

**A.A.W.S.A Water Supply and Sanitation Development and Rehabilitation
Project Office**

Final Report

**Environmental Audit of the Boreholes in an around the City
of Addis Ababa**



B.Sc. (Civil Eng.) M.Sc. (Water and Waste Eng)

November 2009

Addis Ababa

1-Introduction and Background

Addis Ababa with an estimated population size of more than 3.2 million has critical shortage water supply for domestic and commercial use. At present 60 % of the water demand of the city population is fulfilled and the rest of the population uses water from the nearby rivers heavily polluted from municipal and domestic wastes.

Similarly, sanitary coverage of the city is less than 3%. About 24 % of the households have no any form of toilet facilities and 63 % of the households use private and shared pit latrines.

About 25 % of the city's solid waste is left unattended. Most of the solid and liquid waste that comes out of the city is dumped in open spaces, drainage lines, streams and rivers.

The use of ground water in and around the city is expected to partially augment the increasing water supply demand of the city.

The Addis Ababa Water and sanitation Development and Rehabilitation project Office of the Addis Ababa water and Sewerage Authority has launched a project to assess the ground water potential of the aquifers in and around the city by drilling 10 test wells.

The purpose of drilling the test wells is to determine the ground water potential that can be safely utilized to supplement the existing water supply system of the Addis Ababa City.

Mr Tequam Tesfamariam is the lead auditor of this study and he has been assisted by Ato Fekadu (socio-economist) and Terefe (senior surveyor) from the Project Office

2-Audit Objective

The primary purpose of an environmental audit is to check if the environmental and social impact mitigating measures proposed during the planning phase are adequately implemented and identify opportunities to improve quality and ensure regulatory environmental compliance.

3- Scope of Assignment

The consultant was given limited scope of assignment of conducting environmental audit on the 25 boreholes. In reality we have conducted environmental audit on 20 boreholes.

In the TOR the study was limited to undertaking environmental audit on the boreholes. However; the consultant extended the assignment to encompass the transmission pipes and reservoirs to make the study complete and comprehensive

4- Method of Study

- Site visit has been made to identify environmental and socio-economic issues
- Interview and discussion has been conducted with the communities around the boreholes, transmission routes and reservoir sites

5- Draw back of the study

Impact assessment has not been conducted during the planning phase of borehole site identification. Thus, no baseline data has been made available to compare changes on the socio-economic and biophysical environment that might have resulted from the construction of the boreholes, reservoirs and excavation of transmission pipe routes.

6- Salient Features of the Audited boreholes

The table below provides salient features of the audited boreholes.

Table 5.1: Salient Features of the Audited Boreholes in and around Addis Ababa.

S.No.	Name of Site	Locality	B.H code	Coordinate		Ele (m)	Effective Depth (m)	Casing dial. (Inch)	Pump test yield (1/s)	SWL (m)	Optimal Yield (1/s)	Contractor
				North	East							
1	Medhanialem Church	Summit	SUMT V3	482349	995063	2329	210	10	10	52	8	AL NILE
2	Summit	Summit	SUMV 10	482109	993423	2278	228	10	17	37	20	AL NILE
3	Summit 1 km off the Bole Lemi road	Bole Lemi	SMV 21	482849	991509	2336	270	10	18.5	7	15	AL NILE
4	Summit bole/lemi Road	Bole Lemi	SMV 19	482696	990537	2222	270	10	18.5	7	15	CGC
5	Total Belay Zelek 2	Gojamber	TOTV 2	470218	1001886	2608	233	10	10	Flowing	10	CGC
6	Egziabiher ab	GojamBer	BLGZ V2	471026	1002023	2633	222	10	31	23	25	CGC
7	Kechene Meketeya	Gojam Ber	HECH VI	472608	1002066	2551	170	10	7	---	5	CGC
8	Enteto-Kidanameheret	Ferensay Legasion	KMH E V1	474238	1002373	2537	187	10	30	68	25	CGC

Final Environment Audit Report of the Boreholes in and around
Addis Ababa

S.No.	Name of Site	Locality	B.H code	Coordinate		Ele (m)	Effective Depth (m)	Casing dial. (Inch)	Pump test yield (1/s)	SWL (m)	Optimal Yield (1/s)	Contractor
9	New Kera raod EWWCA	Botebe	WND V2	480321	997370	2399	120	10	43	10	35	CGC
10	Enkorcha 2	Koteke	ANK-2	481462	998906	2451	200	10	32	72	30	CGC
11	Abo Derek Bdrige	Ferensay Legasion	FERV ES6	475638	999991	2448	184	10	30	68	25	CGC
12	CMC	SUMMIT	CMCV 1	482682	994124	2293	210	10	17	38	10	AL NILE
13	Legetafo Ayat	Legetafo	AYAT V1	487881	997599	2367	200	10	>50	Flo win g	---	AL NILE
14	Legetafo 1	Legetafo	LGT V1	486790	1001357	2455	250	10	28	8	30	AL NILE
15	Summit	Summit	SMV 13	484883	994701	2320	250	10	16.5	16	15	AL NILE
16	Summit	Summit	SMV 14	485228	994341	2312	250	10	20	12.4	15	AL NILE
17	Sansusi	Asko	---	465724	1002753	2590	270	10	34	52.4	25	AL NILE
18	East Bole	Bole Bulbula	EBV2 4	480760	992453	2261	260	10	19	22	15	AL NILE
19	East Bole	Bole Bulbula	EBV2 3	481061	992052	4002	270	10	19	28	15	AL NILE
20	Mekanisa 1	Woleti Suk	MKV1 5	464527	990017	2278	228	10	21	13	15	AL NILE
21	Kilinito Person	Akaki	---	478130	982300	2115	260	10	15	6	10	AL NILE

7- Detailed Audit results and Proposed Corrective Actions (Recommendations)

(a) Post impact common to all Boreholes

Post Impact

- 1- Almost all borehole sites are located at the bank of a river/stream thus, are vulnerable to erosion, flooding and ground water contamination from entering floodwaters through the borehole.

Corrective Measures

To minimize this risk boreholes heads should be tightly sealed and flood protection embankments should be built around the borehole structure.

Post Impact

- 2- In all most all boreholes sites the fertile soil around the boreholes structure have been covered by non-fertile soil extracted from the borehole thus making the land around the borehole not suitable for a plant growth.

Corrective Measures

To avoid such adverse impact the soil around the borehole will need to be rehabilitated by placing fertile soil on the top of the extracted material to maintain soil fertility.

Post Impact

- 3- There has been spillage of the drilling fluids, motor oils and lubricants during the construction of the boreholes.

Corrective Measures

To avoid pollution of the surrounding environment from such spillages the contractor should reuse and recycle them and finally dispose them in a safe and responsible manner.

(b) Post impact specific to each borehole

(1) Borehole SUMTV3



Borehole SUMTV3

This borehole is constructed very close to Medhanialem Church at the bank of the river that originates from Kotebe area. The Borehole site is covered with tall grass and flowers locally known as “Gelegele Meskel”. The transmission pipe route proposed to convey water from this borehole to SA Reservoir has not yet been decided.

Post Impact

- Due to the construction of the borehole, the community has lost about 400 m² of grazing land /grassland and compensation for such losses will need to be paid to the community.
- The site has been satisfactorily rehabilitated and there is no left over from the construction of the borehole that adversely affects the social and biophysical environment
- The route of the transmission pipe that will convey the water to the summit reservoir is not yet marked on the ground thus difficult to quantify the type and extent of the impact of the transmission pipe at this stage

Recommendation

- The transmission route will need to be marked on the ground to be able to assess social and biophysical impact of the transmission pipe

Summit Reservoir (SA Reservoir)



SA Reservoir



SA Reservoir

This reservoir is constructed on 900 square meter of land and has the capacity of 1000 cubic meters. It is designed to store water from boreholes SMV3, SMV10 and SMV19. The reservoir site before construction was reserved as green area for Washington and Selam Housing Associations.

Addis Ababa Master Plan has not been followed when choosing the reservoir site and we have been informed the same location has been chosen by MS Consult as a reservoir site for the additional boreholes proposed to be constructed on the eastern catchments.

Post Impact

After and during the construction of the Summit Reservoir the following adverse impacts on the biophysical and social environment have been observed:

- The construction of the reservoir has adversely effected the surrounding environment by reducing the open space that was reserved as a green area for the neighboring housing associations thus denying the children access to their playground.
- About 900 meter square of grassland has been transformed from grassland to reservoir construction site and this change, although localized, has to some extent adversely affected soil fertility and accelerated soil erosion due to the losses due to the losses in grass cover.

- After the construction of the reservoir no improvement in the supply of water to the surrounding communities has been observed.
- After the construction of the reservoir the sight has been adequately rehabilitated and you see no construction leftover that negatively affected the biophysical and social environment.

Recommendation

About 900 square meter of land will need to allocated to serve as a green area to the community in compensation to what they lost

(2) Borehole SUMV10



Borehole SUMV10

This borehole is located at the bank of a stream called “Waja” very close to Sellasie Church. This Borehole is constructed on the grazing land owned by Agata Enterprise currently engaged in animal breeding near the borehole site.

Post impact

- The Enterprise has lost about 400 m² of grazing land thus compensation need to be paid to the Enterprise for the land it has lost due to the bore hole construction
- The borehole water is planned to be conveyed to the SA reservoir but the route of the proposed transmission pipe is not defined and the extent and type of impact could not be determined at this stage

Recommendation

- Borehole site is vulnerable to flooding it is therefore important to construct structure around the borehole to protect it from damage due to flood
- The transmission route will need to be marked on the ground to be able to assess social and biophysical impact of the transmission pipe

(3) Borehole SMV21



Borehole SMV21

This borehole has been constructed on a grazing land that is also prone to flooding. It is situated at the bank of a nearby stream. The 400 meter square of grazing land that has been lost due to the construction of the borehole belong to the community

Post Impact

- The community has lost about 400 m² of grazing land due to bore hole construction and compensation need to be paid to the community for such losses

Final Environment Audit Report of the Boreholes in and around
Addis Ababa

- Crushed stone that has been excavated from borehole during construction is observed to have been dumped around the borehole covering the fertile soil underneath and reducing soil fertility for plant growth
- Water from this borehole will be conveyed to SA reservoir but, at this stage the route of the transmission line has not been marked on the ground and it is difficult to assess the type and extent of impact

Recommendation

The transmission route will need to be clearly marked on the ground to be able to assess social and biophysical impact of the transmission pipe

(4) Borehole SMV19



Borehole SMV19



Borehole SMV19



Borehole SMV19

This is artesian borehole constructed on an agricultural land. A person by the name Dr Regassa is currently using this water to irrigate vegetables around the borehole. The owner of the land of the bore hole site has not been identified.

Post impact

- A person whose name has not been identified at this stage has lost about 400 m² of agricultural due to the construction of the borehole.
- The route of the transmission line is not marked on the ground but is expected to follow the Yarer summit highway in most of its routes.

Recommendation

- The owner of the borehole site has not been identified thus further consultation will need to be done to confirm if compensation is paid for the land he has lost.
- The transmission route will need to be clearly marked on the ground to be able to assess social and biophysical impact of the transmission pipe.

(5) Borehole TOTV2



Borehole TOTV2



Shegole Reservoir



Shegole Reservoir

Borehole TOTV2 and Shegole Reservoir

This is artesian borehole located on grassland at the bank of a river and it is owned by kebele. This site has been handed over to AAWSA by the kebele for the purpose of borehole construction.

The borehole site occupied about 400 m² of marginal land. The community around the site is using water from the artesian well for various domestic uses including bathing and washing. The transmission pipe to Shegole has already been installed and in the future the water from the artesian well will be conveyed to this reservoir.

The capacity of Shegole reservoir is about 700 m³ and it will serve to store water from the artesian well (TOTV2). The reservoir is constructed very near to the cemetery of the kidanameheret church.

Reservoir site has been owned by the kefeleketema Environment Office for the purpose of environmental rehabilitation and has been handed over to the AAWSS Authority for the purpose of reservoir construction

Post impact

- The community before the construction of the borehole were using water from the nearby rivers but now they are using clean water from the artesian well for free
- The borehole site has been marginal land owned by the kebele therefore, there is no need of compensation any one for the land that has been lost as a result of bore hole construction
- Installation of the 600 meter long transmission pipe has followed the existing road and there is no loss of property or land that is owned by individuals requiring compensation
- The construction of this reservoir took out about 900 m² of the grassland reserved for environmental rehabilitation.
- The construction of the reservoir foundation have aggravated soil erosion
- The loss of grass land reserved for environmental rehabilitation will need to be compensated by allocating equivalent land for environmental rehabilitation to preserve nature

(6) Borehole BLGZV2





Borehole BLGZV2

The borehole is situated on a marginal land/grass land very close to the bank of a river. The site before borehole construction was owned by kebele. Very close to the borehole there is a spring the community considered as a holy water that is believed to cure various diseases.

Currently, water from the borehole is utilized to irrigate vegetables by the help of drip irrigation system owned by some members of the community. The transmission pipe that will convey water from the borehole to the Gojam Ber reservoir has already been constructed. The route of the transmission pipe to Gojam Ber reservoir has followed the existing road.

Water from the BLGZV2 Bore hole is conveyed by the help of transmission pipes to the reservoir located at the Gojam Ber. This reservoir has been constructed on an area closure designated for rehabilitation. The area protected area (not officially not gazette area closure) is owned by the AA Environmental Protection Authority

Post Impact

- 400 square meter of marginal land has been lost as a result of the borehole construction. The land is owned by the government and thus, there is no body claiming compensation for such losses
- Transmission pipes have already been installed to convey water from BLGZV2 borehole to the reservoir at the Gojam Ber. The transmission route followed the existing road and there was no serious impact on the socio-economic and biophysical environment.

Recommendation

- In the future exploitation of water from the borehole may adversely affect the water yield of the spring and this needs to be monitored from time to time
- This Reservoir has been constructed by clearing “Ted” and eucalyptus trees within the protected area. This has resulted in the loss of about 2500 m² of the protected area and about 30 Ted and eucalyptus trees. The same number of trees has to be planted about the same size of land has to be put under protection to compensate nature.

Final Environment Audit Report of the Boreholes in and around
Addis Ababa

(7) BOREHOLE KECHV1



The borehole site is located on marginal land very close to the bank of the river. The site was previously occupied by six aids patients' four of whom are women. They were using the land for growing vegetables using water from the nearby river. Through 800 meters long transmission pipe the borehole is currently supplying water to existing plastic reservoir (Roto). The community around the borehole was getting water from the Entoto Spring and had critical shortage of water during the dry season.

The situation of the water supply provision to the community around the borehole has very much improved after the borehole has been made operational.

BOREHOLE KECHV1

Post impact

- The marginal land where the bore hole has been constructed has been owned by the aids patients thus need to be compensated by providing them equivalent size of land to support their living
- Provision of water supply to the communities after the borehole is made operational has significantly improved
- The transmission pipe followed the existing road and its impact on the biophysical environment has been minimum
- The existing reservoir (roto) has been installed in the middle of the Entoto protected forest and this has resulted in the clearance of some trees within the forest area (The construction of this Roto reservoir has not been financed by the WB)

Recommendation

The six aids patients need to be given land of equivalent size to earn their living.

(8)Borehole KMHEV1



Borehole KMHEV1

The borehole is located on grassland designated as protected area by the Environmental Protection Authority. Some trees have been planted on the borehole site to commemorate the Ethiopian millennium.

The community around the borehole is currently served from the public fountain which draws its water from the previously constructed borehole by the government.

Currently, water provision to the community around the borehole is very poor and they get water from the existing reservoir(R1) once every three days. The water from this borehole is proposed to supply water to the reservoir designated as EN on the map.

Post impact of the borehole

- The borehole site will take about 400 square meter of the area designated for environmental protection. The environment has to be protected by persevering the same size of land and planting trees on that land
- The route for the transmission pipe is not marked on the ground and the type and extent of impact could not be determined at this stage

Recommendation

The transmission pipe route will need to be marked on the ground to assess the type and extent of biophysical and socio-economic impact of installing the transmission pipe.

(9) Borehole WNDV2



Borehole WNDV2

This borehole is located very close to Gelisa River and it was once part of the river course where waste is dumped. The water from the borehole is planned to be conveyed to the existing reservoir designated as AN on the map close to Yeka Micheal church. The borehole site is prone to flooding.

Post Impact

- The borehole is sited on a place where it was once river course and no compensation has been required during the construction of the borehole

- The route of the proposed transmission pipe will follow the existing road until it reaches the existing reservoir and the impact as a result of the transmission line construction is expected to be minimal

(10) Borehole ANK-2



Borehole ANK-2

The borehole site is located on a grass land very close to the kidanameheret wooden bridge .The site was previously playing ground for those kids living around that area

The water from the borehole will join the existing transmission line until it reaches the existing booster reservoir very close to the security office

Post impacts

- The borehole is constructed on a play ground and the community will need to receive equivalent land (400 square meter of land) to compensate what has been lost
- The route for the transmission pipe is not yet marked on the ground. However, it is expected to follow the exiting road and the impact on the social and biophysical environment is expected to be minimal.

(11) Borehole at Derek Deldi (FERSVES6)

This is located at Fersensay Legasion near a place called the Derek Deldi. The borehole is sited on a grazing land close to the bank to Kebena River.

The land where the borehole site is located belongs to the kebele. The water from this borehole will discharge to the existing Ras kasa reservoir but the route of the transmission pipe has not been marked on the ground to Asses its impact

Post Impact

- The borehole is located on a grazing land owned by the kebele, thus does not require compensation to be paid to any one.
- The route of the transmission route is not marked on the ground thus is difficult to assess impact of the transmission line on the socio-economic and biophysical environment.