MINISTRY OF FINANCE OF THE KYRGYZ REPUBLIC
ASIAN DEVELOPMENT BANK

ISSYK-KUL SUSTAINABLE DEVELOPMENT PROJECT

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SUPPLEMENTARY ENVIRONMENTAL MANAGEMENT PLAN: 4. KARAKOL SEWERAGE NETWORK

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MINISTRY OF FINANCE OF THE KYRGYZ REPUBLIC and THE ASIAN DEVELOPMENT BANK

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4. KARAKOL SEWERAGE NETWORK

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ABBREVIATIONS

ADB	-	Asian Development Bank
AP	-	Affected Person
BoD_5	-	5-day biochemical oxygen demand
BoQ	-	Bill of Quantities
BRD	-	Biosphere Reserve Directorate
CAL	-	Cholpon-Ata Laboratory
CC	-	construction contractor
dB(A)	-	A-weighted decibels
DO	-	dissolved oxygen
DSC	-	design and supervision consultant
EA	-	Executing Agency
EIA	-	Environmental Impact Assessment
EMMP	-	Environmental Management and Monitoring Plan
EMP	-	Environmental Management Plan
EMoP	-	Environmental Monitoring Plan
GKR	-	Government of the Kyrgyz Republic
H&S	-	Health and Safety
IKNTDEP	-	Issyk-Kul/Naryn Territorial Department of Environmental Protection
IMA	-	Independent Monitoring Agency
ISDP	-	Issyk-Kul Sustainable Development Project
L_{Aeq}	-	equivalent continuous A-weighted sound pressure level
L_{max}	-	maximum A-weighted root mean square sound level
O&M	-	Operation and Maintenance
PIO	-	Project Implementation Office
PM_{10}	-	particulate matter with a median diameter of 10 microns
$PM_{2.5}$	-	particulate matter with a median diameter of 2.5 microns
PMO	-	Project Management Office
PS	-	Pumping Station
RC	-	Reinforced Concrete
RoW	-	Right of Way
RP	-	Resettlement Plan
SAEPF	-	State Agency for Environmental Protection and Forestry
SPS	-	Safeguard Policy Statement
TDS	-	Total Dissolved Solids
TSS	-	Total Suspended Solids
UNESCO	-	United Nations Educational Scientific and Cultural Organisation
UV	-	ultraviolet

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I. INTRODUCTION

1. The Issyk-Kul Sustainable Development Project (ISDP) is part of an ongoing initiative by the Asian Development Bank (ADB) to support the Government of the Kyrgyz Republic (GKR) in improving environmental management and urban services in Issyk-Kul oblast in the north-east of the country. The first phase of the project is being implemented between 2010 and 2015. It will: (i) improve essential water supply, sewerage and solid waste infrastructure in the main urban centres (Balykchy, Cholpon-Ata and Karakol); and (ii) improve service delivery through improved resource and institutional management. The Executing Agency (EA) is the Ministry of Finance and the project is administered through a Project Management Office (PMO) in Bishkek and a Project Implementation Office (PIO) in Karakol.

2. Issyk-Kul is the world's second largest saline lake and is internationally important for biodiversity, as the basin supports rare and endemic species and significant flocks of visiting birds. The entire oblast was designated as a Biosphere Reserve by GKR in 1998, and UNESCO in 2001. The lake is also a major tourist attraction, bringing over a million visitors annually, which increases pressure on municipal infrastructure and the lake environment. Because of the international importance of the basin and the risk of new infrastructure causing environmental damage, ADB has classified the project as environmental assessment Category A (the highest category). It is imperative therefore that the environment is fully protected throughout planning and implementation of the ISDP, and especially construction and operation of the planned new infrastructure.

3. An Environmental Impact Assessment (EIA) in 2009 identified the main potential impacts of the project and proposed measures to avoid or mitigate them. An Environmental Management and Monitoring Plan (EMMP) prepared in 2012, specifies how each mitigation measure is to be provided and who is responsible for taking each action. This deals with the entire project and is the main source of information on its impacts, mitigation and monitoring. The PIO is responsible for implementing the EMMP, reporting to the PMO. The EMMP includes an Environmental Monitoring Programme (EMoP), which is conducted by Issyk-Kul/Naryn Territorial Department for Environmental Protection (IKNTDEP) and the Biosphere Reserve Directorate (BRD), as specified by GKR and ADB in the loan/grant agreement.

4. The present document provides a Supplementary Environmental Management Plan (SEMP) for one element of the infrastructure (Karakol sewerage network). It is derived from the EMMP and is intended mainly for use by the Design & Supervision Consultant (DSC) and the Construction Contractors (CC) as it sets out the actions they are required to take to provide all mitigation that is their responsibility. Information is presented with minimal explanation, so that the document is brief and easily usable. The project EMMP provides more detail and should be referred to when necessary.

II. THE PROJECT

5. Table 1 summarises the infrastructure element of the project, and the possible approach to construction and operation. This is provided to illustrate the assessment of impacts only and some details of infrastructure or actual construction methods may differ.

6. Improvements to Karakol sewer network will involve: a) replacing 7 km of single sewer line in 10 separate lengths; b) providing 12 km of new main sewer to a residential area; and c) refurbishing 3 sewage pumping stations. Sewer pipelines are normally buried beneath roads, so construction will involve digging trenches in roads by backhoe digger, with a small team of labourers to position and/or replace pipe-work by hand. Trenches are then refilled and excess soil is loaded onto trucks and taken to municipal dumpsites and the road surface is repaired. The new sewer will cross Karakol River by a pipe-bridge, which will require excavation of foundations in the river bed and construction of 8 reinforced concrete

Table 1: Summary of proposed ISDP infrastructure and the likely approach to construction and operation

Infrastructure	Balykchy	Cholpon-Ata	Karakol	Construction Methods	Operation
Sewerage	Replacing 5.7 km of dual-pipe sewer main		Replacing 7 km of single sewer line in short sections	Excavating trenches in roads by backhoe; fitting new pipes by hand; trench refilling; removing excess soil by truck to disposal site. Excavating foundations in Karakol river and building RC piers for pipe-bridge	The *Vodokanal* Enterprise in each city is responsible for operating the water supply and sewerage systems. Repair and maintenance is planned/organised by engineers and other professionals and conducted by teams of labourers and skilled workers. Repairs are conducted when leaks are reported and involve the same activities as construction (trenching, pipe fitting, etc).
			12 km of new sewer main to a new residential area; including a river crossing		
	Construction of main sewage pumping station		Refurbishing 3 sewage pumping stations	Capital building work (structural concrete, trenching, bricklaying, plastering). Fitting new pumps & other components by hand	
	Providing tools, equipment and vehicles to assist Vodokanals in maintenance and operation of the existing sewer network and pumping stations			Vehicles and equipment are delivered by truck or low-loader from Bishkek	
Water Supply	Rehabilitating 4 boreholes Constructing 1 new borehole	Drilling 1 new borehole; rehabilitating 2 boreholes; upgrading pump stations;		Pumped removal of silt; construction of concrete chambers; installation of new pumps, pipes and UV disinfection	
	Replacing 1 km of dual water transmission main			Trench construction in open terrain as described above	
			New pre-treatment basin at existing Water Treatment Plant	Foundation excavation by backhoe and bulldozer; removal of soil by truck for disposal; and constructing tank structure and sluice gates from reinforced concrete (metal rods encased in wood or metal formwork, into which concrete is poured)	
	3,000 new water meters	2,550 new water meters		Mainly installed by hand in houses, at junctions between existing pipes	
Solid Waste	180 community waste bins (metal); 2 garbage trucks	120 community waste bins (metal); 1 garbage truck	300 community waste bins (metal); 4 garbage trucks	Bins are delivered by truck; and garbage vehicles are driven from Bishkek	Collection & disposal of waste is conducted by *Tazalyk.* This may continue, or disposal may be contracted to a private company.
	Operating a small part of each existing disposal site with improved practices (waste compaction, grading and fortnightly covering with soil) to receive waste in the period until a new regional landfill or other facility is designed and built			Bulldozer will spread, grade and compact waste; and a front-end loader will dig soil from site to cover waste. The operation is expected to take 3 days each fortnight	
Community	Providing new or refurbished toilets and washrooms in all 23 schools in the 3 cities			Small scale trenching and building work, mainly done by hand	Each school authority will maintain toilets

foundations and pillars, supporting a steel box-structure. Refurbishing the pump stations will involve mainly small-scale concreting, brickwork, plastering, etc, followed by installation of new pumps and other components, which are delivered by truck, offloaded by small crane and connected up by hand.

7. Operation of sewerage networks is the responsibility of the *Vodokanal* Enterprise in the city, the government provider of water supply and sewerage services. Maintenance and repairs are managed by senior engineers in the *Vodokanal*, and are also conducted if faults are reported by the public. Repair work is generally similar to the construction described above and normally involves trenching, replacement of pipes and related activities.

III. ENVIRONMENTAL MANAGEMENT PLAN - CONSTRUCTION

8. Improving sewers via network rehabilitation and expansion involves mainly basic construction techniques that are used in building most infrastructure projects (excavation, transportation of materials, disposal of waste spoil, etc). As a result, the environmental risks are mainly those that are common to most construction sites. These include:

- Pollution of land, rivers or groundwater by rainfall washing silt from excavated soil or stored sand; or by spills of fuel and other toxic materials used or stored on site;
- Noise and dust from construction activity may affect workers and local residents;
- Disruption of traffic by trenches in roads; disturbance of residents by diverted traffic;
- Risks to the health and safety of workers and the public from construction activities.

9. These will be mitigated by taking relatively straightforward precautions, which are widely used on construction sites worldwide. These include such actions as:

- Building trenches in short lengths to minimise the amount of soil left on site; refilling trenches quickly; and removing excess soil for disposal soon after excavation;
- Bringing in loose material only when needed, instead of storing in stockpiles on site;
- Maintaining and refuelling vehicles and machinery in offsite garages or workshops, with appropriate pollution prevention and waste management practices;
- Storing fuel, oil and other toxic liquids offsite, also with suitable pollution controls;
- Avoiding using older vehicles and machinery; and maintaining all equipment according to manufacturers' specifications;
- Planning road diversions to minimise traffic disruption and disturbance of residents;
- Implementing a Health and Safety (H&S) Plan with procedures to protect workers and the general public.

10. There are certain other risks associated with the Karakol sewerage scheme, because it involves construction of a pipe-bridge across Karakol River. These include:

- Excavation in the river bed may disturb and kill animals inhabiting the sediment;
- Karakol river, Issyk-Kul lake and inhabiting plants and animals could be affected by disturbed sediment and any pollutants it contains;
- Any materials spilled into the river could also affect flora/fauna in the river and lake.

11. Some special precautions will be required to avoid these impacts, including:

- Conducting construction in the river during the summer/autumn low flow season only;
- Diverting river channels away from work sites to prevent disturbed sediment being washed into the river;
- Prohibiting any refuelling and storage of materials near the river.

12. These and the other potential impacts of improving the Karakol sewerage network are shown in Table 2A below, along with the mitigation required to avoid or reduce each impact to the level of no significance. Most of the mitigation is the responsibility of the Construction Contractor (CC); and there is also action required by other project entities, including the Design and Supervision Consultant (DSC) and the PMO.

IV. ENVIRONMENTAL MANAGEMENT PLAN - OPERATION

13. This project will repair sections of the sewer network, refurbish existing pump stations and provide a new main sewer to a currently un-serviced residential area. This will not increase the load on the sewage treatment plant, or have any environmental impacts in relation to the disposal of treated effluent, because new household connections will not be provided until the sewage treatment plant is upgraded in Phase 2 of the ISDP. The only environmental risks from operation of the infrastructure provided in the current Phase 1 relate to operation of the improved and extended sewer network and any repairs that may subsequently be conducted.

14. Once the new and refurbished network is in operation, any future repairs carried out by the Karakol *Vodokanal* Enterprise will involve the same sorts of activity as conducted when the network was built or refurbished. However repair work is generally small in scale and infrequent, and is therefore unlikely to cause major negative impacts. The main risk associated with the operating network is that the new infrastructure could malfunction if it is not properly operated and maintained, causing sewer leaks and localised flooding, which could affect the health and property of residents. This will be avoided through the range of supporting measures the project will provide for the *Vodokanal* Enterprises in each city, to assist them in improving the delivery of services. These will include the provision of manuals and training in the correct operation and maintenance of the new infrastructure components, and assistance in managing and implementing their work programme, via training, provision of management tools and equipment, etc (see Table 2B).

V. ENVIRONMENTAL SUPERVISION AND MONITORING

15. The Design and Supervision Consultant (DSC) and the Construction Contractors (CC) are legally required by their contracts to take all actions that are allocated to them in this Environmental Management Plan (Table 2). Implementation of these actions will be checked as shown in Table 3 (Columns 5-8) and the environmental impacts of improving the Karakol sewerage network will be monitored as shown in Table 4. This process will be coordinated by the PMO, who will require the responsible parties to take remedial action in the case of any serious or repeated departure from the EMP requirements, or if the supervision or monitoring reveals any significant or unexpected negative environmental or social impacts.

Table 2: Environmental Management Plan for Karakol Sewerage Network (Key at end)

Potential Negative Impact	S	D	Mitigation	Loc	Environmental Management Plan	Rsp	D	14	15	16	Op
A. CONSTRUCTION PERIOD											
1. Soil and Water Quality: a) Land, streams and groundwater may be polluted by spillage of oil or other toxic material used or stored on site	M	T	Maintain, repair and refuel vehicles and machinery in an offsite garage/workshop	AS	Identify existing garages or workshops near the work sites with the capacity to service, repair and refuel vehicles and machinery used in construction	CC		■			
					Ensure waste management at chosen premises complies with law and good practice (eg clean-up of spills; no disposal of waste oil to land or drains, etc)	CC		■	■	■	
					Maintain, repair & refuel all vehicles/machines at chosen premises, not on site	CC		■	■	■	
			Do not store oil, fuel or other toxic material at any construction sites	AS	Identify suitable premises for offsite storage of fuel, oil & other toxic materials	CC		■			
					Ensure storage at chosen premises complies with law and good practice	CC		■	■	■	
					Do not store any fuel, oil or other toxic materials at construction sites	CC		■	■	■	
b) Material dug from trenches could pollute nearby land and streams if silt is washed off mounds of soil during rainfall	M	T	Construct trenches in short lengths to reduce the amount of dug soil left on site	AS	Plan network construction based on trenches of < 200m length where feasible	DSC	■				
			Re-fill trenches quickly so that material to be re-used is on the surface for short time	AS	Complete construction of each trench before starting excavation of new length	CC		■	■	■	
					Dig and refill trenches sequentially, in lengths of <200 m where possible	CC		■	■	■	
			Remove excess trench material to disposal sites soon after excavation	AS	Load excess excavated trench material directly onto trucks and take immediately to disposal sites, wherever possible	CC		■	■	■	
c) Land, streams and groundwater may be polluted if site sewage is not disposed of properly	M	T	Provide adequate portable toilets and washrooms at all work sites	AS	Provide properly-equipped portable toilets and washrooms at all work sites	CC		■	■	■	
					Provide toilets and washrooms at the ratio of 1 unit for every 15 personnel	CC		■	■	■	
			Ensure contents of site toilets are treated & disposed of according to legal standards	AS	Empty and clean toilets and replenish toiletry materials at least twice a week	CC		■	■	■	
					Dispose of toilet contents to comply with national wastewater standards	CC		■	■	■	
			Monitor the quality of any liquid discharges from site	AS	Monitor quality of liquid discharges from site (drainage, sewage, dewatering)	CAL		■	■	■	
					Provide water quality data to PMO; compare results with national standards	CAL		■	■	■	
					Discuss monitoring data with contractor; require mitigation if necessary	PMO		■	■	■	
d) Karakol River, Issyk-Kul and inhabiting plants and animals could be affected by sediment & attached pollutants disturbed by construction of the river crossing	S	T	Limit sediment disturbance by minimising the size of construction area in the river	RC	Calculate the minimum feasible size of the construction area in the river and mark the area accurately on site drawings in tender documents	DSC	■				
					Before work starts, erect a perimeter fence around the river construction area	CC		■			
					Ensure all personnel, vehicles and machinery remain within designated area	CC		■	■	■	
			Limit sediment disturbance by working in the river during the low flow season only	RC	In construction program show river crossing construction in summer-autumn	DSC	■				
					Conduct tender process for Karakol sewerage sub-project in winter; inform bidders that work in the river is only permitted in summer-autumn	PMO	■				
			Prevent contact between river water and the construction area and materials	RC	Divert river channels away from locations of bridge pillars to allow excavation and construction in dry conditions to the extent possible	CC		■	■	■	
					Retain dewatering water in pond to reduce sediment before discharge to river	CC		■	■	■	

Potential Negative Impact	S	D	Mitigation	Loc	Environmental Management Plan	Rsp	D	14	15	16	Op
2. Air Quality and Noise: Noise and dust caused by excavation, site vehicles and other construction activities may affect workers and nearby residents	M	T	Avoid using older vehicles and machines with excessive noise & exhaust emissions	AS	Perform visual and audial checks of vehicles and machinery every 3 months	CC					
					Repair or replace any vehicles/machines with significant noise or exhaust gas	CC					
			Maintain, service and repair all vehicles & machinery to manufacturers' specification	AS	Prepare maintenance schedule for vehicles, machinery, equipment according to manufacturers' specifications; conduct maintenance as scheduled	CC					
			Ensure no noise >70 dB(A) is audible for significant periods 50 m from construction sites in residential areas	AS	Monitor noise every month 50 m outside construction sites near housing	BRD					
					Provide noise monitoring data to PMO; highlight any results >70 dB(A)	BRD					
					Discuss noise monitoring data with contractor; require mitigation if necessary	PMO					
			For any work <150 m from housing, stop work at night, weekends & Public Holidays	AS	Where construction sites are located <150 m from houses, do not work at night (10pm - 6 am), at weekends or on Public Holidays	CC					
			As above: short trenches; refill quickly; etc	AS	Actions as specified in A.1.b above						
			Bring sand and other loose material to site only when needed; do not stockpile on site	AS	Bring sand and other loose material to site only when needed for construction	CC					
					Do not store any loose material on site in stockpiles (except excavated soil)	CC					
			Water unpaved site roads and large areas of exposed soil thrice daily in dry weather	AS	Water unpaved site roads and any large areas of exposed soil three times a day in dry and windy weather (early morning, late morning and mid-afternoon)	CC					
3. Flora and Fauna: Flora and fauna will be lost if trees are removed, so this should be minimised by careful planning and construction	M	P	Locate new sewers pipelines beneath roads or in the RoW alongside roads; and design network route to avoid loss of trees	SN	In designs, locate new sewer pipelines beneath roads or in RoW beside roads	DSC					
					Identify locations of all trees on pipeline routes; adjust alignment to avoid trees	DSC					
			If any trees are removed, plant & maintain 2 of the same species for each tree lost	AS	If loss of trees cannot be avoided, plant and maintain throughout construction period, two trees of the same species, for every one tree that is lost	CC					
					Specify in Bill of Quantities (BoQ) number of trees to be removed & replanting	DSC					
			Clearly mark any trees that have to be removed; and ensure only these are cut	AS	If any trees have to be removed, mark them clearly with paint crosses and give ground clearance crews clear instructions to only remove marked trees	CC					
4. Traffic: Trenches in roads will disrupt traffic; and residents may be disturbed by increased traffic on other roads, or if vehicles drive on waste ground near houses	M	T	Plan road diversions before construction if needed and organise diversions with Police Department and Mayor's Office	SN	During work planning, examine road dimensions and identify locations where there is insufficient space for traffic to pass safely alongside the work-site	CC					
					Before construction discuss the need for traffic diversions with local authorities	CC					
					Arrange for Police Dept to implement road closure & diversions when needed	CC					
5. Socio-economic conditions: a) Businesses could lose customers and income if there is trench construction nearby for a long time	M	T	Increase workers and site inspectors in business and residential areas to finish work quickly	SN	Include in construction program, provision to increase numbers of workers and equipment in business districts and inhabited areas to finish work quickly	CC					
					Include in supervision plan, rapid work inspection in business/residential areas	DSC					
			Leave space between mounds of soil alongside trenches, for pedestrian access	SN	If trenches are built beside roads in business districts & inhabited areas, leave spaces between mounds of soil every few metres to allow pedestrian access	CC					
			Provide walkways and vehicle access where needed over open trenches	SN	Provide safe walkways and vehicle access where needed, to allow people and vehicles to cross open trenches to reach houses and businesses	CC					
			Hold meetings to inform business and residents of work program and access	SN	Devise a program of regular meetings with local communities throughout the construction period to inform them about the project and key issues	PMO					

Potential Negative Impact	S	D	Mitigation	Loc	Environmental Management Plan	Rsp	D	14	15	16	Op
			arrangements before work starts		Include in consultation meetings, details of: overall work program and local schedule; ways in which people could be affected; proposed mitigation; etc	PMO CC					
b) Local people can benefit if employed in contractors' workforce and this can offset some of the disturbance experienced by people living near construction sites	M	T	Employ people who live in the vicinity of construction works as much as possible	AS	Examine home location when considering candidates to employ in workforce	CC					
					Employ people living near construction sites where possible	CC					
			Employ disadvantaged persons as much as possible (eg women, disabled, etc)	AS	Examine social status of candidates for employment in construction workforce	CC					
					Employ people from disadvantaged households to the extent possible	CC					
<u>6. Involuntary Resettlement:</u> a) Owners, tenants and squatters may lose income if private land is acquired along pipeline routes and if houses or shops have to be demolished	S	P	Adjust pipeline routes where necessary to avoid structures and privately owned land	WSN	Plot on drawings, RoW of new pipeline, land ownership and all structures. Adjust pipe route to avoid private land and structures where necessary	DSC					
			If structures cannot be avoided, or if privately owned land is acquired: prepare Resettlement Plan (RP); acquire land and property; pay appropriate compensation for losses by all parties (owners, tenants, squatters)	AS	If structures cannot be avoided or private land is acquired, conduct resettlement studies as required by Kyrgyz law and ADB Safeguard PS (2009)	DSC					
					Identify owners of all land & structures to be acquired, collect socioeconomic data, prepare Entitlement Matrix, discuss compensation with affected persons, etc. Prepare RP for review/approval by national agencies and ADB	DSC					
					Once RP is approved, purchase land and structures, disburse compensation, providing all entitlements as set out in RP (owners, tenants and any squatters)	PMO					
b) Business may lose income if customer access is impeded by construction	S	T	If economic losses are significant, pay compensation to owner/tenants as in RP	AS	Include affected businesses in resettlement planning and provide cash compensation for any significant losses as established in Entitlement Matrix	DSC PMO					
<u>7. Waste Management:</u> Inappropriate disposal of waste from work sites can cause visual and chemical pollution and cause safety risks	M	T	Deposit excavated spoil and other waste at local authority dumpsite; leave material safe, so that it will not affect other users	AS	Consult *rayon* and *Tazalyk* before construction starts to make arrangements for deposition of spoil and other waste at municipal dumpsites	CC					
				AS	Deposit waste material at the disposal site as directed by the waste operators, in a safe condition, without blocking access for other users	CC					
				AS	Make arrangements with *rayon* and *Tazalyk* for safe disposal of hazardous waste from work sites; comply fully with any instructions for deposition/storage	CC					
			Keep construction sites tidy and in a sanitary condition	AS	Provide designated containers for deposition & storage of garbage at all sites	CC					
					Arrange for *Tazalyk* to empty site waste containers at least once a week	CC					
					Do not allow waste burning on site, or waste disposal at unlicensed sites	CC					
<u>8. Health and Safety:</u> All construction carries some risk to the health/safety of workers; and to people who live or work nearby	M	P	Prepare and implement a Health & Safety (H&S) Plan covering all work activity	AS	Specify preparation and implementation of H&S Plan in Bill of Quantities BoQ	DSC					
					Prepare and submit to PMO for approval, H&S Plan describing action to comply with all relevant laws and protect employees and the general public	CC					
					Include in H&S Plan at least: no use of hazardous materials (eg asbestos, lead-based paint); use of hard hats and safety boots at all work sites; etc	CC					
					Train site workers in appropriate H&S before work starts	CC					
					Keep records of accidents; review periodically; amend procedures if needed	CC					
					Include in H&S a procedure for working in areas that may be contaminated with sewage, including leak prevention, clean-up, personal hygiene, etc	CC					

Potential Negative Impact	S	D	Mitigation	Loc	Environmental Management Plan	Rsp	D	14	15	16	Op
9. Public Health: Water supplies may be contaminated if there are leaks in water and sewer pipes located close together	M	T	Locate new sewer pipes away from existing water pipes and in separate trenches where possible	WSN	Take location of existing pipelines into account when designing new networks	DSC					
					Locate new sewer pipes away from water pipes and in separate trenches where possible	DSC					
B. OPERATION AND MAINTENANCE											
1. Public Health and Safety: If new pump stations and sewers are not properly maintained and promptly repaired they will fall into disrepair, causing leaks, which may damage other infrastructure and cause risks to public health & safety.	S	P	Strengthen *Vodokanal* with training and other support to improve management of water and sewerage systems. Support to cover financial/project management, work planning/implementation, monitoring, etc	V	Provide *Vodokanals* with training and consultancy support to help manage the operation of water supply and sewerage systems. Include financial and project management, work planning and implementation, software tools, etc	PMO					
					Set up and operate improved management & monitoring systems to facilitate effective management of water supply and sewerage systems	V					
					Regularly inspect and maintain all infrastructure as specified in O&M manuals	V					
			Prepare or update *Vodokanal* Operation & Maintenance (O&M) Manuals; specify how network maintenance/repair is to be done	AS	Review *Vodokanal* O&M manuals & procedures; assess the need for revision	DSC					
					Describe in O&M Manuals how to operate/maintain all new infrastructure	DSC					
			Include in sewer O&M Manual, measures to avoid contact with wastewater	WSN	Include in O&M procedures, H&S precautions to protect workers & the public	DSC					
					For sewers specify how to avoid contact with wastewater (eg first isolate faulty section and pump out contents). Specify personal hygiene in event of contact	DSC					
			Train O&M staff in maintenance of all new infrastructure; supervise all O&M teams	AS	Ensure all O&M staff and supervisors are suitably qualified and experienced	V					
					Train O&M staff in all relevant maintenance & repair before starting work and periodically thereafter. Include maintenance & repair of water & sewer network	V					
					Prepare work schedules for O&M teams. Ensure supervisors actively manage and oversee each team to ensure work is done as specified in manuals	V					
2. Noise: Noise from operating pumps can disturb people who live nearby	S	P	Specify in design and contract documents use of low-noise pumps in inhabited areas	PS	If pump stations are located near housing, specify in design and contract documents the use of low-noise pumps	DSC					
			Minimise pump malfunction by maintaining as specified in manufacturer's handbooks	PS	Schedule and conduct pump maintenance as specified in manufacturer's handbooks; supervise pump maintenance to ensure work is done as specified	V					

KEY TO TABLE 2

S = Significance of impact: S = Significant; M = Moderately Significant; N = Not Significant

D = Duration of impact: P = Permanent; T = Temporary

Loc = Location: AS = Mitigation required at all construction sites; SN = Mitigation required only at sites of Sewerage Networks; RC = River Crossing

Rsp = Responsibility: CC = Construction Contractors; DSC = Design and Supervision Consultant; PMO = Project Management Office; V = Vodokanal; CAL = Cholpon-Ata Laboratory (IKNTDEP, SAEPF); BRD = Biosphere Reserve Directorate (SAEPF)

Programme: **D** = Design Stage; **14, 15, 16** = Construction Period (2014-16); **Op** = Operational Period

Table 3: Environmental Supervision for Karakol Sewerage Network (Columns 5-8) (Key at end)

Impact	Mitigation	Environmental Management	Rsp	Supervision - Method	Rsp	Loc	Frequency
A. CONSTRUCTION PERIOD							
1. Soil and Water Quality: a) Land, streams or ground water may be polluted by spills of oil or other toxic material stored or used on site	Maintain, repair and refuel vehicles and machinery in an offsite garage/workshop	Identify suitable local garage or workshop	CC	Check Contractor's records or other evidence	DSC	AS	One check
		Ensure good waste management at premises	CC	Observe waste management at garage/workshop	DSC	VMS	Monthly
		Maintain/refuel all vehicles/machinery at premises	CC	Watch vehicle/machinery maintenance/refuelling	DSC	VMS	Monthly
	Do not store oil, fuel or other toxic material at any construction sites	Identify suitable premises for storage of fuel, etc	CC	Check Contractor's records or other evidence	DSC	AS	One check
		Storage of fuel, oil, etc - ensure good practice	CC	Observe storage of hazardous materials	DSC	FSS	Monthly
		Do not store fuel, oil, etc at construction sites	CC	Observe construction sites - ensure no fuel stored	DSC	AS	Monthly
b) Soil dug from trenches could pollute land and streams if silt is washed from soil mounds by rain	Dig short trenches to minimise soil on site	Plan construction via trenches of <200m if feasible	DSC	Check assumed trench length in design reports	PMO	SN	One check
	Re-fill trenches quickly	Refill one trench before excavating the next	CC	Observe network construction sites	DSC	SN	Weekly
	Remove excess soil for disposal quickly	Load excess soil directly onto trucks if feasible	CC	Observe network construction sites	DSC	SN	Weekly
c) Land, streams or ground water may be polluted if site sewage is not disposed of properly	Provide adequate portable toilets and washrooms at all sites	Provide equipped toilets & washrooms at all sites	CC	Observe construction sites	DSC	AS	Monthly
		Provide 1 toilet/washroom for every 15 personnel	CC	Check numbers at construction sites	DSC	AS	Monthly
	Ensure contents of site toilets are treated & disposed of according to legal standards	Empty, clean, re-equip toilets at least twice weekly	CC	Check condition of site toilets; observe cleaning	DSC	AS	Monthly
		Dispose of sewage to legal discharge standards	CC	Observe sewage disposal; check CC records	DSC	AS	Monthly
	Monitor the quality of any liquid discharges from construction sites	Monitor quality of drainage, sewage, dewatering	CAL	Observe water quality monitoring	PMO	AS	Monthly
		Provide water quality data to PMO	CAL	Review water quality data	PMO	AS	Monthly
		Require mitigation by CC if necessary	PMO	Observe mitigation when implemented on site	DSC	AS	Monthly
d) Karakol River, Issyk-Kul and plants/animals may be affected by sediment and pollutants disturbed when river crossing is built	Limit sediment disturbance by minimising the size of construction area in the river	Plan minimum worksite area; show on tender map	DSC	Check tender documents	PMO	RC	One check
		Erect fence around river construction area	CC	Observe river construction site	DSC	RC	Monthly
		Ensure workers, vehicles remain in fenced area	CC	Observe river construction site	DSC	RC	Monthly
	Limit sediment disturbance by working in the river in the low flow season only	Work programme: river crossing summer/autumn	DSC	Check draft construction programme	PMO	RC	One check
		Tender - winter; tell bidders river crossing program	PMO	Check tender documents and pre-bid meeting	PMO	RC	One check
	Prevent contact between river water and the construction area and materials	Divert river channels away from bridge pillar sites	CC	Observe river construction site	DSC	RC	Weekly
		Keep dewatering water in pond before discharge	CC	Observe river construction site	DSC	RC	Weekly
2. Air Quality and Noise: Noise and dust caused by excavation, site vehicles and work activity can affect workers and local residents	Avoid using older vehicles and machines with excessive noise & exhaust	Visually check vehicles/machines every 3 months	CC	Check CC record; observe site vehicles/machines	DSC	AS	Monthly
		Repair/replace any with significant noise/exhaust	CC	Observe vehicles and machinery at work sites	DSC	AS	Monthly
	Maintain, service and repair vehicles and machinery to manufacturers' specification	Prepare maintenance schedules as specified by manufacturer; conduct maintenance as scheduled	CC	Check CC schedule and maintenance records Observe state of vehicles and machinery on site	DSC	AS	Monthly
	No noise >70 dB(A) audible for long	Monitor noise 50 m from work sites near houses	BRD	Observe noise monitoring at borehole sites	PMO	AS	Monthly

Impact	Mitigation	Environmental Management	Rsp	Supervision - Method	Rsp	Loc	Frequency
	periods 50m from sites in residential areas	Provide noise monitoring data to PMO	BRD	Review noise monitoring reports	PMO	AS	Monthly
		Require noise mitigation by CC if necessary	PMO	Observe mitigation when implemented on site	DSC	AS	Monthly
	For any work <150 m from housing, stop work at night, weekends & Public Holidays	At work sites <150 m from houses: no work at night (10pm - 6am), weekends or Public Holidays	CC	Check CC work program Observe work sites at night, weekends, holidays	DSC	AS	Monthly
	As above: short trenches; refill quickly, etc	Actions shown in A.1.b above					
	Bring sand and other loose material to site only when needed; do not stockpile on site	Bring sand to site only when needed	CC	Observe construction sites; ensure no stockpiles	DSC	AS	Weekly
		Do not stockpile loose material on site	CC				
	Water unpaved site roads & exposed soil	Water site roads/soil 3 times a day when dry/wind	CC	Observe site watering during dry & windy weather	DSC	AS	As necessary
3. Flora and Fauna: Flora & fauna will be lost if trees are removed	Locate sewer pipes below road or in RoW beside road; plan routes to avoid trees	Locate sewers below roads or in RoW alongside	DSC	Check design reports and drawings	PMO	SN	One check
		Plot tree locations; adjust route alignment to avoid	DSC	Check design reports & drawings; observe on site	DSC	SN	Monthly
	Plant/maintain 2 trees for every 1 removed	Plant/maintain 2 trees for every 1 tree removed	CC	Check planting; check tree numbers cut & planted	DSC	SN	One check
		BoQ: specify numbers of trees removed/replanted	DSC	Check BoQ	PMO	SN	One check
	Mark all trees to be cut; only remove these	Trees to be cut: mark with paint crosses; instruct ground clearance crews to only fell marked trees	CC	Observe ground clearance; check tree felling	DSC	SN	Weekly
4. Traffic: Road excavation will disrupt traffic; this may disturb residents especially if drivers use waste ground	Plan road diversions before work starts; organise with Police and Mayor's Office	Check road width; identify if traffic cannot pass	CC	Check evidence provided by CC	DSC	SN	One check
		Discuss traffic diversions with local authorities	CC	Check CC meeting notes	DSC	SN	One check
		Ask Police to implement road closure/diversions	CC	Check CC correspondence	DSC	SN	One check
5. Socio-economics: a) Businesses may lose customers & income if trench construction is nearby for a long time	Increase workers/site inspectors to finish work quickly in business/residential areas	Work program: increase workers and equipment in business/residential areas to finish work quickly	CC	Compare worker numbers with other work sites	DSC	WSN	Monthly
		Supervision plan: rapid inspection in these areas	DSC	Observe site inspections	PIO	SN	Monthly
	Leave space for access between soil piles	Leave space in soil mounds for pedestrian access	CC	Observe network construction sites	DSC	SN	Monthly
	Walkways/metal sheets for vehicle access	Walkways & vehicle access over open trenches	CC	Observe network construction sites	DSC	SN	Monthly
	Meet business and residents. Inform about work program & access arrangements	Program regular meetings with local communities	PMO	Check consultation program; attend meetings	PMO	AS	As necessary
		In meetings, discuss: work; impacts; mitigation	PMO	Attend public consultation meetings	PMO	AS	As necessary
b) Local people benefit if employed in contractors' workforce; this can offset disturbance felt by people who live near work sites	Employ people who live near construction sites as much as possible	Consider home location of work applicants	CC	Check CC employment records	DSC	AS	One check
		Employ people living near work sites if possible	CC	Interview employees; check home locations	DSC	AS	One check
	Employ disadvantaged persons as much as possible (women, disabled, etc)	Consider social status of work applicants	CC	Check CC employment records	DSC	AS	One check
		Employ disadvantaged people when available	CC	Interview employees	DSC	AS	One check
6.Involuntary Resettlement a) Owners, tenants and squatters may lose income if private land is acquired or if houses or shops are	Adjust pipeline routes where necessary to avoid structures and privately owned land	Plot pipeline RoW, land ownership, structures; adjust pipe route to avoid private land & structures	DSC	Check design reports/drawings; observe sites	PMO	AS	One check
	If structures or land acquisition cannot be avoided: prepare RP, buy land/property;	If structures are not avoided: resettlement study	DSC	Check Resettlement Plan; obtain ADB approval	PMO	AS	One check
		Identify all Affected Persons, prepare Entitlement	DSC	Independent checks of resettlement planning, RP,	IMA	AS	As necessary

Impact	Mitigation	Environmental Management	Rsp	Supervision - Method	Rsp	Loc	Frequency
demolished	pay fair compensation to owner, tenants, squatters	Matrix and RP. Obtain approval (national & ADB)		disbursement of compensation, public satisfaction			
		Buy land & structures; pay compensation as in RP	PMO	Observe & check land acquisition, disbursement	IMA	AS	As necessary
b) Business lose income if customer access impeded	If economic losses are significant, pay fair compensation to owner/tenants as in RP	Include affected businesses in RP. Provide cash compensation for significant losses as in RP	DSC PMO	Independent observation /checks as in 5.a above	IMA	AS	As necessary
7. Waste Management: Inappropriate disposal of waste from work sites can cause visual and chemical pollution and safety risks	Deposit dug spoil and other waste at local authority dumpsite; leave tidy and safe	Arrange waste disposal with local *rayon* & *tazalyk*	CC	Check CC evidence of waste arrangements	DSC	AS	One check
		Deposit material at dumpsite as directed	CC	Observe waste disposal at dumpsites	DSC	AS	Monthly
		Arrange disposal of hazardous waste with *rayon* & *tazalyk*. Follow instructions for disposal or storage	CC	Check CC evidence of waste arrangements Observe disposal of hazardous waste at dumpsite	DSC	AS	One check Monthly
	Keep construction sites tidy and in a sanitary condition	Provide containers for garbage at all sites	CC	Observe construction sites	DSC	AS	Monthly
		Arrange for *tazalyk* to empty waste at least weekly	CC	Observe waste collection at construction sites	DSC	AS	Bi-monthly
		No waste burning, or disposal at unlicensed sites	CC	Observe waste deposition & storage on site	DSC	AS	Monthly
8. Health and Safety (H&S) All construction carries some risk to health/safety of workers and people who live nearby	Prepare/implement H&S Plan covering all work activity	Specify implementation of H&S Plan in BoQ	DSC	Check Bill of Quantities	PMO	AS	One check
		Prepare H&S Plan; submit to PMO for approval	CC	Review draft H&S Plan; amend or approve	PMO	AS	One check
		Include: no asbestos, etc; use hard hats/boots; etc	CC	Observe compliance with H&S Plan at worksites	DSC	AS	Monthly
		Train all workers in H&S before work starts	CC	Check CC training record; attend training session	DSC	AS	One check
		Keep record of accidents; review; update HS Plan	CC	Check CC accident record & H&S Plan updates	PMO	AS	6-monthly
		HS Plan: procedure for safe working with sewage	CC	Check CC H&S Plan	PMO	AS	One check
9. Public Health: Leaking sewers may contaminate nearby water supply pipes	Locate new sewer pipes away from water pipes, in separate trenches if possible	Network design: consider present pipeline location	DSC	Check design reports	PMO	SN	One check
		Sewer not near water pipes; in separate trench	DSC	Check design reports; observe construction	PMO	SN	As necessary
B. OPERATION AND MAINTENANCE							
1. Public Health & Safety: If new pump stations and sewers are not maintained and promptly repaired they will fall into disrepair, causing leaks, which may damage infrastructure and risk public health & safety.	Strengthen *Vodokanal* by training etc to improve management of water/sewerage systems (financial/project management; work planning/implementation; monitoring)	Give *Vodokanals* training & support by consultants	PMO	No supervision necessary			
		Improve management & monitoring systems	V	Check V system improvements	PMO	V	As necessary
		Inspect/maintain infrastructure as in O&M Manual	V	Check V inspection and maintenance on site	PIO	SN	As necessary
	Prepare/update *Vodokanal* O&M manuals; include network repair & maintenance	Review *Vodokanal* O&M manuals & procedures	DSC	Check DSC monthly work activity reports	PMO	AS	Monthly
		In manuals describe O&M of all new infrastructure	DSC	Review draft O&M Manuals; amend if necessary	PMO	AS	One check
	In Sewer O&M Manual, include measures to avoid contact with wastewater	O&M Manual: include H&S precautions	DSC	Review draft O&M Manuals; amend if necessary	PMO	AS	One check
		Sewer Manual: how to avoid wastewater contact	DSC	Review draft O&M Manuals; amend if necessary	PMO	SN	One check
	Train O&M staff in maintenance of new infrastructure; supervise all O&M teams	O&M staff & supervisors - qualified & experienced	V	Check V personnel records	PMO	V	One check
		Train O&M staff in relevant maintenance & repair	V	Check V training records	PMO	AS	One check
		Prepare O&M work schedules; ensure supervisors actively manage all teams; work as O&M manual	V	Check V work schedules; observe O&M work	PIO	AS	Monthly

Impact	Mitigation	Environmental Management	Rsp	Supervision - Method	Rsp	Loc	Frequency
2.Noise: Noise from pumps may disturb local residents	Use low noise pumps in inhabited areas	Design & Contract Docs: specify low noise pumps	DSC	Check design & contract documents Monitor noise at pump stations near housing	DSC BRD	PS	One check Monthly
	Maintain pumps as in maker's handbook	Plan/conduct pump maintenance as in handbook	V	Check maintenance schedule; watch when done	PIO	PS	As necessary

KEY TO TABLES 3 and 4

Rsp = Responsibility: CC =Construction Contractors; DSC = Design and Supervision Consultant; PMO = Project Management Office; PIO = Project Implementation Office; CAL = Cholpon-Ata Laboratory (IKNTDEP); BRD = Biosphere Reserve Directorate; V = Vodokanal; IMA = Independent Monitoring Agency

Loc = Location: AS = All Sites; VMS = Vehicle Maintenance Site; FSS = Fuel Storage Site; SN = Sewer Network; PS = Pump Station

Table 4: Environmental Monitoring for Karakol Sewerage Network

Impact	Mitigation and Management	Environmental Monitoring	Monitoring Parameters	Monitoring Method	Rsp	Frequency	Location
CONSTRUCTION PERIOD							
1. Water Quality: Land, streams or ground water may be polluted if silt is washed from excavated soil or if site sewage is not disposed of properly	Dig trenches in short lengths; remove waste soil; do not store sand in stockpiles on site; etc Provide adequate portable toilets and washrooms at all sites; and ensure the contents are disposed of according to legal standards	Monitor quality of liquid discharges from site, including drainage, sewage and dewatering if these occur	Drainage & Dewatering: Turbidity, Total Suspended Solids (TSS), Total Dissolved Solids (TDS); oil and grease; hydrocarbons. Sewage Effluent: BoD_5, Dissolved Oxygen, Nitrate, Phosphate and other parameters required by national wastewater standards	Measure water quality *in situ* using portable water quality meter (TSS, TDS, Turbidity, DO). Collect effluent samples for laboratory analysis of nitrate, phosphate, hydrocarbons and other parameters	CAL BRD	Monthly	All construction sites with liquid discharges (including drainage during rainfall and dewatering at river crossing)
2. Noise: Noise from excavation, site vehicles and other activity may affect workers and nearby residents	Maintain vehicles & machinery as specified by manufacturers; avoid using older models Ensure no noise >70 dB(A) is audible for significant periods 50 m from sites in residential areas	Monitor noise 50 m from work sites in residential or business areas	Ambient noise dB(A), expressed as daytime (6am-10pm) and night time (10pm-6am) L_{max} and L_{eq}	Noise meter 50 m outside work sites in residential/business areas. Additional locations inside houses if complaints are received. Monitor noise continuously for 8h periods	BRD	Monthly	Work sites in residential or business areas; plus other areas if complaints are received
3. Air Quality: Dust from excavation, site vehicles and other activity may affect workers and nearby residents	Dig trenches in short lengths; remove waste soil quickly; spray unpaved site roads when dry; etc	Monitor airborne dust at the edge of construction sites in residential or business areas	Airborne particulate matter: PM_{10} and $PM_{2.5}$	Portable dust meter or alternative method, eg gravimetric analysis. Monitor for 8 or 10 h working say and in equivalent control period	CAL	Monthly	Main work sites; plus other areas if complaints are received

Impact	Mitigation and Management	Environmental Monitoring	Monitoring Parameters	Monitoring Method	Rsp	Frequency	Location
4.Involuntary Resettlement If private land is acquired or structures are demolished, owners, tenants and squatters may lose homes and income	Adjust pipeline routes to avoid structures and land acquisition. If this cannot be avoided, prepare Resettlement Plan (RP), purchase land/property and pay specified compensation for losses by all entitled parties	Monitor land acquisition and disbursement of compensation; evaluate socio-economic impacts	Resettlement, land acquisition: Numbers/area of plots acquired; amounts of compensation paid; provision of other RP entitlements. Socio-economic impacts: Income, expenditure, livelihoods of affected households; public satisfaction	Observe land acquisition and provision of entitlements; check PMO documents; interview Affected Persons (APs). AP interviews; review complaints; compare socio-economic indicators before and after project	IMA	Quarterly Annually	All locations where private land or property is acquired
OPERATION PERIOD							
1. Noise: Noise from pumps may disturb people living nearby	Specify use of low-noise pumps in inhabited areas; minimise pump malfunctions by maintaining as specified in manufacturer's handbook	Monitor noise at edge of PS site	Ambient noise dB(A), expressed as daytime (6am-10pm) and night time (10pm-6am) L_{max} and L_{eq}	Noise meter located at edge of PS site. Additional locations in houses if complaints are received. Monitor noise continuously for 8 h periods	BRD	Monthly	All PS located near housing: and inside houses if complaints are received

APPENDIX: APPROVAL OF THE ISDP EMMP BY THE GOVERNMENT OF THE KYRGYZ REPUBLIC

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15.07 2013 г. № 04-01-28/2194

на №_____

Проект «Устойчивое развитие Иссык-Куля»

Иссык-Куль-Нарынское ТУООС

На рассмотрение в Государственное агентство охраны окружающей среды и лесного хозяйства при Правительстве Кыргызской Республики на государственную экологическую экспертизу представлен План управления и мониторинга окружающей среды Проекта «Устойчивое развитие Иссык-Куля».

План управления и мониторинга состояния окружающей среды (ПУМОС) для Проекта Устойчивое развитие Иссык-Куля (ПУРИК) разработан как полное пособие для вероятных воздействий проекта на социальную и окружающую среду, включающий мероприятия по смягчению и мониторингу.

Проект Устойчивое развития Иссык-Куля будет реализоваться с 2010 по 2014 годы, основной целью которого является улучшение инфраструктуры водоснабжения, канализации и твердых отходов в трех городах области, а также улучшение качества предоставления услуг путем повышения ресурса и институциональное управление. Исполнительным агентством (ИА) является Министерство Финансов (МФ), сам проект осуществляется через Офис Управления Проектом (ОУП) в городе Бишкек и Офис Реализации Проекта в (ОРП) в городе Каракол.

Компонент инфраструктуры ПУРИК включает в себя расширение и реабилитацию систем водоснабжения и канализации в трех основных городах области Балыкчи, Чолпон-Ата, и Каракол, улучшение эксплуатации свалок, а также модернизация общественных санитарных узлов. Оценка воздействия на окружающую среду (ОВОС) в период изучения технической подготовки проекта (ТПП), где были определены потенциальные экологические и социальные последствия строительства и эксплуатации новых проектов инфраструктуры, предложены мероприятия

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по смягчению и План управления и мониторинга окружающей среды (ПУМОС). ПУМОС подробно описывает в деталях действия необходимые для смягчения каждого воздействия, а также мониторинг, чтобы обеспечить смягчения и убедиться в эффективности предлагаемой защиты.

Цель проекта ПУМОС заключается в четком установлении воздействий строительства и/или эксплуатации инфраструктуры ПУРИК, смягчений и мониторинга, а также ответственности за каждое принятое действие. Ответственность имеет обязательную юридическую силу, указывающую на действия в основных контрактах проекта в частности: а) Консультанта по проектированию и надзору (КПН) назначенного для проектирования и надзора, а также строительства по каждой схеме; б) Подрядчика, назначенного на строительство каждой схемы и/или отдельных частей этой схемы; и в) компании или агентства, которые могут быть назначены на эксплуатацию индивидуальных схем.

ПУМОС предоставляет базовый уровень информации в последующих «дочерних» планах составленных ответственными организациями и создаёт концептуальную структуру для подготовки и реализации дочерних планов.

Рассмотрев представленные материалы, Государственное агентство охраны окружающей среды и лесного хозяйства **согласовывает** План управления и мониторинга окружающей среды проекта Устойчивое развития Иссык-Куля.

Менеджеру проекта, ОУП, ОРП необходимо:

- зарегистрироваться в Иссык-Куль-Нарынском территориальном управлении охраны окружающей среды;

-обеспечить полное участия двух подразделений (ДБТ, ИКНТУООС) ГАООСиЛХ в проекте, предоставив им оборудование для новой лаборатории, автомобили для полевых исследований, портативные приборы и другое оборудование для ускоренного проведения мониторинга основных параметров качества воды, воздуха, почвы и шума.

-обучение персонала и дополнительная поддержка в виде компьютерное оборудование, программное обеспечение GIS иGPS.

Заместитель директора **А. Рустамов**

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