Draft Initial Environmental Examination

December 2017

GEO: Urban Services Improvement Investment Program – Tranche 3
(Improvement of Gudauri Wastewater System Sub-project

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

ABBREVIATIONS

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

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A. EXECUTIVE SUMMARY

1. It is proposed to improve the waste water system in Gudauri under the Asian Development Bank (ADB) funded Urban Services Improvement Investment Program, which is under preparation stage. This Investment Program, implemented in secondary towns of Georgia, will develop the water and sanitation services, which will improve quality of life and optimize the social and economic development. Ministry of Regional Development and Infrastructure (MoRDI) is the Executing Agency (EA) and United Water Supply Company of Georgia (UWSCG) is the Implementing Agency (IA) of this Program. This subproject will be implemented from 2018 to 2020. 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 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. The scope of work under the consultancy services is to (i) assess the technical, financial, economic, and environmental feasibility of subprojects; (ii) conduct surveys and investigations; (iii) develop hydraulic models; and (iv) prepare detailed designs, drawings, cost estimates, specifications, and bid documents for implementing water supply and sanitation schemes in the Investment Program financed by the MFF.

4. The present IEE document: “Improvement of Gudauri Waste Water System” describes the expected environmental impacts of the sub-project implementation and gives the developed relevant mitigation measures to avoid, mitigate and/or manage such impacts. The present document covers both, construction and operation stages.

5. 5. Gudauri is a ski resort located on the south-facing plateau of the Greater Caucasus Mountain Range in Georgia. The resort is situated in the Stepantsminda District, along the Georgian Military Highway near the Cross Pass, at an elevation of 2,200 meters (7,200 ft.) above sea level with skiable area enjoying maximum exposure to the sun. Gudauri lies 120 km (75 mi) to the North of the capital Tbilisi. The resort offers high quality skiing opportunities. The ski season lasts from December to April. Government of Georgia created a special agency for development of mountainous resorts in Georgia and development of Gudauri is one of the priorities of Government of Georgia.

6. Gudauri water supply and sanitation system was not under operation of “United Water Supply Company of Georgia” LLC. Since 2015, Government of Georgia decided to transfer this responsibility to UWSCG, in order to ensure improved water supply and sanitation in Gudauri.

7. One of the reasons for dissatisfaction of tourists in Gudauri is related to intermittent water supply and sanitation problems. This is one of the reasons also, that new hotels can’t work properly, which interrupts development of tourism in Gudauri.

8. Gudauri water supply and sanitation systems were built around 40 years ago, when the first big resort was constructed, called “Marco Polo”. They constructed water supply and sanitation system.

9. There is one main collector, where hotels are connected. Originally, Sewage Treatment Plant was constructed in Gudauri, in order to ensure discharge of treated water in the Aragvi River. The existing WWTP is ruined (See photos below) and it's not functional any more.

10. The existing sewage network is not in good condition. Based on preliminary information there are two main branches existing in the project area. In the framework of this project, a detailed study of the pre-existing network has been carried out. Its state of conservation and operability is varied. The older collectors are practically out of use and in poor condition. The most recent branches have been incorporated without apparent order and discharging directly into the river beds. In addition, it has been found that more than 40% of the collectors are currently inside private plots, which is an important limitation for possible rehabilitation works and their subsequent labors for operation and maintenance.

E.15.1. Figure 1. Photos of Ruined Old Waste Water Treatment Plant in Gudauri

The Proposed project envisages construction of 6 Waste Water Treatment Plants with different sizes but using the same technological process:

i. New Gudauri. The new development in the north of Gudauri (ab. 750 m^3/day) and Gudauri Heights (350 m^3/day).Upper and Central Gudauri: Located at the same site that the old WWTP, near the church (estimated up to 2000 m^3/day).
ii. Gudauri Downtown. In the head of the big plot of the plateau, down the downtown. (ab. 350 m^3/day).
iii. Plateau-Lower Gudauri. At the end of the plateau for the new development (ab. 750 m^3/day).
iv. Seturebi. One plant to treat the water in Seturebi village (ab. 350 m^3/day).

11. And construction and rehabilitation of sewage network, with estimated length of 34730,95 m (34,73 km).

12. Government of Georgia is working to adopt Gudauri Development master plan. Currently, document is under finalization, based mainly in the proposal of the Resort master

plan by the Mountain Resort Development Company (State Agency).

13. According to the development expected by the Resort master plan, there will be following number of consumers: Local residents and employees living in Gudauri resort – 5,000. Overnight accommodation guests (hotels, guesthouses, apartments, townhouses, etc.) – 15,000.

14. The project will be implemented according to the requirements of Georgian National and Asian Development Bank's Environmental Legislative Framework (SPS 2009).

15. Both, during the trench excavation and pipe installation, great amounts of inert waste such as excavated soil and rock will be accumulated. The Contractor, in agreement with the local authority, shall select dump sites to locate the inert waste.

16. The Contractor, prior to the onset of the construction, is obliged to conduct a number of studies and develop environmental plans, including (i) botanical study of the Project zone, (ii) waste management plan, (iii) Site-Specific Environmental Management Plans (SSEMPs) (iv), “Reinstatement Management Plan”; (v) Health and Safety Management Plan; (VI) Emergency Response Plan.

17. Preliminary botanist Survey has been conducted for proposed IEE in June 2017. Main findings of this survey are presented in para D.2.5 Biodiversity.

18. The present report has been developed to assess project impacts and to ensure that mitigation is put in place which will significantly reduce usual potential negative impacts.

19. At the stage of developing the Initial Environmental examination (IEE) document, a number of consultation meetings was held with the local population, local self-governing bodies and all concerned parties.

20. UWSCG is the executing agency of the project, which in turn hires construction and consulting companies on the basis of the tender. The above mentioned team takes full responsibility for the effective implementation of the project.

21. 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.

22. There should in fact be positive benefits through major improvements in quality of life for individual and overall public health once the scheme is in operation. The project will stimulate economic growth, directly generate new job opportunities, improve river water quality and a good wastewater system is a prerequisite for tourism development.

B. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

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

B.1 ADB Policy

24. 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.

25. Aiming on promotion and sustainability of project outcomes by protecting the environment and People from projects potential adverse impact, 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.

26. 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 the significance of the projects 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.

27. The Gudauri WW subproject has been classified as environmental assessment category B according to the criteria laid down in the checklist for water supply projects of the ADB's Environmental Assessment and Review Framework (November 2010, Updated in May 2015) that was especially prepared for the environmental assessment of the Georgia Urban Services Improvement Investment Program.

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

B.2 Georgian Law

B.2.1 Framework Legislation

29. 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.

30. 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”.

31. 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.

32. The Law of Georgia on Environmental Impact Permit (2008) 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.

33. 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.

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

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

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

35. The Law of Georgia on State Ecological Expertise (2008). 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.

36. Environmental Assessment Code was adopted in June 2017 and will enter into force from January 2018. The new code replace law on Environmental Impact Permit and Ecological Expertise. Environmental Assessment Code sets up regulations and procedures for Environmental Impact Assessment, Strategic Environmental Assessment, Transboundary Environmental Assessment Public Participation and Expertise in the Decision-Making Process. The EIA shall be subject to the activities envisaged by the Annex I of this Code and the activities envisaged by the Annex II of the same Code, which will be subject to EIA on the basis of screening procedure set out in Article 7 of this Code (Article 5 of Chapter 2).

37. 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.

38. 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.

The New Water Law

39. The new law "on Water Resources Management" is drafted by inter-ministerial working group supported by the United Nations Economic Commission for Europe. The darft law is consistent with the principles of integrated water resources management and the EU Water Framework Directive. In particular, the draft law introduces permits for water use and discharge.

40. As it was mentioned above the scope of the Law, in line with the WFD, it covers surface waters, transitional waters, coastal waters, groundwater and the related protected areas, as well as water infrastructural facilities (all water services which provide, for households, public institutions or any economic activity: abstraction, impoundment, storage, treatment and distribution of surface water or groundwater; waste-water collection and treatment facilities which subsequently discharge into surface water etc.).

41. The Law provide for water management on a river-basin with the Ministry of Environment and Natural Resources Protection as central competent authority. The Law also provide for all other aspects of integrated water resources management including water classification system, water quality objectives and standards, water use, water resources planning, pollution prevention, combined approach, economic tools, public participation, monitoring and enforcement, flood risk management, etc.

42. Currently the draft law is under the process of finalization. The final deadline for submission of draft law to the Parliament is its Autumn Session of 2018, as the water law has to be adopted no later than December 2018.

43. 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.

44. 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.

45. 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.

46. 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.

47. Environmental Quality Standards and Norms in accordance with the Law on Public Health, environmental quality standards and norms, among them those of air quality and noise level, are set by Decrees No. 297/N dated 16.08.2001 of the Minister of Labour, Health and Social Affairs of Georgia (including the changes made to it by further decrees of the Minister Nos. 38/N of 02.24.2003, 251/N of 09.15.1006, 351/N of 12.17.2007). Atmospheric air quality standards (level of hazardous pollution) are also defined by the Decree 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 pollutants.

Table 1. Maximum Admissible Concentrations (MAC) of harmful substances in Ambient Air

Substance	MAC, mg/m^3
Nitrogen Dioxide	0.085
Sulphur Dioxide	0.5
Carbon Monoxide	5.0
Saturated Carbohydrates, C6-C10	30.0
Inorganic dust	0.3

48. Noise prevention and mitigation measures should be applied where predicted or measured noise impacts from a project facility or operations exceed the applicable noise level guideline at the most sensitive point of reception. The preferred method for controlling noise from stationary sources is to implement noise control measures at source. In the case of noise, WB/IFC Standards will apply and noise impacts should not exceed the levels presented in Table 2, or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.

Table 2: Noise Level Guidelines5 (IFC)

Receptor	One Hour LAeq (dBA)	
	Daytime 07:00 - 22:00	Nighttime 22:00 - 07:00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

49. Environmental standards regulate quality condition requirements of the environment and determine maximum allowable concentration of substances harmful for human health and environment which are contained in water, air and soil.

50. In Georgia, soil quality evaluation criteria are determined by the instructions on “Level of Chemical Contamination of Soil” (MM 2.1.7. 004-02). Information on maximum admissible concentrations of various substances and elements is soils are given in the Table 3.

Table 3. Maximum admissible concentrations of various substances and elements in soils

Component	Unit	Level
Arsenic	mg/kg	2-10
Copper	mg/kg	3
Mercury	mg/kg	2.1
Nickel	mg/kg	4
Lead	mg/kg	32
Zinc	mg/kg	23
Compound Hydrocarbons	mg/kg	0.1
Phenol (Compound)	mg/kg	-
Cyanide	mg/kg	-
Sulphate	mg/kg	-
Chloride	mg/kg	-
Ammonium Nitrogen	mg/kg	-
Evaporable Organic Compounds		
Benzoyl	mg/kg	0.3
Toluol	mg/kg	0.3
Ethylbenzene	mg/kg	-
Compound Xylene (ortho-, meta-, para -)	mg/kg	0.3
Semi-Evaporable Compounds		
Benzoapiren	mg/kg	0.02
Izopropilen-benzol	mg/kg	0.5
Pesticides		
Atrazin	mg/kg	0.5
Linden	mg/kg	0.1
DDT (and its metabolite)	mg/kg	0.1

51. Georgian legislation does not regulate quality standards for groundwater. Quality of groundwater is regulated by norms set for potable water.

52. Potable water quality criteria are determined by technical regulations on potable water (Government Regulation N 58 from January 15, 2014). Potable water quality criteria are given in Table 4.

Table 4. Potable Water Criteria

Index	Measuring unit	Standard not more than
Common characteristics		
Hydrogen index	pH	6-9
Permanganate oxidation	mg O_2/L	3.0
Nonorganic substance		
Barium (Ba^{2+})	mg/L	0.7
Boron (B, total)	mg/L	0.5
Arsenic (As, total)	mg/L	0.01
Quicksilver (Hg, nonorganic)	mg/L	0.006
Cadmium (Cd, total)	mg/L	0.003
Manganese (Mn, total)	mg/L	0.4
Molybdenum (Mo, total)	mg/L	0.07
Nickel (Ni, total)	mg/L	0.07
Nitrate (short impact by NO- 3)	mg/L	50
Nitrite (long impact by NO-2)	mg/L	0.2
Selenium (Se, total)	mg/L	0.01
Copper (Cu, total)	mg/L	2.0
Lead (Pb, total)	mg/L	0.01
Flourine (F^-)	mg/L	0.7
Chromium (Cr^{6+})	mg/L	0.05
Antimony(Sb)	mg/L	0.02
Cyanide (CN^-)	mg/L	0.07
Organic substance		
Total content of pesticides	mg/L	0.05

53. Sanitary wastewater from industrial facilities may include effluents from domestic sewage, food service, and laundry facilities serving site employees. Miscellaneous wastewater from laboratories, medical infirmaries, water softening etc. may also be discharged to the sanitary wastewater treatment system. Recommended sanitary wastewater management strategies include:

- Segregation of wastewater streams to ensure compatibility with selected treatment option (e.g. septic system which can only accept domestic sewage);
- Segregation and pretreatment of oil and grease containing effluents (e.g. use of a grease trap) prior to discharge into sewer systems;
- If sewage from the industrial facility is to be discharged to surface water, treatment to it should meet WB/EHS Standards for Treated Sanitary Sewage Discharges (Table 5), unless borrower/client will propose full and detailed justification for any proposed alternatives as is stated in SPS 2009 (Article 9: Pollution Prevention and Abatement, Para 33);
- In accordance with the above requirements, it should be emphasized that Georgia signed the Association Agreement with the European Union in June 2014, which entered into force on July 1, 2016. The agenda of the Association provides for the harmonization of Georgia's legislation with the norms and standards of the EU. The country is obliged to agree the standards of urban waste water treatment with the Council Directive 91/271 /EEC within 4 years after the entry into force of this Agreement (Association Agreement, Section VI, Article 3 - Environmental Protection, Annex No. 2);
- In this case levels for Total N should be 15mg/l, Total Suspended Solids - 35mg/l and BOD - 25 mg/l.
- The indicative guideline values applicable to sanitary wastewater discharges to meet National, WB/EHS and EU standards are shown in Table 5;
- If sewage from the industrial facility is to be discharged to either a septic system, or

where land is used as part of the treatment system, treatment to meet applicable national or local standards for sanitary wastewater discharges is required;

- Sludge from sanitary wastewater treatment systems should be disposed in compliance with local regulatory requirements, in the absence of which disposal has to be consistent with protection of public health and safety, and conservation and long term sustainability of water and land resources.

Table 5. Standards for Treated Sanitary Sewage Discharges

Pollutant	Unit	Standards		
		GEO	WB	EU
pH	pH	6-9	6-9	
Biochemical oxygen demand (BOD)	mg/l	35	30	25
Chemical Oxygen Demand (COD)	mg/l	125	125	125
Total Phosphorus	mg/l	2	2	2
Total Nitrogen	mg/l	15	10	15
Total Suspended Solids	mg/l	60	50	35
Coliform bacteria	MPNb/100ml		400	

B.2.2 Licenses & Approvals Required

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

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

56. 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.

57. 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 live and legislation of Georgia, which may result in the reduction in number of 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 6. List of laws relevant to environmental protection

Framework Legislation	
1995	Constitution of Georgia (as amended 04.10.2013) Reg. No - 010.010.000.01.001.000.116

1996	Environmental Protection (as amended 26.12.2014) Reg. No - 360.000.000.05.001.000.184
Permitting Legislation	
2005	Licensing and Permitting (as amended 18.09.2014)
2017	Environmental Assessment Code (01.06.2017) will enter into force from January 2017 (see para 36).
2007	Environmental Impact Permit (as amended 26.12.2014) Reg. No - 360.160.000.05.001.003.078
2007	Ecological Expertise (as amended 25.03.2013) Reg. No - 360.130.000.05.001.003.079
2013	Regulation on EIA (as amended 15.05.2013 by the Decree No 31 of MoENRP)
Specific Environmental Laws	
1994	Soil Protection (as amended 26.12.2014) Reg. No - 370.010.000.05.001.000.080
1996	System of Protected Ares (as amended 30.04.2014) Reg. No - 360.050.000.05.001.000.127
2007	On Status of the Protected Areas (as amended 30.04.2014) Reg. No - 360.050.000.05.001.003.060
2014	Waste Management Code 26.12.2014 Reg. No - 360160000.05.001.017608
1996	Minerals (as amended 26.12.2014) Reg. No - 380.000.000.05.001.000.140
1997	Wildlife (as amended 26.12.2014) Reg. No - 410.000.000.05.001.000.186
1997	Water Protection (as amended 26.12.2014) Reg. No - 400.000.000.05.001.000.253
1997	Transit and Import of Hazardous Waste within and into the Territory of Georgia as amended 11.03.2011) Reg. No - 300230000.05.001.016218
1998	Pesticides and Agrochemicals as amended 08.05.2012) Reg. No - 340120000.05.001.016723
1999	Atmospheric Air Protection as amended 5.02.2014) Reg. No - 420.000.000.05.001.000.595
1999	Forest Code as (amended 6.09.2013) Reg. No - 390.000.000.05.001.000.599

2003	Red List and Red Data Book of Georgia (as amended 6.09.2013) Reg. No - 360.060.000.05.001.001.297
Other Relevant Laws and Normative	
2005	On Fire Protection and Safety 24.06.2005 Reg. No - 140.060.000.05.001.000.355
2006	On Regulation and Engineering Protection of Coasts of Sea, Water Reservoirs and Rivers of Georgia – 27.12.2006 Reg. No - 330.130.000.11.116.005.130
2007	On Cultural Heritage (as amended 26.12.2014) Reg. No - 450.030.000.05.001.002.815
2007	On Public Health (as amended 29.05.2014) Reg. No - 470.000.000.05.001.002.920
2013	Technical regulations applicable to the European Union and the Member States of the Organization for Economic Cooperation and Development, as envisaged by the Annex to the Resolution, shall be enacted in Georgia. Approved by the Government Decree № 50 Reg. No - 300.160.040.10.003.017.214.
2014	Technical Regulations: “on Drinking Water Standards”. Approved by the Government Decree № 58 Reg. No - 300160070.10.003.017676
2014	Environmental Technical Regulations. Approved by the Government Decree № 17 Reg No - 300160070.10.003.017608

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

Short List of the Ratified or Signed Conventions:

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

B.2.3 Administrative Structure in Georgia

59. 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

60. 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.

61. 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). 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.

62. 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.

63. 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.

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

B.3 Compare of the National legislation and ADB Requirements

65. The above accounts of national environmental law 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.

66. 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.

67. 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).

68. 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 guideline requires EMPs for all categories of projects and provides detailed instructions on the content.

69. According to Georgian legislation MoENRP 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 IPMO 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 – UWSCG) 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.

70. 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.

71. 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.

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

Table 7. 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

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

B.4 Harmonization of the ADB and Georgian Legislation Requirements

73. 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.

74. In harmonizing the National and ADB standards the most stringent will be applied in accordance with the SPS 2009.

C. DESCRIPTION OF THE PROJECT

C.1 Type of the Project

75. The proposed Gudauri Waste Water sub-project involves the rehabilitation and extension of the sewerage collectors and network, and the definition of 5 Wastewater districts or sectors that will be served by the correspondent Waste Water Treatment Plants. These devices will have different sizes but the same technologic process.

76. At the expansion upper area (Fig.3; Sector 1) was considered the possibility of subdividing it to manage by means of two different plants, so the project would include a total of 6 Waste Water Treatment Plants. These little-medium size treatment plants presented below are designed to have no odour, almost no maintenance and almost perfect depuration:

i. New Gudauri and Gudauri Heights. The new development in the north of Gudauri. The design probably will be improved considering 2 sub-areas: 1A-New Gudauri (existing areas and future expansion, up to 5,000 inh.) for about 750 m^3/day, and 1B-Gudauri Heights (future expansion), up to 350 m^3/day.

ii. Upper and Central Gudauri. For the existing areas that correspond with the ruined old WWTP in Gudauri near the Church. Estimated up to 2000 m^3/day.

iii. Gudauri Downtown. In the head of the big plot of the plateau, down the downtown. For about 350 m^3/day.

iv. Plateau-Lower Gudauri. This plant will be located at the end of the plateau because of new development. Initially considering 2000 m^3/day; but according the current proposal of the Development Plan probably with 700 or 750 m^3/day will be enough to serve a population of 5,000 inh.

v. Seturebi. One plant to treat the waste water in Seturebi village. For about 350 m^3/day.

77. These characteristics correspond to a first approximation and will be defined more accurately during the detailed design phase.

78. The sizes of each new WWTP must be calculated for each one of location. This size will be function of the plots and buildings collected. The problem is the lack of one strategic master plan with coefficients for buildings, services or population. This means that all the calculation will be theoretical according the cadastral, the surfaces of the plots and coefficient to apply in them. It is worth highlighting that all the design for the sewage network will be done according to the current cadastral, following the instructions of the client.

Figure 2: New Design locations of WWTPs and approach to the Main collectors of the new Waste Water Network

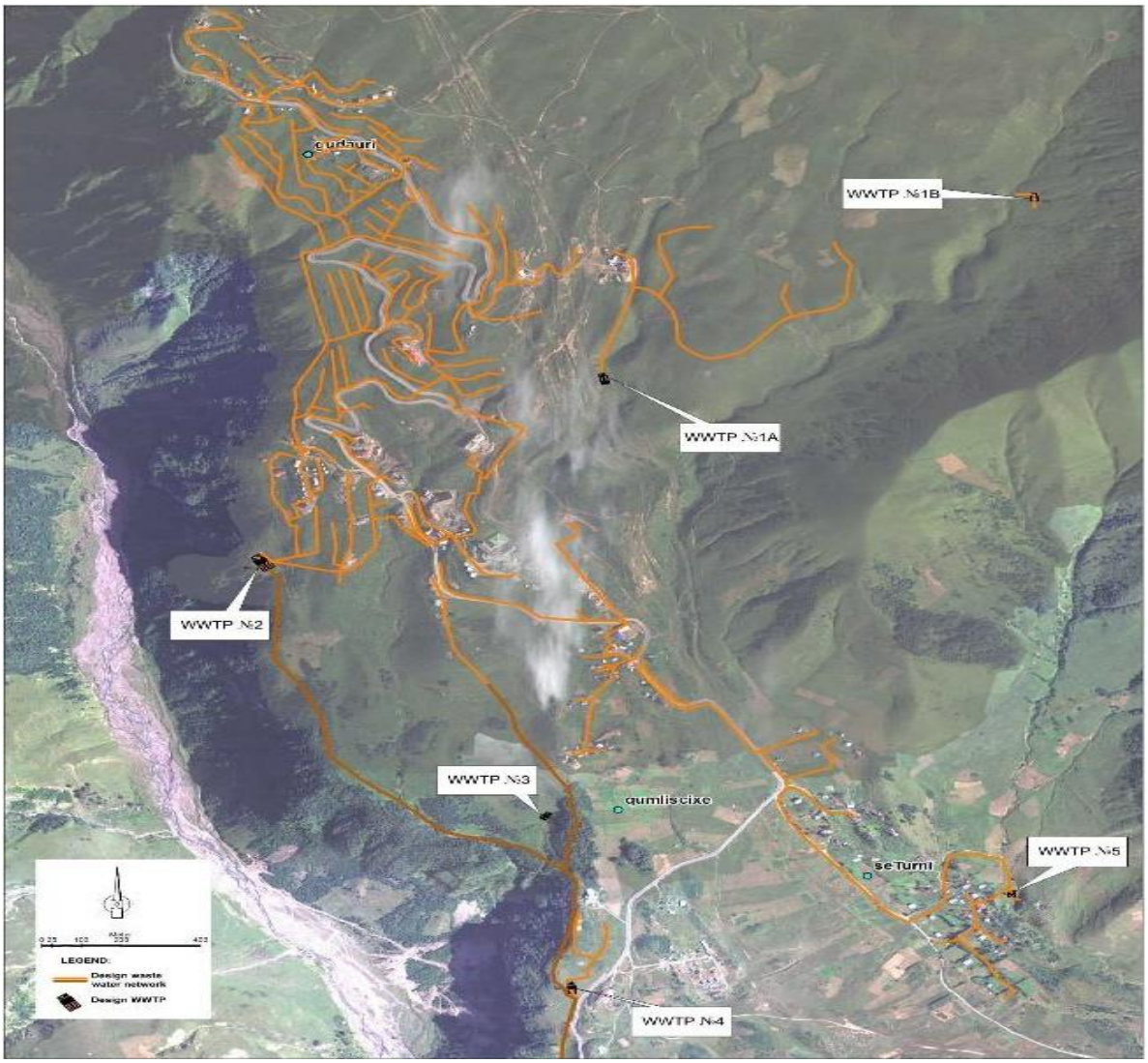


Table 8. Approach to the main characteristics of the new Waste Water Treatment Plants

WWTP #	NAME OF THE TREATMENT PLANT	POPULATION EQUIVALENT*	ESTIMATED MAXIMUM CAPACITY (m^3/day) *	FACILITIES ESTIMATED TOTAL SIZE (m^2) *	FACILITIES INCLUDING TECHNICAL ZONE (m^2) *
1A	New Gudauri	5000	750	702,02	1590
1B	Gudauri Heights	2333	350	401,73	1082
2	Upper and Central Gudauri	13333	2000	1769,14	3200
3	Gudauri Downtown	2333	350	401,73	1082
4	Plateau-Lower Gudauri	5000	700 or 750	702,02	1590
5	Seturebi	2333	350	401,73	1082
TOTAL		**30332**	**4500 - 4550**		

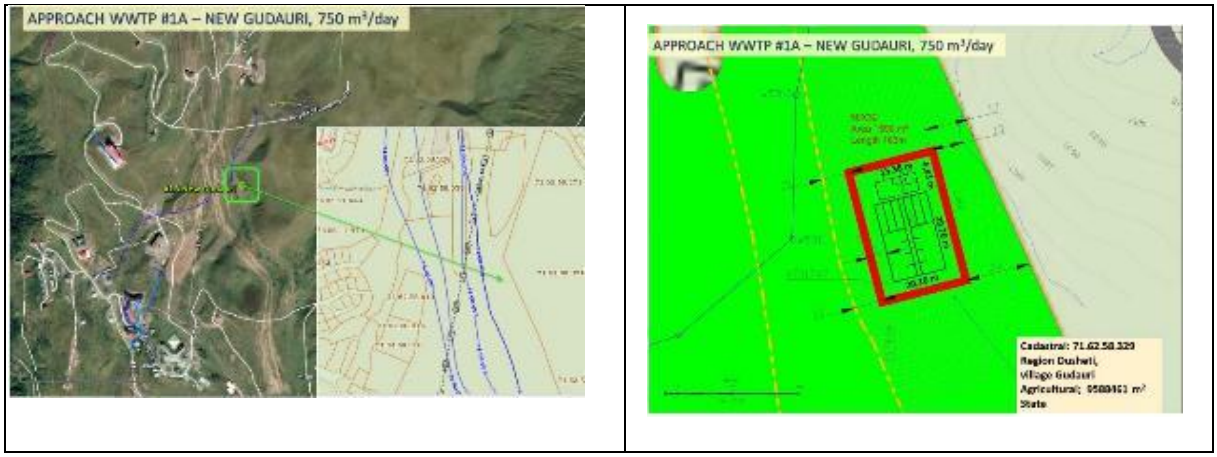
* Provisional

79. At this phase of the project a first approach for the final size of each WWTP is available, according to the maximum capacity, the updated cadastral plots and the basic

technical design -including the corresponding technical/sanitary zones-, are presented at the following figure.

Figure 3: New Design locations of WWTPs by districts

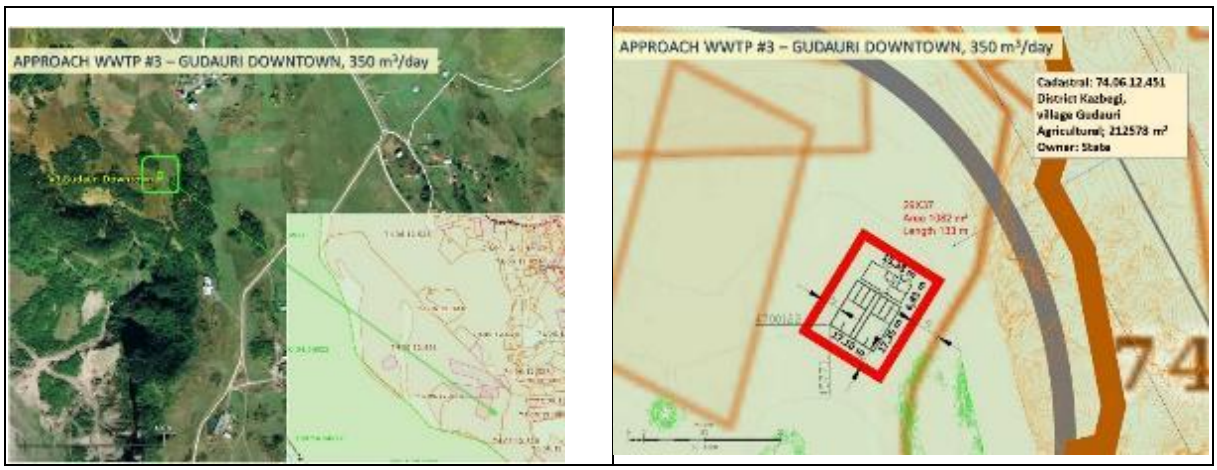
Sector 1. New Gudauri - WWTP Nº 1A.



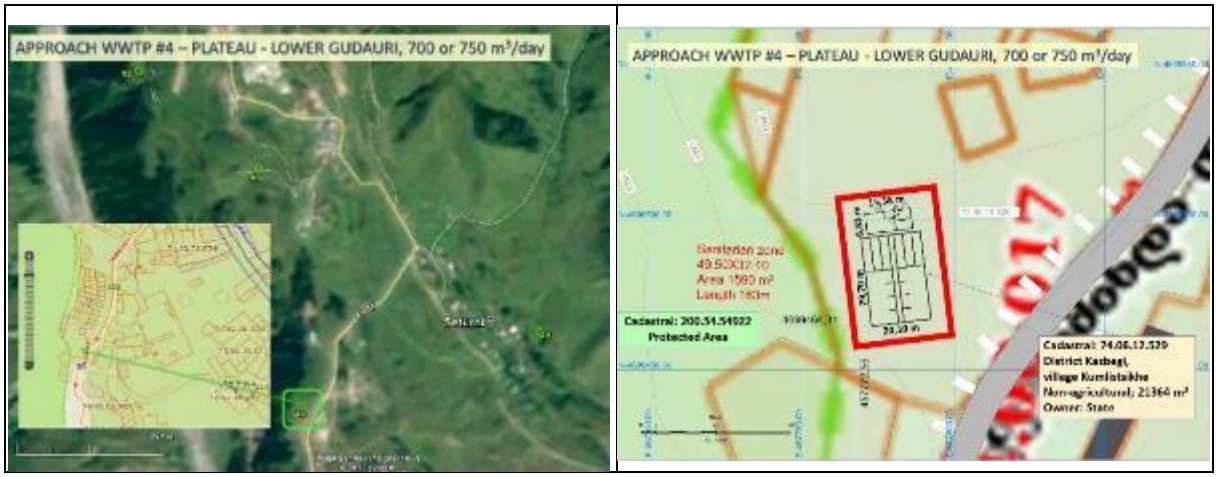
Sector 1. Upper and Central Gudauri - WWTP Nº 1B.

Sector 2. Upper and Central Gudauri - WWTP Nº 2.

Sector 3. Gudauri Downtown - WWTP Nº 3.



Sector 4. Plateau-Lower Gudauri - WWTP Nº 4.



Sector 5. Seturebi - WWTP Nº 5.

80. The project addresses the rehabilitation of the existing network and its extension, using the trace of existing layout whenever possible.

81. Considering the first results of the detailed topographical survey carried out, the existing sewage collectors/network has a length of 5740 m approximately and is located mainly at the north area of Gudauri. According to the updated Cadastral Register (July 2017), approximately the 43% of this existing sewage pipelines is currently inside the private plots.

82. The detailed design of the projected sewage network is being carried out from the results of the detailed topographical survey of the entire project area. Except in sector 3 - currently under study- having more complex topography, the drainage of the waste water has been designed byu gravity, without need of pumping stations. The new layouts for the sewage pipelines will avoid the international road and the main collectors will not cross the private

plots.

83. The tentative total length of the projected network will be 34730,95 m, but this estimation may be fine-tuned as the project design definition progresses.

Table 9. Length of Design Network (first approach)

Pipe Diameter (mm)	Length (m)
<225	25594,80
225	2632,34
250	4420,70
315	2083,11
Total	34730,95

84. The project design also considers the construction of a new pipeline for treated water that will connect the future WWTPs #2, #3, #4 and the discharging point at the Aragvi river, bordering but outside the National Park. This conduction will be 2725 m approximately, with a difference in height between the initial and final points of approximately 380 m.

85. If the availability of land and the hydraulic conditions allow, it would also be possible to connect to this pipeline the outlet of the treated waters from the WWTP #1A.

86. The pipeline envisaged for the outlet water of these treatment plants is under pressure. The technical reason is the use of the huge different level to pass for different places in a more flexible way with no strong requirements for the longitudinal profile.

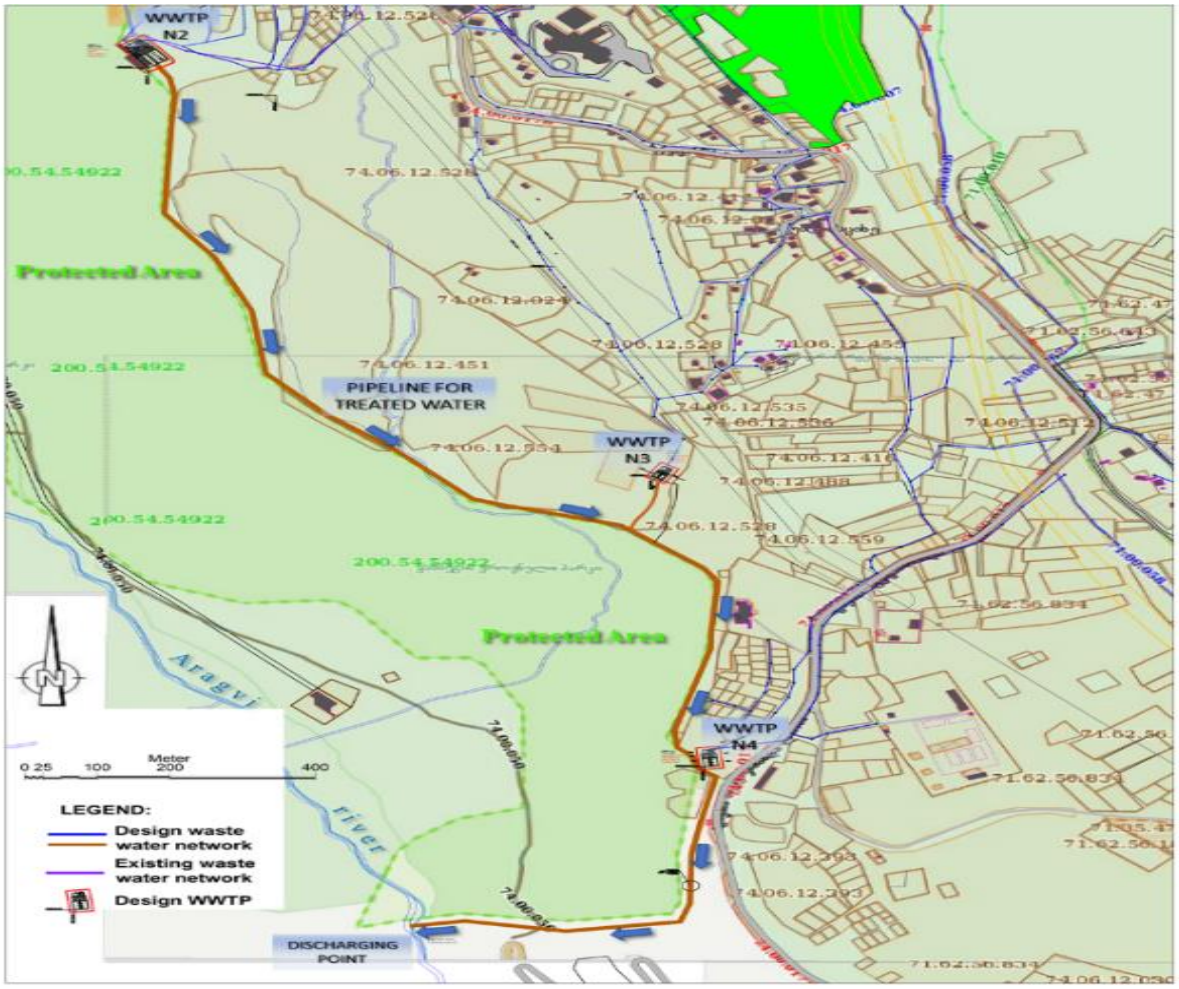
87. According to the hydraulic study, different accessory elements have to be used along the layout of the pipeline, such as air valves and wash outs. The air valves are designed to reduce the air in the high points of the conduction. The wash outs are considered for the maintenance of the pipeline if some work is needed in the future.

88. In case of work or repair, the pipeline has to be empty. The wash out, for a couple of times a year, will be used to get empty the pipeline by tranches. That means that the volume is known and fixed in every wash-out, referred to the water inside the pipeline with the conduction closed by main valves. The flow could be regulated by the opened of the diameter of the valve installed.

89. According to the proposal accepted by the Agency of Protected Areas, the layout of this treated water line will take advantage of the existence of a natural gorge, which has already been inspected by the Environmental Specialist, to bring the water to an overflow tank, immediately prior to its free fall in favor of slope.

90. The definition of this hydraulic structure, along with other small works to reinforce the crossing of the pathway in the lower zone and the small channeling into the riverside of the Aragvi river, will be carried out prior to construction.

Figure 4: New Design pipeline for treated water connecting the future WWTPs #2, #3, #4 and the discharging point at the Aragvi river, bordering and outside the natural protected area.



91. The sludge produced in the process will be typical and with no special conditions. It will be possible to analyze the real conditions of the sludge to manage its disposal and even, in the future, to adapt it potentially for civil use, should the legislation allow.

92. As discussed earlier, the service level of urban water supply and waste water treatment at present is not satisfactory in Georgia. Services are not available to the entire population and the serviced areas suffer with inefficient service levels. Systems are old and inefficient. The situation is no different in the program town of Gudauri. Untreated sewage infiltrates into the underground and pollutes into rivers. The WSS project is needed because the present water supply infrastructure in Gudauri is inefficient and inadequate to the needs of the growing population and tourists.

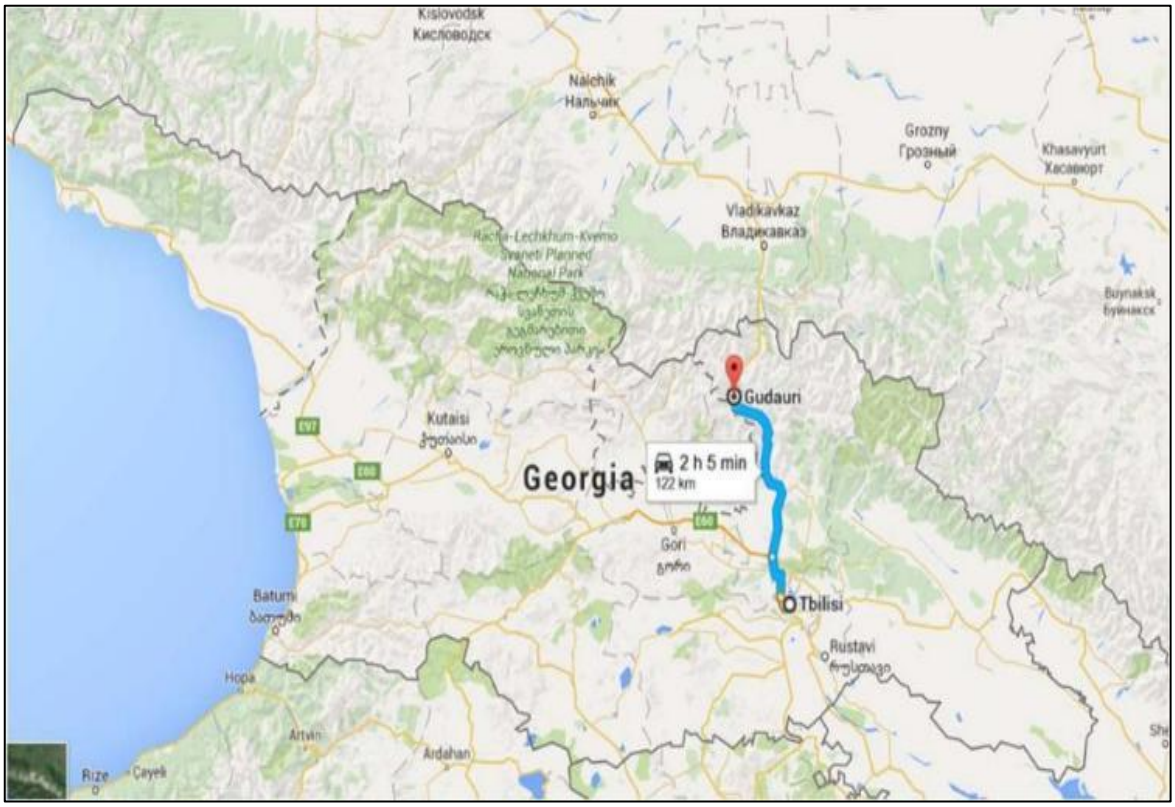
93. One of the reasons for dissatisfaction of tourists in Gudauri is related to intermittent water supply and sanitation problems. This is one of the reasons also, that new hotels can't work properly, which interrupts development of tourism in Gudauri.

C.2 General Information

94. Gudauri is a ski resort located on the south-facing plateau of The Greater Caucasus Mountain Range in Georgia. The resort is situated in the Stepantsminda District, along the Georgian Military Highway near the Cross Pass, at an elevation of 2,200 meters (7,200 ft.) above sea level with skiable area enjoying maximum exposure to the sun. Gudauri lies 120

km (75 mi) to the North of the capital Tbilisi. The resort offers high quality skiing opportunities. The ski season lasts from December to April. Heliskiing is also available throughout the season.

Map1: Project Area on the Map of Georgia



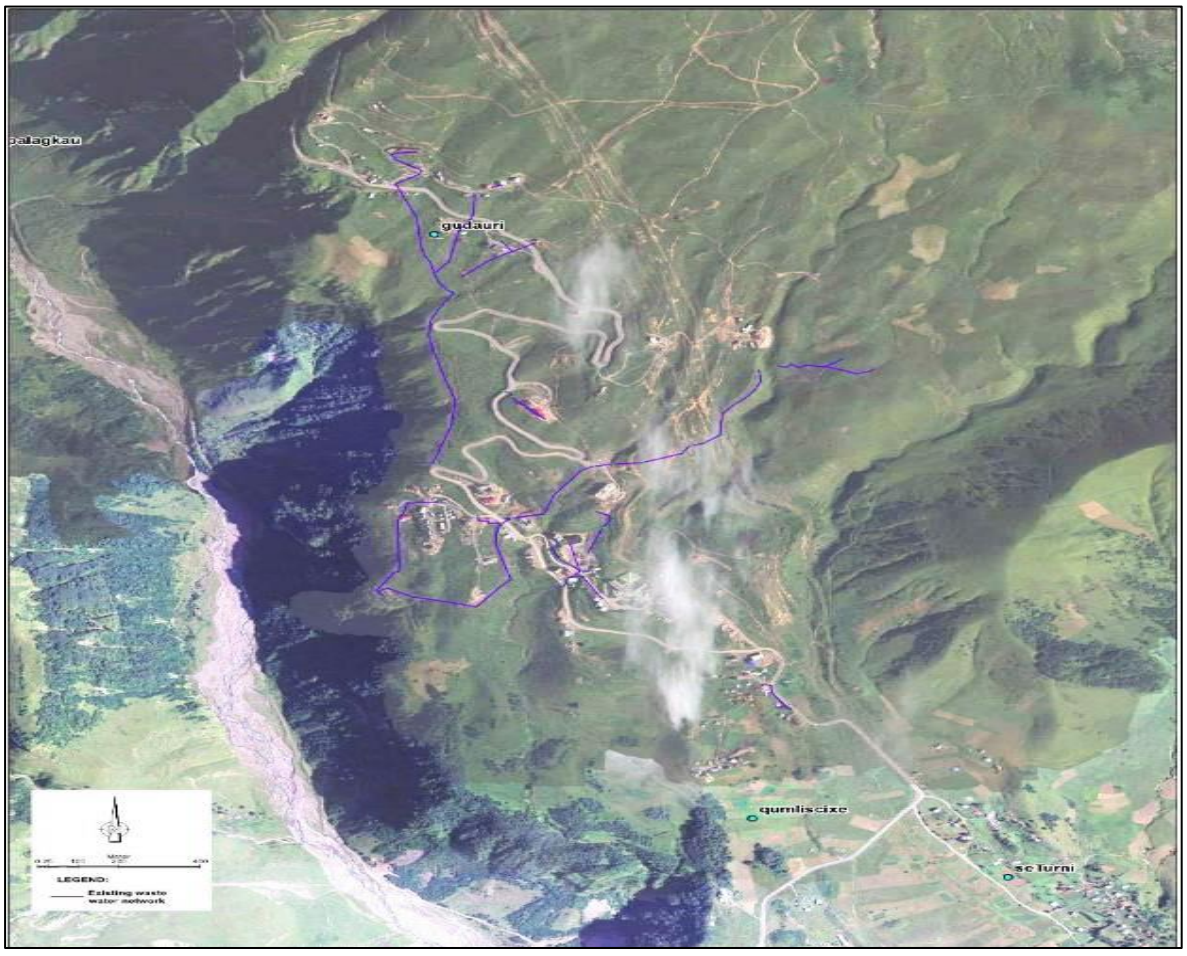
C.3 Existing Situation

95. Gudauri has an existing, rudimentary sewer network with demolished out of order Waste Water Treatment Plant.

96. There is one collector network, with two main converging branches, where hotels are connected. Originally, Sewage Treatment Plant was constructed in Gudauri, in order to ensure discharge of treated water in the Aragvi River. Sewage Treatment Plant is not under operation now, because, it's not functional any more.

Figure 5: Old Wastewater Treatment Plant not in operation

Figure 6: Alignment of the existing manholes and sewers (results of detailed survey)



C.4 Population Development

97. Gudauri Resort the season lasts from December to April. Along the year the Gudauri Area has a typical behaviour of a seasonal ski area, with a strong peak of visitors in winter (6.800 inhabitants), and few of them during summer time (1.100 inhab.). Because of the rapid developing of this winter sports resort located at Kazbegi region the populations are expected to grow up to 27.500 inhab. (2040) – Project horizon period-of 25 years.

Table 10. General Calculations of Water Uses (Current and Future)

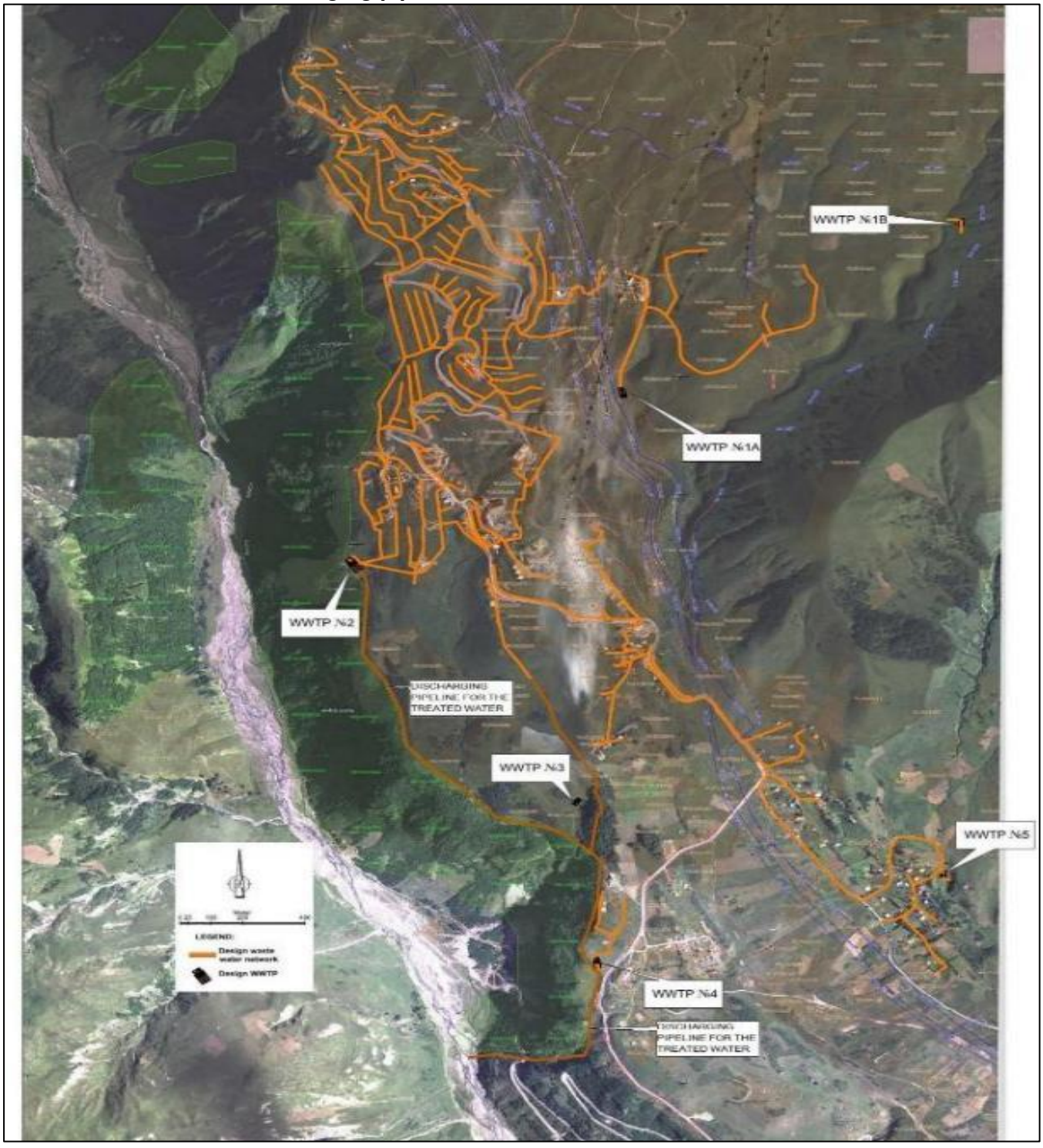
Customer Category	Unit demand (m^3/day)	Population			Daily average (m^3/day)		
		Low Current	*High Current*	*High Future*	*Low Current*	*High Current*	*High Future*
Population	0,15	800	800	5000	120,00	120,00	750,00
Tourists	0,27	275	5500	15000	74,25	1.485,00	4.050,00
Day tourists	0,04	25	500	7500	1,00	20,00	300,00
Total		**1100**	**6800**	**27500**	**195,25**	**1.625,00**	**5.100,00**

Additional considerations	**Water Supply Demand study**			
Apparent losses	6%	11,72	97,50	306,00
Real losses (leakage)	25%	48,81	406,25	1.275,00
New total to be considered for supplying		**255,78**	**2.128,75**	**6.681,00**
	m^3/h	10,66	88,70	278,38
	l/s	2,96	24,64	77,33

C.5 Design of Future Sewerage System

98. The proposed location for future WWTPs by sewerage districts and new discharging pipeline for the treated water is presented in the next Figure.

Figure 7: Proposed location for future WWTPs by sewerage districts and New discharging pipeline for the treated water



C.6 Preliminary Design of Wastewater Treatment Plant

99. After the consideration and the study of several alternatives and types for treatment plants, the adopted preliminary design of the WWTPs consists basically on the installation of medium size facilities spread over the territory of the Gudauri's area, which technology is based on the treatment of wastewaters by means of biological reactors (bioreactors) capable of reducing nutrients and obtaining a treated effluent of high quality.

100. The focus of this preliminary design is to satisfy the particular geographical and climatic conditions of high mountain in Gudauri, taking into account also the current activities and the expected population growth and the development of the area considered in the “Gudauri Mountain Resort Master Plan”, April 2016, as discussed above

C.7 Treatment Process

Description of the process

101. The preferred treatment process will use biological reactors (bioreactors). They are on-site aerobic continuous-flow wastewater treatment plants factory. The decision to use these facilities is for operational reasons and they will be made in ferro-concrete structures whose main elements will be built under the ground. The process is working with active sludge for biological removal of organic pollutants (BOD and COD), nitrogen and phosphorus.

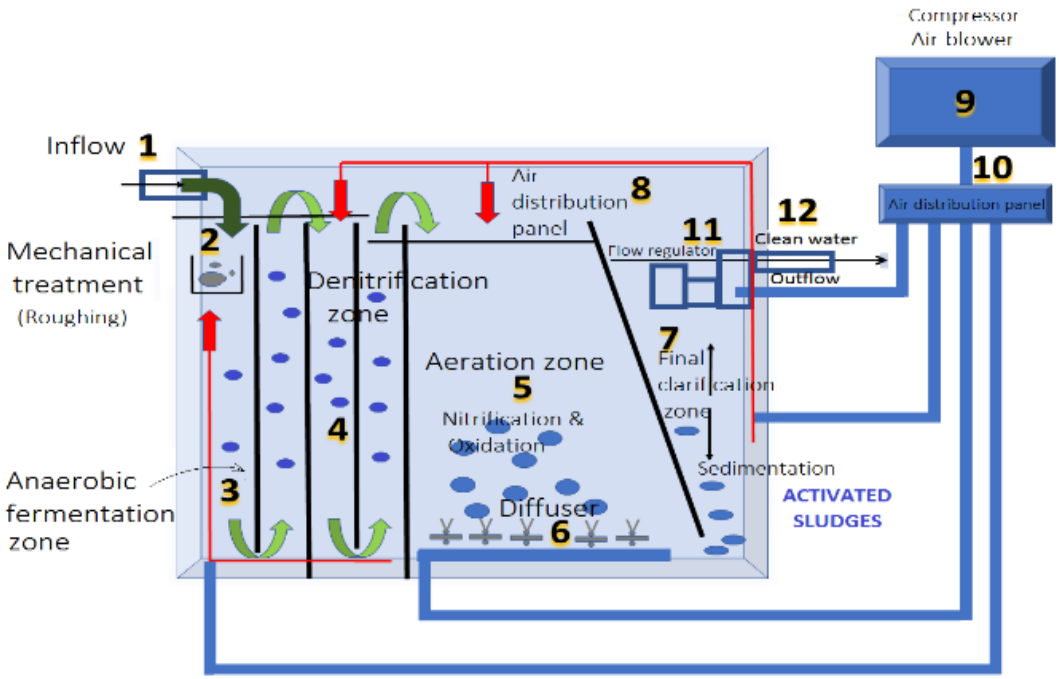
102. The active sludge is used for biological removal of organic pollutants (BDS and ChDS), nitrogen and phosphorus. The bioreactor contains all levels of biological treatment and sludge sedimentation: anaerobic - anoxic, aeration zone and secondary sedimentation tank. All zones will be installed in the aerobic tanks, which the bases of will be made from concrete (if the size is too big) and partitions from polypropylene. The general “hermetic” condition will be studied as priority to avoid any influence in the environment.

103. The treatment unit will include an air blower, mounted next to the plant or in the plant if the size allows it. Along with the increase in the capacity of bioreactors, the corresponding structural parameters of the equipment will be proportional.

104. All zones will be installed in one horizontal space and are separated by walls. By means of the air blower the excess sludge is removed into sludge stabilizer, which is mounted in a separate repository.

105. This treatment system is flexible as the duration of all treatment stages can be easily changed and adjusted. The treatment plants of this type are fitted for treatment of unequal and varying wastewater debits and loads. At this point is very important to take in consideration the huge flow difference between high and low tourist season, existing just now but with bigger gap in the future.

Figure 8: WWTP - Treatment system



DESCRIPTION OF COMPONENTS

1. Inflow
2. Mechanical treatment
3. Anaerobic fermentation zone
4. Denitrification zone
5. Aeration zone
6. Diffuser
7. Final clarification zone
8. Air distribution panel
9. Air blower
10. Air distribution panel
11. Flow regulator
12. Outflow

106. With this process, the results that it can be expected are as follows:

Table 11. Cleaning efficiency for the design of new WWTPs

Parameter	Cleaning efficiency (percentage)		Cleaning efficiency (concentration)	
	Average	Maximum	Average	Minimum
COD	91,7%	95,6%	51,8 mg/l	36 mg/l
BOD_5	97,0%	98,4%	10 mg/l	5 mg/l
SS	97,0%	98,0%	12,1 mg/l	9 mg/l
$N\text{-}NH_4$	98,6%	99,7%	0,8 mg/l	0,2
Ntotal	80,7%	91,1%	14,8 mg/l	10,8 mg/l
Ptotal	75,6%	89,0%	3,3 mg/l	1,3 mg/l

COD- Chemical oxygen demand;
BOD_5- Biochemical oxygen demand; SS-Suspended solids;
N-NH4-Ammonium, as Nitrogen; N total-Total Nitrogen Kjeldahl;
P total-Total Phosphorus

107. The bioreactor contains all levels of biological treatment and sludge sedimentation (anaerobic – anoxic, aeration zone and secondary sedimentation tank). All zones will be installed in the aerobic tanks, which base will be made from concrete with partitions. The

general “closed” condition (the main installations will be covered and located underground) will be studied as priority to avoid any influence in the environment.

108. The treatment unit will include an air blower, mounted next to the plant or in the plant if the size allows it. Along with the increase in the capacity of bioreactors, the corresponding structural parameters of the equipment will be proportional.

109. All zones will be installed in one horizontal space and are separated by walls. By means of the air blower the excess sludge is removed into sludge stabilizer, which is mounted in a separate repository.

110. This treatment system is flexible as the duration of all treatment stages can be easily changed and adjusted. The treatment plants of this type are fitted for treatment of unequal and varying wastewater debits and loads. This point is very important to take in consideration the huge difference flow between high and low season, just now but bigger gap in the future.

Outlets and final treatment

111. With this system, the treated water will have enough quality to give it directly into the Aragvi river (WWTPs #1A, -#2, -#3, and -#4) and the Eastern ravine (#1B and #5). In any case, final treatment would be simple and will guarantee compliance with the Total Coliforms standards (without chlorine), in order to improve the characteristics of the effluent previously its delivery into the river. The design characteristics of the WWTPs will guarantee this compliance even considering seasons of low flows and possible failures in the general power network. The outlet pipes will be on polypropylene, as this will allow to go into the ground with less slope conditions, in the idea of working under pressure. The first approach is to use, as far as possible, the sewage network to go in parallel near the surface using the same trench-line.

C.8 Sewage Sludge Management

112. At this phase of the design is estimated the average sludge quantity that will produce each WWTP using this technology, after the initial period of 2 - 4 years of functioning.

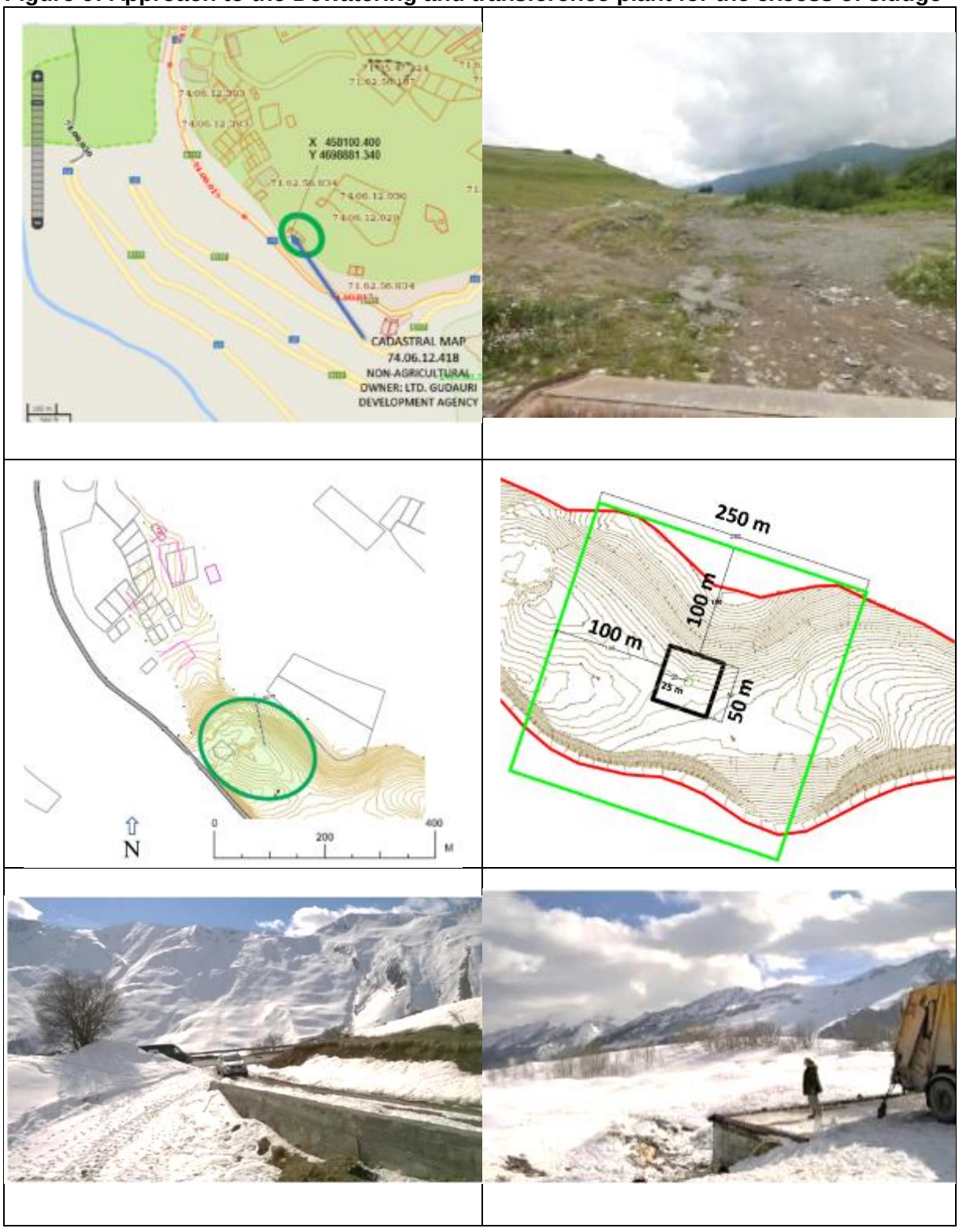
Table 12. Estimated production of excess sludge at the new WWTPs

WWTP TYPE	m^3/day	P.E.	Excess sludge from the bioreactors	Thickened sludge 2% SS (gravitationally)	Thickened sludge 18% SS (mechanically)
			Qpd (m^3/day)	Qpdt (m^3/day)	Qtpdd (m^3/day)
GUDAURI-I	350	2333	20,02	7,36	0,82
GUDAURI-II	750	5000	42,90	15,76	1,75
GUDAURI-III	2000	13333	114,39	42,04	4,67

113. The excess sludge would be treated in two steps: Aerobically stabilized and gravitationally thickened in the excess sludge tank, and then, dewatered with mechanical dewatering equipment.

114. The location of the point for future mechanical dewatering and transference of the excess of sludge from the new WWTPs has been initially proposed at the same plot that current Municipal waste dump. It also corresponds with the envisaged location for the initial alternative considering a single large WWTP. The next Figure presents the initial proposed location, the dimensions and the sanitary zone for this plant.

Figure 9: Approach to the Dewatering and transference plant for the excess of sludge



115. The rate of output of the excess of sludges is very difficult to be right calculated without carrying out a study and follow-up period at the beginning of the operational phase. Typically, it is possible to apply some standard for the calculation of the volume, about 3 dry kg/year by equivalent inhabitant, but this calculation should be considered only as a rough estimate.

116. In any case, the possible time curve of sludge production must be considered, with the population as main variable: From 800 inhab. during the current low season, passing to

5000 inhab. at the current high season, and up to 30000 inhab. at future high season. The existence of excess sludge can begin to be considered after the first two years by the method of production. But if the population is on a rising curve, the sludge needed in the WWTPs process will also go increasing, and consequently there will be no sludge left to treat during the early years.

117. As progresses the detailed project design will be accurately defined the management criteria for the collecting, dewatering and transference operations for the excess of the sludge from the future WWTPs.

118. To calculate in the correct way the volume of excess of sludge produced is necessary to know before the inlet water parameters at each WWTP. After that, and set the outlet water and known the treatment process, it could be possible to make some calculations.

119. The description of the process of the treatment of the sludge is also complicated. The point here is that the characteristics for the outlet sludge can be set. And, according to the future use, this implies the knowledge of the real existing sludge in the WWTP, having the knowledge of the characteristics of the inlet water and the treatment process.

120. Before starting the operation of the WWTPs, Plan for Sewage sludge disposal on the dump site has to be prepared and, complementary, also be studied a Plan for Sewerage sludge application.

121. The excess of sludge will be shipped in first option between the Gudauri WWTPs as activated sludge when needed from time to time.

122. Another alternative for the disposal of the sludge could be its use as fertilizer in the agriculture in crops without human consumption. For example, as organic fertilizer for the maintenance of the skiing lanes or ornamental plants in spring time. The application of sludge can improve the physico-chemical and biological properties of soils, providing organic matter, nutrients and trace elements needed for plant growth. On the other hand, possible negative effects should be controlled through specific studies, such as increasing the apparent density of fine textured soils without amendments or the concentration of heavy metals.

123. The WWTP is equipped with a storage place, where sludge is temporarily stored and could be collected by interested farmers. UWSCG would give away the sludge for free; transportation would have to be provided by the farmers. When UWSCG will have a better understanding of the quality and quantity of the sludge, local service center will announce the possibility to collect sludge from the site of the WWTP depending on the seasonal demand for fertilizer.

124. In order to make viable the alternative for the application of the sludge in agricultural uses, could be integrated the following design and management criteria:

- To consider a simple area for the treatment in general way of the excess of sludge in the future;
- To include a storage area for possible future uses;
- To set the characteristics of the final output of the excess of sludge;
- To recommend, into the maintenance operations, the study of all variables in the process including inlet water and existing sludge.

125. In view of the lack of Georgian legislation with regard to the use of sludge in agriculture, European regulations shall be considered in case the sludge will be used as fertilizer. Sludge Management Plan Preparation guidelines are presented in Annex 6 of this report.

126. According to European legislation the use of sludge is prohibited:

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

127. USA regulations related with the federal biosolids (treated sewage sludge) rule described in the EPA publication is contained in 40 CFR Part 503. Biosolids that are to be land applied must meet these strict regulations and quality standards. The Part 503 rule governing the use and disposal of biosolids contain numerical limits, for metals in biosolids, pathogen reduction standards, site restriction, crop harvesting restrictions and monitoring, 52 record keeping and reporting requirements for land applied biosolids as well as similar requirements for biosolids that are surface disposed or incinerated. Most recently, standards have been proposed to include requirements in the Part 503 Rule that limit the concentration of dioxin and dioxin like compounds in biosolids to ensure safe land application.

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

Table 13: Limit Values Heavy Metals

	Limit values for concentrations of heavy metals in soils	Limit values for heavy metal concentrations in sludge	Limit values for amounts of heavy metals which may be added annually to agricultural land
	mg/kg of dry matter	mg/kg of dry matter	mg/kg of dry matter
Cadmium	1-3	20 – 40	0.15
Copper	50 - 140	1000 - 1750	12
Nickel	30 -75, 300 – 400 (3)	30 -75, 300 – 400 (3)	30 -75, 300 – 400 (3)
Lead	50 - 300	750 – 1,200	15
Zinc	150 - 300	2500 – 4000	30
Mercury	1 - 1,5	16 - 25	0,1

Mitigation Measures

129. 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.

130. Depending on the class of WWTP, it is required to develop a plan for disposal of sludge to the dump site. The plan has to be agreed with the MoENRP of Georgia and as well with Solid Waste Agency, owner of the landfill.

131. Need to have a modern laboratory facilities. It is required that WWTP has modern facility of laboratory to enable test on toxicity and heavy metal content.

132. During the first operating year the sludge management and disposal plans should be developed, focusing on testing to see how much of the material can be used in agriculture. These tests will be for toxic and hazardous material content such as chromium and cadmium. This plan will be agreed with the MoENRP.

D. DESCRIPTION OF THE ENVIRONMENT (BASELINE DATA)

D.1 General

133. The present chapter gives the information about the natural and social-economic conditions of the Project site. This information is based on literary sources and fund materials, statistical data, data provided by the Client and results of the field studies accomplished immediately in the study area. This information will be further used to establish the positive and negative impacts during the construction and exploitation phases of Gudauri water-supply Project and evaluate their scales.

D.2 Physical Resources

D.2.1 Atmosphere

134. According to the Order №1-1 / 1743 (25 August, 2008) of Minister of Economic Development, Tbilisi design standards - "Building Climatology", "Table 11, the temperature of the air" - Gudauri outside air temperature (◦C) rate varies in the range: 33 ° absolute minimum C and the absolute maximum - 27 ° C. And "Normative depth of freeze soil " (cm) by Ground category range from 117 cm and 153 cm-between.

D.2.2 Ambient Air Quality

135. It is obvious that no air quality gauging stations exist in Gudauri for years, and therefore practically no air quality data are available for the project impacted area. Due to such situation, it was found reasonable to apply the methodology approved by the Ministry of Environment and Natural Resources of Georgia (РД 52.04,186-89). This methodology recommends application of the population-based approach for evaluating the baseline ambient air condition for the areas lacking any observation data (Table 16).

Table 14. Recommended baseline pollution levels by population quantities

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

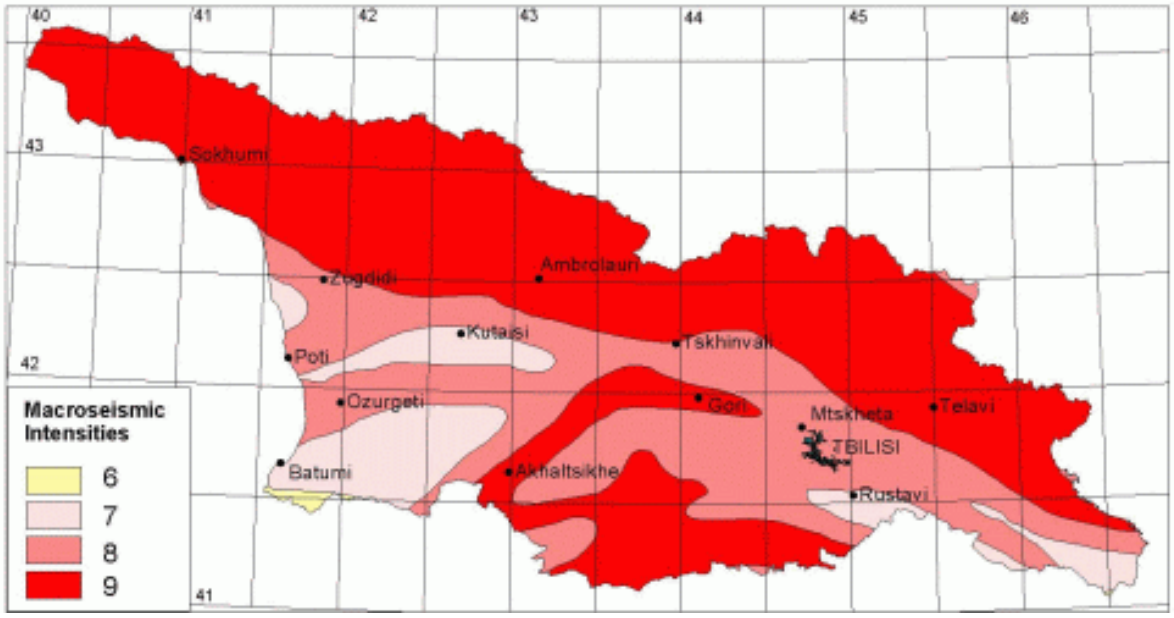
136. The baseline pollution data required for estimating the ambient air impact were determined based on the above methodology with consideration of Gudauri's population and tourists (50-10 thousands, specifically:

- Nitrogen dioxide: 0.008 mg/m³;
- Sulphur dioxide: 0.02 mg/m³;
- Carbon oxide: 0.4 mg/m³;
- Dust: 0.1 mg/m³.

D.2.3 Seismicity

137. Gudauri area is located in the active seismic zone. Due to this, the facility shall be designed and constructed in compliance with the requirements stipulated in the applicable Georgian construction standard Seismic Resistant Construction (PN 01.01-09). The area selected for construction of the project facility is located in the seismic intensity zone 9 (MSK 64 scale).

Map 2: Seismic Zone Map of Georgia



D.2.4 Soil covers

138. Brown soils (Eutric cambisols Calcic kastanozems) are spread mostly on carbonate rocks, and are carbonate consequently. These soils have a clearly formed profile, with a dark accumulative or humus horizon with the depth of 20-30 cm. The soil structure is bean-cloddy, with a heavy loamy content, skeletal, with favorable drainage, highly productive and intensely cultivated. Due to inexpedient exploitation (excess irrigation, mistakes during the land cultivation) the brown soils are being degraded intensely.

139. Solonchaks. This type of soils on the territory of Gudauri is presented by solonchaks and solonetzs. The solonchaks contain more or less solubale salts in the profile, while the absorbed sodium is accumulated in the colloid complex of solonetzs. These two soil categories of salination are closely associated in a genetic respect. Most of the salinated soils contain both, soluble salts and sodium cation accumulated in the absorbing complex. The salination process is associated with the delluvial-prolluvial phenomena taking place here in the past – the weathering products removed from the salt-containing rocks of lagluja ridge by the temporal water currents cause soil salination on the inclined surface of the piedmont zone. As a result, solonchaks are formed. As for the solonetz formation, this process is associated with the desulfitation of the sulphates accumulated in the soil in great amounts. Within the limits of Gudauri, there are slightly, averagely and intensely salinated soils spread.

140. Most of the soils on the territory of Gudauri Municipality have lost their natural appearance and are being degraded to various degrees. This, first of all, is seen in their degraded physical-mechanical, chemical and microbiological properties and reduced productivity.

D.2.5 Hydrographic Network

141. The river Aragvi flows on the territory of the Gudauri. The river Aragvi penetrates the territory of the Gudauri from north-west and it crosses this part of mountainous region.

142. There are no lakes on the territory of the Gudauri.

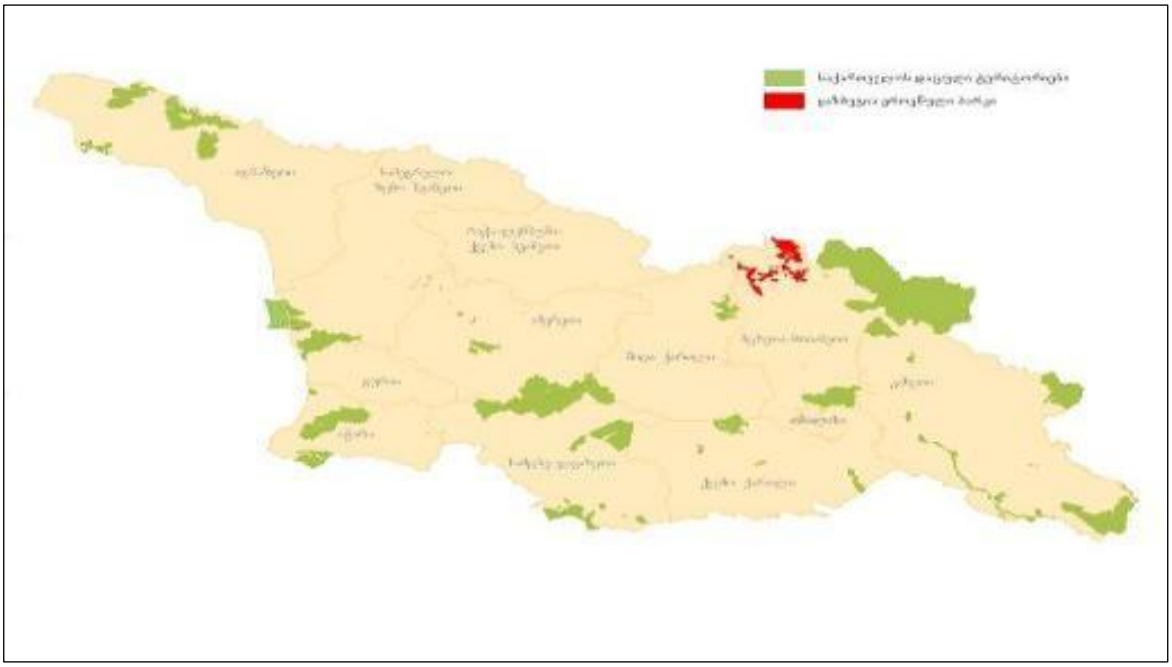
143. Gauging stations and flow scales in the rivers. The description of location and available more recent flow series by the National Environmental Agency (1982-1993) are presented in the Annex 01.

144. According this hydrological information, the Aragvi river has an averaged flow of 6,51 m3/s nearby the Gudauri's area (Aragvi-Mleta station, 1989-1993), fairly evenly distributed throughout the year: minimum averaged flow during December, January and February (5,56 – 5,74 m3/s; and maximum values between April and August (7,18- 7,43 m3/s).

145. Considering these available flow series, the future maximum quantity of treated water from the new WWTPs that will be incorporated to the Aragvi river will be almost insignificant, since it will represent scarcely 1 per cent of the natural river flow.

D.2.6 Biodiversity

Kazbegi National Park
Map 3: Location of Kazbegi National Park



146. The location of the Kazbegi National Park is shown on Map 3 and highlighted in red. Other Protected Areas of Georgia in Green. National Park is located on the northern slopes of Main Caucasus range, in the basin of the Tergi River in the Kazbegi district (gorge); with a total area of 9 030 hectares. All of the Kazbegi National Park is mountainous. Its lowest part is located at 1400 m above sea level and the upper one is within 3000 – 4100 m. Establishing of Kazbegi National Park serves the purpose of protection of the high mountain ecosystems.

147. Its relief is complex, mountainous and very rugged. Kazbegi National Park as well as the whole gorge are constructed with basalt formations such as quartzite, carbonaceous clay shale of the lower Lias age and argillaceous sediments of the lower Toarcian age, where there are many diabase layer-veins. The so-called lava pillows are part of the region's geology. In Dariali gorge, and even to the south, everywhere, where the Tergi River has cut its way through the canyons, the slopes of the gorge are the perfect examples of the local geology. It is easy to see the basalt sections and lava layers in the cliffs.

148. Vegetation cover of Kazbegi National Park is quite diverse. It is enclosed in the very part of the Kazbegi floristic zone of the Greater Caucasus, which is distinguished by richness of endemic species. 1347 species of plants can be found in this floristic zone, 26% out of them are endemic. The alpine, subalpine, xerophytes and plants of other ecological communities can be found here.

149. The forests of Kazbegi National Park are located on the steep slopes. 105 species of wood plants can be found in the Strict Nature Reserve, though mainly there are Litvinov's birch (Betula litwinovi), Sosnovski's pine (Pinus sosnowskyi), junipers (Juniperus - 3 species), Sea-buckthorn (Hippophae rhamnoides). It is remarkable that in Georgia there is a very rare large grove of Sea-buckthorn nearby the settlement of Stepantsminda, and the Caucasian rhododendron (Rhododendron caucasicum), Oriental beech and high-mountain oak are widespread in the vast areas.

150. Existence of diverse vegetation indicates to richness in fauna. And exactly in the Kazbegi Strict Nature Reserve can be found the Georgia's Red List species, such as East Caucasian tur (Carpa cylinricornis), chamois (Rupicarpa rupicarpa), wolf (Canis lupus), Pine Marten (Martes martes), et al.

151. The Strict Nature Reserve is the best environment for birds of prey. Namely, here can be found the Golden eagle, griffon vulture, Bearded vulture, et al. Attention draws the Caucasian Black grouse (*Tetrao mlokosiewiczi*) and Caucasian Snowcock (*Tetraogallus caucasicus*) as well.

152. National Park is rich in Fauna. Here can be found the Georgia's Red List species, such as East Caucasian tur (Carpa cylinricornis), chamois (Rupicarpa rupicarpa), Brown bear, lynx, et al. Birds of prey can be found in the National Park, which are also included in the Red List of Georgia, such as the Golden eagle (Aquila chrysaetos), griffon vulture (Gyps fulvus) and Bearded vulture (Gypaetus barbatus)

153. Historical monuments, such as the fourteenth century Sameba temple, tenth century Garbani church, Sioni three-parted basilica, Akhaltsikhe basilica and seventeenth century Sno castle are very interesting for the visitors as well. Religious traditions and habits of the local people that is a mix of Christian and Pagan habits attract the visitors

Gudauri Project Location and the Kazbegi National Park

154. One component of the Kazbegi National Park is located adjacent to the pipeline corridor in the Aragvi River valley which supports some relict forest. The National Park itself will not be touched by the project and in fact considerable effort has been made to avoid it through design change and improving the existing conditions, as currently untreated waste water goes directly through the National Park from the old WWTP location and directly into the Aragvi River.

Flora and Fauna of Gudauri

155. Flora: More plain and valley vegetation dominates on the territory of Gudauri. The vegetation of beard-and-feather-grass and thornbush-thorny steppes, sparse hemixelous vegetation and floodplain and semi-desert vegetation is spread here. Petrosimonia brachiata, wormwood and Salsola dendroides are typical for semi-deserts. The sub-forest is formed by tamarisk, medlar, sea-buckthorn, cornel, wild plum, hawthorn, etc. The vegetation cover on Gudauri plain is dominated by beard-grass, beard-grass- wormwood, beard-grass and thornbush-thorny and Salsoleta nodulosae vegetation. At some places, there is semi-desert vegetation growing here as well. Iagluja hillock is covered with beard-grass and beard-grass-Festuca supine-feather-grass steppe grasses, as well as xerophytic bushes. Small pine plantations also grow over Loki ridge. The slopes are covered with a hardwood forest with oak and hornbeam dominating in its lower part and beech in its upper part. Box elder, Georgain oak, oriental hornbeam and blackthorn dominate on Babakari hillock.

156. Fauna: Fauna in Gudauri is not very diverse. Wild boar, badger, stone marten, Least Weasel live in the forest; jungle cat, rabbit, wolf, jackal are commonly present throughout the landscape Ornitofauna is numerous: Common pheasant, lark, redleg, partridge, quail, etc. Reptiles are also many in numbers. Different kinds of lizards are

particularly common with Iajluga upland. Tortoise, grass snake, sheltopusik and sand boa (rarely) are also common. Barbel, mursa, khramulya and stone loach are common in the river Debeda.

157. Within the proposed IEE site specific biodiversity study was carried out by a Botanist and Environmental Impact Specialist in June 2017. Based on this survey the "Preliminary Botanic-Ecological Appraisal Report for Selected Areas of WWTP sites and Sewage Collectors' in Gudauri" was developed. Details and main findings of this survey is presented in proposed IEE (see Construction Site Biodiversity Study below – para 135).

158. Most of the Project site covers the territory of the city of Gudauri and is consequently, under a strong anthropogenic impact. The impact on flora and fauna both, in the construction and operation phases of the Project, is moderate.

Construction Site Biodiversity Study

159. 6 WWTP locations have preliminarily been selected for waste water treatment plants construction in borough Gudauri. Design of the WWS system, was developed by the design team of Supervision Company Eptisa. Apart from several technical and geomorphological requirements, the above mentioned locations are mostly defined according to minimization factor of environmental impact. In this point of view, conservation value of the vegetation existing on the sites is considered to be very significant and is importantly taken care of:

i. Vegetation species belonging to Georgian red list; avoiding impact to the nearby Protected Areas (Kazbegi Protected Areas);
ii. Defending vulnerable habitats with high conservation value.

160. Site survey has been done by a botanist and environmental impact specialist – Grigol Deisadze; the environmental specialists of the supervision company "Eptisa" took participation in selection and investigation of the territories.

161. The site survey was done through primary data collection during a site walkover including the WWTP sites and key pipeline sections. During the survey some herbarium samples were also taken for later species identification. Investigation areas have been identified through GPS and UTM UPS 38 T coordinates systems. Photos were taken through a digital camera.

162. Below, particular site botanic-geographic description and characterization is available.

163. **Photo of I site - 1A;** area 400 sq. m (20m/20m- sq. m); Center coordinates: UTM UPS 38 T 0457870/4702064; 2131 m above sea level.

164. The site is located on an even, flat artificial plateu. Engineering arch type bridge structure is adjacent to the territory and probably during its construction the area was leveled. A vertically cut uncultivated natural boundary of exposed earth can be seen, showing that the location is significantly impacted with erosion.

165. Secondary Sub-alpine field fragments are developed on the area and significantly humid sedge groups are given in deepened places.

166. Forest is damaged, it is rare and in fact these are forest remnants only.

The following species are met mostly:

167. Rumex alpines; Tusilago farfara; Cruciata laevipes; Ranunculus caucasicus; Carduus adpressus; Cirsium cosmelii; Urtica dioica; Bromus japonicas; Festuca varia; Juncus inflexus etc.

168. 3-4 examples of Dactylorhiza urvilleana are given on the west edge as high value species.

169. It is obvious that the vegetation developed after the construction activities, during the last 4-6 years, through self-regeneration.

170. Photo of **II site - 1B;** Area 400-500 sq. m (20m/25m- sq. m); 2244 m above sea level; Center coordinates: UTM UPS 38 T 0458944/4702446; UTM UPS 38 T 0457870/4702064

171. A ground road connects the site to the borough that represents a close adjacent to it, it may be said that it represents an above continuation of the ground road.

172. The area of the southern-west exposition had 15° inclination with primary granular-herbous sub-alpine field.

173. Coverage is in the range of 90%. Erosion generating points are observed on the territory; significant trace of pasture that is as well proved with the development species being Veratrum lobelianum.

Dominated by:

174. *Festuca varia*; *Carex meinshauseniana*, *Oxytropis albana*; *Betonica macrantha*. *Gruciata* laevipes; Bromus japonicus; Trifolium ambigum; Veratrum lobelianum and etc.

175. On the western boundary, a small spring is observed on the banks of which typical humid loving species are developed, - Cardamine uliginosa; Primula auriculata etc.

176. It is worth noting that the pipeline installations connecting to 1A collector and other systems will match already areas located along existing road contours and it does not require a significant interruption in the biocoenosis (they themselves represent sub-alpine fields and are mostly similar in species composition and value).

177. The fields are heavily grazed in summer and are often well poached due to ramming.

178. Photo of II site **– WWTP #2;** Area is 1-1, 5 ha; 1953 m above sea level; Adjacent coordinates: UTM UPS 38 T 0457020/4701077

179. **III site – Access road to the WWTP#2;** 1970 m. above sea level. UTM UPS 38 T 0457182/4700977

180. The area represents an amortized leftover of the treatment plant existing there in the 80-s as well as its access roads.

181. The access road goes along the lower boarder lands of the borough and heads to sparse birch grove. During the road reconstruction, it will require extension and accordingly cutting several hardwood species.

182. In addition, basic area reconstruction will definitely require cutting a significant amount of vegetation.

183. The field survey did not identify any red list species which will require cutting during construction and upgrading of the road.

184. Forest is damaged, it is rare and in fact these are forest remnants. The vegetation is formed to hardwood through:

i. *Betula litwinowii; Alnus incana; Rosa canina; Salix caprea; Salix alba;Corilus avelana; Acer trautvetterii (unit examples);Sorbus caucasigena; Ribes biebersteinii; Prunus divaricata; Rubus* ssp.

185. The vegetation is fragmented, secondary generated self-plants very frequent and they do not form completely in the impact area.

186. Connection between the above described old treatment plant and future collectors probably will be done with this and the pipeline separated from the alley down 50-100 m. The probable area shall be appraised visually and in case of decision an additional survey should be done in order to reveal the components of the red list prior to construction.

187. The area, as it was noted, goes along dry and quite shallow and soft relief valley following the bottom of the gorge. The subalpine granulocyte meadow is mainly developed on it, although some of the hard wood groups are present.

188. During design phase of the main, it is possible to apply several alternatives in order to maximally avoid cutting of vegetation.

189. Photo IV site – WWTP **3,** area 400-500 sq. m (20m/25m sq. m); center coordinates:

UTM UPS 38 T 0457524/4700697

190. 1963 m. above sea level, Southern exposition, inclination17-20˚. Multigrass granular field. Coverage in the range of 95%.

191. Adjacent to the area, azalea bush fragments are observed. At the lower, southern side and earth road is adjacent and later village land plots. Vegetation is maintained significantly natural and untouched; the representatives of high conservation value, are:

i. Orchis coriophora; Gymnadenia conopsea; Dactilorhiza urvilleana; D. Euxina.

192. **V site - WWTP 4;** area 400-500 sq.m.(20m/25m sq.m); center coordinates: UTM UPS 38 T 0458895/4699836; 1843 m. above sea level; Souther-eastern exposition with 22-25˚inclination.

193. The area is located on the southern-eastern edge of village Seturebi, on a secondary, terrace type slope. It is adjacent to Populus tremula alley and is along an abandoned garden. The territory is terraced by quadrilaterals and ruderals mixed with multi-grass is developed on it.

194. *Urtica dioica;* Symphitum *asperum; Heracleum asperum; Lamium album; Chaerophillum aureum*, etc.

195. The following hardwood plants are observed on the edges: Pyrus caucasica; Populus tremula; Prunus divaricata; Salix caprea; Rosa canina. No vegetation having conservation value is observed.

196. **VI site – WWTP 5;** area 400-500 sq. m (20m/25m sq. M) center coordinates:

UTM UPS 38 T 0457771/4699497; 1836 m. above sea level

Southern Exposition, inclination 35˚.

197. The area is quite waterlogged. It is approximately 50 meters away from the road, and below it, in the south, is a damaged plot plateau built on damaged vegetation cover that was degraded during road construction.

198. Vegetation is a typical subalpine granulose-dried meadow with fragments of

exposed rock. In the lower part is a small, transmissible meadow fragmentation with azaleas.

199. No high conservation value of red list vegetation was revealed in the area.

200. The final outlet pipeline may be going through the site with 2 possible options:

i. Vertically below, in the shortest way through the river valley. In this case, it would cross the subalpine forest in the protected area and therefore this option is not the preferred route.

ii. The pipeline will go parallel to the road serpentine and will also head to the protected area and will be in touch with natural habitats. The territories close to the roads that are going to be used for it, are already degraded.

201. In the second option, the pipeline will reach to the discharge point, and then vertically head below the valley and finally join the river.

202. In this case, the pipeline will have to cross almost the same subalpine forest through the mentioned point.

203. Relief is quite steep and difficult to study. We came up to a fairly superficial assessment from two different points of territory. After selecting an option, it is desirable to study the area of the impact area thoroughly. Here is a remote visual assessment.

204. Corridor is starting from the point UTM UPS 38 T 0457099/4700937 1934 m. Above sea level. From this point vertically to the point UTM UPS 38 T 0457367/4699104; 1795 m. above sea level.

205. There is a well-developed spruce forest subalpine constituency of which is within 0,5-08. The birch is mainly represented by *Betula litwinowii*, but it is not excluded that the existence of Betula. raddeana is in the Red List of Georgia, and as well the following are forming the forest- *Alnus incana; Populus tremula; Salix caprea; S.alba; Corylus avellana; Rubus ssp. Rosa ssp.Ribes biebersteinii; Sorbus caucasigena* and others.

206. The forest coordinates below the second coordinate are significantly infringed, and there are presented fragments of individual shrubbery and individual trees developed into groups. later rocky and damaged relief and riverbed follows.

D.3 Information About the Background Pollution

207. Construction works in Gudauri will be carried out mainly the whole year except the snow season in winter The main road in Gudauri is very busy in summer time as well as it is main road to Russia so work on sewers crossing the road will be quite devastating. To reduce the traffic impact and noise and dust generated during the construction specific mitigations are identified and presented in proposed IEE (see EMP).

D.3.1. Existing Data About the Air Quality and Noise

208. Noise impacts should not exceed the levels presented in Table 4, in accordance with Georgian regulations - Decree No. 297/N “On Approval of Environmental Quality Norms” (August 16, 2001 of the Ministry of Labor, Health and Social Affairs) and World Health Organization (WHO) 1999, or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.

Table 15: Noise Level Guidelines

Noise	dB National Regulations		dB WHO	
Receptor	Daytime 07:00 - 22:00	Nighttime 22:00 - 07:00	Daytime 07:00- 22:00	Nighttime 22:00- 07:00
Residential;	55	45	55	45

institutional; educational				
Industrial; commercial	70	70	70	70

209. Baseline measurements under Gudauri WWS project were collected by the National Environmental Agency under the MoENRP during the working hours as no work will be undertaken outside the daytime period. The measurements were carried out in various proposed construction sites (see para 183) in July 2017. Location and data are included in the Table 16 below. Monitoring measurements will be carried out at these same locations on a quarterly basis during the construction and results will be reflected in relevant bi-annual EMRs and compared to the baseline.

210. Measurements detailed within the IEE were carried out at the construction sites (WWTP #1A, #2 (existing WWTP), #4 and #5) and also at the nearest sensitive receptor close to the market "Smart". The obtained results do not exceed the National Environmental Standard (Maximum Permissible Level) of Noise, dust and air pollution. All measurements were temporary and conducted during the daytime from 12:00 pm to 15:00pm.

Table 16: Noise Measurement Data

N	Place of measurement	Coordinates	Results			
			Dusts Mg/m3	CO Mg/m3	SO2 Mg/m3	Noise Db Daytime 07:00 - 22:00
	National Environmental Standard (Maximum Permissible Level)		0,5	5,0	0,5	55 Residential; Institutional; Educational 70 Industrial Commercial
	Near the "Smart" (commercial space)	0457362 0701248	0.069	0.55	<0,1	57,7
	WWTP #1A	0457918 4702104	-	-	-	40.8
	Existing WWTP#2	0457000 4701079	0.002	0.13	<0,1	38.3
	WWTP#5	0458783 4699996	-	-	-	37.9
	WWTP #4	0457787 4699315	-	-	-	49.9

D.3.2 Analysis of the Water Quality

211. The description of the analyses of parameters by the National Environmental Agency, corresponding the current water quality of the Aragvi river nearby Gudauri are

presented in the Annex 02. The only available measurements correspond to July 2017, and were carried out in the framework of this project. Subsequently, regarding the preparation of the EMP, it is also expected to have measurements for the winter season (January or February), when the peak for tourism will be in Gudauri.

212. Of the results (see Table 17) the majority are well within the all international and nation standards other than Coliforms and total Phosphorous, which are both above standards, perhaps as a result of existing untreated waste water discharging into the Argvi River from Gudauri.

Map 4: Location of the control point for water quality. Aragvi river, downstream of future discharging point

Table 17. Water quality of the Aragvi river, downstream of future discharging point (July 2017)

Component	Unit	Results	Applied Methods
Suspended Solids	mg/l	10,4	ISO 11923:2007
BOD_5		1,26	ISO 5815 – 1:2010
COD		3,92	ISO 6060:2010
Total N		0,264	Ю.Ю. Лурье "Унифицированные методы анализа вод" "Unified Methods of Water Analysis"
Total P		2,079	Ю.Ю. Лурье "Унифицированные методы анализа вод" "Unified Methods of Water Analysis"
Total Coliforms	Per 1 L	700	Membranous Filtration Method

D.4 Social Surroundings, Social-Economic Description

213. Gudauri is located in the Northern Part of Georgia. The administrative center of the Gudauri is the city of Stepantsminda. The distance between Gudauri and Tbilisi is 120 km.

D.4.1 Population

214. Population of Gudauri is 800 people and tourists 5500 per day and non-staying day

tourists around 500.

215. According to development plan, there will be 5,000 local population, 15,000 tourists and 7,500 non-staying day tourists.

D.4.2 Industry and Trade

216. There are no industries in Gudauri, but there are some markets and shops, mainly acting for tourism goods, such as, ski, winter jackets, etc.

D.4.3 Agriculture

217. The ecological environment, the alpine and the abundance of forest plants contribute to the development of beekeeping in Gudauri and the unique taste of the honey.

D.4.4 Health and Education

218. There is one polyclinic operating in the Gudauri. There is no public school, but there are many sport schools existing for skiing sport.

D.4.5 Infrastructure

219. The territory of Gudauri is totally in the “Magticom”, “Geocell” and “Beeline” coverage zones. In respect of electrification, Gudauri is totally electrified. Electrical power is supplied by “Energo-Pro Georgia“.

D.4.6 Historical and Archeological Monuments

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

D.4.7 Tourism

221. Mountains occupy 80% of Georgia’s territory, therefore there are plenty of opportunities for mountain resorts development. Just a 2-hour drive from the international airport of Tbilisi, Gudauri is the leading ski resort in Georgia. From the Russian side Gudauri is accessible from the center of Vladikavkaz in about 80 km, and from the airport Vladikavkaz-Beslan in approximately 110 km. Nestled in the southern slopes of the Greater Caucasus range at an altitude of 2,196 m above sea level is the most popular ski destination in Georgia, attracting snow enthusiasts from neighboring countries and Europe.

222. Gudauri has modern infrastructure, breathtaking sights and variety of ski services such as: pistes for all level skiers starting from beginner and ending up with experts, Heliski, free-riding, speed riding, paragliding and night skiing. Number of arrivals in Gudauri during 2015/2016 ski season amounted 147 635 that represents 26% increase compared to 2014/2015. As a result of high demand Hospitality market is continuously growing. Number of accommodation facilities in the Resort amount to 43 (2026 beds). Gudauri is expected to add three hotels in 2017 (more than 600 rooms).

223. Government of Georgia is planning a lot of activities to attract many tourists in Gudauri. This sub-project is one part of these activities.

E. E ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

E.1 Summary of Activities and Anticipated Impacts

224. This subproject will have a large positive impact on Gudauri, bringing sanitary sewage services to many small business enterprises and local community. These little-medium size treatment plants are designedto have no odour, almost no maintenance and almost perfect depuration.

225. Some temporary impacts associated with construction works will occur. To deal with those impacts during pre-construction, construction and operation phases, mitigation is proposed as necessary and described in this chapter as well as in environmental management plan (EMP) section. The impact on flora and fauna both, in the construction and operation phases of the Project, is moderate. Activities to be performed within the scope of the Project were examined in 3 phases:

a. Preconstruction Period

- Pre-Construction activities.

226. The potential environmental effects of the pre-construction activities, such as contractor office set ups, necessary equipment stacks, sites preparation, and the adequacy of the accesses will be considered and all these activities will not deteriorate the existing conditions, as described in the Table below.

b. Construction Phase

- Construction of the Treatment Plants and new Sewerage as per tender drawings.

227. 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.

c. Operational Phase

- Commissioning and Operation of the Wastewater Treatment Plants
- Use of treated sludge for agriculture or/and dispose of on the landfill.

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

229. There will be no odour during the operation of WWTPs when it is working well. The spread of an unpleasant odour will occur in the air if the sediment (bacteria) dies in a bioreactor with activated sludge, only after 48 hours. This may be caused by the failure with a constant supply of oxygen, caused by damage to the air compressor in the WWTP.

230. The WWTP in Gudauri will be equipped with both operational and spare compressors, as well as with an additional electric diesel generator. Furthermore the Georgia Power Supply Company usually eliminates the damage within a few hours. Therefore, as expected, this will not allow the spread of odor at the Gudauri WWTPs.

231. The following Table provides a brief description of anticipated site-specific impacts related to the pre-construction and construction phases, according the definitions of the project “Improvement of Gudauri Waste Water Supply System”.

Table 18. Site-Specific Impacts

#	**Pre-Construction Phase. Potential Impacts During Construction site preparation works**	**Risk**	**Sites**
1.	Loss of Topsoil	Moderate	WWTPs project Area
2.	Loss of habitat to be included	Low Risk	No loss of habitats within the protected area shall be expected. Overall habitat loss will be minor given wider habitat extent and minor project footprint.
#	**Pre-Construction Phase. Potential Impacts During**	**Risk**	**Sites**
3.	Displacement of fauna	Low Risk	No damage to fauna shall be expected.
#	**Construction Phase. Potential Impacts During Construction Works**	**Risk**	**Sites**
1.	Dust, noise, vibration	High Risk	During excavation of pipe trenches within the areas of town of Gudauri. WWTPs project area
2.	Potential impact to Protected Area	Law Risk	Alternative for construction of effluent pipe from WWTP#2 to avoid impact on protected area was developed by Eptisa. During the construction of network footprint will be small and machinery used will cause relatively low vibration during a short period. Materials (aggregate and sand) will be brought only when required. Speedy completion of work and proper site clearance after completion will be ensured. Works will be conducted manually with small group of workers.
3.	Vibration impacts on local buildings from WWTP Construction.	Low Risk	Impacts from vibration, is not significant, due to the fact that all major constructions will be carried out in more that 400-500m distance from the local buildings and the nearest occupied structure located in a small rural community separated from the WWTP project area by rural road and district highway.

4.	Vibration impacts on local buildings from sewer pipe network construction.	Moderate Risk	For the pipe network, vibration impacts should be relatively small-scale temporary and no high vibration using equipment will be used during. However, there is a risk that buildings could be affected during initial ground breaking and axcavation.
5.	Pollution of surface water	Moderate Risk	Planned rehabilitation of the existing network of waste water system crosses the catchment area of the Aragvi river in several places.
	<u>Construction Phase</u>. Potential Impacts During Construction Works	**Risk**	**Sites**
6.	Flooding	Moderate Risk	Flooding may occur during construction time only at the outlet areas, nearby the river bed.
7.	Impacts on Archaeological Sites	Low Risk	No damage to any archaeological site shall be expected. The pipe laying sites in Gudauri are located in the areas of extensive on-going human impact.
8.	Impacts on traffic	High Risk	For the implementation of above mentioned project, it will be necessary to cut trenches in the streets of the city which will restrict vehicular transportation or pedestrian movement. Unique challenges will be created in the narrow streets of the town.
9.	Landslides, slumps, slips and other mass movements.	Low Risk	No large scale earthworks are planned under the Project.

10.	Impacts on flora and fauna	Moderate Risk	The impacts on flora and fauna during excavation of pipe trenches, construction of WWTPs and implementation of contractor's yard will be minimised through site selection and installation. The adequate measures identified by the national regulations will be implemented to avoid any impacts on flora and fauna
11.	Pollution risk for ground waters	Moderate Risk	No major spills of fuel and lubricates at construction sites due to leakages are expected. The spills, which are likely to cause groundwater contamination, may occur during fueling construction machinery at the construction sites and/or construction camps.
12.	Pollution risk for air quality	Low Risk	Air pollution may occur in the inhibited areas, including town of Gudauri
#	**<u>Construction Phase</u>. Potential Impacts During Construction Works**	**Risk**	**Sites**
13.	Poaching by construction workers	Low Risk	Aragvi river.
14.	Hazardous Construction Wastes	Low Risk	Small quantities of hazardous wastes will be generated as a result of vehicle operations and the maintenance activities.
15.	Impact on existing infrastructure	Low Risk	Electric power transmission systems, existing water supply and drainage channel systems and channels.
16.	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.
17.	Construction Related Impacts at the Quarrying Sites	Low Risk	The exploration of the borrow pits should be conducted by the licensed companies or the Contractor has to obtain its own license. However, potential impact of the increased quarrying activities on river bed and floodplain landscape, ichthyofauna and groundwater should be considered.

18.	Increased flow to river	Low Risk	The future maximum quantity of treated water from the new WWTPs that will be incorporated to the Aragvi river will be almost insignificant, since it will represent scarcely 1 per cent of the natural river flow.
19.	Change in aquatic ecology of discharge channel (may be positive if polluted) Total system failure due to electricity fault.	Low Risk	No significant change is expected in aquatic ecology of the River, as justified before, the future maximum quantity of treated water from the new WWTPs that will be incorporated to the Aragvi river will be almost insignificant, since it will represent scarcely 1 per cent of the natural river flow.

E.2 Developing Environmental Documents

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

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

a. Define boundaries
b. Identify sensitive receptors & environmental values
c. Specify construction activities
d. Conduct risk assessment
e. Assign environmental management measures
f. Prepare monitoring plan
g. Prepare site plans
h. Prepare environmental work plan

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

i. Following the specifics of the work to be accomplished, the Construction Contractor must develop the Site Specific Waste Management Plan. This document must describe the methods to prepare the construction site and manage the waste originated during construction (collection, transportation, recycling/reuse and placement).

ii. Following the location of the construction site, the Construction Contractor prior to the onset of the construction must develop the Site Specific Noise Management Plan. This document must give the model of the sources and distribution of the noise originated at the construction stage, and possible impact on the adjacent facilities, as well as all mitigation measures and methods to monitor them.

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

E.3 Air Quality

E.3.1 Noise, Dust and Vibration

i. Construction Phase

236. 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. During the pipe replacement stage the rehabilitation works are to be carried out in Gudauri streets. The noise and dust generated in course of excavating the trenches will cause nuisance of the local residents that will further increase during winter season assuming growth of the population on the account of holiday makers.

237. Assessment of the noise, caused by construction activities is based on existing information about operation of various equipment at various stages of construction.

238. 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 19. Noise levels (Administration of the Ministry of Transport of the USA)

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

Table 20: Noise levels (California Department of Transportation)

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

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

Table 21: Noise levels and distances from noise sources

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

240. Noise sources generated by excavation for WWS pipes during construction period in scope of Gudauri are mainly engineering machinery and vehicles, and they are featured by their intermittent nature with mobility and high noise level (which is 80~90 dB from a distance of 5 meters).

241. The existing WWTP (WWTP No.2) is about 300-500 m and more from the nearest occupied structure located in a small rural community separated from the WWTP project area by rural road and district highway. All other WWTPs are also away from any local receptors.

242. Transporting construction materials and spoil materials for disposal. These activities will create a nuisance. Therefore, it is important to consult local authority to seek approval on route that allow to be used for transporting these materials. In addition, The contractor will need to inspect roads used for the transport of earthworks prior to the start of works for their condition and every day, making sure that debris waste materials and earth has not fallen off the back of trucks, generating safety concerns and dust; and that immediate clean up occur if problems are noted. All such trucks will need to be equipped with covers preventing spillage and reducing wind- blown dust from vehicles.

243. Some construction material will also be fabricated by suppliers outside the WWTPs project areas and will need to be trucked through residential areas, creating noise, dust and intermittent traffic congestion. Route selection and timing of these movement, will help to minimize these annoyances. There will be no mobile aggregate of concrete batch plant operations and therefore little noise other than from excavation equipment. Contractors will be required to mitigate noise, dust and other air emissions constantly. This will be achieved through the use of low noise construction equipment (e.g., jackhammers used to break up asphalt and concrete during the sewer work), strict control over working hours, and the installation of temporary noise barriers, such as plywood/foam board barriers at highly sensitive receptors such as playgrounds and in front of the local polyclinic. Limiting the operation of high-noise equipment during the sewer placement to between 0700 and 1730 hr, will help to reduce noise annoyance.

244. Furthermore, the contractor will conduct field noise surveys at each active construction site, at least once a month. The IPMO has to give strict instruction to the contractor on how to mitigate the excessive noise, if any violation of local standard is observed.

Mitigation Measures

245. These impacts can be reduced by a variety of measures. These include:

a. Require adherence to engine maintenance schedules and standards to reduce air pollution.
b. Use of defined, well planned haulage routes and reductions in vehicle speed where required;
c. Haul materials to and from the site in off peak traffic hours;
d. Halting work during excessive winds.
e. Immediately replacing defective equipment and removing it from the work site
f. No truck movements in inhabited areas between 22:00 and 8:00.

g. The population to be informed regarding the pending works.

246. The types of activities during the construction with the potential to generate dust along the Scheme route include: a) movement of vehicles; b); minor demolition (e.g. concrete bases and footings); d) excavation works e) construction of retaining walls; removal of top soil and vegetation.

Mitigation measures:

a. Damp down unsatisfied /bad condition roads to avoid dust generation while using for transport of waste/material
b. Use tarpaulins to cover loose material that is transported to and from the site by truck
c. Control dust generation while unloading the loose material (particularly aggregate and sand) at the site by sprinkling water/unloading inside barricaded area;
d. Clean wheels and undercarriage of haul trucks prior to leaving construction site;
e. Bring the material (aggregate and sand) as and when required;
f. Ensure speedy completion of work and proper site clearance after completion

247. Vibration from the construction activities is a cause concern to the community. The effects of vibration varies and depends on the magnitude of the vibration source, the particular ground conditions between the source and receiver, presence of rocks or other large structures in the area. The intensity, duration, frequency and number of occurrences of a vibration all play an important role in both the annoyance levels caused and the strains induced in structures.

248. Sources of vibration includes construction equipment movement, pile driving, compaction, hammering (hydraulic or pneumatic) and operation of generators. The construction activities are undertaken essentially on ground surface and spreads basically as two-dimensional waves.

249. Table 22 provides an indication of the approximate vibration levels that may be expected for various vibration sources.

Table 22: Approximate Vibration Levels for Various Sources

Activity	Typical levels of ground vibration
Vibratory rollers	Up to 1.5 mm/s at distances of 25 m Higher levels could occur at closer distances; however, no damage would be expected for any building at distances greater than approximately 12 m (for a medium to heavy roller)
Hydraulic rock breakers (levels typical of a large rock breaker operating in hard sandstone)	4.50 mm/s at 5 m 1.30 mm/s at 10 m 0.4 mm/s at 20 m 0.10 mm/s at 50 m
Compactor	20 mm/s at distances of approximately 5 m, 2 mm/s at distances of 15m. at

	distances greater than 30 m, vibration is usually below 0.3 mm/s
Pile driving/removal	1 to 3 mm/s at distances of 25 m to 50 m depending on soil conditions and the energy of the pile driving hammer
Bulldozers	1 to 2 mm/s at distances of approximately 5 m. at distances greater than 20 m. vibration is usually below 0.32 mm/s
Air track drill	4 to 5 mm/s at a distance of approximately 5 m, and 1.5 mm/s at 10 m. at distances greater than 25 m, vibration is usually below 0.6 mm/s and at 50 m or more, vibration is usually below 0.1 mms
Truck traffic (over normal (smooth) road surfaces)	0.01 to 0.2 mm/s at the footing of buildings located 10 to 20 m from a roadway
Truck traffic (over irregular surfaces)	0.1 to 2.0 mm/s at the footings of buildings located 10 m to 20 m from a roadway

Mitigation Measures

- Prior to the commencement of any activity, the Contractor shall identify whether any machinery or planned action will cause significant vibration. If is the answer is yes, the Contractor is to undertake a condition survey of all structures within the zone of influence to be set as part of the SSEMP developement;
- The Contractor shall monitor vibration at the nearest vibration-sensitive receptors at the start of and during use of construction equipment causing vibration. If vibration levels are monitored and found to exceed the vibration threshold set as part of the SSEMP development according to relevant criteria, the Contractor shall modify the construction activities until compliance with the criteria has been achieved.

E.4 Water Quality

E.4.1 Contaminations of Surface Water (Construction Phase)

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

251. 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

252. 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.
- lubricants/fuels should be placed in drip tray or bunded area to 100% of volume stored.

Operational Phase

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

254. The operation of WWTPs will generate treated wastewater. As commented, treated wastewater will be mainly discharged into the Aragvi river (WWTPs #1A, #2, #3 and #4), and in a much smaller amount towards the Eastern ravine (#1B and #5). The quality of the surface water will significantly improve. The quality of the effluent will be in accordance with European and Georgian regulations and can be discharged into the surface water without harm. Georgian legislation requires the preparation of a Report on the Maximum Allowable Discharge into the surface water body.

255. 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.

256. The report confirms the applicability of the norms for Aragvi River. The design of the wastewater treatment plant is in line with these effluent quality parameters.

Table 23: Maximum Permissible Discharge

N°	Parameter	Permissible concentration (mg/l)
1	Suspended solids	**60**
2	BOD_5	**35**
3	COD	**125**
4	Total Nitrogen	**15**
5	Total Phosphorus	**2**

E.4.2 Contamination Underground Water

257. Groundwater table depth within the Project zone is 5-6 meter therefore potential impact arises from implementation and maintenance of contrac'ors' yard, transport, maintenance of vehicles and handling and storage of lubricants and fuel. The required provisions for contra'tor's yard are described in the chapter on impacts and mitigation measures concerning quality of soils.

E.4.2 Downstream users

258. The treated sewage water from WWTPs will be mainly discharged to the Aragvi river. Although there is no precise information on downstream users, the proposed treatment technology will have a positive impact with respect to the conditions in which wastewater is currently flowing into the river bed.

E.5 Soils Quality and Topsoil Management Construction Phase

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

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

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

Mitigation Measures

261. 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 bunded facility with a storage capacity of 110% of the volume of the fuel stored;
- A proper drain should be installed of the concrete bund
- for safely discharging the leakages and prior to this, extracting any contaminated water, prior to discharge.

Operational Phase

262. 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 maybe "bogged". To avoid any kind of leakage due to loss of power supply, each plant will have a small electrical generator.

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

264. Operation of the WWTPs will generate sludge from the treatment processes. The sludge has to be removed regularly to maintain good operational performance. The cannot simply be disposed without proper treatment since it may cause land pollution. To ensure compliance with EHS standards, including the Total coliform bacteria and all indicative values for treated sanitary sewage discharges, the WWTPs will have a disinfection module for the treatment prior to discharge.

265. Another alternative for the disposal of the sludge is its use as fertilizer in agriculture. As there is no other industry in Gudauri the sludge quality is expected to be suitable for this usage. The WWTP will be equipped with a storage place with a volume of about 1000 m^3 where sludge is temporarily stored and can be collected by interested farmers. When UWSCG would give away the sludge for free, transportation would have to be provided by the farmers. After some weeks of operation, when UWSCG will have a better understanding of the quality and quantity of the sludge, UWSCG will anunounce the possibility to collect sludge from the site of the WWTP. Depending on the seasonal demand for fertilizer, the UWSCG will manage the temporary storage at the WWTP in such a way that a potential demand can be best served. In any case management will be carried out to ensure that no unpleasant odors occur in the environment and under the approval of the Ministry of Environment and Natural Resources Protection of Georgia.

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

Table 24: Limit Values Heavy Metals

Heavy metal	**Limit values for concentrations of heavy metals in soils** mg/kg of dry matter	**Limit values for heavy metal concentrations in sludge** mg/kg of dry matter	**Limit values for amounts of heavy metals which may be added annually to agricultural land** kg/ha/yr
Cadmium	1-3	20 – 40	0.15
Copper–50 - 140	1,–00 - 1,750	12	
Nickel	30 -75	300 – 400	3
Lead–50 - 300	750 – 1,200	15	
Zinc	–50 - 300	2,500 – 4,000	30
Mercury	1 - 1.5–16 - 25	0.1	

Mitigation Measures

267. 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.

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

E.6 Biological Environment

Impacts during Construction

269. The impacts on flora and fauna during excavation of pipes, construction of WWTPs and implementation of contractor's yard will be minimized through site selection and installation. As it was mentioned above effluent pipe will be build right along the edge of the Protected Area. The boarder of the protected area will be demarcated, Tool box talks delivered to contractors on how it MUST be avoided. We need to ensure that indirect impacts like run-off or spills don't get into it and fauna that may be associated with it is not affected, so ensuring excavations are closed at night or have self-rescue slopes included, food waste is not left on site and excavations are checked each morning.

270. The following measures need to be implemented to avoid any impacts on flora and fauna:

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

Impacts During Operation

271. The operation of the wastewater supply components of the subproject shall not have any significant negative impact on the biological environment. WWTPs will have the capacity to overcome possible emergency situations. The proposed technological process will enable the WWTPs to remain operational even in the event of general power failures, as they will be equipped with an electrical generator. If necessary, during emergency episodes it will be possible to expand its capacity in a modular manner using several treatment lines simultaneously. This will prevent untreated water discharges into the river and ensure that they do not produce unpleasant odors in their immediate environment.

E.7 Traffic

Impacts during Construction

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

- **Traffic management**. A traffic control and operation plan will be prepared together with the local traffic management authority prior to any construction. The plan shall include provisions for diverting or scheduling construction traffic to avoid morning and afternoon peak traffic hours, regulating traffic at road crossings with an emphasis on ensuring public safety through clear signs, controls and planning in advance;

Information disclosure

273. Residents and businesses will be informed in advance through media of the project activities. A public relations officer will be hired by a contractor who will be the contact person for any information that will be distributed to the local population. Also, posters including details of upcoming works will be developed by a contractor.

274. 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

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

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

Impacts During Operation

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

E.8 Other Wastes from Construction Activities

Non-hazardous waste

E.8.1 Construction Waste

277. Non-hazardous construction waste may be generated on the storage and construction area and will be collected by contractor's workers. Construction wastes in significant amounts will be generated during demolishing of existing buildings of WWTP #2. Storage of such wastes in area close to settlement and untimely or improper disposal may impact on air quality, dust generation and disturbance of neighboring settlements. In addition, waste from packing materials and woods also will be generated.

278. Disposal of construction wastes both on the sites and at the temporary storage facilities has to meet the following requirements:

- 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 can be transferred only to a certified contractor.

Scrap metals

220. Old equipment from WWTP and sewer network, such us old pumps, pipes and etc. will be handed over to the nearest local service center for further use, recycling or disposal.

Mitigation measures:

- Segregation of wastes on recyclable and non-recyclable wastes;
- Selling recyclable wastes to relevant organizations and timely disposal of non-recyclable wastes to the landfill, determinate by local Municipality;
- Burning of waste on any construction site is forbidden small branches from felled trees and bushes will be donated to the local population;
- Create a safe (sheltered with concrete foundation) storage facility

E.8.2 Inert Waste

221. Inert construction waste is accumulated during the construction of new reservoirs, laying the new pipes and replacing the old ones, also during implementation of transmission mains. Such waste is first of all: asphalt and ground.

222. Within the proposed project waste water network has to be newly laid and some part of the network has to be re-placed.

279. The said waste will be transported and placed on the nearest landfill in Gudauri.

E.8.3 Municipal Waste

280. Municipal solid wastes and waste waters will be generated at the construction and camp sites. Mainly this is rubbish, plastic or glass bottles, glasses, waste food, etc. Improper wastes management may cause the spread of infectious diseases, emergence of insects and parasites in construction camp sites. In addition, it may lead to conflict with local population.

281. Waste should be collected both by the specially assigned personnel and the workshop workers on the area. The waste will require segregation and will need to follow the waste hierarchy – reduce, reuse, recycle. For food contaminated or other non-recyclable items the waste will be placed into 0.24m3 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;
- The waste hierarchy should be followed as far as possible;
- Plastic containers should be closed to prevent spread of the smell and also to avoid contact of rodents and insects with the waste.

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

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

283. 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.

Mitigation measures:

284. The followings shall be implemented for proper waste management:

- Segregation of wastes on recyclable and non-recyclable wastes;
- Selling recyclable wastes to relevant organizations (paper, scraps, accumulators) and timely disposal of non-recyclable wastes to the landfill

- Providing hydro isolated septic tank for collecting waste waters at the camp sites and bio toilets for workers at the construction sites and timely disposal of waste waters to the local waste water treatment plants.

E.8.4 Hazardous construction wastes

285. During construction phase hazardous wastes will be generated from vehicle operation and maintenance and rehabilitation works within the proposed projects. In addition, there is possibility of presence of asbestos materials in remaining building of the original WWTP and the existing sewer network (See Annex 5 - Asbestos-Containing Material Management Plan).

Mitigation Measures

286. There is a specific hazardous waste treatment facilities in Georgia. However, prior to disposal appropriate consultation and agreement of MoENRP is 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.

Mitigation measures:

287. A separate Waste Management Plan needs to be developed by Contractor, endorsed by SC and approved by UWSCG and agreed with the MoENRP of Georgia. The Plan has to include information about type of generating wastes, procedure of their collection and disposal in accordance with the new Solid Waste Code of Georgia and per the SPS 2009. All waste should be processed following the waste hierarchy and be segregated, recyclables should be sent to recycle, only waste not recyclable should be compacted and sent to landfill.

E.8.5 Medical Waste

288. 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 (Sanitary).

E.9 Impacts on Archaeological Sites

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

Mitigation Measures

290. 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.

291. Therefore steps should be taken to minimize the risk.

- 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.

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

E.10 Socio-Cultural Resources Impacts during Construction

293. There are limited social-cultural resources (such as school, church, recreation and entertainment centre, 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
- 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
- Timing of work to avoid the peak tourist season during mid winter.

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

- Following standard and safe procedures for all activities - such as provision of shoring in deeper trenches (> 2 m)
- Excluding public from the site - enclosing the construction area and provide warning

and sign boards, and security personnel

- Providing adequate lighting to avoid accidents
- Ensuring that all workers are provided with and use appropriate Personal Protective Equipment - helmets, hand gloves, boots, masks, safety belts (while working at heights etc.).
- Maintaining accidents records and report regularly
- Traffic control. Irregular control of trucks by local police (radar control, safety control). Speed limits to be introduced within construction areas and on access roads.
- Yellow / orange warning tape to protect workers and pedestrians from falling into building pits, to prevent pedestrians from entering the construction site. Warning signs to prevent accidents within the construction site and on access roads.
- Workers of the Gudauri WWS project can be exposed to very low temperatures in winter. In addition Autumn and Spring can still be cold in Gudauri, therefore Contractor is required to be well prepared for the hazards of a cold winter with combination of high-quality protective clothing and careful safety management to protect its workers.

295. *Economic Benefits.* There could be some short-term socio-economic benefits from the construction work if local people gain employment in the workforce. To ensure that these benefits are directed to local people, the Contractor should be required to employ as much of his labour force as possible from the local communities in the vicinity of construction sites. Drawing of majority of workforce from local communities will avoid problems that can occur if workers are imported, including social conflicts and issues of health and sanitation due to labour camps. If temporary labour camps are to be provided, Contractor should ensure that they are maintained well with proper water supply and sanitation facilities. In unavoidable case of sourcing labour from other areas, provide adequate housing facilities so that there are no impacts and conflict with the local people. Following measures shall be followed:

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

E.11 Construction Camps

296. 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.

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

- Layout plan of the work camp including a description of all precautionary measures proposed to avoid potential adverse impacts on the receiving environment (surface and ground water, soils, ambient air, human settlement);
- Sewage management plan for provision of sanitary latrines and proper sewage collection and disposal system to prevent pollution of watercourses or groundwater;

- Waste management plan covering the provision of garbage bins, regular collection and disposal in a hygienic manner, as well as proposed disposal sites for various types of wastes (e.g., domestic waste, used tires, etc.) consistent with applicable national regulations; and
- Description and layout of equipment maintenance areas and lubricant and fuel storage facilities including distance from the nearest surface water body. Storage facilities for fuels and chemicals will be located at a safe distance to the water body. Such facilities will be bounded and provided with impermeable lining to contain spillage and prevent soil and water contamination.
- These plans will be approved by the Engineer prior to beginning of construction activities.

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

E.12 Construction Related Impacts at the Quarrying Sites

299. The quarries and borrow pits will be finally selected by the contractor. However, potential impact of the increased quarrying activities on river bed and floodplain landscape, ichthyofauna and groundwater should be considered.

Mitigation Measures

300. 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.

301. Quarry and Borrow Sites. The following measures shall be implemented at quarry and borrow sites to minimize impacts on water quality, reduce dust emission during transport, minimize soil erosion and siltation of nearby water courses and avoid damage to productive land and ecologically sensitive areas:

(i) Utilize readily available sources of materials. If contractor procures materials from existing borrow pits and quarries, ensure that these conform to all relevant regulatory requirements;
(ii) Borrow areas and quarries (if these are being opened up exclusively for the project) must comply with environmental requirements, as applicable.
(iii) If additional quarries will be required after construction has started, obtain written approval from IPMO and contractor and
(iv) Submit to IPMO on a monthly basis the documentation of sources of materials
(v) Ensure satisfactory reinstatement of the site if the quarries are opened for this proposed project
(vi)

302. Relevant SSEMP, including some level of Impact Assessment should be prepared by contractor about 10 days before starting quarrying activities.

E.13 Existing Asbestos Pipes

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

304. Best practice only requires the removal of asbestos cement pipe that is exposed and will be disturbed during repair or replacement activities.

305. When a section of asbestos cement pipe is being repaired or replaced, the remaining portions of that pipeline are not required to be removed, provided that they are not exposed by excavation activity.

306. Additionally, if a section of asbestos cement pipe that is being actively used (e.g., a utility conduit) is exposed by excavation but will not be impacted by the repair or replacement work, it may be left in place and backfilled. Asbestos management plan is attached to this IEE (see Annex 5)

Mitigation Measures

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

- Special training for the personnel of the contractor;
- Environmental specialist of the consulting company must develop a special procedure and present to the water company which will be used in the process of cutting of the trenches in case of the connection with the existing Asbestos pipes;
- Environmental specialist of the contractor must attend the process of cutting of the trenches;
- In case of finding asbestos pipes, the excavator must stop working and cutting of the trenches must be continued by means of the blade;
- In case of the damage of Asbestos pipes the construction works must be stopped. Environmental specialist of the consulting company should be immediately informed about this and the fact should be written down by environmental specialist of the contractor;
- Further works to be implemented only after issuance of the permission.
- All workers and personal on the construction site should be equipped with PPE
- Usage of appropriate breathing apparatus and protective equipment by persons delegated to deal with the AC material;
- Suppress dust by spraying of water

E.14 Cumulative Impacts

308. The following infrastructure projects are underway and are planned in Gudauri: the Rehabilitation of Water Supply System (phase 2) in Gudauri will start from Spring of 2018 funded by the ADB. Ongoing development of Gudauri, including New Gudauri with its new Hotels and ski trails should be considered as well.

309. It is clear that there is a certain link between these WWS projects and some cumulative effect is expected. While Water Supply and WWTP projects may coincide in time. In fact, there will be disturbance of the population of Gudauri with noise, dust, vibration and street closure as well.

310. At the same time, if the two projects are uncoordinated, the negative impact on the

population will be longer and the level of noise and vibration due to the project will be higher. In addition, an uncoordinated action of the two projects will lead to the increased amount of waste.

311. Following the above-mentioned, in case of uncoordinated implementation of the two projects, the population of Gudauri and its tourists will be subject to the cumulative negative impact, which was possible to avoid provided the projects were planned expediently. These issues were discussed during the meeting with the representatives of the small entrepreneurs and it was agreed that all activities will be coordinated on the Municipal level.

312. The cumulative impacts that would result from a combination of the proposed water supply and waste water project as well as local development activities include:

- Air Quality Impacts;
- Impacts to the Noise Environment;
- Impacts from Vibration
- Waste generation
- Traffic generation
- Impacts to the Ecological Environment (Increased Habitat Loss and Disturbance of Wildlife); and
- Impacts to the Social Environment (Visual and Landscape Impacts).

Mitigation measures:

313. As the construction activities are temporary and because suitable mitigation will be in place, the potential for significant impacts is reduced.

- Schedule the construction activities in harmony with the other on-going works Contractor should collaborate with local authority, so as to establish agreements regarding the use and maintenance of unpaved haul roads and in keeping the speed of all traffic using unpaved roads

- Consultations with the local community will be conducted to ensure coordination of the activities planned within the different projects, because when people know what is going on and what to expect, they will not be so annoyed.

E.15 Climate Change Impact

E.15.1. Natural Threats

314. As the data of the above-stated group suggest, the natural threats in the Municipality include: intense rain, flood/flashflood, mudflow, drought and hail. Although there are no systematic records yet, it seems that Flood/flashflood, river-bank erosion and hail have been more frequent in recent year.

315. At the moment, based on the existing evaluation of avalanche risk from the National Environmental Agency (NEA, July 2017), can be inferred that all areas with avalanche risk remain in the northern sector, outside the project development zone. The designed infrastructures are not affected by the risk areas identified by the NEA, as presented in the Annex 03.

E.15.2. Conclusions

316. The expected climate changes in Gudauri Municipality are not assessed yet. However, following the general trends, we may consider that the climate changes in the future make Gudauri Municipality more vulnerable to the natural threats.

E.15.3. GHG Emissions from Waste Water Systems

317. Wastewater can be a source of methane (CH4) when treated or disposed anaerobically. It can also be a source of nitrous oxide (N2O) emissions. Domestic wastewater is defined as wastewater from household water use, while industrial wastewater is from industrial practices only.

318. Methane(CH4): Wastewater as well as its sludge components can produce CH4 if it degrades anaerobically. The extent of CH4 production depends primarily on the quantity of degradable organic material in the wastewater, the temperature, and the type of treatment system. With increases in temperature, the rate of CH4 production increases. Below 15°C, significant CH4 production is unlikely because methanogens are not active. However, when the temperature rises above 15°C, CH4 production is likely to resume. The principal factor in determining the CH4 generation potential of wastewater is the amount of degradable organic material in the wastewater. Common parameters used to measure the organic component of the wastewater are the Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD). Under the same conditions, wastewater with higher COD, or BOD concentrations will generally yield more CH4 than wastewater with lower COD (or BOD) concentrations.

319. Nitrous oxide (N2O) is associated with the degradation of nitrogen components in the wastewater, e.g., urea, nitrate and protein. Domestic wastewater includes human sewage mixed with other household wastewater, which can include effluent from shower drains, sink drains, washing machines, etc. After being processed, treated effluent is typically discharged to a receiving water environment. Direct emissions of N2O may be generated during both nitrification and denitrification of the nitrogen present. Both processes can occur in the plant and in the water body that is receiving the effluent.

[7]Because the methodology is on a per person basis, emissions from commercial wastewater are estimated as part of domestic wastewater. To avoid confusion, the term municipal wastewater is not used in this text. Municipal wastewater is a mix of household, commercial and non-hazardous industrial wastewater, treated at wastewater treatment plants.

Table 25: CH_4 and N_2O emission potentials for wastewater and sludge treatment and discharge systems

Types of treatment and disposal			CH_4 and N_2O emission potentials	
C o.	Untreated	River discharge	Stagnant, oxygen-deficient rivers and lakes may allow for anaerobic decomposition to produce CH_4. Rivers, lakes and estuaries are likely sources of N_2O.	
		Sewers (closed and under ground)	Not a source of CH_4/N_2O.	
		Sewers (open)	Stagnant, overloaded open collection sewers or ditches/canals are likely significant sources of CH_4.	
		Centralized aerobic wastewater treatment plants		May produce limited CH_4 from anaerobic pockets. Poorly designed or managed aerobic treatment systems produce CH_4. Advanced plants with nutrient removal (nitrification and denitrification) are small but distinct sources of N_2O.

	T r	Aerobic treatment	Sludge anaerobic treatment in centralized aerobic	Sludge may be a significant source of CH_4 if emitted CH_4 is not recovered and flared.
			Aerobic shallow ponds	Unlikely source of CH_4/N_2O. Poorly designed or managed aerobic systems produce CH_4.
		Anaerobic treatment	Anaerobic lagoons	Likely source of CH_4. Not a source of N_2O.
			Anaerobic reactors	May be a significant source of CH_4 if emitted CH_4 is not recovered and flared.

Wastewater Treatment

320. Wastewater treatment systems are designed to remove soluble organic matter, suspended solids, pathogenic organisms, and chemical contaminants in wastewaters before the water can be discharged into natural water systems. Wastewater treatment systems used to treat household wastewater and sewage are referred to as municipal wastewater treatment systems. Wastewater treatment systems used to treat wastewater generated at an industrial facility are referred to as industrial wastewater treatment systems.

321. When considering CO2 emissions from wastewater treatment systems, there are two primary classes of biological treatment units: aerobic treatment units and anaerobic treatment units. Regardless of the type of biological treatment employed, the biochemical reactions are similar, with organic carbon compounds being oxidized to form new cells, CO2 and/or CH4, and water. For those waste water treatment plants in the project towns with a capacity of over30,000 Population Equivalents (PE), the activated sludge technology with separate anaerobic sludge digestion is chosen. This technology was compared to alternatives in the feasibility study and determined to be the most feasible option as discussed in detail in Section F below.

E.15.4. Recommendations

322. For the purpose of adaptation to the climatic changes in the Municipality, the following measures are recommended:

- Restoration of the wind break belts (what was the priority of the self-government, too), what will reduce the impact of winds and promote the regulation of the temperature regime during high temperatures.

323. Evaluation of the river bed management methods to identify the most efficient methods to reduce the risks of the expected catastrophes.

324. Obtaining the information about the volume of the inert material obtained from the rivers; fixing the facts of the riverbank washout and high-risk sites; submitting this information to the body issuing the license for mining the inert materials so that to review the available resources of the inert material and regulate the mining volumes as necessary. Managing the database about the natural threats and damage inflicted by them, as well as about the agriculture, water resources, forest resources and waste management to provide a full picture of the challenges to the Municipality and plan due responses.

F. ANALYSIS OF ALTERNATIVES

F.1 Sewage system

325. After finishing the detailed inventory of the existing sewage collectors and manholes (August 2017), and considering the current register of cadastral plots, the project will be planned in detail including requested works of rehabilitation and extension of the sewage network.

F.2 Wastewater Treatment Plants

326. The alternatives for the detail design of the sewage system in Gudauri (layouts, diameters and length of pipes, etc.) depend mainly on the selected alternative for the Wastewater Treatment Plants (WWTPs). As will be explained below, these alternatives basically consist of designing a single large WWTP outside the urban nucleus of Gudauri, or the design of several WWTPs with small-medium size in different sectors of the village.

327. The first Study of Alternatives for the single large WWTP for Gudauri was based on the rotating biological contactors with the following premises:

1) No nutrient reduction was required.
2) Optimization of Operation & Maintenance costs.
3) Ensuring a quality at final discharge point in accordance with European regulations.

328. According to these premises the alternative of rotating biological contactors was chosen as preferred in the Study, because it presents the following characteristics:

1) It adapts to the extreme weather conditions in Gudauri, where temperatures reach up to -20 ^{o}C in winter.
2) The design with rotating biological contactors has inherent the provision of coverage, as required for WWTP in Gudauri.
3) This is the alternative that presents the shorter downtime and commissioning, depending on the great differences that occur between the high season (winter) and low (summer) in the ski resort and its neighboring area.
4) This is the option that would generate less waste.
5) It would reduce nitrogen, and phosphorus chemically.

329. On the other hand, the option of active sludge is the only alternative that would guarantee the nutrient reduction, as long as the waste water has temperatures above 10 oC at the entrance of the WWTP. However, active sludge has a much higher economic cost over the life of the facility compared rotating biological contactors, especially O & M costs.

330. In the second Study of Alternatives has raised as “mandatory” to reduce the phosphorus and nitrogen content in the waste waters of the future WWTP of Gudauri. The approach including the reduction of phosphorus and nitrogen radically changes the starting premises. With this new approach, the design must achieve a reduction of nitrogen below 15 ppm at the exit of the WWTP and temperatures of water above 10 oC.

331. With this new premise, the pre-selected option of rotating biological contactors was vulnerable. Considering the requirement to reduce the waste water nitrogen in the Gudauri area, even at the cost of a higher economic cost, the most robust solution was the prolonged aeration, since it is the only one that can ensure the nitrogen reduction with temperatures above 10 oC .

332. The alternative suggested consisted of a single plant, which was formed by the following facilities, working by phases in the two different seasons and in the whole period of

life (different volumes and capacities):

1) Inlet chamber: one well with pre-rough filtering designed for future high season
2) One raw water pumping
3) One compact pre-treatment, designed for the current low season
4) One conventional pretreatment for the rest of the seasons, i. e., current high season, future low season and future high season, and that would be formed by:
    a) Four fine thinning channels (3 + 1R)
    b) Three desanders-degreasers
5) Three biological rafts x 1,800 m3 of unit volume
6) A secondary decanter (5 m diameter) for the current low season
7) Three secondary decanters designed for future high season
8) A thickener designed for future high season
9) A sludge drier designed for future high season

333. It should be noted that before proceeding to the detail design of the WWTP Gudauri, it is essential to verify properly the adjustment of the starting data regarding the loads (nutrients and volumes) and the temperatures that will have the waste water at the inlet of the WWTP."

334. The Final Alternative was one different approach with several plants spread over the area by districts or sectors, according the catchment areas. These little-medium size plants are designed as with no smell, almost no maintenance and almost perfect depuration.

335. According this approach two problems would be solved: the temperature of the inlet water to the WWTP because of the short distance to run up to, and the inexistence of long line of collectors crossing all the village. As is described at following table, the design will include 1 plant for 2000 m3/day; 1 plant for 700-750 m3/day; and 4 plants for maximum 350 m3/day.

Table 26: Final Alternative: Sewage districts and WWTPs location (first approach)

WWTP	SEWAGE DISTRICT	SEWAGE CATCHMENT (hectares)*	UTMX-38T*	UTMY-38T*	LONG*	LAT*	ESTIMATED MAXIMUM CAPACITY (m^3/day)*
1A	New Gudauri	37.43	457873.5051	4702007.8219	44.487546	42.469260	750
1B	Gudauri Heights	70.91	458944.4047	4702446.6644	44.500543	42.473271	350
2	Upper and Central Gudauri	185.27	457000.4612	4701079.2613	44.476997	42.460855	2000
3	Gudauri Downtown	47.31	457566.0210	4700615.7852	44.483915	42.456708	350
4	Plateau-Lower Gudauri	54.22	457719.4894	4699446.3518	44.485862	42.446189	700 or 750
5	Seturebi	38.18	458895.2020	4699836.7074	44.500134	42.449764	350

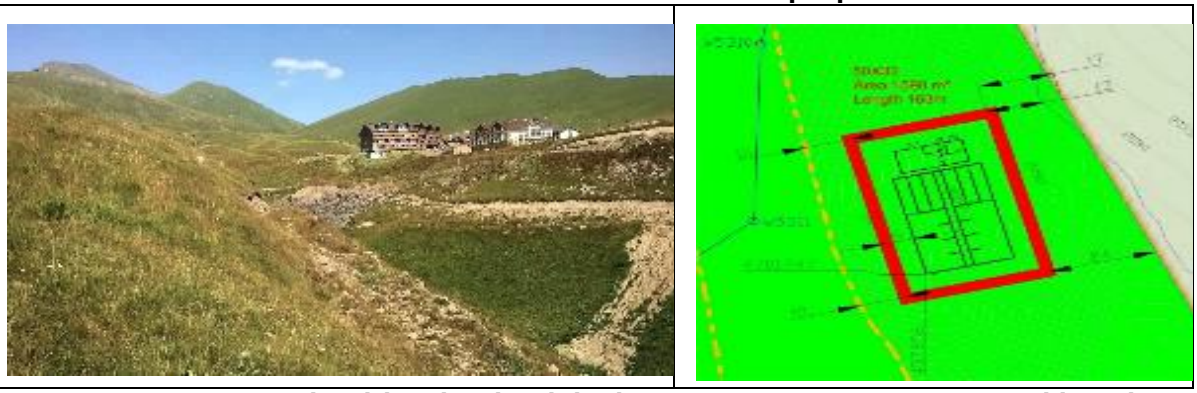
* Provisional

336. It is also important to state that some of these proposed locations for the WWTPs as well as the wastewater discharge network were changed or moved with respect to the first design study, including their surrounding technical areas, in order to avoid the Kazbegi

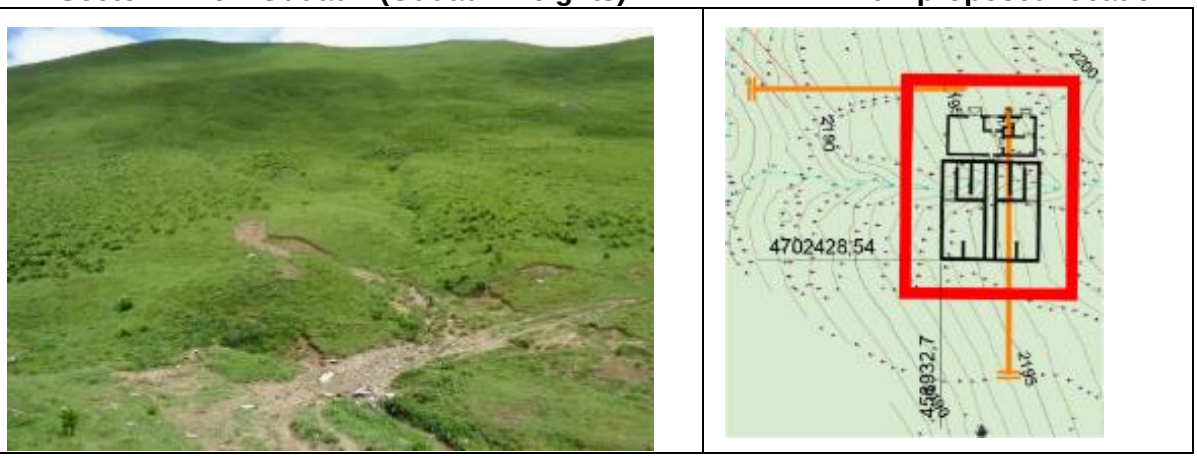
National Park and protected area, and also the current private plots. The new proposals will only occupy public parcels and will maintain the technical distances with respect to the existing infrastructures and supply lines, as presented in the following figure.

Figure 10. WWTPs locations changed to avoid impacts to the protected areas and the private land plots

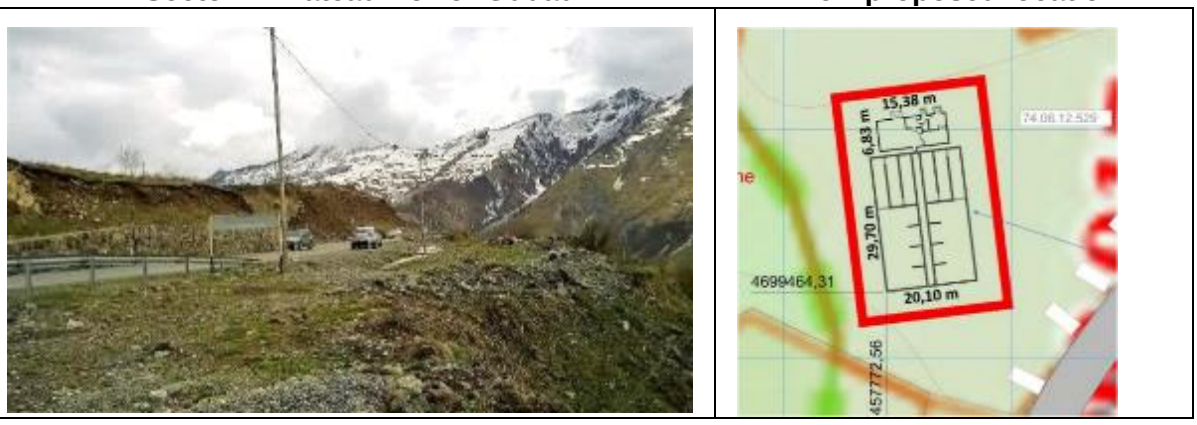
Sector 1. New Gudauri - WWTP Nº 1A. New proposed location.



Sector 1. New Gudauri (Gudauri Heights) - WWTP Nº 1B. New proposed location.



–Sector 4. Plateau-Lower Gudauri - WWTP Nº 4. New proposed location.



337. Complementary to the first study for the WTTPs outlets and taking in account the close proximity to the Kazbegi National Park.It was decided that detailed project design will consider the hydraulical and structural characteristics of one new pipeline for the treated waters, that must be constructed in order to avoid any direct discharge inside the protected area.

G. INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

338. One of the main goals of the IEE is to facilitate the participation of all stakeholders and local communities at all stages of the project cycle: from the pre-construction phase and construction activities to its operation. In this regards, a number of consultations were held in the project area to capture the stakeholders' opinions about the project, and agree on the project activities.

339. Consultations have been carried out with the representatives of the Ministry of Environment and Natural Resources Protection of Georgia on 7 June 2017, namely the Agency of Protected Areas and Water Resources Division of Integrated Department of MoENRP of Georgia. Meetings were attended by the representatives of Agency of Protected Areas, SC/EPTISA, UWSCG/USIIP, ADB/Georgian Resident Mission and representatives of the Water Division (List of participants are presented in ANNEX 4).

340. Additional consultations have been carried out with the Agency of Protected Areas of MoENRP, to discuss close proximity of the WWTP#2 to the Kazbegi National Park. Final agreement was made on the technical and environmental characteristics of the Project Design, namely the layout of the effluent pipe from WWTP#2 down to the River Aragvi without affecting the Protected Area. Table 27 below presents list of consultations and meetings carried out during the preparation of this IEE.

Table 27: List of Consultations Conducted during the Preparation of the IEE

N_0	Agency/ Location	Data of Consultation/Meetings	Comments
1	Ministry of Environment and Natural Resources Protection/Agnecy of Protected Area	June 7, 2017	
2	Water Resources Division, Integrated Department of MoENRP	June 7, 2017	
3	Local population, representatives of business community/Gudauri	June 9, 2017	Consultations were carried out with the representatives of the local business communities directly in Gudauri
4	Public Consultation/UWSCG Head Office in Tbilisi	June 28, 2017	
5.	Ministry of Environment and Natural Resources Protection/Agnecy of Protected Area	October 2017	

341. Consultations were held in Gudauri with representatives of the hotel business development, on June 9, 2017.

342. The Public Hearing was held in the UWSCG's conference hall, on June 28, 2017, at 13:00 pm inviting all internal and external stakeholders, such as representatives of the Gudauri Business community, the Eptisa supervisory company and representatives of UWSCG. The meetings were attended by more than 20 participants. Signed list of participants is attached to the proposed IEE (see ANNEX 4).

343. The dialog was made through informing communities about the proposed project and obtaining suggestions about the anticipated environmental impacts and developed mitigation measures. Project objectives and main findings of conducted environmental assessment, EMP and GRM was presented in Power Point presentation, by the USIIP environmental specialist Ms.Kate Chomakhidze. Hard copies of EMP translated in Georgian were distributed among participants. People were requested to give their opinions and suggestions about the proposed project. In addition, participants were provided with contact information of IPMO and USIIP Environmental Specialist for further suggestions and questions.

344. The stakeholders/consultation participants were informed that Contractors would develop a Banner with information on project objectives, activities, implementers, schedule of construction works, deadlines, contact information and logbooks for complaints and

suggestions on each construction site.

345. The main issues raised during the public consultation are presented in the Table 28 below:

Table 28: Issues raised during public consultation of Gudauri WWTP project

Issues raised	Response	Addressed in IEE
Scope and area of the project activities, including type of works to be implemented within the project	More detail information on Gudauri were provided	Details provided in Chapter proposed IEE, Executive Summary and description of project
Roles and responsibilities of community and other stakeholders	Number of public awareness activities will be provided for communities and business representatives of Gudauri as part of awareness raising program to be implemented by the SC with close cooperation of UWSCG/IPMO and PA department Informational leaflets will be developed and distributed among the local population. including information about GRM as well	Details is provided in Ch–pter H - Grievance Redress Mechanism
Life time of pipes	Polyethylene pipes characterized by extremely low roughness coefficient will be used for the construction of the water network, which ensure more than 40 years life time	Details explained by Eptisa
Project implementation timing	Expected duration of the project is 2 years, starting date – beginning of 2018 and completion date – beginning of 2020	Information is presented in Executive Summary
Implementation Arrangements and Responsibilities	The main institutions that will be involved in implementation of the sub-projects are UWSCG the USIIP, Supervision Consultant (SC) the Contractor and to a lesser extent the Ministry of Environment and Natural Resources Protection of Georgia (MoENRP).	Details are provided in Para 316-323 below

346. As is was already mentioned above during the public consultations the GRM was

discussed in details. Stakeholders were explained that GRM to be a continuous process that envisages a collaboration of the Implementation Agency with population during the entire project cycle. The detailed information on this mechanism is presented in the chapter H of the proposed IEE.

347. This IEE incorporates comments and suggestions from all concerned stakeholders. The final IEE report will be made available on UWSCG official website and in English on ADB's website.

348. For the interested parties the IEE will be available at the office of the local service center and local Municipality.

349. In order to maintain the transparency of public disclosure process, the semiannual environmental monitoring reports (EMRs) will be published on the ADB and UWSCG websites as well. The hard copies of EMRs will be also sent to the Gudauri local Municipality.

350. Future consultations for project stakeholders shall follow as mentioned below:

a. During detailed design stage, in case of any major changes in the design/alignment/location, the IEE will be updated accordingly. The IPMO will hold at least one public consultation meeting at early stages to solicit perceived impacts, issues, concerns and recommendations from affected communities.

b. in parallel to construction, the IPMO will conduct an intensive public awareness campaign to ensure the sufficient level of awareness/information among the affected communities regarding the construction, its anticipated impacts, the grievance redress mechanism, contact details and location of the IPMO, and status of compliance with the Government's environmental safeguard requirements. A community liaison officer assigned by contractor will participate in public awareness campaign

c. Among others, the information banners containing information about the subproject, implementation schedule and contact details of the executing agency and Contractors will be installed at the strategic locations within the subprojects' main areas of intervention.

H. GRIEVANCE REDRESS MECHANISM

351. For the effective implementation of a GRM system under the USIIP, UWSCG issued special order (#122) on 30 April 2014. The "Establishment of GRM within the Framework of the Asian Development Bank Funded Projects" signed by the head of UWSCG gives clear instructions to every involved stakeholder how to act when affected people are impacted by the project.

352. After issuance of the special order, a GRM was first set up by UWSCG in Kutaisi under the REG-01 project of USIIP. The GRM allows affected people to appeal any disagreeable decision, practice or activity arising from project implementation.

353. Any affected person can apply at a UWSCG local service centre through different ways, either by going to the service centre, sending a letter to the service centre, or calling a hotline. The operators of the service centre can respond by going directly to the affected person if they are disabled to get the written grievance from them. Than AP's complaints are registered by the operator of the service center and AP get queue number.

354. It should be mentioned also that complaints log book is available at each construction site and any affected person may apply to Community Liaison Officer of the contractor to fill the log book at the camp site and/or submit the complaint to the contractor directly.

Fig. 11: AP gets queue registration number at Local Service center

GRM in Gudauri will operate in three stages:

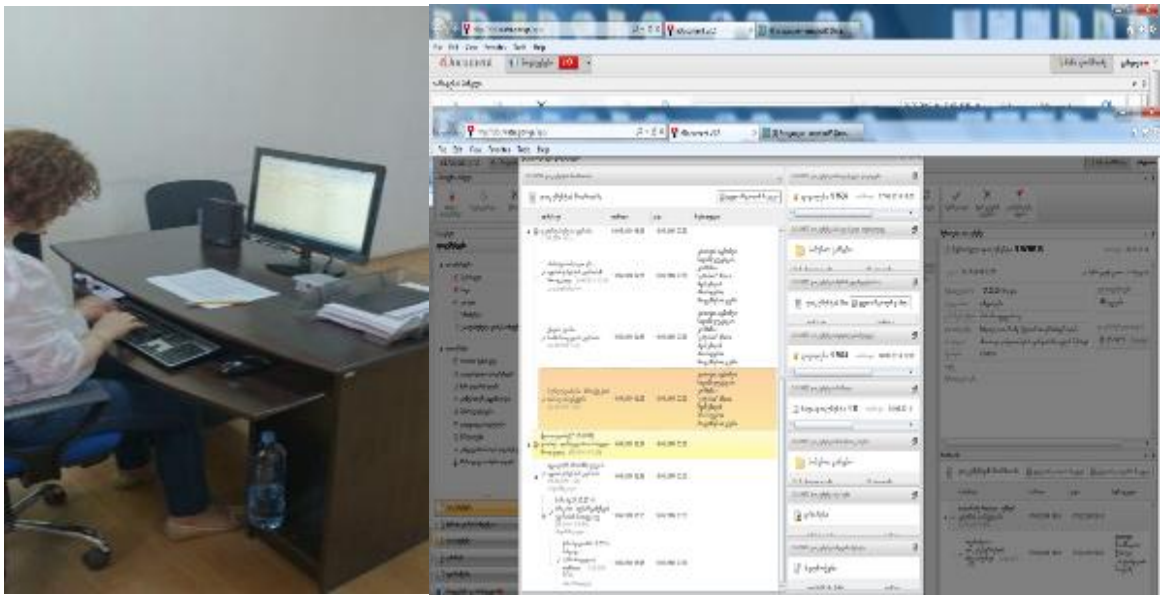
355. During the first stage, complaints are discussed within two weeks of being received by the local service centre of UWSCG, based on the verbal or written complaint. In the first stage of grievance review and resolution, an authorized representative of the local service centre is responsible for ensuring the registration of the claim and its further processing. He/she engages in the grievance review and resolution process representatives (managers and environmental specialists) of Construction and Supervision Companies, and the representatives of UWSCG central office as required. At the local service centre, the affected person is provided with a queue number and then registers the grievance at the service desk.

356. The service centre operators, who are trained1 in USIIP/Reg-01 project, register all relevant grievances with support of an online task management system, which tracks

[1] UWSCG and Supervision Consultant (Eptisa) conducted trainings for service center operators covering general procedures of GRM functioning in order to ensure proper coordination of different departments.

information on the grievance review process and the responsible person. Moreover, the operators fill the ADB complaints log with the registered grievance that coincides with local internal forms.This electronic intranet system2allows the UWSCG Tbilisi Office to immediately see claims. Therefore, claims submitted to any regional service centre can be monitored by the Head of the Investment Projects Management Office (IPMO), as well as the Head of the Environmental Protection, Resettlement and Permits Departement, Maka Goderdzishvili.

Figure 12: The Service center operator registers grievances through eDocument – Task Management System



357. When a grievance is solved positively in the first stage, the grievance is closed through an Agreement Protocol, which is reflected in the eDocument – Task Management System.

358. The grievance enters a second stage if it is not solved. In that case, the authorized representative of the local service centre will help the claimant prepare a package of grievance application documents for official submission to the Grievance Redress Committee (GRC). The package contains the following information:

- Name, ID, address and contact details of the claimant
- Description of the essence of the complaint
- Supporting documents and evidences (photos, maps, drawings/sketches, conclusion of experts or any other documents confirming the claim)
- Brief description of the actions proposed for the grievance resolution at the first stage and the reasons why these actions were denied
- Minutes of meetings conducted at the first stage

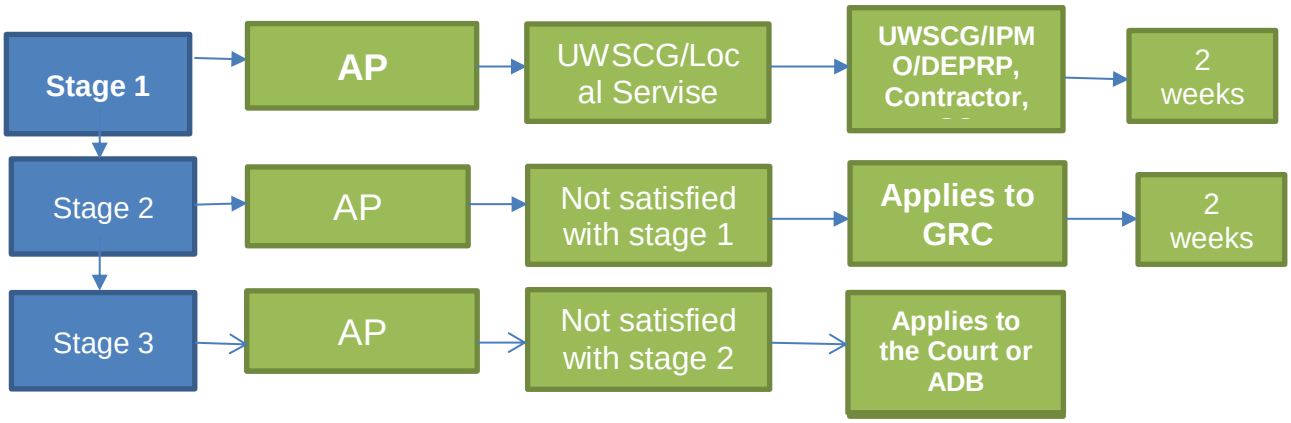
[2]The **eDocument - Task Management System** was developed by LEPL Financial-Analytical Service of the Ministry of Finance of Georgia. It is an innovative electronic document and task management mechanism for electronically processing of documents. Used by almost all the major budgetary organizations in Georgia, the eDocumentservice offers an opportunity to manage, find, and trackdocuments for information-intensive organizations. The system significantly simplifies the process of organizing and managing documents, tasks, information and processes. It thereby enables State companies, organizations and agencies to increase their efficiency and productivity. The many benefits of the eDocument service include: a) significant saving of time; b) effective management of tasks; c) flexible installation procedures; d) synchronized with MS Office; e) control of tasks implementation process; f) group working opportunities on assignments; g) automatic scanning; h) high quality security; i) electronic signature and electronic conformation; k) control of various versions of documents; and j) control of accomplished and uncompleted documents.*eDocument service is used by almost all the major budgetary organizations in Georgia.*

359. The GRC should make a decision within two weeks after the registration of the grievance. The GRC is staffed as follows: (i) Representative of self-government – the head of committee; (ii) Director/ Manager of UWSCG service centre; (iii) Investments Project Management Division representative of the company; (iv) Representative of local authoritative NGO (according to the claim reference); (v) Stakeholders' female representative;(vi) Stakeholders' informal representative; and (vii) Heads of local municipalities.

360. The GRC will review the package of grievance documents, set a date for a meeting with the claimant, discuss the claim at the meeting, and set up a plan for further actions (actions, responsible persons, schedule etc.). Upon the resolution of the case, the GRC will prepare a brief resume and protocol and the protocol signed by complainant and all parties will be registered in a grievance log.

361. There is a third stage in case there is a failure to resolve the grievance. APs can also apply to the ADB Complaints Review Officer through the Accountability Mechanism.

Figure13: GRM Mechanism



362. **Public awareness:** affected people will be fully informed of their rights and of the procedures for addressing complaints, whether verbally or in writing, during comprehensive public awareness activities (door-to-door campaign, consultation meetings and media campaign) to be carried out by the supervision consultant and UWSCG/DEPRP/PR Division.

I. ENVIRONMENTAL MANAGEMENT PLAN

I.1 Introduction

363. The Environmental Management Plan (EMP) documents the impacts identified in the EIA report, the actions required to mitigate those impacts to acceptable levels in accordance with the laws of the country and the ADB safeguard policy, and the monitoring activities that are to be undertaken as part of the project to confirm that the mitigation actions have been effective in achieving their objectives or to initiate changes in the actions required.

364. The EMP also details the institutional arrangements and capacities that currently exist, or that will be put in place as part of the project implementation, to ensure that the environmental due diligence (including the EMP) has comprehensively considered both the national and ADB requirements for environmental protection, has identified all likely environmental impacts and proposed appropriate mitigation measures, and has the systems in place to ensure that effective procedures for environmental monitoring and control of the project impacts and mitigation measures are implemented throughout the life of the project.

I.2 Environmental Impacts, Mitigation and Monitoring Plans

365. The environmental impacts associated with The proposed sub-project have been detailed above in the relevant sections of this IEE. Mitigation measures required to address the impacts identified in the IEE have been summarized in each of the relevant sections covering the physical, biological and socio-economic environment affected by the project. The impacts identified and the specific mitigation measures proposed to address them have been consolidated into the environmental mitigation plan presented in Table 30, which includes time frames, responsibilities and where applicable, estimated costs for each measure.

366. The environmental mitigation plan includes a number of standalone construction-related management plans on: health and safety; waste; sewage; soil (including topsoil and vegetation); site drainage; traffic control; noise; air pollution; dust and cultural/archeological finds. In addition, it specifies the need for the Contractor to provide method statements on spillage control and the location of fuel storage, filling stations and vehicle washing sites to be provided to ARS for approval.

367. An environmental monitoring plan is presented in Table 31 which outlines the activities and responsibilities associated with monitoring the effectiveness of the proposed mitigation plan.

I.3 Implementation Arrangements and Responsibilities

368. The main institutions that will be involved in implementation of the EMP are UWSCG the USIIP executing agency (EA), Supervision Consultant (SC) the Contractor and to a lesser extent the Ministry of Environment and Natural Resources Protection (MoENRP).

369. Investment Program Management Office (IPMO) established within UWSCG will be responsible for the day to day management of the project including implementation of the EMP. The IPMO currently has one Environmental Specialist who is responsible for management of the environmental and social aspects of USSIP.

370. The IPMO (Environmental Specialist) responsibilities in respect of implementation of the EMP are as follows:

(i) Ensure that all relevant EMP requirements (including environmental designs and mitigation measures) are duly incorporated into the project bidding documents.
(ii) Assist to obtain necessary permits and/or clearance, as required, from MoENRP and other relevant government agencies, ensuring that all necessary regulatory clearances are obtained before commencing any civil work on the project.

(iii) Ensure that contractors have access to the EMP and IEE report.
(iv) Ensure that contractors understand their responsibilities to mitigate environmental problems associated with their construction activities and facilitate training of their staff in implementation of the EMP.
(v) Approve the Site Specific Environmental Management Plan (SSEMP) before Contractor takes possession of construction site
(vi) Monitor the contractor's implementation of the EMP in accordance with the environmental monitoring plan.
(vii) Submit six monthly Environmental Monitoring Reports to ADB.
(viii) In case unpredicted environmental impacts occur during the project implementation, prepare and implement as necessary an environmental emergency program in consultation with MoENRP, any other relevant government agencies, and ADB.

371. The SC will include a part time international environmental specialist and fulltime site-based national environmental specialist to assist the IPMO supervise and monitor implementation of the EMP during construction.

372. A Non Compliance Notice will be issued to the contractor if the SC requires action to be taken. The contractor will be required to prepare a corrective action plan which is to be implemented by a date agreed with the SC. Non-compliance will be ranked according to the following criteria:

- Non Compliance Level I: A situation that is not consistent with requirements of the EMP, 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.
- Non Compliance Level II: A situation that has not yet resulted in clearly identified damage or irreversible impact, but which demonstrates potential significance. Level II requires expeditious corrective action and site-specific attention to prevent severe effects. Repeated Level II concerns may become Level III concerns if left unattended.
- Non Compliance Level III: A critical situation that will result in significant social or environmental damage occurring or a reasonable expectation of very severe impending damage. Intentional disregard of Non Compliance Notices or specific prohibitions is also classified as a Level III concern.

373. The failure to prepare a corrective action plan or to implement it within the required timeframe will result in the Employer undertaking the work at the Contractor's expense (as will be specified in the Contract).

374. The Contractor will appoint a full time Environmental Manager (EM) to be a senior member of the construction management team based on site for the duration of the contract. The EM shall have a university degree (preferably at Masters level) in Environmental Science or related discipline and have at least 10 years work experience in environmental management of infrastructure project.

375. Key responsibilities of the Contractor (through the EM) are as follows:
(i) Preparing the site specific environmental management plan (SSEMP) for endorsement by SC approval by the Employer (IPMO) prior to the Contractors taking possession of the construction site (see below)
(ii) Ensuring the SSEMP is implemented effectively throughout the construction period.
(iii) Coordinating community relations issues through acting as the Contractor's community relations focal point (proactive community consultation, complaints investigation and grievance resolution)
(iv) Establishing and maintaining site records of:
    - weekly site inspections using checklists based on SEMP,

- environmental accidents/incidents including resolution activities
- environmental monitoring data,
- non-compliance notifications issued by the DSC
- Corrective action plans issued to the DSC in response to non-compliance notices.
- Community relations activities including maintaining complaints register
- Monitoring reports
- Routine reporting of SEMP compliance and community liaison activities (see below).
- Adhoc reporting to the Employer's Engineer of environmental incidents/spillages including actions taken to resolveues

I.4 Site Specific Environmental Management Plan (SSEMP)

376. Following the award of the contract and prior to construction commencing the Contractor will review the EMP and develop this into a detailed Site Specific Environmental Management Plan (SSEMP) that amplifies the conditions established in the EMP that are specific for the site and the tasks involved. SSEMPs will include:

- Introduction & Overview of the Site Specific EMP
- Definition of Boundaries
- Sensitive Receptors and Environmental Values
- Construction Activities
- Risk Assessment
- Environmental Management Measures
- Site plan
- Environmental Monitoring Plan

377. The SSEMP will also include a monitoring plan and a reporting program corresponding to the requirements of the EMP. The SSEMP will be submitted to PIU for approval at least 10 days before taking possession of any worke.

I.5 Site Induction

378. SSEMP is confirmed with the Contractor to ensure that all compliance conditions are clearly understood. Following confirmation of the SSEMP with the Contractor the DSC's International Environmental Specialist advises the DSC Team Leader that the Contractor is now cleared to take possession of the Site and may commence moving equipment to the Site.

379. The Contractor will be responsible for ensuring that all sub-contractors abide by the conditions of the SSEMP.

Reporting

380. The Contractor will prepare a monthly concise report (Maximum 3 pages and appendices, if required) in respect of compliance with EMP/SSEMP requirements that will be submitted to the PIU through the DSC. The report will contain the following sections.

(i) Details of any environmental incidents
(ii) Status of all non-conformance identified during audits and inspections that are identified by non compliance notices.
(iii) Complaints from the public and proactive community relations activities
(iv) Monthly Accident Report
(v) Waste volumes, types and disposal
(vi) Details of any contaminated areas that have been identified and rehabilitated.
(vii) Details of any archaeological discoveries.

(viii) Details of any ecological issues.
(ix) Other relevant environmental issues.

381. The Contractor will have a duty to immediately report to the Engineer if any serious environmental breach has occurred during construction e.g. clearing of sensitive areas, serious oil spills etc.

382. ADBs responsibilities in regard to implementation of environmental safeguards requirements for the project include: undertaking periodic monitoring of the EMP implementation and due diligence as part of an overall project review mission; and if required, provide advice to company in carrying out its responsibilities to implement the EMP for the project.

I.6 Implementation Costs

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

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

Table 29: Environmental Management Cost

Item	Quantity[3]	Unit Cost	Total Cost	Remarks
Baseline Parametric Measurements	6	200 USD	1,200	To be conducted by the Contractor for air emissions, dust, vibratio measurements
Monthly Parametric Measurements (at least 3 sites) Noise, vibration and dust	108	200 USD	21 600	Tests to be conducted by the Contractor at 3 sites x 36 months monthly monitoring. Noise, dust and vibration should be monitored on the regular bases as well as during the peak operation of Construction Equipment and Machinery.
Monthly Water Quality testing	108	300 USD	32 400	To be conducted by the Contractor
Environmental Management Specialist (SC)	36 months	2,500 USD	90 000	The costs are included in the contract signed between UWSCG and SC and no additional costs will occur.

Item	Quantity[3]	Unit Cost	Total Cost	Remarks
International Environmental Specialist (SC)	36 Months			The contract with the International Environmental Specialist should be included in the contract price between the SC and UWSCG
Environmental specialist (Contractor)	36 month	1500 USD	54.000	The costs will be included in the contract signed between UWSCG and Contractor.
International Environmental Specialist (Contractor)	36 Months	-	-	The contract with the International Environmental Specialist should be included in the contract price between the contractor and UWSCG
E&HS Trainings	33 (on monthly daze)	18000 USD	5000 USD	Training should be conducted for all persons involved in construction process
Study of the landslide-prone areas and buildings and premises on the adjacent territories	1	15000	15000	Study should be conducted before construction activities started.
Traffic Specialist	12 month	2.500	30.000	Specialist will be hired in Gudauri
Construction dust and noise barriers	140 m	250	35.000	To be installed by Contractor at the WWTP construction site
Miscellaneous			251.80	10% for above Items
Subtotal			60,080.00	Total for above

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

Table 30. Environmental Impacts and Mitigation Measures

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost	Monitoring of Mitigations
Pre-construction					
Biological study of the project area	Prior to start construction activities, construction should carry out additional biological study of the project area. Results of the work submitted for consideration to UWSCG.	Contractor	Gudauri WWTP areas, main collector	6 000 USD	Check the identified mitigation measures, review & approval of report
Aquatic ecology survey of water bodies	Prior to start construction activities, contractor should carry out aquatic ecology survey of any water bodies likely to be directly or indirectly affected during the construction	Contractor	Project area	Included in Project price	Check the identified mitigation measures, review & approval of report
Consultations	Consultation should be carried out prior to the start of works to inform residents of upcoming activities, including noise, dust vibration and to make them aware of the GRM System	PA Specialist of Contractor PA Specialist of SC With cooperation of UWSCG/IPMO and PA department	Representatives of the Gudauri business communities and local population	Included in Project price	Check the number of consultations carried out, photos, issues discussed
Building survey in Gudauri	Prior to start construction activities contractor should carry out Building survey in Gudauri where there is potential for damage to buildings from vibration.	Contractor	Gudauri	Included in Project price	Review and approve building Survey report
Roads condition survey	Prior to start of construction Contractor will conduct condition survey for the roads likely to be heavily used and damaged by the project prior to the start of construction.		Gudauri project area	Included in Project price	Review and approve Road Condition Survey report
Survey of all new infrastructure locations	Prioritize areas within or nearest possible vacant space in the project location;	Contractor	Gudauri	Included in	Review of Survey report

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost	Monitoring of Mitigations
including quarry, camp, construction yard etc.	If it is deemed necessary to locate elsewhere, consider sites that will not promote instability and result in destruction of property, vegetation, and drinking water supply systems; Do not consider residential areas; Take extreme care in selecting sites to avoid direct disposal to water body (river near intake) which will inconvenience the community. For excess spoil disposal, ensure (a) site shall be selected preferably from barren, infertile lands. In case agricultural land needs to be selected, written consent from landowners will be obtained; (b) debris disposal site shall be at least 200 m away from surface water bodies; (c) no residential areas shall be located within 50 m downwind side of the site; and (d) site is minimum 250 m away from sensitive locations like settlements, ponds/lakes/ river or other water bodies			Project price	
Sources of Materials	To obtain a written approval from the MoENRP of Georgia.	Contractor		Included in Project price	(i) List of approved quarry sites and sources of materials
Utilities	(i) Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; and (ii) contractor to prepare a contingency plan to include actions to be done in case of unintentional interruption of services. (iii) Contractor to prepare spoils management plan and traffic management plan	Contractor		Included in Project price	(i) List of affected utilities and operators; (ii) spoil management plan; (iii) and traffic management plan
Preparation of "Inert Waste Management	Prior to start construction activities, contractor should choose the areas for disposal inert waste	Environmental Specialist of	Gudauri WWTP	Included in	review & approval of Inert waste

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost	Monitoring of Mitigations
Plan”	and prepare “Inert waste management plan”. Prepared plan should be submitted to SC for endorcemnet and to UWSCG for approval.	Contractor Environmental Specialist of SC Approved by UWSCG	sites	Project price	management plan
SSEMP	Prior to start construction activities, construction contractor should prepare SSEMP and submit to SC for endorcement and to UWSCG for approval.	Environmental Specialist Of Contractor ES of SC	Project Area	Included in Project price	review & approval of SSEMP
Social Issues	Contractor to hire local workers in case similar qualification to give priority local representatives.	Contractor	Contract documents	Project prise	Number of local workers employed by contractor
Possible removal of Terrestrial habitat. Loss of the top soil	If at the stage of the detailed biological study, there are rare or red-listed species are fixed in the project area, the Construction Contractor is obliged to: • Replant the rare or red-listed species found in the Project area and return them to their original site after the completion of the Project. • Attempt to avoid cutting down the trees in the Project zone (by considering the Project alternatives). • Develop a compensatory planting plan and submit it to the relevant bodies for approval, if it is unavoidable to cut down the trees. • Pay compensation sum identified by the MoENRP of Georgia	Environmental Specialist Of Construction Company	Construction and labour camp, storage area. WW Pipe construction	Part of construction cost	Number of replanted red list species Changes in design to avoid cutting of trees Developed Compensatory planting plan Amount of sum paid for compensation

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost	Monitoring of Mitigations
A negative impact on soil, water and air may be caused because of an incorrect management of the generated inertial waste. Also the generated noise, dust and vibration during demolition may cause a negative impact on the surrounding buildings and population.	Prohibited use of blasting equipment during the demolition process of reservoirs; No use of heavy duty equipment is allowed; Prior to the commencement of any activity, the Contractor shall identify whether any machinery or planned action will cause significant vibration. If is the answer is yes, the Contractor is to undertake a condition survey of all structures within the zone of influence; The Contractor shall monitor vibration at the nearest vibration-sensitive receptors at the start of and during use of non-blasting equipment causing vibration. If vibration levels are monitored and found to exceed the vibration threshold according to relevant criteria, the Contractor shall modify the construction activities until compliance with the criteria has been achieved; Restrict demolition activities during period of the high winds or under more stabile conditions when winds could nevertheless direct dust towards adjacent communities; Using a water truck for dust suppression on all exposed areas as required; Active areas adjacent to residents should be kept damp at all times; Establish and enforcing vehicle speed limits to minimize dust generation; Using tarpaulins to cover fugitive loads (for demolition concrete materials) on haul trucks moving off-site; Select plant and equipment, design work practices, and limit hours of operation to minimize potential impacts as far as practicable;	Contractor	Gudauri project sites	Included in Project price	Monitoring of noise, dust and vibration, detales are provided in table 31 below.

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost	Monitoring of Mitigations
	Operators of noisy equipments or any other workers in the vicinity of excessive noisy equipment are to be provided with ear protection equipment; Under noisy conditions, do not allow operators or other workers to be exceed the threshold that has been establish for exposure to noise; Schedule construction so as to minimize the multiple use of the most noisy equipments near sensitive receivers; Ensure that all equipments is in good repair and operated in the correct manner; Consult with local residents and building owners the address community concerns;				
Construction					

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost	Monitoring of Mitigations
Ambient Air and Local Dust[4]	• Cover or damp down by water spray on the excavated mounds of soil to control dust generation; • Apply water prior to levelling or any other earth moving activity to keep the soil moist throughout the process; • Bring the material (aggregate and sand) as and when required; • Ensure speedy completion of work and proper site clearance after completion; • Damp down unsatisfied /bad condition roads to avoid dust generation while using for transport of waste/material • Use tarpaulins to cover loose material that is transported to and from the site by truck • Control dust generation while unloading the loose material (particularly aggregate and sand) at the site by sprinkling water/unloading inside barricaded area • Clean wheels and undercarriage of haul trucks prior to leaving construction 'ite Don't allow access in the work area except workers to limit soil disturbance and prevent access by fencing	Contractor	Excavation areas for trenches at Gudauri;	Part of construction cost	(i) Location of stockpiles; (ii) Complaints from sensitive receptors; (iii) Heavy equipment and machinery with air pollution control devices; (iv) Certification that vehicles are compliant with Air Act
Surface water	(i) Prepare and implement a spoils management plan as the part of the Construction Management Plan. (ii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by	Contractor	Surface water body	Part of construction cost	(i) Areas for stockpiles, storage of fuels and lubricants and waste materials; (ii) Number of

[4]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	Monitoring of Mitigations
	tarpaulins or plastic sheets; (iii) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies; (iv) Laying of pipelines during dry season and closing of all trenches before rainy season and avoid any chances of collecting the water in the trenches or pumping. (v) Place storage areas for fuels and lubricants away from any drainage leading to water bodies; (vi) Dispose any wastes generated by installation of pipeline in designated sites; and (vii) Conduct surface quality inspection according to the Environmental Management Plan (EMP).				silt traps installed along trenches leading to water bodies; (iii) Records of surface water quality inspection; (iv) Effectiveness of water management measures; (v) No visible degradation to nearby drainages, nallahs or water bodies due to civil works
Work Camps and worksites Temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants Unsanitary and poor living conditions for workers	(i) Consult with UWSCG/IPMO before locating project offices, sheds, and construction plants; (ii) Minimize removal of vegetation and disallow cutting of trees; (iii) Provide drinking water, water for other uses, and sanitation facilities for employees; (iv) Ensure conditions of liveability at work camps are maintained at the highest standards possible at all times; (v) Prohibit employees from poaching wildlife and cutting of trees for firewood; (vi) Train employees in the storage and handling of materials which can potentially cause soil contamination; (vii) Recover used oil and lubricants and reuse or remove from the site; (viii) Manage solid waste according to the preference hierarchy: reuse, recycling and disposal to designated areas; (ix) Ensure unauthorized persons especially children are not allowed in any worksite at any given time.	Contractor	Project area	Part of construction cost	Site observation

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost	Monitoring of Mitigations
Noise Pollution5	• 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 Gudauri 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. • Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor	Environmental Specialist	Project Area	Part of construc tion cost	(i) Complaints from sensitive receptors; (ii) Use of silencers in noiseproducing equipment and sound barriers; (iii) Equivalent day and night time noise levels
Vibratiuon	• Prior to the commencement of any activity, the Contractor shall identify whether any machinery or planned action will cause significant vibration. If is the answer is yes, the Contractor is to undertake a condition survey of all structures within the zone of influence;	Environmental Specialist	Project Area	Part of construc tion cost	(i) Complaints from sensitive receptors; (ii) Equivalent day and night time vibration levels

[5]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

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost	Monitoring of Mitigations
	• The Contractor shall monitor vibration at the nearest vibration-sensitive receptors at the start of and during use of non-blasting equipment causing vibration. If vibration levels are monitored and found to exceed the vibration threshold according to relevant criteria, the Contractor shall modify the construction activities until compliance with the criteria has been achieved				
Quarry and Borrow Sites.	Utilize readily available sources of materials. If contractor procures materials from existing borrow pits and quarries, ensure that these conform to all relevant regulatory requirements; Borrow areas and quarries (if these are being opened up exclusively for the project) must comply with environmental requirements, as applicable. If additional quarries will be required after construction has started, obtain written approval from IPMO and Contractor.				
Nuisance/ disturbance to sensitive areas Schools, hospitals and religious places due construction work in the proximity (within 250 m of such place)	• No material should be stocked in this area; material shall be brought to the site as and when required • Conduct work manually with small group of workers and less noise; minimize use of equipment and vehicles • Material transport to the site should be arranged considering school timings; material should be in place before school starts; Notify concerned schools, hospitals etc.	Contractor	Gudauri	Part of construction cost	Site observation, Number of Public Awareness activities

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost	Monitoring of Mitigations
	2 weeks prior to the work conduct a 30 minutes awareness program at on nature of work, likely disturbances and risks and construction work, mitigation measures in place, entry restrictions				
Asbestos Cement Pipes Health risk due to exposure to asbestos materials	(i) Follow instructions provided in ANNEX D of this IEE - AC pipe Management plan (ii) Require all personnel (including manual labourers) to undergo training as per AC management plan (iii) Left AC pipes in-situ. (iv) Training of all personnel (including manual laborers) (v) Site-specific OH&S Plan including AC pipe protocol (vi) Development and application of a detailed OH&S procedure to protect both workers and citizens. This should comply with national and international standards for dealing with asbestos, and should include: (a) removal of all persons to a safe distance; (b) usage of appropriate breathing apparatus and protective equipment by persons delegated to deal with the AC material; and (c) Procedures for the safe removal and long-term disposal of all asbestos-containing material encountered.	Contractor Supervision Consultant	Gudauri old pipes	Part of construction cost	(i) Site-specific OH&S Plan including AC pipe protocol (iii) record of OH&S orientation on AC Cement Materials Protocol (iv) personal protective equipment for AC materials (v) sign boards for pipe alignment identified as AC pipes.
Impact on surface water bodies due to construction	• In case of heavy rain, protect open trenches from entry of rain water by raising earthen bunds with excavated soil • Confine construction area including the material storage (sand and aggregate) so that runoff from upland areas will not enter the site • Ensure that drains are not blocked with excavated soil	Of Construction Company	Project area	Part of construction cost	
Soil Contamination	• The contractors will be required to instruct and train their workforce in the storage and handling	Environmental Specialist	Construction sites	Part of construc	

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost	Monitoring of Mitigations
	of materials and chemicals that can potentially cause soil contamination. • Solid waste generated during construction and at campsites will be properly treated and safely disposed of only in demarcated waste disposal sites. • Construction chemicals will be managed property • Clearly labelling all dangerous products, • Fuel tanks (diesel or oil) should be placed in a concrete pool which its perimeter walls will be at least 1.0 m high with the concrete or plastered masonry wall, • A proper floor drain should be installed on the slab of the concrete pool for safely discharging the leakages.	Of Construction Company	Camp	tion cost	
Impact on Traffic	• Informing all residents and businesses about the nature and duration of any work well in advance so that they can make necessary preparations if necessary; • Providing wooden walkways/planks across trenches for pedestrians and metal sheets where vehicle access is required • Increasing workforce to complete the work in minimum time in these stretches Traffic Management Plan should be part of the Construction Management Plan. (i) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;	Environmental Specialist Of Construction Company	Constructio n site Access Road	Part of construc tion cost	(i) Traffic route during construction works including number of permanent signages, barricades and flagmen on worksite (Appendix 5); (ii) Complaints from sensitive receptors; (iii) Number of signages placed at project location.

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost	Monitoring of Mitigations
	(ii) Schedule transport and hauling activities during non-peak hours; (iii) Locate entry and exit points in areas where there is low potential for traffic congestion; (iv) Keep the site free from all unnecessary obstructions; (v) Drive vehicles in a considerate manner; (vi) Coordinate with Traffic Police for temporary road diversions and with for provision of traffic aids if transportation activities cannot be avoided during peak hours;				
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.	Environmental Specialist Of Construction Company	Construction site Storage Area	Part of construction cost	Waste Management Plan review & approval
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.	Environmental Specialist Of Construction Company	Project area Storage	Part of construction cost	Waste Management Plan review & approval

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost	Monitoring of Mitigations
	• Waste must be placed in secondary protective basins. • This waste can be transferred only to a certified contractor. • The personnel involved in the handling of hazardous and non-hazardous waste will undergo specific training in: • Waste handling • Waste treatment; and • Waste storage.		Area Constructio n camp		
Loss of top soil	• Top soil of about 1 ft depth (0.3 m) shall be removed and stored separately during excavation work, and after pipeline construction the same soil shall be replaced on the top.	Environmental SpecialistOf Construction Company	Pipeline work in pasture lands, agricultural land,	Part of construc tion cost	Site observation
Erosion due to excavation/refilling	• Ensure proper compaction of refilled soil and there shall not be any loose soil particles on the top; the material shall be refilled in layers and compacted properly layer by layer. • In the steep slopes, local grass species shall be planted on the refilled trenches.	Environmental Specialist Of Construction Company	All constructio n sites	Part of construc tion cost	Site observation
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	Environmental SpecialistOf Construction Company	Gudauri Project Area	Part of construc tion cost	See Table 31
Socio-economic benefits from employing local people in construction work	• To the extent possible labour force should be drawn from the local community	Environmental Specialist Of Construction Company	All constructio n sites	Part of construc tion cost	
SocioEconomic –	(i) Prepare and implement spoils management				(i) Employment records;

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost	Monitoring of Mitigations
Income. Impede the access of residents and customers to nearby shops	plan (ii) Leave spaces for access between mounds of soil; (iii) Provide walkways and metal sheets where required for people; (iv) Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools; (v) Consult businesses and institutions regarding operating hours and factoring this in work schedules; and (vi) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints				(ii) Records of sources of materials (iii) Compliance to core labor laws (See appendix 4 of this IEE)
Occupational Health and Safety Occupational hazards which can arise during work	• (i) Comply with all national, state and local labor laws (ii) Develop and implement site-specific occupational health and safety (OH&S) Plan, and include in the Construction Management plan. The OH & S plan will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use personal protective equipment like helmet, gumboot, safety belt, gloves, nose mask and ear plugs; (c) OH&S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents; (iii) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site; (iv) Provide medical insurance coverage for workers; (v) Secure all installations from unauthorized intrusion and accident risks; (vi) Provide supplies of potable drinking water; (vii) Provide clean eating areas where workers are not exposed to hazardous or				(i) Sitespecific OH&S Plan; (ii) Equipped first-aid stations; (iii) Medical insurance coverage for workers; (iv) Number of accidents; (v) Supplies of potable drinking water; (vi) Clean eating areas where workers are not exposed to hazardous or noxious substances; (vii) record of H&S orientation trainings (viii) personal protective equipment; (ix) % of moving equipment outfitted with audible backup alarms; (x) permanent sign boards for hazardous areas such as

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost	Monitoring of Mitigations
	noxious substances; (viii) Provide H&S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; (ix) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted; (x) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; (xi) Ensure moving equipment is outfitted with audible back-up alarms; (xii) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; and (xiii) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.				energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. (xi) Compliance to core labor laws
Community Health and Safety. Traffic accidents and vehicle collision with pedestrians during material and waste	(i) Plan routes to avoid times of peak-pedestrian activities. (ii) Liaise with UWSCG/IPMO in identifying high-risk areas on route cards/maps. (iii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure. (iv)				(i) Traffic Management Plan; (ii) Complaints from sensitive receptors

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost	Monitoring of Mitigations
transportation	Provide road signs and flag persons to warn of on-going				
Work Camps and worksites Temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants Unsanitary and poor living conditions for workers	(i) Consult with UWSCG/IPMO before locating project offices, sheds, and construction plants; (ii) Minimize removal of vegetation and disallow cutting of trees; (iii) Provide drinking water, water for other uses, and sanitation facilities for employees; (iv) Ensure conditions of liveability at work camps are maintained at the highest standards possible at all times; Prohibit employees from poaching wildlife and cutting of trees for firewood; (v) Train employees in the storage and handling of materials which can potentially cause soil contamination; (vi) Recover used oil and lubricants and reuse or remove from the site; (vii) Manage solid waste according to the preference hierarchy: reuse, recycling and disposal to designated areas; (viii) Ensure unauthorized persons especially children are not allowed in any worksite at any given time				(i) Complaints from sensitive receptors; (ii) Drinking water and sanitation facilities for employees
Impacts due to import of labour and establishment of temporary labour camps	In unavoidable case of sourcing labour from other areas, provide adequate housing facilities so that there are no impacts and conflict with the local people: • Establish temporary labour camps in consultation with the local authority • Shall be located away from water bodies • No clearance of trees vegetation shall be allowed for establishment of camp	Environmental Specialist Of Construction Company	Temporary labour camps	Part of construction cost	

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost	Monitoring of Mitigations
	• 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				
Safety risk – public and worker	• Follow standard and safe procedures for all activities – such as provision of shoring in deep trenches (>2 m) • Exclude public from the site – enclose construction area, provide warning and sign boards, security personnel • Provide adequate lighting to avoid accidents • Ensure that all workers are provided with and use appropriate Personal Protective Equipment - helmets, hand gloves, boots, masks, safety belts (while working at heights etc.); • Maintain accidents records and report regularly • Trench construction shall be taken up in small segments, so that work (excavation, pipe laying and refilling) in each segment is completed in a day. No trenches shall be kept open in the night/after work hours.	Environmental Specialist Of Construction Company	All constructio n sites	Part of construc tion cost	
Land use Environmental Issues due to land use change Not applicable	The impact due to change in land use will be negligible due to this project.				
Historical, archaeological chance finds during excavation	• Contractor shall put in place a protocol for conducting any excavation work, to ensure that any chance finds are recognized and measures	Environmental Specialist Of Construction	All constructio n sites	Part of construc tion cost	Records of chance finds

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost	Monitoring of Mitigations
	are taken to ensure they are protected and conserved. This should involve: ○ Having excavation observed by a person with archaeological field training; ○ Stopping work immediately to allow further investigation if any finds are suspected; ○ Calling in the state archaeological authority if a find is suspected, and taking any action they require to ensure its removal or protection in situ..	Company			
Cumulative impacts – repeated disturbance to roads and people	• Schedule the construction activities in harmony with the other on-going works • Schedule works before road work	Environmental Specialist Of Construction Company, SC	Works on waste water supply network in the town	Part of construc tion cost	Developed plan reviewd and approved by SC and UWSCG
Postconstruction clean-up Damage due to debris, spoils, excess construction materials	(i) Remove all spoils wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and (ii) All excavated roads shall be reinstated to original condition. (iii) All disrupted utilities restored (iv) All affected structures rehabilitated/compensated (v) The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these shall be cleaned up. (vi) All hardened surfaces within the construction camp area shall be ripped, all imported materials removed, and the area shall be top soiled and regrassed using the guidelines set out in the revegetation specification that forms part of this document. (vii) The contractor must arrange the cancellation of all temporary services. (viii)	Contractor			Supervision Consultants report in writing that (i) worksite is restored to original conditions; (ii) camp has been vacated and restored to pre-project conditions; (iii) all construction related structures not relevant to O&M are removed; and

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost	Monitoring of Mitigations
	Request PMU/CSS to report in writing that worksites and camps have been vacated and restored to pre-project conditions before acceptance of work.				
Cumulative impacts – repeated disturbance to roads and people	• Schedule the construction activities in harmony with the other on-going works • Contractor should collaborate with local authority, so as to establish agreements regarding the use and maintenance of unpaved haul roads and in keeping the speed • of all traffic using unpaved roads	Contractor	Pipe line excavation area	Part of construction cost	Complaints from sensitive receptors
Climate Change	Restoration of the wind break belts in the area adjacent to the Project zone what will reduce the soil erosion potential and will help regulate the temperature regime during the high air temperatures;	Environmental Specialist Of Construction Company	Construction area	Part of construction cost	Records of on implemented measures
Operation Phase					
Risk of accidental release of untreated wastewater at the WWTP	• As far as operation failure of STPs are 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 STP design. For this purpose, there has to be 100% power back-up, and sufficient spare	UWSCG	Well fields, water network	Part of operating costs	

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost	Monitoring of Mitigations
	parts to rectify any such failures within shortest possible time. The same has been included in the design of STPs. Since these STPs are being bid out on design-build-operate basis, the operator will have responsibility to operate and maintain the STP 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 STP as a part of construction cost, which will be financed from the loan.				
Foul Odor Off-site Migration from WWTP	• close monitoring of the aerobic units to ensure the conditions are not anoxic(without enough oxygen), • landscaping with trees and shrubs around the facility shall be done to position them as wind breaks, and	UWSCG	WWTP	Part of operating costs	
Disturbance/ nuisance/ noise due to operation activity	• Consulting company has to define the noise level and its spreading area generated at the stage of WWTP operation; Additional changes will have to be included in the design if required and also noise reducing barriers will have to be arranged	UWSCG	pumping stations, WWTP area	Part of operation costs	
Grievance redress during O & M	Appropriate registers shall be maintained to record complaints and Junior Engineer/s from ULB shall be assigned to track follow up action to ensure that the complaint is addressed in a timely manner by the contractor. - If the complaint is such that it cannot be dealt with at his level, it can be				

Potential Negative Impacts	Mitigation measures	Responsibility	Location	Cost	Monitoring of Mitigations
	referred to higher authority to take the required decision and followed up with the contractor for the compliance. - Concerned engineer from ULB shall do frequent vigilant checks at the areas from where maxim				
Disturbance/ nuisance/ noise due to operation activity	• Consulting company has to define the noise level and its spreading area generated at the stage of pumping stations operation; • Additional changes will have to be included in the design if required and also noise reducing barriers will have to be arranged	UWSCG	pumping stations area	Part of operation costs	See Table 31
land pollution cause from sludge dispose	Plan for Sewage sludge disposal on the dump site has to be prepared before starting the operation. The plan has to be agreed with the Ministry of Environment and natural resources of Georgia and also waste management company.	UWSCG	Gudauri Municipal Landfill	Part of operation costs	

I.7 Monitoring

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

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

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

Table 31: Environmental Monitoring Plan for general construction activities in Gudauri

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, SC
Contract documentation with construction contractor	Environmental Issues	Once before contract signature	Environmental audit of contract documents to ensure relevant sections of the SSEMP have been included	The contract document shall reflect all environmental mitigation measurements	UWSCG, SC
Contract documentation with construction contractor	Social Issues	Once before contract with construction company signed	Ensure relevant section of contractor's responsibilities to hire local population have been included in contract.	50 % of workers should be hired from local population.	UWSCG, SC
Construction company prepared all necessary environmental management plans and conducted all requested investigations	Environmental Issues	Once before contract signature	Environmental audit of the environmental plans prepared by construction contractor	All environmental plans were prepared and approved by relevant organizations.	UWSCG, SC
Construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.	Environmental Issues	Before strating Construction Activities	(i) List of selected sites for construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas. (ii) Written consent of landowner/s (not lessee/s) for reuse of		SC

Item	Parameter	Frequency	Action Level	Response When Action Level Exceeded	Responsibility
			excess spoils to agricultural land		
Surface water quality			Areas for stockpiles, storage of fuels and lubricants and waste materials; (ii) Number of silt traps installed along trenches leading to water bodies; (iii) Records of surface water quality inspection; (iv) Effectiveness of water management measures; (v) No visible degradation to nearby drainages, nallahs or water bodies due to civil works		
Construction					
Ambient Air	Dust	Continual Dust should be monitored on the regular bases as well as during the peak operation of Construction Equipment and Machinery	Visual assessment during the Works Measuring at nearest potentially sensitive receivers.	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	Contractor, under the supervision of SC
Noise	(15 minute) Noise Levels	Periodic attended Monitoring at hourly Intervals.	Measuring at nearest potentially sensitive receivers.	If noise action level is exceeded then review work practices and noise control procedures,	Contractor, under the supervision of SC

Item	Parameter	Frequency	Action Level	Response When Action Level Exceeded	Responsibility
		Noise, should be monitored on the regular bases (weekly) as well as during the peak operation of Construction Equipment and Machinery		including maintenance of equipment, installation of silencers, provision of noise barriers and modification of work hours.	
Vibration	(15 minute) Vibraition level	Periodic attended Monitoring at hourly Intervals. Vibration should be monitored on the regular bases as well as during the peak operation of Construction Equipment and Machinery	Measuring at nearest potentially sensitive receivers.	If vidration level is exceeded then review work practices, maintenance of equipment.	Contractor, under the supervision of SC
Water Quality	Quality/ Contaminant concentrates	Continue In rain weather after 10-15 minits rain stats.	Guideline / licence requirements (whichever is Applicable) Impact Monitoring Compliance Monitoring	If contaminant concentrations /licence conditions are exceeded, review disposal options and decide on most applicable. Report any accidences of licence (of applicable) to issuing authority.	Contractor, under the supervision of SC

Item	Parameter	Frequency	Action Level	Response When Action Level Exceeded	Responsibility
Waste Management Implications	Segregation, Storage and transport of wastes	Daily 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.	Contractor, under the supervision of 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	Contractor, under the supervision of SC
Ecological Resources	Fauna and Flora	Continual	Minimal ecological impacts Impact Monitoring	Required to ensure the recommended mitigation measures are properly implemented.	Contractor, under the supervision of SC
Landscape and Visual	Surface treatment of temporary structures	Once at the Completion of work	Minimum disturbance of the original landscape. Impact Monitoring	Required to ensure the recommended mitigation measures are properly implemented	Contractor, under the supervision of SC
Operation					
Conduct source water quality monitoring	As per the government regulations	1 sample from each borehole	Comparison with the base values and standards as per government regulations	Required to ensure the recommended mitigation measures are properly implemented.	UWSCG

Item	Parameter	Frequency	Action Level	Response When Action Level Exceeded	Responsibility
Treated water quality monitoring	As per the government regulations	At the outlet of chlorination plant; at reservoir sites; and at extreme points of network in various locations in town	Comparison with the base values and standards as per government regulations	Required to ensure the recommended mitigation measures are properly implemented.	UWSCG

J. CONCLUSION AND RECOMMENDATION

J.1 Recommendation

388. The process described in this document has assessed the environmental impacts of all elements of the Gudauri Waste Water System project. All potential impacts were identified in relation to pre-construction, construction, and operation phases. Planning principles and design considerations have been reviewed and incorporated into the site planning process whenever possible. Environmental impacts as being due to the project design or location were not considered to be significant following redesign of the project to be outside the Kazbegi National Park boundary. However, the social impacts (access disruptions) due to construction activities are unavoidable, as the residential and commercial establishments exist along the project corridor.

389. During the construction phase, impacts mainly arise from the need to dispose waste soil and from the disturbance of residents, businesses, traffic and important buildings by the construction work. These are common impacts of construction in urban areas, and there are well developed methods for their mitigation. Since the pipe line works are conducted along the roads, there is potential to create disturbance. To minimize this, the contractor should develop a Method Statement, which should be approved by the UWSCG/IPMO prior to start of work, and should conduct the work strictly in line with the Method Statement.

390. There were limited opportunities to provide environmental or community enhancements, but certain measures were included. For example it is proposed that the project will employ in the workforce people who live in the vicinity of construction sites to provide them with a short-term economic gain; and ensure that people employed in the longer term to maintain and operate the new facilities are residents of nearby communities.

391. 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 EMP and monitoring plan

392. itigation will be assured by a program of environmental monitoring conducted during construction and operation to ensure that all measures are implemented, and to determine whether the environment is protected as intended. This will include observations on- and off-site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the UWSCG/IPMO.

393. The public participation processes undertaken during project design ensured stakeholders are engaged during the preparation of the IEE. The planned information disclosure measures and process for carrying out consultation with affected people will facilitate their participation during project implementation. The list of already conducted meetings and consultations are presented in chapter G.

394. The project's grievance redressal mechanism will provide the citizens with a platform for redressal of their grievances, and describes the informal and formal channels, time frame, and mechanisms for resolving complaints about environmental performance.

395. A copy of the EMP/SSEMPS shall be kept on-site during the construction period at all times. The EMP shall be made binding on all contractors operating on the site, and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document shall constitute a failure in compliance.

396. The Gudauri local community including small business representatives as well as tourists will be the major beneficiaries of the improved 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 will help to

increase the number of tourists and improve economic conditions of local population.

397. The Gudauri WWS subproject is unlikely to cause significant adverse impacts. The potential impacts that are associated with design, construction, and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures.

398. Based on the findings of the IEE, the classification of the Project as Category “B” is confirmed, and no further special study or detailed EIA needs to be undertaken to comply with ADB SPS (2009), but as for Georgian Regulations development, an EIA is required to obtain permit from the MoENRP of Georgia for construction of WWTPs.

399. 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.

400. 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 water supply system are presented in a monitoring plan.

401. 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.

402. The proposed subprojects – Improvement of the Waste Water Systems in Gudauri is unlikely to cause significant adverse impacts. The potential impacts that are associated with design, construction and operation can be mitigated to meet project standards.

403. It should be clearly stated also, that the alternatives assessment work identified that proposed effluent pipe from WWTP#2 will completely avoid Kazbegi National Park. This was agreed between the represenatives of UWSCG, Eptisa and the Department of Protected Areas of MoENRP of Georgia as it is satetd in para 329.

404. The following recommendations have been developed within the proposed biodiversity survey of the project sites:

- Construction of the planned modern technology waste water treatment plant, for rapidly growing Borough Gudauri represents an extremely important thing for maintaining the existing sustainable and vulerable habitats.

405. Despite the unavoidable negative impact caused by the construction and operation to the natural environment, the ratio of avoiding the negative impact is immeasurably important.

- We consider reasonable to conduct the planned works on the areas studied from our side, as in point of vegetation losses the results will be minimal.
- Unconfirmed construction sites shall require extra study and selection of additional optimal routes.
- It is very important to protect the ecologically sophisticated strict discipline of saving technologies during works.
- The plants of high conservation that are already revealed or will as well be revealed should be replanted in optimal locations.
- In our point of view (confirmed by the company’s management as well) it is unacceptable to conduct construction works in protected areas and it is better to find an optimal alternative.

J.2 Conclusion

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

407. The improvement that has been introduced with respect to the Initial Project technical proposals for the Sewerage network and the WWTPs is highlighted, through the study and selection of the best alternatives from the technical and environmental approach. In agreement with the promoter and the environmental authorities, important technical work has been carried out to develop the solution for the treatment of waste water with several WWTPs by districts, instead the alternative with one big facility for the treatment. After, this new solution was improved relocating some treatment plants, as well as considering in the design of a pipeline in the western area of Gudauri that will collect the treated waters for subsequent discharge, without affecting the Kazbegi National Park.

408. 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.

409. 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:

1. GAUGING STATIONS – FLOW IN THE RIVERS

N	Station name სადგურის სახელწოდება	Coordinates კოორდინატები	
		განედი - Lat	გრძედი - Long
1	Khadiskhevi - Tskere ხადისხევი - წკერე	42º 29’	44 º 32’
2	Mtiuleti Aragvi - Mleta მთიულეთის არაგვი - მლეთა	42 º 26’	44 º 30’

LATEST MEASUREMENTS AVAILABLE IN THE STUDY AREA

Coordinates: 38 T 461933.08 m E 4703528.39 m N
Units: m^3/s

1 - River Khadiskhevi - Tskere (m^3/s)

Area: 18,8 km^2

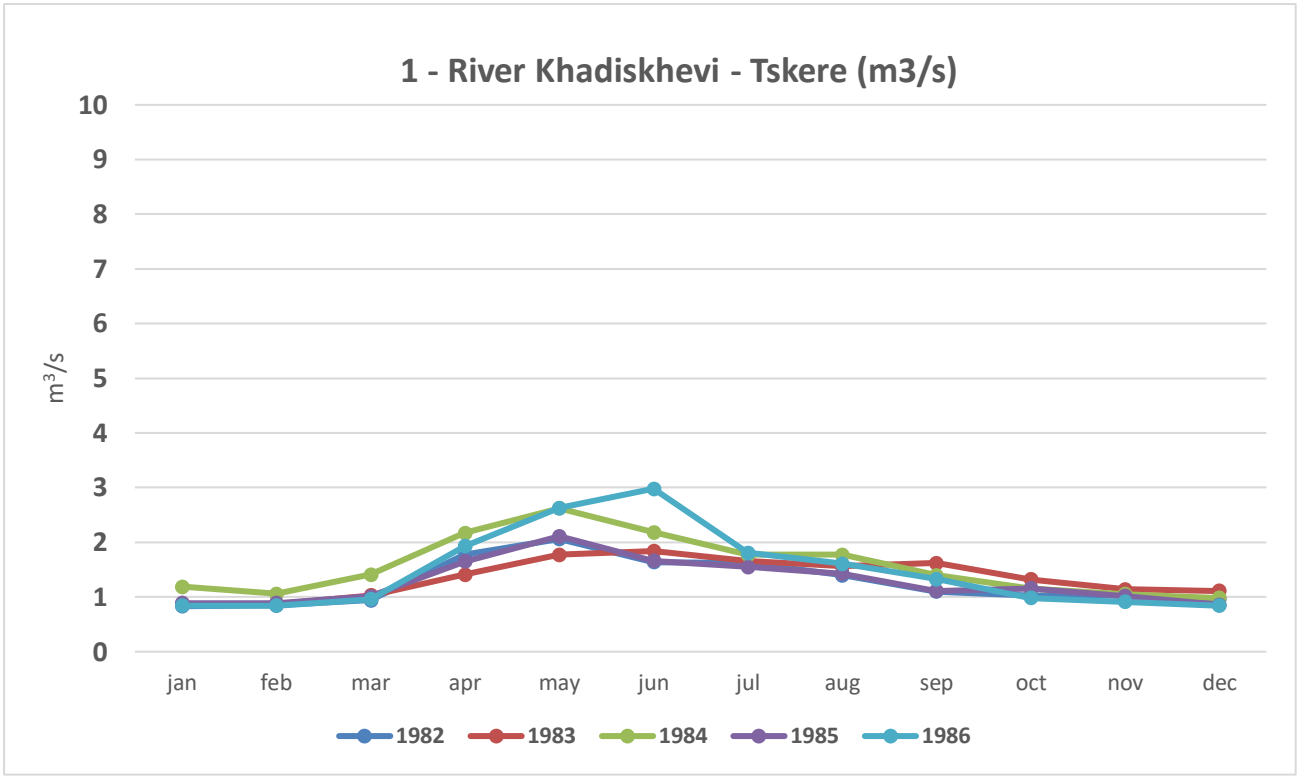
Year	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec	average
1982	0,83	0,85	0,94	1,77	2,06	1,64	1,62	1,40	1,10	1,03	1,03	0,96	1,27
1983	0,87	0,87	1,03	1,41	1,77	1,84	1,66	1,56	1,62	1,32	1,14	1,11	1,35
1984	1,19	1,06	1,41	2,17	2,62	2,18	1,77	1,77	1,40	1,15	1,05	0,98	1,56
1985	0,89	0,89	1,01	1,65	2,11	1,66	1,55	1,43	1,11	1,16	1,02	0,86	1,28
1986	0,84	0,84	0,96	1,93	2,63	2,98	1,81	1,61	1,33	0,98	0,91	0,84	1,47
Average	0,92	0,90	1,07	1,79	2,24	2,06	1,68	1,55	1,31	1,13	1,03	0,95	1,39

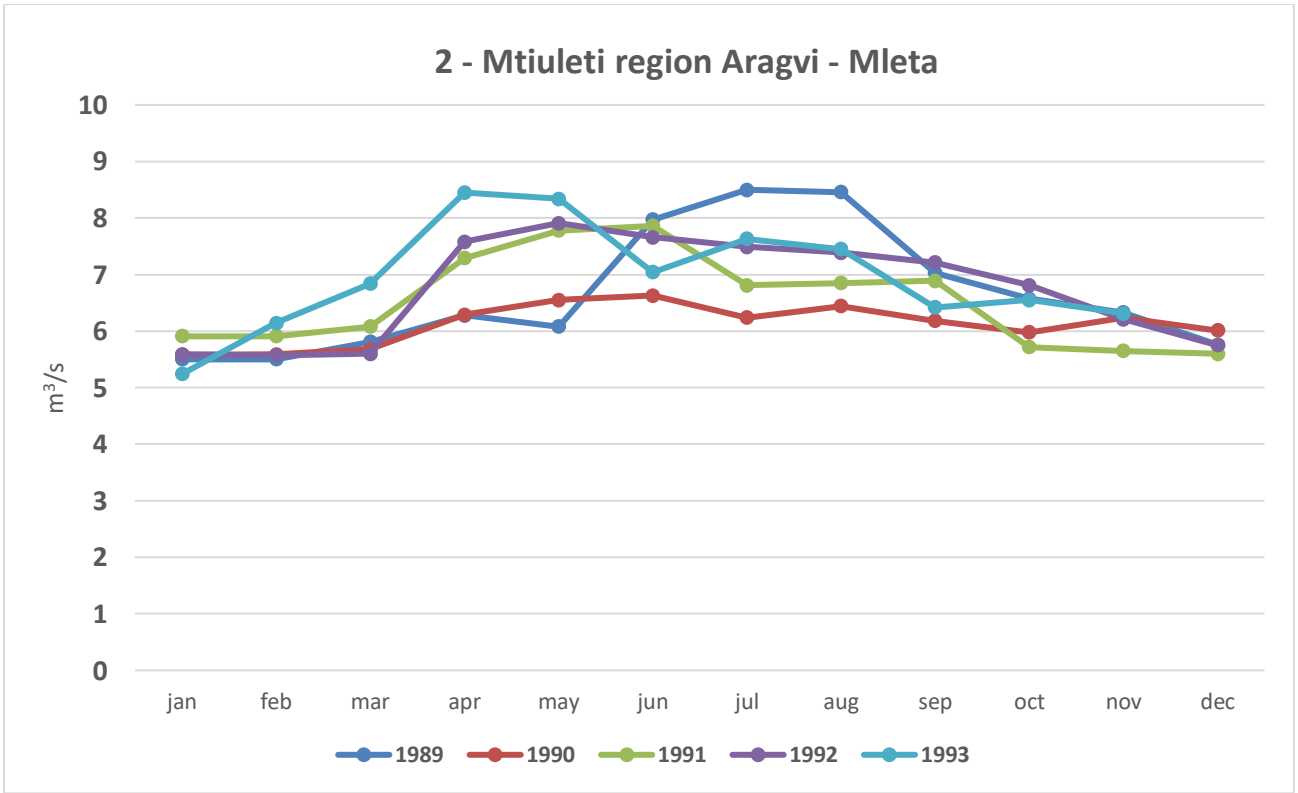
Coordinates: 38 T 458873.27 m E 4698011.63 m N
Units: m^3/s

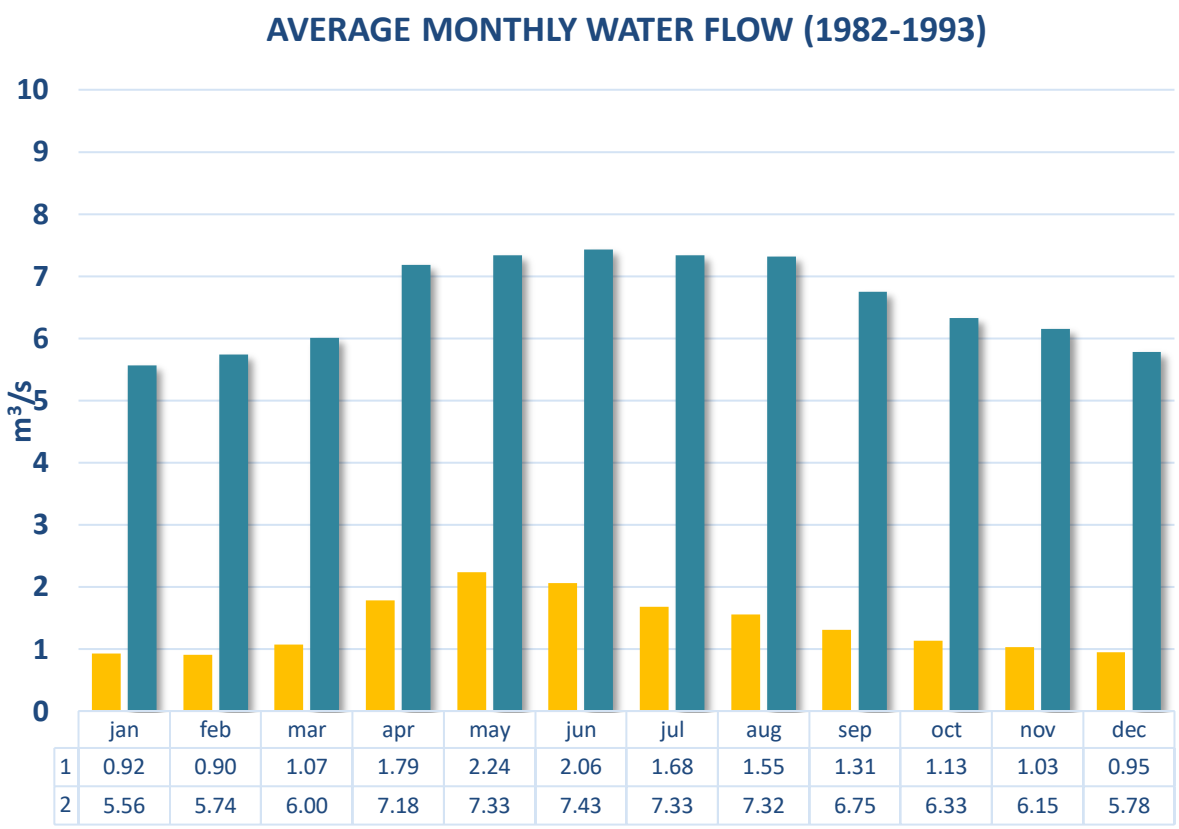
2 - Mtiuleti region Aragvi - Mleta

Area: 107,0 km^2

Year	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec	average
1989	5,50	5,50	5,81	6,28	6,08	7,97	8,50	8,46	7,03	6,57	6,33	5,76	6,65
1990	5,58	5,59	5,68	6,29	6,55	6,63	6,24	6,44	6,18	5,98	6,24	6,01	6,12
1991	5,91	5,91	6,08	7,29	7,78	7,86	6,81	6,85	6,89	5,72	5,65	5,60	6,53
1992	5,59	5,57	5,60	7,58	7,91	7,66	7,49	7,39	7,21	6,81	6,21	5,75	6,73
1993	5,24	6,14	6,84	8,45	8,34	7,04	7,63	7,45	6,42	6,55	6,31		
Average	5,56	5,74	6,00	7,18	7,33	7,43	7,33	7,32	6,75	6,33	6,15	5,78	6,51


1 - River Khadiskhevi - Tskere (m3/s)
m³/s
10
9
8
7
6
5
4
3
2
1
0
jan
feb
mar
apr
may
jun
jul
aug
sep
oct
nov
dec
1982
1983
1984
1985
1986


2 - Mtiuleti region Aragvi - Mleta
m³/s
10
9
8
7
6
5
4
3
2
1
0
jan
feb
mar
apr
may
jun
jul
aug
sep
oct
nov
dec
1989
1990
1991
1992
1993



	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
1	0.92	0.90	1.07	1.79	2.24	2.06	1.68	1.55	1.31	1.13	1.03	0.95
2	5.56	5.74	6.00	7.18	7.33	7.43	7.33	7.32	6.75	6.33	6.15	5.78

ANNEX 2

2. WATER QUALITY (ARAGVI RIVER)

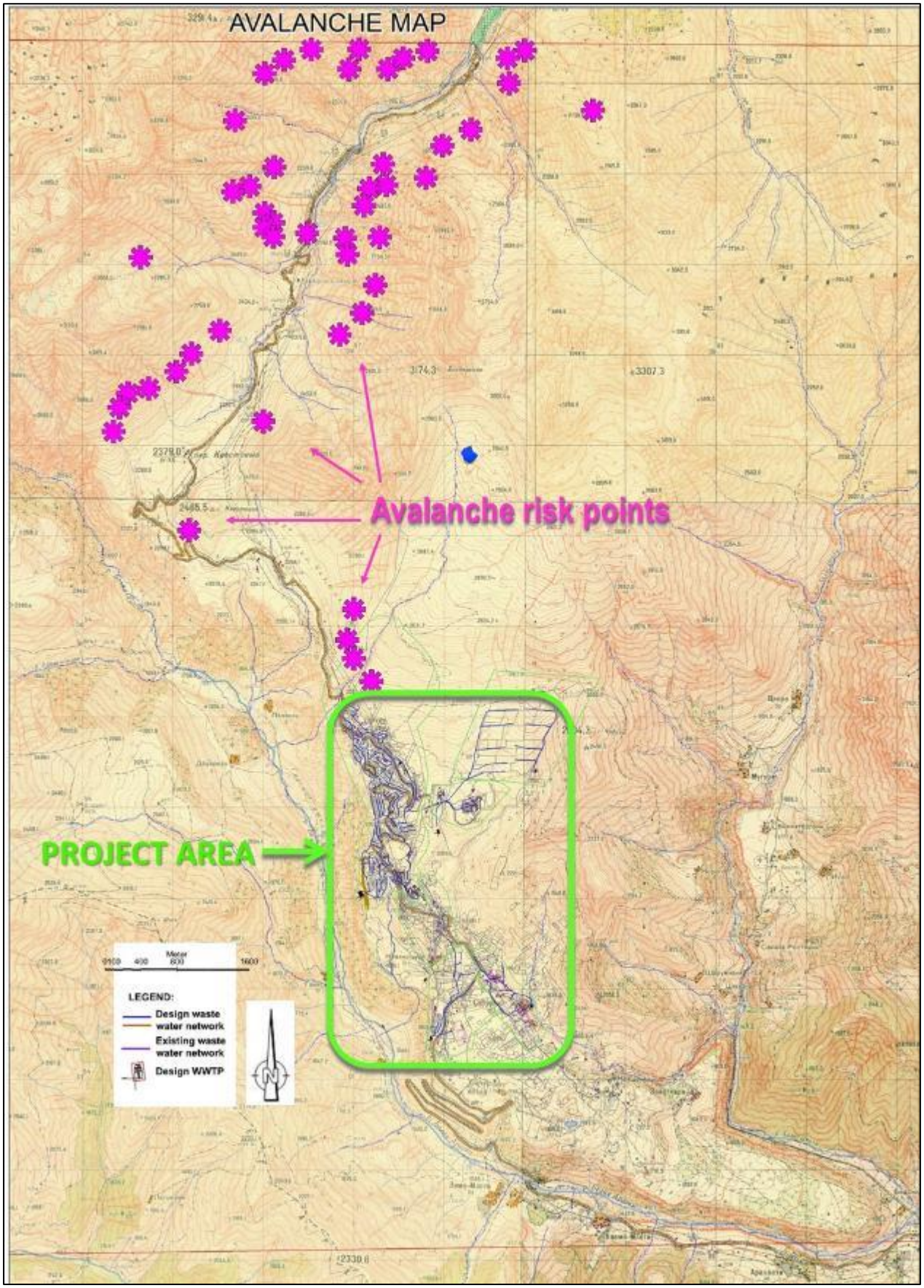
2. WATER QUALITY (ARAGVI RIVER)

NEA EXAMINATION REPORT: #93-2017, 25/07/2017
SAMPLE: #802 (1), 18/07/2017
ARAGVI RIVER – GUDAURI SURFACE WATER
COORDINATES: 38 T, 0457081 m E, 4699672 m N

#	Component	Unit	Results	Applied Methods
1	Suspended Solids	mg/l	10,4	ISO 11923:2007
2	BOD_5		1,26	ISO 5815 – 1:2010
3	COD		3,92	ISO 6060:2010
4	Total N		0,264	Ю.Ю. Лурье "Унифицированные методы анализа вод" "Unified Methods of Water Analysis"
5	Total P		2,079	Ю.Ю. Лурье "Унифицированные методы анализа вод" "Unified Methods of Water Analysis"
6	Total Coliforms	Per 1 L	700	Membranous Filtration Method

ANNEX 3: AVALANCHE RISK (GUDAURI AREA)

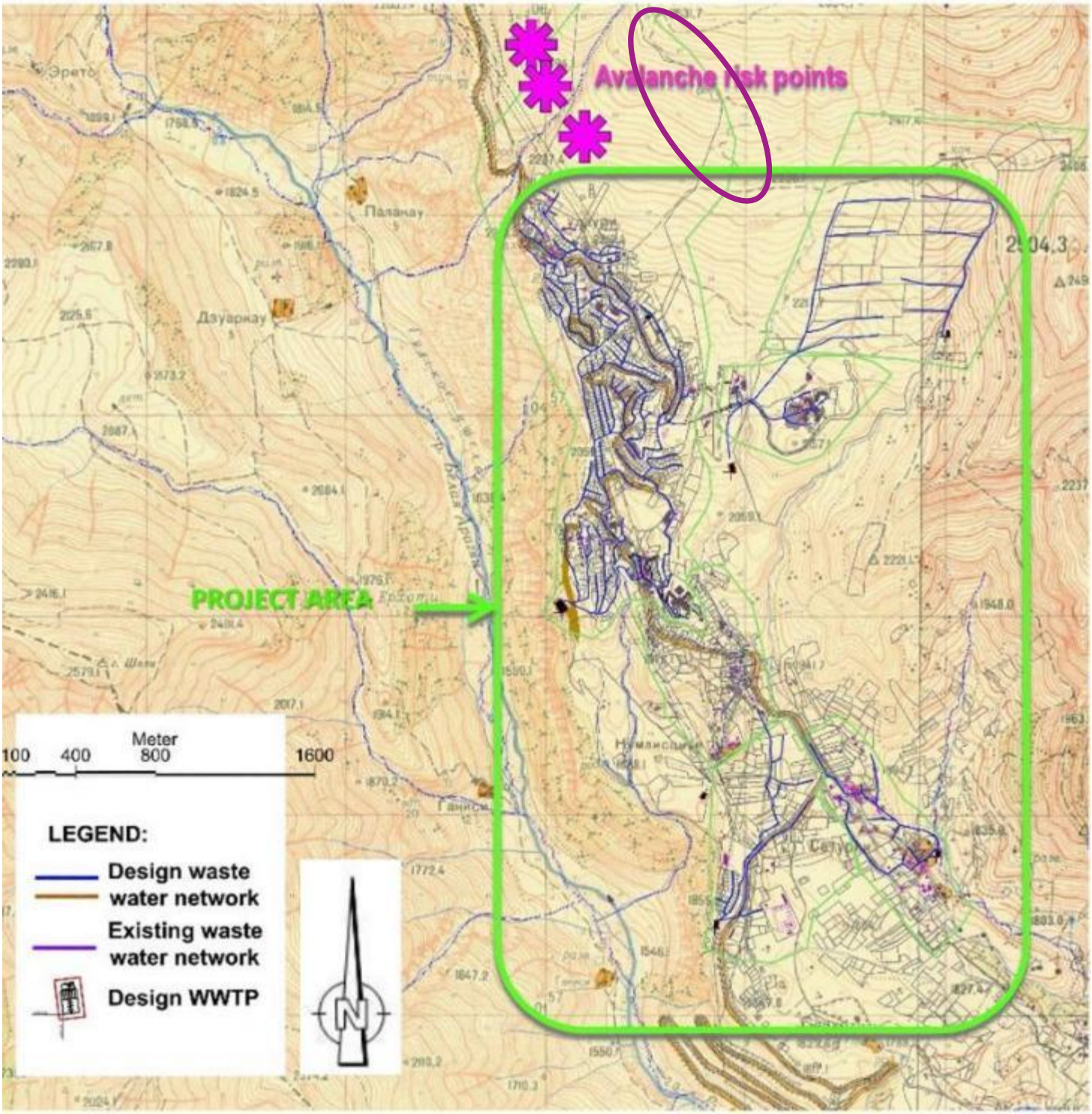
Map provided by the National Environmental Agency.

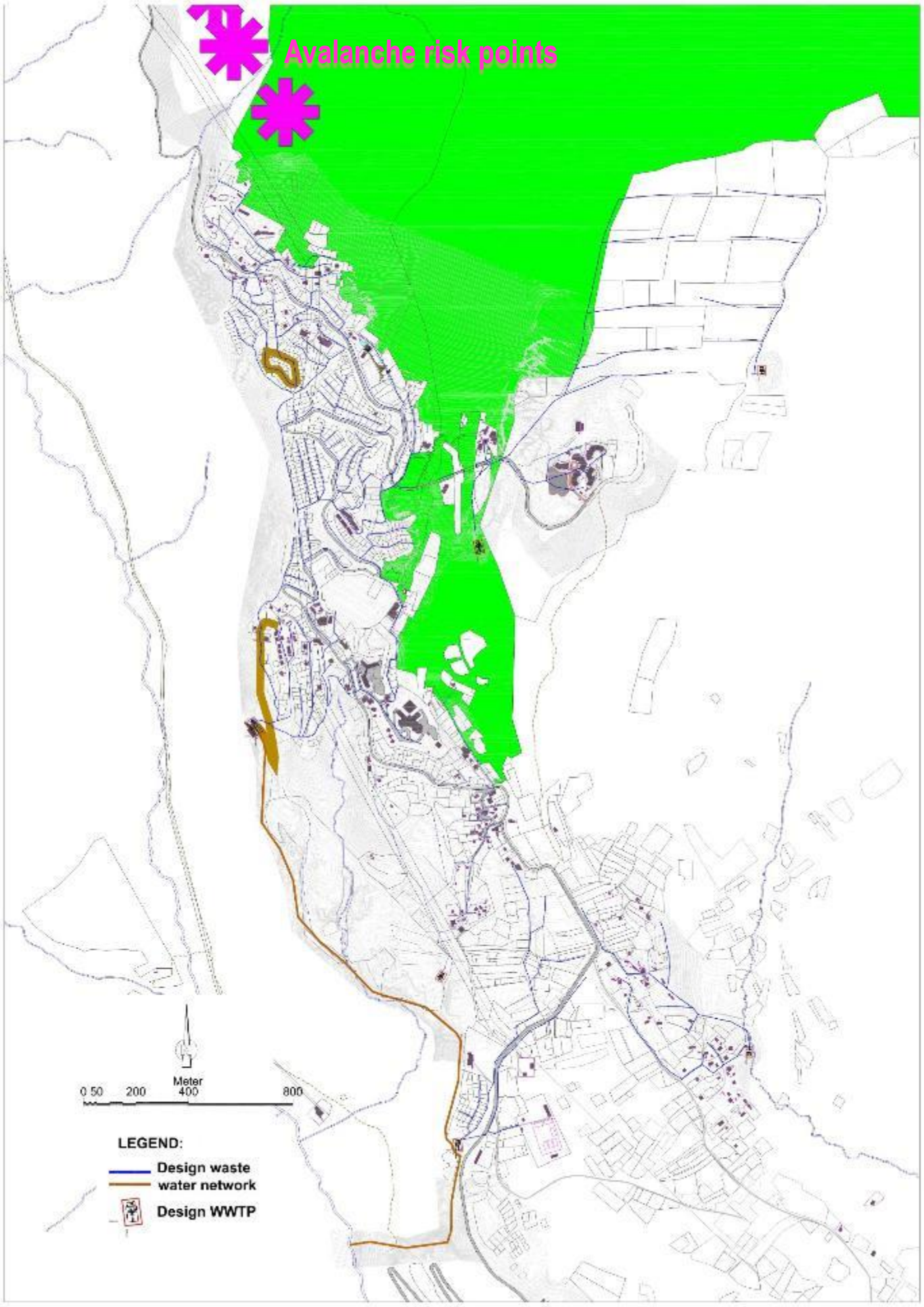


Avalanche Map by the Environmental National Agency, Original 1:17000. July 2017.

Location of avalanche risk points (☆) and Project Area.

All areas with avalanche risk remain in the northern sector, outside the project development zone.
The designed infrastructures are not affected by the risk areas identified by the NEA, as shown in the following maps.




Avalanche risk points
Meter
0 50 200 400 800
LEGEND:
Design waste
water network
Design WWTP

ANNEX 4: Signed List of Participants of Public Consultations

მშენებლობის წყალარინების სისტემის რეაბილიტაციის პროექტი
წინასწარი ეკოლოგიური შეფასების ანგარიშის
საჯარო განხილვა

Construction of Waste Water System in Gudauri
Initial Environmental Examination
Public Consultations

28 ივნისი, 2017

სახელი, გვარი	ორგანიზაცია	საკონტაქტო ინფორმაცია	ხელმოწერა
[illegible]	"შპს. [illegible]"		
JOSÉ MARÍA ESPAÑOLA	EPTISA SERVICIOS DE INGENIERÍA, S.L.		
[illegible]	EPTISA Servicios de Ingeniería		
JESÚS BERMILLO	EPTISA GEORGIA		
Manuel F. Villafranca	EPTISA GEORGIA		

სახელი, გვარი	ორგანიზაცია	საკონტაქტო ინფორმაცია	ხელმოწერა
[illegible]	Eptisa		
[illegible]	Eptisa		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
მაკა [illegible]	UWSCG		
[illegible]	UWS CG		
[illegible]	[illegible]		

სახელი, გვარი	ორგანიზაცია	საკონტაქტო ინფორმაცია	ხელმოწერა

ANNEX 5: Asbestos-Containing Material Management Plan

Waste Asbestos-Containing Material Management Plan

Definitions

Asbestos means the asbestiform varieties of: Chrysotile (serpentine); crocidolite (riebeckite); amosite (cummingtonitegrunerite); anthophyllite; tremolite; and actinolite.

Asbestos-containing material (ACM) means any material or product which contains more than 1 percent asbestos.

Asbestos-containing building material (ACBM) means surfacing ACM, thermal system insulation ACM, or miscellaneous ACM that is found in or on interior structural members or other parts of a school building.

Asbestos debris means pieces of ACBM that can be identified by color, texture, or composition, or means dust, if the dust is determined by an accredited inspector to be ACM.

Airborne Asbestos Fibers Any material that contains greater than one percent asbestos, and which can be crumbled, pulverized, or reduced to powder by hand pressure. This may also include previously non-friable material that becomes broken or damaged.

Abbreviations

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

1. Legislative Requirements

1.1. Georgian Legislation

The hygienic requirements, sanitary rules and standards related to asbestos and ACM (asbestos-containing materials) on the territory of Georgia are regulated by Decree No. 2004 of the Minister of Labour, Health and Social Affairs of Georgia "**The hygienic requirements for the sanitary rules and standards for asbestos and asbestos-containing materials**".
The said law regulates packing, storing and transportation of the asbestos-containing materials, as well as collecting, storing and utilization processes of asbestos-containing industrial and municipal waste.

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

1.2 IFI Group Approach to Asbestos Health Risk

The WBG EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP)[6]. When one or more members of the WBG are involved in a project, the EHS Guidelines are applied as required by their respective policies and standards.

The WBG's EHS Guidelines[7] specify that the use of ACM should be avoided in new buildings and construction or as a new material in remodeling or renovation activities. Existing facilities with ACM should develop an asbestos management plan that clearly identifies the locations where the ACM is present, its condition (e.g., whether it is in friable form or has the potential to release fibers), procedures for monitoring its condition, procedures to access the locations where ACM is present to avoid damage, and training of staff who can potentially come into contact with the material to avoid damage and prevent exposure. The plan should be made available to all persons involved in operations and maintenance activities. Repair or removal and disposal of existing ACM in buildings should be performed only by specially trained personnel[8] following host country requirements or, if the country does not have its own requirements, internationally recognized procedures[9]. Decommissioning sites may also pose a risk of exposure to asbestos that should be prevented by using specially trained personnel to identify and carefully remove asbestos insulation and structural building elements before dismantling or demolition[10].

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

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

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

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

[10]

1.3 International Convention and Standards for Working with Asbestos

The International Labor Organization (ILO) established an Asbestos Convention (C162) in 1986 to promote national laws and regulations for the "prevention and control of, and protection of workers against, health hazards due to occupational exposure to asbestos."[11] The convention outlines aspects of best practice: Scope and Definitions, General Principles, Protective and Preventive Measures, Surveillance of the Working Environment, and Workers' Health. As of March 4, 2008, 31 countries had ratified the Convention;[12] 17 of them have banned asbestos.
Some of the ILO asbestos convention requirements:

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

2. Risk Assessment

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

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

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

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

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

1. The project area is the driving route for the cattle of the nearby villages (the cattle is driven across the project area twice a day). The cattle use the waste in the

http://www.ifc.org/ifcext/enviro.nsf/AttachmentsByTitle/gui_EHSGuidelines2007_GeneralEHS/$FILE/Final+ +General+EHS+Guidelines.pdf (pp. 71, 91, 94)
[11] www.ilo.org/ilolex
[12] http://www.ilo.org/ilolex/english/convdisp1.htm

area as a feed. Consequently, the ACMs in question are subject to further impact every day.

2. The local population permanently dispose the waste in the said area in an uncontrolled manner what is another source of damage for the ACM.

As already mentioned, the area where the ACM waste is placed, is an open area and is in direct contact with air.

Following the above-mentioned, the existing situation can be evaluated as highly risky. ACM is friable and not in a stable condition, and there is a risk to health, it must be removed by a certified asbestos removalist as soon as practicable.
Within the scope of the project, it is necessary to ensure the separation/collection, transportation and safe disposal of the AC waste by the Contractor prior to the preparatory works.

3. Waste Asbestos-Containing Material Management Plan

3.1 Project Goals and Objectives

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

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

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

3.2 Rights and Responsibilities

The companies and organizations engaged in the AC waste have the following rights and obligations:
Executive Agency (UWSCG):

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

Contractors:

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

4.3 Awareness Training

4.3.1 Asbestos Separators/Removalists

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

4.3.2 Site employees

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

- the purpose of the training;
- the health risks of asbestos;
- the types, uses and likely occurrence of ACM at the specific construction site;
- the trainees' roles and responsibilities under the project Waste ACM Management plan;
- where each site-specific register of ACM is located and how it can be accessed;
- the timetable for removal of ACM from the particular construction site;
- the processes and procedures to be followed to prevent exposure, including exposure from any accidental release of asbestos dust into the workplace;
- where applicable, the correct use of maintenance and control measures, protective equipment and work methods to minimize the risks from asbestos, limit the exposure of workers and limit the spread of asbestos fibers outside any asbestos work area;
- control levels for asbestos; and
- the purpose of any air monitoring or health surveillance that may occur.

4.3.3 Local population

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

- the purpose of the training;
- the health risks of asbestos;
- the types, uses and likely occurrence of ACM at the specific construction site;
- where each site-specific register of ACM is located and how it can be accessed;
- the timetable for removal of ACM from the particular construction site;

- the processes and procedures to be followed to prevent exposure, including exposure from any accidental release of asbestos dust into the workplace;

4.4 Waste Separation

4.4.1 General requirements

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

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

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

Medications and infectious waste including pills, medicines, dressings, needles, sharps, human blood or tissue, isolation waste, pathological waste, infectious human or animal waste, etc.
Asbestos-containing material from individual all sources may include asbestos pipe wrap, boiler coatings, loose insulation, transit (older cement type siding and electrical backing), vermiculite (light, platy insulating material) and other materials APPENDIX 1. SOME ALTERNATIVES TO ASBESTOS-CONTAINING PRODUCTS). Please label all bags or containers “Asbestos Waste.” Asbestos Waste must be disposed at approved solid waste facilities.

4.4.2 Fencing the working area

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

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

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

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

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

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

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

4.5 Personal Protective Equipment (PPE)

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

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

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

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

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

4.6 Packing Asbestos-Containing Materials

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

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

Controlled wetting of asbestos waste is to be done to reduce the possibility of dust emissions during the bagging or other containment of the waste. If asbestos waste cannot be disposed of immediately (e.g. because of volume requirements for disposal), it is to be stored in a solid

waste drum, bin or container or skip and sealed and secured upon the completion of each day's work so that unauthorized access is prevented.

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

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

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

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

4.7 Waste Transportation

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

Once the waste bags have been removed from the asbestos work area, they are to be either:
• be placed in a solid waste drum, bin or skip; or
• be removed from the site by an approved and licensed carrier.

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

4.8. Offsite Waste Disposal

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

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

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

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

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

d. Asbestos Exposure Register

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

5. Project Supervision and Monitoring

5.1 General Conditions

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

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

5.2 Air Monitoring

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

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

A documented air-monitoring program is to be developed. The air-monitoring program is to include requirements for clearance monitoring. An air-monitoring program is recommended for the removal of non-friable ACM, as it is good occupational hygiene practice. The air monitoring is to be performed in accordance with the NOHSC Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibers [(NOHSC: 3003 (2005)].
Asbestos removal work must not commence until the air monitoring has commenced.

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

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

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

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

The results of all air monitoring are to be provided to all relevant parties as soon aspossible. Constructon contractor shall submit detaled Monitoring Plan before commencing construction activities. The following information is to be included in the asbestos removal/separationmonitoring:

1. **Identification** - Details of the ACM to be removed (e.g. the location(s), whether it is friable or non-friable, type, condition and the quantity to be removed;
2. **Preparation** – (i) Consultation; (ii) Assigned responsibilities for the removal; (iii) Program of commencement and completion dates (iv) Emergency Plans; (iv) Asbestos removal boundaries, including the type and extent of isolation required and the location of any signs and barriers; (v) Control of electrical and lighting installations; (vi) Personal protective equipment (PPE) to be used, including; (vii) respiratory protective equipment (RPE); (viii) Details of air monitoring program; (ix) Waste storage and disposal program;
3. **Removal/Separation** – (i) Methods for removing the ACM (wet or dry methods); (ii) Asbestos removal equipment (spray equipment, asbestos vacuum cleaners, cutting tools, etc); (iii) Details on required enclosures, including details on their size shape structure, etc, smoke testing enclosures, and the location of negative pressure exhaust units' (iv) Details on temporary required by the asbestos removals (e.g. decontamination units), including details on water, lighting and power requirements, negative air pressure exhaust units and the locations of decontamination units; (v) Other control measures to be used to contain asbestos within the asbestos work area;
4. **Decontamination** - Detailed procedures for workplace decontamination, the decontamination of tools and equipment, personal decontamination and the decontamination of non-disposable PPE and RPE;
5. **Waste Disposal** - Methods of disposing of asbestos wastes, including details on the disposal of: (i) disposable protective clothing and equipment, and (ii) the structure(s) used to enclose the removal area;
6. **Air Monitoring** – (i) Location, types and methods, for monitoring airborne fibres and dusts; (ii) Ways of communicating monitoring results to workers;
7. **Training** – (i) Training that reflects the specific types of asbestos work to be undertaken; (ii) Keeping written records of inductions and asbestos awareness training;
8. **Health Surveillance** – (i) Details on any exposures to asbestos by workers; (ii) Details on all asbestos workers health records.

5.3 Control Levels for monitored airborne asbestos fibers

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

The control levels shown in the Table below are be used to determine the effectiveness

ofcontrol measures:

Table 1. Control levels and required actions

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

5.4 Clearance Inspections

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

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

The need for clearance monitoring will be assessed as part of asbestos removal control plan and for undertaking any maintenance work involving ACM. It will be undertaken by a competent person, independent of the person conducting the asbestos work, after cleaning has been completed and the area dried.

Air samples are to be taken in the asbestos work area. For jobs involving an enclosed area, this is to be done within the enclosed area, following the completion of the work but prior to the removal of the enclosure and again after the removal of the enclosure.

The removal, cleaning and clearance work will not be considered completed until an airborne fiber level of less than 0.01 fibers/mL has been achieved, as determined by the clearance monitoring.

5.5 Settled Dust Sampling

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

6. Emergency Response Procedures

6.1 Evacuation Event

An emergency associated with the potential for exposure to airborne asbestos fibersacross the project area site may necessitate the need to evacuate. Site procedures for evacuation are to be conveyed to contractors and employees during the site induction. The risks associated with any asbestos removal work should be assessed and include contingencies in the case of an emergency.

Decontamination procedures can be temporarily waived in the event of an emergency requiring evacuation. This is to be based on an informal risk assessment conducted at the time.

Persons involved in asbestos removal must evacuate to the evacuation assembly point but remain downwind to ensure any fibers remaining on clothes, as a result of not decontaminating completely, do not enter the breathing space of others.

Upon arrival at the evacuation point, emergency wardens and health and safety personnel are to be notified of the status of the asbestos removal work and the assessed level of risk associated, as well as the assessed level of risk associated with asbestos removal person not undergoing the complete decontamination process.

6.2 Damage of ACM

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

- The site emergency contact number is to be used to report the location of the potential contamination.
- Asbestos trained workers are to respond (wearing suitable respiratory protection, gloves and disposable coveralls), assess the risks associated with the spill and secure the affected area, plant or equipment using asbestos warning tape and signs,
- Ensure fans, wind sources are controlled to prevent further spread of the contamination,
- The areas below and adjacent or above are secured and barricaded with asbestos warning tape to prevent materials dropping or passing into those areas
- Use surface soaking sprays to wet down the material and obtain a bagged sample of the suspect material, or
- Use plastic sheeting and adhesive tape to seal or encapsulate the affected area or plant,
- Use materials such as plastic drop sheets, binding material and or suitable adsorbent material to contain the water spray and run off,
- Clean up the affected areas using suitable tools (soft brushes, mops, dust pans etc.) and if necessary vacuum using HEPA filters,
- Apply sealant or repairs to the damaged areas to prevent further contamination,
- Inspect the work to ensure all suspect materials have been removed,
- All contaminated articles and clothing are to be bagged in suitable asbestos disposal bags and be disposed off as asbestos waste,
- Set up an air monitor in the work area to monitor airborne fiber concentrations and secure the work area until the results are obtained,
- Send the sample off for testing and determine if it contains asbestos,
- Undertake further asbestos removal work to make the area safe using a safe work method statement and an asbestos removalspecialist;
- Provide details of the material sample results and monitoring results to the workers involved who may have been exposed,
- Undertake medical assessments of the workers involved who may have been exposed and provide copies of the assessments to the workers.
- Have the workers who were potentially exposed to uncontrolled asbestos fibers complete a Form S0268 – Asbestos Exposure Questionnaire (see Annex 2)
- Maintain records of the incident reporting, investigation and health assessments with the Asbestos Exposure Register.

ANNEX 6: Sludge Management Plan Preparation Guidelines

1. Sludge Disposal Alternatives

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.

Sludge disposal. After the sludge treatment, the sludge is stabilized, it is not digesting anymore and it has been dewatered. As there are number of industries will be connected to the WWTP the sludge should be permanently monitored on heavy metals.

There is a temporary sludge storage area at the WWTP that has sufficient volume to store the sludge for 30 days. From time to time the sludge shall be transported to the landfill of the town of Djizzak. Approximately one half of the costs of operating secondary sewage treatment plants in Europe can be associated with sludge treatment and disposal.

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

Sludge and soil on which it will be used must be sampled and analyzed. Sludge shall be analyzed for heavy metals every 12 months. The limit values were given in the Table 1.

Table 1. Limit Values Heavy Metals

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

2. Sludge Disposal Management Plan Preparation Guidelines

A generator of sludge required to prepare a Disposal Management Plan (DMP) prior to disposal of the sludge at a landfill or other approved disposal facility permitted to accept sludge. Prior to the landfill's acceptance of the sludge to disposal, a specific DMP must be prepared by Contractor. The DMP must be reviewed and approved by the MoENRP prior to disposal of the sludge. The DMP must also be accepted and implemented by the disposal facility prior to disposal of the sludge.

The following sections are generally required in the DMP:

1. Current Operations – Explain the current waste water or water treatment plant operations including type of operations: origin of sludge (e.g. city system, treatment methodology or other); estimated sludge generated rate per year; current volume of stockpiled sludge, if applicable; explain how generated sludge will be stored or stockpiled (include estimated volume to be stored and other details); provide anticipated volumes to be transported and frequency of disposal;

2. Disposal Facility – Identify the landfill(s) or other disposal facilities where sludge is to be disposed. Ensure disposal facilities are permitted to accept sludge and provide the physical address, state-issued permit number and identity of the facility operator. When available, attach copies of the correspondence between the disposal facility and treatment plant operator. When included such correspondence should demonstrate the disposal facility's awareness of the nature of the sludge, estimated quantity or volume, necessary sampling frequency and parameters for testing of the sludge, and the willingness to incorporate the terms of the DMP into the disposal facility's records and operations. The DMP should also include a description of the disposal method or alternative use of the sludge at the landfill (as indicated by the operator of the proposed disposal facility). Prior to transporting sludge to an approved disposal facility, a copy of the landfill operator's written acceptance of the DMP shall be provided to the MoENRP;

3. Sludge Transportation - Provide assurance that a current and property registered commercial of special waste hauler authorized for transport of sludge is proposed. If such a hauler has not been selected at the time of the DMP submittal, insert a statement in the DMP indicated that the identity of the proposed will be provided to the MoENRP at least 10 days prior to commencement of hauling, thereby allowing the MoENRP time to verify the registration status of the hauler. If a hauler has been selected, identify the hauler business name, address, certificate number and contact person. For each load of sludge to be transported all necessary signatures, dates, addresses, telephone numbers and permit or registration numbers should be used. Assets that the contractor will retain copies of both the originating and finalized manifests for period of at least three years, and that such manifest will be made available to the MoENRP for inspection, upon request. Finally, indicate the truck route to each of the disposal facilities planned for use, beginning at the WWTP location. While not required it is preferred that road map to attached;

4. Sludge Sampling and Analysis – Explain how collected samples will representative in nature (e.g. number of gram samples will be collected and mixed together from various locations and depths from the drying bed or stockpile to comprise one representative sample, or grab will be taken from the belt press just to tipping into the transporting truck and/or storage container). Provide the frequency of sampling and analysis in order to meet the requirements under Georgian National Legislation. Identify the analytical laboratory to perform the analysis by business name, address and telephone number and provide a written assurance that the proposed laboratory a statement acknowledging that all sludge analysis results require IPMO approval to initial disposal and thereafter as indicated in the approved DMP.

Prior to transporting sludge to an approved disposal facility, a copy of the laboratory analysis shall be provided to UWSCG for review and approval:

1. Contingency plan or action – Explain the actions necessary in the event of an unplanned release or spill and how the materials will be contained, cleaning up and how the spill area will be disinfected. This is also required by the registered sludge hauler while the waste in transport and a similar incident is encountered;

2. Future Changes to the DMP Required Notification – Insert an acknowledgement that any future changes or deviations from the terms and requirements of the approved DMP require prior notification to the IPMO for review and approval;

3. Attachments – List of label all attached documents, including letters or other correspondence, maps, special waste manifests examples, laboratory reports and related documentations, and all other exhibited items.

3. Environmental protection

Care should always be taken when applying sewage sludge to land to prevent any form of adverse environmental impact. The sludge must not contain non-degradable materials, such as plastics, which would make land disposal unsightly. Movement of sludge by tanker from sewage treatment plant to agricultural land can create traffic problems and give rise to noise and odor nuisance. Vehicles should be carefully selected for their local suitability and routes chosen so as to minimize inconvenience to the public. Access to fields should be selected after consultation with the highway authority and special care must be taken to prevent vehicles carrying mud onto the highway.

Odor control is the most important environmental dimension of sludge application to land. Enclosed tankers should be used for transporting treated sludge, which tends to be less odorous than raw sludge. Discharge points for sludge from tankers or irrigators should be as near to the ground as is practicable and the liquid sludge trajectory should be kept low so as to minimize spray drift and visual impact. Untreated sludge should be injected under the soil surface using special vehicles or tankers fitted with injection equipment.

Great care is needed to prevent sludge running off onto roads or adjacent land, depending on topography, soil and weather conditions. On sloping land there is the risk of such runoff reaching watercourses and causing serious water pollution. Sludge application rates must be adjusted accordingly and, under certain circumstances, spreading might have to be discontinued. In addition to the problem of surface runoff, pollution may arise from the percolation of liquid sludge into land drains, particularly when injection techniques are used or liquid sludge is applied to dry fissured soils. In highly sensitive water pollution areas, sludge should be used only in accordance with the requirements of the pollution control authority as well as of good farming practice. Sludge storage on farms can optimize the transport and application operations but every effort must be made to ensure that storage facilities are secure.