

APPENDIX-9

WATER ANALYSIS METHOD

Appendix – 9 Water Analysis Method

Official analysis methods

Item	Methods	Limit value for analysis
pH (-)	Electrometric	0.01 (-)
T (°C)	Standard Platinum Resistance Thermometer	-
Turbidity (NTU)	Nephelometric	0.2 (NTU)
Color (Pt Co units 25 °C)	Colorimetric, Pt-Co	1 (Pt Co units)
EC (uS/cm)	Electrometric	0.1(uS/cm)
Alkalinity -OH ⁻ (mg/l as CaCO ₃)	Titration methods	0.2 (mg/L)
Alkalinity -CO ₃ ²⁻ (mg/l as CaCO ₃)	Titration methods	0.2 (mg/L)
Alkalinity -HCO ₃ ³⁻ (mg/l as CaCO ₃)	Titration methods	0.2 (mg/L)
Calcium (mg/L)	Titration methods	0.2(mg/L)
Magnesium (mg/L)	Titration methods	0.2 (mg/L)
Total Hardness (mg-CaCO ₃ /l)	Titration methods	0.2 (mg/L)
Potassium (mg/L)	Flame emission photometry	0.05 (mg/l)
Sodium (mg/L)	Flame emission photometry	0.1 (mg/l)
Chlorides (mg-Cl/L)	Titration methods, silver nitrate	0.25 (mg/L)
SO ₄ ²⁻ (mg/L SO ₄)	Colorimetric	7(mg/L)
TDS (mg/L)	Electrometric	1(mg/L)
NH ₄ -N (mg/L)	Colorimetric	0.001(mg/L)
NO ₃ -N (mg/L)	Colorimetric	0.09(mg/L)
NO ₂ -N (mg/L)	Colorimetric	0.5(mg/L)
Fe (mg/L)	Flame AAS	0.25(mg/L)
	ICP-Methods ^{※2}	0.01(mg/L)
Mn (mg/L)	Graphite Furnace AAS	0.001(mg/L)
Arsenic (mg/L)	Graphite Furnace AAS	0.001(mg/L)
Selenium (mg/L)	Graphite Furnace AAS	0.001(mg/L)
Copper (mg/L)	Graphite Furnace AAS	0.001(mg/L)
Cadmium (mg/L)	Graphite Furnace AAS	0.00025(mg/L)
Chromium (mg/L)	Graphite Furnace AAS	0.001(mg/L)
Cyanide (mg/L)	Spectrophotometer HACH 8027	0.02(mg/L)
Lead (mg/L)	Graphite Furnace AAS	0.001(mg/L)
	ICP-Methods ^{※2}	0.001(mg/L)
Mercury (mg/L)	EPA200-7/8	0.0005(mg/L)
	Atomic Absorption ^{※2}	0.0005(mg/L)
Boron (mg/L)	EPA200-7/8	0.05(mg/L)
Barium (mg/L)	EPA200-7/8	0.002(mg/L)
Molybdenum (mg/L)	Graphite Furnace AAS	0.005(mg/L)
Nickel (mg/L)	Graphite Furnace AAS	0.0025(mg/L)
Fluorine (mg/L)	Spectrophotometer HACH 8027	0.2(mg/L)
Total Coliforms (CFU/100ml)	Membrane filtration	1CFU/100ml
E.Coli. (CFU/100ml)	Membrane filtration	1CFU/100ml
Residual Chloride (mg/L)	DPD methods	0.01mg/L
Total Phosphorus (mg/L)	Persulfate digestion/Colorimetric	0.04mg/L
DO (mg/L)	Polarographic	0.01mg/L
BOD (mg/L)	Membrane electrode	2mg/L
COD _{Cr} (mg/L)	Colorimetric	2mg/L
SS (mg/L)	Grvmetric	1mg/L

※1 All tests are performed in accordance to the "Standard Methods for the Examination of Water and

※2 This methods is adopted at official water quality lab. in Japan

Simplified analysis methods

Item	Methods	Limit value for analysis
pH	Electrode analysis	0.1 (-)
T	With alcohol thermometer	0.1 (°C)
Turbidity	With turbidimeter	0.01 (NTU)
Color	With color comparison tube	2 (°)
EC	Electrode analysis	1(mS/m)
NH ₄ -N	Indophenol-blue color comparison method (PACKTEST)	0.1 (mg/L)
NO ₃ -N	Naphtyl -ethlenediamine method after zinc reduction(PACKTEST)	0.2 (mg/L)
PO ₄ ³⁻ P	Molybdenum blue color comparison method (PACKTEST)	0.05 (mg/L)
COD	Oxidation with potassium permanganate in Alkalinity and color comparison method (PACKTEST)	1(mg/L)
SiO ₂	Molybdenum blue color comparison method (PACKTEST)	0.5 (mg/L)
Fe	Reduction and bathophenantholine color comparison method	0.05 (mg/L)
Mn	Potassium periodid color comparison method (PACK TEST)	0.5 (mg/L)
Total Coliforms	Simplified analysis paper	1 (unit/ml)
E.Coli.	Simplified analysis paper	1 (unit/ml)
HClO (mg/L)	MBTH color comparison method	0.1 (mg/L)
Phenolic compounds (mg/L)	4-Aminoantipyrene Color Comparison Method with EnzymeEnzyme	0.2(mg/L)

APPENDIX-10

RESULT OF WATER QUALITY SURVEY

**WATER QUALITY ANALYSIS FOR THE MASTER
PLAN STUDY ON URBAN FACILITIES
RESTORATION AND IMPROVEMENT IN
MONROVIA (LIBERIA)**

Final Report

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1 INTRODUCTION

1.1 PROJECT BACKGROUND

The Ministry of Public Works, together with other related Government Ministries and agencies, through the Japan International Cooperation Agency (JICA) has commissioned Earthtime Inc. to conduct a water quality survey for the master plan study on urban facilities restoration and improvement in Monrovia, Liberia. This report summarizes the methodology and results of this work.

1.2 STRUCTURE OF THE REPORT

The report is structured in three (3) main sections in addition to the introduction. Section 2 describes the adopted methodology. Section 3 presents and provides the obtained results.

2 WORK METHODOLOGY

2.1 MONITORING PARAMETERS

When designing a monitoring plan, one of the most important elements is to identify the parameters that are relevant for the project and vary according to the type and the purpose of the project. The monitoring parameters identified by JICA experts were targeting physical, biological, and chemical properties of the water.

Taped water, surface water and groundwater locations were selected and identified by JICA experts.

2.2 ANALYTICAL EQUIPMENT

All the samples collected are analyzed at the American University of Beirut laboratory in Lebanon, which is equipped with the necessary apparatus to perform basic as well as extended physico-chemical and bacteriological water quality analysis.

All tests are performed in accordance to the “Standard Methods for the Examination of water and wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation.

Table 2-1: List of Parameters Measured.

Parameters	
<i>Bacteriological Analysis</i>	
• Fecal Coliform	• Fecal Coliform
<i>Metals Analysis</i>	
• Boron	• Lead
• Barium	• Manganese
• Mercury	• Molybdenum
• Arsenic	• Nickel
• Cadmium	• Potassium
• Chromium	• Sodium
• Copper	• Selenium
• Iron	
<i>Physical and Chemical Analysis</i>	
• Cyanide	• Magnesium hardness
• Fluorides	• Calcium
• Turbidity	• Magnesium
• Conductivity	• Silica
• Apparent color	• Sulfate
• pH	• Nitrate
• Hydroxide Alkalinity	• Nitrate-Nitrogen
• Carbonate Alkalinity	• Nitrite
• Bicarbonate Alkalinity	• Nitrite-Nitrogen
• Total Hardness	• Ammonia-Nitrogen
• Calcium Hardness	• Chlorides
• Biochemical Oxygen Demand	• Total Dissolved Solids

- Total Phosphorous
- Total Nitrogen
- Chemical Oxygen Demand
- Total Suspended Solids

2.2.1 In situ Monitoring Equipment

In addition to the analysis conducted in the laboratory, Earthtime was conducting in-situ water monitoring at each location using in-situ Troll 9500. The temperature and residual chloride of the water bodies were measured in-situ at each location.

2.3 SAMPLING METHODOLOGY

Seven sampling phases listed were conducted by Earthtime to collect the water samples.

Surface water and groundwater samples were collected and placed in pre-cleaned plastic bottles with various volumes depending on the parameter to be analyzed. After collected, the bottles were properly sealed, labeled and placed in cooler at a temperature below 40 °C and transported to the laboratory facility for analysis within 24 hours after the sampling time. Although the exact locations of the collected samples were pre-defined by Jica Study Team, a Global Positioning System (GPS) was used to approximate the geographic coordinates of each sampling location. Regarding in-situ monitoring, instruments were calibrated prior to usage as per manufacturer specifications. Moreover, specific sampling and preservation requirements were adopted depending on the parameter intended for analysis.

When collecting the water samples from surface water for analysis the below steps were followed:

1. The sampling bottles were labeled with the site name, date and time.
2. The cap was removed from the bottle just before sampling. Touching the inside of the bottle of the cap was avoided.

3. The bottom sediments were disturbed as little as possible. However, water that has sediment from bottom disturbance was not collected. Stood facing upstream. Collected the water sample on the upstream side, in front of the hydrogeologist (sample collector). In some cases, the bottled was taped to an extension pole to sample from deeper water.
4. Held the bottle near its base and plunge it (opening downward) below the water surface. Collected a water sample 8 to 10 inches beneath the surface or midway between the surface and the bottom if the stream reach is shallow.
5. Turned the bottle underwater into the current. In slow-moving stream reaches, the bottle was pushed underneath the surface and away from the hydrogeologist in an upstream direction.
6. The bottles were not filled completely, leaving approximately 1-inch air space so that the sample can be shaken just before analysis. Recapped the bottle underwater, remembering not to touch the inside.
7. Filled in the appropriate information in the field data sheet.
8. Placed samples in a cooler and immediately transport to the laboratory.

When collecting the water samples from wells and tap the below steps were followed:

1. Labeled the bottle with the site name, date and time.
2. Allowed the water to run for ten minutes before taking the sample.
3. Removed the cap from the bottle just before sampling. Avoided touching the inside of the bottle or the cap.
4. Recapped the bottle without touching the inside.
5. Placed samples in a cooler and immediately transport to the laboratory.

2.4 SAMPLING PHASES & LOCATIONS

Water samples were taken from waste water, tapped water, wells, and surface water in a distributed method within the study area. Thirty eight water samples were collected on seven different phases in order to provide a baseline on the existing water quality of the study area. The phases were arranged as follows:

Phase I: included collecting a total of six samples from surface and groundwater sources (Table 2-2);

Phase II: included collecting seven samples from groundwater sources (mainly hand-dug wells) used by local residents for drinking and sanitation purposes (Table 2-3);

Phase III: included collecting eleven samples, six of which were from tap water and five from wastewater sources (Table 2-4);

Phase IV: included four samples of tap water sources (Table 2-5);

Phase V: included collecting two samples from borehole # 1 and borehole # 4 which are identified as Well J1 and Well J4 by Earthtime (Table 2-6). These samples were collected by a member from Jica Study Team and delivered at Earthtime;

Phase VI: this phase included collecting two samples from groundwater sources which are borehole # 2 and borehole # 3 which are identified as Well J2 and Well J3, respectively (Table 2-7); additional sample was re-collected from Well J1 to confirm the relatively high value of the lead parameter in this borehole. Therefore, Phase VI included three samples; these samples were also collected by a member from Jica Study Team and delivered at Earthtime

Phase VII: included re-visiting three sites from which samples will be collected in Phase I. Three samples both from groundwater and surface water sources were collected (Table 2-8); additional samples were re-collected from Well J1 and Wells J2 to confirm the relatively high value of the mercury parameters in these boreholes. Therefore, a total of five samples were collected during this phase two of which were surface water samples and three were groundwater samples (Table 2-8).

Sampling points are located on the topographic map; Appendix C is added at the end of this report and presents topographic maps indicating the exact locations of the proposed sampling locations that were taken by Earthtime Team.

Table 2-2: Summary of Water Quality sampling locations of Phase I

Phase I						
No.	Sample ID	X (UTM)	Y (UTM)	Altitude (m)	Date	Type
1.	<i>Raw water intake</i>	718465.93	317460.03	14	22-JAN-09 10:59:09AM	Surface water
2.	<i>Raw Water Intake St. Paul</i>	715067.68	314623.43	0	22-JAN-09 9:34:29AM	Surface water
3.	<i>Well 6</i>	698777.61	315605.99	10	22-JAN-09 12:56:50PM	Groundwater
4.	<i>Well 7</i>	697660.20	315354.60	18	22-JAN-09 1:30:21PM	Groundwater
5.	<i>Well 8</i>	701768.46	316801.33	14	22-JAN-09 12:28:07PM	Groundwater
6.	<i>LWSC Deep Well 1</i>	694252.24	312806.09	12	22-JAN-09 2:07:07PM	Groundwater





Figure 2-1: Photographic Illustration of Water sampling locations of Phase I.

Table 2-3: Summary of Water Quality sampling locations of Phase II

Phase II						
No.	Sample ID	X (UTM)	Y (UTM)	Altitude (m)	Date	Type
1.	Well 1	700687.19	306797.23	8	29-JAN-09 9:25:18AM	Groundwater
2.	Well 2	699611.63	307993.32	16	29-JAN-09 10:52:09AM	Groundwater
3.	Well 3	697054.70	310982.16	7	29-JAN-09 12:12:45PM	Groundwater
4.	Well 4	697676.64	311414.20	-2	29-JAN-09 11:41:30AM	Groundwater
5.	Well 5	699112.33	313078.62	12	29-JAN-09 12:46:46PM	Groundwater
6.	Well 9	703694.95	313415.38	24	29-JAN-09 10:03:59AM	Groundwater
7.	Well 10	694715.82	304628.68	12	29-JAN-09 1:41:37PM	Groundwater





Figure 2-2: Photographic illustration of water sampling location of Phase II

Table 2-4: Summary of water quality sampling locations of Phase III.

Phase III						
No.	Sample ID	X (UTM)	Y (UTM)	Altitude(m)	Date	Type
1.	Clara Town	699668.53	301288.31	5	12-FEB-09 11:28:56AM	Tap water
2.	Fiamah SWTP Intake	695930.30	304335.20	6	12-FEB-09 12:59:04PM	Wastewater
3.	BTC Drain	697437.06	300764.04	11	12-FEB-09 1:53:19PM	Wastewater
4.	Musurado River	698870.02	300492.44	6	12-FEB-09 2:33:38PM	Wastewater
5.	New Kru Town	704840.57	301356.74	13	12-FEB-09 10:23:01AM	Tap water
6.	SKD Community	700650.64	302447.69	6	12-FEB-09 11:01:17AM	Tap water
7.	Saint Paul Bridge	706533.33	302810.93	11	12-FEB-09 9:34:50AM	Tap water
8.	24 th Street	694920.39	303955.59	0.00	12-FEB-09 12:33:04PM	Tap water
9.	Mamba Point	698032.60	299144.70	184	12-FEB-09	Tap water

					12:03:02PM	
10.	<i>BTC Sewer Channel</i>	697431.46	300777.62	9	12-FEB-09 1:54:07PM	Wastewater
11.	<i>Musurado Drain</i>	698870.02	300492.44	5	12-FEB-09 3:02:25PM	Wastewater





Figure 2-3: Photographic illustration of water sampling locations of Phase III

Table 2-5: Summary of water sampling locations of Phase IV

<i>Phase IV</i>						
No.	Sample ID	X	Y	Altitude	Date	Type
1.	<i>Congo Town</i>	692593.28	310187.36	17	05-MAR-09 11:23:29AM	Tap water
2.	<i>Old street</i>	694794.51	306341.93	9	05-MAR-09 11:51:11AM	Tap water
3.	<i>Police Academy</i>	694667.11	312100.29	20	05-MAR-09 10:57:00AM	Tap Water
4.	<i>Pipe line load</i>	696833.90	312945.18	18	05-MAR-09 10:23:03AM	Tap water



Figure 2-4: Photographic illustration of water sampling location of Phase IV.

Samples for phase V and phase VI were collected by Jica study team member Mr. Oura and handled to Earthtime.

Table 2-6: Summary of water sampling locations of Phase V.

Phase V						
No.	Sample ID	X	Y	Altitude (m)	Date	Type
1.	Well J1	703713	310557	Not provided by Jica Study Team	12-April-09 9:00 – 9:15AM	Groundwater
2.	Well J4	703713	313557	25	13-April-09 9:00 – 9:30 AM	Groundwater

Table 2-7: Summary of water sampling locations of Phase VI.

Phase VI						
No.	Sample ID	X	Y	Altitude (m)	Date	Type
1.	Well J2	697073	311059	16	Not provided by Jica Study Team	Groundwater
2.	Well J3	699444	316083	13	Not provided by Jica Study Team	Groundwater
3.	Well J1	703713	310557	Not provided by Jica Study Team	Not provided by Jica Study Team	Groundwater

Table 2-8: Summary of water sampling locations of Phase VII.

Phase I						
No.	Sample ID	X (UTM)	Y (UTM)	Altitude (m)	Date	Type
1.	Raw water intake	718465.93	317460.03	14	16-July-09 12:48:09 PM	Surface water
2.	Raw Water Intake St. Paul	715067.68	314623.43	0	16-July-09 1:34:29 PM	Surface water
3.	Well J1	703713	310557	Not provided by Jica Study Team	16-July-09 9:35:56 AM	Groundwater
4.	Well J2	697073	311059	16	16-July-09 10:04:23 AM	Groundwater

5.	<i>LWSC Deep Well 1</i>	694252.24	312806.09	120	16-July-09 3:07:07 PM	Groundwater
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3 RESULTS AND DISCUSSION

3.1 WATER QUALITY

Water samples were analyzed for physical properties such as turbidity, conductivity, odor, and color, chemical properties such as Sulfate, Bicarbonate, Aluminum content, (HCO_3^-), and nitrate, metals such as Chromium, Lead, Mercury, Boron, Barium, Cyanide, and microbiological contaminants such as Fecal Coliforms and Total Coliforms. Table 3-1,

Table 3-2, Table 3-3, Table 3-4, Table 3-5, Table 3-6, Table 3-7 and Table 3-8 show the results for the different samples collected at the different phases. Appendix A presents the Laboratory results.

Table 3-1: Summary of Water Quality Analysis of Phase I.

Parameter	Raw Water Intake St. Paul	Raw Water WTP)	Well6	Well7	Well8	LWSC Deep Well 1
<i>Bacteriological Analysis</i>						
Fecal Coliform (CFU/100ml)	1240	466	36	0	0	0
Total Coliform (CFU/100ml)	1500	>500	48	0	0	0
<i>Metals Analysis</i>						
Arsenic (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Barium (mg/L)	0.04	0.007	0.01	0.04	0.03	0.01
Cadmium (mg/L)	0.00048	0.00036	0.00087	0.00055	0.00049	<0.00025
Chromium (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper (mg/L)	0.003	0.0023	0.008	0.0038	0.0381	0.0381
Cyanide (mg/L)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Fluorides (mg/L)	<0.2	0.49	<0.2	0.6	<0.2	<0.2
Iron (mg/L)	4.3	0.52	0.63	<0.25	<0.25	<0.25
Lead (mg/L)	0.0028	0.0034	0.0098	0.0045	0.0035	0.0027
Manganese (mg/L)	0.0311	0.0046	0.003	<0.001	0.0129	0.0025
Mercury (mg/L)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Molybdenum (mg/L)	<0.005	<0.005	<0.005	<0.005	<0.005	0.005
Nickel (mg/L)	<0.0025	<0.0025	< 0.0025	<0.0025	<0.0025	0.0025
Potassium (mg/L)	0.8	1.1	2.1	2.6	1.3	2.0
Sodium (mg/L)	5	4	4	7	7	5
Selenium (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.001
<i>Physical and Chemical Analysis</i>						
Temperature (°C)	25.4	26.8	29.3	28.8	28.6	29.4
Turbidity (NTU)	15.2	2.3	<0.2	<0.2	<0.2	<0.2
Conductivity (uS/cm at 25 °C)	28.7	27.1	124.9	101.8	64.5	64.0
Apparent color (Pt Co units)	201	55	72	13	15	11
pH (pH Units 25°C)	6.17	6.32	5.75	5.65	4.65	4.39

Hydroxide Alkalinity (mg/L as CaCO₃)	0	0	0	0	0	0
Carbonate Alkalinity (mg/L as CaCO₃)	0	0	0	0	0	0
Bicarbonate Alkalinity (mg/L as CaCO₃)	25.2	23.2	82.8	91	8.4	7.2
Total Hardness (mg/L as CaCO₃)	9	10	96	67	16	16
Calcium Hardness (mg/L as CaCO₃)	<1	3	78	55	5	10
Magnesium hardness (mg/L as CaCO₃)	8.5	7	18	12	11	6
Calcium (mg/L Ca²⁺)	<0.4	1.2	31.3	22	2.0	4.0
Magnesium (mg/L Mg²⁺)	2.1	1.7	4.4	2.9	2.7	1.5
Residual Chloride (ppm)¹	0.05	0.03	<0.01	<0.01	<0.01	<0.01
Silica (mg/L Si)	9.8	4.6	5.3	6.9	3.8	1.1
Sulfate (mg/L SO₄²⁻)	<7	<7	<7	<7	<7	9
Nitrate (mg/L NO₃⁻)	7.0	8.5	5.4	6.6	24.6	21.7
Nitrate-Nitrogen (mg/L NO₂⁻-N)	1.6	1.9	1.2	1.5	5.6	4.9
Nitrite (mg/L NO₂⁻)	<0.007	0.007	0.008	0.009	0.015	0.011
Nitrite-Nitrogen (mg/L NH₃⁻-N)	<0.001	0.002	0.002	0.003	0.004	0.003
Ammonia-Nitrogen (mg/L NO₃⁻-N)	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09
Chlorides (mg/L Cl⁻)	5.20	5.0	13.3	5.6	10.5	10.6
Total Dissolved Solids (mg/L 25°C)	14.2	13.6	62.5	50.8	32.5	32.0

¹ Values for Residual Chloride parameter were obtained on July 3, 2009

Table 3-2: Summary of Water Quality Analysis of Phase II

Parameter	Well 1	Well 2	Well 3	Well 4	Well 5	Well 9	Well 10
<i>Bacteriological Analysis</i>							
Fecal Coliforms (CFU/100ml)	26	85	~200	0	13	~>500	1
Total Coliforms (CFU/100ml)	~>200	~>200	>500	2	25	~>500	10
<i>Metals Analysis</i>							
Arsenic (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron (mg/L)	<0.05	<0.05	0.08	<0.05	<0.05	<0.05	<0.05
Barium (mg/L)	0.007	0.022	0.024	0.016	0.046	0.012	0.081
Cadmium (mg/L)	0.00078	<0.00025	<0.00025	0.00051	0.00039	0.00031	0.00039
Chromium (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper (mg/L)	0.0085	0.0068	0.0018	0.0074	0.0018	0.0032	0.0011
Cyanide (mg/L)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Fluorides (mg/L)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Iron (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25	0.31	<0.25
Lead (mg/L)	0.0109	0.0031	0.0034	0.0043	0.004	0.0027	0.0065
Manganese (ug/L)	0.0013	0.0203	0.0198	0.0041	0.0072	0.0137	0.0136
Mercury (mg/L)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Molybdenum (mg/L)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nickel (mg/L)	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
Potassium (mg/L)	3.5	4.5	8.1	1.1	1.2	0.5	6.0
Sodium (mg/L)	18	27	88	7	10	2	22.5
Selenium (mg/L)	0.0014	<0.001	0.0011	<0.001	<0.001	<0.001	0.0014
<i>Physical and Chemical Analysis</i>							
Temperature (°C)	27.9	28.5	28.5	28.0	28.2	27.4	29.6
Turbidity (NTU)	<0.2	7.5	7.0	<0.2	<0.2	10.3	<0.2
Conductivity (uS/cm at 25°C)	137	196	960	42.9	64.3	20.4	125.5
Apparent color (Pt Co units)	4	23	23	7	14	31	3
pH (pH Units 25°C)	5.79	5.86	6.18	5.07	5.59	5.36	5.27
Hydroxide Alkalinity (mg/L as CaCO ₃)	0	0	0	0	0	0	0
Carbonate Alkalinity (mg/L as CaCO ₃)	0	0	0	0	0	0	0
Bicarbonate Alkalinity (mg/L as CaCO ₃)	37.2	63.6	92.4	17.6	25.4	13.8	18.4
Total Hardness	58	97	190	18	25	1	41

(mg/L as CaCO ₃)							
Calcium Hardness (mg/L as CaCO ₃)	46	59	127	15	21	<1	32
Magnesium hardness (mg/L as CaCO ₃)	12	38	63	3	4	≤1	9
Calcium (mg/L Ca ²⁺)	18.4	23.6	50.9	6.0	8.4	<0.4	12.8
Magnesium (mg/L Mg ²⁺)	2.9	9.2	15.3	0.73	0.97	≤0.24	2.2
Residual Chloride (ppm) ²	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.07
Silica (mg/L Si)	0.73	4.44	3.52	2.3	4.60	2.12	2.94
Sulfate (mg/L SO ₄ ²⁻)	31	32	64	<7	<7	<7	17
Nitrate (mg/L NO ₃ ⁻)	23.1	6.7	14.8	8.8	12.9	5.0	35.2
Nitrate-Nitrogen (mg/L NO ₂ ⁻ -N)	5.2	1.5	3.3	2.0	2.9	1.1	7.9
Nitrite (mg/L NO ₂ ⁻)	0.021	0.023	0.026	0.016	0.031	0.009	0.025
Nitrite-Nitrogen (mg/L NH ₃ ⁻ -N)	0.006	0.007	0.008	0.005	0.009	0.003	0.008
Ammonia-Nitrogen (mg/L NO ₃ ⁻ -N)	<0.09	<0.09	<0.09	<0.09	<0.09	1.75	<0.09
Chlorides (mg/L Cl ⁻)	17.1	46.2	328.5	9.15	13.8	5.3	19.2
Total Dissolved Solids (mg/L 25°C)	68.3	97.7	481	21.1	32.3	10.1	62.8

Table 3-3: Summary of Water Quality Analysis of Tap Water of Phase III.

Parameter	Clara Town	St. Paul Bridge	Mamba Point	New Kru Town	SKD Community	24 th Street
<i>Bacteriological Analysis</i>						
Fecal Coliforms (CFU/100ml)	1	0	8	3	0	0
Total Coliform (CFU/100ml)	6	0	20	32	~>1000	46
<i>Physical and Chemical Analysis</i>						
Temperature (°C)	32.32	33.41	31.59	31.23	30.42	31.73
Turbidity (NTU)	<0.2	<0.20	21.0	<0.2	53	<0.2
Conductivity (uS/cm at 25 °C)	46.8	45.6	47.0	41.9	46.5	46.2
pH (pH Units 25°C)	6.71	6.69	6.69	6.65	6.29	6.37
Residual Chloride (ppm) ³	<0.01	0.04	4	0.02	0.29	<0.01

2 Values for Residual Chloride parameter were obtained on July 3, 2009

3 Values for Residual Chloride parameter were obtained on July 3, 2009

4 The pump at this location has been out of order for the past 3 months, since the construction of cape hotel fence began, says community sources (car washer).

Table 3-4: Summary of Water Quality Analysis of Wastewater of Phase III.

Parameter	Musurado Drain	BTC Drain	BTC Sewer Channel	Fiamah SWTP Intake	Musurado River
<i>Bacteriological Analysis</i>					
Fecal Coliform (CFU/ml)	~>500	~>1000	~>1,000	~>1,000	184
Total Coliform (CFU/ml)	~>500	~>1000	~>1,000	~>1,000	~>500
<i>Physical and Chemical Analysis</i>					
Temperature (°C)	30.9	31.4	31.7	30.4	29.9
Conductivity (uS/cm at 25 °C)	4490	6750	3760	2610	48300
pH (pH Units 25 °C)	6.89	6.87	6.89	6.49	7.52
Total Nitrogen(mg/L N)	194	129	128	35	12
Total Phosphorus(mg/L P)	31	21.5	22	5.3	0.11
DO (mg/L)	1.325	0.432	0.483	0.433	1.461
Biochemical Oxygen Demand (mg/L BOD ₅)	510	343	357	30	*
Chemical Oxygen Demand (mg/L mg/L O ₂)	1304	938	987	121	545
Total Suspended Solid (mg/L)	620	220	265	13	85.3

*BOD₅ could not be analyzed accurately because of the high salinity of the sample

Table 3-5. Summary of Water Quality Analysis of Phase IV (Tap Water).

Parameter	Pipeline Load	Police Academy	Congo Town	Old Street
<i>Bacteriological Analysis</i>				
Fecal Coliforms (CFU/100ml)	0	0	0	0
Total Coliform (CFU/100ml)	440	0	20	0
<i>Physical and Chemical Analysis</i>				
Temperature (°C)	31	32.6	31.4	32.2
Turbidity (NTU)	1.09	0.87	2.12	0.95
Conductivity (uS/cm at 25 °C)	44.2	40.7	41.3	44.6

pH (pH Units 25 °C)	6.73	6.33	6.38	6.65
Total Dissolved Solids (mg/L 25°C)	22.3	20.2	20.7	22.3
Residual Chloride (ppm) ⁵	0.04	<0.01	<0.01	<0.01

Table 3-6: Summary of Water Quality Analysis for Phase V.

Parameter	Well J1	Well J4
<i>Bacteriological Analysis</i>		
Fecal Coliforms (CFU/100ml)	0	0
Total Coliforms (CFU/100ml)	500	5000
<i>Metals Analysis</i>		
Arsenic (mg/L)	<0.001	<0.001
Boron (mg/L)	<0.1	<0.1
Barium (mg/L)	0.25	0.055
Cadmium (mg/L)	0.00092	0.00066
Chromium (mg/L)	<0.001	<0.001
Copper (mg/L)	0.0098	0.007
Cyanide (mg/L)	<0.02	<0.02
Fluorides (mg/L)	<0.2	0.2
Iron (mg/L)	<0.25	<0.25
Lead (mg/L)	0.0144	0.0117
Manganese (mg/L)	0.39	0.271
Mercury (mg/L)	<0.0005	<0.0005
Molybdenum (mg/L)	<0.005	<0.005
Nickel (mg/L)	<0.0025	<0.0025
Potassium (mg/L)	5.8	2.1
Sodium (mg/L)	32.5	20
Selenium (mg/L)	<0.001	<0.001
<i>Physical and Chemical Analysis</i>		
Temperature (°C)	*	*
Turbidity (NTU)	0.61	4.2
Conductivity (uS/cm at 25°C)	338	197.7
Apparent color (Pt Co units)	<1	30
pH (pH Units 25°C)	6.87	7.00
Hydroxide Alkalinity(mg/L as CaCO ₃)	0	0
Carbonate Alkalinity (mg/L as CaCO ₃)	0	0
Bicarbonate Alkalinity (mg/L as CaCO ₃)	212	178
Total Hardness (mg/L as CaCO ₃)	128	120

5 Values for Residual Chloride parameter were obtained on July 3, 2009

Calcium Hardness (mg/L as CaCO ₃)	87	79
Magnesium hardness (mg/L as CaCO ₃)	41	41
Calcium (mg/L Ca ²⁺)	35	31.7
Magnesium (mg/L Mg ²⁺)	10	10
Residual Chloride (ppm) ⁶	0.06	0.04
Silica (mg/L Si)	8.1	15.1
Sulfate (mg/L SO ₄ ²⁻)	<7	8
Nitrate (mg/L NO ₃ ⁻)	3.9	4.6
Nitrate-Nitrogen (mg/L NO ₂ ⁻ -N)	0.9	1.0
Nitrite (mg/L NO ₂ ⁻)	0.008	0.019
Nitrite-Nitrogen (mg/L NH ₃ ⁻ -N)	0.002	0.006
Ammonia-Nitrogen (mg/L NO ₃ ⁻ -N)	<0.09	<0.09
Chlorides (mg/L Cl ⁻)	9.4	5.2
Total Dissolved Solids (mg/L 25°C)	171	98.8

* Temperature value is not shown in this table because it was analyzed by JICA Study Team.

Table 3-7: Summary of Water Quality Analysis for Phase VI. Note that only the fecal coliform, total coliform, and lead parameters were analyzed for Well J1 in order to counter check the values obtained in Phase V.

Parameter	Well J2	Well J3	Well J1
<i>Bacteriological Analysis</i>			
Fecal Coliforms (CFU/100ml)	150	476	0
Total Coliforms (CFU/100ml)	200	600	0
<i>Metals Analysis</i>			
Arsenic (mg/L)	<0.001	<0.001	-
Boron (mg/L)	<0.05	<0.05	-
Barium (mg/L)	0.141	0.1	-
Cadmium (mg/L)	0.00076	0.00088	-
Chromium (mg/L)	<0.001	<0.001	-
Copper (mg/L)	0.0026	0.0039	-
Cyanide (mg/L)	<0.02	<0.02	-
Fluorides (mg/L)	0.39	0.6	-
Iron (mg/L)	<0.25	4.3	-
Lead (mg/L)	0.00124	0.0034	<0.001
Manganese (mg/L)	0.435	0.277	-

⁶ Values for Residual Chloride parameter were obtained on July 16, 2009

Mercury (mg/L)	0.005	0.004	-
Molybdenum (mg/L)	<0.005	<0.005	-
Nickel (mg/L)	9.5	0.0036	-
Potassium (mg/L)	6.55	1.6	-
Sodium (mg/L)	93.9	6.8	-
Selenium (mg/L)	<0.001	<0.001	-
<i>Physical and Chemical Analysis</i>			
Temperature (°C)	*	*	*
Turbidity (NTU)	2.35	38	-
Conductivity (uS/cm at 25°C)	672	147.7	-
Apparent color (Pt Co units)	18	156	-
pH (pH Units 25°C)	5.73	5.99	-
Hydroxide Alkalinity(mg/L as CaCO ₃)	0	0	-
Carbonate Alkalinity (mg/L as CaCO ₃)	0	0	-
Bicarbonate Alkalinity (mg/L as CaCO ₃)	54	126	-
Total Hardness (mg/L as CaCO ₃)	160	103	-
Calcium Hardness (mg/L as CaCO ₃)	92	80	-
Magnesium hardness (mg/L as CaCO ₃)	68	23	-
Calcium (mg/L Ca ²⁺)	36.8	32.1	-
Magnesium (mg/L Mg ²⁺)	16.5	5.6	-
Residual Chloride (ppm) ⁷	0.02	0.04	-
Silica (mg/L Si)	6.9	9.1	-
Sulfate (mg/L SO ₄ ²⁻)	26	<7	-
Nitrate (mg/L NO ₃ ⁻)	5.1	1.4	-
Nitrate-Nitrogen (mg/L NO ₂ ⁻ -N)	1.1	0.3	-
Nitrite (mg/L NO ₂ ⁻)	0.010	<0.001	-
Nitrite-Nitrogen (mg/L NH ₃ ⁻ -N)	0.003	<0.001	-
Ammonia-Nitrogen (mg/L NO ₃ ⁻ -N)	<0.09	<0.09	-
Chlorides (mg/L Cl ⁻)	231	5.7	-
Total Dissolved Solids (mg/L 25°C)	337	73.8	-

*Temperature value is not shown in this table because it was analyzed by JICA Study Team

Table 3-8: Summary of Water Quality Analysis for Phase VII. Note that only mercury analysis was conducted for both Well J1 and Well J2 as part of re-checking the values for verification with previous results obtained phases V and VI.

⁷ Values for Residual Chloride parameter were obtained on July 16, 2009.

Parameter	LWSC Deep Well 1	Raw Water WTP	Raw Water Intake, St. Paul	Well J1	Well J 2
<i>Bacteriological Analysis</i>					
Fecal Coliform (CFU/100ml)	0	1700	40	-	-
Total Coliform (CFU/100ml)	20	4500	2300	-	-
<i>Metals Analysis</i>					
Arsenic (mg/L)	<0.001	<0.001	<0.001	-	-
Boron (mg/L)	0.01	<0.005	<0.005	-	-
Barium (mg/L)	0.012	0.033	0.04	-	-
Cadmium (mg/L)	0.00072	0.00039	0.0045	-	-
Chromium (mg/L)	<0.001	<0.001	<0.001	-	-
Copper (mg/L)	0.0373	0.0037	0.0034	-	-
Cyanide (mg/L)	<0.02	<0.02	<0.02	-	-
Fluorides (mg/L)	<0.2	<0.2	<0.2	-	-
Iron (mg/L)	<0.25	0.79	1.45	-	-
Lead (mg/L)	0.0034	0.0123	0.00161	-	-
Manganese (ug/L)	0.0058	0.0206	0.0318	-	-
Mercury (mg/L)	<0.0005	0.003	<0.0005	<0.001	0.0005
Molybdenum (mg/L)	<0.005	<0.005	<0.005	-	-
Nickel (mg/L)	<0.001	0.00428	0.00137	-	-
Potassium (mg/L)	3.5	1.1	1.45	-	-
Sodium (mg/L)	16.5	4.5	4.0	-	-
Selenium (mg/L)	<0.001	<0.001	<0.001	-	-
<i>Physical and Chemical Analysis</i>					
Temperature (°C)	28.9	26.6	27.1	-	-
Turbidity (NTU)	0.56	3.8	18.8	-	-
Conductivity (uS/cm at 25°C)	103.9	18.16	20.1	-	-
Apparent color (Pt Co units)	8	136	164	-	-
pH (pH Units 25°C)	4.55	5.86	5.86	-	-
Hydroxide Alkalinity(mg/L as CaCO ₃)	0	0	0	-	-
Carbonate Alkalinity (mg/L as CaCO ₃)	0	0	0	-	-
Bicarbonate	6.4	18.2	14.2	-	-

Alkalinity (mg/L as CaCO₃)					
Total Hardness (mg/L as CaCO₃)	50	13	16	-	-
Calcium Hardness (mg/L as CaCO₃)					
Hardness (mg/L as CaCO₃)	33	6	10	-	-
Magnesium hardness (mg/L as CaCO₃)					
hardness (mg/L as CaCO₃)	17	7	6	-	-
Calcium (mg/L Ca²⁺)	13.2	2.4	4	-	-
Magnesium (mg/L Mg²⁺)	4.1	1.7	1.5	-	-
Residual Chloride (ppm)	<0.01	0.03	0.05	-	-
Silica (mg/L Si)	0.80	4.10	4.44	-	-
Sulfate (mg/L SO₄²⁻)	11	<7	<7	-	-
Nitrate (mg/L NO₃⁻)	37.3	2.0	<2.0	-	-
Nitrate-Nitrogen (mg/L NO₂⁻-N)	8.4	0.5	<0.5	-	-
Nitrite (mg/L NO₂⁻)	0.015	0.008	0.004	-	-
Nitrite-Nitrogen (mg/L NH₃⁻-N)	0.005	0.002	0.001	-	-
Ammonia (mg/L NH₃)	<0.09	<0.09	<0.09	-	-
Ammonia-Nitrogen (mg/L NO₃⁻-N)	<0.09	<0.09	<0.09	-	-
Chlorides (mg/L Cl⁻)	17.2	3.6	4.2	-	-
Total Dissolved Solids (mg/L 25°C)	51.9	9.09	10.0	-	-

Appendix A: RESULTS OBTAINED FROM AUB LABORATORIES

Plate A1 (Phase I)

Plate A2 (Phase II)

Plate A3 (Phase III)

Plate A4 (Phase IV)

Plate A5 (Phase V)

Plate A6 (Phase VI)

Plate A7 (Phase VII)

Appendix B: Results Arranged by Location, MDL & Methods of Analysis

Plate B1 (LWSC Deep Well 1)

Phase Number: I

Location of Sample: LWSC Deep Well 1, Monrovia, Liberia

Date of Sampling: 22-01-2009

Date of Analysis: 23-01-2009

Date of Report Generation: 12-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	0	1CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	0	1CFU/100ml	Membrane filtration
3.	Arsenic	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
4.	Boron	mg/ L	<0.05	0.05 mg/L	EPA200-7/8
5.	Barium	mg/ L	0.01	0.002 mg/L	EPA200-7/8
6.	Cadmium	mg/L	<0.00025	0.00025 mg/L	Graphite Furnace-AAS
7.	Chromium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
8.	Copper	mg/L	0.0381	0.001 mg/L	Graphite Furnace-AAS
9.	Cyanide	mg/ L	<0.02	0.02 mg/L	Spectrophotometer HACH 8027
10.	Flouride	mg/ L	<0.2	0.2 mg/L	Spectrophotometer HACH 8027
11.	Iron	mg/L	<0.25	0.25mg/L	Frame-AAS
12.	Lead	mg/L	0.0027	0.001 mg/L	Graphite Furnace-AAS
13.	Manganese	mg/L	0.0025	0.001 mg/L	Graphite Furnace-AAS
14.	Mercury	mg/ L	<0.0005	0.0005 mg/L	EPA200-7/8
15.	Molybdenum	mg/ L	0.005	0.005 mg/L	Graphite Furnace-AAS
16.	Nickel	mg/ L	0.0025	0.0025 mg/ L	Graphite Furnace-AAS
17.	Potassium	mg/L	2.0	0.05 mg/L	Flame emission photometry
18.	Sodium	mg/L	5	0.1 mg/L	Flame emission photometry
19.	Selenium	mg/L	< 0.001	0.001 mg/L	Graphite Furnace-AAS
20.	Temperature	°C	29.4	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
21.	Turbidity	NTU	<0.2	0.2 NTU	Nephelometric
22.	Conductivity	uS/cm at 25°C	64.0	0.1 uS/cm	Electrometric
23.	Apparent color	Pt Co units	11	1 PtCo units	Colorimetric, Pt-Co
24.	pH	pH Units 25°C	4.39	0.01	Electrometric
25.	Hydroxide	mg/L as CaCO ₃	0	*	*

	Alkalinity				
26.	Carbonate Alkalinity	mg/L as CaCO ₃	0	*	*
27.	Bicarbonate Alkalinity	mg/L as CaCO ₃	7.2	*	*
28.	Total Hardness	mg/L as CaCO ₃	16	1 mg/L CaCO ₃	Titrimetric, EDTA
29.	Calcium Hardness	mg/L as CaCO ₃	10	1 mg/L CaCO ₃	Titrimetric, EDTA
30.	Magnesium hardness	mg/L as CaCO ₃	6	1 mg/L CaCO ₃	Titrimetric, EDTA
31.	Calcium	mg/L Ca ²⁺	4.0	**	**
32.	Magnesium	mg/L Mg ²⁺	1.5	**	**
33.	Residual Chloride ⁸	ppm	<0.01	0.01	DPD-1 Free Chlorine
34.	Silica	mg/L Si	1.1	0.01 mg/L SiO ₂	Colorimetric, Heteropoly
35.	Sulfate	mg/L SO ₄ ²⁻	9	7 mg/L	Colorimetric
36.	Nitrate	mg/L NO ₃ ⁻	21.7	***	***
37.	Nitrate-Nitrogen	mg/L NO ₃ ⁻ -N	4.9	0.5 mg/L	Colorimetric
38.	Nitrite	mg/L NO ₂ ⁻	0.011	***	***
39.	Nitrite-Nitrogen	mg/L NO ₂ ⁻ -N	0.003	0.001 mg/L	Colorimetric
40.	Ammonia-Nitrogen	mg/L NH ₃ -N	<0.09	0.09 mg/L	Colorimetric, salicylate
41.	Chlorides	mg/L Cl ⁻	10.6	0.25 mg/L	Titrimetric, silver nitrate
42.	Total Dissolved Solids	mg/L 25°C	32.0	1.0 mg/L	Electrometric

*Alkalinity tests are done by titration with HCL as phenolphthalein and mixed indicator alkalinities (MDL 0.2 mg/L as CaCO₃) from which the corresponding OH, HCO₃, and CO₃ alkalinities are calculated.

**Calcium and magnesium are calculated from calcium and total hardness tests which are determined by titration with EDTA (MDL 0.2 mg/L as CaCO₃).

*** Nitrate and nitrite are determined colorimetrically, MDLs are 0.5 mg/L NO₃-N and 0.001 mg/L NO₂-N, respectively

All tests are performed in accordance to the "standard Methods for the Examination of Water and Wastewater", 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

⁸ Values for Residual Chloride parameter were obtained on July 16, 2009.

Plate B2 (Raw water intake, St. Paul, White Plains)

Phase Number: I

Location of Sample: Raw water intake, St. Paul, White Plains, Liberia (Phase I)

Date of Sampling: 22-01-2009

Date of Analysis: 23-01-2009

Date of Report Generation: 12-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	1240	1CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	1500	1CFU/100ml	Membrane filtration
3.	Arsenic	mg/ L	<0.001	0.001 mg/L	Graphite Furnace-AAS
4.	Boron	mg/ L	<0.05	0.05 mg/L	EPA200-7/8
5.	Barium	mg/ L	0.04	0.002 mg/L	EPA200-7/8
6.	Cadmium	mg/L	0.00048	0.00025 mg/L	Graphite Furnace-AAS
7.	Chromium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
8.	Copper	mg/L	0.003	0.001 mg/L	Graphite Furnace-AAS
9.	Cyanide	mg/ L	<0.02	0.02 mg/L	Spectrophotometer HACH 8027
10.	Flouride	mg/ L	<0.2	0.2 mg/L	Spectrophotometer HACH 8027
11.	Iron	mg/L	4.3	0.25mg/L	Frame-AAS
12.	Lead	mg/L	0.0028	0.001 mg/L	Graphite Furnace-AAS
13.	Manganese	mg/L	0.0311	0.001 mg/L	Graphite Furnace-AAS
14.	Mercury	mg/ L	<0.0005	0.0005 mg/L	EPA200-7/8
15.	Molybdenum	mg/L	<0.005	0.005 mg/L	Graphite Furnace-AAS
16.	Nickel	mg/L	<0.0025	0.0025 mg /L	Graphite Furnace-AAS
17.	Potassium	mg/L	0.8	0.05 mg/L	Flame emission photometry
18.	Sodium	mg/L	5	0.1 mg/L	Flame emission photometry
19.	Selenium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
20.	Temperature	°C	25.4	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
21.	Turbidity	NTU	15.2	0.2 NTU	Nephelometric
22.	Conductivity	uS/cm at 25°C	28.7	0.1 uS/cm	Electrometric
23.	Apparent color	Pt Co units	201	1 Pt Co units	Colorimetric, Pt-Co
24.	pH	pH Units 25°C	6.17	0.01	Electrometric
25.	Hydroxide Alkalinity	mg/L as CaCO ₃	0	*	*
26.	Carbonate	mg/L as CaCO ₃	0	*	*

	Alkalinity				
27.	Bicarbonate Alkalinity	mg/L as CaCO ₃	25.2	*	*
28.	Total Hardness	mg/L as CaCO ₃	9	1 mg/L CaCO ₃	Titrimetric, EDTA
29.	Calcium Hardness	mg/L as CaCO ₃	<1	1 mg/L CaCO ₃	Titrimetric, EDTA
30.	Magnesium hardness	mg/L as CaCO ₃	8.5	1 mg/L CaCO ₃	Titrimetric, EDTA
31.	Calcium	mg/L Ca ²⁺	<0.4	**	**
32.	Magnesium	mg/L Mg ²⁺	2.1	**	**
33.	Residual Chloride ⁹	ppm	0.05	0.01	DPD-1 Free Chlorine
34.	Silica	mg/L Si	9.8	0.01 mg/L SiO ₂	Colorimetric, Heteropoly
35.	Sulfate	mg/L SO ₄ ²⁻	<7	7 mg/L	Colorimetric
36.	Nitrate	mg/L NO ₃ ⁻	7.0	***	***
37.	Nitrate-Nitrogen	mg/L NO ₃ ⁻ -N	1.6	0.5 mg/L	Colorimetric
38.	Nitrite	mg/L NO ₂ ⁻	<0.007	***	***
39.	Nitrite-Nitrogen	mg/L NO ₂ ⁻ -N	<0.001	0.001 mg/L	Colorimetric
40.	Ammonia-Nitrogen	mg/L NH ₃ ⁻ -N	<0.09	0.09 mg/L	Colorimetric, salicylate
41.	Chlorides	mg/L Cl ⁻	5.20	0.25 mg/L	Titrimetric, silver nitrate
42.	Total Dissolved Solids	mg/L 25°C	14.2	1.0 mg/L	Electrometric

*Alkalinity tests are done by titration with HCL as phenolphthalein and mixed indicator alkalinities (MDL 0.2 mg/L as CaCO₃) from which the corresponding OH, HCO₃, and CO₃ alkalinities are calculated.

**Calcium and magnesium are calculated from calcium and total hardness tests which are determined by titration with EDTA (MDL 0.2 mg/L as CaCO₃).

*** Nitrate and nitrite are determined colorimetrically, MDLs are 0.5 mg/L NO₃-N and 0.001 mg/L NO₂-N, respectively

All tests are performed in accordance to the "standard Methods for the Examination of Water and Wastewater", 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

⁹ Values for Residual Chloride parameter were obtained on July 16, 2009.

Plate B3 (Raw Water WTP, White Plains)

Phase Number: I

Location of Sample: Raw Water WTP, White Plains, Liberia

Date of Sampling: 22-01-2009

Date of Analysis: 23-01-2009

Date of Report Generation: 12-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	466	1CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	>500	1CFU/100ml	Membrane filtration
3.	Arsenic	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
4.	Boron	mg/ L	<0.05	0.05 mg/L	EPA200-7/8
5.	Barium	mg/ L	0.007	0.002 mg/L	EPA200-7/8
6.	Cadmium	mg/L	0.00036	0.00025 mg/L	Graphite Furnace-AAS
7.	Chromium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
8.	Copper	mg/L	0.0023	0.001 mg/L	Graphite Furnace-AAS
9.	Cyanide	mg/ L	<0.02	0.02 mg/L	Spectrophotometer HACH 8027
10.	Flouride	mg/ L	0.49	0.2 mg/L	Spectrophotometer HACH 8027
11.	Iron	mg/L	0.52	0.25mg/L	Frame-AAS
12.	Lead	mg/L	0.0034	0.001 mg/L	Graphite Furnace-AAS
13.	Manganese	mg/L	0.0046	0.001 mg/L	Graphite Furnace-AAS
14.	Mercury	mg/ L	<0.0005	0.0005 mg/L	EPA200-7/8
15.	Molybdenum	mg/L	<0.005	0.005 mg/L	Graphite Furnace-AAS
16.	Nickel	mg/L	<0.0025	0.0025 mg /L	Graphite Furnace-AAS
17.	Potassium	mg/L	1.1	0.05 mg/L	Flame emission photometry
18.	Sodium	mg/L	4	0.1 mg/L	Flame emission photometry
19.	Temperature	°C	26.8	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
20.	Selenium	mg/L	<0.001	v	Graphite Furnace-AAS
21.	Turbidity	NTU	2.3	0.2 NTU	Nephelometric
22.	Conductivity	uS/cm at 25°C	27.1	0.1 uS/cm	Electrometric
23.	Apparent color	Pt Co units	55	1 Pt Co units	Colorimetric, Pt-Co
24.	pH	pH Units 25°C	6.32	0.01	Electrometric

25.	Hydroxide Alkalinity	mg/L as CaCO ₃	0	*	*
26.	Carbonate Alkalinity	mg/L as CaCO ₃	0	*	*
27.	Bicarbonate Alkalinity	mg/L as CaCO ₃	23.2	*	*
28.	Total Hardness	mg/L as CaCO ₃	10	1 mg/L CaCO ₃	Titrimetric, EDTA
29.	Calcium Hardness	mg/L as CaCO ₃	3	1 mg/L CaCO ₃	Titrimetric, EDTA
30.	Magnesium hardness	mg/L as CaCO ₃	7	1 mg/L CaCO ₃	Titrimetric, EDTA
31.	Calcium	mg/L Ca ²⁺	1.2	**	**
32.	Magnesium	mg/L Mg ²⁺	1.7	**	**
33.	Residual Chloride ¹⁰	ppm	0.03	0.01	DPD-1 Free Chlorine
34.	Silica	mg/L Si	4.6	0.01 mg/L SiO ₂	Colorimetric, Heteropoly
35.	Sulfate	mg/L SO ₄ ²⁻	<7	7 mg/L	Colorimetric
36.	Nitrate	mg/L NO ₃ ⁻	8.5	***	***
37.	Nitrate-Nitrogen	mg/L NO ₃ ⁻ -N	1.9	0.5 mg/L	Colorimetric
38.	Nitrite	mg/L NO ₂ ⁻	0.007	***	***
39.	Nitrite-Nitrogen	mg/L NO ₂ ⁻ -N	0.002	0.001 mg/L	Colorimetric
40.	Ammonia-Nitrogen	mg/L NH ₃ ⁻ -N	<0.09	0.09 mg/L	Colorimetric, salicylate
41.	Chlorides	mg/L Cl ⁻	5.0	0.25 mg/L	Titrimetric, silver nitrate
42.	Total Dissolved Solids	mg/L 25°C	13.6	1.0 mg/L	Electrometric

*Alkalinity tests are done by titration with HCL as phenolphthalein and mixed indicator alkalinities (MDL 0.2 mg/L as CaCO₃) from which the corresponding OH, HCO₃, and CO₃ alkalinities are calculated.

**Calcium and magnesium are calculated from calcium and total hardness tests which are determined by titration with EDTA (MDL 0.2 mg/L as CaCO₃).

*** Nitrate and nitrite are determined colorimetrically, MDLs are 0.5 mg/L NO₃-N and 0.001 mg/L NO₂-N, respectively

All tests are performed in accordance to the "standard Methods for the Examination of Water and Wastewater", 21st Edition, 2005 as approved by the American Public Health Association, the

¹⁰ Values for Residual Chloride parameter were obtained on July 16, 2009.

American Water Works Association, and the Water Environment Federation unless otherwise noted.

Plate B4 (Well 6)

Phase Number: I

Location of Sample: Well 6, Monrovia, Liberia

Date of Sampling: 22-01-2009

Date of Analysis: 23-01-2009

Date of Report Generation: 12-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	36	1CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	48	1CFU/100ml	Membrane filtration
3.	Arsenic	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
4.	Boron	mg/L	<0.05	0.05 mg/L	EPA200-7/8
5.	Barium	mg/L	0.01	0.002 mg/L	EPA200-7/8
6.	Cadmium	mg/L	0.00087	0.00025 mg/L	Graphite Furnace-AAS
7.	Chromium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
8.	Copper	mg/L	0.008	0.001 mg/L	Graphite Furnace-AAS
9.	Cyanide	mg/L	<0.02	0.02 mg/L	Spectrophotometer HACH 8027
10.	Flouride	mg/L	<0.2	0.2 mg/L	Spectrophotometer HACH 8027
11.	Iron	mg/L	0.63	0.25mg/L	Frame-AAS
12.	Lead	mg/L	0.0098	0.001 mg/L	Graphite Furnace-AAS
13.	Manganese	mg/L	0.003	0.001 mg/L	Graphite Furnace-AAS
14.	Mercury	mg/L	<0.0005	0.0005 mg/L	EPA200-7/8
15.	Molybdenum	mg/L	<0.005	0.005 mg/L	Graphite Furnace-AAS
16.	Nickel	mg/L	< 0.0025	0.0025 mg /L	Graphite Furnace-AAS
17.	Potassium	mg/L	2.1	0.05 mg/L	Flame emission photometry
18.	Sodium	mg/L	4	0.1 mg/L	Flame emission photometry
19.	Selenium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
20.	Temperature	°C	29.3	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
21.	Turbidity	NTU	<0.2	0.2 NTU	Nephelometric
22.	Conductivity	uS/cm at 25°C	124.9	0.1 uS/cm	Electrometric
23.	Apparent color	Pt Co units	72	1 Pt Co units	Colorimetric, Pt-Co
24.	pH	pH Units 25°C	5.75	0.01	Electrometric

25.	Hydroxide Alkalinity	mg/L as CaCO ₃	0	*	-
26.	Carbonate Alkalinity	mg/L as CaCO ₃	0	*	*
27.	Bicarbonate Alkalinity	mg/L as CaCO ₃	82.8	*	*
28.	Total Hardness	mg/L as CaCO ₃	96	1 mg/L CaCO ₃	Titrimetric, EDTA
29.	Calcium Hardness	mg/L as CaCO ₃	78	1 mg/L CaCO ₃	Titrimetric, EDTA
30.	Magnesium hardness	mg/L as CaCO ₃	18	1 mg/L CaCO ₃	Titrimetric, EDTA
31.	Calcium	mg/L Ca ²⁺	31.3	**	**
32.	Magnesium	mg/L Mg ²⁺	4.4	**	**
33.	Residual Chloride ¹¹	ppm	<0.01	0.01	DPD-1 Free Chlorine
34.	Silica	mg/L Si	5.3	0.01 mg/L SiO ₂	Colorimetric, Heteropoly
35.	Sulfate	mg/L SO ₄ ²⁻	<7	7 mg/L	Colorimetric
36.	Nitrate	mg/L NO ₃ ⁻	5.4	***	***
37.	Nitrate-Nitrogen	mg/L NO ₃ ⁻ -N	1.2	0.5 mg/L	Colorimetric
38.	Nitrite	mg/L NO ₂ ⁻	0.008	***	***
39.	Nitrite-Nitrogen	mg/L NO ₂ ⁻ -N	0.002	0.001 mg/L	Colorimetric
40.	Ammonia-Nitrogen	mg/L NH ₃ ⁻ -N	<0.09	0.09 mg/L	Colorimetric, salicylate
41.	Chlorides	mg/L Cl ⁻	13.3	0.25 mg/L	Titrimetric, silver nitrate
42.	Total Dissolved Solids	mg/L 25°C	62.5	1.0 mg/L	Electrometric

*Alkalinity tests are done by titration with HCL as phenolphthalein and mixed indicator alkalinities (MDL 0.2 mg/L as CaCO₃) from which the corresponding OH, HCO₃, and CO₃ alkalinities are calculated.

**Calcium and magnesium are calculated from calcium and total hardness tests which are determined by titration with EDTA (MDL 0.2 mg/L as CaCO₃).

*** Nitrate and nitrite are determined colorimetrically, MDLs are 0.5 mg/L NO₃-N and 0.001 mg/L NO₂-N, respectively

All tests are performed in accordance to the "standard Methods for the Examination of Water and Wastewater", 21st Edition, 2005 as approved by the American Public Health Association, the

¹¹ Values for Residual Chloride parameter were obtained on July 3, 2009.

American Water Works Association, and the Water Environment Federation unless otherwise noted.

Plate B5 (Well 7)

Phase Number: I

Location of Sample: Well 7, Monrovia, Liberia

Date of Sampling: 22-01-2009

Date of Analysis: 23-01-2009

Date of Report Generation: 12-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	0	1CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	0	1CFU/100ml	Membrane filtration
3.	Arsenic	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
4.	Boron	mg/L	<0.05	0.05 mg/L	EPA200-7/8
5.	Barium	mg/L	0.04	0.002 mg/L	EPA200-7/8
6.	Cadmium	mg/L	0.00055	0.00025 mg/L	Graphite Furnace-AAS
7.	Chromium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
8.	Copper	mg/L	0.0038	0.001 mg/L	Graphite Furnace-AAS
9.	Cyanide	mg/L	<0.02	0.02 mg/L	Spectrophotometer HACH 8027
10.	Flouride	mg/L	0.6	0.2 mg/L	Spectrophotometer HACH 8027
11.	Iron	mg/L	<0.25	0.25mg/L	Frame-AAS
12.	Lead	mg/L	0.0045	0.001 mg/L	Graphite Furnace-AAS
13.	Manganese	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
14.	Mercury	mg/L	<0.0005	0.0005 mg/L	EPA200-7/8
15.	Molybdenum	mg/L	<0.005	0.005 mg/L	Graphite Furnace-AAS
16.	Nickel	mg/L	<0.0025	0.0025 mg /L	Graphite Furnace-AAS
17.	Potassium	mg/L	2.6	0.05 mg/L	Flame emission photometry
18.	Sodium	mg/L	7	0.1 mg/L	Flame emission photometry
19.	Selenium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
20.	Temperature	°C	28.8	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
21.	Turbidity	NTU	<0.2	0.2 NTU	Nephelometric
22.	Conductivity	uS/cm at 25°C	101.8	0.1 uS/cm	Electrometric
23.	Apparent color	Pt Co units	13	1 Pt Co units	Colorimetric, Pt-Co
24.	pH	pH Units 25°C	5.65	0.01	Electrometric

25.	Hydroxide Alkalinity	mg/L as CaCO ₃	0	*	*
26.	Carbonate Alkalinity	mg/L as CaCO ₃	0	*	*
27.	Bicarbonate Alkalinity	mg/L as CaCO ₃	91	*	*
28.	Total Hardness	mg/L as CaCO ₃	67	1 mg/L CaCO ₃	Titrimetric, EDTA
29.	Calcium Hardness	mg/L as CaCO ₃	55	1 mg/L CaCO ₃	Titrimetric, EDTA
30.	Magnesium hardness	mg/L as CaCO ₃	12	1 mg/L CaCO ₃	Titrimetric, EDTA
31.	Calcium	mg/L Ca ²⁺	22	**	**
32.	Magnesium	mg/L Mg ²⁺	2.9	**	**
33.	Residual Chloride ¹²	ppm	<0.01	0.01	DPD-1 Free Chlorine
34.	Silica	mg/L Si	6.9	0.01 mg/L SiO ₂	Colorimetric, Heteropoly
35.	Sulfate	mg/L SO ₄ ²⁻	<7	7 mg/L	Colorimetric
36.	Nitrate	mg/L NO ₃ ⁻	6.6	***	***
37.	Nitrate-Nitrogen	mg/L NO ₃ ⁻ N	1.5	0.5 mg/L	Colorimetric
38.	Nitrite	mg/L NO ₂ ⁻	0.009	***	***
39.	Nitrite-Nitrogen	mg/L NO ₂ -N	0.003	0.001 mg/L	Colorimetric
40.	Ammonia-Nitrogen	mg/L NH ₃ ⁻ N	<0.09	0.09 mg/L	Colorimetric, salicylate
41.	Chlorides	mg/L Cl ⁻	5.6	0.25 mg/L	Titrimetric, silver nitrate
42.	Total Dissolved Solids	mg/L 25°C	50.8	1.0 mg/L	Electrometric

*Alkalinity tests are done by titration with HCL as phenolphthalein and mixed indicator alkalinities (MDL 0.2 mg/L as CaCO₃) from which the corresponding OH, HCO₃, and CO₃ alkalinities are calculated.

**Calcium and magnesium are calculated from calcium and total hardness tests which are determined by titration with EDTA (MDL 0.2 mg/L as CaCO₃).

*** Nitrate and nitrite are determined colorimetrically, MDLs are 0.5 mg/L NO₃-N and 0.001 mg/L NO₂-N, respectively

¹² Values for Residual Chloride parameter were obtained on July 3, 2009.

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

Plate B6 (Well 8)

Phase Number: I

Location of Sample: Well 8, Monrovia, Liberia

Date of Sampling: 22-01-2009

Date of Analysis: 23-01-2009

Date of Report Generation: 12-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	0	1CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	0	1CFU/100ml	Membrane filtration
3.	Arsenic	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
4.	Boron	mg/L	<0.05	0.05 mg/L	EPA200-7/8
5.	Barium	mg/L	0.03	0.002 mg/L	EPA200-7/8
6.	Cadmium	mg/L	0.00049	0.00025 mg/L	Graphite Furnace-AAS
7.	Chromium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
8.	Copper	mg/L	0.0381	0.001 mg/L	Graphite Furnace-AAS
9.	Cyanide	mg/L	<0.02	0.02 mg/L	Spectrophotometer HACH 8027
10.	Flouride	mg/L	<0.2	0.2 mg/L	Spectrophotometer HACH 8027
11.	Iron	mg/L	<0.25	0.25mg/L	Frame-AAS
12.	Lead	mg/L	0.0035	0.001 mg/L	Graphite Furnace-AAS
13.	Manganese	mg/L	0.0129	0.001 mg/L	Graphite Furnace-AAS
14.	Mercury	mg/L	<0.0005	0.0005 mg/L	EPA200-7/8
15.	Molybdenum	mg/L	<0.005	0.005 mg/L	Graphite Furnace-AAS
16.	Nickel	mg/L	<0.0025	0.0025 mg /L	Graphite Furnace-AAS
17.	Potassium	mg/L	1.3	0.05 mg/L	Flame emission photometry
18.	Sodium	mg/L	7	0.1 mg/L	Flame emission photometry
19.	Selenium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
20.	Temperature	°C	28.6	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
21.	Turbidity	NTU	<0.2	0.2 NTU	Nephelometric
22.	Conductivity	uS/cm at 25°C	64.5	0.1 uS/cm	Electrometric
23.	Apparent color	Pt Co units	15	1 Pt Co units	Colorimetric, Pt-Co
24.	pH	pH Units 25°C	4.65	0.01	Electrometric
25.	Hydroxide	mg/L as CaCO ₃	0	*	*

	Alkalinity				
26.	Carbonate Alkalinity	mg/L as CaCO ₃	0	*	*
27.	Bicarbonate Alkalinity	mg/L as CaCO ₃	8.4	*	*
28.	Total Hardness	mg/L as CaCO ₃	16	1 mg/L CaCO ₃	Titrimetric, EDTA
29.	Calcium Hardness	mg/L as CaCO ₃	5	1 mg/L CaCO ₃	Titrimetric, EDTA
30.	Magnesium hardness	mg/L as CaCO ₃	11	1 mg/L CaCO ₃	Titrimetric, EDTA
31.	Calcium	mg/L Ca ²⁺	2.0	**	**
32.	Magnesium	mg/L Mg ²⁺	2.7	**	**
33.	Residual Chloride ¹³	ppm	<0.01	0.01	DPD-1 Free Chlorine
34.	Silica	mg/L Si	3.8	0.01 mg/L SiO ₂	Colorimetric, Heteropoly
35.	Sulfate	mg/L SO ₄ ²⁻	<7	7 mg/L	Colorimetric
36.	Nitrate	mg/L NO ₃ ⁻	24.6	***	***
37.	Nitrate-Nitrogen	mg/L NO ₃ ⁻ -N	5.6	0.5 mg/L	Colorimetric
38.	Nitrite	mg/L NO ₂ ⁻	0.015	***	***
39.	Nitrite-Nitrogen	mg/L NO ₂ ⁻ -N	0.004	0.001 mg/L	Colorimetric
40.	Ammonia-Nitrogen	mg/L NH ₃ -N	<0.09	0.09 mg/L	Colorimetric, salicylate
41.	Chlorides	mg/L Cl ⁻	10.5	0.25 mg/L	Titrimetric, silver nitrate
42.	Total Dissolved Solids	mg/L 25°C	32.5	1.0 mg/L	Electrometric

*Alkalinity tests are done by titration with HCL as phenolphthalein and mixed indicator alkalinities (MDL 0.2 mg/L as CaCO₃) from which the corresponding OH, HCO₃, and CO₃ alkalinities are calculated.

**Calcium and magnesium are calculated from calcium and total hardness tests which are determined by titration with EDTA (MDL 0.2 mg/L as CaCO₃).

*** Nitrate and nitrite are determined colorimetrically, MDLs are 0.5 mg/L NO₃-N and 0.001 mg/L NO₂-N, respectively

All tests are performed in accordance to the "standard Methods for the Examination of Water and Wastewater", 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

¹³ Values for Residual Chloride parameter were obtained on July 3, 2009.

Phase B7 (Well 1)

Phase Number: II

Location of Sample: Well 1, Monrovia, Liberia

Date of Sampling: 29-01-2009

Date of Analysis: 30-01-2009

Date of Report Generation: 12-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	26	1CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	~>200	1CFU/100ml	Membrane filtration
3.	Arsenic	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
4.	Boron	mg/L	<0.05	0.05 mg/L	EPA200-7/8
5.	Barium	mg/L	0.007	0.002 mg/L	EPA200-7/8
6.	Cadmium	mg/L	0.00078	0.00025 mg/L	Graphite Furnace-AAS
7.	Chromium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
8.	Copper	mg/L	0.0085	0.001 mg/L	Graphite Furnace-AAS
9.	Cyanide	mg/L	<0.02	0.02 mg/L	Spectrophotometer HACH 8027
10.	Flouride	mg/L	<0.2	0.2 mg/L	Spectrophotometer HACH 8027
11.	Iron	mg/L	<0.25	0.25mg/L	Frame-AAS
12.	Lead	mg/L	0.0109	0.001 mg/L	Graphite Furnace-AAS
13.	Manganese	mg/L	0.0013	0.001 mg/L	Graphite Furnace-AAS
14.	Mercury	mg/L	<0.0005	0.0005 mg/L	EPA200-7/8
15.	Molybdenum	mg/L	<0.005	0.005 mg/L	Graphite Furnace-AAS
16.	Nickel	mg/L	<0.0025	0.0025 mg /L	Graphite Furnace-AAS
17.	Potassium	mg/L	3.5	0.05 mg/L	Flame emission photometry
18.	Sodium	mg/L	18	0.1 mg/L	Flame emission photometry
19.	Selenium	mg/L	0.0014	0.001 mg/L	Graphite Furnace-AAS
20.	Temperature	°C	27.9	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
21.	Turbidity	NTU	<0.2	0.2 NTU	Nephelometric
22.	Conductivity	uS/cm at 25°C	137	0.1 uS/cm	Electrometric
23.	Apparent color	Pt Co units	4	1 Pt Co units	Colorimetric, Pt-Co
24.	pH	pH Units 25°C	5.79	0.01	Electrometric
25.	Hydroxide	mg/L as CaCO ₃	0	*	*

	Alkalinity				
26.	Carbonate Alkalinity	mg/L as CaCO ₃	0	*	*
27.	Bicarbonate Alkalinity	mg/L as CaCO ₃	37.2	*	*
28.	Total Hardness	mg/L as CaCO ₃	58	1 mg/L CaCO ₃	Titrimetric, EDTA
29.	Calcium Hardness	mg/L as CaCO ₃	46	1 mg/L CaCO ₃	Titrimetric, EDTA
30.	Magnesium hardness	mg/L as CaCO ₃	12	1 mg/L CaCO ₃	Titrimetric, EDTA
31.	Calcium	mg/L Ca ²⁺	18.4	**	**
32.	Magnesium	mg/L Mg ²⁺	2.9	**	**
33.	Residual Chloride ¹⁴	ppm	<0.01	0.01	DPD-1 Free Chlorine
34.	Silica	mg/L Si	0.73	0.01 mg/L SiO ₂	Colorimetric, Heteropoly
35.	Sulfate	mg/L SO ₄ ²⁻	31	7 mg/L	Colorimetric
36.	Nitrate	mg/L NO ₃ ⁻	23.1	***	***
37.	Nitrate-Nitrogen	mg/L NO ₃ ⁻ -N	5.2	0.5 mg/L	Colorimetric
38.	Nitrite	mg/L NO ₂ ⁻	0.021	***	***
39.	Nitrite-Nitrogen	mg/L NO ₂ ⁻ -N	0.006	0.001 mg/L	Colorimetric
40.	Ammonia-Nitrogen	mg/L NH ₃ ⁻ -N	<0.09	0.09 mg/L	Colorimetric, salicylate
41.	Chlorides	mg/L Cl ⁻	17.1	0.25 mg/L	Titrimetric, silver nitrate
42.	Total Dissolved Solids	mg/L 25°C	68.3	1.0 mg/L	Electrometric

*Alkalinity tests are done by titration with HCL as phenolphthalein and mixed indicator alkalinities (MDL 0.2 mg/L as CaCO₃) from which the corresponding OH, HCO₃, and CO₃ alkalinities are calculated.

**Calcium and magnesium are calculated from calcium and total hardness tests which are determined by titration with EDTA (MDL 0.2 mg/L as CaCO₃).

*** Nitrate and nitrite are determined colorimetrically, MDLs are 0.5 mg/L NO₃-N and 0.001 mg/L NO₂-N, respectively

¹⁴ Values for Residual Chloride parameter were obtained on July 3, 2009.

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

Plate B8 (Well 2)

Phase Number: II

Location of Sample: Well 2, Monrovia, Liberia

Date of Sampling: 29-01-2009

Date of Analysis: 30-01-2009

Date of Report Generation: 12-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	85	1CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	~>200	1CFU/100ml	Membrane filtration
3.	Arsenic	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
4.	Boron	mg/L	<0.05	0.05 mg/L	EPA200-7/8
5.	Barium	mg/L	0.022	0.002 mg/L	EPA200-7/8
6.	Cadmium	mg/L	<0.00025	0.00025 mg/L	Graphite Furnace-AAS
7.	Chromium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
8.	Copper	mg/L	0.0068	0.001 mg/L	Graphite Furnace-AAS
9.	Cyanide	mg/L	<0.02	0.02 mg/L	Spectrophotometer HACH 8027
10.	Flouride	mg/L	<0.2	0.2 mg/L	Spectrophotometer HACH 8027
11.	Iron	mg/L	<0.25	0.25mg/L	Frame-AAS
12.	Lead	mg/L	0.0031	0.001 mg/L	Graphite Furnace-AAS
13.	Manganese	mg/L	0.0203	0.001 mg/L	Graphite Furnace-AAS
14.	Mercury	mg/L	<0.0005	0.0005 mg/L	EPA200-7/8
15.	Molybdenum	mg/L	<0.005	0.005 mg/L	Graphite Furnace-AAS
16.	Nickel	mg/L	<0.0025	0.0025 mg /L	Graphite Furnace-AAS
17.	Potassium	mg/L	4.5	0.05 mg/L	Flame emission photometry
18.	Sodium	mg/L	27	0.1 mg/L	Flame emission photometry
19.	Selenium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
20.	Temperature	°C	28.5	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
21.	Turbidity	NTU	7.5	0.2 NTU	Nephelometric
22.	Conductivity	uS/cm at 25°C	196	0.1 uS/cm	Electrometric
23.	Apparent color	Pt Co units	23	1 Pt Co units	Colorimetric, Pt-Co

24.	pH	pH Units 25°C	5.86	0.01	Electrometric
25.	Hydroxide Alkalinity	mg/L as CaCO ₃	0	*	*
26.	Carbonate Alkalinity	mg/L as CaCO ₃	0	*	*
27.	Bicarbonate Alkalinity	mg/L as CaCO ₃	63.6	*	*
28.	Total Hardness	mg/L as CaCO ₃	97	1 mg/L CaCO ₃	Titrimetric, EDTA
29.	Calcium Hardness	mg/L as CaCO ₃	59	1 mg/L CaCO ₃	Titrimetric, EDTA
30.	Magnesium hardness	mg/L as CaCO ₃	38	1 mg/L CaCO ₃	Titrimetric, EDTA
31.	Calcium	mg/L Ca ²⁺	23.6	**	**
32.	Magnesium	mg/L Mg ²⁺	9.2	**	**
33.	Residual Chloride ¹⁵	ppm	<0.01	0.01	DPD-1 Free Chlorine
34.	Silica	mg/L Si	4.44	0.01 mg/L SiO ₂	Colorimetric, Heteropoly
35.	Sulfate	mg/L SO ₄ ²⁻	32	7 mg/L	Colorimetric
36.	Nitrate	mg/L NO ₃ ⁻	6.7	***	***
37.	Nitrate-Nitrogen	mg/L NO ₃ ⁻ -N	1.5	0.5 mg/L	Colorimetric
38.	Nitrite	mg/L NO ₂ ⁻	0.023	***	***
39.	Nitrite-Nitrogen	mg/L NO ₂ ⁻ -N	0.007	0.001 mg/L	Colorimetric
40.	Ammonia-Nitrogen	mg/L NH ₃ ⁻ -N	<0.09	0.09 mg/L	Colorimetric, salicylate
41.	Chlorides	mg/L Cl ⁻	46.2	0.25 mg/L	Titrimetric, silver nitrate
42.	Total Dissolved Solids	mg/L 25°C	97.7	1.0 mg/L	Electrometric

*Alkalinity tests are done by titration with HCL as phenolphthalein and mixed indicator alkalinities (MDL 0.2 mg/L as CaCO₃) from which the corresponding OH, HCO₃, and CO₃ alkalinities are calculated.

**Calcium and magnesium are calculated from calcium and total hardness tests which are determined by titration with EDTA (MDL 0.2 mg/L as CaCO₃).

*** Nitrate and nitrite are determined colorimetrically, MDLs are 0.5 mg/L NO₃-N and 0.001 mg/L NO₂-N, respectively

¹⁵ Values for Residual Chloride parameter were obtained on July 3, 2009.

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

Plate B9 (Well 3)

Phase Number: II

Location of Sample: Well 3, Monrovia, Liberia

Date of Sampling: 29-01-2009

Date of Analysis: 30-01-2009

Date of Report Generation: 12-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	~200	1CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	>500	1CFU/100ml	Membrane filtration
3.	Arsenic	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
4.	Boron	mg/L	0.08	0.05 mg/L	EPA200-7/8
5.	Barium	mg/L	0.024	0.002 mg/L	EPA200-7/8
6.	Cadmium	mg/L	<0.00025	0.00025 mg/L	Graphite Furnace-AAS
7.	Chromium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
8.	Copper	mg/L	0.0018	0.001 mg/L	Graphite Furnace-AAS
9.	Cyanide	mg/L	<0.02	0.02 mg/L	Spectrophotometer HACH 8027
10.	Flouride	mg/L	<0.2	0.2 mg/L	Spectrophotometer HACH 8027
11.	Iron	mg/L	<0.25	0.25mg/L	Frame-AAS
12.	Lead	mg/L	0.0034	0.001 mg/L	Graphite Furnace-AAS
13.	Manganese	mg/L	0.0198	0.001 mg/L	Graphite Furnace-AAS
14.	Mercury	mg/L	<0.0005	0.0005 mg/L	EPA200-7/8
15.	Molybdenum	mg/L	<0.005	0.005 mg/L	Graphite Furnace-AAS
16.	Nickel	mg/L	<0.0025	0.0025 mg/L	Graphite Furnace-AAS
17.	Potassium	mg/L	8.1	0.05 mg/L	Flame emission photometry
18.	Sodium	mg/L	88	0.1 mg/L	Flame emission photometry
19.	Selenium	mg/L	0.0011	0.001 mg/L	Graphite Furnace-AAS
20.	Temperature	°C	28.5	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
21.	Turbidity	NTU	7.0	0.2 NTU	Nephelometric

22.	Conductivity	uS/cm at 25°C	960	0.1 uS/cm	Electrometric
23.	Apparent color	Pt Co units	23	1 Pt Co units	Colorimetric, Pt-Co
24.	pH	pH Units 25°C	6.18	0.01	Electrometric
25.	Hydroxide Alkalinity	mg/L as CaCO ₃	0	*	*
26.	Carbonate Alkalinity	mg/L as CaCO ₃	0	*	*
27.	Bicarbonate Alkalinity	mg/L as CaCO ₃	92.4	*	*
28.	Total Hardness	mg/L as CaCO ₃	190	1 mg/L CaCO ₃	Titrimetric, EDTA
29.	Calcium Hardness	mg/L as CaCO ₃	127	1 mg/L CaCO ₃	Titrimetric, EDTA
30.	Magnesium hardness	mg/L as CaCO ₃	63	1 mg/L CaCO ₃	Titrimetric, EDTA
31.	Calcium	mg/L Ca ²⁺	50.9	**	**
32.	Magnesium	mg/L Mg ²⁺	15.3	**	**
33.	Residual Chloride ¹⁶	ppm	<0.01	0.01	DPD-1 Free Chlorine
34.	Silica	mg/L Si	3.52	0.01 mg/L SiO ₂	Colorimetric, Heteropoly
35.	Sulfate	mg/L SO ₄ ²⁻	64	7 mg/L	Colorimetric
36.	Nitrate	mg/L NO ₃ ⁻	14.8	***	***
37.	Nitrate-Nitrogen	mg/L NO ₃ ⁻ -N	3.3	0.5 mg/L	Colorimetric
38.	Nitrite	mg/L NO ₂ ⁻	0.026	***	***
39.	Nitrite-Nitrogen	mg/L NO ₂ ⁻ -N	0.008	0.001 mg/L	Colorimetric
40.	Ammonia-Nitrogen	mg/L NH ₃ ⁻ -N	<0.09	0.09 mg/L	Colorimetric, salicylate
41.	Chlorides	mg/L Cl ⁻	328.5	0.25 mg/L	Titrimetric, silver nitrate
42.	Total Dissolved Solids	mg/L 25°C	481	1.0 mg/L	Electrometric

*Alkalinity tests are done by titration with HCL as phenolphthalein and mixed indicator alkalinities (MDL 0.2 mg/L as CaCO₃) from which the corresponding OH, HCO₃, and CO₃ alkalinities are calculated.

**Calcium and magnesium are calculated from calcium and total hardness tests which are determined by titration with EDTA (MDL 0.2 mg/L as CaCO₃).

*** Nitrate and nitrite are determined colorimetrically, MDLs are 0.5 mg/L NO₃-N and 0.001 mg/L NO₂-N, respectively.

¹⁶ Values for Residual Chloride parameter were obtained on July 3, 2009.

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

Plate B10 (Well 4)

Phase Number: II

Location of Sample: Well 4, Monrovia, Liberia

Date of Sampling: 29-01-2009

Date of Analysis: 30-01-2009

Date of Report Generation: 12-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	0	1CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	2	1CFU/100ml	Membrane filtration
3.	Arsenic	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
4.	Boron	mg/L	<0.05	0.05 mg/L	EPA200-7/8
5.	Barium	mg/L	0.016	0.002 mg/L	EPA200-7/8
6.	Cadmium	mg/L	0.00051	0.00025 mg/L	Graphite Furnace-AAS
7.	Chromium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
8.	Copper	mg/L	0.0074	0.001 mg/L	Graphite Furnace-AAS
9.	Cyanide	mg/L	<0.02	0.02 mg/L	Spectrophotometer HACH 8027
10.	Flouride	mg/L	<0.2	0.2 mg/L	Spectrophotometer HACH 8027
11.	Iron	mg/L	<0.25	0.25mg/L	Frame-AAS
12.	Lead	mg/L	0.0043	0.001 mg/L	Graphite Furnace-AAS
13.	Manganese	mg/L	0.0041	0.001 mg/L	Graphite Furnace-AAS
14.	Mercury	Mg/L	<0.0005	0.0005 mg/L	EPA200-7/8
15.	Molybdenum	mg/L	<0.005	0.005 mg/L	Graphite Furnace-AAS
16.	Nickel	mg/L	<0.0025	0.0025 mg /L	Graphite Furnace-AAS
17.	Potassium	mg/L	1.1	0.05 mg/L	Flame emission photometry
18.	Sodium	mg/L	7	0.1 mg/L	Flame emission photometry
19.	Selenium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
20.	Temperature	°C	28.0	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
21.	Turbidity	NTU	<0.2	0.2 NTU	Nephelometric

22.	Conductivity	uS/cm at 25°C	42.9	0.1 uS/cm	Electrometric
23.	Apparent color	Pt Co units	7	1 Pt Co units	Colorimetric, Pt-Co
24.	pH	pH Units 25°C	5.07	0.01	Electrometric
25.	Hydroxide Alkalinity	mg/L as CaCO ₃	0	*	*
26.	Carbonate Alkalinity	mg/L as CaCO ₃	0	*	*
27.	Bicarbonate Alkalinity	mg/L as CaCO ₃	17.6	*	*
28.	Total Hardness	mg/L as CaCO ₃	18	1 mg/L CaCO ₃	Titrimetric, EDTA
29.	Calcium Hardness	mg/L as CaCO ₃	15	1 mg/L CaCO ₃	Titrimetric, EDTA
30.	Magnesium hardness	mg/L as CaCO ₃	3	1 mg/L CaCO ₃	Titrimetric, EDTA
31.	Calcium	mg/L Ca ²⁺	6.0	**	**
32.	Magnesium	mg/L Mg ²⁺	0.73	**	**
33.	Residual Chloride ¹⁷	ppm	<0.01	0.01	DPD-1 Free Chlorine
34.	Silica	mg/L Si	2.3	0.01 mg/L SiO ₂	Colorimetric, Heteropoly
35.	Sulfate	mg/L SO ₄ ²⁻	<7	7 mg/L	Colorimetric
36.	Nitrate	mg/L NO ₃ ⁻	8.8	***	***
37.	Nitrate-Nitrogen	mg/L NO ₃ ⁻ -N	2.0	0.5 mg/L	Colorimetric
38.	Nitrite	mg/L NO ₂ ⁻	0.016	***	***
39.	Nitrite-Nitrogen	mg/L NO ₂ ⁻ -N	0.005	0.001 mg/L	Colorimetric
40.	Ammonia-Nitrogen	mg/L NH ₃ ⁻ -N	<0.09	0.09 mg/L	Colorimetric, salicylate
41.	Chlorides	mg/L Cl ⁻	9.15	0.25 mg/L	Titrimetric, silver nitrate
42.	Total Dissolved Solids	mg/L 25°C	21.1	1.0 mg/L	Electrometric

*Alkalinity tests are done by titration with HCL as phenolphthalein and mixed indicator alkalinities (MDL 0.2 mg/L as CaCO₃) from which the corresponding OH, HCO₃, and CO₃ alkalinities are calculated.

**Calcium and magnesium are calculated from calcium and total hardness tests which are determined by titration with EDTA (MDL 0.2 mg/L as CaCO₃).

*** Nitrate and nitrite are determined colorimetrically, MDLs are 0.5 mg/L NO₃-N and 0.001 mg/L NO₂-N, respectively

¹⁷ Values for Residual Chloride parameter were obtained on July 3, 2009.

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

Plate B11 (Well 5)

Phase Number: II

Location of Sample: Well 5, Monrovia, Liberia

Date of Sampling: 29-01-2009

Date of Analysis: 30-01-2009

Date of Report Generation: 12-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	13	1CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	25	1CFU/100ml	Membrane filtration
3.	Arsenic	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
4.	Boron	mg/L	<0.05	0.05 mg/L	EPA200-7/8
5.	Barium	mg/L	0.046	0.002 mg/L	EPA200-7/8
6.	Cadmium	mg/L	0.00039	0.00025 mg/L	Graphite Furnace-AAS
7.	Chromium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
8.	Copper	mg/L	0.0018	0.001 mg/L	Graphite Furnace-AAS
9.	Cyanide	mg/L	<0.02	0.02 mg/L	Spectrophotometer HACH 8027
10.	Fluoride	mg/L	<0.2	0.2 mg/L	Spectrophotometer HACH 8027
11.	Iron	mg/L	<0.25	0.25mg/L	Frame-AAS
12.	Lead	mg/L	0.004	0.001 mg/L	Graphite Furnace-AAS
13.	Manganese	mg/L	0.0072	0.001 mg/L	Graphite Furnace-AAS
14.	Mercury	mg/L	<0.0005	0.0005 mg/L	EPA200-7/8
15.	Molybdenum	mg/L	<0.005	0.005 mg/L	Graphite Furnace-AAS
16.	Nickel	mg/L	<0.0025	0.0025 mg /L	Graphite Furnace-AAS
17.	Potassium	mg/L	1.2	0.05 mg/L	Flame emission photometry
18.	Sodium	mg/L	10	0.1 mg/L	Flame emission photometry
19.	Selenium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
20.	Temperature	°C	28.2	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
21.	Turbidity	NTU	<0.2	0.2 NTU	Nephelometric
22.	Conductivity	uS/cm at 25°C	64.3	0.1 uS/cm	Electrometric
23.	Apparent color	Pt Co units	14	1 Pt Co units	Colorimetric, Pt-Co
24.	pH	pH Units 25°C	5.59	0.01	Electrometric

25.	Hydroxide Alkalinity	mg/L as CaCO ₃	0	*	*
26.	Carbonate Alkalinity	mg/L as CaCO ₃	0	*	*
27.	Bicarbonate Alkalinity	mg/L as CaCO ₃	25.4	*	*
28.	Total Hardness	mg/L as CaCO ₃	25	1 mg/L CaCO ₃	Titrimetric, EDTA
29.	Calcium Hardness	mg/L as CaCO ₃	21	1 mg/L CaCO ₃	Titrimetric, EDTA
30.	Magnesium hardness	mg/L as CaCO ₃	4	1 mg/L CaCO ₃	Titrimetric, EDTA
31.	Calcium	mg/L Ca ²⁺	8.4	**	**
32.	Magnesium	mg/L Mg ²⁺	0.97	**	**
33.	Residual Chloride ¹⁸	ppm	<0.01	0.01	DPD-1 Free Chlorine
34.	Silica	mg/L Si	4.60	0.01 mg/L SiO ₂	Colorimetric, Heteropoly
35.	Sulfate	mg/L SO ₄ ²⁻	<7	7 mg/L	Colorimetric
36.	Nitrate	mg/L NO ₃ ⁻	12.9	***	***
37.	Nitrate-Nitrogen	mg/L NO ₃ ⁻ -N	2.9	0.5 mg/L	Colorimetric
38.	Nitrite	mg/L NO ₂ ⁻	0.031	***	***
39.	Nitrite-Nitrogen	mg/L NO ₂ ⁻ -N	0.009	0.001 mg/L	Colorimetric
40.	Ammonia-Nitrogen	mg/L NH ₃ ⁻ -N	<0.09	0.09 mg/L	Colorimetric, salicylate
41.	Chlorides	mg/L Cl ⁻	13.8	0.25 mg/L	Titrimetric, silver nitrate
42.	Total Dissolved Solids	mg/L 25°C	32.3	1.0 mg/L	Electrometric

*Alkalinity tests are done by titration with HCL as phenolphthalein and mixed indicator alkalinities (MDL 0.2 mg/L as CaCO₃) from which the corresponding OH, HCO₃, and CO₃ alkalinities are calculated.

**Calcium and magnesium are calculated from calcium and total hardness tests which are determined by titration with EDTA (MDL 0.2 mg/L as CaCO₃).

*** Nitrate and nitrite are determined colorimetrically, MDLs are 0.5 mg/L NO₃-N and 0.001 mg/L NO₂-N, respectively

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

¹⁸ Values for Residual Chloride parameter were obtained on July 3, 2009.

Plate B12 (Well 9)

Phase Number: II

Location of Sample: Well 9, Monrovia, Liberia

Date of Sampling: 29-01-2009

Date of Analysis: 30-01-2009

Date of Report Generation: 12-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	~>500	1CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	~>500	1CFU/100ml	Membrane filtration
3.	Arsenic	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
4.	Boron	mg/L	<0.05	0.05 mg/L	EPA200-7/8
5.	Barium	mg/L	0.012	0.002 mg/L	EPA200-7/8
6.	Cadmium	mg/L	0.00031	0.00025 mg/L	Graphite Furnace-AAS
7.	Chromium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
8.	Copper	mg/L	0.0032	0.001 mg/L	Graphite Furnace-AAS
9.	Cyanide	mg/L	<0.02	0.02 mg/L	Spectrophotometer HACH 8027
10.	Flouride	mg/L	<0.2	0.2 mg/L	Spectrophotometer HACH 8027
11.	Iron	mg/L	0.31	0.25mg/L	Frame-AAS
12.	Lead	mg/L	0.0027	0.001 mg/L	Graphite Furnace-AAS
13.	Manganese	mg/L	0.0137	0.001 mg/L	Graphite Furnace-AAS
14.	Mercury	mg/L	<0.0005	0.0005 mg/L	EPA200-7/8
15.	Molybdenum	mg/L	<0.005	0.005 mg/L	Graphite Furnace-AAS
16.	Nickel	mg/L	<0.0025	0.0025 mg /L	Graphite Furnace-AAS
17.	Potassium	mg/L	0.5	0.05 mg/L	Flame emission photometry
18.	Sodium	mg/L	2	0.1 mg/L	Flame emission photometry
19.	Selenium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
20.	Temperature	°C	27.4	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
21.	Turbidity	NTU	10.3	0.2 NTU	Nephelometric
22.	Conductivity	uS/cm at 25°C	20.4	0.1 uS/cm	Electrometric
23.	Apparent color	Pt Co units	31	1 Pt Co units	Colorimetric, Pt-Co
24.	pH	pH Units 25°C	5.36	0.01	Electrometric
25.	Hydroxide Alkalinity	mg/L as CaCO ₃	0	*	*

26.	Carbonate Alkalinity	mg/L as CaCO ₃	0	*	*
27.	Bicarbonate Alkalinity	mg/L as CaCO ₃	13.8	*	*
28.	Total Hardness	mg/L as CaCO ₃	1	1 mg/L CaCO ₃	Titrimetric, EDTA
29.	Calcium Hardness	mg/L as CaCO ₃	<1	1 mg/L CaCO ₃	Titrimetric, EDTA
30.	Magnesium hardness	mg/L as CaCO ₃	≤1	1 mg/L CaCO ₃	Titrimetric, EDTA
31.	Calcium	mg/L Ca ²⁺	<0.4	**	**
32.	Magnesium	mg/L Mg ²⁺	≤0.24	**	**
33.	Residual Chloride ¹⁹	ppm	<0.01	0.01	DPD-1 Free Chlorine
34.	Silica	mg/L Si	2.12	0.01 mg/L SiO ₂	Colorimetric, Heteropoly
35.	Sulfate	mg/L SO ₄ ²⁻	<7	7 mg/L	Colorimetric
36.	Nitrate	mg/L NO ₃ ⁻	5.0	***	***
37.	Nitrate-Nitrogen	mg/L NO ₃ ⁻ -N	1.1	0.5 mg/L	Colorimetric
38.	Nitrite	mg/L NO ₂ ⁻	0.009	***	***
39.	Nitrite-Nitrogen	mg/L NO ₂ ⁻ -N	0.003	0.001 mg/L	Colorimetric
40.	Ammonia-Nitrogen	mg/L NH ₃ ⁻ -N	1.75	0.09 mg/L	Colorimetric, salicylate
41.	Chlorides	mg/L Cl ⁻	5.3	0.25 mg/L	Titrimetric, silver nitrate
42.	Total Dissolved Solids	mg/L 25°C	10.1	1.0 mg/L	Electrometric

*Alkalinity tests are done by titration with HCL as phenolphthalein and mixed indicator alkalinities (MDL 0.2 mg/L as CaCO₃) from which the corresponding OH, HCO₃, and CO₃ alkalinities are calculated.

**Calcium and magnesium are calculated from calcium and total hardness tests which are determined by titration with EDTA (MDL 0.2 mg/L as CaCO₃).

*** Nitrate and nitrite are determined colorimetrically, MDLs are 0.5 mg/L NO₃-N and 0.001 mg/L NO₂-N, respectively

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

¹⁹ Values for Residual Chloride parameter were obtained on July 3, 2009.

Plate B13 (Well 10)

Phase Number: II

Location of Sample: Well 10, Monrovia, Liberia

Date of Sampling: 29-01-2009

Date of Analysis: 30-01-2009

Date of Report Generation: 12-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	1	1CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	10	1CFU/100ml	Membrane filtration
3.	Arsenic	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
4.	Boron	mg/L	<0.05	0.05 mg/L	EPA200-7/8
5.	Barium	mg/L	0.081	0.002 mg/L	EPA200-7/8
6.	Cadmium	mg/L	0.00039	0.00025 mg/L	Graphite Furnace-AAS
7.	Chromium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
8.	Copper	mg/L	0.0011	0.001 mg/L	Graphite Furnace-AAS
9.	Cyanide	mg/L	<0.02	0.02 mg/L	Spectrophotometer HACH 8027
10.	Flouride	mg/L	<0.2	0.2 mg/L	Spectrophotometer HACH 8027
11.	Iron	mg/L	<0.25	0.25mg/L	Frame-AAS
12.	Lead	mg/L	0.0065	0.001 mg/L	Graphite Furnace-AAS
13.	Manganese	mg/L	0.0136	0.001 mg/L	Graphite Furnace-AAS
14.	Mercury	mg/L	<0.0005	0.0005 mg/L	EPA200-7/8
15.	Molybdenum	mg/L	<0.005	0.005 mg/L	Graphite Furnace-AAS
16.	Nickel	mg/L	<0.0025	0.0025 mg /L	Graphite Furnace-AAS
17.	Potassium	mg/L	6.0	0.05 mg/L	Flame emission photometry
18.	Sodium	mg/L	22.5	0.1 mg/L	Flame emission photometry
19.	Selenium	mg/L	0.0014	0.001 mg/L	Graphite Furnace-AAS
20.	Temperature	°C	29.6	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
21.	Turbidity	NTU	<0.2	0.2 NTU	Nephelometric
22.	Conductivity	uS/cm at 25°C	125.5	0.1 uS/cm	Electrometric
23.	Apparent color	Pt Co units	3	1 Pt Co units	Colorimetric, Pt-Co
24.	pH	pH Units 25°C	5.27	0.01	Electrometric
25.	Hydroxide Alkalinity	mg/L as CaCO ₃	0	*	*

26.	Carbonate Alkalinity	mg/L as CaCO ₃	0	*	*
27.	Bicarbonate Alkalinity	mg/L as CaCO ₃	18.4	*	*
28.	Total Hardness	mg/L as CaCO ₃	41	1 mg/L CaCO ₃	Titrimetric, EDTA
29.	Calcium Hardness	mg/L as CaCO ₃	32	1 mg/L CaCO ₃	Titrimetric, EDTA
30.	Magnesium hardness	mg/L as CaCO ₃	9	1 mg/L CaCO ₃	Titrimetric, EDTA
31.	Calcium	mg/L Ca ²⁺	12.8	**	**
32.	Magnesium	mg/L Mg ²⁺	2.2	**	**
33.	Residual Chloride ²⁰	ppm	0.07	0.01	DPD-1 Free Chlorine
34.	Silica	mg/L Si	2.94	0.01 mg/L SiO ₂	Colorimetric, Heteropoly
35.	Sulfate	mg/L SO ₄ ²⁻	17	7 mg/L	Colorimetric
36.	Nitrate	mg/L NO ₃ ⁻	35.2	***	***
37.	Nitrate-Nitrogen	mg/L NO ₃ ⁻ -N	7.9	0.5 mg/L	Colorimetric
38.	Nitrite	mg/L NO ₂ ⁻	0.025	***	***
39.	Nitrite-Nitrogen	mg/L NO ₂ ⁻ -N	0.008	0.001 mg/L	Colorimetric
40.	Ammonia-Nitrogen	mg/L NH ₃ ⁻ -N	<0.09	0.09 mg/L	Colorimetric, salicylate
41.	Chlorides	mg/L Cl ⁻	19.2	0.25 mg/L	Titrimetric, silver nitrate
42.	Total Dissolved Solids	mg/L 25°C	62.8	1.0 mg/L	Electrometric

*Alkalinity tests are done by titration with HCL as phenolphthalein and mixed indicator alkalinities (MDL 0.2 mg/L as CaCO₃) from which the corresponding OH, HCO₃, and CO₃ alkalinities are calculated.

**Calcium and magnesium are calculated from calcium and total hardness tests which are determined by titration with EDTA (MDL 0.2 mg/L as CaCO₃).

*** Nitrate and nitrite are determined colorimetrically, MDLs are 0.5 mg/L NO₃-N and 0.001 mg/L NO₂-N, respectively

All tests are performed in accordance to the "standard Methods for the Examination of Water and Wastewater", 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

²⁰ Values for Residual Chloride parameter were obtained on July 3, 2009.

Plate B14 (24th Street)

Phase Number: III

Location of Sample: 24th Street, Monrovia, Liberia

Date of Sampling: 12-02-2009

Date of Analysis: 13-02-2009

Date of Report Generation: 18-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	0	1 CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	46	1 CFU/100ml	Membrane filtration
3.	Temperature	°C	31.7	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
4.	Turbidity	NTU	<0.2	0.2 NTU	Nephelometric
5.	Conductivity	uS/cm at 25°C	46.2	0.1 uS/cm	Electrometric
6.	pH	pH Units 25°C	6.37	0.01	Electrometric
7.	Residual Chloride ²¹	ppm	<0.01	0.01	DPD-1 Free Chlorine

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

²¹ Values for Residual Chloride parameter were obtained on July 3, 2009.

Plate B15 (Clara Town)

Phase Number: III

Location of Sample: Clara Town, Monrovia, Liberia

Date of Sampling: 12-02-2009

Date of Analysis: 13-02-2009

Date of Report Generation: 18-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	1	1 CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	6	1 CFU/100ml	Membrane filtration
3.	Temperature	°C	32.3	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
4.	Turbidity	NTU	<0.2	0.2 NTU	Nephelometric
5.	Conductivity	uS/cm at 25°C	46.8	0.1 uS/cm	Electrometric
6.	pH	pH Units 25°C	6.71	0.01	Electrometric
7.	Residual Chloride ²²	ppm	<0.01	0.01	DPD-1 Free Chlorine

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

²² Values for Residual Chloride parameter were obtained on July 3, 2009.

Plate B16 (Mamba Point)

Phase Number: III

Location of Sample: Mamba Point, Monrovia, Liberia

Date of Sampling: 12-02-2009

Date of Analysis: 13-02-2009

Date of Report Generation: 18-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	8	1 CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	20	1 CFU/100ml	Membrane filtration
3.	Temperature	°C	31.6	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
4.	Turbidity	NTU	21.0	0.2 NTU	Nephelometric
5.	Conductivity	uS/cm at 25°C	47.0	0.1 uS/cm	Electrometric
6.	pH	pH Units 25°C	6.69	0.01	Electrometric
7.	Residual Chloride ²³	ppm	*	0.01	DPD-1 Free Chlorine

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

*The pump at this location has been out of order for the past 3 months, since the construction of cape hotel fence began, says community sources (car washer).

²³ Values for Residual Chloride parameter were obtained on July 3, 2009.

Plate B17 (New Kru Town)

Phase Number: III

Location of Sample: New Kru Town, Monrovia, Liberia

Date of Sampling: 12-02-2009

Date of Analysis: 13-02-2009

Date of Report Generation: 18-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	3	1 CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	32	1 CFU/100ml	Membrane filtration
3.	Temperature	°C	31.2	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
4.	Turbidity	NTU	<0.2	0.2 NTU	Nephelometric
5.	Conductivity	uS/cm at 25°C	41.9	0.1 uS/cm	Electrometric
6.	pH	pH Units 25°C	6.65	0.01	Electrometric
7.	Residual Chloride ²⁴	ppm	0.02	0.01	DPD-1 Free Chlorine

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

²⁴ Values for Residual Chloride parameter were obtained on July 3, 2009.

Plate B18 (SKD Community)

Phase Number: III

Location of Sample: SKD Community, Monrovia, Liberia

Date of Sampling: 12-02-2009

Date of Analysis: 13-02-2009

Date of Report Generation: 18-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	0	1 CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	~>1000	1 CFU/100ml	Membrane filtration
3.	Temperature	°C	30.4	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
4.	Turbidity	NTU	53	0.2 NTU	Nephelometric
5.	Conductivity	uS/cm at 25°C	46.5	0.1 uS/cm	Electrometric
6.	pH	pH Units 25°C	6.29	0.01	Electrometric
7.	Residual Chloride ²⁵	ppm	0.29	0.01	DPD-1 Free Chlorine

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

²⁵ Values for Residual Chloride parameter were obtained on July 3, 2009.

Plate B19 (St. Paul Bridge)

Phase Number: III

Location of Sample: St. Paul Bridge, Monrovia, Liberia

Date of Sampling: 12-02-2009

Date of Analysis: 13-02-2009

Date of Report Generation: 18-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	0	1 CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	0	1 CFU/100ml	Membrane filtration
3.	Temperature	°C	33.4	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
4.	Turbidity	NTU	<0.20	0.2 NTU	Nephelometric
5.	Conductivity	uS/cm at 25°C	45.6	0.1 uS/cm	Electrometric
6.	pH	pH Units 25°C	6.69	0.01	Electrometric
7.	Residual Chloride ²⁶	ppm	0.04	0.01	DPD-1 Free Chlorine

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

²⁶ Values for Residual Chloride parameter were obtained on July 3, 2009.

Plate B20 (BTC Drain)

Phase Number: III

Location of Sample: BTC Drain, Monrovia, Liberia

Date of Sampling: 12-02-2009

Date of Analysis: 13-02-2009

Date of Report Generation: 18-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/ml	~>1000	1 CFU/ml	Membrane filtration
2.	Total Coliform	CFU/ml	~>1000	1 CFU/ml	Membrane filtration
3.	Temperature	°C	31.4	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
4.	Conductivity	uS/cm at 25°C	6750	0.1 uS/cm	Electrometric
5.	pH	pH Units 25°C	6.87	0.01	Electrometric
6.	Total Nitrogen	mg/L N	129	0.5 mg/L	Colorimetric, cadmium reduction
7.	Total Phosphorus	Mg/L P	21.5	0.04 mg/L	Persulfate digestion/Colorimetric
8.	DO	mg/L	0.43	0.01 mg/L	Polarographic
9.	Biochemical Oxygen Demand (BOD ₅)	mg/L	343	2 mg/L	Membrane electrode
10.	Chemical Oxygen Demand (COD _{cr})	mg/L	938	2 mg/L	Colorimetric
11.	Total Suspended Solids	mg/L	220	1.0 mg/L	Gravimetric

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

Plate B21 (BTC Sewer Channel)

Phase Number: III

Location of Sample: BTC Sewer Channel, Monrovia, Liberia

Date of Sampling: 12-02-2009

Date of Analysis: 13-02-2009

Date of Report Generation: 18-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/ml	~>1,000	1 CFU/ml	Membrane filtration
2.	Total Coliform	CFU/ml	~>1,000	1 CFU/ml	Membrane filtration
3.	Temperature	°C	31.7	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
4.	Conductivity	uS/cm at 25°C	3760	0.1 uS/cm	Electrometric
5.	pH	pH Units 25°C	6.89	0.01	Electrometric
6.	Total Nitrogen	mg/L N	128	0.5 mg/L	Colorimetric, cadmium reduction
7.	Total Phosphorus	Mg/L P	22	0.04 mg/L	Persulfate digestion/Colorimetric
8.	DO	mg/L	0.48	0.01 mg/L	Polarographic
9.	Biochemical Oxygen Demand (BOD ₅)	mg/ L	357	2 mg/L	Membrane electrode
10.	Chemical Oxygen Demand (COD _{-cr})	mg/L	987	2 mg/L	Colorimetric
11.	Total Suspended Solids	mg/L	265	1.0 mg/L	Gravimetric

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

Plate B22 (Fiamah SWTP Intake)

Phase Number: III

Location of Sample: Fiamah SWTP intake, Monrovia, Liberia

Date of Sampling: 12-02-2009

Date of Analysis: 13-02-2009

Date of Report Generation: 18-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/ml	~>1,000	1 CFU/ml	Membrane filtration
2.	Total Coliform	CFU/ml	~>1,000	1 CFU/ml	Membrane filtration
3.	Temperature	°C	30.4	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
4.	Conductivity	uS/cm at 25°C	2610	0.1 uS/cm	Electrometric
5.	pH	pH Units 25°C	6.49	0.01	Electrometric
6.	Total Nitrogen	mg/L N	35	0.5 mg/L	Colorimetric, cadmium reduction
7.	Total Phosphorus	mg/L P	5.3	0.04 mg/L	Persulfate digestion/Colorimetric
8.	DO	mg/L	0.43	0.01 mg/L	Polarographic
9.	Biochemical Oxygen Demand (BOD ₅)	mg/	30	2 mg/L	Membrane electrode
10.	Chemical Oxygen Demand (COD _{-cr})	mg/L	121	2 mg/L	Colorimetric
11.	Total Suspended Solids	mg/L	13	1.0 mg/L	Gravimetric

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

Plate B23 (Musurado Drain)

Phase Number: III

Location of Sample: Musurado Drain, Monrovia, Liberia

Date of Sampling: 12-02-2009

Date of Analysis: 13-02-2009

Date of Report Generation: 18-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/ml	~>1,000	1 CFU/ml	Membrane filtration
2.	Total Coliform	CFU/ml	~>1,000	1 CFU/ml	Membrane filtration
3.	Temperature	°C	30.9	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
4.	Conductivity	uS/cm at 25°C	4490	0.1 uS/cm	Electrometric
5.	pH	pH Units 25°C	6.89	0.01	Electrometric
6.	Total Nitrogen	mg/L N	194	0.5 mg/L	Colorimetric, cadmium reduction
7.	Total Phosphorus	mg/L P	31	0.04 mg/L	Persulfate digestion/Colorimetric
8.	DO	mg/L	1.33	0.01 mg/L	Polarographic
9.	Biochemical Oxygen Demand (BOD ₅)	mg/ L	510	2 mg/L	Membrane electrode
10.	Chemical Oxygen Demand (COD _{-cr})	mg/L	1304	2 mg/L	Colorimetric
11.	Total Suspended Solids	mg/L	620	1.0 mg/L	Gravimetric

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

Plate B24 (Musurado River)

Phase Number: III

Location of Sample: Musurado River, Monrovia, Liberia

Date of Sampling: 12-02-2009

Date of Analysis: 13-02-2009

Date of Report Generation: 18-02-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/ml	184	1 CFU/ml	Membrane filtration
2.	Total Coliform	CFU/ml	~>500	1 CFU/ml	Membrane filtration
3.	Temperature	°C	29.9	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
4.	Conductivity	uS/cm at 25°C	48300	0.1 uS/cm	Electrometric
5.	pH	pH Units 25°C	7.52	0.01	Electrometric
6.	Total Nitrogen	mg/L N	12	0.5 mg/L	Colorimetric, cadmium reduction
7.	Total Phosphorus	mg/L P	0.11	0.04 mg/L	Persulfate digestion/Colorimetric
8.	DO	mg/L	1.46	0.01 mg/L	Polarographic
9.	Biochemical Oxygen Demand (BOD ₅)	mg/ L	*	2 mg/L	Membrane electrode
10.	Chemical Oxygen Demand (COD _{cr})	mg/L	545	2 mg/L	Colorimetric
11.	Total Suspended Solids	mg/L	85.3	1.0 mg/L	Gravimetric

*BOD₅ could not be analyzed accurately because of the high salinity of the sample.

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

Plate B25 (Congo Town)

Phase Number: IV

Location of Sample: Congo Town, Monrovia, Liberia

Date of Sampling: 05-03-2009

Date of Analysis: 06-03-2009

Date of Report Generation: 13-03-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	0	1 CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	20	1 CFU/100ml	Membrane filtration
3.	Temperature	°C	31.4	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
4.	Turbidity	NTU	2.12	0.2 NTU	Nephelometric
5.	Conductivity	uS/cm at 25°C	41.3	0.1 uS/cm	Electrometric
6.	pH	pH Units 25°C	6.38	0.01	Electrometric
7.	Total Dissolved Solids	mg/L 25°C	20.7	1.0 mg/L	Electrometric
8.	Residual Chloride ²⁷	ppm	<0.01	0.01	DPD-1 Free Chlorine

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

²⁷ Values for Residual Chloride parameter were obtained on July 3, 2009.

Plate B26 (Old Street)

Phase Number: IV

Location of Sample: Old Street, Monrovia, Liberia

Date of Sampling: 05-03-2009

Date of Analysis: 06-03-2009

Date of Report Generation: 13-03-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	0	1 CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	0	1 CFU/100ml	Membrane filtration
3.	Temperature	°C	32.2	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
4.	Turbidity	NTU	0.95	0.2 NTU	Nephelometric
5.	Conductivity	uS/cm at 25°C	44.6	0.1 uS/cm	Electrometric
6.	pH	pH Units 25°C	6.65	0.01	Electrometric
7.	Total Dissolved Solids	mg/L 25°C	22.3	1.0 mg/L	Electrometric
8.	Residual Chloride ²⁸	ppm	<0.01	0.01	DPD-1 Free Chlorine

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

²⁸ Values for Residual Chloride parameter were obtained on July 3, 2009.

Plate B27 (Pipeline Load)

Phase Number: IV

Location of Sample: Pipeline Load, Monrovia, Liberia

Date of Sampling: 05-03-2009

Date of Analysis: 06-03-2009

Date of Report Generation: 13-03-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	0	1 CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	440	1 CFU/100ml	Membrane filtration
3.	Temperature	°C	31	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
4.	Turbidity	NTU	1.09	0.2 NTU	Nephelometric
5.	Conductivity	uS/cm at 25°C	44.2	0.1 uS/cm	Electrometric
6.	pH	pH Units 25°C	6.73	0.01	Electrometric
7.	Total Dissolved Solids	mg/L 25°C	22.3	1.0 mg/L	Electrometric
8.	Residual Chloride ²⁹	ppm	0.04	0.01	DPD-1 Free Chlorine

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

²⁹ Values for Residual Chloride parameter were obtained on July 3, 2009.

Plate B28 (Police Academy)

Phase Number: IV

Location of Sample: Police Academy, Monrovia, Liberia

Date of Sampling: 05-03-2009

Date of Analysis: 06-03-2009

Date of Report Generation: 13-03-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	0	1 CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	0	1 CFU/100ml	Membrane filtration
3.	Temperature	°C	32.6	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
4.	Turbidity	NTU	0.87	0.2 NTU	Nephelometric
5.	Conductivity	uS/cm at 25°C	40.7	0.1 uS/cm	Electrometric
6.	pH	pH Units 25°C	6.33	0.01	Electrometric
7.	Total Dissolved Solids	mg/L 25°C	20.2	1.0 mg/L	Electrometric
8.	Residual Chloride ³⁰	ppm	<0.01	0.01	DPD-1 Free Chlorine

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

³⁰ Values for Residual Chloride parameter were obtained on July 3, 2009.

Plate B29-A (Well J1)

Phase Number: V

Location of Sample: Borehole 1 (Well J1), Monrovia, Liberia

Date of Sampling: 12-04-2009

Date of Analysis: 16-04-2009

Date of Report Generation: 24-04-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	0	1CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	500	1CFU/100ml	Membrane filtration
3.	Arsenic	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
4.	Boron	mg/L	<0.1	0.1 mg/L	EPA200-7/8
5.	Barium	mg/L	0.25	0.002 mg/L	EPA200-7/8
6.	Cadmium	mg/L	0.00092	0.00025 mg/L	Graphite Furnace-AAS
7.	Chromium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
8.	Copper	mg/L	0.0098	0.001 mg/L	Graphite Furnace-AAS
9.	Cyanide	mg/L	<0.02	0.02 mg/L	Spectrophotometer HACH 8027
10.	Flouride	mg/L	<0.2	0.2 mg/L	Spectrophotometer HACH 8027
11.	Iron	mg/L	<0.25	0.25mg/L	Frame-AAS
12.	Lead	mg/L	0.0144	0.001 mg/L	Graphite Furnace-AAS
13.	Manganese	mg/L	0.39	0.001 mg/L	Graphite Furnace-AAS
14.	Mercury	mg/L	<0.0005	0.0005 mg/L	EPA200-7/8
15.	Molybdenum	mg/L	<0.005	0.005 mg/L	Graphite Furnace-AAS
16.	Nickel	mg/L	<0.0025	0.0025 mg/L	Graphite Furnace-AAS
17.	Potassium	mg/L	5.8	0.05 mg/L	Flame emission photometry
18.	Sodium	mg/L	32.5	0.1 mg/L	Flame emission photometry
19.	Selenium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
20.	Temperature	°C	+		
21.	Turbidity	NTU	0.61	0.2 NTU	Nephelometric
22.	Conductivity	uS/cm at 25°C	338	0.1 uS/cm	Electrometric
23.	Apparent color	Pt Co units	<1	1 PtCo units	Colorimetric, Pt-Co
24.	pH	pH Units 25°C	6.87	0.01	Electrometric
25.	Hydroxide Alkalinity	mg/L as CaCO ₃	0	*	*
26.	Carbonate Alkalinity	mg/L as CaCO ₃	0	*	*

27.	Bicarbonate Alkalinity	mg/L as CaCO ₃	212	*	*
28.	Total Hardness	mg/L as CaCO ₃	128	1 mg/L CaCO ₃	Titrimetric, EDTA
29.	Calcium Hardness	mg/L as CaCO ₃	87	1 mg/L CaCO ₃	Titrimetric, EDTA
30.	Magnesium hardness	mg/L as CaCO ₃	41	1 mg/L CaCO ₃	Titrimetric, EDTA
31.	Calcium	mg/L Ca ²⁺	35	**	**
32.	Magnesium	mg/L Mg ²⁺	10	**	**
33.	Residual Chloride ³¹	ppm	0.06	0.01	DPD-1 Free Chlorine
34.	Silica	mg/L Si	8.1	0.01 mg/L SiO ₂	Colorimetric, Heteropoly
35.	Sulfate	mg/L SO ₄ ²⁻	<7	7 mg/L	Colorimetric
36.	Nitrate	mg/L NO ₃ ⁻	3.9	***	***
37.	Nitrate-Nitrogen	mg/L NO ₃ ⁻ -N	0.9	0.5 mg/L	Colorimetric
38.	Nitrite	mg/L NO ₂ ⁻	0.008	***	***
39.	Nitrite-Nitrogen	mg/L NO ₂ ⁻ -N	0.002	0.001 mg/L	Colorimetric
40.	Ammonia-Nitrogen	mg/L NH ₃ ⁻ -N	<0.09	0.09 mg/L	Colorimetric, salicylate
41.	Chlorides	mg/L Cl ⁻	9.4	0.25 mg/L	Titrimetric, silver nitrate
42.	Total Dissolved Solids	mg/L 25°C	171	1.0 mg/L	Electrometric

This sample was submitted by Jica Study Team.

†Temperature value is not shown in this table because it was analyzed by JICA Study Team

*Alkalinity tests are done by titration with HCL as phenolphthalein and mixed indicator alkalinities (MDL 0.2 mg/L as CaCO₃) from which the corresponding OH, HCO₃, and CO₃ alkalinities are calculated.

**Calcium and magnesium are calculated from calcium and total hardness tests which are determined by titration with EDTA (MDL 0.2 mg/L as CaCO₃).

*** Nitrate and nitrite are determined colorimetrically, MDLs are 0.5 mg/L NO₃-N and 0.001 mg/L NO₂-N, respectively.

All tests are performed in accordance to the "standard Methods for the Examination of Water and Wastewater", 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

³¹ Values for Residual Chloride parameter were obtained on July 16, 2009.

Plate B29-B (Well J1)

Phase Number: VI

Location of Sample: Borehole 1 (Well J1), Monrovia, Liberia

Date of Sampling: 14-05-2009

Date of Analysis: 16-05-2009

Date of Report Generation: 27/05/2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/0.1ml	0	1CFU/0.1ml	Membrane filtration
2.	Total Coliform	CFU/0.1ml	0	1CFU/0.1ml	Membrane filtration
3.	Lead	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS

This sample was submitted by Jica Study Team

Plate B30 (Well J4)

Phase Number: V

Location of Sample: Borehole 4 (Well J4), Monrovia, Liberia

Date of Sampling: 12-04-2009

Date of Analysis: 16-04-2009

Date of Report Generation: 24-04-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	0	1CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	5000	1CFU/100ml	Membrane filtration
3.	Arsenic	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
4.	Boron	mg/L	<0.1	0.1 mg/L	EPA200-7/8
5.	Barium	mg/L	0.055	0.002 mg/L	EPA200-7/8
6.	Cadmium	mg/L	0.00066	0.00025 mg/L	Graphite Furnace-AAS
7.	Chromium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
8.	Copper	mg/L	0.007	0.001 mg/L	Graphite Furnace-AAS
9.	Cyanide	mg/L	<0.02	0.02 mg/L	Spectrophotometer HACH 8027
10.	Fluoride	mg/L	0.2	0.2 mg/L	Spectrophotometer HACH 8027
11.	Iron	mg/L	<0.25	0.25mg/L	Frame-AAS
12.	Lead	mg/L	0.0117	0.001 mg/L	Graphite Furnace-AAS
13.	Manganese	mg/L	0.271	0.001 mg/L	Graphite Furnace-AAS
14.	Mercury	mg/L	<0.0005	0.0005 mg/L	EPA200-7/8
15.	Molybdenum	mg/L	<0.005	0.005 mg/L	Graphite Furnace-AAS
16.	Nickel	mg/L	<0.0025	0.0025 mg/L	Graphite Furnace-AAS
17.	Potassium	mg/L	2.1	0.05 mg/L	Flame emission photometry
18.	Sodium	mg/L	20	0.1 mg/L	Flame emission photometry
19.	Selenium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
20.	Temperature	°C	+		
21.	Turbidity	NTU	4.2	0.2 NTU	Nephelometric
22.	Conductivity	uS/cm at 25°C	197.7	0.1 uS/cm	Electrometric
23.	Apparent color	Pt Co units	30	1 Pt Co units	Colorimetric, Pt-Co
24.	pH	pH Units 25°C	7.00	0.01	Electrometric
25.	Hydroxide Alkalinity	mg/L as CaCO ₃	0	*	*
26.	Carbonate	mg/L as CaCO ₃	0	*	*

	Alkalinity				
27.	Bicarbonate Alkalinity	mg/L as CaCO ₃	178	*	*
28.	Total Hardness	mg/L as CaCO ₃	120	1 mg/L CaCO ₃	Titrimetric, EDTA
29.	Calcium Hardness	mg/L as CaCO ₃	79	1 mg/L CaCO ₃	Titrimetric, EDTA
30.	Magnesium hardness	mg/L as CaCO ₃	41	1 mg/L CaCO ₃	Titrimetric, EDTA
31.	Calcium	mg/L Ca ²⁺	31.7	**	**
32.	Magnesium	mg/L Mg ²⁺	10	**	**
33.	Residual Chloride ³²	ppm	0.04	0.01	DPD-1 Free Chlorine
34.	Silica	mg/L Si	15.1	0.01 mg/L SiO ₂	Colorimetric, Heteropoly
35.	Sulfate	mg/L SO ₄ ²⁻	8	7 mg/L	Colorimetric
36.	Nitrate	mg/L NO ₃ ⁻	4.6	***	***
37.	Nitrate-Nitrogen	mg/L NO ₃ ⁻ -N	1.0	0.5 mg/L	Colorimetric
38.	Nitrite	mg/L NO ₂ ⁻	0.019	***	***
39.	Nitrite-Nitrogen	mg/L NO ₂ ⁻ -N	0.006	0.001 mg/L	Colorimetric
40.	Ammonia-Nitrogen	mg/L NH ₃ ⁻ -N	<0.09	0.09 mg/L	Colorimetric, salicylate
41.	Chlorides	mg/L Cl ⁻	5.2	0.25 mg/L	Titrimetric, silver nitrate
42.	Total Dissolved Solids	mg/L 25°C	98.8	1.0 mg/L	Electrometric

This sample was submitted by Jica Study Team.

†Temperature value is not shown in this table because it was analyzed by JICA Study Team

*Alkalinity tests are done by titration with HCL as phenolphthalein and mixed indicator alkalinities (MDL 0.2 mg/L as CaCO₃) from which the corresponding OH, HCO₃, and CO₃ alkalinities are calculated.

**Calcium and magnesium are calculated from calcium and total hardness tests which are determined by titration with EDTA (MDL 0.2 mg/L as CaCO₃).

*** Nitrate and nitrite are determined colorimetrically, MDLs are 0.5 mg/L NO₃-N and 0.001 mg/L NO₂-N, respectively.

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

³² Values for Residual Chloride parameter were obtained on July 16, 2009.

Plate B31 (Well J2)

Phase Number: VI

Location of Sample: Borehole 2 (Well J2), Monrovia, Liberia

Date of Sampling: 14-05-2009

Date of Analysis: 16-05-2009

Date of Report Generation: 27/05/2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	150	1CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	200	1CFU/100ml	Membrane filtration
3.	Arsenic	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
4.	Boron	mg/L	<0.05	0.05 mg/L	EPA200-7/8
5.	Barium	mg/L	0.141	0.002 mg/L	EPA200-7/8
6.	Cadmium	mg/L	0.00076	0.00025 mg/L	Graphite Furnace-AAS
7.	Chromium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
8.	Copper	mg/L	0.0026	0.001 mg/L	Graphite Furnace-AAS
9.	Cyanide	mg/L	<0.02	0.02 mg/L	Spectrophotometer HACH 8027
10.	Flouride	mg/L	0.39	0.2 mg/L	Spectrophotometer HACH 8027
11.	Iron	mg/L	<0.25	0.25mg/L	Frame-AAS
12.	Lead	mg/L	0.00124	0.001 mg/L	Graphite Furnace-AAS
13.	Manganese	mg/L	0.435	0.001 mg/L	Graphite Furnace-AAS
14.	Mercury	mg/L	0.005	0.0005 mg/L	EPA200-7/8
15.	Molybdenum	mg/L	<0.005	0.005 mg/L	Graphite Furnace-AAS
16.	Nickel	mg/L	9.5	0.0025 mg/L	Graphite Furnace-AAS
17.	Potassium	mg/L	6.55	0.05 mg/L	Flame emission photometry
18.	Sodium	mg/L	93.9	0.1 mg/L	Flame emission photometry
19.	Selenium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
20.	Temperature	°C	+		
21.	Turbidity	NTU	2.35	0.2 NTU	Nephelometric
22.	Conductivity	uS/cm at 25°C	672	0.1 uS/cm	Electrometric
23.	Apparent color	Pt Co units	18	1 Pt Co units	Colorimetric, Pt-Co
24.	pH	pH Units 25°C	5.73	0.01	Electrometric
25.	Hydroxide Alkalinity	mg/L as CaCO ₃	0	*	*
26.	Carbonate Alkalinity	mg/L as CaCO ₃	0	*	*
27.	Bicarbonate	mg/L as CaCO ₃	54	*	*

Alkalinity					
28.	Total Hardness	mg/L as CaCO ₃	160	1 mg/L CaCO ₃	Titrimetric, EDTA
29.	Calcium Hardness	mg/L as CaCO ₃	92	1 mg/L CaCO ₃	Titrimetric, EDTA
30.	Magnesium hardness	mg/L as CaCO ₃	68	1 mg/L CaCO ₃	Titrimetric, EDTA
31.	Calcium	mg/L Ca ²⁺	36.8	**	**
32.	Magnesium	mg/L Mg ²⁺	16.5	**	**
33.	Residual Chloride ³³	ppm	0.02	0.01	DPD-1 Free Chlorine
34.	Silica	mg/L Si	6.9	0.01 mg/L SiO ₂	Colorimetric, Heteropoly
35.	Sulfate	mg/L SO ₄ ²⁻	26	7 mg/L	Colorimetric
36.	Nitrate	mg/L NO ₃ ⁻	5.1	***	***
37.	Nitrate-Nitrogen	mg/L NO ₃ ⁻ -N	1.1	0.5 mg/L	Colorimetric
38.	Nitrite	mg/L NO ₂ ⁻	0.010	***	***
39.	Nitrite-Nitrogen	mg/L NO ₂ ⁻ -N	0.003	0.001 mg/L	Colorimetric
40.	Ammonia-Nitrogen	mg/L NH ₃ ⁻ -N	<0.09	0.09 mg/L	Colorimetric, salicylate
41.	Chlorides	mg/L Cl ⁻	231	0.25 mg/L	Titrimetric, silver nitrate
42.	Total Dissolved Solids	mg/L 25°C	337	1.0 mg/L	Electrometric

This sample was submitted by Jica Study Team.

†Temperature value is not shown in this table because it was analyzed by JICA Study Team

*Alkalinity tests are done by titration with HCL as phenolphthalein and mixed indicator alkalinities (MDL 0.2 mg/L as CaCO₃) from which the corresponding OH, HCO₃, and CO₃ alkalinities are calculated.

**Calcium and magnesium are calculated from calcium and total hardness tests which are determined by titration with EDTA (MDL 0.2 mg/L as CaCO₃).

*** Nitrate and nitrite are determined colorimetrically, MDLs are 0.5 mg/L NO₃-N and 0.001 mg/L NO₂-N, respectively.

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

³³ Values for Residual Chloride parameter were obtained on July 16, 2009.

Plate B32 (Well J3)

Phase Number: VI

Location of Sample: Borehole 3 (Well J3), Monrovia, Liberia

Date of Sampling: 14-05-2009

Date of Analysis: 16-05-2009

Date of Report Generation: 27/05/2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	476	1CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	600	1CFU/100ml	Membrane filtration
3.	Arsenic	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
4.	Boron	mg/L	<0.05	0.05 mg/L	EPA200-7/8
5.	Barium	mg/L	0.1	0.002 mg/L	EPA200-7/8
6.	Cadmium	mg/L	0.00088	0.00025 mg/L	Graphite Furnace-AAS
7.	Chromium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
8.	Copper	mg/L	0.0039	0.001 mg/L	Graphite Furnace-AAS
9.	Cyanide	mg/L	<0.02	0.02 mg/L	Spectrophotometer HACH 8027
10.	Flouride	mg/L	0.6	0.2 mg/L	Spectrophotometer HACH 8027
11.	Iron	mg/L	4.3	0.25mg/L	Frame-AAS
12.	Lead	mg/L	0.0034	0.001 mg/L	Graphite Furnace-AAS
13.	Manganese	mg/L	0.277	0.001 mg/L	Graphite Furnace-AAS
14.	Mercury	mg/L	0.004	0.0005 mg/L	EPA200-7/8
15.	Molybdenum	mg/L	<0.005	0.005 mg/L	Graphite Furnace-AAS
16.	Nickel	mg/L	0.0036	0.0025 mg/L	Graphite Furnace-AAS
17.	Potassium	mg/L	1.6	0.05 mg/L	Flame emission photometry
18.	Sodium	mg/L	6.8	0.1 mg/L	Flame emission photometry
19.	Selenium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
20.	Temperature	°C	+		
21.	Turbidity	NTU	38	0.2 NTU	Nephelometric
22.	Conductivity	uS/cm at 25°C	147.7	0.1 uS/cm	Electrometric
23.	Apparent color	Pt Co units	156	1 Pt Co units	Colorimetric, Pt-Co
24.	pH	pH Units 25°C	5.99	0.01	Electrometric
25.	Hydroxide Alkalinity	mg/L as CaCO ₃	0	*	*
26.	Carbonate Alkalinity	mg/L as CaCO ₃	0	*	*
27.	Bicarbonate	mg/L as CaCO ₃	126	*	*

Alkalinity					
28.	Total Hardness	mg/L as CaCO ₃	103	1 mg/L CaCO ₃	Titrimetric, EDTA
29.	Calcium Hardness	mg/L as CaCO ₃	80	1 mg/L CaCO ₃	Titrimetric, EDTA
30.	Magnesium hardness	mg/L as CaCO ₃	23	1 mg/L CaCO ₃	Titrimetric, EDTA
31.	Calcium	mg/L Ca ²⁺	32.1	**	**
32.	Magnesium	mg/L Mg ²⁺	5.6	**	**
33.	Residual Chloride ³⁴	ppm	0.04	0.01	DPD-1 Free Chlorine
34.	Silica	mg/L Si	9.1	0.01 mg/L SiO ₂	Colorimetric, Heteropoly
35.	Sulfate	mg/L SO ₄ ²⁻	<7	7 mg/L	Colorimetric
36.	Nitrate	mg/L NO ₃ ⁻	1.4	***	***
37.	Nitrate-Nitrogen	mg/L NO ₃ ⁻ -N	0.3	0.5 mg/L	Colorimetric
38.	Nitrite	mg/L NO ₂ ⁻	<0.001	***	***
39.	Nitrite-Nitrogen	mg/L NO ₂ ⁻ -N	<0.001	0.001 mg/L	Colorimetric
40.	Ammonia-Nitrogen	mg/L NH ₃ ⁻ -N	<0.09	0.09 mg/L	Colorimetric, salicylate
41.	Chlorides	mg/L Cl ⁻	5.7	0.25 mg/L	Titrimetric, silver nitrate
42.	Total Dissolved Solids	mg/L 25°C	73.8	1.0 mg/L	Electrometric

This sample was submitted by Jica Study Team.

†Temperature value is not shown in this table because it was analyzed by JICA Study Team

*Alkalinity tests are done by titration with HCL as phenolphthalein and mixed indicator alkalinities (MDL 0.2 mg/L as CaCO₃) from which the corresponding OH, HCO₃, and CO₃ alkalinities are calculated.

**Calcium and magnesium are calculated from calcium and total hardness tests which are determined by titration with EDTA (MDL 0.2 mg/L as CaCO₃).

*** Nitrate and nitrite are determined colorimetrically, MDLs are 0.5 mg/L NO₃-N and 0.001 mg/L NO₂-N, respectively.

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

³⁴ Values for Residual Chloride parameter were obtained on July 16, 2009.

Plate B33 (LWSC Deep Well 1)

Phase Number: VII

Location of Sample: LWSC Deep Well 1, Monrovia, Liberia

Date of Sampling: 16-07-2009

Date of Analysis: 17-07-2009

Date of Report Generation: 03-08-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	0	1CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	20	1CFU/100ml	Membrane filtration
3.	Arsenic	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
4.	Boron	mg/L	0.01	0.005 mg/L	EPA200-7/8
5.	Barium	mg/L	0.012	0.002 mg/L	EPA200-7/8
6.	Cadmium	mg/L	0.00072	0.00025 mg/L	Graphite Furnace-AAS
7.	Chromium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
8.	Copper	mg/L	0.0373	0.001 mg/L	Graphite Furnace-AAS
9.	Cyanide	mg/L	<0.02	0.02 mg/L	Spectrophotometer HACH 8027
10.	Flouride	mg/L	<0.2	0.2 mg/L	Spectrophotometer HACH 8027
11.	Iron	mg/L	<0.25	0.25mg/L	Frame-AAS
12.	Lead	mg/L	0.0034	0.001 mg/L	Graphite Furnace-AAS
13.	Manganese	mg/L	0.0058	0.001 mg/L	Graphite Furnace-AAS
14.	Mercury	mg/L	<0.0005	0.0005 mg/L	EPA200-7/8
15.	Molybdenum	µg/L	<0.005	0.005 mg/L	Graphite Furnace-AAS
16.	Nickel	µg/L	<0.001	0.0025 mg/L	Graphite Furnace-AAS
17.	Potassium	mg/L	3.5	0.05 mg/L	Flame emission photometry
18.	Sodium	mg/L	16.5	0.1 mg/L	Flame emission photometry
19.	Selenium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
20.	Temperature	°C	28.9	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
21.	Turbidity	NTU	0.56	0.2 NTU	Nephelometric
22.	Conductivity	uS/cm at 25°C	103.9	0.1 uS/cm	Electrometric
23.	Apparent color	Pt Co units	8	1 Pt Co units	Colorimetric, Pt-Co
24.	pH	pH Units 25°C	4.55	0.01	Electrometric
25.	Hydroxide Alkalinity	mg/L as CaCO ₃	0	*	*

26.	Carbonate Alkalinity	mg/L as CaCO ₃	0	*	*
27.	Bicarbonate Alkalinity	mg/L as CaCO ₃	6.4	*	*
28.	Total Hardness	mg/L as CaCO ₃	50	1 mg/L CaCO ₃	Titrimetric, EDTA
29.	Calcium Hardness	mg/L as CaCO ₃	33	1 mg/L CaCO ₃	Titrimetric, EDTA
30.	Magnesium hardness	mg/L as CaCO ₃	17	1 mg/L CaCO ₃	Titrimetric, EDTA
31.	Calcium	mg/L Ca ²⁺	13.2	**	**
32.	Magnesium	mg/L Mg ²⁺	4.1	**	**
33.	Residual Chloride ³⁵	ppm	<0.01	0.01	DPD-1 Free Chlorine
34.	Silica	mg/L Si	0.80	0.01 mg/L SiO ₂	Colorimetric, Heteropoly
35.	Sulfate	mg/L SO ₄ ²⁻	11	7 mg/L	Colorimetric
36.	Nitrate	mg/L NO ₃ ⁻	37.3	***	***
37.	Nitrate-Nitrogen	mg/L NO ₃ ⁻ -N	8.4	0.5 mg/L	Colorimetric
38.	Nitrite	mg/L NO ₂ ⁻	0.015	***	***
39.	Nitrite-Nitrogen	mg/L NO ₂ ⁻ -N	0.005	0.001 mg/L	Colorimetric
40.	Ammonia-Nitrogen	mg/L NH ₃ ⁻ -N	<0.09	0.09 mg/L	Colorimetric, salicylate
41.	Chlorides	mg/L Cl ⁻	17.2	0.25 mg/L	Titrimetric, silver nitrate
42.	Total Dissolved Solids	mg/L 25°C	51.9	1.0 mg/L	Electrometric

*Alkalinity tests are done by titration with HCL as phenolphthalein and mixed indicator alkalinities (MDL 0.2 mg/L as CaCO₃) from which the corresponding OH, HCO₃, and CO₃ alkalinities are calculated.

**Calcium and magnesium are calculated from calcium and total hardness tests which are determined by titration with EDTA (MDL 0.2 mg/L as CaCO₃).

*** Nitrate and nitrite are determined colorimetrically, MDLs are 0.5 mg/L NO₃-N and 0.001 mg/L NO₂-N, respectively

All tests are performed in accordance to the "standard Methods for the Examination of Water and Wastewater", 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

³⁵ Values for Residual Chloride parameter were obtained on July 16, 2009.

Plate B34 (Raw water WTP)

Phase Number: VII

Location of Sample: Raw water WTP, Monrovia, Liberia

Date of Sampling: 16-07-2009

Date of Analysis: 17-07-2009

Date of Report Generation: 03-08-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	1700	1CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	4500	1CFU/100ml	Membrane filtration
3.	Arsenic	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
4.	Boron	mg/L	<0.05	0.05 mg/L	EPA200-7/8
5.	Barium	mg/L	0.033	0.002 mg/L	EPA200-7/8
6.	Cadmium	mg/L	0.00039	0.00025 mg/L	Graphite Furnace-AAS
7.	Chromium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
8.	Copper	mg/L	0.0037	0.001 mg/L	Graphite Furnace-AAS
9.	Cyanide	mg/L	<0.02	0.02 mg/L	Spectrophotometer HACH 8027
10.	Flouride	mg/L	<0.2	0.2 mg/L	Spectrophotometer HACH 8027
11.	Iron	mg/L	0.79	0.25mg/L	Frame-AAS
12.	Lead	mg/L	0.0123	0.001 mg/L	Graphite Furnace-AAS
13.	Manganese	mg/L	0.0206	0.001 mg/L	Graphite Furnace-AAS
14.	Mercury	mg/L	0.003	0.0005 mg/L	EPA200-7/8
15.	Molybdenum	µg/L	<0.005	0.005 mg/L	Graphite Furnace-AAS
16.	Nickel	µg/L	0.00428	0.0025 mg/L	Graphite Furnace-AAS
17.	Potassium	mg/L	1.1	0.05 mg/L	Flame emission photometry
18.	Sodium	mg/L	4.5	0.1 mg/L	Flame emission photometry
19.	Selenium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
20.	Temperature	°C	26.6	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
21.	Turbidity	NTU	3.8	0.2 NTU	Nephelometric
22.	Conductivity	uS/cm at 25°C	18.16	0.1 uS/cm	Electrometric
23.	Apparent color	Pt Co units	136	1 Pt Co units	Colorimetric, Pt-Co
24.	pH	pH Units 25°C	5.86	0.01	Electrometric

25.	Hydroxide Alkalinity	mg/L as CaCO ₃	0	*	*
26.	Carbonate Alkalinity	mg/L as CaCO ₃	0	*	*
27.	Bicarbonate Alkalinity	mg/L as CaCO ₃	18.2	*	*
28.	Total Hardness	mg/L as CaCO ₃	13	1 mg/L CaCO ₃	Titrimetric, EDTA
29.	Calcium Hardness	mg/L as CaCO ₃	6	1 mg/L CaCO ₃	Titrimetric, EDTA
30.	Magnesium hardness	mg/L as CaCO ₃	7	1 mg/L CaCO ₃	Titrimetric, EDTA
31.	Calcium	mg/L Ca ²⁺	2.4	**	**
32.	Magnesium	mg/L Mg ²⁺	1.7	**	**
33.	Residual Chloride ³⁶	ppm	0.03	0.01	DPD-1 Free Chlorine
34.	Silica	mg/L Si	4.10	0.01 mg/L SiO ₂	Colorimetric, Heteropoly
35.	Sulfate	mg/L SO ₄ ²⁻	<7	7 mg/L	Colorimetric
36.	Nitrate	mg/L NO ₃ ⁻	2.0	***	***
37.	Nitrate-Nitrogen	mg/L NO ₃ ⁻ -N	0.5	0.5 mg/L	Colorimetric
38.	Nitrite	mg/L NO ₂ ⁻	0.008	***	***
39.	Nitrite-Nitrogen	mg/L NO ₂ ⁻ -N	0.002	0.001 mg/L	Colorimetric
40.	Ammonia-Nitrogen	mg/L NH ₃ ⁻ -N	<0.09	0.09 mg/L	Colorimetric, salicylate
41.	Chlorides	mg/L Cl ⁻	3.6	0.25 mg/L	Titrimetric, silver nitrate
42.	Total Dissolved Solids	mg/L 25°C	9.09	1.0 mg/L	Electrometric

*Alkalinity tests are done by titration with HCL as phenolphthalein and mixed indicator alkalinities (MDL 0.2 mg/L as CaCO₃) from which the corresponding OH, HCO₃, and CO₃ alkalinities are calculated.

**Calcium and magnesium are calculated from calcium and total hardness tests which are determined by titration with EDTA (MDL 0.2 mg/L as CaCO₃).

*** Nitrate and nitrite are determined colorimetrically, MDLs are 0.5 mg/L NO₃-N and 0.001 mg/L NO₂-N, respectively

³⁶ Values for Residual Chloride parameter were obtained on July 16, 2009.

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

Plate B35 (Raw water intake St. Paul)

Phase Number: VII

Location of Sample: Raw water intake St. Paul, Monrovia, Liberia

Date of Sampling: 16-07-2009

Date of Analysis: 17-07-2009

Date of Report Generation: 03-08-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Fecal Coliform	CFU/100ml	40	1CFU/100ml	Membrane filtration
2.	Total Coliform	CFU/100ml	2300	1CFU/100ml	Membrane filtration
3.	Arsenic	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
4.	Boron	mg/L	<0.05	0.05 mg/L	EPA200-7/8
5.	Barium	mg/L	0.04	0.002 mg/L	EPA200-7/8
6.	Cadmium	mg/L	0.0045	0.00025 mg/L	Graphite Furnace-AAS
7.	Chromium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
8.	Copper	mg/L	0.0034	0.001 mg/L	Graphite Furnace-AAS
9.	Cyanide	mg/L	<0.02	0.02 mg/L	Spectrophotometer HACH 8027
10.	Flouride	mg/L	<0.2	0.2 mg/L	Spectrophotometer HACH 8027
11.	Iron	mg/L	1.45	0.25mg/L	Frame-AAS
12.	Lead	mg/L	0.00161	0.001 mg/L	Graphite Furnace-AAS
13.	Manganese	mg/L	0.0318	0.001 mg/L	Graphite Furnace-AAS
14.	Mercury	mg/L	<0.0005	0.0005 mg/L	EPA200-7/8
15.	Molybdenum	µg/L	<0.005	0.005 mg/L	Graphite Furnace-AAS
16.	Nickel	µg/L	0.00137	0.0025 mg/L	Graphite Furnace-AAS
17.	Potassium	mg/L	1.5	0.05 mg/L	Flame emission photometry
18.	Sodium	mg/L	4.0	0.1 mg/L	Flame emission photometry
19.	Selenium	mg/L	<0.001	0.001 mg/L	Graphite Furnace-AAS
20.	Temperature	°C	27.1	-5.0 °C	Standard Platinum Resistance Thermometer (ITS-90)
21.	Turbidity	NTU	18.8	0.2 NTU	Nephelometric
22.	Conductivity	uS/cm at 25°C	20.1	0.1 uS/cm	Electrometric
23.	Apparent color	Pt Co units	164	1 Pt Co units	Colorimetric, Pt-Co
24.	pH	pH Units 25°C	5.86	0.01	Electrometric

25.	Hydroxide Alkalinity	mg/L as CaCO ₃	0	*	*
26.	Carbonate Alkalinity	mg/L as CaCO ₃	0	*	*
27.	Bicarbonate Alkalinity	mg/L as CaCO ₃	14.2	*	*
28.	Total Hardness	mg/L as CaCO ₃	16	1 mg/L CaCO ₃	Titrimetric, EDTA
29.	Calcium Hardness	mg/L as CaCO ₃	10	1 mg/L CaCO ₃	Titrimetric, EDTA
30.	Magnesium hardness	mg/L as CaCO ₃	6	1 mg/L CaCO ₃	Titrimetric, EDTA
31.	Calcium	mg/L Ca ²⁺	4	**	**
32.	Magnesium	mg/L Mg ²⁺	1.5	**	**
33.	Residual Chloride ³⁷	ppm	0.05	0.01	DPD-1 Free Chlorine
34.	Silica	mg/L Si	4.44	0.01 mg/L SiO ₂	Colorimetric, Heteropoly
35.	Sulfate	mg/L SO ₄ ²⁻	<7	7 mg/L	Colorimetric
36.	Nitrate	mg/L NO ₃ ⁻	<2.0	***	***
37.	Nitrate-Nitrogen	mg/L NO ₃ ⁻ -N	<0.5	0.5 mg/L	Colorimetric
38.	Nitrite	mg/L NO ₂ ⁻	0.004	***	***
39.	Nitrite-Nitrogen	mg/L NO ₂ ⁻ -N	0.001	0.001 mg/L	Colorimetric
40.	Ammonia-Nitrogen	mg/L NH ₃ ⁻ -N	<0.09	0.09 mg/L	Colorimetric, salicylate
41.	Chlorides	mg/L Cl ⁻	4.2	0.25 mg/L	Titrimetric, silver nitrate
42.	Total Dissolved Solids	mg/L 25°C	10.0	1.0 mg/L	Electrometric

*Alkalinity tests are done by titration with HCL as phenolphthalein and mixed indicator alkalinities (MDL 0.2 mg/L as CaCO₃) from which the corresponding OH, HCO₃, and CO₃ alkalinities are calculated.

**Calcium and magnesium are calculated from calcium and total hardness tests which are determined by titration with EDTA (MDL 0.2 mg/L as CaCO₃).

*** Nitrate and nitrite are determined colorimetrically, MDLs are 0.5 mg/L NO₃-N and 0.001 mg/L NO₂-N, respectively

³⁷ Values for Residual Chloride parameter were obtained on July 16, 2009.

All tests are performed in accordance to the “standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005 as approved by the American Public Health Association, the American Water Works Association, and the Water Environment Federation unless otherwise noted.

Plate B36 (Well J 1)**Phase Number: VII****Location of Sample: Well J 1, Monrovia, Liberia****Date of Sampling: 16-07-2009****Date of Analysis: 17-07-2009****Date of Report Generation: 03-08-2009**

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Mercury	mg/L	0.001	0.0005 mg/L	EPA200-7/8

Plate B37 (Well J 2)

Phase Number: VII

Location of Sample: Well J 2, Monrovia, Liberia

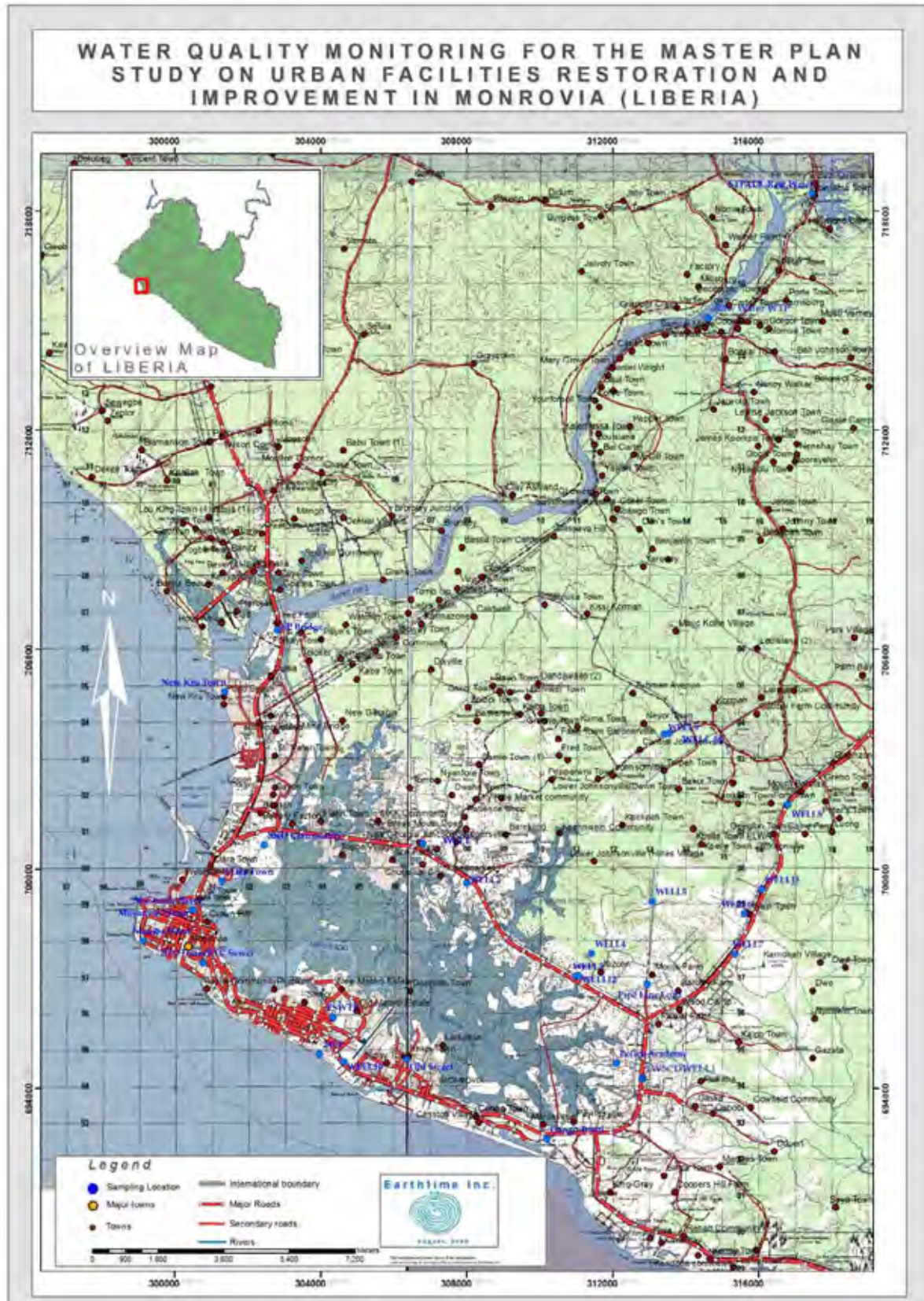
Date of Sampling: 16-07-2009

Date of Analysis: 17-07-2009

Date of Report Generation: 03-08-2009

No.	Parameter	Unit	Measured value	Limit value for analysis	Method
1.	Mercury	mg/L	<0.0005	0.0005 mg/L	EPA200-7/8

APPENDIX C: Location Map



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Chugai Technos Corporation

Kanto environmental technical center

2-2-16 Ohnodai Midori Ward

Chiba City Chiba Prefecture

Tel +81-43-295-1101

Messrs. Yachiyo Engineering Co., Ltd.

Messrs. JICA STUDY TEAM

Date of Reporting; June 12,2009

Report No. E091246

Receipt No. G09-01873,02060

CERTIFICATE of Water Analysis Results

THE MASTER PLAN STUDY ON URBAN FACILITIES

RESTORATION AND IMPROVEMENT IN MONROBIA

IN THE REPUBLIC OF LIBERIA

Sample Name; J - 1

Parameter	Unit	Measured Value	Limit value for analysis	Method
Lead	mg/L	ND	0.001	ICP Method

Sample Name; J - 2

Parameter	Unit	Measured Value	Limit value for analysis	Method
Lead	mg/L	ND	0.001	ICP Method
Total Mercury	mg/L	ND	0.00005	AA Method

Sample Name; J - 3

Parameter	Unit	Measured Value	Limit value for analysis	Method
Lead	mg/L	ND	0.001	ICP Method
Total Mercury	mg/L	ND	0.00005	AA Method

Sample Name; J - 5

Parameter	Unit	Measured Value	Limit value for analysis	Method
Lead	mg/L	0.007	0.001	ICP Method

Date of Sampling; May 16,2009

This sample was brought from Messrs. Yachiyo Engineering Co., Ltd to our laboratory ,and analyzed.

The analysis is carried out with filtration liquid.

※All methods are based on standard method for examination of water.

ND:Denotes"Not Detectable"

Environmental Certified Public Measurers.

Kengo Sonoda

Sig. Kengo Sonoda

Person in analysis charge.

Hidenori Inoue

Sig. Hidenori Inoue

Page; 1/2



Chugai Technos Corporation

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Messrs. Yachiyo Engineering Co., Ltd.
Messrs. JICA STUDY TEAM

Date of Reporting; July 13,2009

Report No. E091510

Receipt No. G09-02366

CERTIFICATE of Water Analysis Results

THE MASTER PLAN STUDY ON URBAN FACILITIES

RESTORATION AND IMPROVEMENT IN MONROBIA

IN THE REPUBLIC OF LIBERIA

Sample Name; J - 2

Parameter	Unit	Measured Value	Limit value for analysis	Method
Total Mercury	mg/L	ND	0.00005	AA Method

Sample Name; J - 3

Parameter	Unit	Measured Value	Limit value for analysis	Method
Total Mercury	mg/L	ND	0.00005	AA Method
Iron	mg/L	ND	0.01	ICP Method

This sample was brought from Messrs. Yachiyo Engineering Co., Ltd to our laboratory ,and analyzed.

The analysis is carried out with filtration liquid.

※All methods are based on standard method for examination of water.

ND:Denotes"Not Detectable"

Environmental Certified Public Measurers.

Kengo Sonoda

Sig. Kengo Sonoda

Person in analysis charge.

Hidenori Inoue

Sig. Hidenori Inoue

Page; 1/2



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Messrs. Yachiyo Engineering Co., Ltd.

Messrs. JICA STUDY TEAM

Date of Reporting; September 10,2009

Report No. E091924

Receipt No. G09-03056

CERTIFICATE of Water Analysis Results

THE MASTER PLAN STUDY ON URBAN FACILITIES

RESTORATION AND IMPROVEMENT IN MONROBIA

IN THE REPUBLIC OF LIBERIA

Sample Name; Saint Paul Mount Coffee Intake

Parameter	Unit	Measured Value	Limit value for analysis	Method
Cadmium	mg/L	ND	0.0005	ICP Method

Sample Name; Saint Paul White Plains Intake

Parameter	Unit	Measured Value	Limit value for analysis	Method
Lead	mg/L	ND	0.001	ICP Method
Total Mercury	mg/L	^ ND	0.0001	AA Method

This sample was brought from Messrs. Yachiyo Engineering Co., Ltd to our laboratory ,and analyzed.

※ All methods are based on Drinking Water Examination Methods.

ND:Denotes"Not Detectable"

Environmental Certified Public Measurers.

Kengo Sonoda

Sig. Kengo Sonoda

Person in analysis charge.

Hidenori Inoue

Sig. Hidenori Inoue