United Nations Development Programme
United Nations Development Group Iraq Trust Fund

World Health Organization

UNDG

COMPLETION REPORT FOR WATER QUALITY CONTROL AND SURVEILLANCE IN IRAQ PROGRAMME

Summary

Participating UN Organisation:

The World Health Organization

Cluster:

Cluster E: Infrastructure Rehabilitation

Project No. and Project Title:

E3-03: Water Quality Control and Surveillance in Iraq Programme

Project Location/Region/Province:

Iraq, Nationwide

Reporting Period:

Beginning to completion of Project
21 Sep.2004 – 30th Nov.2006

Report Number:

Final report
Atlas Project Number: 54869
Atlas Award Number: 66869

Counterpart organisations / implementing partners:

Ministry of Environment, Ministry of Municipalities and Public Works, Private Contractor, UNICEF

Project cost:

Indicate project cost at approval US$ 6,262,094
and project costs at completion US$ 6,262,094

Abbreviations and acronyms:

- MDG Millennium Development Goals
- MOEv: Ministry of Environment
- MOMPW: Ministry of Municipalities and Public Works
- WHO: World Health Organization
- UNICEF: United Nations Children Fund
- WQC: Water Quality Control and Surveillance

Project Duration:

Original project duration
12 months starting 21 Sep.2004
First extension approved 31 Dec 2005, Second extension approved 30 June 2006, Total duration of project 26 months.

I. Purpose

Main objectives and outcomes expected as per approved Project/Programme/project document:

The overall objective of the programme is to ensure further reinforcement of the water quality monitoring program to provide safe water as a right to the consumers according to Iraqi standards and WHO guidelines for safe drinking water. This will include introducing systematic approach to water quality monitoring throughout the governorates.

The following broad operational objectives were envisaged to achieve the above overall objective:

- Enhance and improve chemical and bacteriological analytical capacities inside the laboratories;
- Build the capacity of both the MOEv and MOMPW at the central, governorate and district levels for planning, implementing and monitoring. The main focus will be on reinforcing the technical and managerial capacities of the staff responsible for water quality control;
- Ensure that the MOMPW is providing safe drinking water;
- Improve management of the monitoring system;
- Empower the MOEv staff to enforce the rules and regulations of Iraq, in order to protect the environment in general and water resources from pollution;
- Raise public awareness about the protection and preservation of water resources.

The expected outcomes of the project are:

- Sustainable water quality laboratories network established nationwide, fully furnished and equipped which is comprised of 15 central laboratories and 30 district laboratories.
- Sustainable water quality laboratories at all water treatment plants, fully furnished and equipped which is comprised of 220 laboratories at water treatment plants
- Well trained laboratory technicians and sanitarian professional practicing at all level.
- Water quality surveillance system supported and a comprehensive water quality program is implemented throughout the country.
- Laboratory information management system put in place and for the entire water quality laboratories network as a tool for decision makers.
- Ministry of Environment with capacity to assess and monitor at regional/provincial level and provide regulation, service commission and to monitor functions at central level.
- Public awareness rose especially in terms of hygiene education and protection of water resources from all means of pollution.

Reference to how the programme/project related to the UN Assistance Strategy to Iraq and how it aimed to support Iraq national development goals and the Millennium Development Goals :

The Programme contributes to the following Millennium Development Goals (MDGs) :

- **Goal 7 Target 10** to " Halve by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation" ;
- **Goal 4 Target 5** to "Reduce by two thirds the mortality rate among children under five years".

It also relates to the **UN Assistance Strategy** within "rehabilitate and develop the country's social, economic, financial, physical and institutional infrastructure to ensure sustainable livelihoods and durable solutions to displaced populations in the country."

Furthermore, it relates to the **National Development Strategy, through Goal 6** which is to "achieve universal access to safe drinking water and sanitation" and to target 8 in the strategy which is to "ensure that all people have sustainable access to safe drinking water and improved sanitation."

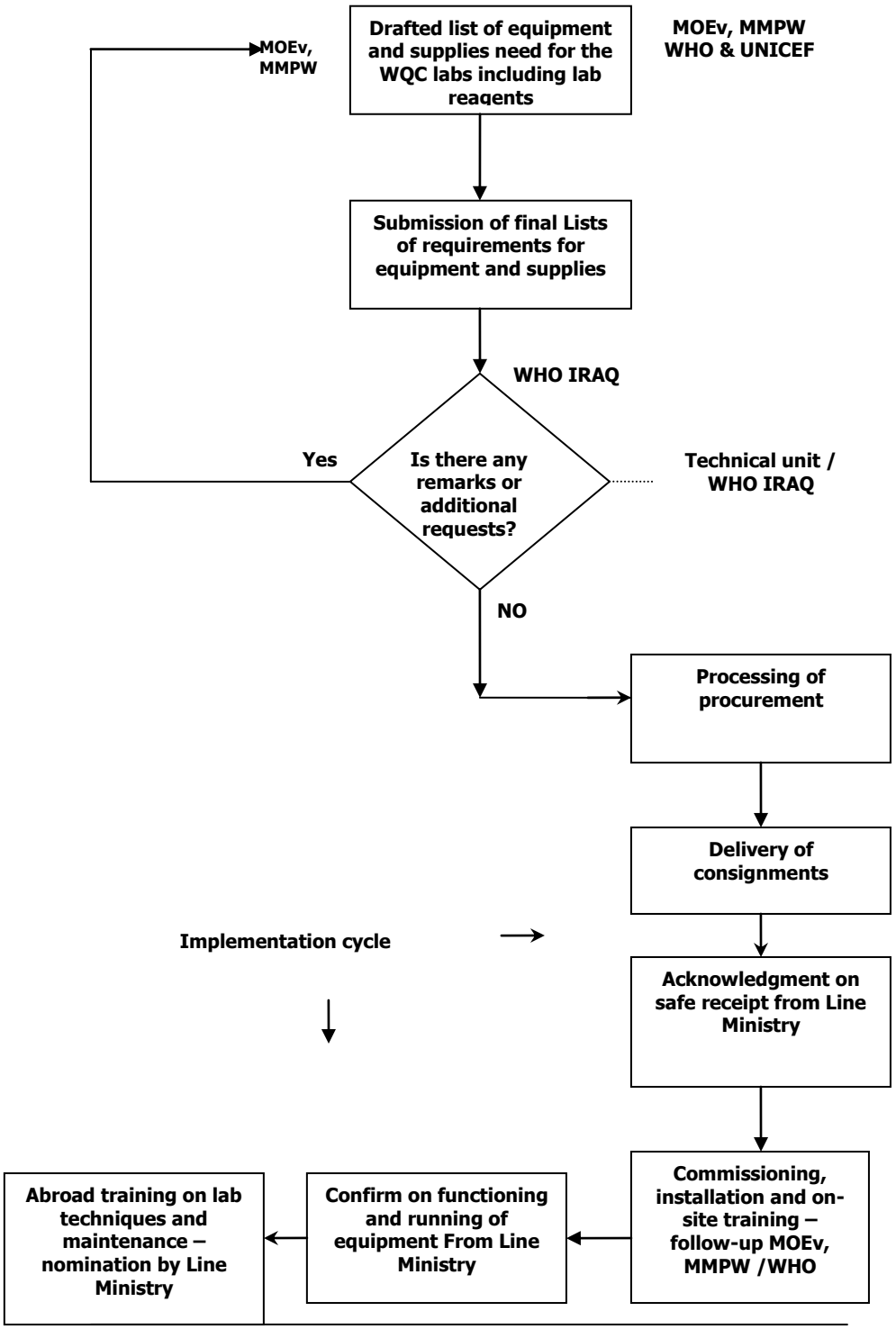
Project Management arrangements

In terms of capacity of the organizations, both WHO and UNICEF have three sub-offices in Iraq (Baghdad, Basra and Erbil) in addition to focal points in the other governorates. In addition, WHO has about 75 national staff (technical and supporting staff) working inside Iraq.

WHO worked in Iraq since 1961 with more than 44 years experience. In Amman WHO has its temporary office with about 30 staff both technical and supporting. In addition, the WHO Regional Office in Cairo, the Headquarters Office in Geneva and the Centre of Environmental Health Activities (CEHA) have a well known expertise in the area of water quality control and surveillance who were a real asset during the implementation of the project. Similarly UNICEF has 30 national staff inside Iraq supported by 92 engineers and monitors hired through an institutional contract. Coordination at the national level was undertaken closely with technical staff of Ministry of Environment, Ministry of Municipalities and Mayoralty of Baghdad during the preparation and implementation of the project. The coordinator with the focal points of the project had to travel between selected governorate to ensure proper implementation of the project and to do the direct monitoring on spot. The project manager worked with the counterparts both on technical and managerial issues, setting with the technical unit the specification for all the equipment and supplies as well as following with WHO Regional Office the process of the procurement. In addition, he facilitated the conduction of the training of trainers activities outside Iraq, in addition to the responsibility for a periodic reporting on the progress of the implementation of the activities. The project manager with the assistance of a UNICEF national staff in Amman was in direct contact with the MOEv technical staff and with WHO and UNICEF national staff via different means of communication mainly through video conferencing to ensure the proper and smooth implementation of the project activities.

The delivery mechanisms adopted were as follow:

- WHO/UNICEF in consultation with the counterparts prepared the technical specifications for the needed water analysis equipment and supplies.
- WHO/UNICEF in consultation with MOEv and MMPW technical staff assessed the chemicals and other laboratory reagents needed for water quality analysis.
- The procurement was done through procurement section of either WHO country, Regional or Headquarters offices. The procured equipment were shipped to Iraq through Jordan and the installation was the responsibility of the suppliers under supervision of both WHO and the line ministries as shown in the below diagram.



- WHO in consultation with the counterparts facilitated the implementation of training of trainers programs outside Iraq where the participants became trainers for the technical staff inside Iraq. This approach was used in many of WHO/UNICEF projects and it is considered as one of the success stories in terms of implementation approaches.
- WHO in consultation with the counterpart designed and supported the implementation of hygiene awareness program for the community leaders.

- In terms of the rehabilitation work, WHO in coordination with MOEv prepared all the drawings, bill of quantities and the bidding documents. MOEv announced the tender in Iraqi local newspaper, after recieving offers from local contractors the offers went through many committees (bid opening, analysis and review committee), then double check has been done by WHO at the field level and at WHO temporary office in Amman to ensure that all the process went according to both WHO and MOEv rules and regulations. During commence of work, both WHO and MOEv engineers supervised and monitored the work.
- WHO focal point inside Iraq followed the implementation of the project components and monitored the progress of all the activities on the ground and prepared a visit report in addition to the weekly and monthly reports.

The main national partners involved in the implementation are the MOEv, MMPW and local contractors. The role of the two ministries is to coordinate with WHO and UNICEF to set the specifications for the needed equipment and supplies, and to implement the training activities inside the country and to ensure the enforcement of rules and regualtions related to the water quality control. In addition, they have to implement the water quality monitoring program to ensure that the water delivered to the end users is tested and within the Iraqi national standard for drinking water. The local contractors were responsible for the rehabilitaion of the MOEv central water quality control laboratory according to the specification set by both WHO and the MOEv.

Both WHO and UNICEF focal points were in close contact with both line ministries (MOEv and MMPW), in addition to the ad hoc visits to the water quality control laboratories to monitor and provide technical advice to ministries' staff. Monthly meeting were conducted to update on the implementation status of the project components. Moreover, three meetings were conducted in Amman between WHO/UNICEF and high official delegations from the line ministries to follow-up on the implementation of the project components (two meetings were headed by WHO Represntative and Minister of Environment). Weekly and monthly reports were recieved from WHO/UNICEF focal poits, also the line ministries used to provide WHO with monthly reports on the water quality status in Iraq.

As far as financial tracking is concerned, the project manager and the finance unit at the country office monitor all the expenses on daily basis through WHO Country Activity Monitoring System (CAMS) and WHO Regional Activity Management System (RAMS). Furthermore, during the timeframe of implementation, the project has been audited by two audit missions, one internal which was during April 2006 and the other was external done during November 2006.

II. Resources

Total approved budget and summary of resources used for the programme/project from the UNDG Iraq Trust Fund (and non-Trust Fund resources where applicable):

UNDG ITF funds received.

The total project budget approved by UNDG Trust Fund Steering Committee was US$ 6,262,094 earmarked from the European Commission. Funds were received into WHO on the 21st September 2004, the official start date of the project. The project components were implemented according to the plan and against the budget line for each component. The funds have been fully utilized as illustrated in Annex 2.

Other additional resources which are being used in the implementation of the project, which were not included in the mentioned budget included:

- Logistics and administrative facilities of WHO such as videoconferencing, which particularly in the context of the security situation in Iraq, have been key to coordination and interaction with the MOEv and MOMPW and other partners involved in the project;
- Technical support and backstopping received from the Regional and Headquarters offices outside the agency management support framework;
- Additional MOEv and MOMPW and WHO personnel involved in the project implementation, monitoring, evaluation and reporting.

Human Resources

In terms of human resources, 2 international and 4 national staff from both WHO and UNICEF were involved in managing the implementation of the project components. In addition to that, other WHO staff at different levels and different locations (inside Iraq, Amman, Regional Office and Headquarters) were partially involved in facilitating the implementation of the project components. The line ministries staff responsible for water quality monitoring were also involved in the implementation of the project activities.

Annex 1: Chemicals for Ministry of Environment Water Quality Control Laboratories

SN	Item Description	QTY	Unit
1	Ammonium Hydroxide	16	2.5Liter
2	Ammonium Chloride	26	500 gm
3	Ascorbic Acid	20	100 gm
4	Buffer Tablets pH 4	20	50 tablets
5	Buffer Tablets pH 7	20	50 tablets
6	Calcium Carbonate anhydrous	20	250 gm
7	Copper Standard Solution for Atomic 1000ppm	10	500 ml
8	Chromium Standard Solution for Atomic 1000ppm	10	500 ml
9	Iron Standard Solution for Atomic 1000ppm	10	500 ml
10	Mercuric Standard Solution for Atomic 1000ppm	10	500 ml
11	Zinc Standard Solution for Atomic 1000ppm	10	500 ml
12	Lead Standard Solution for Atomic 1000ppm	10	500 ml
13	Arsenic Standard Solution for Atomic 1000ppm	10	500 ml
14	Nikle Standard Solution for Atomic 1000ppm	10	500 ml
15	Manganese Standard Solution for Atomic 1000ppm	10	500 ml
16	Cadimium Standard Solution for Atomic 1000ppm	10	500 ml
17	Ethylene Di-amine tetra acetic di-Soudium salt	24	250 gm
18	Erichrom Black T	20	250 gm
19	Methyl Orange	20	10 gm
20	Methyl Red	20	10 gm
21	Meroxide	1	100 gm
22	Calcium Carbonate Anhydrous	26	250 gm
23	Cobaltous Chloride crystals	30	10 gm
24	Pottasium Chloroplatinate	30	10 gm
25	Sodium Boarate decahydrate	20	100 gm
26	Magnesium Chloride Anhydrous	20	250 gm
27	Manganse Sulphate	20	1kg
28	Magnesium Sulphate (MgSO4.7H2O)	10	100 gm
29	Nitric Acid Aristar	50	1 Liter
30	Potassium Chromate	20	250 gm
31	Potassium Iodide	20	500 gm
32	Potassium Nitrate	10	500 gm
33	Pottasium Chloride	20	500 gm
34	Silver Nitrate	16	250 gm
35	Sulfuric Acid (0.5 N)	100	1Liter
36	Sodium Chloride	44	500 gm
37	Sodium Hydroxide pellets	20	500 gm
38	Sodium Acetate	20	500 gm

39	Sodium Thiosulphate	20	500 gm
40	Sodium Carbonate	6	500 gm
41	Sodium Iodide	10	1 kg
42	Silver Sulphate	30	50 gm
43	Acetone 99.5%	20	2.5 Liter
44	Aluminuim Potassium Sulphate	20	250 gm
45	Boric Acid	24	500 gm
46	Calcium Chloride	22	500 gm
47	Chloroform	12	2.5 Liter
48	Chromic Acid	2	250 gm
49	Cupper Sulphate	22	500 gm
50	E.D.T.A Dipotasium salt	2	250 gm
51	Zinc Sulphate	20	500 gm
52	Copper Sulphate	22	500 gm
53	Hydroxy Amino Sulphate	2	500 gm
54	Ammonium Molybidate	8	250 gm
55	Ethanol absolute for analsis 99.8%	16	2.5 Liter
56	Hydrogen Peroxide 30%	22	1 Liter
57	Ferric Chloride anhydrous	20	250 gm
58	Mercurc chloride	16	500 gm
59	Phenol Phthalien Powder	20	100 gm
60	Ferrous Sulphate	20	250 gm
61	DiChloro Ethan	5	1 Liter
62	DiChloro Methan	20	1 Liter
63	Phosphoric Acid 99.9%	2	2.5 Liter
64	Pottasium Hydroxide Pellets	2	500 gm
65	Pottasium Persulphate	2	250 gm
66	Sodium Dihydogen Phosphate	5	500 gm
67	Sodium bicarbonate	20	500 gm

Annex 2: Chemicals for Ministry of Municipalities Water Quality Control Laboratories

SN	Item Specification	Unit	Quantity
1	Ammonium Chloride (NH_4Cl) analar	250g	12
2	Acetic acid (Glacial) CH_3COOH 99.7%Analar	2.5L	5
3	Activated carbon (Activated charcoal)	500g	6
4	Ammonium acetate (NH_4 $C_2H_3O_2$) Analar	50g	8
5	Di Basic Ammonium citrate $(NH_4)_2$ $C_6H_5O_7$ Analar	500g	4
6	Ammonium Hudroxide(Nh_4OH) 25%NH_3 Analar	2.5L	5
7	Ammoinum molybdate$(NH_4)_6Mo_7O_{24}.4H_2O$ analar	250g	10
8	Aluminum Sulphate Al_2 $(SO_4)_3$. $18H_2O$	500g	5
9	Ammonium meta vanadate (NH_4VO_3) Analar	250g	8
10	Buffer tabletes for standardization of PH- meter NO.4	pack of 10	10
11	Buffer tabletes for standardization of PH –meter NO.7	pack of 10	10
12	Buffer tabletes for standardization of PH –meter NO.10	pack of 10	10
13	Barium chloride $BaCL_2.2H_2O$ analar	500g	10
14	Brucine sulphate $(C_{23}H_{26}N_2O_4)_2.H_2So_4.7H_2O$ analar	250g	2
15	Boric acid H_3Bo_3 Analar	500g	10
16	Calcium chloride anhydrous $CaCl_2$ Analar	250g	4
17	Cadmium chloride $CdCL_2$ Analar	250g	4
18	Cadmium standard solution for Atomic spectroscopy 1000P.P.M analar	500 ml	3
19	Carbon tetrachloride (CCL_4) Analar	2.5L	4
20	Citric acid ($H_3C_6H_5O_7$:H_2O) Analar	250g	2
21	Copper standard solution for atomic spectroscopy 1000P.P.M analar	500 ml	3
22	Carbon disulfide(CS_2) Analar	500 ml	3
23	Chromium standard solution for atomic spectroscopy 1000P.P.M analar	500 ml	3
24	Calcium carbonat ($CaCO_3$) Analar	500g	2
25	1.5 dipheny1 carbohydrazide (C_6H_5. NH. $NH)_2$ Co analar	100g	3
26	Erochrom black T for water hardness determination analar	250g	2
27	Ethylene diamine Tetra acetic disodium salt analar (CH_2..N(CH_2.COOH). CH_2. $COONa)_2$. $2H_2O$	500g	2
28	Ferric chloride $FeCL_3$. $6H_2O$ analar	250g	2
29	Ferrous ammonium sulphate analar	500g	8
30	Ferrous sulphate ($FeSO_4$ $7H_2O$)analar	250g	10
31	Glucose O.(CH. $OH)_4$.CH CH_2OH analar	250g	2
32	Glutamic acid NH_2.CH(COOH).CH_2. CH_2. COOH	250g	2
33	Hydrochloric acid aristar HCL 37%	2.5L	5
34	Hydrochloric acid concetrated 36.46% analar	2.5L	6
35	Hydroxy1 ammonium chloride analar	500g	2

36	Iodine I analar	250g	3
37	Iron standard solution for atomic spectroscopy 1000P.P.M	500 ml	3
38	Lead nitrate pb $(NO3)_2$ Analar	250g	4
39	Lead standard solution for atomic spectroscopy 1000P.P.M analar	500 ml	3
40	Magnesium sulphate $MgSO_4.7H_2O$ analar	250g	6
41	Mercuric sulphate $HgSO_4$	250g	2
42	Methy1 red PH- indicator	50g	10
43	Methy1 Orange PH-indicator	250g	2
44	Mercuric chloride $HgCL_2$ Analar	250g	2
45	Methanol special quality (solvent) 99.5% CH_3OH analar	2.5L	6
46	Magnesium chloride hexa hydrate $MgCL_2.6H_2O$	500g	2
47	Murexide (ammonium purpurate) $C_8H_4N_5O_6.NH_4$	100g	1
48	Mercuric standard solution for atomic spectroscopy 1000P.P.M analar	500 ml	3
49	1-naphthy lamine $C_{10}H_7NH_2$ Analar	250g	6
50	Nickel standard Solution ,1000 p.p.m (analar)	500 ml	3
51	Nitric acid aristar HNO_3 69%	1L	2
52	Potassium dihydrogen phosphate anhydrous	500g	10
53	Dipotassium hydrogen phosphate anhydrous	500g	10
54	Potassium iodide (KI) analar	250g	8
55	Potassium dichromate $K_2Cr_2O_7$ Analar	250g	8
56	Potassium chromate $K_{2CrO}4$ Analar	250g	10
57	1.10 phenanthroline monohydrate Analar	25g	3
58	Potassium chloride (KCL) analar	250g	4
59	Potassium nitrate (KNO_3) Analar	250g	6
60	Potassium permangnate $KmnO_4$ Analar	250g	2
61	Potassium cyanide (KCN) analar	250g	2
62	Potassium dichromate convol 0.5N $K_2Cr_2O_7$	Pack of 6	5
63	Potassium acid phthalat $(COOHC_6H_4COOK)$	250g	2
64	Phenol phthalein(soild) PH indicator $(C_{2o}H_{14}O_4)$	50g	5
65	Phosphate standard solution for atomic spectroscopy 1000P.P.M analar	500 ml	3
66	Disodium hydrogen phosphate hepta hydrate $Na_2HPO_4.7H_2O$ analar	250g	2
67	Sodium hydroxide pellets(NaOH)analar	500g	20
68	Sodium hydroxide convo1.0 N analar	Pack of 6	2
69	Sodium azide (NaN_3) Analar	250g	3
70	Sodium Bicarbonate NaHCO3 (Analar)	250g	4
71	Salicylic Acid Analar C6H4OH. COOH	500g	2
72	Sodium thiosulphate$(Na_2S_2O_3.5H_2O)$ analar	500g	2
73	Sodium thiosulphate convo10.5 N	Pack of 6	4
74	Sodium arsenite (NaAsO2) Analar	100g	2
75	Sodium pyrophosphate $(Na_4P_2O7.10H_2O)$ Analar	250g	2
76	Sodium acetate $(NaC_2H_3O_2.3H_2O)$ Analar	250g	8

77	Sodium sulphite (Na_2SO_3)Analar anhydrous	500g	1
78	Sodium potassium tartrate Na K($C_4H_4O_6.4H_2O$) Analar	250g	3
79	Sodium chloride NaCL analar	500g	3
80	Sulfuric acid conc.(H_2SO_4)98% analar	2.5L	20
81	Starch soluible extra pure analar	500g	2
82	Sodium carbonate – 10 Hydrate (Na_2 CO_3. 10H20)	100g	10
83	Sulphamic acid analar ($NH_2.SO_3H$)	500g	2
84	Sodium Nitrite ($NaNo_2$) Analar	250g	2
85	Silver nitrate $AgNO_3$ Analar	500g	1
86	Sulphanillic acid ($NH_2C_6H_4SO3H$) analar	100g	6
87	Zinc standard solution for atomic spectroscopy 1000P.P.M analar	500 ml	2
88	Tartaric Acid $C_4H_6O_6$ (Analar)	250g	4

Annex 3: Glassware for Ministry of Environment Water Quality Control Laboratories

No	Item Description	QTY	Unit
1	Gooch Crucibles, porcelain pack of 5 pieces	20	pack
2	Buechner Funnel, Duran, Schott (Cat No. 112134122)	20	ea
3	Crystallizing Dishes, DURAN, Schott Pack of 10 (112131132)	20	pack
4	Crystallizing Dishes, DURAN, Schott Pack of 10 (112131144)	10	pack
5	50 ml Volumetric Flask, Hirschmann (Cat No. 14 88 60175) pk/2	150	pack
6	100 ml Volumetric Flask, Hirschmann (Cat No. 14 88 60180)	150	pack
7	250 ml Volumetric Flask, Hirschmann (Cat No. 14 88 60186) pk/2	150	pack
8	500 ml Volumetric Flask, Hirschmann (Cat No. 14 88 60190) pk/2	100	pack
9	1000 ml Volumetric Flask, Hirschmann (Cat No. 14 88 60193) pk/2	50	pack
10	Mortar with foot made of 18/8 steel, BOCHEM (Cat No. 31 05 08933)	10	ea
10.1	*Pestle, SS additional accessory offered by Supplier*	10	ea
11	Wash Bottles NALGENE, IDL pack of 6 bottles (Cat. No. 22 87 24014)	10	pack
12	Wash Bottles NALGENE, IDL pack of 6 bottles (Cat. No. 22 87 24015)	10	pack
17	Graduated Separatory Funnels, Rettberg (Cat. No. 11 41 11124)	20	ea
18	Graduated Separatory Funnels, Rettberg (Cat. No. 11 41 11144)	20	ea
19	Graduated Separatory Funnels, Rettberg (Cat. No. 11 41 11154)	20	ea
20	50 ml graduated cylinder class B, Hirschmann (Cat No. 14 93 70075)	100	ea
21	100 ml graduated cylinder class B, Hirschmann (Cat No. 14 93 70078)	100	ea
22	250 ml graduated cylinder class B, Hirschmann (Cat No. 14 93 70084)	100	ea
23	500 ml graduated cylinder class B, Hirschmann (Cat No. 14 93 70088)	80	ea
24	1000 ml graduated cylinder class B, Hirschmann (Cat No. 14 93 70092)	80	ea
25	Kjedahl Flask, DURAN, and Schott 1000 ml, h: 350 mm pack of 10 (Cat. No. 112123154)	20	pack
26	0.5 ml Graduation Pipett, Hirschmann Pack of 12 (Cat No. 14 71 11121)	20	pack
27	1 ml Graduation Pipett, Hirschmann Pack of 12 (Cat No. 14 71 11127)	50	pack
28	2 ml Graduation Pipett, Hirschmann Pack of 12 (Cat No. 14 71 11135)	100	pack
29	5 ml Graduation Pipett, Hirschmann Pack of 12 (Cat No. 14 71 11148)	100	pack
30	10 ml Graduation Pipett, Hirschmann Pack of 12 (Cat No. 14 71 11158)	100	pack
31	25 ml Graduation Pipett, Hirschmann Pack of 12 (Cat No. 14 71 11166)	100	pack
32	50 ml Graduation Pipett, Hirschmann Pack of 6 (Cat No. 14 71 11373)	100	pack
33	Bulb Pipette Type BRAND size 1 ml pack of 12 (Cat No. 144912630)	30	pack
34	Bulb Pipette Type BRAND size 2 ml pack of 12 (Cat No. 144912638)	20	pack
35	Bulb Pipette Type BRAND size 5 ml pack of 6 (Cat No. 144912650)	50	pack
36	Bulb Pipette Type BRAND size 10 ml pack of 6 (Cat No. 144912660)	50	pack
37	Bulb Pipette Type BRAND size 25 ml pack of 6 (Cat No. 144912669)	30	pack
38	50 ml beaker, low form with graduation and spout, DURAN, Schott pack of 10 (Cat No. 11 21 10617)	40	pack

39	100 ml beaker, low form with graduation and spout, DURAN, Schott pack 0f 10 (Cat No. 11 21 10624)	40	pack
40	250 ml beaker, low form with graduation and spout, DURAN, Schott pack of 10 (Cat No. 11 21 10636)	40	pack
41	600 ml beaker, low form with graduation and spout, DURAN, Schott pack of 10 (Cat No. 11 21 10648)	40	pack
42	1000 ml beaker, low form with graduation and spout, DURAN, Schott pack of 10 (Cat No. 11 21 10654)	40	pack
43	250 ml beaker, transparent, low form with graduation , BRAND pack of 5 (Cat No. 234989386)	40	pack
44	500 ml beaker, transparent, low form with graduation , BRAND pack of 5 (Cat No. 234989390)	30	pack
45	1000 ml beaker, transparent, low form with graduation BRAND pack of 5 (Cat No. 234989395)	30	pack
46	Analytical Funnels, DURAN, Schott pack of 10 (Cat No. 112133137)	20	pack
47	Analytical Funnels, DURAN, Schott pack of 10 (Cat No. 112133141)	20	pack
48	Analytical Funnels, DURAN, Schott pack of 10 (Cat No. 112133148)	20	pack
51	100 ml Dropping bottle made of Soda-Lime glass, IDL pack of 10 (Cat. No 120027024)	40	pack
56	Amber glass bottle with PTFE-Coated cap, Behr 1000 ml (Cat. No. 124820054)	50	ea
57	Test Tube Racks, 5 x 11 Type BRAND (Cat No. 294943411)	100	ea
58	Petri Dishes Disposable box of 840 dishes (Cat No. 29 78 93060)	50	Box
59	Water sampling flat bottle with Capacity 250ml Pack of 10 bottles (Cat No. 19 31 65253)	150	pack
60	Test tube with rim 18*180mm pack of 100 (Cat No. 11 26 13023)	40	pack
61	Test tube with rim 20*150mm pack of 100 (Cat No. 11 26 13026)	40	pack
62	Durham tube 7.5*50mm, pack of 100	40	pack
63	Transport basket with handle made of stainless steel (Cat. No 396396001)	20	ea
64	Bunsen burner Type BOCHEM 13 mm diameter	40	ea
68	Flat bottom flask wide neck, DURAN, Schott 1000ml pack of 10 (Cat. No. 112173154)	20	pack
70	Spatula Type BOCHEM Twin spatula made of SS, polished, 2 ends curved in spoon form (Cat. No. 330503187)	50	ea
71	Spatula Type BOCHEM Twin spatula made of SS, polished, one end curved in spoon form (Cat. No. 330503216)	50	ea
73	Inoculating Loop dia. 5mm with platinum-iridium (Cat. No 333100005)	30	ea
73.1	*loop holder - additional item offered by sandberg*		

Annex 4: Equipment & supplies for Ministry of Environment Water Quality Control Laboratories

No	Item Description	Quantity	Unit
1	**Gas-Liquid Chromatograph for pesticides, hydrocarbon and PCBS measurements with following features and accessories:**	4	Unit
	1- Automatic sampler		
	2- Carrier Gases: Air, helium, hydrogen, nitrogen, argon-methane		
	3- Oven with temperature range -99 to +450 Deg.C		
	4- Dual Columns: Capillary and packed		
	5- Electronic pneumatic control		
	6- Exhaust Vent		
	7- Detectors:		
	Flame Ionization Detector (FID)		
	Flame Photometric Detector (FPD)		
	Electron Capture Detector (ECD)		
	8- Integrator (built-in or module)		
	9- Printer		
	10- Recommended spare parts and accessories for 3-month operation		
	11- Installation and application training for 2 weeks inside Iraq		
	12- One year warranty starting date of installation		
	13- Backup UPS		
2	**High Performance liquid Chromatography (HPLC) for measurement of hydrocarbon and Pesticides**	4	System
	1- This section describes basic equipment requirements for a HPLC system and shall includes the following components:		
	1-1 **Sample Injector:**	4	units
	1-1-1 Automatic sample injector		
	1-1-2 Number of vials: 48		
	1-1-3 Auto flushing		
	1-1-4 Standard vial: 12 x 32 mm: 22 x 38mm: 23 x 46mm		
	1-2 **Pump:**	4	units
	1-2-1 Gradient pump (quadruple), flow ranges: 0.000-8,000 ml/min (step 0.001). Pressure range up to 400 bars		
	1-3 **Detector types for wide range of application:**		
	1-3-1 UV-Visible Detector	4	
	1-3-2 Diode array	4	
	1-4 **3 channels Self cleaning vacuum system**	4	
	1-5 **Recommended spare parts and accessories for 3-month operation**	4	set
	1-6 **Installation and application training for 2 weeks inside Iraq**	4	
	1-7 **One year warranty starting date of installation**	4	year

	1-8 **HPLC Columns:** Standard high speed stainless steel column	4	set
	Column mounted panel		
	1-9 Supplied complete with solvent and pipe organizer	4	
3	**Spectrophotometer, UV/Vis with a wavelength range from: 190nm - 900nm. JENWAY Model 6405.** Wave length accuracy +1.0 nm; 5nm band width. High resolution, grapgics LCD. Units selection: ppm,mg/L,g/L,M,%,Blank. Analogue bi-directional output. Supplied with full user manual in English.	15	Unit
	1- Microprocessor – controlled UV/VIS spectrophotometer shall have single beam operation with automatic reference corrected measurements		
	2- The unit shall feature a wavelength range from 190-900 nm		
	3- High resolution CRT with optional function changing dynamic keys		
	4- The spectrophotometer shall perform a self test at power-up. It is preferable if the operator has access to a diagnostic mode to verify the system function		
	5- Cuvettes		
	5-1 Glass, standard size	15	ea
	5-2 Quartz	15	ea
	6- Spare light source		
	6-1 Tungsten Lamp	15	pcs
	6-2 Deuterium Lamp	15	pcs
4	**Microscope, light binocular version with digital camera**	3	Unit
	1- At minimum, the microscope shall include a lens system (eyepieces, objectives, and substage condenser), a body (observation tubes with diopter adjustment, interpupillary adjustment, and revolving nosepiece), a stage and stage controls, and an illumination system (iris diaphragm, focusing knobs, and light port).		
	2- Shall incorporate a binocular observation tube with an inclination of 45°.		
	2-1 The optical tubes shall be have provisions for auxiliary eyepieces.		
	3- The eyepiece power shall be 10x, wide field.		
	3-1 The eyepiece shall have an interpupillary distance of no greater than 75 mm.		
	3-2 Objectives of 4x to 100x shall be achievable.		
	3-3 Total maximum magnification shall be no less than 1,000x.		
	4- The stand shall be moving stage, rack and pinion.		
	4-1 Adjustments shall be in 1 mm increments.		
	5- The stage shall include coaxial X-Y controls, and motion shall be roller-bearing.		
	6- The illumination condenser shall be abbe type.		
	6-1 The numerical aperture shall be 1.25.		
	6-2 The light source shall be a Halogen bulb with no less than 20 W.		
	6-3 Replacement Halogen bulb	8	ea
	7- Contrast methods shall include, but not be limited to, phase, brightfield, darkfield, incident, polar, interference, and contrast.		

	8- The unit shall include a custom sterile cover.		
	9- The unit shall be configured with digital mera and adaptor with following specifications:		
	10- The unit shall be configured with a photo/video adapter and color monitor 15".	4	
	11- The unit shall be configured with digital camera, and adaptor	4	
	Digital Camera: Resolution 480, 320x240 pixel		
5	**Microscope, light - binocular version**	15	Unit
	1-1 At minimum, the microscope shall include a lens system (eyepieces, objectives, and substage condenser), a body (observation tubes with diopter adjustment, interpupillary adjustment, and revolving nosepiece), a stage and stage controls, and an illumination system (iris diaphragm, focusing knobs, and light port).		
	1-2 Shall incorporate a binocular observation tube with an inclination of 45°.		
	1-3 The eyepiece power shall be 10x, wide field.		
	1-3-1 Objectives of 4x to 100x shall be achievable.		
	1-3-2 Total maximum magnification shall be no less than 1,000x.		
	1-4 The stand shall be moving stage, rack and pinion.		
	1-5 The illumination condenser shall be abbe type.		
	1-5-1 The numerical aperture shall be 1.25.		
	1-5-2 The light source shall be a Halogen bulb with no less than 20 W.		
	1-5-3 Spare Halogen bulb.	30	ea
	1-6 Contrast methods shall include, but not be limited to, phase, brightfield, darkfield, incident, polar, interference, and contrast.		
	1-7 The unit shall include a custom sterile cover.		
6	**Atomic Absorption Spectrometer,** model AA-50/55 or similar with all necessary accessories and installation kit (Exhaust system). Also including Backup UPS, Nitrous oxide burner, nebulizer component set guages and gas regulators and air compressor.	8	unit
	1- The Spectrophotometer shall possess the following components:		
	A light source		
	An atomizer assembly		
	A wavelength dispersing device (monochromator)		
	A photo detector		
	A meter or readout device		
	Autosampler unit		
	Nebuliser Assembly		
	Acetylene / Air Burner Head		
	Cold Vapour technique		
	Circulationg Cooling System		
	Gas control - automatic		
	2- Two hollow cathode lamps for each of the following elements:		set
	Ca, Mg, Fe, Cu, Cr, Cd, Pb, Mn, Hg, Al, Zn, Ni, As. Co.	16	set
	3- Installation kit and accessories including Exhaust system: Chimney, exhaust fan with regulator and etc.	set	

	4- Back Up UPS		
	5- Safety system		
	5-1 Separate ignite/flame - off buttons		
	5-2 Serial interlocks to include:		
	1 Monitor burner type		
	2 Burner correctly fitted		
	3 Liquid trap		
	4 Pressure relief bung		
	5 Flame shield		
	6 Flame operation		
	7 Oxidant pressure within safety reservoir		
	6- Flame atomization system: Premix universal atomizer with fully adjustable nebulizer.		
	7- Display		
	7-1 LCD screen display of the following:		
	1 Choice of available methods		
	2 Measurement parameters		
	3 Optimization		
	4 Calibration parameters		
	5 Results (concentration, precision (% RSD or % precision), mean absorbance, etc…)		
	6 Instrument parameters and options		
	8- Installation and application training for 10 days inside Iraq	8	
	9- Consumables for 1000 Analysis Graphite Technique	8	
	10- Consumables for 1000 Analysis Flame Technique	8	
7	**Kjeldahl digestion** apparatus Type GERHARDT (Cat No. 472850031) with 6 recesses for flasks 18 to 50ml. Stainless Steel case fitted with adjustable clamps, fume tube supports and energy regulators. Is used to determine amino acid.	15	Unit
8	**Ion Chromatograph with following features & accessories:**	1	Unit
	1-1 **Sample Injector:**	1	units
	1-1-1 Automatic sample injector		
	1-1-2 Number of vials: 48		
	1-1-3 Auto flushing		
	1-1-4 Standard vial: 12 x 32 mm: 22 x 38mm: 23 x 46mm		
	1-2 **Columns:** standard stainless steel, Peek column	1	set
	1-2-1 Particle size , um : 7, >=10		
	1-2-2 Particle type: Spherical irregular		
	1-2-3 Sorbent types: C18, polymeric		
	1-2-4 Normal phase: Silica, polymer-based anion and cation exchange		
	1-3 **Detector types:**		
	1-3-1 UV-Visible Detector 190 - 800 nm	1	
	1-4 **Pump: 1 Pump heads**	1	units
	1-4-1 Standard flow ranges: 0.01-10 mL/min.		

	1-5 Data management software package with LCD display, with 1-2 channels, Integrated recording system	1	
	1-6 **Recommended spare parts and accessories for 3-month operation**	1	set
	1-7 **Installation and application training for 2 weeks inside Iraq**	1	
	1-8 **One year warranty starting date of installation**	1	year
	1-9 **Backup UPS**	1	
9	**Water Bath type GFL with stainless steel cover**. Microprocessor-controlled temperature regulation model 1004 (Cat. No. 441112004)	15	Unit
10	**Microbiological Incubator,** Binder BD 400 (Cat. No. 41 40 11073)	15	Unit
11	**Mono Water Stills** made of glass type GFL capacity 4 L/hr model 2204 (Cat. No. 941112204)	20	Unit
	1- Spare heater element	20	ea
	2- Storage tank 8 L	20	ea
12	**Heating Oven and Sterlizer** type Binder model ED115 (Cat No. 414012096)	15	Unit
13	**Multiple Magnetic Stirrer** type Multipoint H+P Labortechnic model Multipiont 6 (Cat No. 517930625)	11	Unit
14	**Electrical Hot Plate** (38 - 350 DegC) with variable temperature control type Gestigkeit model HD 0 (Cat No. 430600120)	11	Unit
15	**Steam Autoclave**, Type Kestrel 150 Liters (Cat No. 48 78 01150)	15	Unit
16	**Table Top Shaker (speed: 30 - 420 rpm)** Type Certomat SII/25mm (Cat No. 520862524) with universal attachment	4	Unit
17	**Conductivity Meter** HANNA Model HI 9932	8	Unit
18	**Electronic Analytical Balance, (160g)** Keren type 770 series (Cat. No. 64 58 77015)	15	Unit
19	**Dissolved Oxygen Meter** HANNA Model HI 964400	6	Unit
20	**Laminar-Flow Safety work Bench Cabinet** Type BDK (Cat No. 839910406)	15	Unit
	Spare filters	15	ea
21	**Fume Hood** type Kottermann (Cat No. 911245400)	15	Unit
22	**Centrifuge** Type Heraeus Model Labofuge 200 (Cat No. 553313630) with rotor head with max capacity of 4x750 mL, rubber insert for 100ml tubes, & adaptors.	4	Unit
23	**Turbidity Meter** HANNA Model LP 2000	5	Unit
	Cuvettes, with cap, pack of 6	5	ea
	Spare lamp kit	5	ea
	Standardization kit, with Gelex	5	ea
24	**Portable Turbidity Meter** HANNA Model 93703-C (Cat No. 639693703)	10	Unit
25	**Hot Plate Magnetic Stirrer** Type MBT(Cat No. 517882000)	15	Unit
26	**Flame photometer**, Type JENWAY Model PFP7 order No. 500094. 3.5 digital readout, 190-250V, 50/60Hz, supplied with filters for Na and K only, fuel and air connectors, major spare kits and instructions and service manual	15	
	Air compressor. Provides moisture and oil-free air, 220/240V, 50Hz	15	
	Propane gas regulator	15	
	Calcium filter	15	

	Lithium filter	15	Unit
	Barium filter	15	
	Industrial calibration standard, Na, 1000ppm, Sodium, 500ml	30	
	Industrial calibration standard, K, 1000ppm, Potassium, 500ml	30	
	Industrial calibration standard, Li, 1000ppm, Lithium, 500ml	30	
	Industrial calibration standard, Ba, 3000ppm, Barium, 500ml	30	
	Industrial calibration standard, Ca, 1000ppm, Calcium, 500ml	30	
	Industrial calibration standard, Ba, 1000ppm, Barium, 500ml	30	
27	**Lovibond PCCheckit COD** measurement station (Cat No. 807709240)	15	
28	**Thermocycling Incubator** Type RUMED (Cat No. 417723201)	15	Unit
29	**Colony Counter** Model BZG 30 (Cat No. 88 81 38314)	10	Unit
30	**Chemicals Cupboard** with filter system Type CAPTAIR (Cat No. 914080400)	15	
31	**Water Test meter** Type HANNA for pH, Conductivity, Temperature and ORP code No HI 98204	30	Unit
32	**CO2 Incubator** Type BINDER CB150 (Cat. NO. 414040001)	3	Unit
33	**Water grab sampler** Type ORI (Cat No. 392250723)	30	

Annex 5: Equipment & supplies for Ministry of Municipalities Water Quality Control Laboratories

SN	Commodity	UNIT	Quantity
1	Microbiological Incubator, Binder BD240 (Cat. No. 41 40 11089)	Each	31
2	Thermostat- Controlled table Top Autoclave Type Kleinfeld Model CertoClav CV-EL 18 LGS (Cat No. 48 72 11018)	Each	31
3	Top bench pH meter HANNA Model pH 213 with electrodes	Each	105
4	Conductivity Meter HANNA Model HI 9932	Each	180
5	Dissolved Oxygene Meter HANNA Model HI 964400	Each	105
6	Turbidity Meter HANNA Model LP 2000	Each	180
7	Portable Turbidity Meter complying with ISO 7027 Type HANNA model HI 93703-C	Each	800
8	Colony Counter Model BZG 30 (Cat No. 88 81 38314)	Each	60
9	DPD Chlorine Comparator kit Model LaMotte (Cat No. 66170-136)	Each	800
10	DPD No.1 Chlorine Tablets Pack of 50 (Cat No. 66130-255)	Pack	40000
11	Bunsen burners, BOCHEM (Cat No. 32 05 07000)	Each	31
12	VARIOMAG Magnetic Stirrer, H+P Labortechnik (Cat No. 51 79 36102)	Each	31
13	Magnetic Stirring Bars Set, IDL (Cat No. 24 00 10010)	set	31
14	Electronic Analytical Balance Keren type 770 series (Cat. No. 64 58 77015)	Each	31
15	Universal Oven Type Memmert (Cat. No. 412631301)	Each	31
16	Water Bath Type Memmert model WB14 with cover (Cat. No. 442630014)	Each	31
17	Water Distiller Type GFL with capacity 4L/hour (Cat No. 941112204)	Each	31
18	Desiccator with knobbed lid, DURAN, Schott (Cat No. 122478157)	Each	31
19	Bench-top orbital shaker type CERTOMAT (Cat. No. 520862621)	Each	2
20	Digital Pocket Thermometer, Windaus (Cat. No. 680300570)	Each	105
21	Analytical Seive Shakers Type RETSCH (Cat. No. 542916050)	Each	2
	Jar Tester Type BEHR model JF/6 (Cat. No. 804800012)	Each	31
22	Petri Dishes , Quartz Glass, OGT Bad Herzburg (Cat No. 183675013)	Each	15000
23	Test tube with rim 160*16mm pack of 100 (Cat No. 11 26 13021)	Pack	400
24	Test tube with rim 180*18mm pack of 100 (Cat No. 11 26 13023)	Pack	400
25	Durham tube 7.5*50mm, pack of 100	Pack	800
26	Digital Dispenser Model SOCOREX (Cat No. 14 75 51124)	Each	65
27	Amber glass thread bottle Volume 1000 ml (Cat No. 14 75 52210)	Each	200
28	Transport Basket with handle (Cat No. 39 63 96001)	Each	150
29	Test Tube Racks (Cat No. 39 00 01239)	Each	400
30	25 ml Volumetric Flask, Hirschmann (Cat No. 14 88 60170)	Each	500
31	50 ml Volumetric Flask, Hirschmann (Cat No. 14 88 60175)	Each	400
32	100 ml Volumetric Flask, Hirschmann (Cat No. 14 88 60180)	Each	400
33	1000 ml Volumetric Flask, Hirschmann (Cat No. 14 88 60193)	Each	200
34	50 ml beaker, low form with graduation and spout, DURAN, Schott (Cat No. 11 21 10617)	Each	500
35	100 ml beaker, low form with graduation and spout, DURAN, Schott	Each	400

	(Cat No. 11 21 10624)		
36	600 ml beaker, low form with graduation and spout, DURAN, Schott (Cat No. 11 21 10648)	Each	300
37	2000 ml beaker, low form with graduation and spout, DURAN, Schott (Cat No. 11 21 10663)	Each	100
38	50 ml graduated cylinder class B, Hirschmann (Cat No. 14 93 70075)	Each	500
39	500 ml graduated cylinder class B, Hirschmann (Cat No. 14 93 70088)	Each	300
40	2000 ml graduated cylinder class B, Hirschmann (Cat No. 14 93 70096)	Each	200
41	1 ml Graduation Pipett, Hirschmann Pack of 12 (Cat No. 14 71 11127)	Pack	200
42	2 ml Graduation Pipett, Hirschmann Pack of 12 (Cat No. 14 71 11135)	Pack	200
43	5 ml Graduation Pipett, Hirschmann Pack of 12 (Cat No. 14 71 11148)	Pack	300
44	10 ml Graduation Pipett, Hirschmann Pack of 12 (Cat No. 14 71 11158)	Pack	400
45	Wash Bottles NALGENE, IDL pack of 6 bottles (Cat. No. 22 87 24014)	Pack	100
46	Automatic Burettes, Hirschmann 25ml (cat No. 14 82 54165)	Each	50
47	Automatic Burettes, Hirschmann 50 ml (cat No. 14 82 54172)	Each	50
48	Analytical Filter Papers, Schleicher & Schuell Pack of 100 (cat. No. 25 02 01216)	Pack	100
49	Analytical Filter Papers, Schleicher & Schuell Pack of 100 (cat. No. 25 02 012100)	Pack	100
50	Analytical Filter Papers, Schleicher & Schuell Pack of 100 (cat. No. 25 02 01202)	Pack	100
51	Analytical Filter Papers, Schleicher & Schuell Pack of 100 (cat. No. 25 02 01204)	Pack	100
52	Inoculating Loop dia. 2 mm platinum-iridium (Cat No. 33 31 00002)	Each	400
53	Inoculating Loop dia. 5 mm platinum-iridium (Cat No. 33 31 00005)	Each	400
54	Disposable gloves, Braun Pack of 100 (Cat No. 36 42 53004)	Pack	200
55	Mortar with foot made of 18/8 steel, BOCHEM (Cat No. 31 05 08933)	Each	50
56	Gooch Crucibles, porcelain pack of 5 pieces (Cat No. 21 21 29038)	Pack	50
57	Filtration Rack made of polyvinylchloride for 4 funnels (Cat No. 240513104)	Each	20
58	Graduated Separatory Funnels, Rettberg (Cat. No. 11 41 11144)	Each	100
59	Analytical Funnels, Duran Pack of 10 pieces (Cat. No. 11 21 33141)	Pack	50
60	**Spectrophotometer, UV/Vis with a wavelength range from: 190nm - 900nm. JENWAY Model 6405.** High resolution, grapgics LCD. Units selection: ppm,mg/L,g/L,M,%,Blank. Supplied with user manual in English	Unit	31
	1- Microprocessor – controlled UV/VIS spectrophotometer shall have single beam operation with automatic reference corrected measurements		
	2- The spectrophotometer shall perform a self test at power-up. It is preferable if the operator has access to a diagnostic mode to verify the system function		
	3- Cuvettes		
	5-1 Glass, standard size		31
	5-2 Quartz		31
	6- Spare light source		31

	6-1 Tungsten Lamp		31
	6-2 Deuterium Lamp		31
61	**Flame photometer**, Type JENWAY Model PFP7. 3.5 digital readout, 220V, 50/60Hz, supplied with filters for Na and K only, fuel and air connectors, major spare kits and instructions and service manual	Unit	16
	Air compressor. Provides moisture and oil-free air		16
	Propane gas regulator		16
	Calcium filter		16
	Lithium filter		16
	Barium filter		16
	Industrial calibration standard, Na, 1000ppm, Sodium, 500ml		32
	Industrial calibration standard, K, 1000ppm, Potassium, 500ml		32
	Industrial calibration standard, Li, 1000ppm, Lithium, 500ml		32
	Industrial calibration standard, Ba, 3000ppm, Barium, 500ml		32
	Industrial calibration standard, Ca, 1000ppm, Calcium, 500ml		32
	Industrial calibration standard, Ba, 1000ppm, Barium, 500ml		32

III. Results

An assessment of the extent to which the programme/project component / programme /project has achieved the outcomes and outputs expected

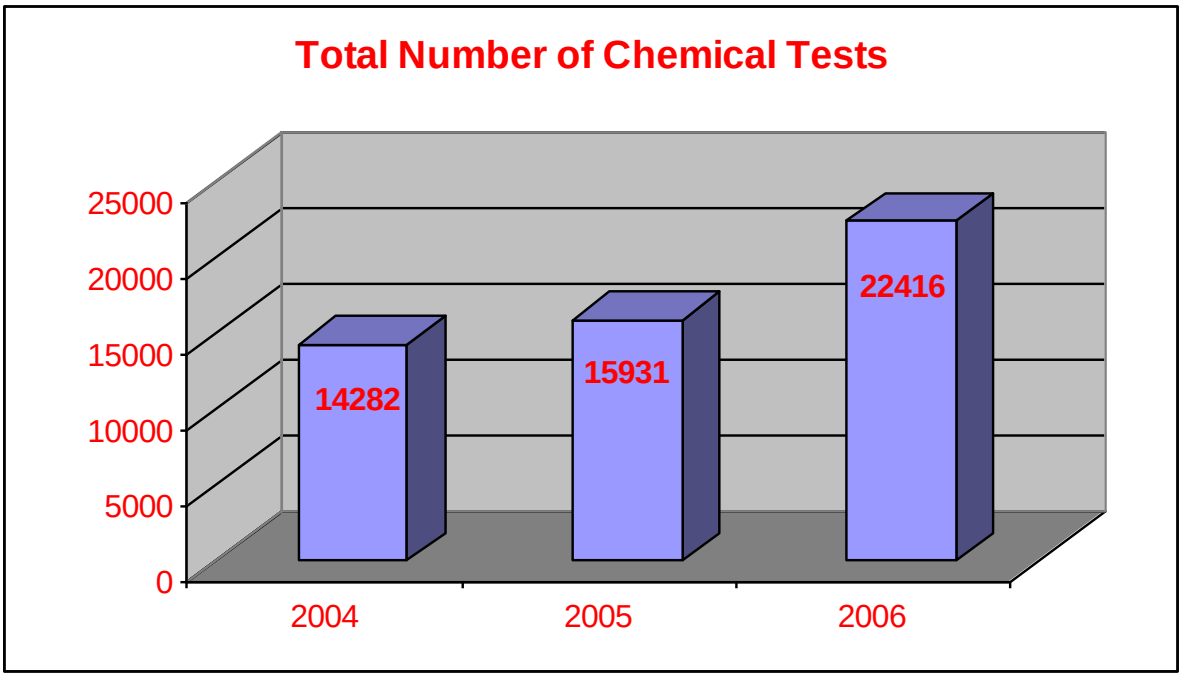
The establishment of **265** water quality control laboratories network (**15** governorate, **30** district and **220** operational at water treatment plant level) in south, centre and north enhanced the water quality monitoring system and helped in increasing water samples testing to **80%** (44,631 samples during 2,006 in comparison with 24,585 samples during 2004). The equipment, laboratory supplies and reagents procured and received by the laboratories have enhanced the water testing procedures and facilitated the analysis of many tests which were not used to be done before. This lead to an increase in new water quality parameters tests by almost **60%**.

The **16** training of trainers courses which were conducted in Amman for about **200** laboratory technicians from both MOEv and MOMPW had positive impact on the performance of the staff by exposing them to the up-to-date technology and procedures in water quality testing and monitoring. The trained technicians were able to conduct **36** similar courses on-job trainings inside Iraq for about **1,200** technicians from all over Iraq. The said figures represent **167%** of what had been planned within the project document.

33 training activities (school awareness and community mobilization campaigns) were conducted in Al Sadr city of Baghdad and in four southern governorates targeting 680 school teachers, community and religious leaders. Information materials, posters and school children booklet were also produced. The impact of the campaigns enhanced the hygiene practices within the community and some water born diseases were reduced, for example no cholera case were reported in the last two years. In addition, the number of diarrhoeal incidence for under 5 years children were decreased by **25%**.

The programme contributed to overall objectives of the PHC and health care delivery system through promotion and protection of health and improving the quality of living standards, reducing the incidence of communicable diseases and community involvement and participation in the activities.

In conclusion currently both MOEv and MOMPW had well established and sustainable water quality control laboratories network which serve as a good diagnosis tool for identifying sources of water pollution.



Main activities undertaken and achievements/ impacts:

Rehabilitation of Central Water Quality Control Laboratory in Baghdad

The rehabilitation of MOEv central water quality control laboratory in Baghdad has been completed at a total cost of around US$ 333,000. The laboratory is now fully furnished and all the procured equipment has been installed. Currently the laboratory is fully functioning, and is conducting analysis of water quality samples collected from several water sources and is also effectively diagnosing sources of water pollution. The laboratory worked as a reference laboratory for the whole country. The photos of the completed laboratory are shown below.

Front elevation of MOEv Central Lab after Rehabilitation

Front elevation of MOEv Central Lab before Rehabilitation

Re-establishing a water quality control network throughout Iraq by equipping the laboratories with all essential equipment and laboratory supplies

Provision of equipment for both Ministry of Environment and Ministry of Municipalities and Public Works water quality control laboratories

Based on the priority and real needs, equipments, supplies and laboratory reagents cost circa 4.6 Million US$ were procured including 36 vehicles for transporting water samples from different water sampling points to the laboratories. All were delivered and installed at the water quality control laboratories**.** All the procured equipment and supplies were distributed and installed in the rejuvenating **265** water quality control laboratories (45 under umbrella of MOEv and 220 under umbrella of MMPW), which are now fully functional and used for water quality testing to ensure that water produced and distributed to the consumers is in compliance with the national drinking water quality standard for Iraq. The impact of the provision of the equipment and supplies appeared by the increased number of water samples being tested (80%) and the fully functional water quality monitoring laboratories network which ensures good diagnosis of water pollution sources. Together, these interventions led to a positive impact on reducing water borne diseases as mentioned earlier. Moreover, the procured equipment facilitated and enhanced water quality testing through conducting analysis of water quality parameters which was not the case two years ago.

MMPW Laboratory after supplying equipment and supplies

MMPW Laboratory before supplying equipment and supplies

Development of human capacity among laboratory managers, technicians and sanitarian professionals through trainings and workshops

In terms of capacity building, WHO organized and facilitated **16** training of trainers which were conducted in Amman for about **200** laboratory technicians from both MOEv and MOMPW. Training activities inside Iraq where conducted for 400 technicians and all were facilitated by the master trainers who were trained in Amman. That brings the total trainings conducted inside and outside Iraq to 63 training activities.
The training sessions which were funded under the water quality control programme have enhanced and upgraded the knowledge of the laboratory technicians through transferring up-to-date and international standards, knowledge and techniques to Iraq. This transferred technology and knowledge improved the performance of the technical staff working on the water quality monitoring and surveillance, and consequently improved the diagnosis of the water pollution.

Training outside Iraq

Since the start of the project, WHO have organized 16 training courses in Amman for the water quality control technicians working in the laboratories in both the MOEv and MOMPW as shown in the table below:

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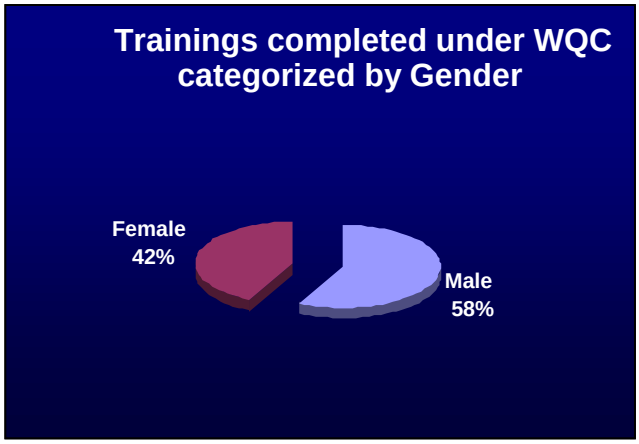
Training Title	No. of attendees
How to conduct Sanitary Survey for Water System	20
Geographic Information System	10
Simplified Procedures for Water Examination	16
Determination of Organic Pollutants by using HPLC Techniques	7
Isolation and Diagnosis of Vibrio Cholera	8
Environmental Impact Assessment	10
Determination of Trace elements and Heavy Metals by using Atomic Absorption Techniques	6
Diagnosis of Algae and Fungi in Water	7
Quality Assurance and Quality Control for Laboratory Procedures	9
Laboratory Information Management System	9
Drinking Water Monitoring Plans and Sampling	16
Basic Environmental Health	12
Environmental Audit	16
Chemical Safety	20
Environmental Awareness	16
State of Environment Writing Report	16

The total number of direct beneficiaries is approximately 196 technicians. Gender balance and geographical locations were taken into consideration as shown in the diagrams below. Some of these technicians acted as trainers and run similar courses inside Iraq, thus increasing the number of indirect beneficiaries.



Training inside Iraq

Since the start of the project, WHO has supported the MOEv in the implementation of 27 training courses in water quality control areas within the country, 675 laboratory technicians benefited from the trainings. WHO also supported 20 training courses conducted by the Ministry of Municipalities and Public Works, 400 laboratory technicians benefited from the training.

On job training of laboratory technicians on water quality analysis

Impact - By improving water quality control monitoring system within Iraq the project helped avert outbreaks of water-borne diseases such as cholera and dysentery which occurred from 1999 up to 2004. The project complemented other projects implemented within cluster E which have directly addressed the needs of safe water provision to 15 million people.

Cost effectiveness – the strategy adapted was 'rehabilitation' which itself is a cost effective means compared to constructing a new system. Cost effectiveness is an integral part of the project design. In addition to that the capacity building approach was the milestone for the sustainability of the project.

UN's assistance focused on 'rehabilitation' of defunct/dysfunctional systems rather than creating 'new' systems. The rehabilitation approach brought immediate dividends i.e. the systems became operationalized quickly and cost effectively by simply attending to the malfunctioning part of the system. The project provided a good mix of hardware and software interventions.

Provision of Publications and Books for Ministry of Environment and Ministry of Municipalities and Public Works

In order to enhance the capabilities of the technical staff responsible for water quality monitoring and surveillance and to give them access to the latest publications and literature in the area of water quality, WHO has provided the MOEv with more than 1,900 copies of publications and books in the water quality field. Further, the Ministry of Municipalities and Public Works received more than 300 copies of different publications and books related to water treatment, supplies and quality. WHO also has provided technical materials on CD ROMS.

Implement a hygiene education campaign, with special attention to the high risk areas in terms of water born diseases

In addition to the hygiene education campaign which was implemented in Asadr city of Baghdad during July 2005, another campaigns were conducted in 4 southern governorates targeting about 300 health professionals and community leaders, the campaigns focused on slum and high risk areas in terms of water born diseases.

School teachers and community leaders, being trained on hygiene education

Involving the NGOs and the institutions, over 700 community leaders and teachers have been oriented on hygiene promotion. With the capacity development activities, government staff is now better placed to adapt the knowledge and skills for improving efficiency, new techniques, public private partnership and community involvement. It is expected that the emerging stability and a conducive environment will provide better opportunities for introducing new ideas

Implementation constraints, lessons learned from addressing these and knowledge gained from assessments, evaluations and studies that have taken place during the project:

Implementation constraints:

- The unpredicted security situation led to limiting the numbers as well as movement of WHO staff. Moreover, the prevailing deteriorated situation affecting Baghdad has rendered communications between the capital and the governorates hazardous. However, innovative implementation mechanisms such as enhanced virtual management, national staff presence and a network of national focal points working hand in hand with local authorities at governorate levels assisted to mitigate the adverse impact of the security situation. Obviously there were increased management costs implications due the lack of security.
- Implementation of $ 6.2 million project in 12 months in such situation was difficult. Therefore, extensions have been requested.

- Timely installation of laboratory equipments and start-up operation was among the challenges, as it was too difficult for suppliers to go to Iraq and start the installation and commissioning of the received equipment.

The lessons learned during the implementation of the project components were:

- Engagement of Iraqi counterparts at every stage of planning and implementation is essential to ensure ownership and congruence with their future vision.
- Building capacity at different hierarchical levels ensured efficient and effective implementation of the programs.
- Partnership, communication and coordination between all stakeholders, including local community leaders, were essential for successful implementation at all levels.
- WHO Iraq team always worked with different scenarios and options when planning any activities inside Iraq, in Amman or in the Region. Flexible agendas and precautionary measures with bookings and travel were observed.
- Capitalization on Headquarters Office, Regional Office and collaborating centers expertise added more value to results achieved.

Monitoring and evaluation:

1. Ensuring involvement of Iraqi counterparts

- WHO maintained close collaboration with all Iraqi key partners and technical team at the end-user/beneficiary sites/facilities) and engaged them in each step from project proposal formulation till final execution of the project components.
- WHO implemented the project components through line ministries' staff, WHO international and national staff, private contractors, regional authorities and ensured involvement of community and religious leaders.
- The implementation of the project was guided by the project steering committee (PSC) which is composed of representatives (senior officials) of the line ministries, WHO and UNICEF

2. Follow-up on actual project implementation

- In terms of the rehabilitation works, WHO in coordination with line ministries prepared all the drawings, bill of quantities and the bidding documents. The line ministry announces the tender in Iraqi local newspaper, after receiving offers from local contractors and the offers pass through several committees (bid opening, analysis and review committees), then a double check has to be done by WHO technical staff at the field level and then by WHO country office in Amman where all documents are scrutinized by the technical team led by the technical officer in charge before submitting the project documents to WHO Representative for approval. This is to ensure that all the process is done according to both WHO and ministry rules and regulations and are in accordance with the guidelines for rehabilitation projects.
- During the project implementation, both WHO and line ministries engineer teams supervised and monitored the works. (refer to section II of the present note for further details)
- For the procurement of goods, this is done through procurement section at either WHO country, Regional and Headquarters offices depending on the amount of money involved and availability of required supplies on the local market. The procured goods are shipped to Iraq through Jordan and the installation is the responsibility of the suppliers with supervision from both WHO and the line ministries.
- WHO supervisory teams and focal points are in daily contacts with line ministry teams at central and governorate levels. This is in addition to ad hoc visits to the project sites to monitor and provide technical advice to ministries staff. Monthly meetings and reporting are conducted to update on the implementation status of the project components.
- Technical project review meetings were conducted in Amman between WHO and line ministry technical teams involved in the implementation. This is in addition to

meetings held with ministry officials during project related capacity building activities conducted in Amman.

- WHO in consultation with the counterparts facilitated the implementation of training of trainers programs outside Iraq where the participants become trainers for the technical staff inside Iraq.
- WHO is using different innovative communication modus operandi such as tele/video conferencing and enhanced access to internet which facilitate interactions despite the current security strains.

3. Monitoring Reporting

- Weekly and monthly reports are received from WHO focal points, also the line ministries implementing and monitoring teams provide WHO with monthly reports on the implementation progress.
- Monthly financial reports are prepared by WHO country office and validated through internal WHO global financial procedures before sharing with UNDP, New York as the administrative agent of the UNDG ITF.
- Six month progress reports are prepared by WHO with involvement of line ministries' technical teams.

4. Internal and external auditing of UNDG ITF projects

- At the request of WHO country office, three weeks internal auditing was conducted on all UNDG ITF projects in which WHO is involved including water quality control and surveillance in Iraq project.
- A four weeks external auditing also focused on UNDG ITF projects have been conducted during 2006.
- The recommendations and suggestions mentioned in the auditing report for improving the performance of the implementation were seriously considered and implemented.

Key partnerships and inter-agency collaboration, impact on results:

The good coordination and continuous cooperation between all key stakeholders (the MOEv, MOMPW, WHO and UNICEF) had led to smooth implementation of the major activities which as a consequence will have positive impact on the performance and functionality of the water quality monitoring system and will lead to more precise diagnosis of the pollution sources and consequently help the decision makers to choose the best available solutions.

Highlights and cross cutting issues pertinent to the results e.g. gender disaggregation, policy engagement and participation of the public:

In general, the project addressed many cross cutting issues. In terms of the environment, the project targeted the protection of water resources from pollution through good diagnosis mechanisms. As a result it has positive impact on the environment, population health and improving the quality of services provided. In terms of gender, the project benefited all water consumers (men, women and children). Also gender balance was tackled with regard to capacity building. In terms of employment creation, the rehabilitation works and local procurement and transport of goods have created more than 300 job opportunities. In terms of public participation, the hygiene campaign was based purely on public participation which is an important element of PHC.

IV. Follow up actions and sustainability

Priority actions that should be supported/implemented following completion of project to build on achievements and partnerships rectify shortcomings encountered and use the lessons learned during the project with strong emphasis on achieving sustainability of the outcomes:

A second phase project was approved and funded by the UNDG ITF to ensure the continuity of water quality monitoring, and to expand the water quality monitoring network to cover additional water sources and include wastewater treatment plants and to perform extra water quality analysis to meet Iraqi national standard for drinking water.

Indication of major adjustments in the strategies, targets or key outcomes and outputs:

No any adjustment made to the targets or the key outcomes, the project components were implemented according to the designed work plan.

Estimated Budget required:

The second phase was funded with a budget of 4.297 million US$.

Logical Framework

Objectives	Measurable indicators	Means of verification	Outcomes
Development Objective			
• "To ensure further reinforcement of the water quality monitoring program with the overall purpose of supporting the provision of safe drinking water as a right to the consumers according to Iraqi Standards and WHO guidelines for potable drinking water. This will include introducing systematic approach to water quality monitoring through out the governorates".	• 80% of water pollution sources identified and controlled. Number of water pollution sources will be identified which lead to drinking water quality improvement. • 90% of water born diseases incidents will be reduced.	• Water Quality Data from weekly, monthly and annual reports of both ministries (MoEnv ,MMPW and Mayoralty of Baghdad) • Ministry of Health annual reports. • WHO communicable diseases reports. • UNICEF reports on morbidity/ mortality rates	• Sustainable water quality control laboratories network composed of 265 labs. are functioning all over Iraq. • Sources of water pollution are well diagnosis through continuous monitoring. • Diarrhoeal diseases decreased by 25%.
Immediate Objectives:			
• Enhance and improve chemical and bacteriological analytical capacities inside the laboratories; • Build the capacity of both the MOEv and MOMPW at the central, governorate and district levels for planning, implementing and monitoring – main concentration will be on the improvement of technical and managerial capacities of the staff responsible for water quality control; • Ensure that the MOMPW is providing safe drinking water; • Improve management of the monitoring system; • Empowerment of the MOEv staff to enforce the rules and regulations of Iraq, in order to protect the environment in general and water resources from pollution; • Raise public awareness about the protection and preservation of water resources. • Water quality surveillance system supported, where a comprehensive water quality program is implemented through out the country.	• 200 quality control labs equipped with essential analysis equipment. • 1160 laboratory technicians trained on testing and monitoring techniques and regulations. • 8 Hygiene education campaigns conducted.	• Weekly, monthly and annual water quality data reports from MoEnv, MMPW. • Monitoring reports from WHO/UNICEF focal points.	• Water samples collected and tested increased by 80%. • The water quality control network supplied with all essential equipment of water quality parameter testing. • New water quality parameters were tested which were not done before 2004. The percentage of those new parameters is about 60%. • 1400 lab. technicians have been trained on water quality monitoring and testing with an increase by 167% of what has been planned. • Hygiene education campaigns were conducted through training of about 680 school teachers, community and religious leaders including women.
Outputs:			
• Conduct 30 training courses of 8 days duration for the laboratory technicians in the governorates. • Procurement of equipment, supplies and laboratory reagents for water quality control laboratories. • Rehabilitation of the water quality control laboratories. • Laboratory Information Management System strengthened for the entire water quality laboratories network.	• Functional water quality monitoring system nationwide. • 840 Labs. technicians trained • 200 refurbished laboratories. • Functional Laboratory Information Management System.	• MoEnv, MMPW and Mayoralty of Baghdad water quality status reports. • Monitoring reports from WHO/UNICEF focal points. • Receiving report from both ministries.	• Central water quality control laboratory of MOEnv rehabilitated and furnished. • Equipment, supplies and laboratory reagents worth about 4.6 million US$ were procured and distributed to the 265 water quality control laboratories. • IT equipment (Computers, printers, servers, scanners and photocopy machines) were procured and distributed to the central and governorate water quality control laboratories. This enhanced data management and reporting process.

Annex 2
PROJECT COSTS

CATEGORY	UNDG ITF approved budget	Actual cost	Percentage of approved	Budget revision approved (give date)	Percentage of revision
1. Personnel • including staff and consultants	276,000	276,000	100%		
2. Contracts • including companies, professional services, grants	285,000	285,000	100%		
3. Training	586,800	586,800	100%		
4. Transport					
5. Supplies and commodities	714,000	714,000	100%		
6. Equipment	3,930,000	3,930,000	100%		
7. Travel					
8. Security					
9. Miscellaneous	115,836	115,836	100%		
10. Agency Management Support	354,458	354,458	100%		
Total Expenditure	6,262,094	6,262,094	100%		