Report on Fieldwork to Map out Quarrying activities and Recently Graded Roads around Lake Ol Bolossat

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Executive Summary

East African Wild Life Society (EAWLS) through funding from Birdlife International (BI) under the Critical Ecosystem Partnership Fund (CEPF) is implementing a 6-month project entitled "***Enhancing Environmental Regulations in Safeguarding Lake Ol Bolossat in Nyandarua County, Kenya***". This project was initiated in October 2016 and is expected to end in March 2017.

A survey was conducted around the lake to map out and assess the quarrying sites and recently graded roads around the lake. The survey was preceded by a meeting with officials from the County Government and key national government agencies to inform them of the project EAWLS is implementing, and to familiarise with conservation challenges around Lake Ol Bolossat, as well as the plans in place towards conserving the lake.

One clear message that emerged from the discussions with officers from the County Government and the government agencies is that they have not been able to discharge their mandates effectively in as far as conserving Lake Ol Bolossat is concerned, because the lake has not been gazetted. The other issue that emerged was poor coordination and working relationship between different stakeholders.

The findings show that eighty percent (80%) of all the quarrying sites mapped are not licenced, and therefore, are not monitored by NEMA to ensure their full compliance with the environmental regulations. Moreover, these quarries operate in very close proximity to the lake; some right inside the reclaimed part of the lake while others on the edges of the lake causing high siltation and receding of the underground water levels. The results further show that environmental safeguards were not put in place during the grading of the roads around the lake, with the drainage system directed towards the lake. The end of these roads were characterised by a relatively flat area with heaps of soil deposits.

This report recommends sensitization of the quarry merchants and various county government officials on the environmental safeguards, and development of a joint monitoring plan for Lake Ol Bolossat. The bedrock to conserving this lake is its Gazettment, and therefore the great need to fast-track the process of its gazettment by a concerted effort of the national government (Ministry of Environment and Natural Resources and National Land Commission), county government and other relevant authorities.

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Acronyms

BI:	Birdlife International
CDF:	Constituency Development Fund
CEC:	County Executive Committee
CEPF:	Critical Ecosystem Partnership Fund
EAWLS:	East African Wild Life Society
EIA:	Environmental Impact Assessment
GPS:	Global Positioning System
IBA:	Important Bird Area
KBA:	Key Biodiversity Area
KWS:	Kenya Wildlife Service
LUP:	Land Use Planning
NBC:	Nyahururu Bird Club
NEMA:	National Environmental Management Authority
SNR:	Samburu National Reserve
SWOT:	Strengths, Weakness, Opportunities, Threats
WRMA:	Water Resources Management Authority

1.0 Introduction

1.1 Project Overview

East African Wild Life Society (EAWLS) through funding from Birdlife International (BI) under the Critical Ecosystem Partnership Fund (CEPF) is implementing a 6-month project entitled "***Enhancing Environmental Regulations in Safeguarding Lake Ol Bolossat in Nyandarua County, Kenya***". The fundamental goal of the CEPF is to ensure civil society is engaged in biodiversity conservation.

This project was initiated in October 2016, and was designed to strengthen environmental impact assessment implementation in order to address ongoing and emerging threats to Lake Ol Bolossat, a priority Key Biodiversity Area (KBA). This project has three components which include (1) documenting all the quarrying sites and road upgrade activities around the lake; (2) engaging the media to profile and highlight the issues facing the Lake; and (3) organizing a workshop to sensitize all stakeholders on environmental safeguards and regulations, and initiate a joint monitoring programme.

This report gives the background information of the project; reports findings on the assessment of the quarrying activities and recently graded roads around Lake Ol Bolossat; and presents the proposed interventions.

1.2 Brief description of Lake Ol Bolossat Ecosystem

Lake Ol Bolossat catchment is a unique ecosystem containing a variety of habitats that include an alkaline lake, the Satima escarpment and the plains of grasslands in the lake basin. The nature, geology, climate, soils and ecology all interact to make this a vulnerable and fragile ecosystem. Lake Ol Bolossat is in the only natural lake in central Kenya, and covers an area of 43.3 square kilometers (4 km^2 open water and 39.3 km^2 riparian section-grassland) (Annex 2). This alkaline lake was designated as 5^{th} Important Bird Area (IBA) in central province and 61^{st} in Kenya. It is centrally located touching on four out of the five Sub Counties of Nyandarua County. This clearly indicates that more than 70% of Nyandarua county populace depends on this lake for survival. In addition, Lake Ol Bolossat is the main source of Thomson falls and Ewaso Ngiro River that flows through key national conservation areas, among them Samburu National Park (SNR) and Buffalo

Springs, all of which are designated IBAs. The existence of this lake also benefits other counties such as Laikipia, Isiolo and Samburu. The catchment area has a variety of land use systems that include urban centres, small and large-scale intensive agriculture, ranching, forestry, and wildlife conservation.

Lake Ol Bolossat is home to hippopotamus and over 100 bird species which are either residential or migrant Palearctic and afro-tropical water birds. Some of these birds are rated as endangered while others are either threatened or are endemic to Kenya. These birds include Grey crested crane, Jacksons widowbird, Long-tailed widowbird, Hunter's cisticola, Grey crested grebe, Great white Egret, Moccoa duck, White-backed duck, African Marsh Harrier, Saddle-billed stork, Cinnamon-chested bee eater, White-eyed slaty flycatcher and Bronze sunbird among many more. The lake catchment and basin are important for local and national socio - economic development especially agriculture[1]. The central location of the lake with respect to the national tourist circuit and its proximity to the equator confer the site an added advantage. The potential for tourism development is high but remains largely unexploited.

There are several conservation challenges in the catchment arising from human activities and land use changes threatening to disrupt its ecological integrity. These challenges include encroachment on the riparian lands, pollution, deforestation, over-fishing, overgrazing, hunting of waterbirds for meat and eggs, and erosion from the agricultural farmlands, quarries and recently graded roads. These activities have resulted into siltation, introduction of invasive species, receding water levels, disruption of hydrological balance, habitat loss, animal mortalities and human- wildlife conflicts (human-hippo conflicts). In addition, demographic changes and its associated activities have led to resource over-exploitation and poverty.

Several initiatives have been undertaken in the past to address these issues. However, these initiatives have been largely ineffective due to several factors, which include fragmented and sectoral approach in initiation and implementation, limited scope and objective, weak interagency linkages and inadequate stakeholder involvement. The overall weakness has been lack of a framework that integrates and guides these initiatives to achieve the overall environmental

[1] Lake Ol Bolossat Integrated Management Plan (2008-2013)

conservation and development targets. EAWLS has previously played a key role in supporting the surrounding community in developing a 5-year management plan (2008-2013) for Lake Ol Bolossat.

2.0 Approach and Methodology

The field trip was undertaken between 25th and 27th October, 2016 by 2 project staff. Prior to the field work, the project staff developed data collection tools (checklists) (see Annex 1) based on the available literature and in consultation with other experts who have done such projects before. The trip involved mapping out of the quarrying sites and upgraded roads around the lake. This was preceded by meetings with key County Government officials (Departments of Tourism and Wildlife; Public works, Roads and Transport; Water and Irrigation; and environment and Natural Resources) and key government agencies (KWS, WRMA, and NEMA).

The objective of the meetings was to inform and brief the county government and these key government agencies about the project EAWLS is undertaking around Lake Ol Bolossat, and to familiarize with the conservation issues around the lake as well as know the future plans the County Government has in place towards conserving the lake.

Survey around the lake involved identifying the roads that drain directly into the lake, and the quarrying activities that take place near the lake boundary. Data collected was filled into the data collection tools. The project team was guided around the lake by a member from Nyahururu Bird Club (NBC).

Transcriptions and other data collected from the survey were analysed thematically and summarized in text.

3.0 Findings

3.1 Summary of the outcomes from the entry meeting with County Government and National agencies (including KWS, WRMA and NEMA)

3.1.1 Key issues surrounding conservation of the lake

- The area was not recognized as a lake in the colonial era, and thus most people are not aware of its existence.
- Lake Ol Bolossat has not been gazetted. However, two attempts had been made to delineate and demarcate the boundaries of the lake (2012 & 2013); all of which flopped. Main challenges towards the gazettment of this lake are land issues and lack of community support. The land around the lake is privately owned and therefore taking up the land implies resettling the land owners which has substantial cost implication.
- Inadequate coordination among the key stakeholders (County Government, local communities and NEMA) affecting the working relationship for the benefit of the lake. This has resulted into outright rejection of most of the projects implemented by government agencies or County government by the local communities. For example, NEMA had two projects- one in Chebarungu forest and the other in Morai. The projects were not successful due to rejection by some communities. In Morai there was a small spring from which the communities depended on as their source of water. People used 10 inch pipes to draw water from it. In attempt to save this spring, a fence was erected through the Constituency Development Fund (CDF). Group of communities who have livestock did not support this initiative for fear that it would limit access to this water source for their livestock. In Chebarungu forest a nature based project, tree seedlings were provided for tree planting, chain links and poles purchased but the beehives were never procured (disincentivised the locals). The two projects were not successful due to lack of support by the local communities. Also, the ministry of tourism under the county government wanted to establish a tourism facility but it was opposed out rightly by the locals citing lack of involvement.

- ❖ Enforcement of the integrated management plan for Lake Ol Bolossat (which expired in 2013) was a great challenge because the lake has not been gazetted. It was pointed out that this management plan needs to be reviewed.

3.1.2 Conservation Challenges Facing Lake Ol Bolossat (threats)

- The lake suffers the "tragedy of the common" which has resulted into massive encroachment into the lake shores
- Overfishing (especially the catfish which is the most predominant in the lake)
- Overgrazing along the lake shores
- Siltation as a result of soil erosion from the recently graded roads, quarrying sites and farming activities upstream and in the adjacent areas.
- Water abstraction
- Hunting of birds for meat and eggs by the community members (both children and adults).

3.1.3 The plans the County Government of Nyandarua has towards conserving the lake

- ➢ Gazettment of the lake: The letter towards the gazettment has been tabled to the Ministry of Environment and Natural Resources, and copies circulated to the other relevant Ministries and Government Agencies.
- ➢ Awareness creation about the existence of the lake. The County Government has set aside funds to design signage which will be erected at a strategic locations to inform people of the existence of the lake. In addition, the county is organizing a marathon dubbed "**Ol Bolossat Marathon".** All the proceeds from the marathon shall go to the conservation kit of the lake.
- ➢ Boost tourism sector within the County using the lake as an attraction. A SWOT analysis conducted by the County Government revealed cold weather (not conducive for most tourists) as one of the threats to tourism in the county. The County, therefore, proposes to put up a leisure park next to the lake and construct a swimming pool which will act as a weather changer, and will be heated using solar energy. A borehole with freshwater will be drilled to supply the facility with freshwater. In addition, communities will also be allowed to fetch water from the borehole freely thereby enlisting their support and appreciation for the lake. Ten million Kenyan shillings has been allocated to fund this venture.

- Marketing of the lake. The County Government intends to engage youths from the communities surrounding the lake in designing wheel covers for the County Ministers with the inscription "**Lake Ol Bolossat.**"
- Enhancing access to the lake. The county intends to tarmac two main roads leading to the lake namely "Kasuku" and "Rurii" which are 7 km and 6.5 km long respectively.
- Resource mobilization towards supporting the conservation of the lake. The County Government intends to mobilize other counties benefiting from the existence of Lake Ol Bolossat to contribute towards conserving the lake. These counties include; Samburu, Laikipia and Isiolo.

3.2 Recently Graded Roads around Lake Ol Bolossat

It is the mandate of the County Government under the ministry of public works, roads and transport to create access roads that connect the communities to the town centre to help them ferry their farm produce to market destinations. Recently, the County Government of Nyandarua funded the grading of a number of access roads connecting the communities, and to enhance access to the lake such as Figure 1 below.

Figure 1: Recently graded road with loose pebbles on the surface. PHOTO Courtesy of EAWLS. 26/10/2016

This project focused on the roads around the lake that were recently graded and quarries. In total, eighteen roads were mapped out, majority of which were on the western side of the lake. Out of the 18 roads, 28% (5) were graded up to the lake boundary, 39% (7) up to less than 100 m while the remaining 33% (6) to at least 100 m from the lake boundary (Annex 3). The ministry of public works, roads and transport under the county government only focused on opening the roads and did not give any considerations to the environmental concerns. An officer from NEMA confirmed that no Environmental Impact Assessment (EIA) is required for upgrading such feeder roads. However, the environmental concerns can be put into perspective through the intervention of the County Executive Committee (CEC) water, environment and natural resources. This committee should come up with various legislation that guide implementation of such development projects near the lake.

The road side drainage system of all the roads mapped was channeled into the lake with no environmental safeguards put in place (Figure 2). This has contributed significantly to siltation of the lake. The distance between the road end and the lake boundary was characterized by heaps of soil deposits making this buffer zones relatively flat full of grass. This is a very clear indication of the extent of siltation of the lake. Siltation causes receding water levels in the lake affecting directly on the aquatic life.

The roads that are commonly used to access the lake (such as Kasuku and Rurii) and are characterized by presence of plastic pollutants which are carried down to the lake when it rains, (Annex 3).

Figure 2: A recently graded road ending on the lake boundary. PHOTO courtesy of EAWLS. 25/10/2016

3.3 Quarrying Activities Mapped around Lake Ol Bolossat

This survey sought to map out all the quarrying sites in close proximity to Lake Ol Bolossat. A total of five quarries were identified and mapped out. Out of the five quarries, only one is duly registered and licensed by the County Government as required by law. This quarry covers an approximate area of nine (9) acres, uses machine for extraction, and its operations are keenly monitored by NEMA. The remaining four quarries are not registered/licensed, extract manually, and are operated on public land. The length of operation for the quarries on "public land" was not ascertained because the operations are carried out by different individuals.

Three of these quarries touches on the lake boundary causing direct siltation. In addition, no decommission is conducted in any of these quarries and therefore loose soil deposits are left in heaps which are carried into the lake when it rains.

No safeguards have been put in place to prevent siltation (Figure 3) except one quarry site which is privately owned and is keenly monitored by NEMA. In this quarry site, water is pumped out of the quarry peats to the staff houses during rainy season, thus minimizing the extent of siltation to the lake.

The quarries also exhibited poor waste management causing direct pollution into the lake. Oil and grease spills, metals and organic waste are not properly handled. Remarkably, one quarry is situated right within Ndaragua forest with massive deforestation evident in the surrounding area in attempt to open more space for quarrying

The number of workers spotted on site directly correlated with the size of the quarry; Kamau quarry which is privately owned and measures a total of 9 acres (largest of all the quarries mapped out) had the highest number of workers on site (12)(Annex 4).

Figure 3: Quarrying site (within Ndaragua forest) about 100m from the lake, and is along a road leading to the lake. PHOTO courtesy of EAWLS. 25/10/ 2016.

4.0 Conclusion

Lake Ol Bolossat suffers the "*tragedy of the commons*", and may not survive the next two decades due to the continued immense pressure of human encroachment, overgrazing, and siltation that results from soil erosion from the recently graded roads, quarrying sites and farming activities upstream. Therefore, environmental safeguards such as EIA are key during the commencement of projects in the lake ecosystem to ensure sustainable utilization.

The lake is not only important for the conservation of wildlife (birds and hippo) but also supports the livelihoods of the local communities as well as the economy of the county and the country as a whole. Drying up of this lake if not conserved will lead to massive wildlife migration and mortalities, and affect people's wellbeing.

There is poor working relationship and coordination among the County Government, relevant government agencies (KWS, NEMA, and WRMA) and the local communities. This has led to outright hostility and mistrust by the local communities making implementation of projects in the area a great challenge. Partnership with local communities is inevitable for any conservation project to be implemented successfully. Therefore, projects initiated around any conservation area should take into consideration the aspirations of conservation as well as the felt needs of the communities.

There is no integrated Land Use Plan (LUP) for Lake Ol Bolossat ecosystem. The management plan has expired as well and a consultative review is needed. As a result, implementing policies and laws to effectively manage this resource remains a challenge.

The tourism potential for Lake Ol Bolossat has not been fully realized and tapped to improve the living standards of the communities and boost tourism earnings for the County. There is need to leverage this opportunity by marketing this lake to attract potential tourism investors.

5.0 Proposed interventions

- Gazettment of the lake.
- Review and implement the integrated ecosystem management plan for Lake Ol Bolossat.
- The County Government should engage closely with the local communities, adopting a bottom-up approach to conservation. This will enlist community support for any projects in the area, and build synergies to push for the gazettment of the lake.
- Sensitize the communities on the impacts of quarrying and farm activities on the lake.
- Train the communities on alternative livelihood activities that are compatible with conservation such as beekeeping, tour guiding for the birdwatchers (avi-tourism), cultural tourism, high altitude sporting, and game viewing among others.
- Closure of all illegally operating quarrying sites.
- Develop a joint monitoring plan for Lake Ol Bolossat.
- The County department of water, environment and natural resources, in consultation with NEMA, should develop by-laws that guide infrastructural development such as roads within the county.
- NEMA should ensure strict monitoring of all the quarrying activities to ensure strict adherence to environmental regulations.
- Develop a land use plan to guide activities around Lake Ol Bolossat.
- Explore the possibility of designing a payment of ecosystem services scheme to support conservation and protection of the lake catchment area.

ANNEXES

Annex 1: Data Collection Tools

a) Checklist for Mapping Recently Graded roads around Lake Ol Bolossat

A. General information

1. Name & Class……..
2. Location (administrative location)……...…….
3. GPS coordinates: Northings ……Eastings …….……..
4. Length of the road (km)……...……..….
5. End point distance from the lake (m)……..……..

B. Site Assessment

Parameter	Observation (s)	Environmental safeguard (s) (indicate where present)
Road drainage system(presence of erosion, soil erosion arresters, depth of the side ditches)		
Road side vegetation (disturbances in the roadside vegetation due to off-roading etc.)		
Presence of any pollutants (oil spills, dumping sites along the roadside, metals etc.)		
General road condition (presence of soil deposits, grading etc.)		
Evidence of road usage by wild animal (use of the road by wildlife as a connectivity)		

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b) Checklist for Mapping out Quarrying Sites around Lake Ol Bolossat

A. Quarry Details

1. Quarry ownership (type, owner(s))……
2. Size of concession area (in acres) ……..
3. Duration of operation (in years)……..
4. GPS Co-ordinates: Northings ……Eastings……
5. Proof of land ownership (lease/sale agreement): YES ( ) NO ( )
6. Permits (permits and reference number) ……. Status: Renewed ( ) outdated ( )
7. Other operational document (EIA/EA): YES ( ) NO ( )
8. Mode of extraction: Machine ( ) Manual ( ) Blasting ( )
9. Workforce (Number of employees): ……

B. Site Assessment

Parameters	**Observation(s)**	**Environmental safeguards (describe where applicable)**
Waste management (effluents such as food waste, equipment parts, papers, used lubricants etc.; sewerage system (liquid waste management technique), dumping sites etc.)		
Water source for the quarry (water source, average daily consumption, mode of storage, means of transportation etc.)		
Vegetation cover (natural vegetation cover, bare land, cultivated vegetation within the concession area)		
Surface drainage system (direction of flow in relation to the lake, drainage channel, run offs etc.)		
Storage of materials (explosives (used in blasting), water, machinery and equipment, processed products etc.)		
Cleaning and maintenance of quarry equipment and machinery (where cleaning is done, any leaks (oil, grease spills, cleaning chemicals, disposal etc.)		

Depth of the quarry pits (estimated in ft.- influences the water table and lake volume)		
Approximate distance from the lake (in km)		
Gradient of the site (gentle, steep, flat)		
Others (e.g. human wildlife conflicts for example with hippos, resource use conflicts due to the existence of the quarry etc.)		

C. General Remarks

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Annex 2: Map of Lake Ol Bolossat

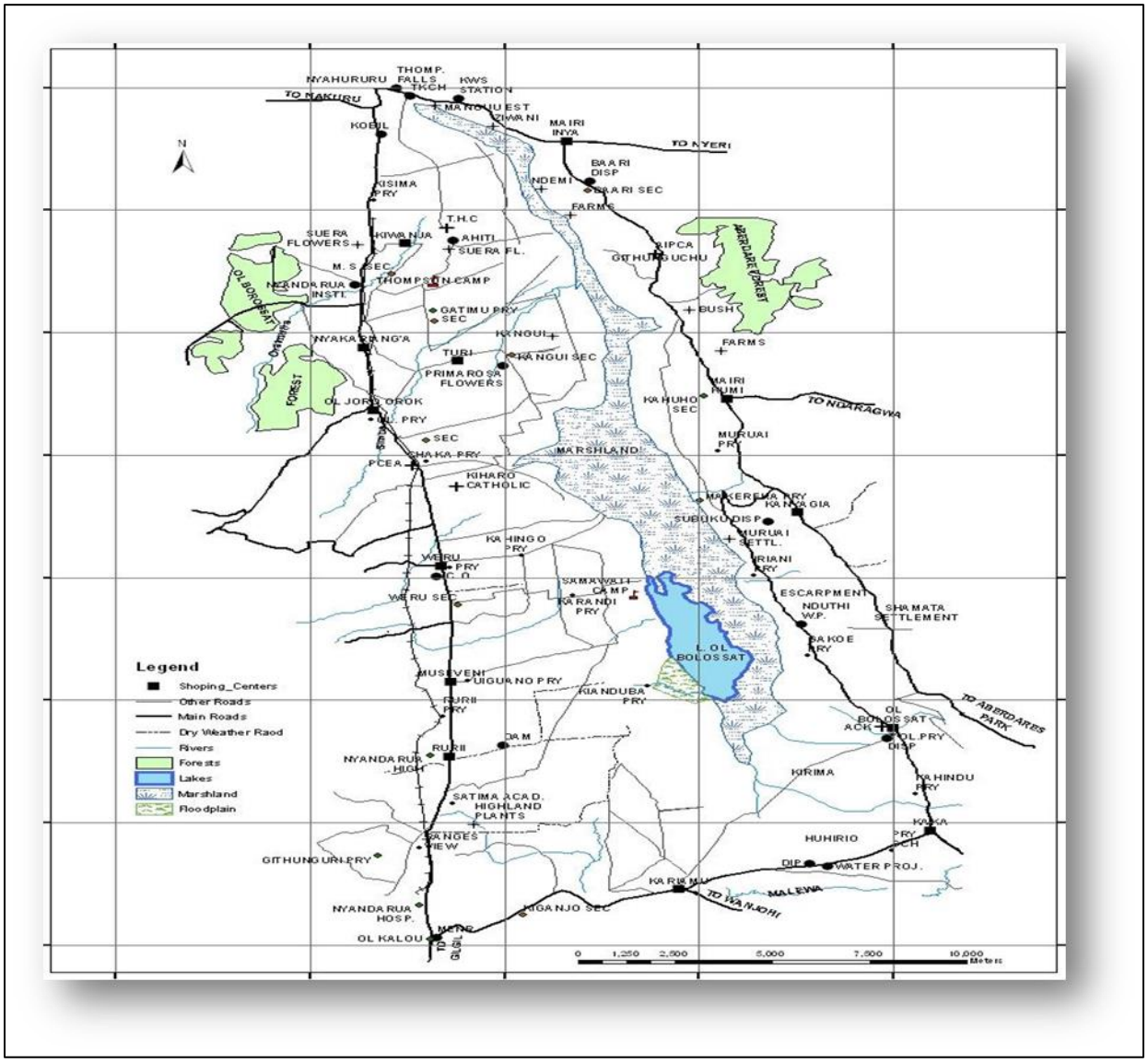

Figure 4: Map of Lake Ol Bolossat-Project Site

Source: Wetland department, KWS

Annex 3: Recently Graded Roads Mapped around Lake Ol Bolossat

Identity	Coordinates	Elevation (m)	Road end to the lake (m)	Observational features	Environmental safeguards
R1	N-00^{0}00.693’	2339	Touches lake	Deep side ditches towards the lake with rocks visible.	No safeguards
	E-036^{0}23.760’			Soil deposits near the lake shore	
				Eucalyptus planted on the road side.	
				Few grasses on the road side.	
R2	N-00^{0}00.198’	2341	Touches the lake	Deep side ditches towards the lake with rocks visible.	No safeguards
	E-036^{0}23.885’			Soil deposits near the lake shore	
				Eucalyptus planted on the road side.	
				Few grasses on the road side.	
R3	S-00^{0}00.041’	2344	Touches the lake	Little natural grass on the road surface	No safeguards
	E-035^{0}22.958’			Shallow side ditches towards the lake	
R4	S-00^{0}00.221’	2343	Touches the lake	Side ditches shallow towards the lake.	No safeguards
	E-036^{0}24.037’			A farm full of eucalyptus observed on the side of the road stretching up to 1km into the lake	
R5	S-00^{0}00.477’	2341	500	Does not drain into the lake	No safeguards
	E-036^{0}24.041’			A plantation of eucalyptus between the road end and the lake	
R6	S-00^{0}02.999’	2346	500	Covered with loosely held stones	No safeguards
	E 036^{0}24.862’			Not well compacted	
				little grass on the side of the road	
R7	S-00^{0}03.128’	2247	400	People respect the boundary	No safeguards
	E-036^{0}24.952’			No lake encroachment	
				Road surface full of grass	
R8	S-00^{0}05.075’	2344	5	No, stones on the road surface, only marram.	none
	E-036^{0}24.155’			A cabbage and maize farm on the road side near the lake	
				Used to transport materials from the quarry near the lake	
				Little grass on the side of the lake	

R9	S-00^{0}07.432’	2340	Less than 5	Presence of soil deposits near the end of the road	none
	E-036^{0}25.566’			Drains directly into the road	
Kasuku	S-00^{0}08.530’	2345	600	Leads to Kichakani and Samawati view points	
	E-036^{0}25.587’			Boating activities witnessed in the area	No safeguards
				Water on the road sides drains directly into the lake evident by a natural drainage line breaking from the edge of the road to the lake	
				Plastic pollutants observed	
				Covers about 7km from the tarmac	
				Well graded and compacted	
Rurii	S-00^{0}10.923’	2340	500	Well graded and compacted	
	E-036^{0}26.645’			About 6.5km long	
				No human activities in this area	
				No encroachment	none
				Long track of undisturbed long grasses between the road and the lake which offer good buffer for the lake against siltation	
				Eucalyptus plantation at the road end	
R12	S-00^{0}10.624’	2345	100	Ends in a steep slope	
	E-036^{0}25.675’			Slight siltation	
				Maize plantation at the road end	no safeguards
				Used by animals to traverse into the lake in look for pasture	
				Hippo witnessed from a distance away from open waters	
R13	N-00^{0}00.561’	2340	20	Grass along the drainage system	
	E-036^{0}24.067’			Recently graded and is well compacted	
				Drainage ends into the lake	none
				The space between the road end and the lake relatively flat with presence of soil deposits	
				Human activities rampant(illegal grazing in the lake	
				The road act as a link between the homesteads and the lake. The domestic animals are directed through it to the lake	

				Blue gam planted on the road side	
				Near Maili Nne village	
R14	N-00^{0}00.668’	2336	Less than 5	Farmlands along the road near the lake.	
	E-036^{0}24.027’			Presence of soil deposits	none
				Pollutants deposited along the lake shore	
				Road frequently used by humans	
				Shallow side ditches towards the end of the road	
				Drains directly into the lake	
R15	N-00^{0}00.806’	2333	Less than 5m	Side ditches very shallow towards the lake an indication that much soils are swept downstream	
	E-036^{0}24.013’			Highly used	no arrestors
				Pollutants like plastics between the road end and the lake.	
				Drains into the lake	
R16	N-00^{0}00.284’	2335	5	Eucalyptus plantation near the lake on the road sides	
	E-036^{0}24.143’			Loose soils at the edge of the road	
				Cattle grazing	none
				Grass on the road surface	
R17	N-00^{0}00.180’	2338	Touches on the lake	Farm with nappier grass on the road side near the lake, however they do not serve to trap soil	
	E-036^{0}24.177’			Eucalyptus planted along the lake	none
R18	S-00^{0}00.306’	2336	30		
	E-036^{0}24.429’				none

Annex 4: Quarries Mapped Around Lake Ol Bolossat

Name	Coordinates, elevation & distance from the lake	Estimated size (acres), method of extraction	Ownership & length of operation	Legality	Number of workers, toilets, damping sites, staff housing	General observations	Environmental safeguards
Gatumbiro	S-00^{0}05.000'	3	on public land- different individuals have their specific sites within the quarry	not registered-No permits	24 individuals on site	Pool of water within the peats	No safeguards
	E-036^{0}24.229'	manual	Length of operation not ascertained	EIA not done		Peats are about 20ft deep	No decommissioning done
	2340m					Extraction up to the lake shore	
	Touches the lake					Heaps of soils within the quarry sites	
						Canter for transportation spotted on site during the visit	
						Peats are left uncovered	
QR2	S-00^{0}04.942'	0.25 acres	Is on public land, no owner,	Not registered-No permits/EIA/EA	Not ascertained, only one worker found on the site	Extends inside the lake,	No safeguards
	E-036^{0}24.255	Manual	Less than a year in operation	Operates illegally		Peats filled with water and heap of soils observed	No decommissioning done
	2344m					Destruction of the surrounding vegetation by vehicles- canter spotted on site	
	Touches the lake						

	N-00^{0}01.191'	Machine	on private land-owned by Kamau , confirmed by NEMA	Duly registered(licensed) and EIA was done	10 workers	Pool of water in the quarry peats, about 10ft	Pumps out the water from the peats to the staff houses during rainy days
Kamau (QR3)	E-036^{0}23.566'	9 acres	About 2 years in operation	Operations monitored by NEMA periodically	Staff houses present, made of the stones produced from the quarry	Extends into the lake	no decommissioning
	2328m				Toilet made of iron sheets on site	Grey crowned crane spotted near the site	
	Touches the lake basin				Metallic wastes damped near the toilet	The machine is heavy and uses electricity	
						Oil and grease spills spotted where the machine stands	
						Papyrus reeds near the quarry on the side touching the lake	
QR4	N-00^{0}01.140'	Manual	on public land-Individuals possess different portions of the quarry area	not duly registered-illegally operating	2 individuals found on site	Found in a relatively high ground	No safeguard
	E-036^{0}23.706'	2 acres	Length of operation not ascertained			Water drains down the stream	no decommissioning
	2336					Steep slope	
	Situated within Ndaragua forest next to the lake						
QR5 (Chini Ya Jela)	N-00^{0}00.881'	Previously machine was used	Individually owned	No permits	5 workers	Soil heaps and pool of water (peats about 6ft deep)	No safeguard

	E-036^{0}23.657 2332m 1km from the lake	Now operations are manual 3 acres	Less than a year in operation	On individual land	One house made of iron sheets		no decommissioning