the typical value of 3.5 persons/household, the result will be that the current population in Mestia is 2933, which is near the value given by the Design Consultant for resident population in 2010; we can thus assume the estimation made is accurate.

W. Wastewater flow in the 4 catchment areas

196. For estimating the wastewater flow which will be discharged on each one of the outfalls, we will use the same values for current population, flow assignment and pollution load used by the Design Consultant in its report, resulting on the expected wastewater flow characterization we show on the following table:

	Area 1	Area 2	Area 3	Area 4
No of Households	412	30	386	10
%	49%	4%	46%	1%
Average wastewater flow (m3/d)	493,61	35,94	462,46	11,98
total BOD5 load (kg/d)	187	14	175	5
average BOD5 concentration (mg/l)	379	379	379	379
total SS load (kg/d)	219	16	205	5
average SS concentration (mg/l)	443	443	443	443
total TKN load (kg/d)	34	3	32	1
average TKN concentration (mg/l)	70	70	70	70
total P load (kg/d)	5	0	5	0
average P concentration (mg/l)	11	11	11	11

197. If we consider that for the present situation there is not going to be more than 30% of connections during the initial year of operation starting Oct. 2014, the values will be the following:

	Area 1	Area 2	Area 3	Area 4
Average wastewater flow (m3/d)	148	11	139	4
total BOD5 load (kg/d)	56	4	53	1
total SS load (kg/d)	66	5	61	2
total TKN load (kg/d)	10	1	10	0
total P load (kg/d)	2	0	2	0

198. The concentration values will remain the same as we are dividing the flow accordingly.

X. Effluent standard

199. The Georgian regulation considers 2 categories of discharge:

- **Discharges below 1 000 m3/d**. They are ruled by the order n° 745 of the Minister of Environment Protection and Natural Resources issued the 13th of November 2008. It sets the maximum admissible concentrations in discharge water for certain parameters. The main of them are the following:

Parameter	Maximum permitted concentration
Suspended Solids	60 mg / l
BOD (biochemical oxygen demand)	25 mg / l
Total phosphorus	2 mg / l
Total nitrogen	15 mg / l

– **Discharges above 1 000 m3/d.** They are regulated under the law of Georgia on Permit for Impact on the Environment, December 14, 2007, Article 4. In the mentioned law it is stated that an EIA must be performed in which a specific calculation of the Maximum Admissible Concentration in the receiving water body must be carried out resulting in Maximum Admissible Discharge Limits for the wastewater.

6. PRELIMINARY IMPACT ASSESSMENT AND ANALYSIS

Y. Methodology

200. The types and objects of the impact that may be caused by the discharge of untreated effluent at the terminal outlet (location of WWTP, after Area 3 which will collect 99% of the sewerage when the 2 PS and 2 pressure collectors are nstaleld) needs to be established. Changes in quantitative and qualitative characteristics of the environmental condition must be predicted. Environmental impact is to be assessed for the operation of the 4 sewerage collectors and outfalls (exploitation phase).

201. Approaches used for this environmental impact assessment, as well as the quantitative and qualitative criteria have been developed for unification and standardization, which ensures the objectivity. The following scheme have been used during the preliminary assessment of the environmental and social impact that may be caused by the discharge of untreated effluent

- *Determination of the major types of the impact*: determination of those impacts that may be significant when discharge untreated effluent at the 4 outfalls.
- *Baseline study* and field measurements: identification of the receptors in the areas of the terminal outfall, which is expected to be impacted by the discharge; determination of sensitivity of the receptors based on river quality flow and quality and wastewater flow and pollution loads of the terminal collectors
- *Characterization and assessment of the impact*: determination of the nature, probability, significance and other characteristics of the impact, taking into account the sensitivity of the receptor at the terminal outfall; description of the expected changes in the environment and evaluation of their significance.
- *Identification of mitigation measures: determination of mitigation, prevention or compensating measures for significant impact.*

Z. Impact Receptors and their Sensitivity

202. The project may lead to a change in the qualitative and quantitative characteristics of physical and biological resources at the 4 outfalls, such as:

- Ambient air quality;
- Surface water quality;
- The quantity of habitats, flora and fauna (biological environment)
- Others (soil stability, ground water quality, etc.)

203. The population, which may be affected by the effluent discharge include people living in the vicinity of the outfalls and others (e.g. tourists picnicking in the vicinity of the outfalls, etc.). The closest residents to the outfalls are considered as potentially sensitive receptors.

204. Sensitivity of a receptor is related to the magnitude of the impact and to the ability of a receptor to resist change or recover after changes, as well as to its relative ecological, social or economic value.

AA. Characterization of the Impact

205. The major influence factors have been identified for the preliminary impact assessment during the operation phase, when the 4 collectors will be put in operation (Oct. 2014). Assessment of the expected impact is to be implemented in accordance with the following classification:

- Nature - positive or negative, direct or indirect;
- Magnitude - very low, low, medium, high or very high;
- Probability of influence - low, medium or high risk;
- Impact area - district, area;
- Duration - Short and long term;
- Reversibility - reversible or irreversible.

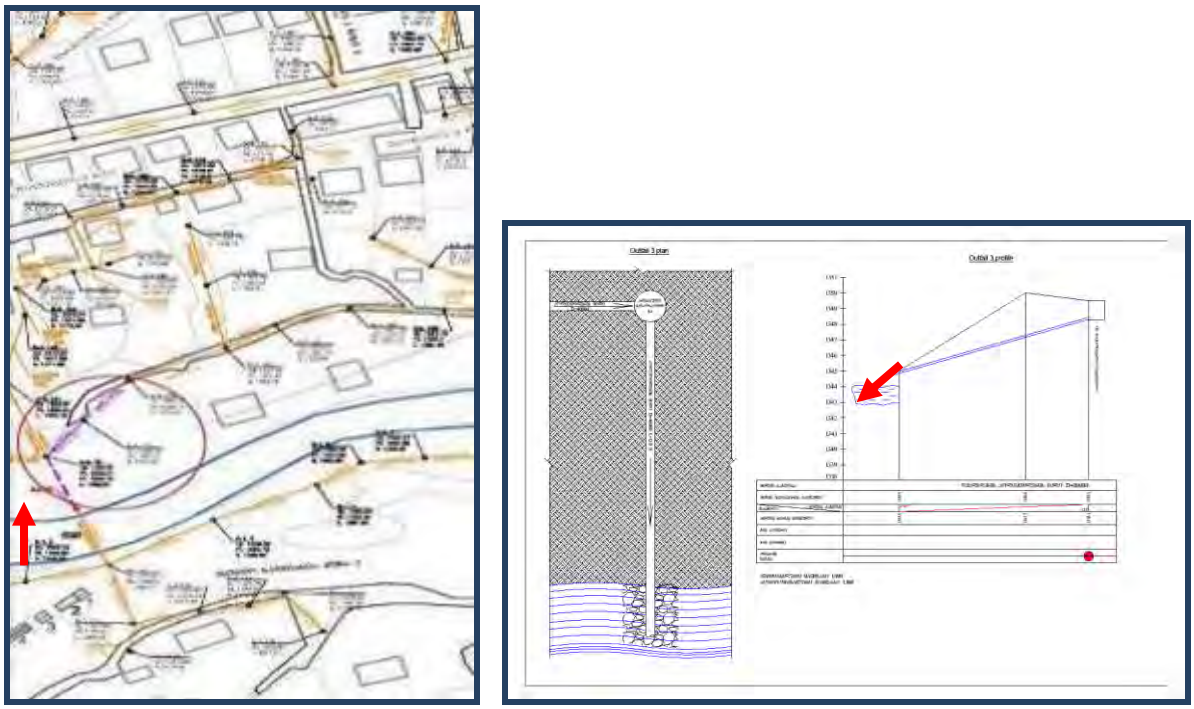
206. Expected changes in the environment and their nature, area of the influence and duration, reversibility and probability of risk realization will be determined for the operational phase of the sewerage system. The impact is mainly determined quantitatively. Assessment of the impacted environment will be implemented based on the projected flow and design loads in the 4 collectors as established above, the projected rates of connections and the quality standards and flow of the receiving river water at the 4 outfalls.

207. Below are the criteria established for the assessment of the impact on environmental and social receptors; Characterization of the impact; List of relevant mitigation measures; Using established criteria for determining significance and scope of the impact before and after the implementation of mitigation measures.

208. Before characterizing the impact it is necessary at this point to make a short technical description of the outfall at the future location of the WWTP where wastewater is currently discharge untreated.

209. The terminal pipeline will discharge at this outfall all sewerage effluent produced in Mestia when the 2 sewerage pumping stations and collectors will be installed. This outfall is located at the plot of the future WWTP and is actually the future river outfall of the combined system The outfall plan and profile are shown in below pictures:

Fig. 11: Location and profile of terminal pipeline and outfall at WWTP



210. There are no near residents around the outfall. The route of the outfall (steel casing DN 200mm) is shown in picture below:

Fig. 12: Route of outfall collector and nearest users downstream

BB. Impact on Ambient Air Quality

211. For the assessment of impact on ambient air quality normative documents of Georgia will be used, which determine the air quality standards. Standards are defined for the protection of health. As the impact on health depends on the concentration of harmful substances, as well as on the duration of the impact, evaluation criteria considers two parameters: Short-term concentration (< 24 h) and Unpleasant odour distribution (long-term)

Table 9: Assessment criteria for the impact on ambient air quality

Ranking	Category	Short-term concentration (< 24 h)	Unpleasant odor distribution (long-term, or frequent)
1	**Very low**	C <0.5 MPC	10% of < OU_E/m^3
2	**Low**	0.5 MPC < C < 0.75 MPC	10-20% of OUE/m3 standard
3	**Medium**	0.75 MPC < C <1 MPC	20-50% of OUE/m3 standard

4	**High**	1 MPC < C <1.5 MPC	50-100% of OUE/m3 standard
5	**Very high**	C > 1.5 MPC	> 100% of OUE/m3 standard

Note: C - Estimated concentrations in the environment, considering the baseline

212. Emission of harmful substances is not expected during the operational phase of the sewerage collectors and terminal outfall. The maximum single and daily average maximum permissible concentrations of harmful substance are given below

Table 10: Maximum permissible concentrations of harmful substances in ambient air

№	Harmful substances	Code	Maximum permissible concentrations mg/m^3	
			Maximum single	Daily average
1	Nitrogen dioxide	0301	0,2	0,04
2	Nitric oxide	0304	0,4	0,06
3	Particulate	0328	0,15	0,05
4	Sulfur Dioxide	0330	0,5	0,05
5	**Hydrogen sulphide**	**0333**	**0,008**	-

213. No impact on ambient air quality during the operational phase of the sewerage terminal collector are expected, unless some form of pre-treatment or treatment is created at the terminal WWTP site. Indeed impact on air quality can only be related to foul odors stemming from hydrogen sulfide. Degradation of organic matter in a wastewater treatment process is accompanied by a large amount of hydrogen sulfide emissions, which is the source of foul odor spread. Without treatment process at the final WWTP outfall no impact is foreseen. The outfall arrangement calls for the terminal sewerage collector to be installed below the river static water level meaning no treatment and spread of hydrogen sulfide can take place. In case a treatment plant is built in the future some mitigation will be required. In this case and in order to minimize the disturbance of the operation staff and population of the nearest residential zone, the project must envisages arrangement of biological treatment system for gasses, which minimize the risk of spreading foul odor. The summary of impacts is given in the table below:

Table 11: Summary of impacts on ambient air quality

Description of impacts and impact sources	Impact receptors	Residual Impact Assessment					
		Nature	Probability of influence	Influence area	Duration	Reversibility	Residual impact
Operation phase:							
Combustion products, welding aerosols and other harmful substances emitted into ambient air near the outfalls.	**Population, technical staff, biological environment**	**Direct, Negative**	**Low risk**	**adjacent residential area**	**Short term**	**Reversible**	**Very low**

Foul odor emission Degradation process of organic matter in treatment plant, pre-treatment plant or pump station		**Direct, Negative**	**Medium risk**	**adjacent residential area**	**Permanent**	**Irreversible**	**Very low (in case PS, WWTP is built)**

CC. Impact on Surface Waters (Mestiachala River)

214. With regard to the impact on the receiving surface waters the risks related to the deterioration of water quality near the terminal outfall if no WWTP is built at that location is discussed below. Impacts, such as changes in water debit, limited movement of river sediment, violation of stability of river-bed and river banks are also discussed.

215. Assessment of the water quality deterioration at the vicinity of the terminal outfall will be made as per the criteria listed in the table 13 below.

216. The major impact receptor is the Mestiachala River. During the operation of the terminal sewerage collector and outfall, untreated wastewater effluent will be discharged into the river, before the WWTP plant is installed and operational. Consequently, the river water pollution risk at the terminal outfall is related to the discharging of untreated wastewater. Another source of pollution is the improper management of agricultural-fecal or storm waters or other pollutants by the users of the sewerage system (it is observed that some users have already connected both sewerage (grey and black domestic sewerage) and rainwater collectors into their domestic sewerage connection and shafts.).

217. In case of a WWTP, an effective system is proposed for biological treatment of wastewater, which, in case of protecting the operational rules, provides standardized treatment of wastewater. In this case, the risk of contamination of the river water will be minimized. However, in absence of full treatment at the terminal outfall, the risk of water pollution is high and its impact should be assessed.

218. National Environmental Agency (NEA) with its expedition team did sampling of Mestiachala River in Mestia. The expedition sent for sampling collected samples during one week (daily samplings). The baseline samples were taken before the terminal outfall. Samples were analysed for different parameters (Temp, Dissolved Oxigen, BOD, COD, Total N, Total P, Suspended Solids, Total Coliforms). The official communication and sample parameters with identity numbers (from #865 to #884) can be found in Annex 2.

219. The NEA expedition took place on October, 1-6. 2014 and summarized data are shown in the table below:

Table 12: Data of samples analysis

No of sample	Parameter Measured								
	Temp (ºC)	Dissolved Oxygen (mg/l)	Dissolved Oxygen (%)	BOD5 (mg/l)	COD (mg/l)	Nt (mg/l)	Pt (mg/l)	Suspended Solids (mg/l)	Total Coliforms
#874 (02.10.14) Outfall III	5.5	8.7	80	1.07	3.36	1.69	2.47	29.7	23000
#875 (03.10.14) Outfall III	5.4	7.8	73	0.96	4.2	1.67	3.05	2.3	40000
#876 (04.10.14) Outfall III	6.3	8	78	1.37	5.04	1.63	2.45	2	29500
#877 (05.10.14) Outfall III	6.6	8.4	80	1.14	3.36	1.45	2.2	2	14000
Average	6.12	8.02	76.2	1.21	4.85	1.58	2.44	33.65	23925

220. For evaluating the impact of the continuous discharge of wastewater into the Mestiachala River at the terminal outfall (WWTP future location), we are using the classical Streeter–Phelps model, neglecting the effects of photosynthesis, respiration and sediment oxygen demand which will require an extremely thorough analysis and characterization of the ecological community existing in the river. As we will see later, the small amount of wastewater discharge compared to the river magnitude confirms this assumption.

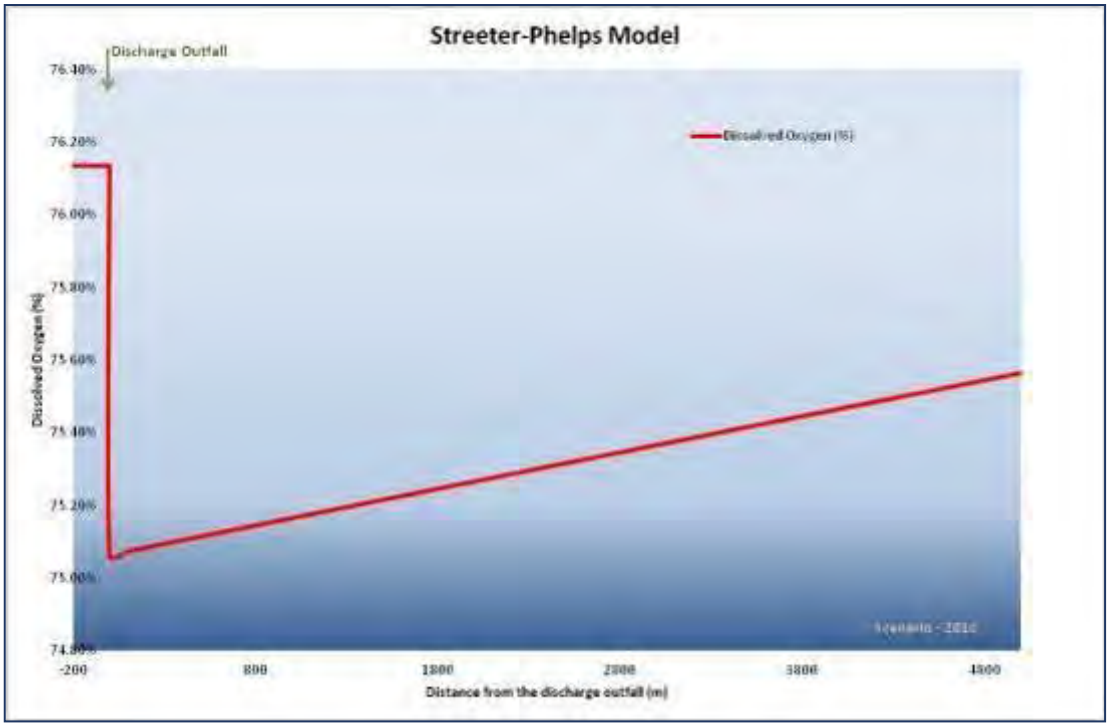
221. The equation is as follows:

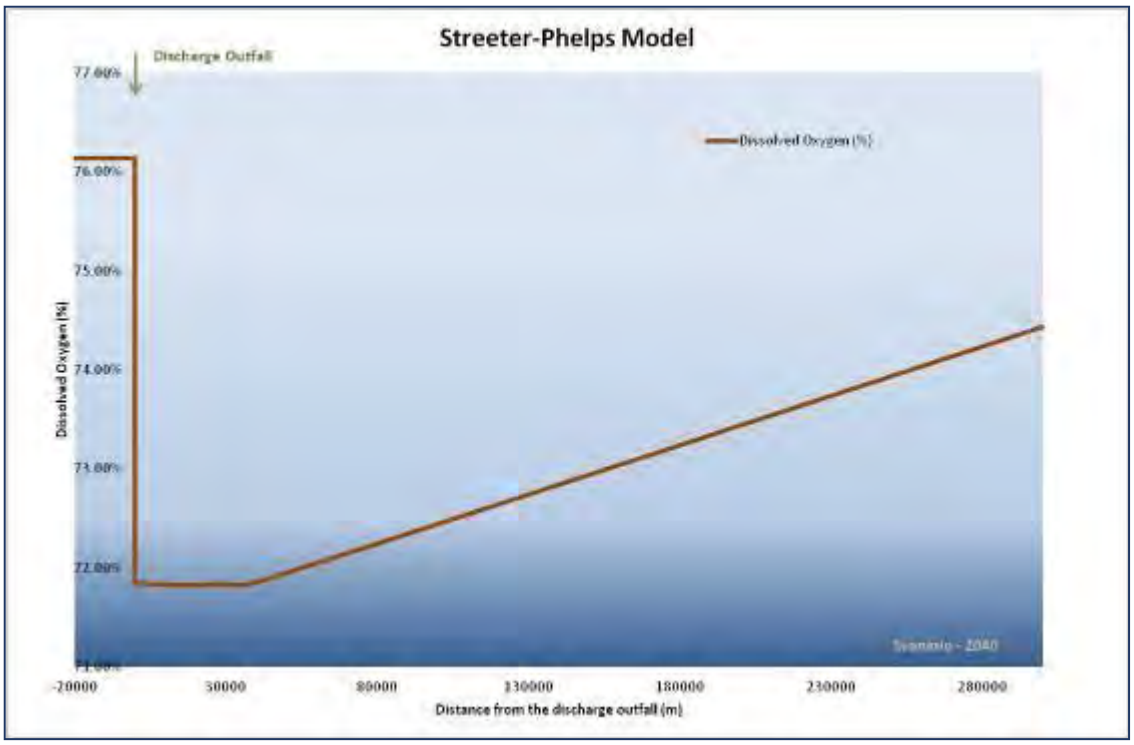
$$D = \frac{K \cdot Lo}{K2 - K} \cdot (e^{-K \cdot t} - e^{-K2 \cdot t}) + Do \cdot e^{-K2 \cdot t}$$

222. Where:

- *D* is the dissolved oxygen deficit, which can be derived from the dissolved oxygen concentration at saturation minus the actual dissolved oxygen
- *K is the decay coefficient, dependent on the temperature*
- *K2 is the surface aeration rate, dependent on the temperature*
- *Lo is the initial oxygen demand of organic matter in the water*
- *Do is the initial oxygen deficit*
- *t is the travel time, usually length dived by cross-section average velocity*

223. The impact of the wastewater on the Mestiachala River in the worst-case-scenario (conveying all the wastewater generated to a unique outfall (outfall#3 which is the future WWTP facility discharge point), and using the minimum average flow record in Mestiachala River of 0.81 m3/s) as for classical Streeter-Phelps model (also called Dissolved-Oxygen Sag Analysis) is shown on the following 3 graph:





224. The estimation of different pollution parameters, based on the worst-case-scenario considered is shown in Tab.14, depending on different prognosis year. (As it is not stated in the Design Report by Kocks, the initial value for COD concentration in the sewerage network has been computed using the typical values shown on Metcalf & Eddy's Wastewater Engineering Treatment Disposal Reuse, considering a medium concentration value).

Table 13: Estimations of different pollution parameters (worst-case-scenario)

		Pollution level (2015)	MPC	
BOD5 concentration	(mg/l)	6.55	3-6	Exceeding MPC set on attachment N1
COD concentration	(mg/l)	11.85	15-30	Not exceeding MPC
N concentration	(mg/l)	2.55	15	(*)
P concentration	(mg/l)	2.56	2	(*)
SS concentration	(mg/l)	39.43	<5%	Exceeding MPC set on attachment N1
		Pollution level (2020)	MPC	
BOD5 concentration	(mg/l)	9.44	3-6	Exceeding MPC set on attachment N1
COD concentration	(mg/l)	15.81	15-30	Exceeding MPC set on attachment N1
N concentration	(mg/l)	3.06	-	(*)
P concentration	(mg/l)	2.63	-	(*)
SS concentration	(mg/l)	42.53	<5%	Exceeding MPC set on

				attachment N1
		Pollution level (2040)	MPC	
BOD5 concentration	(mg/l)	21.59	3-6	Exceeding MPC set on attachment N1
COD concentration	(mg/l)	32.72	15-30	Exceeding MPC set on attachment N1
N concentration	(mg/l)	5.24	-	(*)
P concentration	(mg/l)	2.92	-	(*)
SS concentration	(mg/l)	55.61	<5%	Exceeding MPC set on attachment N1

Notes: (*) For total Nitrogen and total Phosphorus values, there is not a clear limit set on the mentioned Resolution, and can't thus be assessed.

225. **Analysis:** the calculations in the table above show values exceeding limits in all the parameters after the outfall discharge (including for design horizon 2015), according the values set in the Georgian Government Resolution #25,December 31, 2013 Regarding Technical Regulation Approval of Surface Water Contamination, it is proposed to consider the residual impact as 'high' in case no WWTP is executed

226. The summary of impacts is given in the table below:

Table 14: Summary of impacts on surface waters

		Residual Impact Assessment					
Description of impact and its sources	**Impact receptors**	**Nature**	**Probability of influence**	**Influence area**	**Duration**	**Reversibility**	**residual impact**
Contamination of Mestiachala River with suspended particles and organic substances at the 4 outfalls – Source of contamination : wastewater discharged into the river without treatment – Source of contamination: with suspended particles due to stormwater entering the sewerage network system (e.g. illegal connection of drainages to the sewerage manholes or illegal connection of users of drainage collectors to their sewerage manhole	**Residents of nearby settlement, river inhabitants.**	**Direct, Negative**	**High risk**	**Mestiachal River, from the wastewater discharging points (4 outfalls) downstream till it joins the Enguri dam**	**Permanent or temporary if WWTP is built in future**	**Reversible (by adding treatment)**	**High**

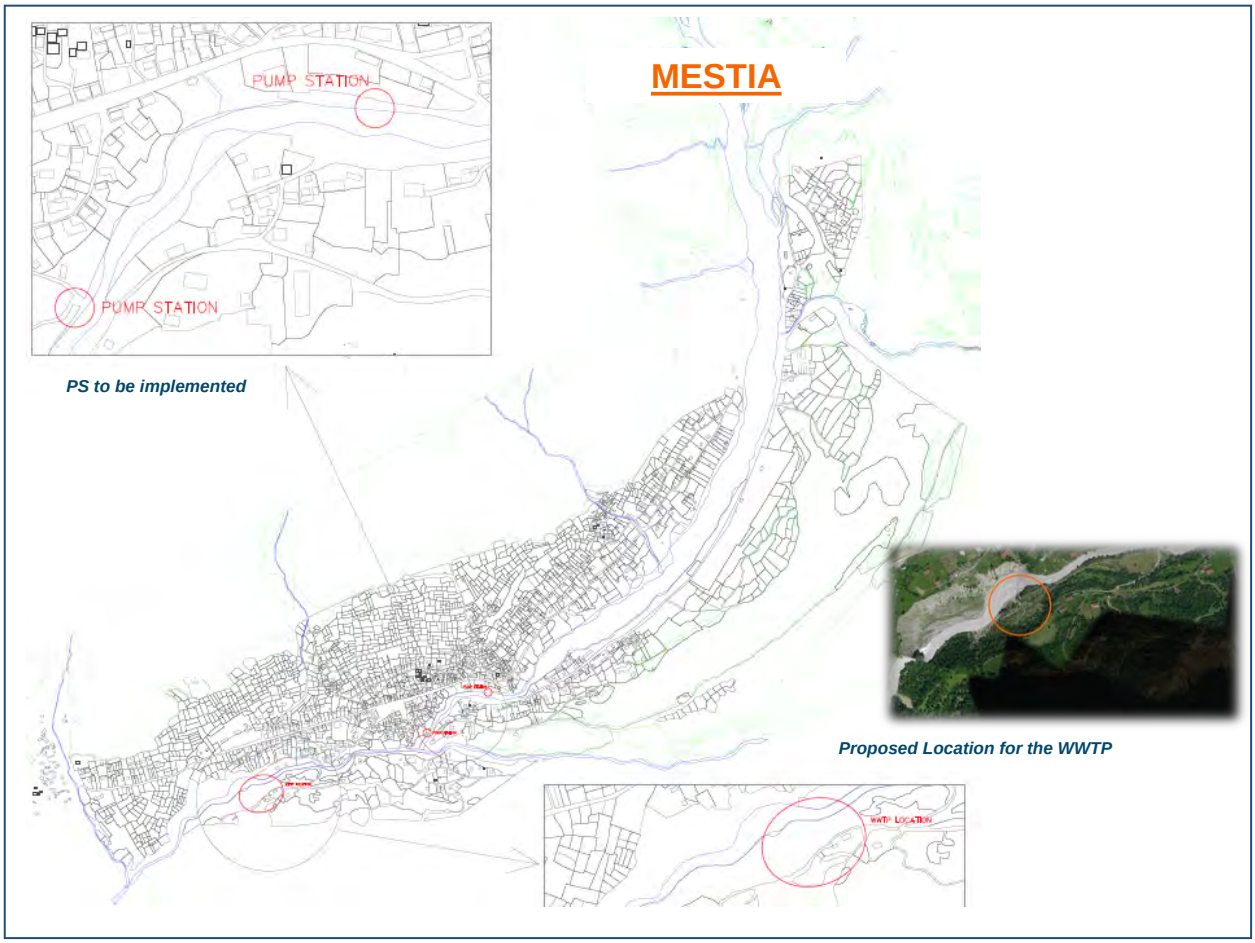
shaft) – Source of contamination with hydrocarbon / chemical substances - due to their spillage, inflow of contaminated surface water runoff, or their spillage in the water bodies through the sewerage system (pipes, manholes or user shafts)							

227. **Recommendations**: According paragraph 3, section 6 a) of the mentioned Georgian Government Resolution #425, it is forbidden to discharge wastewater without proper treatment. It is recommend to:

- Install under tranche 5 of USIIP the **2 sewerage pumping stations and pressure collectors** to convey sewerage to the future location of the WWTP (terminal outfall);
- Build at that location an **activated sludge WWTP** also under tranche 5 of USIIP this plant to include a Pre-treatment Facility (screening and grit and grease removal), a Primary Treatment Facility (aerated grit chamber and a sedimentation tank) and a biological treatment facility (secondary treatment consisting of activated sludge tanks, final sedimentation tanks and sludge storage tank as well as sludge dewatering and emergency sludge storage place)

228. The location of the proposed 2 pumping stations and WWTP are shown in the Figure below:

Fig. 13: Location map of proposed sewerage PS and WWTP

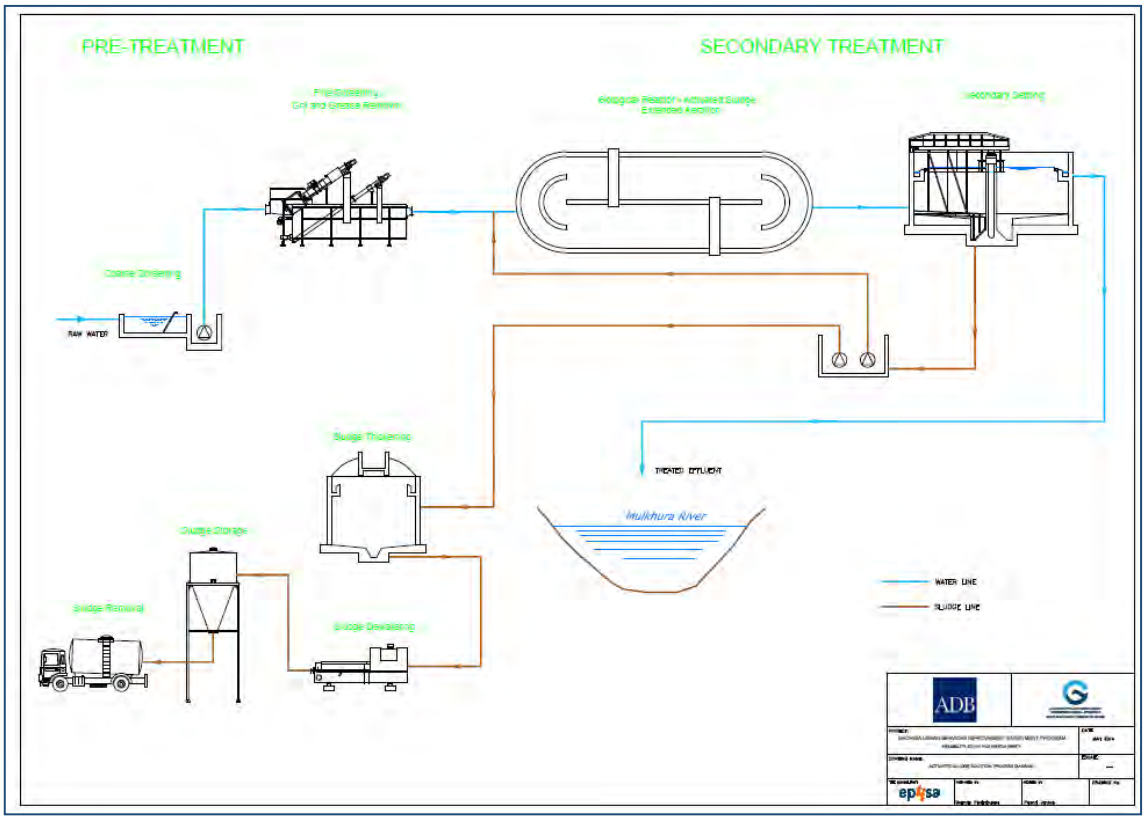


229. The expected removal efficiency obtained after the proposed treatment facility under the proposed Sludge Activated Treatment Facility is as follow:

Parameters	Concentration	Minimum percentage of reduction
Biochemical oxygen demand (BOD5 at 20 °C)	25 mg/l O2	40
Chemical oxygen demand (COD)	125 mg/l O2	75
Total suspended solids	35 mg/l (more than 10 000 p.e.)	90 (more than 10 000 p.e.)

230. The schematic diagram of the process is shown on the figure below

Fig. 14: Process diagram for activated sludge WWTP



231. The values on the river after this treatment will then be the ones shown on the following tables, which remain within acceptable standards for the current situation in Mestia.

Table 15: Estimations of different pollution parameters (with Activated Sludge Treatment Facility)

		Pollution level (2020)
BOD5 concentration	(mg/l)	1.74
COD concentration	(mg/l)	7.51
SS concentration	(mg/l)	33.68 – 0.1%

		Pollution level (2040)
BOD5 concentration	(mg/l)	2.55
COD concentration	(mg/l)	11.62
SS concentration	(mg/l)	33.73 – 0.2%

232. Surface water pollution prevention measures during the operation phase of the sewerage collectors and Primary Treatment Facility are proposed as follow:

- Construction and operation of WWTP including regular maintenance of the pre-treatment facilities (screens/aerated grit chambers), the aerated grit chamber/sedimentation tank and the aeration tanks / sludge disposal facilities at (the the outfall (3)). This includes regular sludge removal from the

sedimentation tank (sludge to be disposed on nearby sludge drying beds for instance)

- Control of the efficiency of above WWTP facilities, in case of possible malfunction; implementation of appropriate corrective measures;
- Systematic supervision on usage rules of the sewerage system (informing users not to connect their drainage household system to the sewerage system)
- In case of fuel/oil emergency spill in sewerage system or in the pre-treatment facilities, localization of the pollution and implementation of measures to prevent deterioration of the surface waters through the sewerage system.

DD. Impact on Biological Environment

233. For the assessment of the impact on biological environment qualitative criteria are introduced for the following categories:

- Integrity of the habitat, where the possible loss or fragmentation of habitats, reduction of the potential capacity of ecosystem and the impact on natural corridors are estimated;
- The loss of species. Impact on species behavior, where the assessment is implemented about changes in their behavior that are caused due to the physical changes, including visual impact, noise and atmospheric emissions, as well as about the impact on breeding, nesting, spawning, daily and seasonal migration, activity, and mortality;
- Protected habitats, protected areas, protected landscapes etc.

234. The impact on protected receptors near the outfalls is summarized below

- Impact on the integrity of the habitat and the destruction of vegetation: considering that no major habitat or land is impacted by the discharge of untreated wastewater at the 4 outfalls, no specific measures are required; Negative impact on vegetation is not expected during the operational phase of the 4 collectors.
- Impact on wildlife: emissions of harmful substances in the ambient air near the outfalls may force certain species of animals to migrate from the sites. In case of polluting water near the outfalls by harmful substances, populations of fish, amphibians, birds and otter inhabiting near the water, as well as the animals living near the contaminated area will be damaged; Therefore impact on the population of fishes in particular should be assessed by a separate biological study which shall evaluate precisely the impact on water-related birds and fishes in case of Mestiachala River water contamination at the location of the 4 outfalls.

7. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

EE. Summary of Activities and Anticipated Impacts

235. 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:

A) Construction Phase

- Pre-construction activities such as contractor office set ups and necessary equipment stacks;
- Construction of the Treatment Plant per tender drawings.

236. 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,

A) Operational Phase

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

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

238. Construction waste and sludge will be removed to Zugdidi municipal landfill (as there is no municipal landfill in Mestia town) under the agreement with the Solid Waste Management Company and local Municipality. Spoil soil will be removed from the construction site and disposed at the site agreed with local municipality

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

#	Construction Phase. Potential Impacts During Construction Works	Risk	Sites
1	Impacts on Archaeological Sites	Low Risk	No damage to any archaeological site shall be expected. The WWTP sites of Mestia is not located in the areas of extensive human impact.
2	Impacts on traffic	Moderate Risk	Only 2 pressure collectors and 2 pumping stations are to be installed under a separate subproject. For its implementation is required excavation of trenches in the streets of the city that will cause breaking of the movement both - transport means and passengers, especially in the narrow streets of the city.
3	Landslides, slumps, slips and other mass movements.	Moderate Risk	Despite this, the landslide processes may be triggered during construction of the pumping stations.

#	Construction Phase. Potential Impacts During Construction Works	Risk	Sites
4	Impacts on flora and fauna	Moderate Risk	Some impact on flora and fauna are foreseen. Few trees and bushes might be removed that can be mitigated adequately by the contractor
5	Pollution risk for air quality	Moderate Risk	Air pollution may occur in the inhibited areas
6	Poaching by construction workers	Low Risk	Mestiachiala river
7	Hazardous Construction Wastes	Low Risk	Small quantities of hazardous wastes will be generated as a result of vehicle operations and the maintenance activities.
8	Impact on existing infrastructure	Low Risk	Electric power transmission systems, existing water supply and drainage channel systems and channels
9	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.
10	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, and groundwater should be considered.

FF. Air Quality

Noise and Dust Caused by Construction Activities and Emissions of Harmful Substances into the Atmosphere Air

Construction Phase

240. Noise and 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.

241. Modelling and assessment of the noise, caused by construction activities is based on existing information about operation of various equipments at various stage of construction. For example, 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 16: Noise levels

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

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

242. 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 level 1 - Noise level 2 = 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

243. 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 houses within 150 m radius from the new pumping stations, therefore, the contractor should implement all mitigation measures mentioned in the document.

Mitigation Measures

244. These impacts can be reduced by a variety of measures, many of which are common in most urban construction. These include:

- Require adherence to engine maintenance schedules and standards to reduce air pollution.
- 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.
- Public awareness about feasible construction works.

Operation Phase

245. No permanent dust emission sources will exist during operation phase. It is expected that in small quantities dust will be generated only during maintenance works.

246. Noise propagation is expected in the operation phase, however, since WWTP location is not closely linked with populated area there is no need to apply for special mitigation measures

247. In the phase of operation sewage sludge wrong placement at Mestia landfill might be one of the sources of air pollution.

Mitigation Measures

248. The standard approaches shall be employed to reduce the dust and 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.

249. Also, after the detailed design of WWTP will be developed, the contractor 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.

250. Odour spreading is expected off-site during operation, hence mitigations include the following:

- close monitoring of the aerobic units to ensure the conditions are not anoxic(without enough oxygen),

- conduct of WWTP‟s annual odor audit to identify operational measures that can prevent odor problems.

251. The role of reliable power supply to the mechanical equipment is very important in ensuring adequate odour 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.

GG. Water Quality

Contamination of Surface Water

Construction Phase

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

253. 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

254. 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

255. 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 Mestiachala; The operation of the WWTP will have positive impact on the restoration and maintaining of the aquatic fauna in the River Mestiachala; There are large positive impacts on the Social Environment elements: improved water supply of the downstream populated areas due to good quality of the ground water, and improved health of the downstream population as a result of the improved quality of drinking water.

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

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

257. 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.

258. 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 WWTP is 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.

259. The operation of the wastewater treatment plant will generate treated wastewater. The treated wastewater will be discharged into Mestiachala 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. 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 Mestiachala River. The design of the wastewater treatment plant is in line with these effluent quality parameters.

Table 18: Maximum Permissible Discharge

N°	Ingredients	Permissible concentration, Mg/l
1	Suspended solids	30
2	BOD5	25
3	COD	125
4	Total Nitrogen	15
5	Total Phosphorus	2

260. 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 5 m^3/s of Mestiachala 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 in 2020	373	746	435	68	11
Inflow WWTP in 2040	363	727	424	67	11
Outflow WWTP	25	125	30	15	2
Mestiachala river baseline	1.21	4.85	33.66	1.58	2.44
Operational case: Dilution of effluent and river water in 2020	1.7	4.9	33.56	1.61	2.43
Operational case: Dilution of effluent and river water in 2040	2.54	9.6	33.7	2.3	2.4
Environmental Standards	25	125	30	15	2
Failure of operation in 2020: Dilution of untreated wastewater and river water	2.1	6.69	34.5	1.74	2.46

E.4.2 Methods to calculate the expected river pollution in case of full failure of WWTP

Based on the accomplished calculations, the population of Mestia will amount to 3.480 people by 2020, using 2,278 m^3 water daily (Domestic, tourists and institutional water demand). 90% of this amount, i.e. 2050 m^3/day will be discharged in the sewerage and flow into the river Mestiachala after being treated at Mestia treatment plant what is approximately 23 liters/sec. As for the river Mestiachala, its average flow velocity is 7000 l/sec.

During the document preparation, the basic analysis of both, the water quality in the river

Mestiachala and discharged untreated sewage waters was done. The results of the analysis for the principal water indicators are given in Table 29.

233. In order to calculate the possible pollution of the river Mestiachala (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 (7000 l/sec) must be multiplied by the amount of BODS per liter of water. Therefore, 7000X1.21= 8470mg.
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 (23 Liter) must be multiplied by the amount of BODS received through the analysis what equals to 23X273= 6279 mg.
3. Accordingly, the total amount of BODS will be 8470 grams + 6279 grams = 14749 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 (14749 gr) must be divided by the total amount of water - 7000 + 23 = 7023 l/sec. The result will be 14749:7023 = 2.1 mg/l.

234. Therefore, in case of accident, the amount of BODS in the river Chkhoushia will reach 2.1 mg/l meaning the deterioration of the basic indicator of 1.21 mg/l. 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.

261. In case of failure of the WWTP the pollution load into Mestiachiala River would amount to 10,504 kg/d BOD5, 1,926 kg/d total TKN, 315 kg/d total P in 2040, when the system is running at full capacity.

262. There is a risk of accidental release of untreated wastewater at the WWTP, due to a possible malfunctioning of the electric, mechanical or control system, or the failure of the treatment process as a result of shock loads or chronic system overload.

263. There is low risk of additional environmental pollution from the north side of the city when house connections are made before the WWTP has been commissioned. In the current situation the wastewater is collected and disposed of untreated already. As for the southern part of the city network will be connected to the existing south Waste Water Treatment Plant.

Mitigation measures

264. The wastewater treatment plant will be designed and constructed in several lines so that even if one line fails, for a short time the other line(s) will remain in operation.

265. Improper disposal of the waste will pollute receiving water bodies. Following measures shall be incorporated into the design:

- Provide a container solution for collection of screenings and grit.

- Provide a proper sludge collection and treatment for achieving stabilised and dewatered sludge.
- Dispose the dried sludge in a landfill

266. Regular monitoring will be conducted at WWTP to ensure that the treated water meets standards. There is occupational health and safety risk involved while working in WWTP, however all the necessary precautionary measures are included. Adequate manpower, operation and maintenance equipment will be provided. Necessary training will also be provided to the personnel. No impacts due to disposal of sludge are envisaged as the sludge will be dried before its disposal. The treatment and drying processes kill enteric bacteria and pathogens.

267. In case all lines of the wastewater treatment plan fail, the following mitigation measures shall be implemented:

- Reduction of sewage pumping, using the network as temporary storage and reactivating the 4 outfalls
- Notification of government agencies, including local government, regional offices of the Ministry of Environment and Natural Resources ;
- Notification of population;
- Notification of services at adjacent facilities;
- Accelerated repair;
- Keeping spare parts in stock at the service centre.
- Temporarily prohibition of swimming in River and close beach areas;
- Measurement of oxygen level in the river

268. Other mitigation measures include:

- 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
- an in-house analytical lab will be established prior to operation of the WWTP. The major analytical equipment will include the following: wastewater sampler, pH meter, flow meter, conductivity meter, DO meter, COD speedy tester, thermostat incubator, electric balance, and centrifuge

269. It is necessary that staff is trained adequately before taking over the WWTP from design-build contractor, and it should also be provided with necessary technical manuals in Georgian language.

270. Emergency Response Plan. An emergency preparedness and response plan will be formulated and put in place before the WWTP becomes operational. The emergency preparedness and response plan will address, among other things, training, resources, responsibilities, communication, procedures, and other aspects required to respond effectively to emergencies associated with the risk of accidental discharges.

Appropriate information about emergency preparedness and response activities, resources, and responsibilities will be disclosed to affected communities.

Mitigation Measures

271. In order to minimize the risk of contamination of the water environment, the contractor must ensure the development of following measures:

- automated on-line, real-time monitoring of influent and effluent quality
- Construction of drain pipes at perimeter of construction site;
- Construction materials (cement, paints, etc.) should be stored in a specially designed storage premises for this purpose;
- To arrange area with gravel for replacement of construction equipment and transport means, with separated place for maintenance and fuel debugging.
- To be arranged sedimentation reservoirs for purification of contaminated water with suspended particles pumped from trenches during the process of excavation works
- To collect faecal sealed wastewater, it should be excavated pits from where it must be taken out by "Mestia water service" cesspool emptier and be discharged into the sewage collector;
- In case of risk of construction machinery oil leakage, the equipment to be equipped with special droppers.
- Adequately licensed disposal contractor should be responsible for collection of segregated construction and household waste, for hazardous waste temporary replacement acceptable from environmental point of view and waste disposal

HH. Soils Quality and Topsoil Management

Construction Phase

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

273. The works for the pressure collectors and pumping stations 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. The excavation is expected to generate surplus material. Surplus material will be used as embankment fill as far as possible

274. Construction of the pumping station and WWTP, as well as performance of trenching works for installation of pressure collectors 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, reservoir and WWTP will be used at other Project sites or handed over to the appropriate authorities.

Mitigation Measures

275. 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

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

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

278. Sludge disposal. After the sludge treatment, the sludge is stabilised, it is not digesting anymore and is has also been dewatered. As there is no industry in Mestia, no heavy metals will be in the treated sludge. The sludge quality and consistency will allow its disposal on a landfill.

279. There is a temporary sludge storage area at the WWTP that has sufficient volume to store the sludge for 30 days in summer 2040 and 75 days in summer 2020. 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. From time to time the sludge shall be transported to the landfill of the town of Zugdidi with the agreement to Municipality authorities as there is no certified

landfill in Mesita. 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.

280. Another alternative for the disposal of the sludge is its use as fertilizer in the agriculture. As there is no industry in Mestia the sludge quality is expected to be suitable for this usage. UWSCG would give away the sludge for free; transportation would have to be provided by the farmers.

Mitigation Measures

281. 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.

282. Considering WWTP class it is necessary to develop plan for sewage sludge landfill. The plan must be implemented in agreement with the Ministry of Environment and Natural Resources, as well as the waste management company.

II. Biological Environment

Impacts during Construction

283. As noted above the project area is poor in terms of vegetation. The tree plants are not met practically. Here is presented units of invaluable plants and various types of weeds. The important thing is that protected plant species were not recorded at this area. Taking this into account during the construction works significant negative impact on vegetation is not expected.

284. According to the results of the audit the wild fauna species have not been identified in the project area, it was observed only a few bird synothropic species and characteristic for populated places rodents, reptiles and amphibians existence.

285. During construction works negative impacts can be expected on the wildlife inhabitants in the following fields:

- Increased traffic, movement of people, noise and due to changes of illumination background will cause disturbance factor for animals living near the construction site
- Pollution of environment will result existence of direct and indirect risk of impact on animal habitats

Mitigation Measures

286. At construction stage the mitigation measures are the following:

- Strict adherence of the boundaries of construction sites;
- To reduce the usage of spread light up to minimum;
- The work, which causes overly disturbance of the animals can be implemented in a short timeframe
- Proper waste management

- Water, soil and air pollution, noise and etc, mitigation measures effective implementation;
- Re-cultivation sites after the completion of construction works

287. In considering of above mentioned, during construction works significant impacts on wildlife is not expected.

Impacts during Operation

288. Operation of the wastewater supply components of the subproject will not have any significant negative impact on the biological environment.

JJ. Traffic

Impacts during Construction

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;

- **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

289. 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. The transportation of material/waste shall be implemented by the 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

290. 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 wastewater pipes will be minor and localized. In fact, the improvements to the wastewater 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.

KK. Hazardous Construction Wastes

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

Mitigation Measures

292. 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 of MoENRP 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.

LL. Other Wastes from Construction Activities

Municipal Waste

293. 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 0.24 m^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.

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

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

295. 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.

Medical waste

296. 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).

Non-hazardous construction waste

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

MM. Impacts on Archaeological Sites

298. 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 new archaeological findings still should be expected, therefore, therefore, special care should be taken not only at the new construction sites, but also at construction camps and storage areas.

Mitigation Measures

299. 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.

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

- Constructor must take into account religious holidays and at the adjacent territories of the Virgin Mary's and St. Nickolas Cathedral in these mentioned days all kind of works should be stopped;
- during rehabilitation works to prohibit the movement of heavy equipment at the adjacent territories of historical monuments;
- Monitoring of vibration has to be developed permanently at the adjacent territories of historical monuments
- In case of existing cracks (if they exist) special deformation fixing devices (Strain gauges) should be installed.
- 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

301. 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.

NN. Socio-Cultural Resources

Impacts during Construction

302. There are various social-cultural resources (such as schools, churches, recreation and entertainment centres etc.) in the town. 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
- Increasing the workforce in to complete the work quickly

303. 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:

- 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.

304. *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
- 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

OO. Construction Camps

305. 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.

306. 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 Mestiachiala River. Storage facilities for fuels and chemicals will be located at a safe distance to the river. 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.

307. 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.

PP. Construction Related Impacts at the Quarrying Sites

308. 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

309. 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.

310. 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.

QQ. Cumulative Impacts

311. This subchapter provides a discussion of the potential cumulative and growth-inducing impacts associated with the proposed project. Cumulative impacts are defined as two or more individual effects which, when considered together, are considerable or which compound or increase other environmental effects.

312. The water component of the project in Mestia will have been completed at the time the works for the sewer PS and WWTP components will start so there will be no cumulative impact of these two sub-projects. The works at the sewer network at the works at the WWTP are at different locations (the network is south of Mestiachiala River and the WWTP is north of the Mestiachiala River) and the works will not have a cumulative impact. No other large projects in Mestia are expected during the implementation of the sub-project.

313. With the construction of the new WWTP discussed within this report, no project has occurred recently or are anticipated to occur in the near future within the project study area. While there are environmental impacts of construction and operation of the WWTP, as discussed in Chapter IV of this report and summarized in Table 14, it is not anticipated that the impacts will accumulate over time with impacts from other projects if proper mitigation techniques are utilized.

314. Positive Impacts:

- 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 Mestiachiala
- The operation of the WWTP will have positive impact on the restoration and maintaining of the aquatic fauna in the River Mestiachiala

315. Cumulative impact during operation: No cumulative new customers of the northern part of the wastewater net-work will not be connected before the wastewater treatment plant is in operation.

316. The pollution load of the currently connected population amounts to about 1,800 kg/d BOD5, 2,161 kg TKN and 354 kg/d P. will remain the same until the completion of the WWTP.

317. Project is designed to improve environmental quality and living conditions in Mestia through the improvement of the wastewater 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.

318. 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.

8. ANALYSIS OF ALTERNATIVES

RR. Treatment Alternatives

319. Different treatment processes were compared in the feasibility study. All treatment options have the same effluent quality. 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.

320. 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.

321. 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.

322. 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)

323. 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 Mestia. In the table below 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 Mestia.

Table 20: 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

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9. INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

324. 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 Mestia
- UWSCG as implementing agency
- Other government regulatory institutions
- Municipality of of Mestia
- NGOs and CBOs working in the affected communities;
- Other community representatives (prominent citizens, religious leaders, elders, women's groups);
- The beneficiary community of Mestia in general; and
- The ADB, as funding agency

325. The public meeting with population, non-governmental organizations, business representatives and local government officials and industry specialists took place at several stages of the preparation of the IEE.

326. Public Opinion. 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.

327. By giving advertisements in advance at Mestia 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 Mestia sub-project.

328. 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

329. The public consultation showed a support for the Mestia subproject by the local population. During public consultation importance of a good cooperation between the local population, the contractor and UWSCG has been discussed. Local population were aware of the need to improve the water and sanitation system services. Residents also were of the view that the proposed project will improve the public health, the environment, and the socio-economic development of Mestia.

330. The residents were mainly interested in the start and the duration of the project, the impacts and benefits of the sub-project as well as in the planned social safeguard measures. UWSCG explained the schedule of works and underlined that impacts are mainly limited to construction works and temporary. The Contractor will have to follow an Environmental Management Plan to minimize impacts and carry out mitigation measures. The principal benefit will be the 24h supply with drinking water after completion of the project.

331. 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 Mestia (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.

332. On December 12, 2014 Public Hearing has been held in Mestia. In attachment # 1 is given protocol of the public meeting and relevant photo material.

10. GRIEVANCE REDRESS MECHANISM

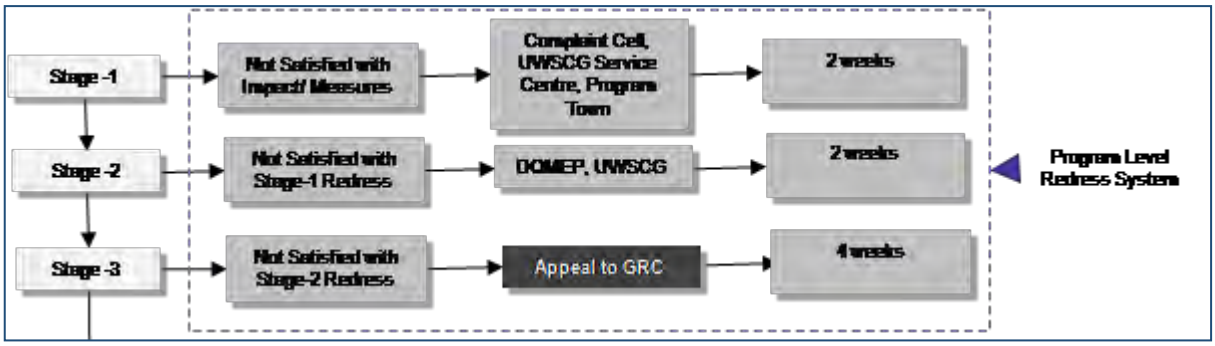
333. The contractor is obliged to implement the environmental management plan during the whole construction period and the supervising consultant will monitor these activities. The consultant will point out any deviations from the EMP and make sure

that the contractor addresses all issues of the EMP in a timely and professional manner.

334. A grievance resolution mechanism is set up within Mes-01 and Mes-02 projects in Mestia to allow an AP appealing any disagreeable decision, practice or activity arising from project implementation. APs are fully informed (through very intensive public consultation process carried out within Mes-01 and Mes-02 projects) 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 the Service Centre of UWSCG. The UWSCG and its service centre are obliged to respond on the grievances, which have been received from population or other interested parties.

335. 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. A Grievance Redress Committee is established in Mestia town at the local UWSCG service centre, which will function throughout the construction period.

336. A three stage grievance redress mechanism is indicated in figure below.



- Complaints received (written or oral communication) by the Complaint Cell (CC) at service centre 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.
- The Complaint Cell and the Investment Program Management Office (IPMO), which is the Investment Projects Management Department at 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.
- 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 Contractor and Supervision Contractor to take immediate actions as per the EMP.

- If this is an unanticipated issue, the UWSCG IPMO and DREP will identify mitigation measures and advise Contractor accordingly and a corrective action should be taken and a Corrective Action Plan (CAP) prepared.
- The Complaint Cell will review Contractor's response on corrective action and update the complainant within two weeks.
- If the complainant is still dissatisfied with the action taken or decision, he/she may approach Grievance Redress Committee (GRC, see below) established in the town.

337. **Grievance Redress Committee (GRC).** GRC is 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 consists of following members – representatives of Mestia municipality, UWSCG Service Centre Head, Designated informal leader of sub-project affected community, Female AP, Local NGO representative.

338. 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

339. 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.

11. ENVIRONMENTAL MANAGEMENT PLAN

340. EMP is addressed as a condition of the contract.

Institutional Arrangements

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

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

- oversee progress and provide guidance on the Investment Program 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

343. 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 and auditing
- manage all consultants
- coordinate with all line ministries to ensure smooth and efficient implementation
- 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
- award contracts prepare quarterly progress reports

344. 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 Mestia 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. 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.

345. 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 SEMP;
- 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 SEMP implementation costs should be included into the construction budget

346. Local Service Centre of UWSCG in Mestia will coordinate all line agencies at the local level including Municipality of Mestia and existing Non-governmental organizations to ensure smooth and effective implementation of sub-project.

347. The environmental specialist (ES) is hired by UWSCG under the Urban Services Improvement Investment Program (USIIP) to assist and advise the Division of Resettlement and Environmental Protection (DREP) of UWSCG in USIIP program implementation in compliance with the, ADB Safeguard Policy Statement, 2009 and National Legislation, and oversee the work of DCs and SCs in safeguard compliance. ES supports DREP in EARF implementation, in particular, reviewing IEE/EIA Reports and overseeing implementation of EMP/SEMPs and in training and capacity building activities.

Reporting

348. The **Contractor** is responsible for preparation of weekly environmental monitoring reports that shall be sent to SC.

349. The **Supervision Consultant** is responsible for preparation of quarterly environmental monitoring reports that shall be sent to UWSCG.

350. The **Environmental Specialist** is responsible for preparation of bi-annual and annual Environmental Monitoring Reports (based on contractor's and supervisor's and own audit reports) and will provide to ADB.

Inspection

351. 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:

352. **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.

353. **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.

354. **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.

355. 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.

Implementation Costs

356. 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. All of the implementation of mitigation measures shall be part of the contractual works and obligation of the Contractor.

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

Table 21: 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 will be included in the contract signed between UWSCG and SC
Environmental specialist (Contractor)	36 month	1500 USD	54000	The costs will be included in the contract signed between UWSCG and Contractor.
Dust and noise barriers	1	10000 USD	10000	To be installed by Contractor at the WWTP construction site
Miscellaneous			16900	10% for above Items
Subtotal			186500	Total for above
Contingency			22380	12% of Subtotal
GRAND TOTAL			**208.880**	**For the entire construction period of 36 Months**

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

Table 22: Environmental Impacts and Mitigation Measures

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost
Pre-Construction				
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	Contractor	Construction area	Part of construction cost
Climate Change	• Evaluation of riverbed management methods to identify the most efficient methods to reduce the risks of expected catastrophes.	Contractor	Construction area	Part of construction cost
Construction				
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	Company	construction area	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
	• 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			
Noise Pollution[3]	• 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 Mestia 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.	Contractor	construction area	Part of construction cost
Climate Change	• Extend river protection works by erection double gabion walls as it is constructed 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
Impact on surface water bodies due to construction[4]	• 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	Contractor	Construction area	Part of construction cost
Impact on underground water	• Construction materials (cement, paints, etc.) should be placed in a specially designed storage premises for this purpose	Contractor	Construction area	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
	• To arrange area with gravel for replacement of construction equipment and transport means, with separated place for maintenance and fuel debugging • In case of risk of construction machinery oil leakage, the equipment to be equipped with special droppers.			
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 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.	Contractor	Construction site	Part of construction cost
Impact on Flora and Fauna	• Avoid tree cutting • In unavoidable cases, plant four 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. • Strict adherence of the boundaries of construction sites; • To reduce the usage of spread light up to minimum; • The work, which causes overly disturbance of the animals can be implemented in a short timeframe	Contractor	Construction sate	Part of construction cost

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost
	• proper waste management • Water, soil and air pollution, noise and etc, mitigation measures effective implementation; • Re-cultivation sites after the completion of construction works			
Impact on Traffic	The Contractor shall coordinate with local Traffic Management Department to minimize construction traffic impact in the following topics: • 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	Contractor	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.	Contractor	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.	Contractor	Construction site Storage Area	Part of construction cost

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost
	• This waste can be transferred only to a certified contractor.			
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 construction the same soil shall be replaced on the top.	Contractor	Construction locations	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. •	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	Contractor	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	Contractor	Construction sites	Part of construction cost
Safety risk – public and worker	• 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 •	Contractor	Construction sites	Part of construction cost
Historical, archaeological chance finds during	• Contractor shall put in place a protocol for conducting any excavation work, to ensure that any chance finds are recognized and measures are	Contractor	Construction sites	Part of construction cost

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost
excavation	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.			
Cumulative impacts – repeated disturbance to roads and people	• Schedule the construction activities in harmony with the other on-going works	Contractor, SC	Construction sites	Part of construction cost
Operation Phase				
Risk of accidental release of untreated wastewater at the WWTP	• 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 WWTP is 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.	UWSCG	Well fields, water network	Part of operating costs

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost
	• 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			
Foul Odour Off-site Migration from WWTP	• Conduct of WWTPs annual odour audit to identify operational measures that can prevent odour problems	UWSCG	WWTP location	Part of operating costs
Land pollution cause from sludge dispose	Prior to the operation should be prepared the plan of replacement of sewage silt on the landfill in agreement with Ministry of Environment Protection and Natural Resources and Solid Waste management company	UWSCG	Municipal Landfill	Part of operation costs

Table 23: Environmental Monitoring Plan for general construction activities in Mesta

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	UWSCG DREP SC

Item	Parameter	Frequency	Action Level	Response When Action Level Exceeded	Responsibility
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	UWSCG DREP 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 will monitor based on measurements executed by the Contractor.
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 will monitor based on measurements executed by the Contractor.
Water Quality	Quality/ Contaminant concentrates	Continual In rain weather	guideline / licence requirements (whichever is Applicable)	If contaminant concentrations/licence conditions are exceeded, review disposal options and	SC will monitor based on measurements executed by the Contractor.

Item	Parameter	Frequency	Action Level	Response When Action Level Exceeded	Responsibility
			Impact Monitoring Compliance Monitoring	decide on most applicable. 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

Item	Parameter	Frequency	Action Level	Response When Action Level Exceeded	Responsibility
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	Coliforms	monthly	Monitor		UWSCG

Item	Parameter	Frequency	Action Level	Response When Action Level Exceeded	Responsibility
monitoring, outflow			development		
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
River Mestiachala water quality monitoring	Suspended particles, BODoverall, 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

Item	Parameter	Frequency	Action Level	Response When Action Level Exceeded	Responsibility
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

12. CONCLUSION AND RECOMMENDATION

Recommendation

358. The environmental impacts of infrastructure elements proposed in the waste water system improvement subproject in Mestia 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.

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

360. 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.

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

362. The main beneficiaries of the improved system will be the citizens of Mestia, 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.

363. 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.

364. 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.

Conclusion

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

366. 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.

367. 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.

ANNEX 1: MINUTES OF MEETING OF PUBLIC HEARING ON 12TH OF DECEMBER 2014

LCC "United Water Supply Company of Georgia"

Improving the Waste Water Supply System in Mestia

Minutes

Mestia 12.12.2014

The following stakeholders attended the meeting:

1. "United Water Supply Company of Georgia", LLC (UWSCG);
2. Supervision Consultant - Eptisa
3. Local Municipality
4. Local Community

The list of participants is attached to the document.

Meeting Agenda

The public hearing was held on December 12, 2014 in Mestia municipal conference hall and commenced at 11:00 a.m. The meeting covered the sanitation system, including establishment of pumping stations, pressure pipes and wastewater treatment plant in Mestia.

By giving advertisements in advance, attendance of a wide range of related people to the meetings was encouraged. During the public hearing, local population was informed about the activities to be carried out within the scope of the 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.

Public Opinion

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

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

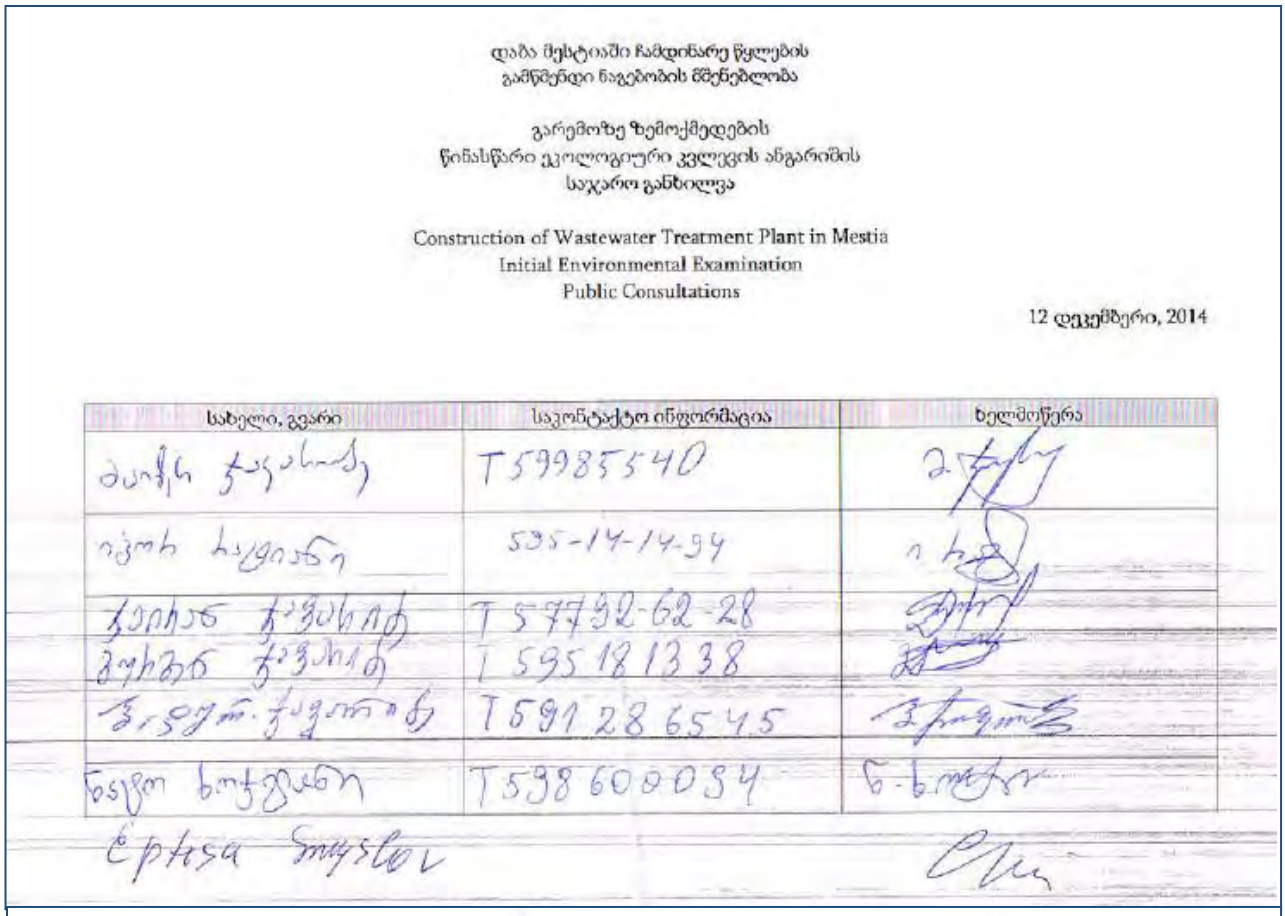
The Following questions have been asked from the local population:

#	Questions from local residents	Answers from the United Water Supply Company of Georgia
1.	After completion of the construction who is responsible for the reinstatement of the construction area?	After completion of the construction Contractor is responsible for the full reinstatement of the site bringing it to its primary condition
2.	How to settle the environmental impact issues caused by the construction process?	The environmental impact cases should be addressed to the Service Centre of the UWSCG by the means of GRM system
3.	Is there any GRM system established in Mestia?	At the moment, in Mestia there is already established GRM system. The system has three stages, that at first stage Service Center reviews complains and based on the particular case Contractor and Supervision Consultants might be involved. If complains are not adequately addressed then case will be directed to the GRC, and if complains are not addressed by the GRC then case will be directed to ADB
4.	What is duration, date of start and completion of the construction of the project?	Project will start in the beginning 2016 and end in 2018
5.	Who will supervise and monitor construction and operation of the project?	Project implementation will be monitored by the UWSCG and supervised by the Supervision Consultant
6.	Will local people employed in the construction?	Yes, contractor will be encouraged to employee unskilled labour from the local population during the construction.
7.	What type of impact on environment is associated with the project? And what mitigation measures will be taken?	Impacts mainly arise from generation of dust from soil excavation and refilling; These include: (i) utilizing surplus/waste soil for beneficial purposes; (ii) using measures to reduce/control dust generation; (iii) providing prior public information; (iv) planning transport routes/schedules carefully and awareness creation in drivers; (v) following standard and safe procedures for public and worker safety; (vi) avoiding tree cutting through location alignment changes.
8.	Who is sponsoring the Project?	Project is co-financed by the Asian Development Bank (ADB) and the Government of Georgia.
9.	What kind of sewerage treatment plant will be built?	The treatment plant will have all standard stages. Started with mechanical treatment to biological treatments and sedimentation tanks.
10.	What is the cost of building of Mestia sewerage system	This question could not be answered and was noted for the next meeting.

Local population noted the importance of the construction of waste water treatment plant since being without WWTP may cause high risk to human health and pollution of environment.

Photos of the public consultation:

List of participants:



დაბა მესტიაში ჩამდინარე წყლების
გამწმენდი ნაგებობის მშენებლობა

გარემოზე ზემოქმედების
წინასწარი ეკოლოგიური კვლევის ანგარიშის
საჯარო განხილვა

Construction of Wastewater Treatment Plant in Mestia
Initial Environmental Examination
Public Consultations

12 დეკემბერი, 2014

სახელი, გვარი	საკონტაქტო ინფორმაცია	ხელმოწერა
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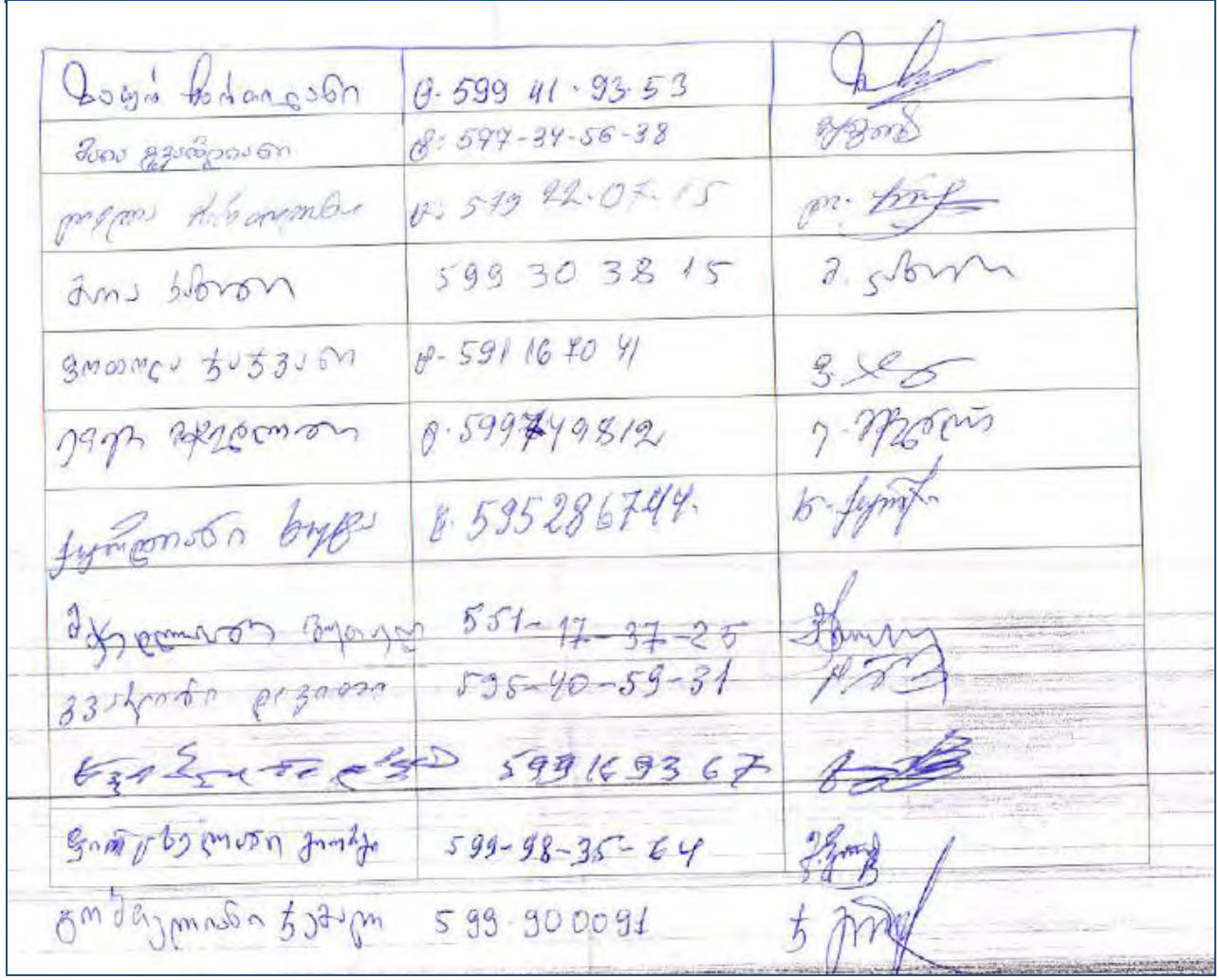

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[illegible]	599 30 38 15	[illegible]
[illegible]	591 16 70 41	[illegible]
[illegible]	599 49 98 12	[illegible]
[illegible]	595 28 67 44	[illegible]
[illegible]	551-17-37-25	[illegible]
[illegible]	595-40-59-31	[illegible]
[illegible]	599 16 93 67	[illegible]
[illegible]	599-98-35-64	[illegible]
[illegible]	599 90 00 91	[illegible]

ANNEX 2: DESIGN CONSIDERATIONS ON CLIMATE RISKS

Climate risks	Design questions	Design considerations
Mestia WWTP Flooding/flash flooding, potential storm surges	Siting of project components	The proposed wastewater treatment plant location under the project is on the banks of river Mestiachiala.In the design of WWTP, flood protection measures are considered based on hydro-meteorological parameters of past 100 years of Mestiachiala river. Peak winds are considered in the structural design of the WWTP according to SNIP "construction climatology" 0105.09.5
	Hydro-meteorological parameters	The construction material shall be resistant to withstand the extreme climatic conditions.
Seismic	Structural design	Seismic forces are considered according to SNIP "seismic strength of construction" 0101.09.

[5] Inputs from Kocks Consulting, GmbH, Project Design Consultants.

ANNEX 3: SAMPLES ANALYSIS DATA CONDUCTED BY NATIONAL ENVIRONMENTAL AGENCY (NEA)

საქართველოს გარემოსა და ბუნებრივი რესურსების დაცვის სამინისტრო MINISTRY OF ENVIRONMENT AND NATURAL RESOURCES PROTECTION OF GEORGIA

გარემოს ეროვნული სააგენტო
NATIONAL ENVIRONMENTAL AGENCY

№ 12/1-479 21 10 2014 წ.

შპს „ეპტისა სერვისიოს დე ინხენიერია ეს.ელ-ის
ფილიალი საქართველოში“ პროექტის დირექტორს
ბ-ნ ალბერტო დელგადო ფრიასს

ბატონო ალბერტო დელგადო,

საქართველოს გარემოსა და ბუნებრივი რესურსების დაცვის სამინისტროს ს.ს.ი.პ „გარემოს ეროვნულ სააგენტო“-სა და შპს „ეპტისა სერვისიოს დე ინხენიერია ეს.ელ-ის ფილიალი საქართველოში“-ს შორის 2014 წლის 23 სექტემბერს გაფორმებული ფასიანი მომსახურების შესახებ №ფმ-3/549 ხელშეკრულების შესაბამისად, გაწვდით დაბა მესტიაში, მდ. მესტიაჭალიდან აღებული წყლის 20 სინჯის ქიმიური და ბაქტერიოლოგიური ანალიზის შედეგებს.

დანართი: 13 გვ.

პატივისცემით,

სააგენტოს უფროსი ვლადიმერ ლაზარიშვილი

დ.აღმაშენებლის ნაბ. 150, 0112, თბილისი, საქართველო
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რეგისტრირებული სინჯის ნომერი: №865-№884

გამოცდის ოქმის გვერდების რიცხვი: 13

დამკვეთის სახელი: შპს „ეპტისა სერვისიოს დე ინხენიერია ეს.ელ-ის ფილიალი“

დამკვეთის მისამართი: ქ.თბილისი, ფალიაშვილის ქ. №75

ტელ.: (+99532) 2 31 31 28

ელექტრონული ფოსტა:

დამკვეთის მიერ მიცემული ეტიკეტი: №1-№20

სინჯის აღწერა და იდენტიფიკაცია (მატრიცა, ფორმა): ზედაპირული წყალი

გამოყენებული მეთოდი/ხელსაწყო: იონ-ქრომატოგრაფი, ტიტრიმეტრული, წონითი, სპექტროფოტომეტრული, მობილური აპარატურა, მემბრანული ფილტრაციის მეთოდი

სინჯის მიღების თარიღი **CR:** 07.10.2014

ანალიზის ჩატარების თარიღი: 07.10.2014 –15.10.2014

გაცემის თარიღი: 20.10.2014

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№ 865 (2)

მესტია P2 - მდ.მესტიაჭალა I, ჩაშვების ადგილი
X-0315073 Y-4768273
02.10.2014

№	გაზომილი პარამეტრები	ერთეული	გაზომვის შედეგები	გამოყენებული მეთოდი
1	ტემპერატურა	^0C	5.4	მობ. აპარატი-Oxi330i/340i
2	გახსნილი ჟანგბადი	მგ/ლ	7.9	მობ. აპარატი-Oxi330i/340i
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4	ჟბმ$_5$	მგ/ლ	1.28	ISO 5815-1:2010
5	ჟქმ	მგ/ლ	6.72	ISO 6060:2010
6	ჯამური აზოტი	მგ/ლ	1.61	Ю.Ю Лурье "Унифицированные методы анализа вод"
7	ჯამური ფოსფორი	მგ/ლ	2.45	Ю.Ю Лурье "Унифицированные методы анализа вод"
8	შეწონილი ნაწილაკები	მგ/ლ	5.0	ISO 11923:2007
9	ტოტალური კოლიფორმები	1 ლ-ში	19 000	მემბრანული ფილტრაც. მეთოდი

№ 866 (7)

მესტია P2 - მდ.მესტიაჭალა I, ჩაშვების ადგილი
X-0315073 Y-4768273
03.10.2014

№	გაზომილი პარამეტრები	ერთეული	გაზომვის შედეგები	გამოყენებული მეთოდი
1	ტემპერატურა	^0C	5.6	მობ. აპარატი-Oxi330i/340i
2	გახსნილი ჟანგბადი	მგ/ლ	7.6	მობ. აპარატი-Oxi330i/340i
3	გახსნილი ჟანგბადი	%	71	მობ. აპარატი-Oxi330i/340i
4	ჟბმ$_5$	მგ/ლ	1.14	ISO 5815-1:2010
5	ჟქმ	მგ/ლ	3.36	ISO 6060:2010
6	ჯამური აზოტი	მგ/ლ	1.28	Ю.Ю Лурье "Унифицированные методы анализа вод"
7	ჯამური ფოსფორი	მგ/ლ	2.70	Ю.Ю Лурье "Унифицированные методы анализа вод"
8	შეწონილი ნაწილაკები	მგ/ლ	4.0	ISO 11923:2007
9	ტოტალური კოლიფორმები	1 ლ-ში	14 500	მემბრანული ფილტრაც. მეთოდი

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X-0315073 Y-4768273
04.10.2014

№	გაზომილი პარამეტრები	ერთეული	გაზომვის შედეგები	გამოყენებული მეთოდი
1	ტემპერატურა	^0C	6.4	მობ. აპარატი-Oxi330i/340i
2	გახსნილი ჟანგბადი	მგ/ლ	7.5	მობ. აპარატი-Oxi330i/340i
3	გახსნილი ჟანგბადი	%	70	მობ. აპარატი-Oxi330i/340i
4	ჟბმ$_5$	მგ/ლ	0.87	ISO 5815-1:2010
5	ჟქმ	მგ/ლ	4.2	ISO 6060:2010
6	ჯამური აზოტი	მგ/ლ	1.29	Ю.Ю Лурье "Унифициро-ванные методы анализа вод"
7	ჯამური ფოსფორი	მგ/ლ	2.18	Ю.Ю Лурье "Унифициро-ванные методы анализа вод"
8	შეწონილი ნაწილაკები	მგ/ლ	4.7	ISO 11923:2007
9	ტოტალური კოლიფორმები	1 ლ-ში	27 500	მემბრანული ფილტრაც. მეთოდი

№ 868 (15)

მესტია P2 - მდ.მესტიაჭალა I, ჩაშვების ადგილი
X-0315073 Y-4768273
05.10.2014

№	გაზომილი პარამეტრები	ერთეული	გაზომვის შედეგები	გამოყენებული მეთოდი
1	ტემპერატურა	^0C	7.4	მობ. აპარატი-Oxi330i/340i
2	გახსნილი ჟანგბადი	მგ/ლ	8.3	მობ. აპარატი-Oxi330i/340i
3	გახსნილი ჟანგბადი	%	81	მობ. აპარატი-Oxi330i/340i
4	ჟბმ$_5$	მგ/ლ	0.89	ISO 5815-1:2010
5	ჟქმ	მგ/ლ	3.36	ISO 6060:2010
6	ჯამური აზოტი	მგ/ლ	1.46	Ю.Ю Лурье "Унифициро-ванные методы анализа вод"
7	ჯამური ფოსფორი	მგ/ლ	2.83	Ю.Ю Лурье "Унифициро-ванные методы анализа вод"
8	შეწონილი ნაწილაკები	მგ/ლ	4.4	ISO 11923:2007
9	ტოტალური კოლიფორმები	1 ლ-ში	23 500	მემბრანული ფილტრაც. მეთოდი

გარემოს ეროვნული სააგენტო
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ხსდ 6

№ 869 (19)

მესტია P_2 - მდ.მესტიაჭალა I, ჩაშვების ადგილი
X-0315073 Y-4768273
06.10.2014

№	გაზომილი პარამეტრები	ერთეული	გაზომვის შედეგები	გამოყენებული მეთოდი
1	ტემპერატურა	^0C	6.0	მობ. აპარატი-Oxi330i/340i
2	გახსნილი ჟანგბადი	მგ/ლ	8.3	მობ. აპარატი-Oxi330i/340i
3	გახსნილი ჟანგბადი	%	79	მობ. აპარატი-Oxi330i/340i
4	ჟბმ$_5$	მგ/ლ	1.02	ISO 5815-1:2010
5	ჟქმ	მგ/ლ	5.04	ISO 6060:2010
6	ჯამური აზოტი	მგ/ლ	1.62	Ю.Ю Лурье "Унифицированные методы анализа вод"
7	ჯამური ფოსფორი	მგ/ლ	1.68	Ю.Ю Лурье "Унифицированные методы анализа вод"
8	შეწონილი ნაწილაკები	მგ/ლ	27.3	ISO 11923:2007
9	ტოტალური კოლიფორმები	1 ლ-ში	32 500	მემბრანული ფილტრაც. მეთოდი

№ 870 (5)

მესტია P_5 - მდ.მესტიაჭალა II, ჩაშვების შემდეგ
X-0314911 Y-4768053
02.10.2014

№	გაზომილი პარამეტრები	ერთეული	გაზომვის შედეგები	გამოყენებული მეთოდი
1	ტემპერატურა	^0C	6.3	მობ. აპარატი-Oxi330i/340i
2	გახსნილი ჟანგბადი	მგ/ლ	8.1	მობ. აპარატი-Oxi330i/340i
3	გახსნილი ჟანგბადი	%	79	მობ. აპარატი-Oxi330i/340i
4	ჟბმ$_5$	მგ/ლ	2.07	ISO 5815-1:2010
5	ჟქმ	მგ/ლ	8.4	ISO 6060:2010
6	ჯამური აზოტი	მგ/ლ	2.13	Ю.Ю Лурье "Унифицированные методы анализа вод"
7	ჯამური ფოსფორი	მგ/ლ	1.32	Ю.Ю Лурье "Унифицированные методы анализа вод"
8	შეწონილი ნაწილაკები	მგ/ლ	49.7	ISO 11923:2007
9	ტოტალური კოლიფორმები	1 ლ-ში	28 000	მემბრანული ფილტრაც. მეთოდი

გარემოს ეროვნული სააგენტო
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ატმოსფერული ჰაერის, წყლისა და
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№ 871 (8)

მესტია Ps - მდ.მესტიაჭალა II, ჩაშვების შემდეგ
X-0314911 Y-4768053
03.10.2014

№	გაზომილი პარამეტრები	ერთეული	გაზომვის შედეგები	გამოყენებული მეთოდი
1	ტემპერატურა	^0C	6.1	მობ. აპარატი-Oxi330i/340i
2	გახსნილი ჟანგბადი	მგ/ლ	7.9	მობ. აპარატი-Oxi330i/340i
3	გახსნილი ჟანგბადი	%	74	მობ. აპარატი-Oxi330i/340i
4	ჟბმ$_5$	მგ/ლ	1.01	ISO 5815-1:2010
5	ჟქმ	მგ/ლ	4.2	ISO 6060:2010
6	ჯამური აზოტი	მგ/ლ	1.27	Ю.Ю Лурье "Унифицированные методы анализа вод"
7	ჯამური ფოსფორი	მგ/ლ	2.43	Ю.Ю Лурье "Унифицированные методы анализа вод"
8	შეწონილი ნაწილაკები	მგ/ლ	70.0	ISO 11923:2007
9	ტოტალური კოლიფორმები	1 ლ-ში	27 000	მემბრანული ფილტრაც. მეთოდი

№ 872 (12)

მესტია Ps - მდ.მესტიაჭალა II, ჩაშვების შემდეგ
X-0314911 Y-4768053
04.10.2014

№	გაზომილი პარამეტრები	ერთეული	გაზომვის შედეგები	გამოყენებული მეთოდი
1	ტემპერატურა	^0C	6.2	მობ. აპარატი-Oxi330i/340i
2	გახსნილი ჟანგბადი	მგ/ლ	7.8	მობ. აპარატი-Oxi330i/340i
3	გახსნილი ჟანგბადი	%	75	მობ. აპარატი-Oxi330i/340i
4	ჟბმ$_5$	მგ/ლ	1.51	ISO 5815-1:2010
5	ჟქმ	მგ/ლ	4.37	ISO 6060:2010
6	ჯამური აზოტი	მგ/ლ	1.68	Ю.Ю Лурье "Унифицированные методы анализа вод"
7	ჯამური ფოსფორი	მგ/ლ	2.30	Ю.Ю Лурье "Унифицированные методы анализа вод"
8	შეწონილი ნაწილაკები	მგ/ლ	5.7	ISO 11923:2007
9	ტოტალური კოლიფორმები	1 ლ-ში	25 000	მემბრანული ფილტრაც. მეთოდი

გარემოს ეროვნული სააგენტო
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ატმოსფერული ჰაერის, წყლისა და
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№ 873 (16)

მესტია P_5 - მდ.მესტიაჭალა II, ჩაშვების შემდეგ
X-0314911 Y-4768053
05.10.2014

№	გაზომილი პარამეტრები	ერთეული	გაზომვის შედეგები	გამოყენებული მეთოდი
1	ტემპერატურა	^0C	7.4	მობ. აპარატი-Oxi330i/340i
2	გახსნილი ჟანგბადი	მგ/ლ	8.4	მობ. აპარატი-Oxi330i/340i
3	გახსნილი ჟანგბადი	%	86	მობ. აპარატი-Oxi330i/340i
4	ჟბმ$_5$	მგ/ლ	1.33	ISO 5815-1:2010
5	ჟქმ	მგ/ლ	4.70	ISO 6060:2010
6	ჯამური აზოტი	მგ/ლ	1.45	Ю.Ю Лурье "Унифицированные методы анализа вод"
7	ჯამური ფოსფორი	მგ/ლ	2.78	Ю.Ю Лурье "Унифицированные методы анализа вод"
8	შეწონილი ნაწილაკები	მგ/ლ	22.7	ISO 11923:2007
9	ტოტალური კოლიფორმები	1 ლ-ში	26 000	მემბრანული ფილტრაც. მეთოდი

№ 874 (3)

მესტია P_3 - მდ.მესტიაჭალა III, ჩაშვების შემდეგ
X-0314329 Y-4767837
02.10.2014

№	გაზომილი პარამეტრები	ერთეული	გაზომვის შედეგები	გამოყენებული მეთოდი
1	ტემპერატურა	^0C	5.5	მობ. აპარატი-Oxi330i/340i
2	გახსნილი ჟანგბადი	მგ/ლ	8.7	მობ. აპარატი-Oxi330i/340i
3	გახსნილი ჟანგბადი	%	80	მობ. აპარატი-Oxi330i/340i
4	ჟბმ$_5$	მგ/ლ	1.07	ISO 5815-1:2010
5	ჟქმ	მგ/ლ	3.36	ISO 6060:2010
6	ჯამური აზოტი	მგ/ლ	1.69	Ю.Ю Лурье "Унифицированные методы анализа вод"
7	ჯამური ფოსფორი	მგ/ლ	2.47	Ю.Ю Лурье "Унифицированные методы анализа вод"
8	შეწონილი ნაწილაკები	მგ/ლ	29.7	ISO 11923:2007
9	ტოტალური კოლიფორმები	1 ლ-ში	23 000	მემბრანული ფილტრაც. მეთოდი

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ხსდ 6

№ 875 (9)

მესტია P3 - მდ.მესტიაჭალა III, ჩაშვების შემდეგ
X-0314329 Y-4767837
03.10.2014

№	გაზომილი პარამეტრები	ერთეული	გაზომვის შედეგები	გამოყენებული მეთოდი
1	ტემპერატურა	^0C	5.4	მობ. აპარატი-Oxi330i/340i
2	გახსნილი ჟანგბადი	მგ/ლ	7.8	მობ. აპარატი-Oxi330i/340i
3	გახსნილი ჟანგბადი	%	73	მობ. აპარატი-Oxi330i/340i
4	ჟბმ$_5$	მგ/ლ	0.96	ISO 5815-1:2010
5	ჟქმ	მგ/ლ	4.2	ISO 6060:2010
6	ჯამური აზოტი	მგ/ლ	1.67	Ю.Ю Лурье "Унифицированные методы анализа вод"
7	ჯამური ფოსფორი	მგ/ლ	3.05	Ю.Ю Лурье "Унифицированные методы анализа вод"
8	შეწონილი ნაწილაკები	მგ/ლ	2.3	ISO 11923:2007
9	ტოტალური კოლიფორმები	1 ლ-ში	40 000	მემბრანული ფილტრაც. მეთოდი

№ 876 (13)

მესტია P3 - მდ.მესტიაჭალა III, ჩაშვების შემდეგ
X-0314329 Y-4767837
04.10.2014

№	გაზომილი პარამეტრები	ერთეული	გაზომვის შედეგები	გამოყენებული მეთოდი
1	ტემპერატურა	^0C	6.3	მობ. აპარატი-Oxi330i/340i
2	გახსნილი ჟანგბადი	მგ/ლ	8.0	მობ. აპარატი-Oxi330i/340i
3	გახსნილი ჟანგბადი	%	78	მობ. აპარატი-Oxi330i/340i
4	ჟბმ$_5$	მგ/ლ	1.37	ISO 5815-1:2010
5	ჟქმ	მგ/ლ	5.04	ISO 6060:2010
6	ჯამური აზოტი	მგ/ლ	1.63	Ю.Ю Лурье "Унифицированные методы анализа вод"
7	ჯამური ფოსფორი	მგ/ლ	2.45	Ю.Ю Лурье "Унифицированные методы анализа вод"
8	შეწონილი ნაწილაკები	მგ/ლ	2.0	ISO 11923:2007
9	ტოტალური კოლიფორმები	1 ლ-ში	29 500	მემბრანული ფილტრაც. მეთოდი

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ხსდ 6

№ 877 (17)

მესტია P3 - მდ.მესტიაჭალა III, ჩაშვების შემდეგ
X-0314329 Y-4767837
05.10.2014

№	გაზომილი პარამეტრები	ერთეული	გაზომვის შედეგები	გამოყენებული მეთოდი
1	ტემპერატურა	^0C	6.6	მობ. აპარატი-Oxi330i/340i
2	გახსნილი ჟანგბადი	მგ/ლ	8.4	მობ. აპარატი-Oxi330i/340i
3	გახსნილი ჟანგბადი	%	80	მობ. აპარატი-Oxi330i/340i
4	$ჟბმ_5$	მგ/ლ	1.14	ISO 5815-1:2010
5	ჟქმ	მგ/ლ	3.36	ISO 6060:2010
6	ჯამური აზოტი	მგ/ლ	1.45	Ю.Ю Лурье "Унифицированные методы анализа вод"
7	ჯამური ფოსფორი	მგ/ლ	2.20	Ю.Ю Лурье "Унифицированные методы анализа вод"
8	შეწონილი ნაწილაკები	მგ/ლ	2.0	ISO 11923:2007
9	ტოტალური კოლიფორმები	1 ლ-ში	14 000	მემბრანული ფილტრაც. მეთოდი

№ 878 (4)

მესტია P4 - მდ.მესტიაჭალა IV, ჩაშვების შემდეგ
X-0313909 Y-4767746
02.10.2014

№	გაზომილი პარამეტრები	ერთეული	გაზომვის შედეგები	გამოყენებული მეთოდი
1	ტემპერატურა	^0C	5.7	მობ. აპარატი-Oxi330i/340i
2	გახსნილი ჟანგბადი	მგ/ლ	8.3	მობ. აპარატი-Oxi330i/340i
3	გახსნილი ჟანგბადი	%	77	მობ. აპარატი-Oxi330i/340i
4	$ჟბმ_5$	მგ/ლ	0.96	ISO 5815-1:2010
5	ჟქმ	მგ/ლ	4.2	ISO 6060:2010
6	ჯამური აზოტი	მგ/ლ	1.84	Ю.Ю Лурье "Унифицированные методы анализа вод"
7	ჯამური ფოსფორი	მგ/ლ	2.70	Ю.Ю Лурье "Унифицированные методы анализа вод"
8	შეწონილი ნაწილაკები	მგ/ლ	82.7	ISO 11923:2007
9	ტოტალური კოლიფორმები	1 ლ-ში	20 000	მემბრანული ფილტრაც. მეთოდი

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№ 879 (10)

მესტია P4 - მდ.მესტიაჭალა IV, ჩაშვების შემდეგ
X-0313909 Y-4767746
03.10.2014

№	გაზომილი პარამეტრები	ერთეული	გაზომვის შედეგები	გამოყენებული მეთოდი
1	ტემპერატურა	^0C	5.5	მობ. აპარატი-Oxi330i/340i
2	გახსნილი ჟანგბადი	მგ/ლ	7.8	მობ. აპარატი-Oxi330i/340i
3	გახსნილი ჟანგბადი	%	72	მობ. აპარატი-Oxi330i/340i
4	ჟბმ$_5$	მგ/ლ	1.26	ISO 5815-1:2010
5	ჟქმ	მგ/ლ	6.72	ISO 6060:2010
6	ჯამური აზოტი	მგ/ლ	1.60	Ю.Ю Лурье "Унифицированные методы анализа вод"
7	ჯამური ფოსფორი	მგ/ლ	1.98	Ю.Ю Лурье "Унифицированные методы анализа вод"
8	შეწონილი ნაწილაკები	მგ/ლ	88.8	ISO 11923:2007
9	ტოტალური კოლიფორმები	1 ლ-ში	34 000	მემბრანული ფილტრაც. მეთოდი

№ 880 (14)

მესტია P4 - მდ.მესტიაჭალა IV, ჩაშვების შემდეგ
X-0313909 Y-4767746
04.10.2014

№	გაზომილი პარამეტრები	ერთეული	გაზომვის შედეგები	გამოყენებული მეთოდი
1	ტემპერატურა	^0C	6.5	მობ. აპარატი-Oxi330i/340i
2	გახსნილი ჟანგბადი	მგ/ლ	8.1	მობ. აპარატი-Oxi330i/340i
3	გახსნილი ჟანგბადი	%	76	მობ. აპარატი-Oxi330i/340i
4	ჟბმ$_5$	მგ/ლ	1.16	ISO 5815-1:2010
5	ჟქმ	მგ/ლ	3.36	ISO 6060:2010
6	ჯამური აზოტი	მგ/ლ	1.50	Ю.Ю Лурье "Унифицированные методы анализа вод"
7	ჯამური ფოსფორი	მგ/ლ	1.97	Ю.Ю Лурье "Унифицированные методы анализа вод"
8	შეწონილი ნაწილაკები	მგ/ლ	63.3	ISO 11923:2007
9	ტოტალური კოლიფორმები	1 ლ-ში	40 000	მემბრანული ფილტრაც. მეთოდი

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ატმოსფერული ჰაერის, წყლისა და
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№ 881 (18)

მესტია P4 - მდ.მესტიაჭალა IV, ჩაშვების შემდეგ
X-0313909 Y-4767746
05.10.2014

№	გაზომილი პარამეტრები	ერთეული	გაზომვის შედეგები	გამოყენებული მეთოდი
1	ტემპერატურა	^0C	6.4	მობ. აპარატი-Oxi330i/340i
2	გახსნილი ჟანგბადი	მგ/ლ	7.6	მობ. აპარატი-Oxi330i/340i
3	გახსნილი ჟანგბადი	%	72	მობ. აპარატი-Oxi330i/340i
4	ჟბმ$_5$	მგ/ლ	1.44	ISO 5815-1:2010
5	ჟქმ	მგ/ლ	7.56	ISO 6060:2010
6	ჯამური აზოტი	მგ/ლ	1.79	Ю.Ю Лурье "Унифицированные методы анализа вод"
7	ჯამური ფოსფორი	მგ/ლ	2.48	Ю.Ю Лурье "Унифицированные методы анализа вод"
8	შეწონილი ნაწილაკები	მგ/ლ	25.7	ISO 11923:2007
9	ტოტალური კოლიფორმები	1 ლ-ში	27 000	მემბრანული ფილტრაც. მეთოდი

№ 882 (20)

მესტია P4 - მდ.მესტიაჭალა IV, ჩაშვების შემდეგ
X-0313909 Y-4767746
06.10.2014

№	გაზომილი პარამეტრები	ერთეული	გაზომვის შედეგები	გამოყენებული მეთოდი
1	ტემპერატურა	^0C	5.8	მობ. აპარატი-Oxi330i/340i
2	გახსნილი ჟანგბადი	მგ/ლ	8.6	მობ. აპარატი-Oxi330i/340i
3	გახსნილი ჟანგბადი	%	81	მობ. აპარატი-Oxi330i/340i
4	ჟბმ$_5$	მგ/ლ	1.71	ISO 5815-1:2010
5	ჟქმ	მგ/ლ	5.04	ISO 6060:2010
6	ჯამური აზოტი	მგ/ლ	1.59	Ю.Ю Лурье "Унифицированные методы анализа вод"
7	ჯამური ფოსფორი	მგ/ლ	2.88	Ю.Ю Лурье "Унифицированные методы анализа вод"
8	შეწონილი ნაწილაკები	მგ/ლ	62.7	ISO 11923:2007
9	ტოტალური კოლიფორმები	1 ლ-ში	25 000	მემბრანული ფილტრაც. მეთოდი

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№ 883 (1)

მესტია P_1 - მდ.მესტიაჭალა ფონური (დროებით ხიდთან)
X-0316890 Y-4770196
02.10.2014

№	გაზომილი პარამეტრები	ერთეული	გაზომვის შედეგები	გამოყენებული მეთოდი
1	ტემპერატურა	^0C	5.5	მობ. აპარატი-Oxi330i/340i
2	გახსნილი ჟანგბადი	მგ/ლ	7.5	მობ. აპარატი-Oxi330i/340i
3	გახსნილი ჟანგბადი	%	70	მობ. აპარატი-Oxi330i/340i
4	$ჟბმ_5$	მგ/ლ	0.94	ISO 5815-1:2010
5	ჟქმ	მგ/ლ	4.0	ISO 6060:2010
6	ჯამური აზოტი	მგ/ლ	1.34	Ю.Ю Лурье "Унифициро-ванные методы анализа вод"
7	ჯამური ფოსფორი	მგ/ლ	3.08	Ю.Ю Лурье "Унифициро-ванные методы анализа вод"
8	შეწონილი ნაწილაკები	მგ/ლ	2.0	ISO 11923:2007
9	ტოტალური კოლიფორმები	1 ლ-ში	1 000	მემბრანული ფილტრაც. მეთოდი

№ 884 (4)

მესტია P_6 - მდ.მესტიაჭალა შესართავი (ფონური),
მესტიაჭალას შეერთების ზემოთ 1.5 კმ
X-0315411 Y-4767892
02.10.2014

№	გაზომილი პარამეტრები	ერთეული	გაზომვის შედეგები	გამოყენებული მეთოდი
1	ტემპერატურა	^0C	6.4	მობ. აპარატი-Oxi330i/340i
2	გახსნილი ჟანგბადი	მგ/ლ	7.9	მობ. აპარატი-Oxi330i/340i
3	გახსნილი ჟანგბადი	%	75	მობ. აპარატი-Oxi330i/340i
4	$ჟბმ_5$	მგ/ლ	1.10	ISO 5815-1:2010
5	ჟქმ	მგ/ლ	5.88	ISO 6060:2010
6	ჯამური აზოტი	მგ/ლ	1.82	Ю.Ю Лурье "Унифициро-ванные методы анализа вод"
7	ჯამური ფოსფორი	მგ/ლ	2.88	Ю.Ю Лурье "Унифициро-ванные методы анализа вод"
8	შეწონილი ნაწილაკები	მგ/ლ	118.3	ISO 11923:2007
9	ტოტალური კოლიფორმები	1 ლ-ში	2 000	მემბრანული ფილტრაც. მეთოდი

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ხსდ 6

ანალიზის ტიპი: A–აკრედიტირებული, N–არააკრედიტირებული, C–საერთაშორისო აკრედიტაციის წინა პერიოდი, ქვესახელშეკრულებო - აკრედიტაცია, ქვესახელშეკრულებო – არააკრედიტირებული

შენიშვნა: ანალიზის შედეგები სადაოა პროტოკოლის მიღების თარიღიდან 14 დღის განმავლობაში.

შემსრულებლები:

გულჩინა კუჭავა

მარინე ჭიღიტაშვილი

სოფო ხმიადაშვილი

ლალი სალამაშვილი

ეკა ქიტოშვილი

ქეთევან კვატაშიძე

ლაბორატორიის უფროსი: ელინა ბაქრაძე