No.

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF MUNICIPALITIES AND PUBLIC WORKS (MMPW), THE REPUBLIC OF IRAQ

THE FEASIBILITY STUDY ON IMPROVEMENT OF THE WATER SUPPLY SYSTEM IN AL-BASRAH CITY AND ITS SURROUNDINGS IN THE REPUBLIC OF IRAQ

FINAL REPORT

(APPENDIX)

JANUARY 2007

TOKYO ENGINEERING CONSULTANTS CO., LTD.

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APPENDIX A

EXISTING CONDITIONS

APPENDIX A EXISTING CONDITIONS

A.1 Socio-economic Conditions of the Country

(1) Administrative Units

In Iraq, the administrative unit consists of Governorates, Districts and Sub-districts. There are 18 Governorates in the country, and Study area is the Governorate of Al-Basrah, which consists of seven (7) districts and fourteen (14) sub-districts.

(2) Population

The transition of population in Iraq from 1977 to 2004 is shown in Table A.1. The population of the country in 2004 is 27.1 million with 2.25 % of the annual growth rate, which are projected by the Central Organization for Statistics and Information Technology (COSIT).

Table A.1 Population of Iraq

Year	Population (million)	Note
1977	12.0	Census, Iraq, 1977, 1987 and 1997
1987	16.3	
1997	22.0	
2003	26.3	Projection by COSIT
2004	27.1	

(3) Macro Economy

The economy of Iraq has relied on the foreign currency obtained by the export of oil. The acquisition of foreign currency by crude oil forms 95% or more of the whole foreign currency of Iraq in the past and the present.

The Iraq economy showed the decline tendency after the invasion of Kuwait of Iraq in 1990. "An exchange plan of oil and food" was started by the United Nations in 1996, and it has allowed exporting the crude oil for humane demand in 1999. The Iraq economy showed recovery in 2000. However, the Iraq War in 2003 and its confusion reduced to 50% of the oil production in the pre-war, and the GDP became negative growth continuously for three years.

In 2004, the amount of annual average crude oil production became about 2 million barrel/day, which was equivalent to 1.5 times of the crude oil production in 2003. The GDP is recovered from 12.7 billion US$ in 2004 to about 25.5 billion US$ in 2005, and the GDP per capita is recovered from 467 US$ to 910 US$. Furthermore, the GDP and the GDP per capita in 2005 have recovered 35.0 billion US$ and 1,264 US$.

These indicators show the improvement in country's economy, however, the labor force of Iraq is still the small part, 6.8 million, of the total population of 28 million. The unemployment rate is very high, ranging from 25 % to 30 %. Major economic indicators are summarized in Table A.2.

Table A.2 Major Economic Indicators of Iraq

Items	2000	2001	2002	2003	2004	2005
Population (million)	25.1	25.8	26.6	27.3	28.1	-
Gross Domestic Product (market prices, US$ million)	25,857	18,939	18,974	12,739	25,539	35,000 [1)]
GDP per capita (US$)	1,031	734	715	467	910	1,264 [2)]
GDP growth (%) At Constant (1989) prices % change, year on year	2.6	-8.2	-14.2	-35.3	46.5	-
Consumer Price Inflation (average)	10	16.4	26.3	36.3	31.7	33 [3)]
Total exports including others (US$m; fob-cif)	21,020	16,457	14,048	8,071	17,989	-
Crude petroleum (US$m; fob-cif)	20,520	15,957	13,548	7,571	17,489	-
Total imports including others (US$m; fob-cif)	11,009	11,152	9,817	9,934	19,569	-
Crude oil production ('000 barrels/day)	2,568	2,355	2,014	1,329	1,995	2,093 [3)]
Total External debt (US$ m)	106,500	108,500	110,500	112,150	102,520	-
Labour force (million)	6.0	6.0	6.5	6.7	6.8	-
Exchange rates (ID/US$)	1,930	1,929	1,957	1,936	1,453	1,476 [3)]

Source: "Country Profile 2005" [1)]
a) The Economist Intelligence Unit estimates and projections.
b) GDP per capita in 2005 is calculated as follows; 1,264 US$= 35 billion US$ / 27.7 million population
c) Source: CIA The World Factbook [2)]

(4) Power Supply Conditions

The questionnaire survey regarding the stability of electricity supply in Iraq and Basrah Governorate were conducted by UNDP in 2004, and the results of survey are shown below.

Table A.3 Stability of Electricity Supply

unit: %

Governorate	Stability of electricity supply			
	Stable	Rather unstable	Unstable	No electricity
Dahok	67	7	25	1
Nineveh	2	1	96	1
Sulaimaniya	4	0	95	1
Al-Tameem	12	1	87	–
Erbil	7	3	90	0
Diala	16	5	77	1
Al-Anbar	15	4	81	0
Baghdad	**4**	**4**	**92**	**–**
Babil	4	12	84	0
Kerbala	8	5	87	0
Wasit	13	2	83	2
Salahuddin	7	3	88	2
Al-Najaf	4	3	92	0
Al-Qadisiya	4	4	91	1
Al-Muthanna	18	28	51	2
Thi-Qar	56	34	11	0
Missan	36	15	47	1
Basrah	**58**	**15**	**27**	**–**
Total	**15**	**7**	**78**	**0**

Source: "Basrah Final Report" 2005

Reference:

1) "Country Profile 2005" The Economist Intelligence Unit, 15 Regent St., London, SW1Y $LR, United Kingdom (mid-year estimates)
2) CIA: The World Factbook
3) "Iraq Living Conditions Survey 2004", central Organization for Statistics and Information Technology / Ministry of Planning and Development Corporation, 2005, Baghdad, Iraq
4) Social and Economic Survey for Iraq Reconstruction "Basrah Final Report" Japan International Cooperation Agency, 2005, Baghdad, Iraq

A.2 Complete and On-Going Project

Table A.4 List of Completed and On-Going Projects

Item	Location	Execution Method	Cost ID	Date Start	Date Completion	Duration	Percentage of Accomplishment
General Maintenance for R-Zero Plant No. Work	center work	Direct execution	22,610,000	9/10/05	9/12/05	60days	100%
Connect Al Maqal compound 2	center	Direct execution	28,500,000	25/9/05	20/12/05	60days	95%
System for low lift Al Maqal Compound3	center	Direct execution	63,500,000	8/12/05	8/2/06	60days	10%
Al Ribat Project 4	center	Direct execution	73,049,000	1/12/05	1/2/06	60days	50%
Garma 1 maintenance compound 5	center	Direct execution	26,025,000	2/12/05	2/2/06	60days	40%
High lift line and maintain pump station in Basra unified plant 6	center	Direct execution	23,200,000	8/12/05	8/2/06	60days	30%
Maintenance of Sihan plant 7	Al fao	Direct execution	20,700,000	22/11/05	22/1/06	60days	60%
Shatt Al Arab maintenance project 8	Shatt Al Arab	Direct execution	40,393,500	1/12/05	1/2/06	60days	35%
Maintain the roof of Abi Sqair building9	center	Sub contractor	14,400,000	15/11/05	14/1/06	60days	35%
Al Faw water plant Strengthening 10	Al fao	Direct execution	10,300,000	22/11/05	22/1/06	60days	60%
Maintain and increase Al Nashwa water capacity 11	Nashwa	Sub contractor	20,030,000	6/12/05	6/2/06	60days	35%
Maintain Al Shafi water compound 12	Al deer	Sub contractor	27,555,000	30/11/05	30/1/06	60days	53%
Unit 1Install Water /Million 4 in Al Dair13	Al deer	Direct execution	58,840,000	1/12/05	1/2/06	60days	20%
Ziraji Water Execute Al Network 14	Nashwa	Sub contractor	79,000,000	3/10/05	20/12/05	60days	100%
Install fennec around Al Hwair station 15	Al thoer	Sub contractor	79,000,000	25/9/05	24/11/05	60days	100%
Install al abbas shade16	center	Sub contractor	57,347,000	3/10/05	20/12/05	60days	100%
Build Al Maqal Station17	center	Direct execution	36,982,500	1/12/05	1/2/06	60days	90%
Bradeia Water project18	center	sub contractor	32,712,500	9/11/05	9/1/05	60days	50%

A.3 Rehabilitation Needs of Pumping Stations of SWC

According to the survey through the local consultant company together with MWR, the following

rehabilitation is identified for PS 1 and PS 2.

PS 1

1) The secondary station needs a new generator to feed the pumps set (7 pumps) in case of emergency which is supply in PS2.
2) There is an urgent problem which caused 6 pumps from working. The CB at the starter panels are defect and need to replace by new CBs.
3) The roof of the building is very bad, leaking in the winter (many electrical problems happen due to the rain).
4) No overhead crane in main pump house for maintenance works.
5) The collector pipe of the diesel set is broken under ground so the diesel set is not working. This caused five pumps to stop working at the main station.
6) The operator (6) houses are not to be enough for all operators so that it is necessary to construct a new (6) houses.
7) Around the pump house there is a canal collecting the rain water because the main house is below the Station level. The canal is connected with main house by trench used for cables so this trench channels water into main building. Sometimes water reaches 10 cm above the cables especially in winter.
8) Transformers conditions
    a) One of the transformers is not working so must be replaced by a new one
    b) The gates to the new electrical building (transformer room) need covering to prevent rain entering the room because the gates are built with chain link..
    c) All transformers gates are not closing with locks.

PS 2

1) There is no electrical power supply to PS2 and all the power comes from diesel generators.
2) Gate valves for by pass system needs to be refurbish or replaced by a new ones, size 500 mm Nos 3. These valves controlled the water inside the canal, in order to change the direction of the flow to the desert in order to make maintenance in the canal.
3) All the generators (7) need over all maintenance (not refurbish).
4) Security situation is very bad and many guards for transportation are needed.
5) All the workers at the Station need training for operation and maintenance.
6) Diesel pump area needs to be rearranged.
7) Small hand tools (mechanical & electrical) are required to work on equipment and pump stations. Also required is safety equipment (hard hats, gloves, goggle… etc.) and storage container for equipments.
8) The road needs to be repaired (26 Km) from the check point in Remalla to PS2 because it is slippery in winter.
9) The Over-flow before the pump station needs to be repaired.

10) There is an urgent problem which caused the pumps from working that is the CB at the starter panels are defective and need to be replaced by new CBs.
11) The roof of the building is very bad and is leaking in winter (many electrical problems happen during the rain).
12) Around the pump house there is a canal collecting the rain water because the main house is below the Station level. The canal is connected with the main house by trench used for cables. This trench passes water into main building house, sometime it reaches 10cm above the cables especially in winter.

A.4 Existing Facilities

Table A.5 Pipe Length by Material and Age in Basrah City and Al Hartha

Trunk main									
	1. Al Kabla	2.Al Khalej	3. Al Mqil	4. Al Ribat	5. Al Ashar	6. Al Taga	7. Al Entesar	8. Al Hartha	Total
Length (km)	34.5	45	41.46	34	58.27	5	2	25	245.23
Pipe age									
<=10 years	10	10	10	10	10	10	10	10	
>10 and <=30 years	0	0	0	0	0	0	0	0	
> 30 years	90	90	90	90	90	90	90	90	
Pipe type (%)									
Plastic -PVC	0	0	0	0	0	0	0	0	
Plastic -PE, HDPE	5	5	15	5	5	20	25	20	
Cast Iron	85	85	85	80	85	75	75	75	
Asbestos cement	10	10	0	15	10	5	0	5	
Pipe typ (km)									
Plastic -PVC	0	0	0	0	0	0	0	0	0
Plastic -PE, HDPE	2	2	6	2	3	1	1	5	21
Cast Iron	29	38	35	27	50	4	2	19	204
Asbestos cement	3	5	0	5	6	0	0	1	20
Total	35	45	41	34	58	5	2	25	245
Operational performanc	acceptable	acceptable	acceptable	acceptable	acceptable	acceptable	acceptable	acceptable	
Current state	poor	poor	poor	poor	poor	poor	poor	poor	

Supply network									
	1. Al Kabla	2.Al Khalej	3. Al Mqil	4. Al Ribat	5. Al Ashar	6. Al Taga	7. Al Entesar	8. Al Hartha	Total
Length (km)	502.74	1180	530	563.63	730.5	35	15	110	3,667
Pipe age									
<=10 years	15	15	15	15	15	15	15	15	
>10 and <=30 years	85	85	85	85	85	85	85	85	
> 30 years	0	0	0	0	0	0	0	0	
Pipe type									
Plastic -PVC	80	80	80	80	80	70	70	50	
Plastic -PE, HDPE	0	0	0	0	0	0	0	0	
Cast Iron	5	10	5	5	5	10	10	30	
Asbestos cement	15	10	15	15	15	20	20	20	
Pipe typ (km)									
Plastic -PVC	402	944	424	451	584	25	11	55	2,895
Plastic -PE, HDPE	0	0	0	0	0	0	0	0	0
Cast Iron	25	118	27	28	37	4	2	33	272
Asbestos cement	75	118	80	85	110	7	3	22	499
Total	503	1,180	530	564	731	35	15	110	3,667
Operational performanc	acceptable	acceptable	acceptable	acceptable	acceptable	acceptable	acceptable	acceptable	
Current state	poor	poor	poor	poor	poor	poor	poor	poor	
WTP	Basra Unified	Basra Unified	Al Joubaila 1	Al Garma 1	Al Bradia 1	Al Garma 2	Al Garma 2	Al Garma 2	
	Hartha 25 M(	Hartha 25 M(	Al Joubaila 2	Al Ribat	Al Bardia 2			Basrah Unified	

Pipe typ (km)	Total	%
Plastic -PVC	2,895	0.74
Plastic -PE, HDPE	21	0.01
Cast Iron	476	0.12
Asbestos cement	519	0.13
Total	3,912	1.00

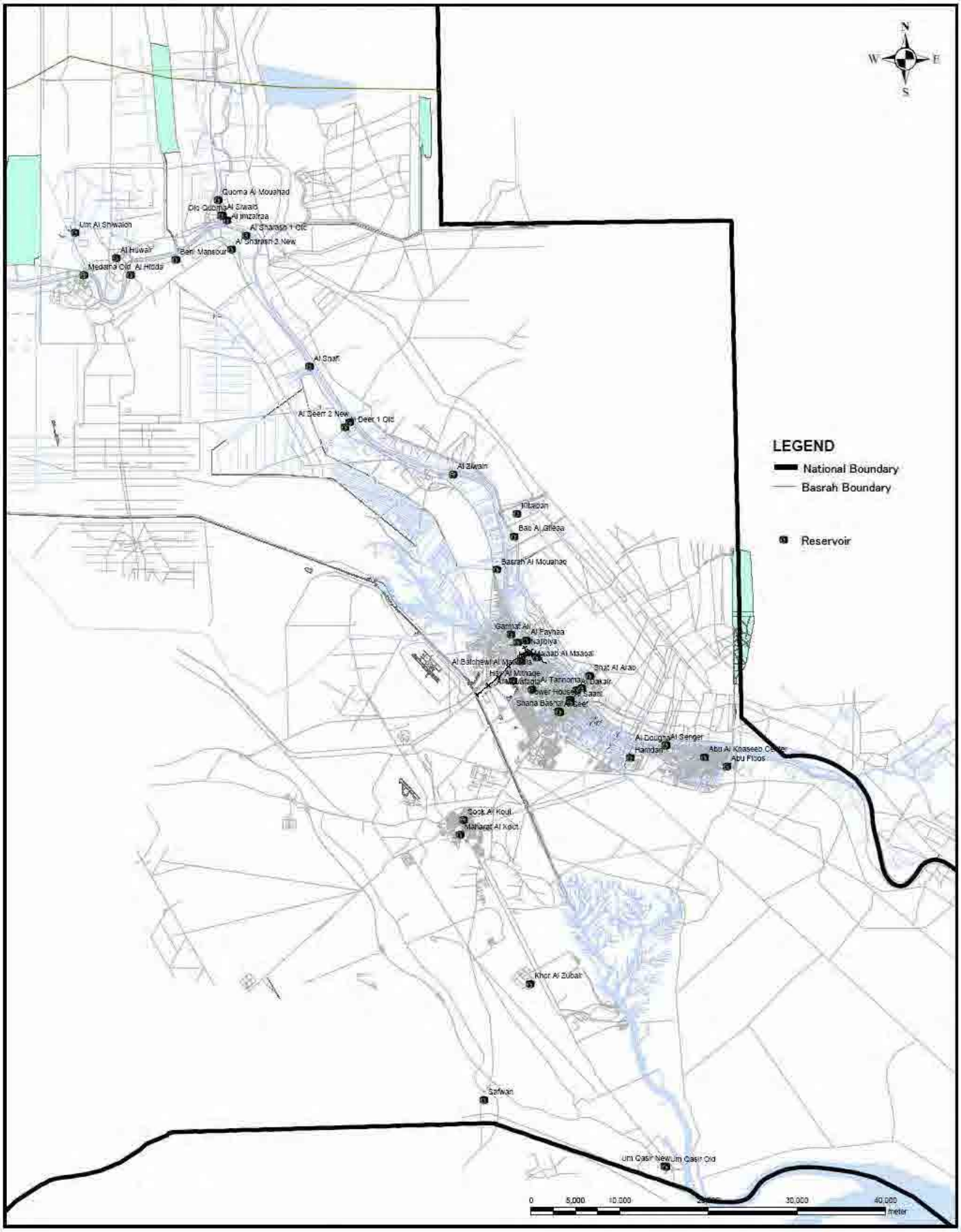
The distribution reservoirs in the Governorate are listed up in Table A.6 for working facilities and Table A.7 for damaged facilities.

Table A.6 Working Distribution Reservoir (ground and elevated tanks)

No.	Name/Location	Capacity	Location	Type	Height of the tower	Design high water level in tank	Design low water level in tank	Condition
		(m3)	Inside WTP/ inside city	Elevated tank or ground tank	(m)	(m)	(m)	
1	Basrah Al Mouahad (Unified)	6,000	Inside WTP	Underground	No tower	0	-5.2	Functioning
5	Al Deer 1 Old	56	Inside WTP	GROUND	4	2	-2	Functioning
20	Um qasser old	3000	Inside WTP	ground	No tower	5.8	0	Functioning
21	Um Qasir new	3000	Inside WTP	ground		5.8	0	Functioning
	Um Qasir new	3000	Inside WTP	ground		5.8	0	Functioning
22	Khor Al Zubair	12800	Inside WTP	u.g		7.5	1	Functioning
23	Safwan*old	250	Inside WTP	Elevated	17	NA		Functioning
	Safwan*old	1000	Inside WTP	UD	0	NA	NA	Functioning
37	Shat Al Arab	2500	Inside WTP	Elevated	20	8	0	Functioning
38	Al Mouafaqia *	8000	inside city	Ground	No tower	3m above ground level	-2.2 meters	Functioning
40	Al Baidhewi Al Mawania	75	inside city	Elevated	13	N.A	Good with 2 pumps & 1 generator + national supply	Functioning
45	AL ASSMAE	800	Inside WTP/	Ground	0	5	0.8	Functioning
46	HAY AL HUSSAIN	5000	inside city	Ground	0	4	0.5	Functioning
	TOTAL FUNCTIONING Existing Reservoir and Elevated Tower (m3)	45,481						

Table A.7 Damaged Distribution Reservoir (ground and elevated tanks)

No.	Name/Location	Capacity(m^3)	Location	Type	Height of the tower(m)	Condition
1	Basrah AlMouahad (Unified)	N.A	Inside WTP	Elevated	30	Out of order
2	Bab Al Gileaa	20	Inside WTP	Elevated	5	Out of order
3	Kitaiban	20	Inside WTP	Elevated	5	Out of order
4	Al Ziwain	60	Inside WTP	Elevated	25	Out of order
5	Al Deer 1 Old	144	Inside WTP	Elevated	25	Out of order
6	Al Deerr 2 New	117.15	Inside WTP	Elevated	25	Out of order
7	Al Shafi	117.15	Inside WTP	Elevated	25	Out of order
9	Al Sharash 2 New	250	inside city	Elevated	20	Out of order
10	Al Sharash 1 Old	144	inside city	Elevated	20	Out of order
11	Al Imzairaa *	33.5	inside city	Elevated	12	Out of order
12	Al Siwaib	90	Inside WTP	Elevated	10	Out of order
13	Old Quorna	120	Inside WTP	Elevated	20	Out of order
14	Quorna Al Mouahad	200	Inside WTP	Elevated	25	Out of order
15	Beni Mansour *	144	inside city	Elevated	15	Out of order
16	Al Hidda *	144	inside city	Elevated	15	Out of order
17	Al Huwair	N.A	Inside WTP	aElevted	20	Out of order
18	Medaina	300	Inside WTP	Ground	No tower	Out of order
19	Um Al Shiwaich *	75	inside city	Elevated	15	Out of order
20	Um Qasir Old*	550	Inside WTP	Elevated	20	Out of order
22	Khor Al Zubair	126	inside city	Elevated	15	Out of order
	Khor Al Zubair	32	inside city	Elevated		Out of order
23	Safwan*old	90	inside city	Elevated	17	Out of order
24	Sook Al Kout *	N/A	Inside city	Eleveted2	25	Out of order
25	Maharat Al Kout *	N.A	inside	E	15	Out of order
26	Abu Floos *	147	inside city	Elevated	18	Out of order
27	Abu Al Khaseeb Center AL LABANI	60	inside city	Elevated	9	Out of order
28	Al Dougha *	60	inside city	Elevated	20	Out of order
29	Al Senger *	24	inside city	Elevated	10	Out of order
30	Hamdan *	90	inside city	Elevated	25	Out of order
31	Shara Bashar *	144	inside city	Elevated	10	Out of order
32	Al Seef *	144	inside city	Elevated	10	Out of order
33	Power House *	N.A	inside city	Elevated	15	Out of order
34	Al Saadi *	330	inside city	Elevated	15	Out of order
35	Al Dakair *	330	inside city	Elevated	15	Out of order
36	Al Tannoma *	90	inside city	Elevated	10	Out of order
39	Al Malaab Al Maaqal *	147	inside city	Elevated	10	Out of order
41	Al Najibiya *	75	inside city	Elevated	13	Out of order
42	Al Fayhaa old	24	inside city	Elevated	13	Out of order
43	Hay Al Mithaqe *	N A	inside city	Elevated	15	Out of order
44	Garmat Ali *	176	inside city	Elevated	10	Out of order
47	Abu baseri	100	inside city	Elevated	30	Out of order
	Abu baseri	20	inside city	Elevated	9	Out of order
48	Abu mesheh	600	inside city	Elevated	17	Out of order



The Development Study on Al-Basrah Unified Water Treatment Plant and Transmission System Project in the Republic of Iraq	Reservoirs in Basrah Governorate (Elevated Tank and Ground Reservoir)	Fig No. A.1

A.5 Problems of Operation and Maintenance

(1) Difficulties related to Compact Water Treatment Units

The potable water produced in Basra governorate is by two types of treatment plants, conventional and compact units. Because of the special situations facing Basra in the last 30 years the implementation of conventional treatment plants was interrupted. There was no other option to meet demand but to use the compact units as the urgent solution. The widespread use of compact units as a treatment plant makes Basrah Water Directorate (BWD) about 70% dependent on water from Compact Units. Compact units are of different design according to their capacity and the source of raw water. These can be divided to three types:

- Compact units constructed before 1999
- Compact units constructed after 1999
- Compact units under constructions

1) The compact units constructed before 1999

Most of this type of CU were imported from western countries and the others are constructed by the Iraqi state industry companies which were mostly (1,200 m^3/day) capacity. All these CUs are beyond their working age because the newest ones were implemented at 1986. These CUs capacities are more than 250,000 m^3/day and 80% of their capacity is to feed Basra city, these CUs are facing many difficulties as follows:

a) Most of the sedimentation tanks, storage tanks, pressure filters, pipes and all metallic equipments are defective due to corrosions
b) All pumps are in a bad condition and need to be replaced with new ones with all accessories.
c) Most of the electrical equipment (CB, MCC, Cables, etc) are in a bad condition and need to be replaced.
d) Most of dosing systems need to be replaced with new ones.
e) Most of the CUs buildings need to be rehabilitated or construct new ones
f) All the CUs. have no flow metering system

2) The compact units constructed after 1999 :

Most of this type of CUs are imported according to the UN oil against food program from European countries having a good relations with the previous regime without caring about quality, all of these units have 4,800 m^3/day capacity. The other CUs are constructed by the Iraqi state industry companies which are

mostly (1,200 m^3/day) capacity. The total capacity of these CUs is 190,000 m^3/day. All these CUs are facing the same difficulties of the previous ones, with the following additional difficulties:

a) CU's were imported without spare parts, which normally should cover at least 5- operational years.
b) No any training was provided to the staff for the operation and maintenance of these CUs
c) There was not enough money to complete the installation, so many of these units remained for a long time before installation which caused a lot of damage to the metal CU body and essential components went missing.

3) The compact units under construction:

All these CUs are constructed in Iraq by private workshops using existing CUs as a model design. This type of CUs has a total capacity of approximately 144,000 m^3/day. These CUs are constructed using the materials available in the local markets and by using local engineers who have not had a long experience in this field. Most of the contractors who build these CUs have no opportunity to learn from outside experience. Because of the low costs of the constructions the main difficulties which may be faced by BWD are:

a) Poor materials used in the construction can not resist the long term operation processes. Consequently these units need to be rehabilitated after a short time of operations
b) Because of the multiple sources of materials/parts used the maintenance programs are facing difficulties of availability of parts. Some times this causes the engineers to look for substitute parts which cause additional cost.
c) The different quality of materials results in different working life for components which cause a continuous headache to BWD and frequent production breakdowns.
d) The quality of the water produced was not examined before the commissioning so water quality will differ from one CU to another.

4) The main difficulties for all type of CUs are :

a) Heavy requirement for maintenance and insufficient maintenance budget.
b) Short working life.
c) No operation and planned maintenance programs because of the shortage of the budget.
d) Frequent electricity supply interruptions causing production shortfalls.
e) Insufficient generators to cover the electricity demand.
f) Not enough and low experience operators to operate the CUs and the generators
g) The difficulty of providing fuel and disinfection materials because of the lack of transportation and security.
h) The wide geographic area causes management problems and slows up urgent support from the main office of BWD

i) There are no help from the people who benefit from the water supply especially those who pay no water tariff.

A.6 Existing Reverse Osmosis Plants in Basrah Governorate

District	Basrah City and Al Hathra						Shat Al-Arab			
No.	1	2	3	4	5	Total	1	2	3	Total
Item	Al - Basrah Unified	Al Jubila 2	Al Ribat	Bradeia 2	Al Mofaqua PS		Shat Al-Arab Unified	Al Fayhaa	Ktaban Shat Al Arab	
Design capacity (m3/hr)	48	48	48	10	10		48	10	10	
Nos. of unit (m3/hr)	1	2	1	1	1		1	1	1	
Total capacity (m3/hr)	48	96	48	10	10	212	48	10	10	68
Design hours (hr/day)	10	10	10	10	10		10	10	10	
Current production (m3/day or working hour (h))	10	10	10	10	10		10			
Storage tank volume (m3)	N.A	N.A	N.A	N.A	N.A		N.A	N.A	N.A	
Status	Working	Working	Working	Working	Working		Working	Working	U.C.P.	
Funded by	DFID	DFID	UAE	DFID	DFID		DFID			
Owner	BWD	BWD	BWD	BWD	BWD		BWD			
Operator										

District	Abu Al Khaseeb					Al Zubail					Al Fao				
No.	1	2	3	4	Total	1	2	3	4	5	Total	1	2	3	Total
Item	Abu Al Khaseeb (Labani)	Abu Al Khaseeb-Jekor	Mhaila(Abu Al Khaseeb) al labni	Hamdan CUs		Khor Al Zubair	Al Shuaiba	Umm-Qaser	Safwan	Safwan		Al Fao	Al Fao	Al Fao	
Design capacity (m3/hr)	48	25	14	35		20	20	20	20	25		20	10+ 25	10	
Nos. of unit (m3/hr)	1	1	1	1		1	1	1	1	1		1	1	2	
Total capacity (m3/hr)	48	25	14	35	87	20	20	20	20	25	105	20	35	20	75
Design hours (hr/day)	10	10	10	10		10	10	10		10		10	10	10	
Current production (m3/day or working hour (h))	10	N.A	10							N.A			N.A	N.A	
Storage tank volume (m3)		U.C.P.	N.A	N.A		N.A	N.A	N.A	?	working		N.A	Run by Al Fao Local	working	
Status		AL Mahba	Working	U.C.P.		Working	Working	Working	Working	regional plan		Working	run by	constructio n unit	
Funded by	DFID		UAE										PRDC	PRDC	
Owner	BWD		BWD												
Operator															

District	Al Quorna					
No.	1	2	3	4	5	Total
Item	Al Quorna Unified	Al Deer	Al Nashwa	Al Zrachi Al Nashwa	Ali Noor Al Nashwa	
Design capacity (m3/hr)	48	20	20	35	50	
Nos. of unit (m3/hr)	1	1	1	1	1	
Total capacity (m3/hr)	48	20	20	35	50	173
Design hours (hr/day)	10	10	10	10	10	
Current production (m3/day or working hour (h))	10					
Storage tank volume (m3)	N.A	N.A	N.A	N.A	N.A	
Status	Working	Working	Working	U.C.P.	U.C.P.	
Funded by	DFID					
Owner	BWD					
Operator						

U.C.P. means under construction plant
BWD means Basrah Water Directorate
PRDC Reconstruction for Local Municipality Council of Basrah

as of 27-7-2006

Al Medaina												
1	2	3	4	5	6	7	8	9	10	11	12	Total
Al Medaina	Al Medaina	Al Madaina	Al Sodan Al Madaina	Al Saleem Al Madina	Al Hwer	AL Traba Al Hwair	Al Jassim	Talha Al Sadiq	Al Rahmania Al Sadeq	Talha Al Salim	AL Hotta	
15	20	10	35	N.A	20	25	20	35	N.A	10	20	
1	1	1	1		1	1	1	1		1	1	
15	20	10	35		20	25	20	35		10	20	210
10	10	10	10	10	10	10	10	10	10	10	10	
10		N.A								N.A		
N.A	N.A	ready for work	N.A	N.A	N.A	N.A	N.A	N.A	N.A	working	N.A	
Working	Working	constructio n unit	ready for work	U.C.P.	Working	U.C.P.	Working	U.C.P.	U.C.P.	constructio n unit	Working	
Bridge to Bagdad		PRDC								PRDC		
BWD												

APPENDIX B

SOCIO-ECONOMIC SURVEY

APPENDIX B SOCIO-ECONOMIC SURVEY

B.1 Objective

The object of the socio-economic survey is to investigate social living conditions and awareness of population about the water supply service by questionnaire. The target area of the socio-economic survey is Al-Basrah and its neighboring towns within 20 to 30 km radius. The number of properties selected for the questionnaire is 400 households in 10 communities. The surveyed properties are selected by condition of urbanization and the economic situation that is estimated by housing condition.

B.2 Contents of Questionnaire

Contents of questionnaire are listed below. The Questionnaire sheet is shown in Attchment-1, and 2.

- Information of Respondent (for Household survey (HS) and Community survey (CS))
  The information includes name, gender, house type and size.
- Family Structure and Economic Condition (for HS)

The information includes the income, household size, and employment patterns. The goal is to have basic household information that might explain some of the results of the survey, which might suggest preferences toward certain options.

Condition of Water Usage (for HS and CS)

The information covers issues related to the water availability, water bills and water consumption patterns.

- Awareness of People about Water Supply Service (for HS and CS)
  Along with the previous section, this information should help in identifying the urgent needs of households and would provide a preliminary understanding of their willingness to pay for better services.
- Willingness to pay and installation of Water Meter (for HS)
  This section would assess the willingness of customers toward the idea of introducing water meters, since the water meters are not operational for the last 15 years.
- Health and Sanitary Condition (for HS and CS)
  The assessment of the sanitation utilities will help in understanding the water consumption pattern.

B.3 Number of Object for Questionnaire Survey

Total number of object for questionnaire survey is 400 households and 10 communities in the Study area.

Table B.1 Number of Properties for Questionnaire Survey and Condition of Selection

Condition of Selection			No. of Object
Object	Area	Economic Condition	
Household	Urban area	High – middle class	100
		Middle – low class	100
		Low class	100
		Sub-total	300
	Rural area		100
	Total		400
Community	Urban area		5
	Rural area		5
	Total		10
Total			410

B.4 Methodology

(1) Selection of properties

<Household>

The total number of interviewed customers was 400. The interviewed customers were selected at random, representing a fair distribution between the different areas of Basrah and the surrounding neighborhoods. The process of selecting the interviewed customer took into consideration the socio-economic criteria of income as a factor. The final number of selected customers was distributed evenly between high income, middle income and low income families.

<Community>

In total, the survey was conducted in 13 communities. Although it was desired to select the communities randomly, security issues prevented this being carried out to the fullest extent. In general, the survey field team leader would approach the community representative (head of local council), explain the purpose of the survey, and then hold a structured interview with him covering all the aspects addressed in the survey tool. Although the initial target was to survey 10 communities, the survey team visited 3 communities as a pre-test to examine the appropriateness of the survey tool. Although not major, some modifications were made to the survey tool in coordination with the study team before proceeding with the remaining 10 communities.

(2) Method of survey

Survey method is described as below.

- Surveyor team is composed of men and women in consideration of the culture and custom

of the Study area.

- Field survey is visiting and interview investigation by the survey team.

The results of the socio-economic survey for household and community are shown in Attachment-3 and Attachment -4, respectively, and the results of the socio-economic survey are summarized as below.

B.5 Results of Household Survey

The socio-economic survey for household was started on May 10th, 2006, and the fieldwork was carried out from the middle of May 19th 2006 to June 16th 2006.

(1) Information of Respondent

The interviewed sample was divided to 67.5% as males, and 32.5% as females. This is a fair distribution given the cultural nature of Iraq, in which the male is the responsible party for his family. Thus a higher percentage of male respondents is expected. Almost 80% of the respondents lived in owned houses, while the remaining 20% were in leased ones. The distribution between the types of houses was even. *Figure B.1* shows the number of households in each type of housing.

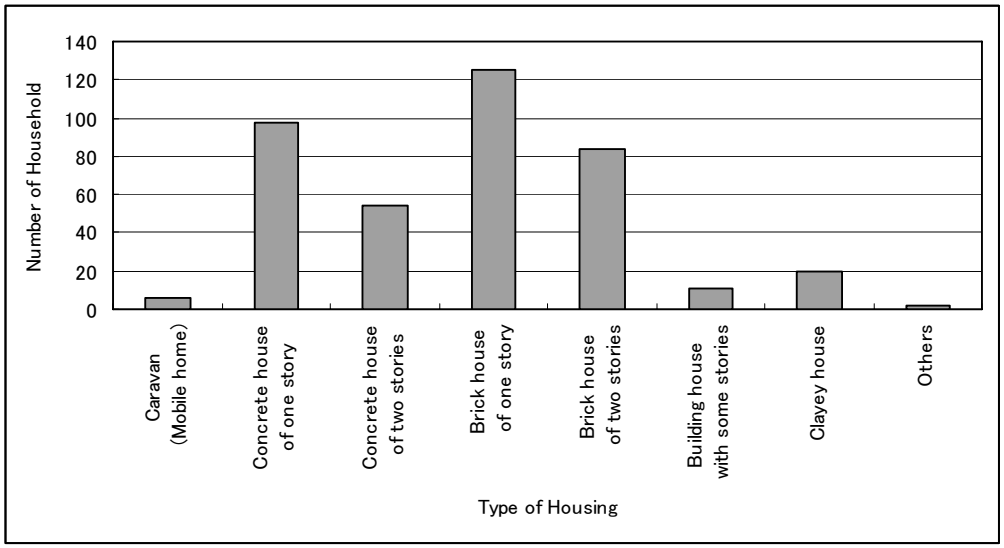


Figure B.1 Distribution of households between the types of housing

It is important to note that the type of housing is not indicative for the socio-economic condition of the families, since the majority of those houses are built before the war. Almost 27% of the sample had a house space that is less than 100 m^2, while 53% had a space that is between 100 and 200 m^2. The remaining 20 lived in a space that ranges between 200 to 450 m^2. Among the interviewed houses, 55% of them owned a car, although 57% had a space for car park. A close percent of interviewed customers of 56% owned a desert cooler, a water consumer type of coolers.

(2) Family Structure and Economic Condition

<Family size>

Average family size in the interviewed household is 7.9 person/household (the range is from 2 person to 30 persons per household), and the large proportion of family size in interviewed household is 6 person/family.

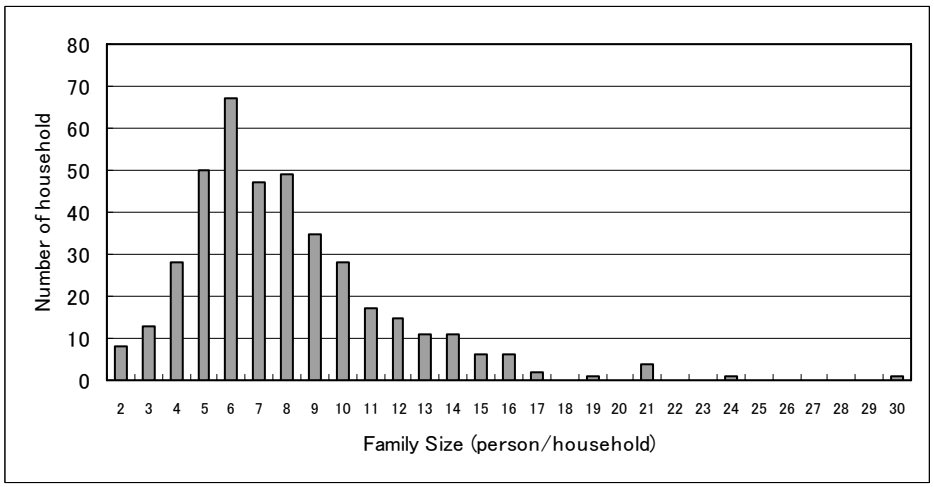


Figure B.2 Family Size of the Interviewed Household

The average monthly income of household is 836,000 ID/month (approximately 560 USD/month as 1,500 ID/USD), and maximum and minimum monthly income are 100,000 ID/month and 5,000,000 ID/month, respectively. Two thirds of all household is concentrating on the range of between 250,000 ID/month and less than 1,000,000 ID/month.

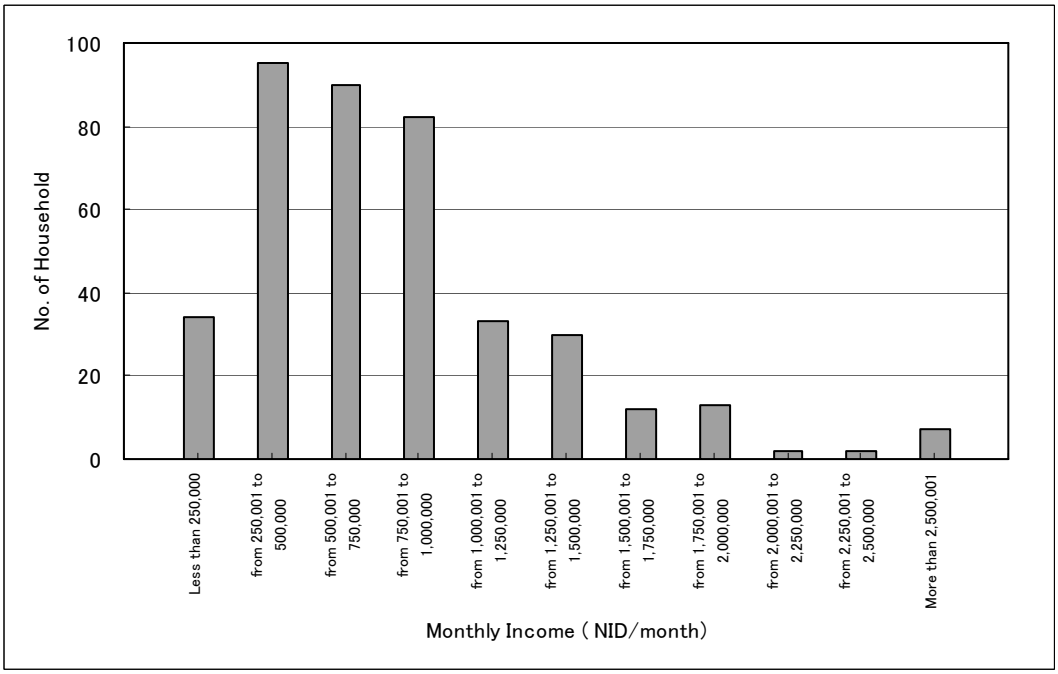


Figure B.3 Monthly Income of Household

Average proportion of expenditure in income is 68 percent, households with more than 90 percent occupied approximately 20 percent.

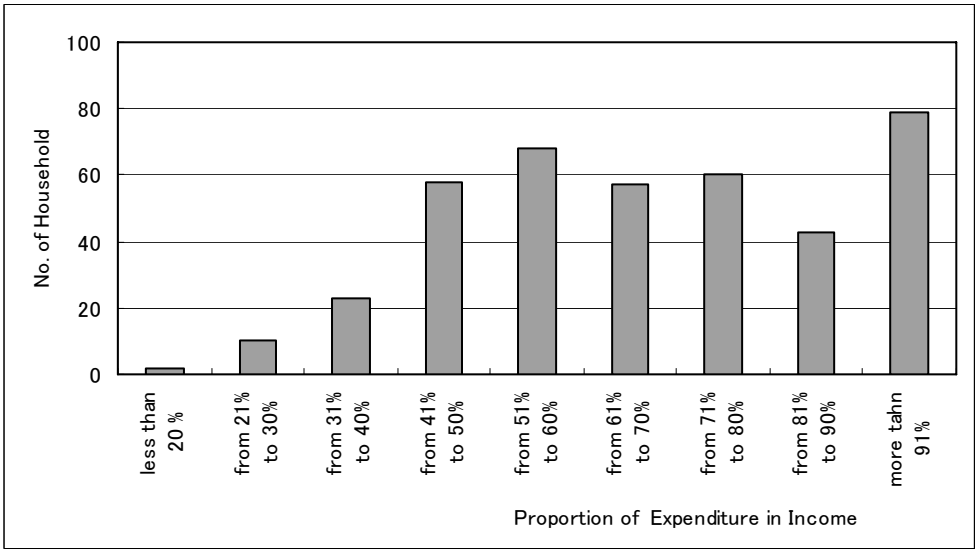


Figure B.4 Proportion of Expenditure in Income

(3) Condition of Water Usage

98 percent of interviewed households have received supplied water from the water supply service. Furthermore, bottled water is used for drinking and cooking in almost all of the interviewed households (398 households out of 400 households), it can be said that use of bottle water is established completely in

the Study area.

<Water Consumption by Use>

Average unit water consumption (including bottled water) is 144 litter/capita /day (lcd), and it ranges from 40 lcd to 513 lcd. Approximately 86 percent of households are concentrated on the range of between 50 lcd and 150 lcd. Average unit water consumption of bottled water is 4.5 lcd (median= 4.0 lcd), and 25 percentile and 75 percentile are 2.9 lcd and 5.0 lcd, respectively.

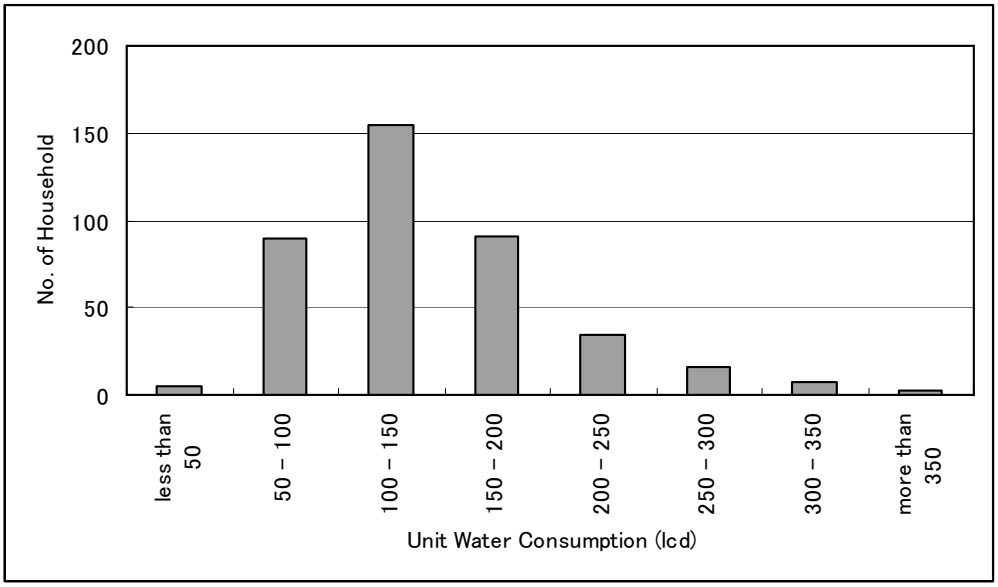


Figure B.5 Unit Water Consumption

Unit water consumption by the difference in an amount of income has the tendency for the amount of unit water consumption to become large with the increase in an amount of income. While, unit water consumption of bottled water does not increase in proportion as the income increase. However this value is not measured water consumption but estimated value by supposition.

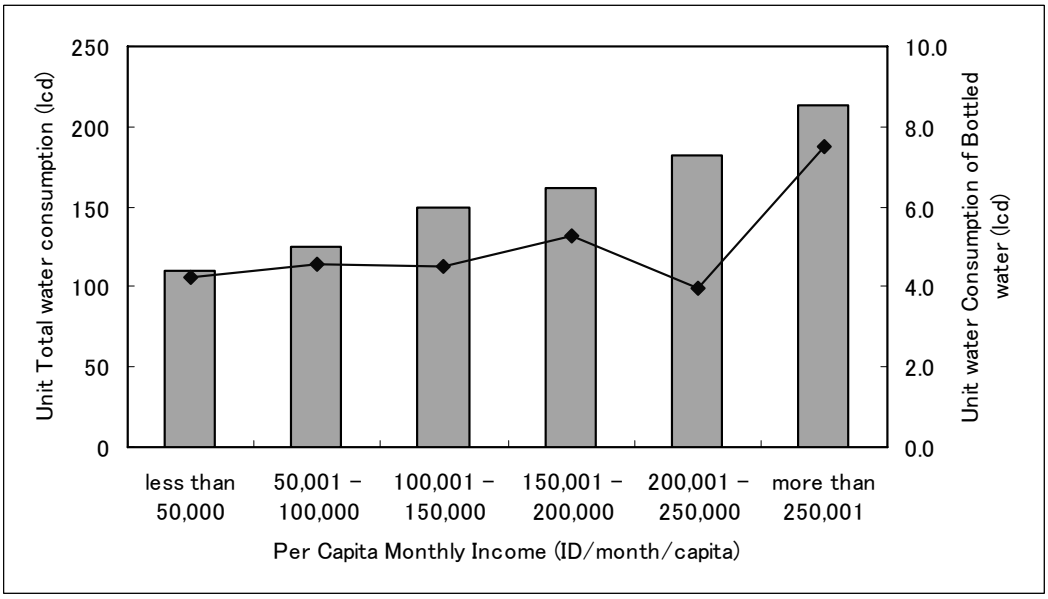


Figure B.6 Unit Water Consumption and per capita Monthly Income

Average composition ratio of water consumption by use is shown as follows. Water use of washing /cleaning and shower/bathtub occupy more than 60 percent. The next is toilet, gardening and car washing.

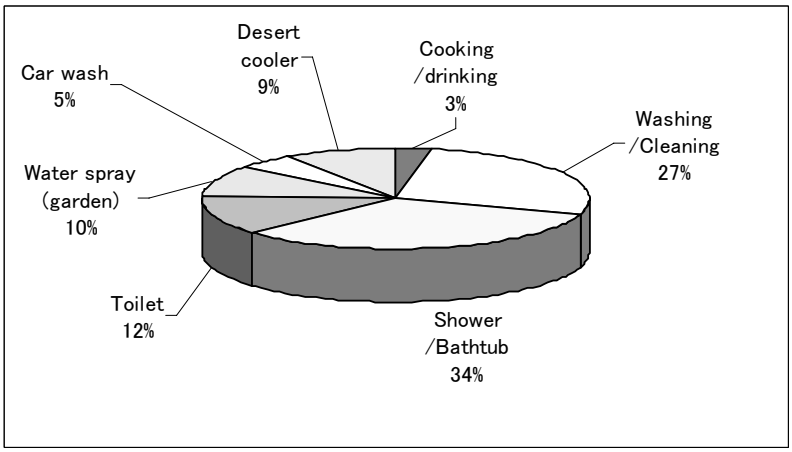


Figure B.7 Composition Ratio of Water Consumption by Use

<Situation of Water Supply Service>

The water supply service time in Basrah is 24 hours/day basically. However, it seems that the actual water supply service time is restricted by a power failure, the shortage of capacity and poor maintenance of water supply facilities. From results of the interview survey, households have service time of less than 6 hours account for 38 percent, 25 % of from 6 to 12 hours, 3% of from 12 to 18 hours, 31 % of from 18 to 24 hours and 3% of households receive no water supply.

Consequently, approximately all of household have storage tank and lifting pump. Large number of

households installed the required facilities in order to compensate the shortage of the water supply service. Average capacity of storage tank is 1.1 m^3 (0.1 – 3.0 m^3), average height of tank top is 4.5 m (0.5 m – 12 m).

The average water rate for water supply service in interviewed household is 2,300 ID/month/household, and it ranges from 1,000 to 5,000 ID/month/household. While, average monthly expenditure for bottled water is 12,200 ID/month/household (1,000 - 140,000 ID/month/household), and it reached about 5.3 times to water rate for water supply service. Average composition ratio of expenditure for water supply service in the average income is 1.7 percent, and average composition ratios of expenditure for water supply service and bottled water are 0.3 percent and 1.5 percent, respectively.

(4) Awareness of People about Water Supply Service

Figure B.8 summarizes the percent of families that expressed dissatisfaction with the current water supply conditions. The vast majority of surveyed families were dissatisfied with the service, and only 6 families (1.5%) were concerned about the water tariff. The top priority is improvement of supplied water amount actual service time, and next priority is improvement of water quality of distributed water.

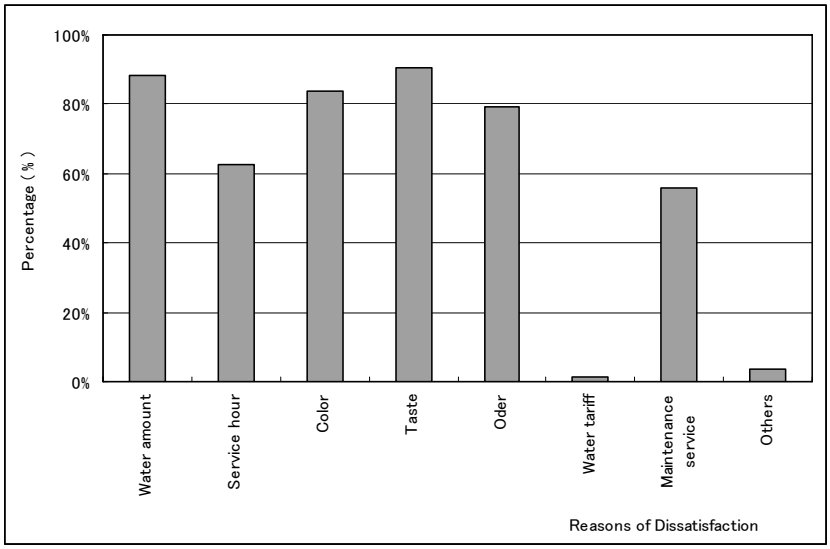


Figure B.8 Reasons for Dissatisfaction among Surveyed Families

(5) Willingness to Pay for the Water Supply Service

Based on the results of the Socio-economic Survey, information of willingness people to pay for the water supply service obtained as follows.

< Willingness to Pay for the Current Water Service>

170 households (43%) refused the payment for the current water supply service. 230 households (57%) are willing to pay for the current water supply service, and average of willingness to pay for the water supply service under the current service condition is 2,500 NID/month/household. This willingness to pay is nearly same amount as the average of existing payment for water supply service. (The average existing payment is 2,300 ID/month/household.)

< Willingness to Pay for the Satisfied Water Supply Service >

16 households refused the payment for the water service or they can not pay because of insufficient income. From results of 384 interviewed households, average of willingness to pay for the satisfied water supply service is 8,600 ID/month/household (median= 10,000 ID/month/household) (refer to *Figure B.9*). The amount of willingness pay for the satisfied water supply service is 3.4 times of the one for the current water supply service.

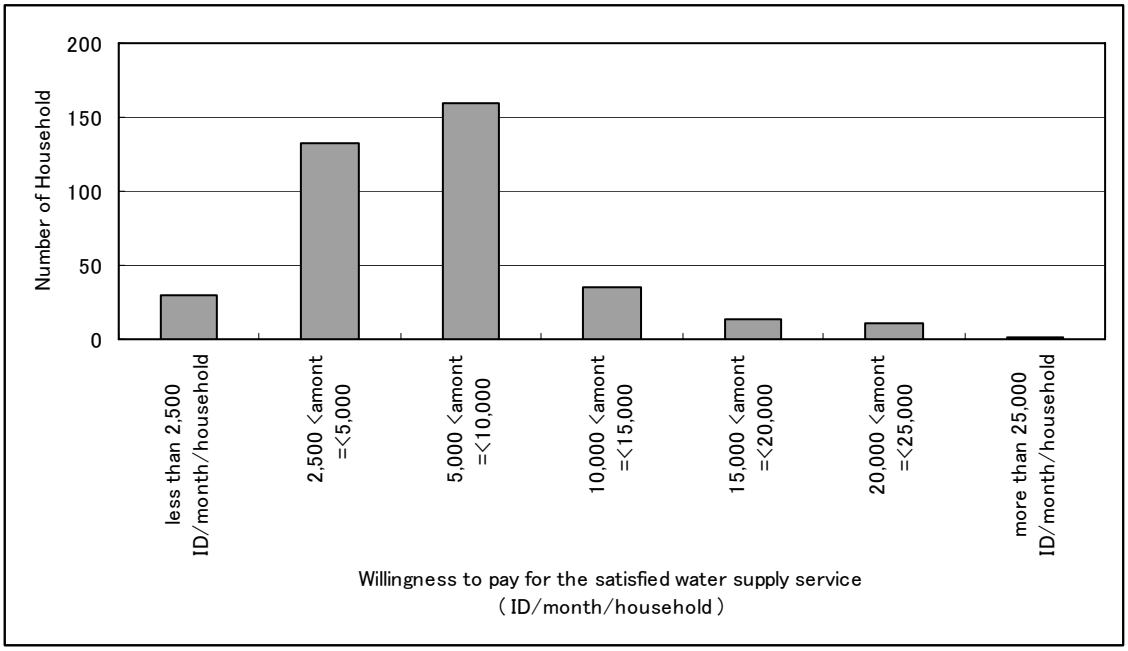


Figure B.9 Distribution of Willingness to Pay for the Satisfied Water Supply Service

(6) Installation of Water Meter

Although 400 of the surveyed families did not have any working water meters, 95% of them expressed willingness to install new meters at their premises. From the 20 families that did not agree to have a water meter at their premises, 11 insisted on refusing to have water meters even though it was explained to them that having water meters will help in securing enough safe water to every one in the community (*Figure B.10*).

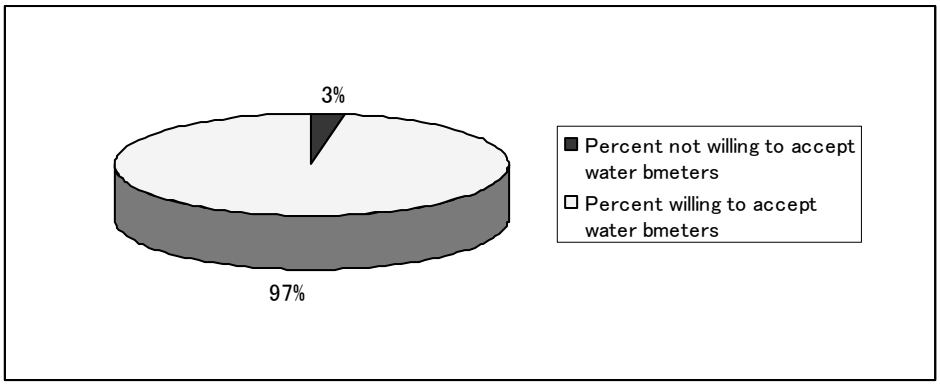


Figure B.10 Willingness to have water meters

Despite that only 3 percent refused to have water meters installed at their premises, 33 % did not agree on the notion that they would pay for installing those meters. The remaining 64 % were willing to pay for installing the meters at different ranges of rates as explained in *Figure B.11* and 95% (381 families) of households agree to pay for the water bill according to the actual water consumption.

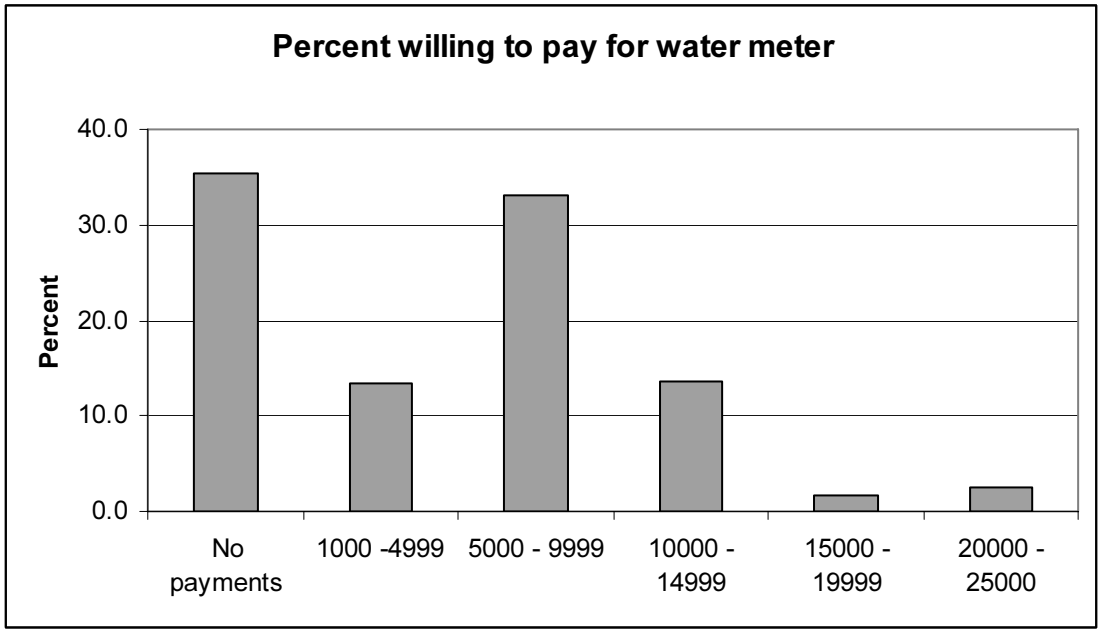


Figure B.11 Percent willing to pay for water meters

(7) Health and Sanitation

From the 400 surveyed families, only one did not have internal toilet facilities. This family is using their neighboring facilities. For all those who had toilet facilities, 69% of them are using poor flush toilet with septic tank (water proofed pit), (see *Figure B.12*)).

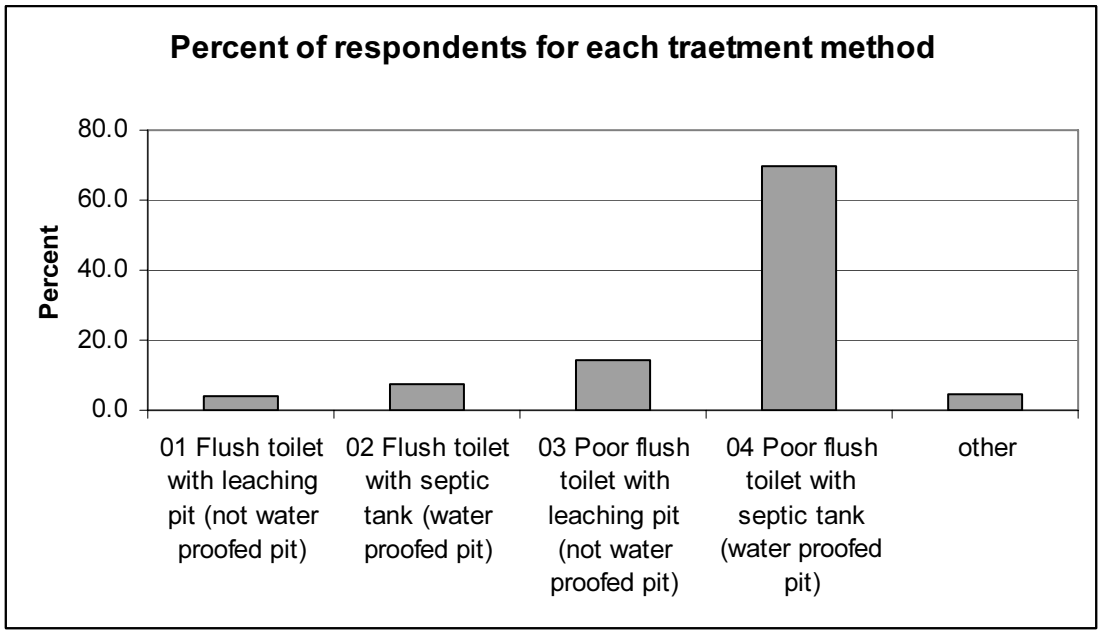


Figure B.12 Percent of respondents for the different sanitation facilities

Out of the 231 respondents who confirmed that one of their family members had diarrhea during the year of 2006, only 13 out of the 44 who are using siphon flush toilet responded positively. The remaining 31 families did not contract diarrhea during the year of 2006. Whatever the type of sanitation facilities used to deal with the accumulated waste, the reported positive cases of diarrhea did not drop below 50% of the respondents. However, it is note worthy to comment that whenever there was water proofed pit, the number of diarrhea cases has dropped when compared to non water proofed pit. For the 228 families who reported treating their families for diarrhea, the average cost for medicine and medical examination was 19,000 ID.

B.6 Results of Community Survey

The socio-economic survey for community started on May 10th 2006, and the fieldwork was carried out from May 19th 2006 to June 16th 2006. The field survey team visited thirteen communities in Basrah Governorate. Those communities were as follows: and are shown in *Figure B.13* below.

Al Junaineh District	Shat Al Arab/ Al Kbasi
Hay Al Khadra'a	Al Zereiji Village/Shat Al Arab
Al Kindy District	Shat Al-Arab
Abu Al-Khaseeb	Hay Al Jehad
Al Sekak District	Um Al shawig Village / Al mdaineh District
Al Mowafaqiah	Um Qaser District
Port resident society	

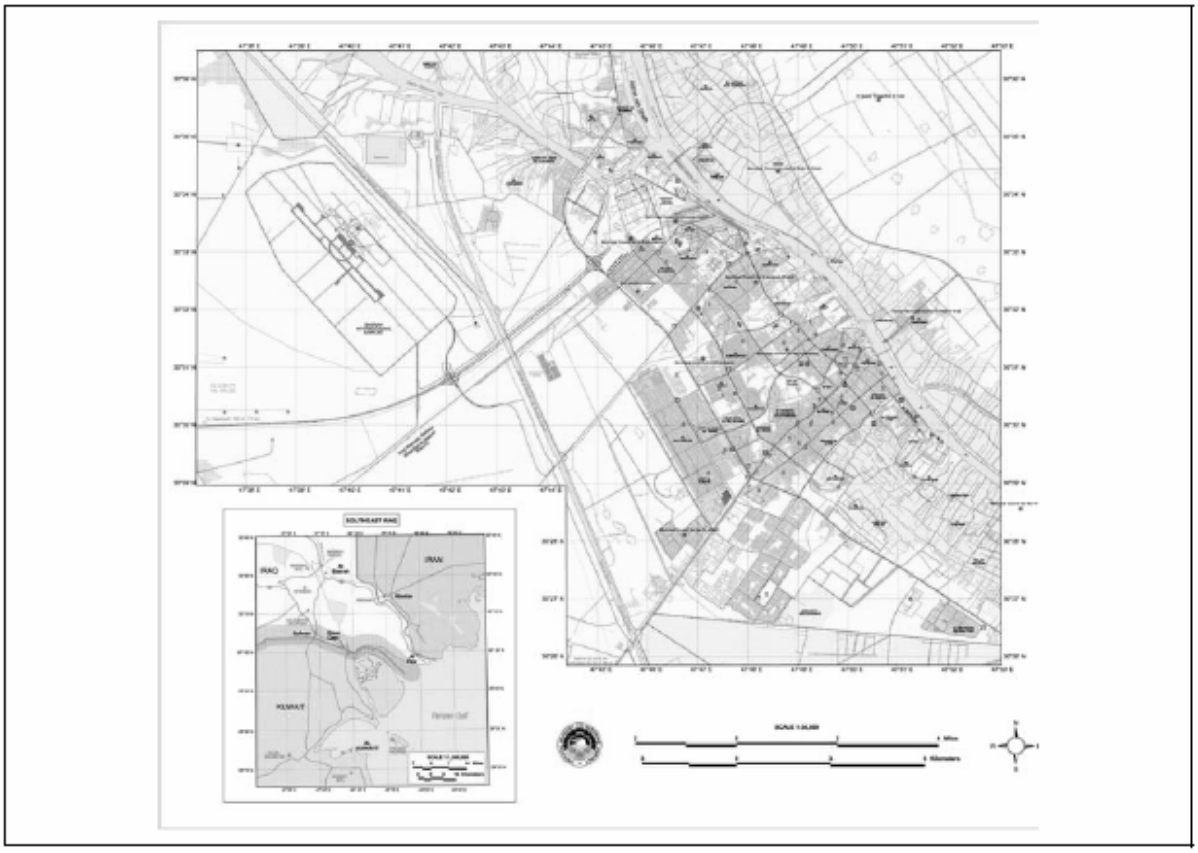


Figure B.13 Location of Visited Communities

(1) Information of Communities

Generally, 46 % of these communities were Rural whereas the remaining 54% were Urban, as shown in *Figure B.14* below.

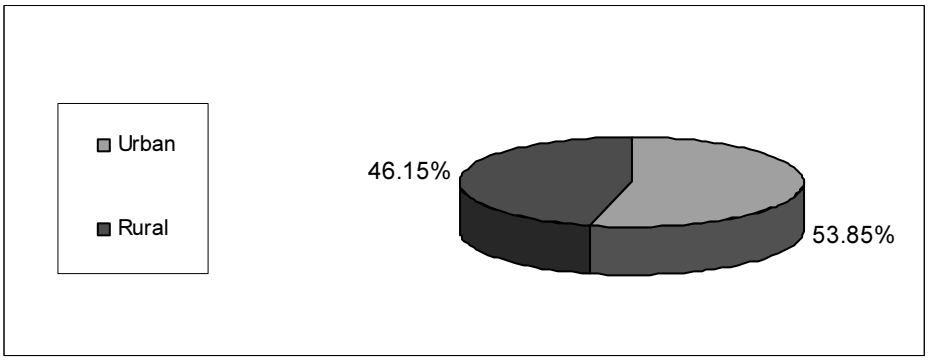


Figure B.14 Distribution of Communities

In terms of the surveyed communities' *Land use patterns*, 38% of the communities were found to be exclusively residential, 23% had a mixture of residential and commercial areas, 23% had a mixture of residential and agricultural areas, 7% had a mixture of residential and industrial areas, while the remaining 7% had a mixture of residential, industrial and agricultural area, as shown in *Figure B.15* below.

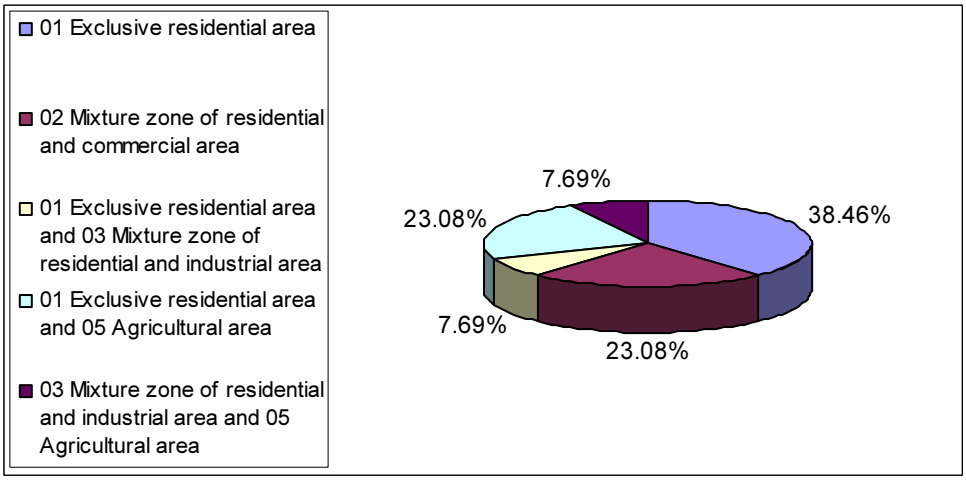


Figure B.15 Land Use Distribution

(2) Economic Conditions

About 62% of households in the surveyed communities were within the middle to low class while the remaining 38% were within low class, as shown in *Figure B.16*.

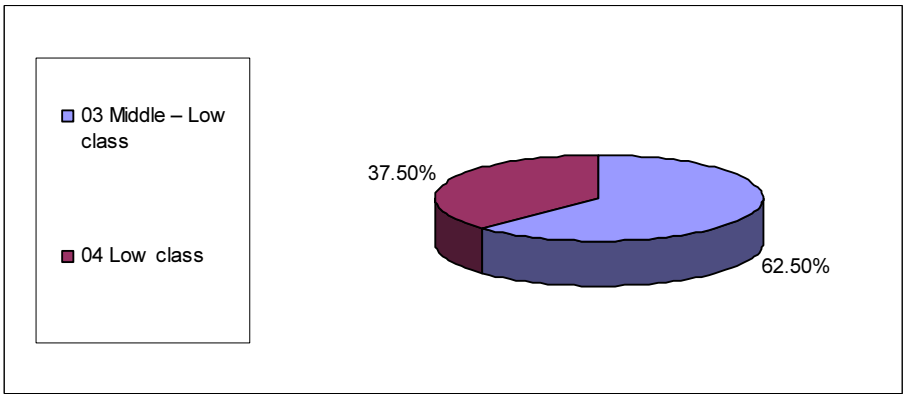


Figure B.16 Economic Condition

The occupation profile of the communities showed that the highest percent of occupations is for the services/office worker category, while the lowest percent is for agriculture sector, as shown in *Figure B.17*. It should be mentioned that the survey revealed that there is a high percent (17%) of un-employed people, which affects the economic condition of households.

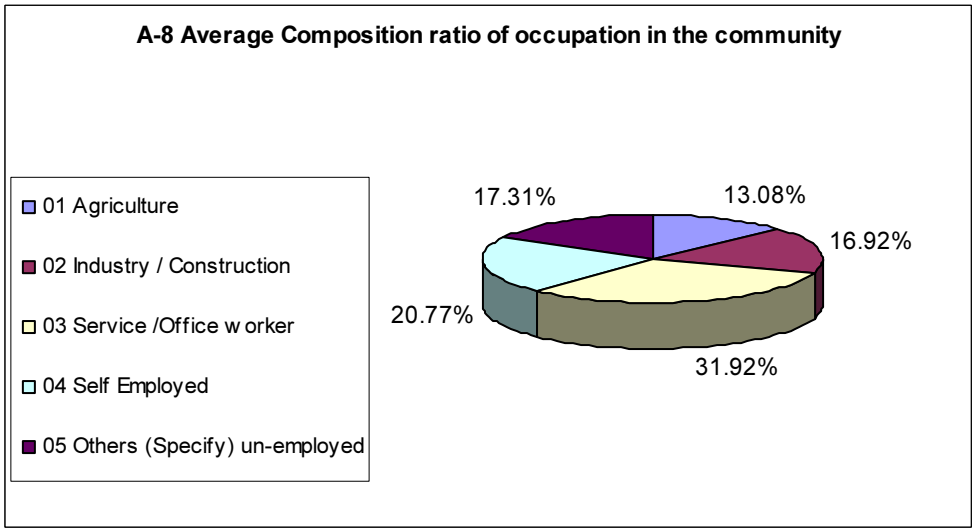
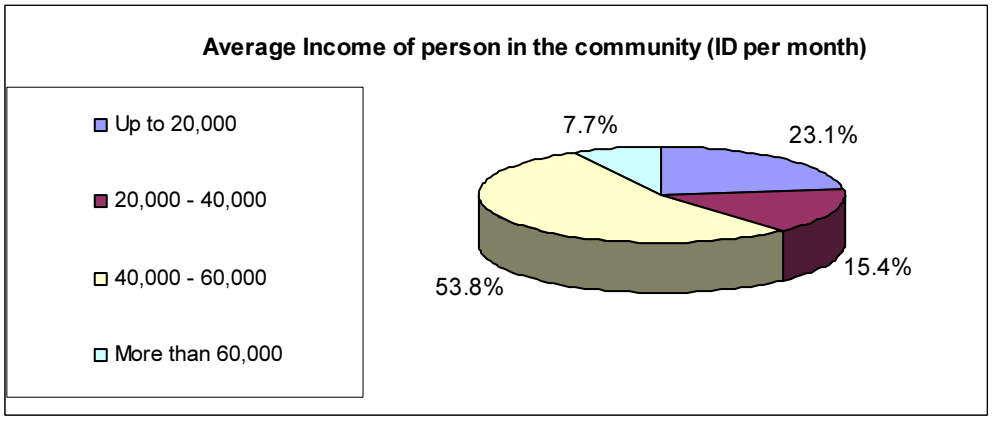
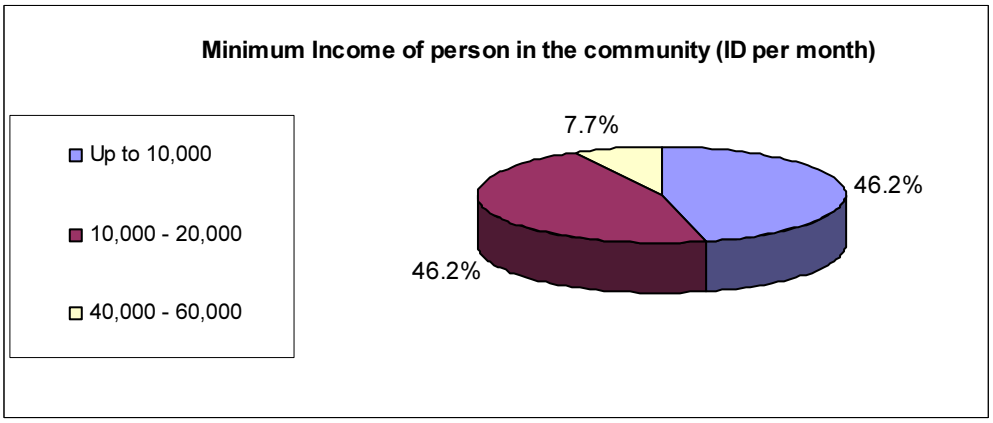


Figure B.17 Occupation Profile

In terms of monthly income, a proportion of 54% of communities' members reported an average monthly income in the range of 40,000 to 60,000 ID/month. This range is typical for middle-low income per capita in Iraq at the time of the survey. Only 8% of community members have an average monthly income 60,000 ID/month, which is the average middle income per capita in Iraq at the time of the survey. A proportion of 38% of community members have an average monthly income below 40,000 ID/month, which is typical for very low income per capita in Iraq at the time of the survey, as shown in *Figure B.18*. The same Figure shows the minimum and maximum monthly income of the community members, respectively.



Income Statistics (1)



Income Statistics (2)

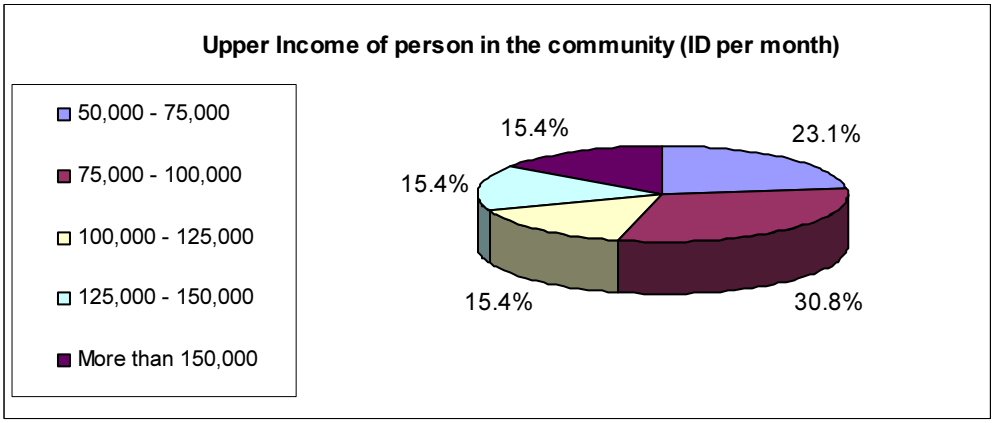


Figure B.18 Income Statistics (3)

As can be seen in *Figure B.20* below, 61% of community members have a monthly income less than the average income, whereas 38% have a monthly income more than the average income.

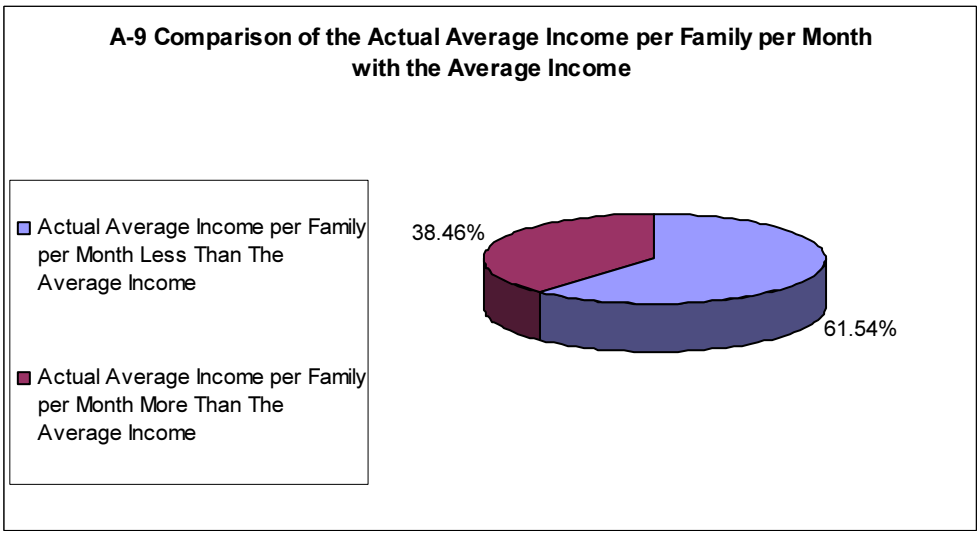


Figure B.19 Income Versus Average Income

The respondents also indicated that the average monthly income per family has increased by 100% compared with before the war (in 2000 - 2003). Nearly 53% of low income family's respondents suggested an average monthly income per capita in the range of 100,000 to 125,000 ID/month as a reasonable income per capita.

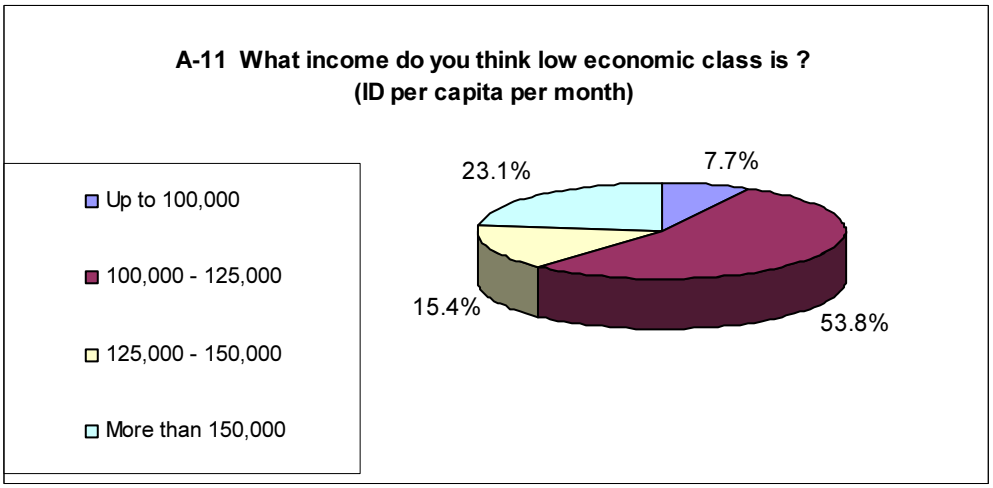


Figure B.20 Acceptable Income

Figure B.21 shows the monthly income per capita as an average for all communities. It should be mentioned that average monthly income per capita is about 39,602 ID, which is very low income per capita in Iraq at the time of survey, and the suggested average monthly income per capita is about 129,464 ID This range is typical for high income per capita in Iraq at the time of the survey.

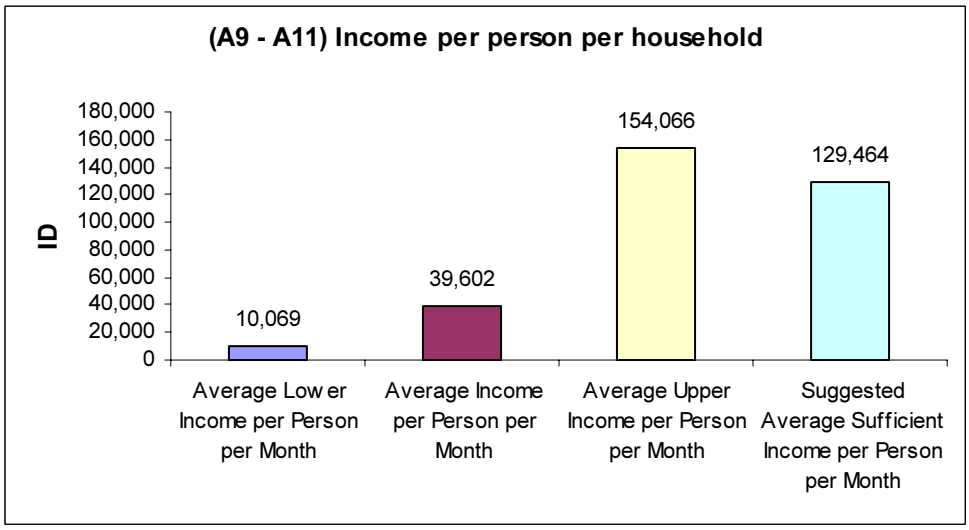


Figure B.21 Monthly Income per capita as an Average for all Communities

(3) Conditions of Water Usage

As shown in *Figure B.22*, about 53.8% of the households in the communities use water-supplied water through house connections combined (not mixed) with bottled water. Nearly 30.8% of them use water supplied through house connections combined with bottled water and in addition to rivers and/or water tankers. Nearly 7.7% use all the above sources in addition to public taps, while the remaining 7.7% have no water supply (house connections) so they only use only rivers and/or water tankers in addition to bottled water.

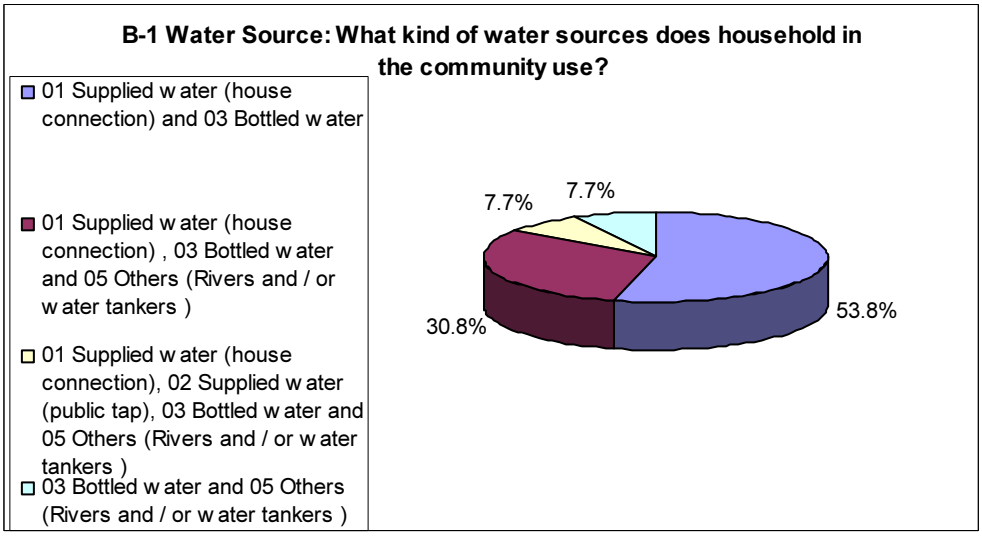


Figure B.22 Water Sources

As an average ratio of water supply in the communities, about 81% of the households have house connections, 18% have water from rivers and/or water tankers. Nearly 0.39% of them use public water taps

only as shown in *Figure B.23.*

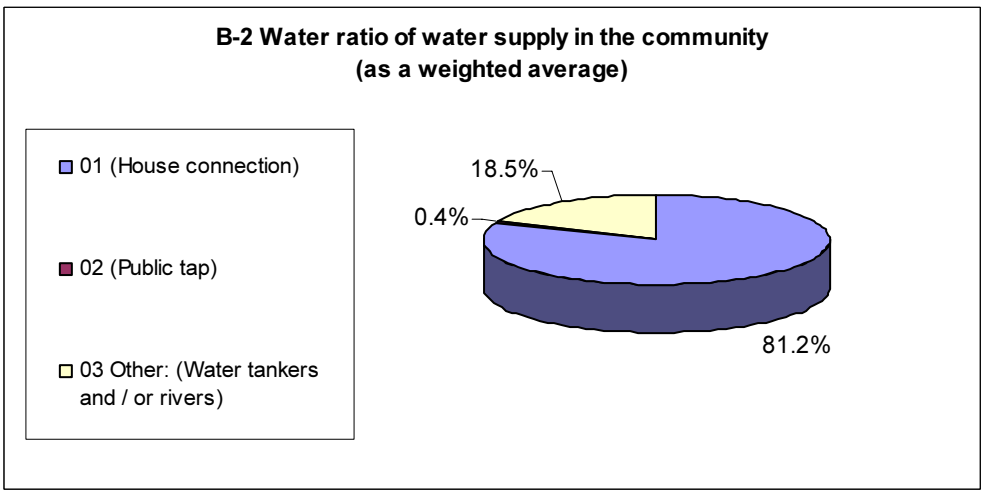


Figure B.23 Water Service

Figures A.24 and A.25 show household water expenditures for water supply (house connection) and for bottled water per year, (ID/year). For water supplied through house connection, nearly 15% of households do not pay any thing for water supply, 23% pay 10000 – 20000 ID per year, 30% pay 20000 – 30000 ID per year, 7% pay 30000 – 40000 ID per year, and the remaining 23% pay more than 40000 ID per year.

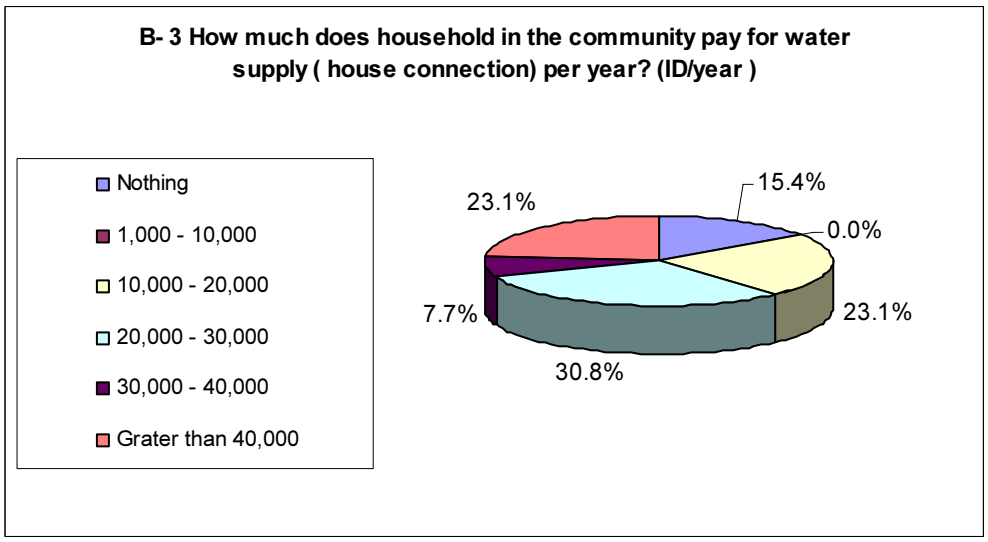
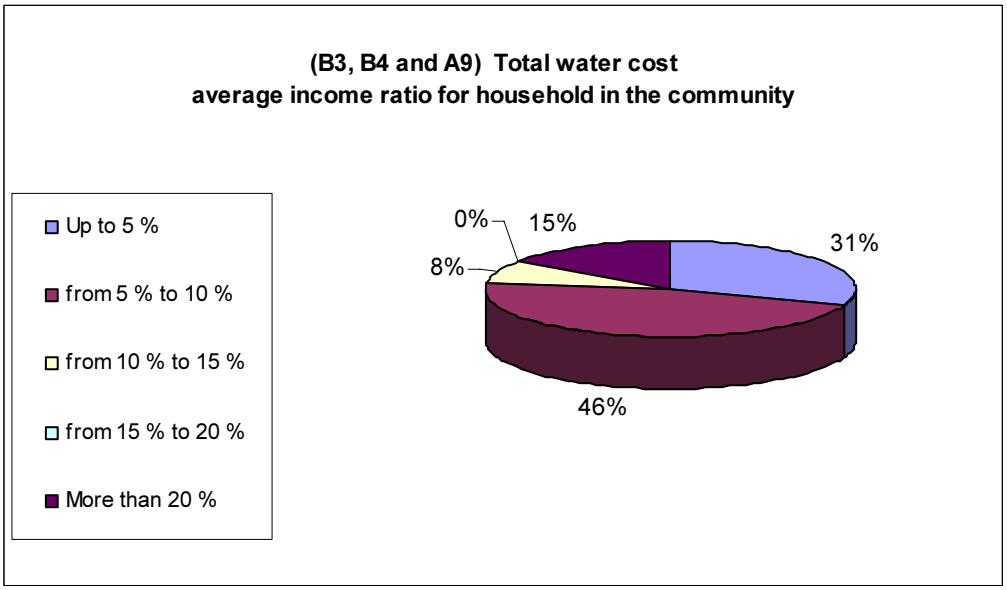


Figure B.24 Household Water Expenditure (Connections)

For the bottled water, 23% of households pay up to 100000 ID per year, 30% pay 100000 – 200000 and 200000 – 300000 ID per year, 7% pay 300000 – 400000 and more than 400000 ID per year. As it is shown, the bottled water cost is very high compared with water supply (house connection) cost. Most households choose to use bottled water because of the bad water quality and quantity supplied by the municipal system.



Household Water Expenditure (1) Total Water

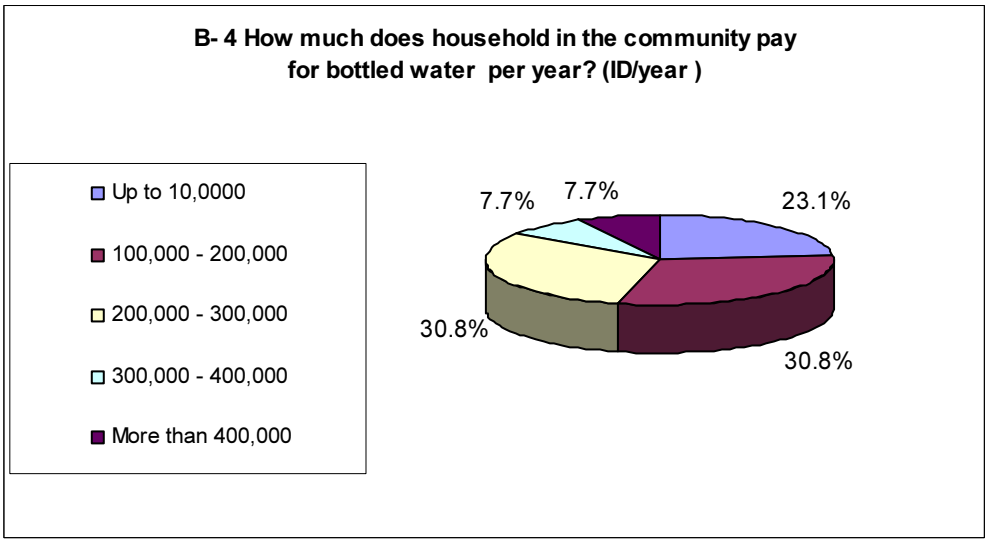


Figure B.25 Household Water Expenditure (2) Bottled Water

Figure B.26 shows the total water expenditures as a ratio of the average income per household in the community. As it is shown, 30% of households spend up to 5% of their income for water, 46% spend (5-10)% of their income for water, and the remaining 23% spend more than 10% of their income for water. The bottled water cost is very high compared water supply through house connections.

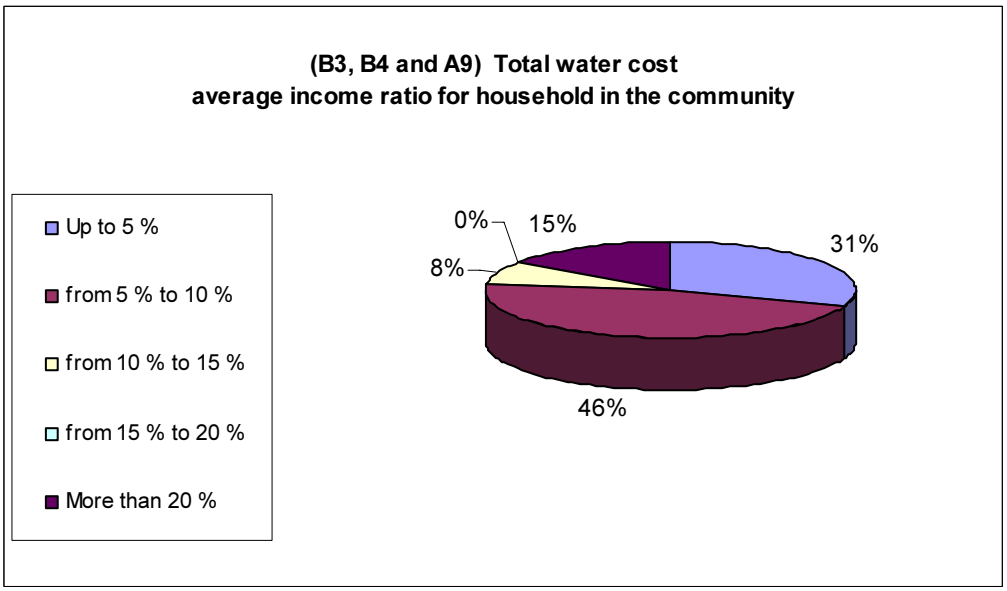


Figure B.26 Water Expenditure as Ratio of Income

It should be mentioned public water taps are free of charge. The households in the community indicated receiving water from the supply service (house connection) with frequencies as shown in *Figure B.27*. As mentioned before, 7.69% have no water supply (house connection). A proportion of 54% have water supply up to 6 hrs/day, 7.69% have water supply in the range of 6-12hrs/day, 7.69% have water supply in the ranges of 18-24 hrs/day, and the remaining 23.08% have water supply in the range of 12-18 hrs/day. Most of households suffer from low water pressure and/ or bad water quality.

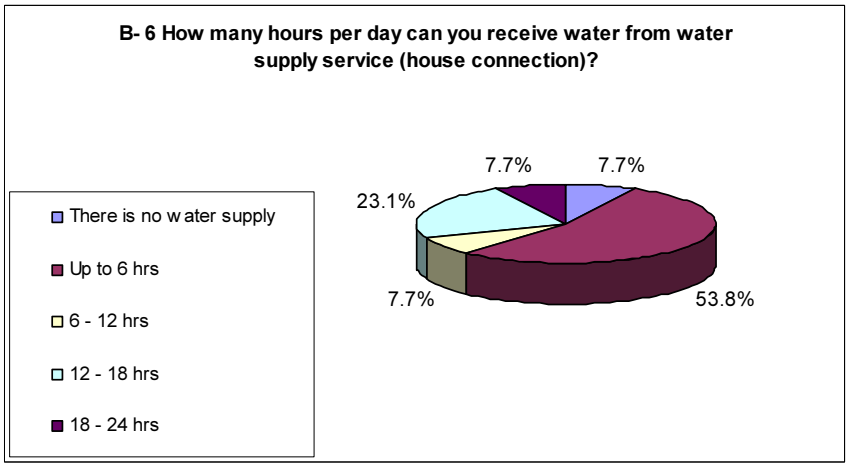


Figure B.27 Frequency of Supply

(4) Awareness of People about Water Supply Service

All communities' members are dissatisfied with the existing water supply service. The reason of the members' complains are mainly caused by the amount of supplied water, hydraulic pressure, bad water quality, and maintenance service. As it is shown above, 7.69% of the communities' households have no

water supply. The other reason of the members' complaints is caused by service hours. Other complaints include branch network connection with the main network for water supply to other regions from regional network, some of water treatment CUs have no power supply from the main power network so it depends on a generator and some of them are installed near very polluted branch rivers, illegal connection to the network, and some of old (broken) conveying water pipe passing through rivers and this causes water pollution in the network during periods of no water pumping in the pipe. A proportion of 23% of communities not satisfied with the existing water tariffs, and this is caused by their low-income. *Figure B.28* shows percentages of communities having problems with the existing water supply service.

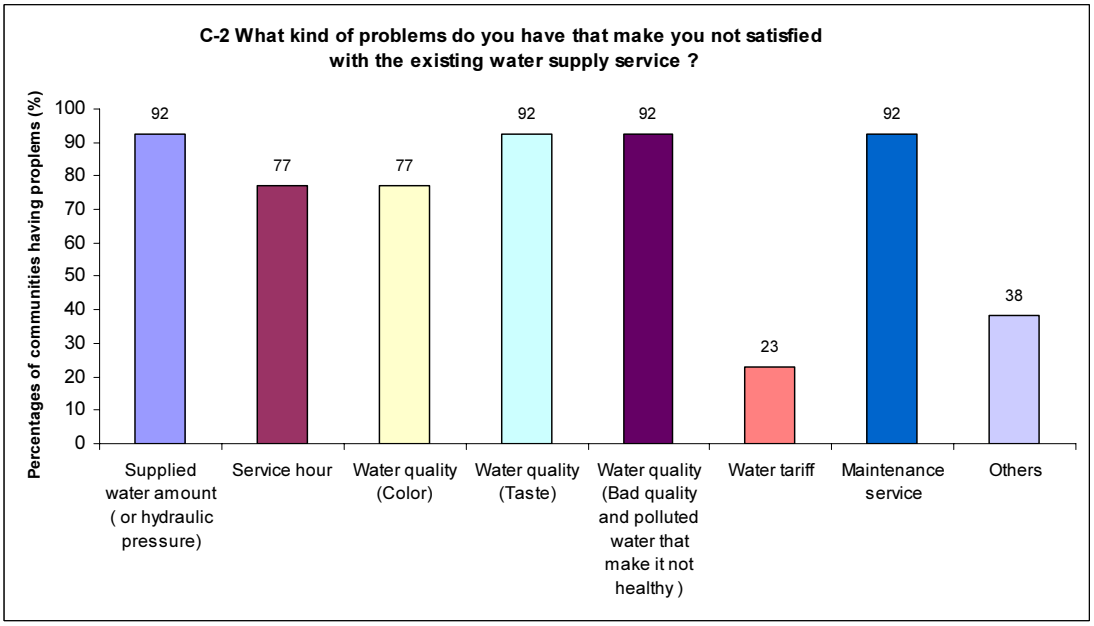


Figure B.28 Water Related Problem

Regarding to the two major problems with the existing water supply service, a proportion of 61% of respondents have selected supplied water amount (or hydraulic pressure) and water quality (bad quality and polluted water that make it not healthy), 30% selected service hours and water quality (bad quality and polluted water that make it not healthy) while the remaining 7% have no water supply, as shown in *Figure B.29*.

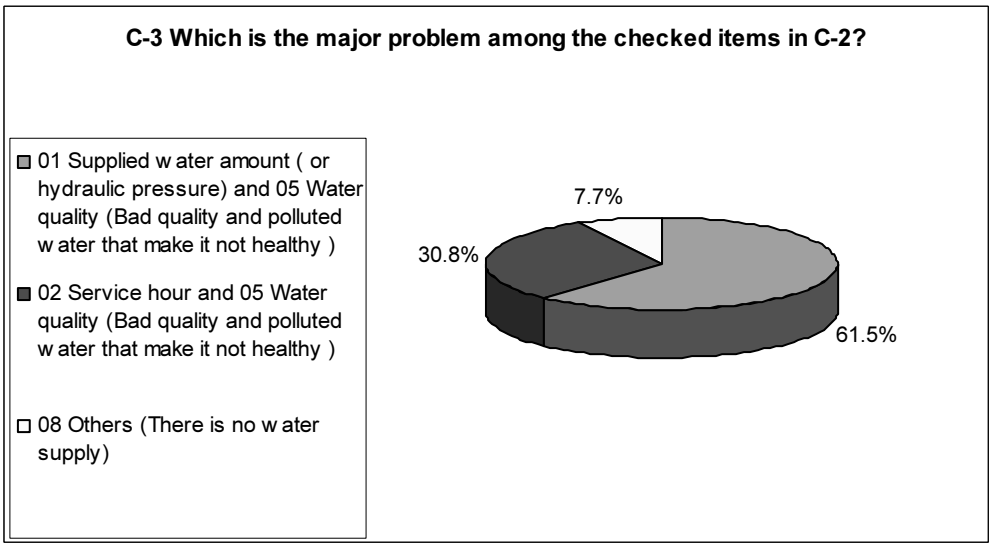


Figure B.29 Major Water Related Problem

The problems with the water supply facilities due to war damages are shown in *Figure B.30*. Nearly 61.54% of the respondents have no problems, while the remaining 38.46% suffered from some problems due to the war damages, such as: low water pressure in the water network, bad water quality, increase population due to coming back from Iran and other places without any expansion for water facilities, chlorine and alum deficit, maintenance services are bad, there is no water supply from Basrah city to Um-Qaser city due to illegal connection with the conveying main pipes from some of farmers and factories owner, and there is indirect problem (electricity discontinuity lead to water discontinuity).

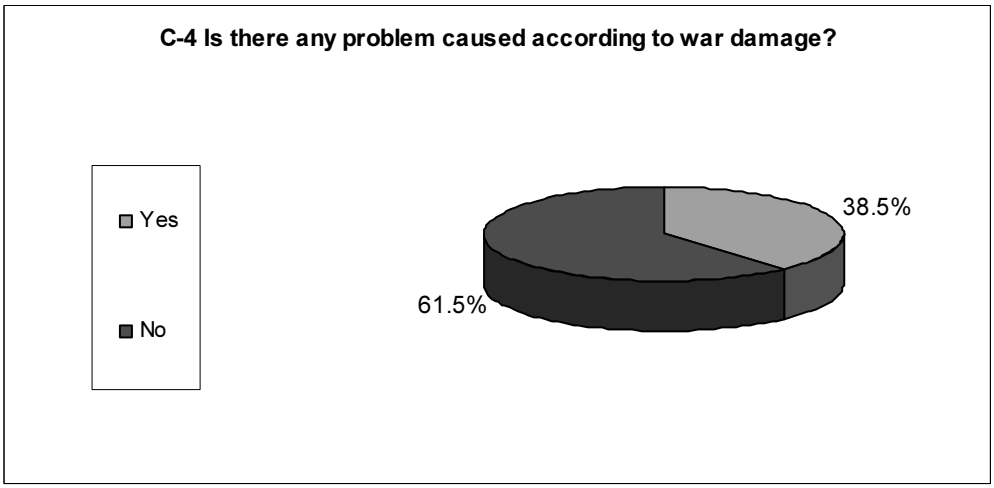


Figure B.30 War Related Problem

To become satisfied with the water supply services in the current time, the respondents indicated that the needed services improvements are as follows:

1. Deliver fresh water to the citizens and collect water fees according to the number of people living in the house,

2. Rehabilitate or new construction of the water network and WTP or CUs,
3. Increase water pressure, duration and quantity by constructing elevated water tanks and PSs,
4. For the districts have no water supply, install ground tanks,
5. Provide generators for pumping stations and select specialist teem for maintenance work,
6. Control the illegal connection.

Whereas to make the respondents satisfied with the water supply services in the future, the services should be improved are as follows:

1. Providing fresh, safe, efficient and healthy water through new construction of efficient water system and maintain the old WTPs and water system.
2. Sea water desalinization with new WTP and complete the new network for Um-Qaser.
3. Providing spare parts for operation and maintenance of water facilities.
4. Control the pollution source to the water sources.

For the water supply service under the current service condition, there are 61.54% of respondents that indicated they will pay nothing, 7.69% indicated willingness to pay 1000 IDs per month or 4000 IDs per moth, and 23.08% indicated willingness to pay 2000 IDs per month, as shown in *Figure B.31*.

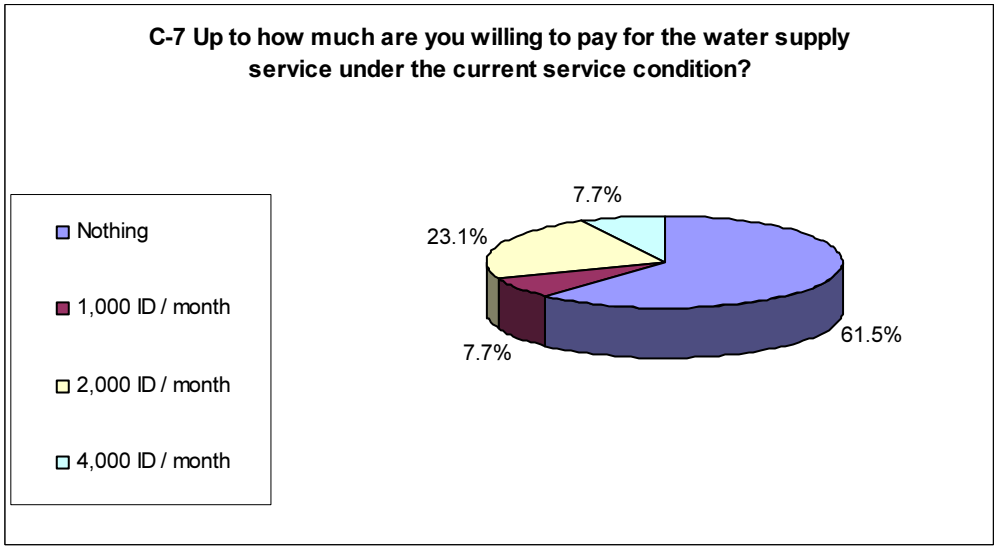


Figure B.31 Willingness to Pay Under Existing Conditions

For satisfactory water supply service 15.38% of respondents indicated willingness to pay 2000 IDs per month, 7.69% would pay in the range 2000-4000 IDs per month, 46.15% would pay in the range 4000-6000 IDs per month, 7.69% would pay in the range 6000-8000 IDs per month, 23% would pay more than 8000 IDs per month, while the remaining 23.08% would pay more than 8000 IDs per month, as shown in *Figure B.32*.

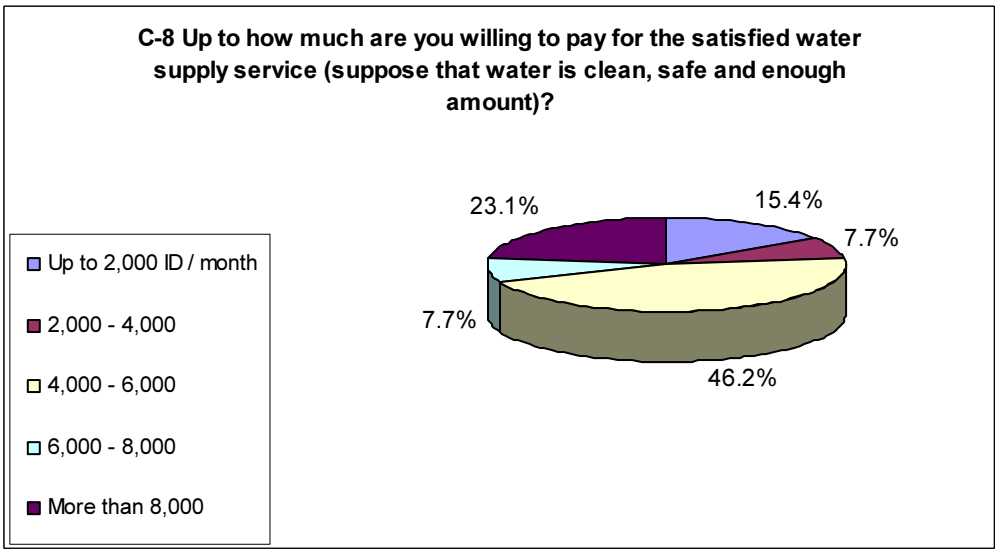


Figure B.32 Willingness to Pay Under Improved Conditions

For respondents who suffered from war damages, a percent of 40% would pay 1000 IDs per month for the water supply service for the pre-war service condition, while the remaining 60% would pay 2000 IDs per month, as shown in *Figure B.33*.

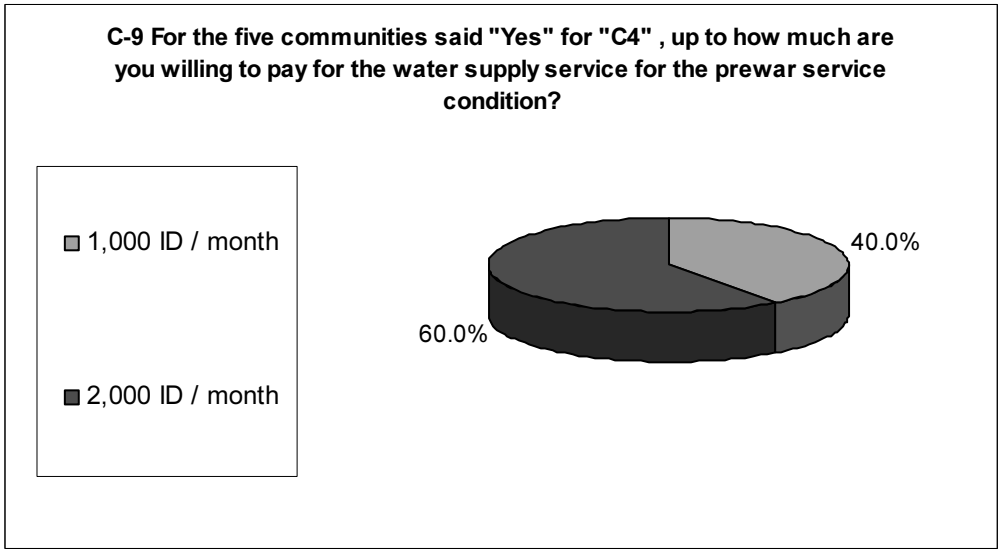


Figure B.33 Willingness to Pay Under Pre-War Conditions

A) Sanitary Condition

Figure B.34 shows the percentages of communities infected with some of water-born diseases in different degree of infection.

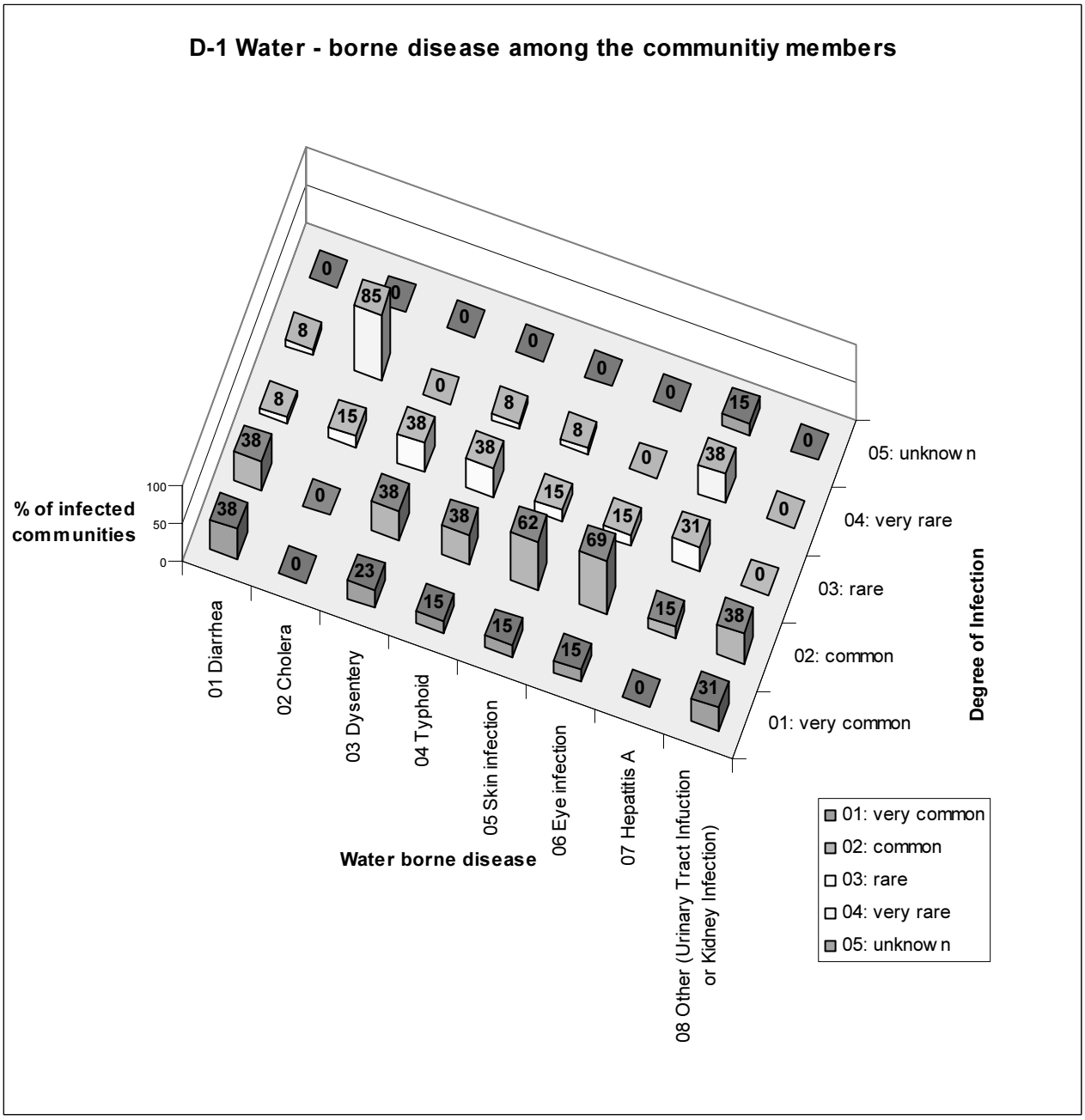
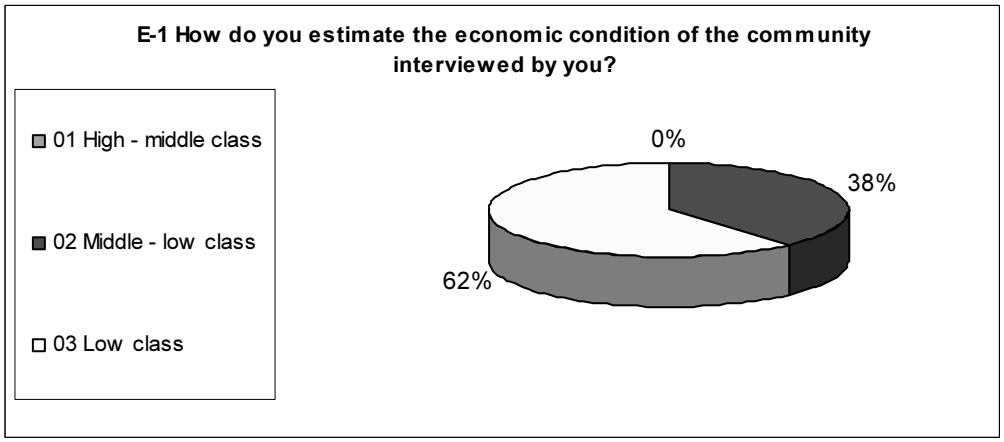


Figure B.34 Waterborne Diseases and Frequency

(5) Interviewer's Comments

According to the economic condition of the community, a percent of 38% of communities are in the range of middle - low class, while the remaining 62 are in the range of low class, as shown in *Figure B.36*. It should be mentioned that there are some very rich families with very high income live in the same poor community's area, and vice versa. The same Figure shows that 31% of the communities are in the range of moderate for the environment of the community and the other 69% are in the range of dirty. This reason is caused by very bad environment services. It should be mentioned that many of house sewers discharge into rivers that deliver wastes to the main water source in Basra.



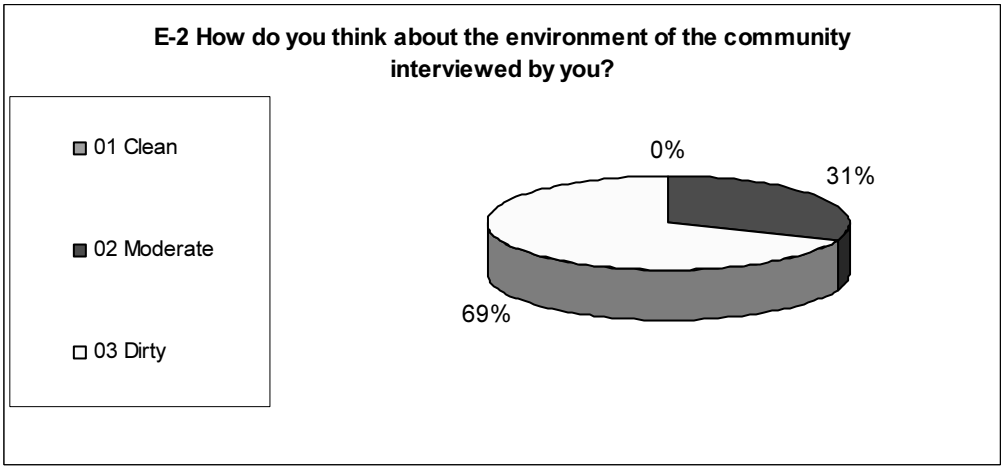


Figure B.35 Interviewers Perception

Attachment -1

Table 1 Socio-Economic Survey for Household (1 / 4)

Section-A Information of Respondent

A- 1 Serial Number

A- 2 Day/Month/Year of Interview

Date: Time (Start) :

A- 3 Name of Respondent

Name:

Address:

A-4 Gender of Respondent 【Please Tick】

☐01 Male ☐02 Female

A- 5 Is there water meter in your house?

☐ Yes / ☐ No

A- 6 Type of Housing (1)

☐01 Owned house

☐02 Leased house

A- 7 Type of Housing (2)

☐01 Wooden house of one story (same as flat)

☐02 Caravan (Mobile home)

☐03 Concrete house of one story

☐04 Concrete house of two stories

☐05 Brick house of one story

☐06 Brick house of two stories

☐07 Building house with some stories

☐08 Clayey house

☐09 Hut

☐10 Others(Specify)

A- 8 Type of Housing (3)

☐01 with garden sq. m

☐02 with flower pot sq. m

☐03 with car park

☐04 Car

☐05 Desert cooler (water cooled type)

A-9 Total floor area of housing (not land area)

Total floor area: sq. m

Section-B Family Structure and Economic Condition

B-1 Family Structure

☐01 adult (with main income)	Male: person	Female: person
☐02 adult (with income)	Male: person	Female: person
☐03 adult (without income)	Male: person	Female: person
☐04 child (less than 18 years old)	Male: person	Female: person
☐05 Total	Male: person	Female: person

B-2 Occupation (Head of Family)

☐01 Salaried employee ☐02 Self-employed worker

B-3 Age (Head of Family)

☐01 20 - 30

☐02 31 - 40

☐03 41 - 50

☐04 51 -

B-4 Category of Occupation (Head of Family)

☐01 Agriculture

☐02 Industry

☐03 Construction

☐04 Service

☐05 Others ( )

B-5 Total Amount of Income

☐01 Total: NID/month /whole family

☐02 Income by head of family NID/month

☐03 Income by others NID/month

Did your income increase or decrease compared with before the war (in 2000 - 2003)?

☐04 Increase (approx. %)

☐05 remain the same

☐06 decrease (approx. %)

B-6 Itemized Expenditure and its Amount

☐01 Housing expenditure NID/month

☐02 Meal expenditure NID/month

☐03 Clothing expense NID/month

☐04 Education expense NID/month

☐05 Electricity and fuel expenses NID/month

☐06 Water expense NID/month

☐07 Others ( ) NID/month

☐08 Others ( ) NID/month

☐09 Others ( ) NID/month

Table 1 Socio-Economic Survey for Household (2 / 4)

Section-C Condition of Water Usage

C-1 Water Source【Multiple Answer】
What kind of water sources does your household use?

☐01 Supplied water (house connection)
☐02 Supplied water (public tap)
☐03 Bottled water
☐04 Groundwater (well water)
☐05 Others(Specify_____)

C-2 Water Consumption 【Multiple Answer】
How much does your household use water per month? (annual average)

☐01 Supplied water (indoor tap)_____ cu. m /month
☐02 Supplied water (yard tap) _____ cu. m /month
☐03 Bottled water _____ cu. m /month
☐04 Groundwater (well water) _____ cu. m /month
☐05 Others(_____ cu. m /month

C-3 Purpose of Water Use 【Multiple Answer】

☐01 Cooking /drinking _____ litter /day (through year / season: _____)
☐02 Washing /Cleaning _____ litter /day (through year / season: _____)
☐03 Shower /Bathtub _____ litter /day (through year / season: _____)
☐04 Toilet _____ litter /day (through year / season: _____)
☐05 Water spray (garden) _____ litter /day (through year / season: _____)
☐06 Car wash _____ litter/day (through year / season: _____)
☐07 Desert cooler _____ litter /day (through year / season: _____)
☐08 Others (Specify_____) _____ litter /day (through year / season: _____)

C-4 How much does your household pay **for water supply** per year?
_____NID/year

C-5 How much does your household pay **for bottled water** per year?
_____NID/year

C-6 How much does your household pay **for public tap** per year?
_____NID/year

C-7 How many hours per day can you receive water from water supply service?
_____hours/day
from _____ to _____

C-8 What kind of facilities do you have?
【Multiple Answer】

☐01 Storage tank
(capacity= gal. , height of tank top= m)
☐02 Suction pump
☐03 Indoor tap
☐04 Yard tap
☐05 Others(Specify_____)

Section-D Awareness of People about Water Supply Service

D-1 Are you satisfied with the existing water supply service?

☐01 Yes
☐02 No

D-2 If no, what kind of problems do you have?
【Multiple Answer】

☐01 Supplied water amount (or hydraulic pressure)
☐02 Service hour
☐03 Water quality (Color)
☐04 Water quality (Taste)
☐05 Water quality (Others)
☐06 Water tariff
☐07 Maintenance service
☐08 Others(_____)

D-3 Which is the major problem among the checked items in D-2?
☐01 _____ ☐02 _____

D-4 Is there any problem caused according to war damage?
☐ 01 Yes (What kind of problems? _____)
☐ 02 No

D-5 If check in the question of D-2, what should be improved? Please give your comments.

Table 1 Socio-Economic Survey for Household (3 / 4)

continue: Section-D Awareness of People about Water Supply Service
D-6 Up to how much are you willing to pay for the water supply service under the current service condition? _____ NID/month Please give your comments:
D-7 Up to how much are you willing to pay for the satisfied water supply service (suppose that water is clean, safe and enough amount)? _____ NID/month Please give your comments:
D-8 If yes in D-4 question, up to how much are you willing to pay for the water supply service for the prewar service condition? _____ NID/month Please give your comments:

Section-E Installation of Water Meter	
E-1 If no water meter, do you agree with the installation of water meter? ☐01 Yes ☐ 02 No (reason:_____)	E-2 If water meter is required for sufficient water supply service, can you accept it? ☐01 Yes ☐02 No
E-3 If yes, how much can you pay for it? _____ NID	E-4 Do you agree to pay water bill which is charged according to actual water consumption measured by water meter? ☐01 Yes ☐ 02 No (reason:_____)

Section-F Condition of Toilet	
F-1 Does your household have a toilet in your home? ☐01 Yes ☐02 No	F-2 If no, what kind of toilet do you use? ☐01 Public toilet ☐02 Neighboring toilet ☐03 Others (_____)
F-3 If yes, what kind of treatment facilities do you have? ☐01 Flush toilet with leaching pit (not water proofed pit) ☐02 Flush toilet with septic tank (water proofed pit) ☐03 Poor flush toilet with leaching pit (not water proofed pit) ☐04 Poor flush toilet with septic tank (water proofed pit) ☐05 Pit latrine (or No facilities) ☐06 Others (_____)	F-4 If check 2 or 4 in the question of F-3, where is wastewater from toilet discharged? ☐01 River (name:_____) ☐02 Drainage channel ☐03 Sea ☐04 Others (_____)

Table 1 Socio-Economic Survey for Household (4 / 4)

Section-G Sanitary Condition	
G-1 Have any members of your family contracted Diarrhea diseases during this year? ☐01 Yes ☐02 No	G-2 If Yes, how many persons contracted the diseases? _____person
	G-3 If Yes, how much did your household pay for medical examination and medicine? _____NID

Time (finish) _____:

Section-H Interviewer's Comments	
H-1 How do you estimate the economic condition of the household interviewed by you? ☐01 High – middle class ☐02 Middle – low class ☐03 Low class	Comment (if any)
H-2 How do you think about the environment of the household interviewed by you? ☐01 Clean ☐02 Moderate ☐03 Dirty	Comment (if any)
Comments (if any) **Name of Interviewer:**	

Attachment -2

Table 2 Socio-Economic Survey for Community (1 / 3)

Section-A Information of Respondent	
A- 1 Serial Number	A- 2 Day/Month/Year of Interview Date: Time (Start) :
A- 3 Community 01 Name: 02 City: 03 Address:	A- 4 Respondent 01 Name: 02 Position:
A- 5 Community Population _____	
A- 6 Land Use of community's area ☐01 Exclusive residential area ☐02 Mixture zone of residential and commercial area ☐03 Mixture zone of residential and industrial area ☐04 Commercial area ☐05 Agricultural area ☐06 Others(Specify_____)	A- 7 Economic Condition of household in the community ☐01 High class ☐02 High – Middle class ☐03 Middle – Low class ☐04 Low class ☐04 Others(Specify_____)
A-8 Composition ratio of occupation in the community ☐01 Agriculture (%) ☐02 Industry / Construction (%) ☐03 Service /Office worker (%) ☐05 Others ( ) (%)	A-9 Average Income of family in the community 01 _____ NID/month / family 02 (from to NID/month / family)
A-10 Did the average income of family in the community increase or decrease compared with before the war (in 2000 - 2003)? ☐01 Increase (approx._____%) ☐02 remain the same ☐03 decrease (approx._____%)	A-11 What income do you think low economic class is? **Less than NID/ month /family**
Section-B Condition of Water Usage	
B-1 Water Source【Multiple Answer】 What kind of water sources does household in the community use? ☐01 Supplied water (house connection) ☐02 Supplied water (public tap) ☐03 Bottled water ☐04 Groundwater (well water) ☐05 Others(Specify_____)	B-2 Service ration of water supply in the community ☐01_____% (House connection) ☐02_____% (Public tap) ☐03_____% (Other: Specify_____)
B-3 How much does household in the community pay **for water supply (house connection)** per year? Average payment NID/year	

Table 2 Socio-Economic Survey for Community (2 / 3)

continue: Section-B Condition of Water Usage
B-4 How much does household in the community pay **for bottled water** per year? Average payment _____ NID/year
B-5 How much does household in the community pay **for public tap** per year? Average payment _____ NID/year
B-6 How many hours per day can you receive water from water supply service (house connection)? _____ hours/day (from _____ to _____)

Section-C Awareness of People about Water Supply Service	
C-1 Are you satisfied with the existing water supply service? ☐01 Yes ☐02 No	C-2 If no, what kind of problems do you have? 【Multiple Answer】 ☐01 Supplied water amount (or hydraulic pressure) ☐02 Service hour ☐03 Water quality (Color) ☐04 Water quality (Taste) ☐05 Water quality (Others) ☐06 Water tariff ☐07 Maintenance service ☐08 Others(_____)
C-3 If check in the question of C-2, what should be improved immediately? ☐01 _____ ☐02 _____	
C-4 Is there any problem caused according to war damage? ☐ 01 Yes (What kind of problems? _____) ☐ 02 No	
C-5 If check in the question of C-2, what should be improved immediately? Please give your comments.	
C-6 In the future, what kind of water supply service do you desire? (satisfied water supply service for your community) Please give your comments	
C-7 Up to how much are you willing to pay for the water supply service under the current service condition? _____ NID/month Please give your comments:	
C-8 Up to how much are you willing to pay for the satisfied water supply service (suppose that water is clean, safe and enough amount)? _____ NID/month Please give your comments:	

Table 2 Socio-Economic Survey for Community (3 / 3)

continue: Section-C Awareness of People about Water Supply Service

C-9 If yes in C-4 question, up to how much are you willing to pay for the water supply service for the prewar service condition?

_____ NID/month Please give your comments:

Section-D Sanitary Condition

D-1 Water-borne disease among the Community members

☐01 Diarrhea	01: very common	02: common	03: rare	04: very rare	05: unknown
☐02 Cholera	01: very common	02: common	03: rare	04: very rare	05: unknown
☐03 Dysentery	01: very common	02: common	03: rare	04: very rare	05: unknown
☐04 Typhoid	01: very common	02: common	03: rare	04: very rare	05: unknown
☐05 Skin infection	01: very common	02: common	03: rare	04: very rare	05: unknown
☐06 Eye infection	01: very common	02: common	03: rare	04: very rare	05: unknown
☐07 Hepatitis A	01: very common	02: common	03: rare	04: very rare	05: unknown
☐08 Other (Specify: _____)	01: very common	02: common	03: rare	04: very rare	05: unknown

Time (finish) :

Section-E Interviewer's Comments

E-1 How do you estimate the economic condition of the community interviewed by you? ☐01 High – middle class ☐02 Middle – low class ☐03 Low class	Comment (if any)
E-2 How do you think about the environment of the community interviewed by you? ☐01 Clean ☐02 Moderate ☐03 Dirty	Comment (if any)

Comments (if any)

Name of Interviewer:

Attachment –3

Table 3 Result of Socio-economic Survey (Household, 1/4)

A- 1 Serial Number				-
Section-A Information of Respondent	A- 2 Day/Month/Year of Interview	Date:		-
		Time		-
	A- 3 Name of Respondent	Name		-
		Address		-
	A-4 Gender of Respondent		Male	270
			Female	130
			total	400
	A- 5 Is there water meter in your house?		Yes	2
			No	398
	A- 6 Type of Housing (1)		Owned house	321
			Leased house	79
	A- 7 Type of Housing (2)	01 Wooden house of one story		-
		02 Caravan (Mobile home)		6
		03 Concrete house of one story		98
		04 Concrete house of two stories		54
		05 Brick house of one story		125
		06 Brick house of two stories		84
		07 Building house with some stories		11
		08 Clayey house		20
		09 Hut		-
		10 Others		2
	A- 8 Type of Housing (3)	01 with garden (sq. m)	Number of household	276
			Average	91.8
			Max.	2,500
			Min.	6
			Medan	30
		02 with flower pot (sq. m)	Number of household	13
			Average	8.1
			Max.	28
			Min.	1
			Medan	5
		03 with car park		229
		04 Car		219
		05 Desert cooler (water cooled type)		223
	A-9 Total floor area of housing (not land area) (sq. m)		Average	163
			Max.	30
			Min.	450
			Medan	150
Section-B Family Structure and Economic Condition	B-1 Family Structure		Male (person)	4.2
			Female (person)	3.7
			Total	7.9
	B-2 Occupation (Head of Family)		Salaried employee	250
			Self-employed worker	150
			Total	400
	B-3 Age (Head of Family)		01 20 - 30	13
			02 31 - 40	121
			03 41 - 50	181
			03 51 -	85
	B-4 Category of Occupation (Head of Family)		01 Agriculture	20
			02 Industry	71
			03 Construction	44
			04 Service	261
			05 Others	4
	B-5 Total Amount of Income	01 Total ID/month /whole family	Average	835,533
			Max.	100,000
			Min.	5,000,000
			Medan	750,000
		02 Income by head of family ID/month	Average	477,313
			Max.	75,000
			Min.	3,450,000
			Medan	400,000
		03 Income by others ID/month	Average	504,536
			Max.	100
			Min.	3,900,000
			Medan	400,000

Table 3 Result of Socio-economic Survey (Household, 2/4)

Section-B Family Structure and Economic Condition	B-5 Total Amount of Income	Did your income increase or decrease compared with before the war (in 2000 - 2003)?	04 Increase	310
			05 remain the same	83
			06 decrease	6
	B-6 Itemized Expenditure and its Amount (ID/month)	01 Housing expenditure	Average	111,908
			Min.	4,000
			Max.	250,000
			Medan	100,000
			No.of data	65
		02 Meal expenditure	Average	288,338
			Min.	25,000
			Max.	6,000,000
			Medan	250,000
			No.of data	400
		03 Clothing expense	Average	65,518
			Min.	1,000
			Max.	500,000
			Medan	50,000
			No.of data	398
		04 Education expense	Average	57,488
			Min.	2,000
			Max.	400,000
			Medan	50,000
			No.of data	299
		05 Electricity and fuel expenses	Average	16,383
			Min.	2,000
			Max.	150,000
			Medan	14,500
			No.of data	398
		06 Water expense	Average	14,714
			Min.	2,000
			Max.	140,000
			Medan	12,500
			No.of data	392
		07 Others (Generator)	Average	31,575
			Min.	7,000
			Max.	150,000
			Medan	25,000
			No.of data	333
		08 Others (Medical)	Average	24,593
			Min.	2,000
			Max.	150,000
			Medan	20,000
			No.of data	327
		09 Others	Average	32,180
			Min.	2,000
			Max.	300,000
			Medan	20,000
			No.of data	255
		Tota	Average	512,233
			Min.	100,000
			Max.	6,288,500
			Medan	469,750
			No.of data	400
Section-C Condition of Water Usage	C-1 Water Source 【Multiple Answer】 What kind of water sources does your household use?	01 Supplied water (house connection)		392
		02 Supplied water (public tap)		2
		03 Bottled water		398
		04 Groundwater (well water)		1
		05 Others		35

Table 3 Result of Socio-economic Survey (Household, 3/4)

Section-C Condition of Water Usage	C-2 Water Consumption 【Multiple Answer】 How much does your household use water per month? (annual average, cu. m /month)	01 Supplied water (house connection)	Average (m^3 /month)	29.1
			No.of data	389
		02 Supplied water (public tap)	Average (m^3 /month)	4.8
			No.of data	2
		03 Bottled water	Average (m^3 /month)	1.04
			No.of data	393
		04 Groundwater (well water)	Average (m^3 /month)	-
			No.of data	-
		05 Others	Average (m^3 /month)	22.8
			No.of data	31
		Total	Average (m^3 /month)	31.0
			No.of data	400
	Unit Water Consumption (lcd)	Water consumption except bottled water		139.5
		Bottoled water		4.5
		Total		143.9
	C-3 Purpose of Water Use 【Multiple Answer】	01 Cooking /drinking		3.2%
		02 Washing /Cleaning		26.7%
		03 Shower /Bathtub		33.5%
		04 Toilet		12.1%
		05 Water spray (garden)		10.4%
		06 Car wash		4.6%
		07 Desert cooler		9.5%
		08 Others (Specify)		0.0%
	C-4 How much does your household pay **for water supply** per year? (ID/month)		Average	2,299
			No.of data	318
	C-5 How much does your household pay **for bottled water** per year? (ID/month)		Average	12,184
			No.of data	392
	C-6 How much does your household pay **for public tap** per year? (ID/year)			-
	C-7 How many hours per day can you receive water from water supply service?		less than 6 hours/day	151
			6 <hours <= 12	100
			12 <hours <= 24	137
			No.of data	388
	C-8 What kind of facilities do you have? 【Multiple Answer】	01 Storage tank	Capacity (Av., m^3)	1.1
			Max.	3.0
			Min.	0.1
			Medan	1.0
			No.of data	398
			height of tank (Av. m)	4.5
			Max.	12.0
			Min.	0.5
			Medan	4.0
			No.of data	398
		02 Suction pump		389
Section-D Awareness of People about Water Supply Service	D-1 Are you satisfied with the existing water supply service?		Yes	25
			No	375
	D-2 If no, what kind of problems do you have? 【Multiple Answer】	01 Supplied water amount (or hydraulic pressure)		353
		02 Service hour		250
		03 Water quality (Color)		335
		04 Water quality (Taste)		362
		05 Water quality (Others)		317
		06 Water tariff		6
		07 Maintenance service		224
		08 Others( )		15
	D-3 Which is the major problem among the checked items in D-2?	01 Supplied water amount (or hydraulic pressure)		94.1%
		02 Service hour		66.7%
		03 Water quality (Color)		89.3%
		04 Water quality (Taste)		96.5%
		05 Water quality (Others)		84.5%
		06 Water tariff		1.6%
		07 Maintenance service		59.7%
		08 Others( )		4.0%
	D-4 Is there any problem caused according to war damage?	Yes		138
		If Yes, What kind of problems?		-
	D-5 If check in the question of D-2,	what should be improved? (Please give your comments)		-

Table 3 Result of Socio-economic Survey (Household, 4/4)

Section-D Awareness of People about Water Supply Service	D-6 Up to how much are you willing to pay for the water supply service under the current service condition? (ID/month)		Average	2,472
			Min.	500
			Max.	10,000
			Medan	2,000
			No.of data	230
	D-7 Up to how much are you willing to pay for the satisfied water supply service (suppose that water is clean, safe and enough amount)? (ID/month)		Average	8,604
			Min.	1,000
			Max.	50,000
			Medan	10,000
			No.of data	384
	D-8 If yes in D-4 question, up to how much are you willing to pay for the water supply service for the prewar service condition? (ID/month)		Average	2,614
			Min.	1,000
			Max.	10,000
			Medan	2,000
			No.of data	105
Section-E Installation of Water Meter (if there is no water meter)	E-1 If no water meter, do you agree with the installation of water meter?		Yes	379
			No	20
			No.of data	399
			reason (if No)	-
	E-2 If water meter is required for sufficient water supply service, can you accept it?		Yes	389
			No	11
			No.of data	400
	E-3 If yes for E- 2, how much can you pay for it? (NID)		Average	6,798
			Min.	1,000
			Max.	25,000
			Medan	5,000
			No.of data	255
	E-4 Do you agree to pay water bill which is charged according to actual water consumption measured by water meter?		Choose Yes	381
			reason (if No)	-
Section-F Condition of Toilet	F-1 Does your household have a toilet in your home?		Yes	399
	F-2 If No for F- 1, what kind of toilet do you use?		Neighboring toilet	1
	F-3 If Yes for F-1 , what kind of treatment facilities do you have?	01 Flush toilet with leaching pit (not water proofed pit)		15
		02 Flush toilet with septic tank (water proofed pit)		29
		03 Poor flush toilet with leaching pit (not water proofed pit)		57
		04 Poor flush toilet with septic tank (water proofed pit)		274
		05 Pit latrine (or No facilities)		14
		06 Poor flush toilet without septic tank (direct to the river)		10
	F-4 If check 2 or 4 in the question of F-3, where is wastewater from toilet discharged?	01 River (name:		71
		02 Drainage channel		19
		03 Sea		0
		04 to the wastwater network		216
Section-G Sanitary Condition	G-1 Have any members of your family contracted Diarrhea diseases during this year? (Yes)			231
	G-2 If Yes for G-1, how many persons contracted the diseases? (Person/year)		Average	2.3
			Min.	1
			Max.	24
			Median	2
			No.of data	231
	G-3 If Yes for G-1, how much did your household pay for medical examination and medicine? (ID/household)		Average	19,242
			Min.	1,000
			Max.	200,000
			Median	11,000
			No.of data	228
	How much did your household pay for per person of medical examination and medicine? (ID/person)		Average	9,009
			Min.	500
			Max.	60,000
			Median	7,500
			No.of data	228
Section-H Interviewer's Comments	H-1 How do you estimate the economic condition of the household interviewed by you?		01 High – middle class	110
			02 Middle – low class	157
			03 Low class	133
			Comment (if any)	-
	H-2 How do you think about the environment of the household interviewed by you?		01 Clean	114
			02 Moderate	194
			03 Dirty	92
			Comment (if any)	-
	H-3 Comments (if any)			-

Attachment –4

Table 4 Result of Socio-economic Survey (Community, 1/7)

A- 1 Serial Number	A- 2 Day/Month /Year of Interview		A -3 Community			A- 4 Name of Respondent		A- 5 Community Population (person)	A- 6 Land Use of community's area					
	Date:	Time	01 Name	02 City	03 Address	Name	Position		01 Exclusive residential area	02 Mixture zone of residential and commercial area	03 Mixture zone of residential and industrial area	04 Commercial area	05 Agricultural area	06 Others(Specify)
1	21-May-06	10:30AM	Municipal Council for Al Janaineh District	Al Basrah center - Junaineh	Hay Al Andulos	Abdul-Ameer Jawad Al-Huseini	Head of Municipal Council 0096 4 (0) 7801 434948	28,000		✓				
2	22-May-06	12:00AM	Municipal Council for Hay Al Khadra'a	Al Hakemiah	Hay Al Khadra' a	Mohammad Mtasher	Member of Municipal Council	13,888	✓					
3	23-May-06	6:15PM	Municipal Council for Al Kindy District	Al Kindy District	Al Ma'kel / Al Kindy	Diya'a Hashem	Head of Municipal Council 0096 4 (0) 7802 097554	6,000	✓					
4	24-May-06	11:00AM	Municipal Council for Abu Al-Khaseeb	Abu Al Khaseeb	Abu Al Khaseeb / al Qada' center	Ali Hassan Ali	Head of Municipal Council	200,000	✓				✓	
5	25-May-06	9:45AM	Municipal Council for Al Sekak District	Al Sekak	Al Ma'qel	Reiad Hashem	Deputy Head of Municipal Council	7,000	✓					
6	26-May-06	10:30AM	Municipal Council for AlMowafaqiah	AlMowafaqiah	AlMowafaqiah/ door Al neft	Hashem Mohammad	Head of Municipal Council	5,000	✓					
7	27-May-06	4:00PM	Port resident society	Jam'yat Eskan Al-Mawane'	Basrah/ Al-Meathq St	Raed Nory	Public Figure	4,000		✓				
8	29-May-06	8:40AM	Municipal Council for shat Al Arab/ Al Kbasi	Al Kbasi	Big Al Kbasi	Mo'aiad Aidul-Nabi	Head of Municipal Council	31,000	✓				✓	
9	29-May-06	10:00AM	Al Zereiji Village/Shat Al Arab	Al Zereiji	Al Zereiji	Qader As Saiad Kathem	Public Figure	10,000			✓		✓	

Table 4 Result of Socio-economic Survey (Community, 2/7)

A- 1 Serial Number	A- 7 Economic Condition of household in the community					A-8 Composition ratio of occupation in the community (%)					A-9 Income of family in the community			A-10 Did the average income of family in the community increase or decrease compared with before the war (in 2000 - 2003)?			A-11 What income do you think low economic class is?	
	01 High class	02 High – Middle class	03 Middle – Low class	04 Low class	05 Others(Specify)	01 Agriculture	02 Industry / Construction	03 Service /Office worker	04 Self Employed	05 Others (Specify) un-employed	01 Average ID/month / family	02		04 Increase (approx. %)	05 remain the same	06 decrease (approx. %)	Less than ID/month / family	Average No. of persons per family (person)
												From ID/month / family	To ID/month / family					
1			✓			0	10	15	50	25	300,000	100,000	1,000,000	1,200			600,000	7
2			✓			0	50	30	20	0	500,000	100,000	1,000,000	500			1,500,000	8
3				✓		0	0	70	0	30	300,000	-	1,000,000	1,000			1,000,000	7
4			✓			10	5	45	40		400,000	50,000	750,000	4,000			1,000,000	8
5				✓		0	0	90	0	10	450,000	95,000	1,400,000	5,000			1,500,000	8
6			✓			0	60	20	15	5	300,000	15,000	450,000	1,000			1,000,000	8
7				✓		5	25	25	40	5	350,000	165,000	500,000	366			750,000	7
8				✓		38	10	12	10	30	250,000	50,000	600,000	60			1,000,000	10
9				✓		20	10	20	0	50	175,000	75,000	1,000,000	50			1,000,000	10

Table 4 Result of Socio-economic Survey (Community, 3/7)

A- 1 Serial Number	B-1 Water Source【Multiple Answer】 What kind of water sources does household in the community use?					B-2 Water ratio of water supply in the community 【Multiple Answer】 %			B- 3 How much does household in the community pay **for water supply** (house connection) per year? (ID/year)	B- 4 How much does household in the community pay **for bottled water** per year? (ID/year)	B- 5 How much does household in the community pay **for puplic tap** per year? (ID/year)	B- 6 How many hours per day can you receive water from water supply service (house connection)?		
	01 Supplied water (house connection)	02 Supplied water (public tap)	03 Bottled water	04 Groundwater (well water)	05 Others (Specify)	01 (House connection)	02 (Public tap)	03 (Other: Specify)				hours/day	from	to
1	✓		✓			100 for legal houses; the network did not reach for many of un-legal houses			25,000	360,000		16	Unstable depends on power supply	
2	✓		✓			100			54,000	270,000		14	Unstable depends on power supply. Most of the day is un-available	
3	✓		✓			100			12,000	180,000		24hrs, with pump and power supply		
4	✓	✓	✓		✓ Shat Al-Arab	70	5	25 from rivers	24,000	72,000	0	3	12:00PM	3:00AM
5	✓		✓			100			24,000	180,000		6	12:00PM	6:00AM
6	✓		✓			100			48,000	180,000		10	6:00AM 2:00PM	11:00AM 7:00PM
7	✓		✓			100			18,000	180,000		16	Unstable depends on power supply and need pump	
8	✓		✓		✓ Rivers + R-O water tankers	60		40 from rivers and R-O water tankers	12,000	270,000		2 hrs every 3 dayes	7:00AM	9:00AM
9			✓		✓ Rivers + water tankers			100 from rivers and water tankers	nothing	96,000		0	There is no water supply	

Table 4 Result of Socio-economic Survey (Community, 4/7)

A- 1 Serial Number	C-1 Are you satisfied with the existing water supply service?	C-2 If no, what kind of problems do you have?【Multiple Answer】								C-3 Which is the major problem among the checked items in C-2?	
		01 Supplied water amount (or hydraulic pressure)	02 Service hour	03 Water quality (Color)	04 Water quality (Taste)	05 Water quality (Others)	06 Water tariff	07 Maintenance service	08 Others( )	01	02
1	02 No	✓	✓		✓	✓ Bad quality	✓	✓		Supplied water amount (or hydraulic pressure)	Water quality (Bad Quality)
2	02 No	✓		✓	✓	✓ Bad quality		✓		Supplied water amount (or hydraulic pressure)	Water quality (Bad Quality)
3	02 No	✓		✓	✓	✓ Bad quality		✓	✓ Branch network connection with the main network for water supply to other regions from regional network	Supplied water amount (or hydraulic pressure)	Water quality (Bad Quality)
4	02 No	✓	✓	✓	✓	✓ Bad quality			✓ There is a CU without Power supply , it depends on a generator	Supplied water amount (or hydraulic pressure)	Water quality (Bad Quality)
5	02 No	✓	✓	✓	✓	✓ not healthy		✓		Supplied water amount (or hydraulic pressure)	Water quality (not healthy)
6	02 No	✓	✓	✓	✓	✓ directly from Shat Al-Arab to the network without treatment		✓		Supplied water amount (or hydraulic pressure)	Water quality (directly from Shat Al-Arab to the network without treatment)
7	02 No	✓	✓	✓	✓	✓ not healthy with oder		✓		Supplied water amount (or hydraulic pressure)	Water quality (not healthy with oder)
8	02 No	✓	✓	✓	✓	✓ not healthy		✓	✓ asbestos Pipes, illegal connection to the network, Passing of old (broken) conveying water pipe through rivers and this causes water pollution in the network if there is no water pumping in the pipe	Supplied water amount (or hydraulic pressure)	Water quality (not healthy)
9	02 No							✓	✓ there is no water supply	There is no water supply	

Table 4 Result of Socio-economic Survey (Community, 5/7)

A- 1 Serial Number	C-4 Is there any problem caused according to war damage?		C-5 If check in the question of C-2,	C-6 In the future, what kind of water supply service do you desire? (satisfied water supply service for your community) Please give your comments	C-7 Up to how much are you willing to pay for the water supply service under the current service condition?	
	Choose Yes or No	If Yes, What kind of problems?	what should be improved? (Please give your comments)		ID/month	Please give your comments.
1	02 No		Deliver fresh water to the citizens. Collect water fees according to the number of people live in a house	Full rehabilitation for water system (WTPs, P.S. and water network), distribute fresh water, periodical maintenance for the network pipes, and install water meter for each house	2,000	It should be without money due to bad water system conditions
2	01 Yes	Low pressure in the network-pipes and bad water quality	Rehabilitate or new construction of the water network and WTP	New construction 0f Efficient Water System	1,000	Bad services and bad water quality
3	02 No		Construct an elevated water tanks and PS	Providing fresh water	Nothing	It should be without money due to bad water system conditions
4	01 Yes	Increase population due to coming back from Iran and other places without any expansion for water facilities	Increase water pressure and quantity	New WTP construction to deliver safe, efficient and healthy water to the houses	2,000	Un-efficient water system
5	02 No		Increase water pressure in the water network	New Compact Unit construction and maintain the old WTP and water system	2,000	low water pressure and bad water quality and quantity
6	02 No		Construct Compact Unit in the district	Install new water treatment plant and water network rehabilitation	4,000	Bad water quality
7	02 No		Install water treatment units to provide fresh water for the region and install an elevated water tanks	Rehabilitate water network and WTP to provide good quality and healthy water	Nothing	Bad water conditions
8	01 Yes	1. indirect problems (electricity discontinuity lead to water discontinuity). Direct problems bad water quality due to: 2. There is no water Lab. 3. Chlorine and alum deficit.	Install five control units with 1 MGD capacity in the district	Construction a new WTP and new network to serve Al Basrah District and to insure deliver Fresh water	Nothing	there is insufficient water with very bad quality.
9	02 No		Install ground tanks and filled it from tankers	Install water treatment plant (there are three water networks in the district but without water supply)	Nothing	There is no water suplly

Table 4 Result of Socio-economic Survey (Community, 6/7)

A- 1 Serial Number	C-8 Up to how much are you willing to pay for the satisfied water supply service (suppose that water is clean, safe and enough amount)?		C-9 If yes in C-4 question, up to how much are you willing to pay for the water supply service for the prewar service condition?		D-1 Water-borne disease among the Community members							
	ID/month	Please give your comments.	ID/month	Please give your comments.	01 Diarrhea	02 Cholera	03 Dysentery	04 Typhoid	05 Skin infection	06 Eye infection	07 Hepatitis A	08 Other (Specify:)
1	10,000	If it is drinkable water and enough for consumption			03: rare	04: very rare	03: rare	02: common	04: very rare	02: common	04: very rare	Urinary Tract Infuction 02: common
2	5,000		2,000	Not completely healthy water before the war, but it is better than now.	01: very common	03: rare	02: common	02: common	03: rare	03: rare	03: rare	
3	10,000				02: common	04: very rare	03: rare	03: rare	02: common	02: common	02: common	
4	5,000		2,000	before the war, water conditions were better than now.	02: common	04: very rare	02: common	02: common	02: common	02: common	04: very rare	
5	5,000				01: very common	04: very rare	01: very common	03: rare	02: common	02: common	05: unknown	Urinary Tract Infuction 02: common
6	15,000				04: very rare	04: very rare	01: very common	02: common	01: very common	01: very common	04: very rare	
7	5,000				02: common	04: very rare	03: rare	04: very rare	02: common	02: common	02: common	Kidney Infection 01: very common
8	8,000		2,000	water conditions and quality were better before the war, (it was supplied for (4 hrs)/ day.	02: common	03: rare	03: rare	03: rare	02: common	02: common	05: unknown	Kidney Infection 01: very common
9	5,000				02: common	04: very rare	02: common	03: rare	01: very common	01: very common	03: rare	Kidney Infection 02:common

Table 4 Result of Socio-economic Survey (Community, 7/7)

A- 1 Serial Number	**Time (finish)**	E-1 How do you estimate the economic condition of the community interviewed by you?		E-2 How do you think about the environment of the community interviewed by you?		Comments (if any)	**Name of Interviewer**
		Choose	Comment (if any)	Choose	Comment (if any)		
1	11:30AM	02 Middle - low class		02 Moderate	The Environment is not clean		Diyaa A. Hassan
2	12:30AM	03 Low class	There are very rich families and very poor families	03 Dirty	Very polluted area	Implement Main new Water treatment plant project for drinking water	Diyaa A. Hassan
3	7:15PM	03 Low class		03 Dirty		Poor region with bad environment	Diyaa A. Hassan
4	12:00AM	02 Middle - low class		03 Dirty	Bad environment	Remain the old network for irrigation and construct a new one with new WTP for drinking and domestic uses	Diyaa A. Hassan
5	10:00AM	03 Low class		03 Dirty		Poor and polluted area and there is a water pipe's come through sewer river at this district	Diyaa A. Hassan
6	10:45AM	03 Low class		03 Dirty		Prefer to install Water Treatment Plant. There is a water treatment plant with 10 m3/day capacity, if there is an electricity	Diyaa A. Hassan
7	4:50PM	02 Middle - low class		03 Dirty		Not healthy Environment and polluted district	Diyaa A. Hassan
8	9:00AM	03 Low class		02 Moderate		Water of shat Al Arab branches are polluted water	Diyaa A. Hassan
9	10:35AM	03 Low class		02 Moderate		Poor region and didn't have water supply and there are a lot of animals near by shat Al Arab River branches	Diyaa A. Hassan

APPENDIX C

WATER QUALITY SURVEY

APPENDIX C WATER QUALITY SURVEY

C.1 Objectives

The Object of the water quality survey is to confirm the existing condition and to assess the problems with the water sources for water supply [raw water] and water at the treatment plants and distributed water at the service connections.

C.2 Survey Timing and Sampling

The water quality analysis was carried out at following times.

- Water sources (rivers, canal and well) in the dry season: from 19 to 28 June 2006)
- Raw and treated water in water treatment plans (sampling period: from 19 to 28 June 2006)
- Distributed water at water hydrants (sampling period: from 19 to 28 June 2006)
- Water sources (rivers, canal and well) in the rainy season as the second survey (sampling period: from 15 to 25 August 2006)

The number of samples collected and analyzed was a total of 104 samples. The details of sampling points and analysis methods are shown in Table C.2 – C.4 and Figure C.1 – C.3.

Table C.1 Number of Samples Collected for the Water Quality Analysis

Object	Number of samples collected		Total number of samples
	Dry season	Rainy season	
Water sources (rivers, canal and well)	9	(9)	9
Raw and treated water in water treatment plants	33 WTPs (Raw and treated water)		66
Distributed water at water hydrants	20		20
Total			95

C.3 Water Quality Standards

For the assessment of the water quality to determine the water source for the water supply plan, Iraq Standard for drinking water was basically applied. However, for the water quality items related to the protection of human health and undecided items by Iraq Standard, WHO Guideline was applied to the assessment. The comparative table of the two water quality standards for the drinking water is shown in Table C.5.

C.4 Result of the Analysis

The results of the water quality survey are summarized below and the results of water quality analysis are

shown in Table C.6 for water sources (rivers, canal and well), Table C.7 for raw and treated water in water treatment plants and Table C.8 for distributed water at the water tap, respectively.

(1) Water Sources

According to the results of water quality analysis for water sources, the characteristics of water quality of river, canal and groundwater in the Study area are summarized as follows.

(Well water)
Salinity of the well water in Al Zubair shows higher values (TDS=5635 mg/l, EC=8,133 mS/m) and does not meet the criteria for drinking water or the criteria for water supply. In the water quality survey for water sources it is judged that well water quality conditions are the worst for a source of water supply.

(River water)
Three rivers as potential water sources of water supply in the Study area were selected and these rivers are the Tigris River, Euphrates River and Shat Al Arab. The Tigris River and Euphrates River are flowing from northern and western Iraq and the two rivers flow together to the north of Basra. A sampling point was selected on each river. The river name is changed to Shat Al Arab after the confluence and from there it flows through Basra to the Persian Gulf. Four sampling points were selected from upper reaches to lower reaches of the Shat Al Arab.

The characteristics of the overall water quality in above rivers are described as follows.

1) For some analysis items (Barium, Mercury and some other parameters) the results are still under detailed consideration.
2) Water quality of these rivers satisfy water quality items related to the abstraction of water utilization for drinking and domestic water except some parameters that can be treated by conventional water treatment process.
3) However, some items representing inorganic substances namely, TDS, Total Hardness, Chlorides and Sulphates and n-Hexane extracts do not satisfy the criteria for drinking water.
4) Inorganic substances such as TDS, Total Hardness, Chloride and Sulphate need to have reduced concentration by RO water treatment processing.
5) n-Hexane extracts were detected in the lower reaches of the Shat Al Arab and may generate problems in water treatment processes and cause deterioration of the water quality.

The characteristics of water quality in rivers are described below.

<u>Tigris River</u>
According to the results of this analysis survey the lowest concentration of TDS (863 mg/l in June and was

1,286 mg/l in August) observed in the Tigris while Turbidity was the highest value (115 NTU). It seems that this water quality was affected by rainwater or other factors as it may not be in the normal flow condition. Past water quality data will be necessary to draw more reliable conclusions.

Euphrates River

In comparing the Euphrates River with Tigris River the Euphrates River it is not as good a sources for water supply from a viewpoint of concentration of inorganic substances (TDS of Euphrates River is 1,895 mg/l in June and), however, the water quality of Euphrates River satisfies requirement for water sources.

Shat Al Arab

The TDS inorganic substances of Shat Al Arab are almost the same between the upper reaches and the lower reaches and it ranges from 1,364 mg/l to 1,448 mg/l. N-Hexane extracts are detected in the lower reaches of Shat Al Arab its values at Abu Al Khaseeb and Seehan are 72 mg/l and 672 mg/l, respectively. The pollutant source of n-Hexane extracts is unknown; it is considered likely that sunken ships in the Shat Al Arab and wastewater from Basrah urban area are the pollutant source.

Consequently as a water source the Shat Al Arab is limited to the upper reaches due to the contamination by n-Hexane extracts at the lower reaches.

(Sweet Water Canal)

According to the results of water quality analysis inorganic substances of Sweet Water Canal shows the lowest value with TDS of 542 mg/l, Conductivity of 849 mS/m and Total hardness of 785 mg/l.

It can be concluded that the most suitable water source in the Study Area from the water quality perspective is the SWC.

Major findings of the water quality survey for water sources are as follows:

- From a water quality perspective the Sweet Water Canal is most suitable source in the Study area. While, well water in Al Zubair is not suitable for water supply utilization.
- From the results of this water quality survey the Tigris River and the upper reaches of Shat Al Arab are the most suitable river sources in the Study Area.

(2) Water Treatment Plant

According to the results of the water quality analysis for 33 water treatment plants in the Study area treatment efficiency and the characteristics of water quality of treated water are summarized as follows.

1） The treated water in 24 treatment plants out of a total plants of 33, do not satisfy the criteria of turbidity for drinking water. Similarly, the treated water in 19 treatment plants do not satisfy the criteria for colour.

2） Residual chlorine in the treated water of 13 treatment plants was not detected and Total Coliform and Eschericha coli. were detected.

3） Iron, Manganese and Ammonia Nitrate which are typical water quality parameters related to the abstraction of river water sources satisfy the criteria for drinking and domestic water.

According to the above the following points are concluded:

- Efficient water treatment processing is not performed in three quarters of the treatment plants
- Efficient chlorination processing is not performed in the one third of treatment plants.

(3) Water Hydrant

Based on the results of the water quality analysis for 20 water hydrants in the Study area the characteristics of water quality of distributed water are summarized as follows.

- At 12 distribution hydrants out of a total of 20 hydrants there was no Residual Chlorine detected and Total Coliform and Eschericha Coli. were detected
- It seems that the contamination of Total Coliform and Eschericha Coli. in the distributed water is caused by intrusion of sewage into the distribution pipes or insufficient chlorination processing in water treatment plant.
- Distributed water at 60 percent of the investigated hydrants is not suitable for drinking.

C.5 Cross Check of Water Quality Analysis

As shown in the results of the water quality survey, some parameters, such as Barium, Cadmium, Chromium, Lead and Mercury, exceeded the WHO guidelines for drinking water.

The JICA Study team carried out cross checking analysis in Japan to confirm it. The cross checking water quality analysis is as follows.

Analytical parameters:	Barium, Cadmium, Chromium, Lead and Mercury
Number of Samples:	3 samples (Tigris river, upper reaches of Shat Al Arab and middle reaches of Shat Al Arab) These samples were taken in the same time of the second survey.

Results of the cross checking water quality analysis are shown as below.

Table C.2 Results of the Cross Checking Water Quality Analysis in Japan

Parameter	Tigris River	Upper reaches of SAA	Middle reaches of SAA	Water quality standard for drinking water in Iraq
Barium (Ba)	< 1mg/l	< 1mg/l	< 1mg/l	1mg/l
Cadmium (Cd)	<0.001 mg/l	<0.001 mg/l	<0.001 mg/l	0.01 mg/l
Chromium (Cr)	<0.03 mg/l	<0.03 mg/l	<0.03 mg/l	0.05 mg/l
Lead (Pb)	<0.005 mg/l	<0.005 mg/l	<0.005 mg/l	0.05 mg/l
Mercury (Hg)	<0.0005 mg/l	<0.0005 mg/l	<0.0005 mg/l	0.001 mg/l (WHO)

From above results, it became clear that all the items of three samples are satisfied the water quality standard for drinking water. It may suggest that there were same problems in the reliability of analysis of Iraq, it was judged that all of water quality parameters concerning the protection of human health in the existing water resource are satisfied the water quality standards for drinking water. It is recommended to establish accuracy control system for the water quality analysis.

Table C.3 List of Sampling Points

Water Sources (rivers, canal and well)

Point No.	Sampling Date (dry season)	Sampling Date (rainy season)	Name of Sampling Point	Name of Water Bodies
WS - 1	2006/6/23	2006/8/21	Quorna	Tigris River
WS - 2	2006/6/22	2006/8/21	Al Medaina	EuphratesRiver
WS - 3	2006/6/23	2006/8/21	Al Naswah	Upper readhes of Shat Al Arab
WS - 4	2006/6/19	-	Al Basra	Middle readhes of Shat Al Arab
WS - 5	2006/6/19	2006/8/22	Shat Al Arab	Middle readhes of Shat Al Arab
WS - 6	2006/6/21	-	Abu Al Khaseeb	Middle readhes of Shat Al Arab
WS - 7	2006/6/21	2006/8/20	Seehan	Lower readhes of Shat Al Arab
WS - 8	2006/6/28	2006/8/22	SWC	Lower readhes of SWC
WS - 9	2006/6/18	-	AlZubair	Well water
WS - 10	-	2006/8/22	Basrah	Garmat Ali Riover
WS - 11	-	2006/8/25	-	Upper readhes of SWC

Water Treatment Plant

Point No.	Sampling Date	Name of Water Treatment Plant
TP - 1	2006/6/7	Jubaila 1
TP - 2	2006/6/7	Jubaila 2
TP - 3	2006/6/8	Garma 2
TP - 4	2006/6/8	Ribat
TP - 5	2006/6/12	Qurna 1
TP - 6	2006/6/12	Qurna 2
TP - 7	2006/6/12	Qurna 3
TP - 8	2006/6/11	Deer 1
TP - 9	2006/6/11	Deer 2
TP - 10	2006/6/13	Al-Medaina
TP - 11	2006/6/13	Al-Sadiq
TP - 12	2006/6/13	Al-Huwair
TP - 13	2006/6/10	R-Zero
TP - 14	2006/6/14	Shat Al Arab 1
TP - 15	2006/6/14	Shat Al Arab 2
TP - 16	2006/6/14	Nashwa 1
TP - 17	2006/6/14	Nashwa 2
TP - 18	2006/6/15	Abu Al Khaseeb 1
TP - 19	2006/6/15	Abu Al Khaseeb 2
TP - 20	2006/6/15	Brad'ia1
TP - 21	2006/6/15	Brad'ia 2
TP - 22	2006/6/15	Brad'ia
TP - 23	2006/6/11	Al shauaiba 1
TP - 24	2006/6/11	Al Shauaiba 2
TP - 25	2006/6/10	Basrah Muwahad
TP - 26	2006/6/10	Hartha 25
TP - 27	2006/6/18	um Qasir
TP - 28	2006/6/18	Khur Al Zubair
TP - 29	2006/6/22	Sihan
TP - 30	2006/6/24	Al Ma'aqil 1
TP - 31	2006/6/11	Al Kaim
TP - 32	2006/6/8	Garma 1
TP - 33	2006/6/8	Al Ma'aqil 2

Table C.4 Methods of Water Quality Analysis

Water Quality Items	Method of Analysis	Detection Limit
Temperature	by using a digital thermometer	Accuracy: ± 0.1 ºC
Color	Platinum-Cobalt Standard Method	(5 to 500 units)
Turbidity	using (Turbidity meter (WTW/ TURB 350 IR))	Instrument range: (0-1100) NTU Instrument Accuracy: ± 2% for reading (0 - 500) NTU. ±3% for reading (500 - 1100) NTU
pH	pH-meter (SCHOTT) Type CG 842	1-14 (2 digits) Accuracy: ± 0.01
TDS	by gravimetric method	This method used for high range of TDS
Conductivity (EC)	using conductivity meter (ALTRAMETER-II (MYRON L))	Accuracy: ± 1% of reading value
Total Alkalinity	ACID BASE titration method using methyl orange as an indicator	I have no detecting limit range.
n- hexane Extracts	graphite method using Chloroform in extraction.	This method is being used to detect low ranges of oil in water samples (in ppm)
Total Hardness	titration method using EDTA as a Titrant	This method used for high range of Ca & Mg Hardness
Calcium (Ca)		
Magnesium (Mg)		
Sodium (Na)	Flam emission method. Using A.A. Flam emission QA, Shimadzu Japan	Lower Detection Limit 0.1 mg/L
Chloride (Cl^-)	Titration method using AgNO3 as a Titrant and K2CrO4 as an indicator (Mohr Method).	This method used for high range of Chloride ion.
Sulphate (SO_4)	SulfaVer® 4 Method, Powder Pillows	(2 to 70 mg/L)
Ammonia Nitrogen	Salicylate Method, Powder Pillows	(0.01 to 0.50 mg/L NH3–N)
Nitrate (as NO_3)	Cadmium Reduction Method, Powder Pillows, HR.	(0.3 to 30.0 mg/L NO3—N)
Nitrite (as NO_2)	Diazotization Method, Powder Pillows, LR	(0.002 to 0.300 mg/L NO2—N)
Aluminum (Al)	Aluminon Method, Powder Pillows	(0.008 to 0.800 mg/L)
Antimony (Sb)	Atomic Absorption method using: A.A. SP6 12-300, Shimadzu Japan. With Hydride Generation kit.	Lower Detection limit (0.001 mg/L)
Arsenic (As)		Lower Detecting Limit (0.01 mg/L)
Barium (Ba)	Turbidimetric Method, Powder Pillows	(1 to 100 mg/L)
Boron (B)	Spectrophotometric method. Using: HITACHI Spectrophotometer, U-1500 Japan	Lower Detection limit (0.001 mg/L)
Cadmium (Cd)	Atomic Absorption Method. Using A.A. SP9 By Unicom England.	Lower detection limit 0.01 mg/L
Chromium (Cr)	1,5-Diphenylcarbohydrazide Method, Powder Pillows.	(0.01 to 0.70 mg/L Cr6+)
Copper (Cu)	Bicinchoninate Method, Powder Pillows	(0.04 to 5.00 mg/L)
Cyanide (CN)	Pyridine-Pyrazalone Method, Powder Pillows	(0.001 to 0.240 mg/L CN–)
Fluoride (F)	SPADNS Method, Reagent Solution	(0.02 to 2.00 mg/L F–)
Iron (Fe)	FerroZine® Method	(0.009 to 1.400 mg/L)
Lead (Pb)	Flam emission method. Using A.A. Flam emission QA, Shimadzu Japan	Lower detecting limit 0.001 mg/L
Manganese (Mn)	Periodate Oxidation Method, HR	(0.2 to 20.0 mg/L)
Mercury (Hg)	Atomic Absorption method using: A.A. SP6 12-300, Shimadzu Japan. With cold Mercury kit.	Lower detecting limit 0.001 mg/L
Molybdenum (Mo)	Spectrophotometric method. Using: HITACHI Spectrophotometer, U-1500 Japan	Minimum detecting limit = 0.1 mg/L
Nickel (Ni)	Heptoxime Method, Powder Pillows	(0.02 to 1.80 mg/L Ni)
Selenium (Se)	Atomic Absorption Method. Using A.A. SP9 By Unicom England.	Lower detection limit 0.07 mg/L
Zinc (Zn)	Zincon Method, Powder Pillows	(0.01 to 2.00 mg/L)
Escherichia Coli.	Culture Method Using Auto Analyzer Incubator M 2022	Using Self-filling Test Ampoule (Micro Tester Pro) for the analysis of Source Water Samples, and all Water Treatment Plants Samples, While the Tap Water Samples were being done in WD Center Lap. Using Maconki broth media in culture.
Total Coliforms		

Note

1) All analytical methods in Blue color fonts were being done by using Spectrophotometer HACH DR/2400.

2) All analytical methods in Green color fonts were being done by Basra University.

Table C.5 Water Quality Standards for Drinking Water

Water Quality Items	Unit	Iraq Standards for Drinking Water (No 417 – Year 1986)		WHO Guideline for drinking Water
		Accepted upper limit	Maximum limit	Second edition (2000)
Temperature	℃	-	-	-
Color	TCU	-	-	15
Turbidity	NTU	-	-	5
pH	-	-	-	-
TDS	mg/l	1,500	-	600
Conductivity (EC)	mS/m	-	-	-
Total Alkalinity	mg/l	-	-	-
n- hexane Extracts	mg/l	-	-	-
Total Hardness	mg/l	500	-	-
Calcium (Ca)	mg/l	200	-	-
Magnesium (Mg)	mg/l	50	150	-
Sodium (Na)	mg/l	-	-	-
Chloride (Cl^-)	mg/l	200	600	250 - 300
Sulphate (SO_4)	mg/l	200	400	-
Ammonia Nitrogen	mg/l	-	-	-
Nitrate (as NO_3)	mg/l	-	-	50
Nitrite (as NO_2)	mg/l	-	-	3 / 0.2 *1
Residual Free Chlorine (Cl_2)	mg/l	0.3	1	-
Aluminum (Al)	mg/l	-	-	-
Antimony (Sb)	mg/l	0.05	-	0.02
Arsenic (As)	mg/l		-	0.01
Barium (Ba)	mg/l	1	-	0.7
Boron (B)	mg/l	-	-	0.5
Cadmium (Cd)	mg/l	0.01	-	0.003
Chromium (Cr)	mg/l	0.05	-	0.05
Copper (Cu)	mg/l	1.0	-	2.0
Cyanide (CN)	mg/l	0.02	-	0.07
Fluoride (F)	mg/l	-	-	1.5
Iron (Fe)	mg/l	0.5	-	-
Lead (Pb)	mg/l	0.05	-	0.01
Manganese (Mn)	mg/l	0.1	-	0.4
Mercury (Hg)	mg/l	-	-	0.001
Molybdenum (Mo)	mg/l	-	-	0.07
Nickel (Ni)	mg/l	-	-	0.02
Selenium (Se)	mg/l	0.01	-	0.01
Zinc (Zn)	mg/l	1	-	-
Escherichia Coli.	MPN/100 ml	-	-	ND
Total Coliforms	MPN/100 ml	-	-	ND

*1: Short term / long term

Table C.6 Result of Water Quality Analysis (Water Sources: the First Sampling)

Sampling point		Water Quality Standard / Guideline for Drinking Water			WS - 1	WS - 2	WS - 3	WS - 4	WS - 5	WS - 6	WS - 7	WS - 8	WS - 9
		Iraqi Water Quality Standard		WHO guideline	Quorna	Al Medaina	Al Naswah	Al Basra	Shat Al Arab	Abu Al Khaseeb	Seehan	SWC	AlZubair
Analytical Items		Accepted upper limit	Maximum limit	Potable Water Guideline (2000)	Tigris River	Euphrates River	Upper reaches of Shat Al Arab	Middle reaches of Shat Al Arab	Middle reaches of Shat Al Arab	Middle reaches of Shat Al Arab	Lower reaches of Shat Al Arab	Sweet Water Canal	Well water
Temperature	℃	-	-	-	28.9	28.7	29.6	30.0	29.5	28.8	29.0	27	29.5
Color	TCU	-	-	15	34	32	30	10	12	15	20	10	0
Turbidity	NTU	-	-	-	115	38.8	42.7	13.3	17.8	7.5	21.7	62.9	0.0
pH	-	-	-	-	8.1	8.0	8.0	8.0	8.0	7.3	7.8	8.2	6.9
TDS	mg/l	1,500	-	600	863	1,895	1,392	1,448	1,364	1,410	1,415	542	5,635
Conductivity (EC)	mS/m	-	-	-	1,211	2,630	1,915	2,073	1,973	2,020	2,035	849	8,133
Total Alkalinity	mg/l	-	-	-	160	120	130	125	130	136	130	110	200
n- hexane Extracts	mg/l	-	-	-	2	1	4	28	2	72	672	ND	ND
Total Hardness	mg/l	500	-	-	323	646	497	497	457	472	423	238	1,195
Calcium (Ca)	mg/l	200	-	-	70	142	120	120	113	113	100	50	352
Magnesium (Mg)	mg/l	50	150	-	36.0	70.8	48.0	48.0	42.5	46.1	42.0	27.6	76.8
Sodium (Na)	mg/l	-	-	-	65	105	84	117	140	87	91	70	220
Chloride (Cl^-)	mg/l	200	600	250 - 300	210	615	390	390	355	333	415	110	1300
Sulphate (SO_4)	mg/l	200	400	-	240	600	460	620	600	580	570	250	3100
Ammonia Nitrogen	mg/l	-	-	-	0.05	0.06	0.3	ND	ND	ND	0.02	0.02	0.09
Nitrate (as NO_3)	mg/l	-	-	50	2.4	3.3	3	0.9	2.8	0.3	0.4	1.6	14.4
Nitrite (as NO_2)	mg/l	-	-	3 / 0.2 *1	0.031	0.017	0.023	0.002	0.004	0.012	0.015	0.06	0.142
Aluminum (Al)	mg/l	-	-	-	0.05	0.01	0.12	ND	ND	ND	0.06	ND	0.1
Antimony (Sb)	mg/l	0.05	-	0.02	0.46 ppb	0.37 ppb	0.39 ppb	0.28 ppb	0.41 ppb	0.33 ppb	0.29 ppb	0.03 ppb	0.01 ppb
Arsenic (As)	mg/l	0.05	-	0.01	3.73 ppb	6.17 ppb	4.53 ppb	3.1 ppb	3.6 ppb	3.22 ppb	4.06 ppb	ND	ND
Barium (Ba)	mg/l	1	-	0.7	39	30	35	16	13	24	25	15	25
Boron (B)	mg/l	-	-	0.5	0.067	0.096	0.151	0.094	0.111	0.102	0.193	0.01	0.01
Cadmium (Cd)	mg/l	0.01	-	0.003	0.004	0.003	0.004	0.011	0.003	0.005	0.004	0.001	ND
Chromium (Cr)	mg/l	0.05	-	0.05	0.03	0.04	0.08	0.32	0.03	0.04	0.03	ND	ND
Copper (Cu)	mg/l	1.0	-	2 / 1 *2	0.22	0.6	1.6	1.82	1.15	1.83	1.23	0.09	0.01
Cyanide (CN)	mg/l	0.02	-	0.07	0.006	0.004	0.007	0.001	0.014	0.008	0.002	0.002	ND
Fluoride (F)	mg/l	-	-	1.5	ND	ND	ND	ND	ND	0.02	0.05	ND	0.01
Iron (Fe)	mg/l	0.5	-	-	0.12	ND	0.11	0.03	0.01	0.17	0.05	0.04	0.06
Lead (Pb)	mg/l	0.05	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	ND	ND
Manganese (Mn)	mg/l	0.1	-	0.4	ND	ND	ND	0.1	0.1	ND	0.1	0.01	0.01
Mercury (Hg)	μg/l	-	-	1	19	22	29	15	22	27	15	ND	ND
Nickel (Ni)	mg/l	-	-	0.02	0.002	0.001	0.003	0.002	0.004	0.002	0.001	ND	0.002
Selenium (Se)	mg/l	0.01	-	0.01	0.003	0.006	0.008	0.008	0.003	0.008	0.008	ND	0.001
Zinc (Zn)	mg/l	1.0	-	-	0.03	0.04	ND	0.03	0.04	0.07	0.04	ND	0.01
Escherichia Coli.	MPN/100 ml	-	-	-	6.0E+00	7.0E+00	4.0E+00	1.0E+00	7.0E+00	2.0E+00	3.0E+00	1.0E+02	1.0E+00
Total Coliforms	MPN/100 ml	-	-	-	1.2E+01	1.1E+01	1.2E+01	5.0E+01	8.0E+01	1.0E+01	1.5E+01	1.2E+02	4.0E+00

*1: Short term / long term

*2: Guideline for the protection of human health / the obstruction of water utilization for drinking and domestic water

Table C.7 Result of Water Quality Analysis (Water Sources: the Second Sampling)

Sampling point		Water Quality Standard / Guideline for Drinking Water			WS - 1	WS - 2	WS - 3	WS - 5	WS - 7	WS - 8	WS - 10	WS - 11
		Iraqi Water Quality Standard		WHO guideline	Quorna	Al Medaina	Al Naswah	Shat Al Arab	Seehan	SWC	Basrah	SWC
Analytical Items		Accepted upper limit	Maximum limit	Potable Water Guideline (2000)	Tigris River	Euphrates River	Upper reaches of Shat Al Arab	Middle reaches of Shat Al Arab	Lower reaches of Shat Al Arab	Sweet Water Canal	Garmat Ali River	Upper reaches of Sweet Water Canal
Temperature	℃	-	-	-	29.5	30.0	29.0	30.1	30.0	29.5	29.8	30.0
Color	TCU	-	-	15	48	14	38	8	1	17	29	59
Turbidity	NTU	-	-	-	16	42	15	13	20	55	23	96
pH	-	-	-	-	8	8	8	8	7	8	7	8
TDS	mg/l	1,500	-	600	1,286	1,876	1,729	1,809	1,253	789	1,441	603
Conductivity (EC)	mS/m	-	-	-	1,920	2,800	2,580	2,700	1,870	1,177	2,150	900
Total Alkalinity	mg/l	-	-	-	139	139	121	121	156	133	133	121
n- hexane Extracts	mg/l	-	-	-	1	15	31	55	270	8	4	97
Total Hardness	mg/l	500	-	-	572	839	721	711	497	388	716	338
Calcium (Ca)	mg/l	200	-	-	130	166	166	162	116	94	164	80
Magnesium (Mg)	mg/l	50	150	-	60.0	103.2	74.4	74.4	50.4	37.2	74.4	33.6
Sodium (Na)	mg/l	-	-	-	100	145	110	110	100	22	100	20
Chloride (Cl^-)	mg/l	200	600	250 - 300	303	567	422	398	368	115	413	104
Sulphate (SO_4)	mg/l	200	400	-	600	900	700	700	390	160	300	150
Ammonia Nitrogen	mg/l	-	-	-	0.03	0.08	0.02	0.02	0.02	0.03	0.03	0.03
Nitrate (as NO_3)	mg/l	-	-	50	0.70	0.60	0.30	0.70	0.70	1.00	1.00	0.40
Nitrite (as NO_2)	mg/l	-	-	3 / 0.2 *1	0.005	0.005	0.006	0.004	0.007	0.006	0.004	0.001
Aluminum (Al)	mg/l	-	-	-	0.04	0.05	0.01	0.03	0.05	0.02	0.06	0.04
Antimony (Sb)	μg/l	0.05 mg/l	-	0.02 mg/l	0.29	0.17	0.23	0.21	0.12	0.35	0.25	0.30
Arsenic (As)	μg/l	0.05 mg/l	-	0.01 mg/l	1.1	2.3	3.0	2.3	1.0	2.9	1.4	1.8
Barium (Ba)	mg/l	1	-	0.7	0.9	1.0	0.8	0.8	0.8	0.5	0.6	0.4
Boron (B)	μg/l	-	-	0.5 mg/l	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.04
Cadmium (Cd)	mg/l	0.01	-	0.003	ND	ND	0.008	0.007	ND	0.003	0.005	ND
Chromium (Cr)	mg/l	0.05	-	0.05	0.03	0.02	0.04	0.03	0.04	0.02	0.04	0.04
Copper (Cu)	mg/l	1.0	-	2 / 1*2	ND	ND	0.03	0.15	0.23	0.11	0.17	0.20
Cyanide (CN)	mg/l	0.02	-	0.07	0.002	0.002	0.002	0.002	0.005	0.003	0.001	0.005
Fluoride (F)	mg/l	-	-	1.5	0.01	0.01	ND	0.01	0.01	ND	ND	0.06
Iron (Fe)	mg/l	0.5	-	-	0.02	0.01	0.04	0.01	0.02	0.02	0.09	0.01
Lead (Pb)	mg/l	0.05	-	0.01	0.051	0.043	0.045	0.050	0.030	0.040	0.035	0.044
Manganese (Mn)	mg/l	0.1	-	0.4	ND	ND	ND	ND	ND	ND	ND	ND
Mercury (Hg)	μg/l	-	-	1	2.2	1.9	2.0	2.1	1.6	2.6	2.9	2.6
Nickel (Ni)	mg/l	-	-	0.02	0.001	ND	0.001	0.002	ND	0.002	0.002	0.002
Selenium (Se)	mg/l	0.01	-	0.01	0.13	0.13	0.06	0.09	0.07	0.07	0.05	0.16
Zinc (Zn)	mg/l	1.0	-	-	0.05	0.04	0.08	0.03	0.06	0.03	0.06	0.03
Escherichia Coli.	MPN/100 ml	-	-	-	3.0.E+02	2.8.E+02	2.4.E+02	2.5.E+02	3.1.E+02	5.0.E+02	3.5.E+02	4.0.E+02
Total Coliforms	MPN/100 ml	-	-	-	1.0.E+03	8.0.E+02	7.5.E+02	6.8.E+02	7.4.E+02	1.1.E+03	8.0.E+02	9.0.E+02

*1: Short term / long term

*2: Water quality items related to the protection of human health / the obstruction of water utilization for drinking and domestic water

Table C.8 (1/2) Result of Water Quality Analysis for Water Treatment Plants

Site No.	Name of plant/ Sampling date	Sampling point	Temp. (°C)	Residual Chlorine (Cl_2: mg/)	Color (TCU)	Turbidity (NTU)	Conductivity (EC: mS/m)	pH	Iron (Fe: mg/l)	Manganese (Mn: mg/l)	Ammonia Nitrogen (NH_3: mg/l)	Escherichia Coli. (MPN/100 ml)	Total Coliforms (MPN/100 ml)
Iraq Standards for Drinking Water			-	0.3 / 1	-	-	-	-	0.5	0.1	-	-	-
WHO guideline (2000)			-	-	15	5	-	-	0.3	0.1	1.5	ND	ND
TP - 1	Jubaila 1	raw water	30		70	20.0	2,125	7.4	0.10	ND	0.02	5.0E+02	7.0E+02
		filtlated water	30	2.5	22	2.4	2,140	7.2	0.09	ND	0.01	ND	ND
TP - 2	Jubaila 2	raw water	30		70	20.0	2,125	7.4	0.09	ND	0.02	5.1E+02	7.4E+02
		filtlated water	30	2.5	25	2.1	2,140	7.2	0.09	ND	0.02	ND	ND
TP - 3	Garma 2	raw water	31		53	19.5	2,110	7.6	0.08	ND	0.01	6.0E+02	8.0E+02
		filtlated water	31	2.5	21	1.9	2,140	7.3	0.07	ND	0.01	ND	ND
TP - 4	Ribat	raw water	30		100	26.0	2,080	7.4	0.06	ND	0.04	7.0E+02	8.5E+02
		filtlated water	30	2.4	25	5.0	2,100	7.3	0.15	ND	ND	ND	ND
TP - 5	Qurna 1	raw water	28		24	113	1,270	8.0	0.07	ND	0.03	1.1E+02	1.9E+02
		filtlated water	28	0.1	13	90.3	1,290	7.8	0.08	0.01	0.03	1.0E+02	1.5E+02
TP - 6	Qurna 2	raw water	29		23	109	1,290	8.0	0.06	0.01	0.03	1.2E+02	2.1E+02
		filtlated water	29	0.1	12	87.0	1,290	8.0	0.08	0.01	0.03	1.2E+02	2.1E+02
TP - 7	Qurna 3	raw water	28		58	127	1,290	7.9	0.02	ND	0.04	2.0E+02	3.5E+02
		filtlated water	28	ND	14	99.1	1,310	7.9	0.04	ND	0.04	1.7E+02	2.6E+02
TP - 8	Deer 1	raw water	29		35	43.5	2,120	7.6	0.06	ND	0.06	5.5E+01	9.5E+01
		filtlated water	29	0.1	21	32.8	2,130	7.6	0.08	ND	0.02	3.4E+01	8.0E+01
TP - 9	Deer 2	raw water	29		42	35.8	2,170	7.3	0.02	ND	0.05	4.0E+01	8.0E+01
		filtlated water	28	0.1	40	12.3	2,170	7.3	0.04	ND	0.06	2.0E+01	5.0E+01
TP - 10	Al-Medaina	raw water	29		11	10.4	2,650	7.7	0.03	ND	0.01	1.0E+01	3.0E+01
		filtlated water	29	3.0	8	8.2	2,650	7.3	0.06	ND	ND	ND	ND
TP - 11	Al-Sadiq	raw water	29		25	12.0	2,700	7.3	0.06	ND	0.02	1.0E+02	1.1E+02
		filtlated water	29	ND	22	8.4	2,750	7.2	0.04	ND	0.04	3.0E+02	1.0E+03
TP - 12	Al-Huwair	raw water	29		18	15.9	1,290	7.3	0.03	0.01	ND	1.0E+02	5.7E+02
		filtlated water	29	ND	18	5.6	1,300	7.2	0.03	ND	0.04	1.6E+03	3.0E+03
TP - 13	R-Zero	raw water	27		10	62.9	849	8.2	0.02	ND	0.02	7.0E+01	1.2E+02
		filtlated water	27	2.5	3	1.8	862	7.8	0.03	ND	ND	ND	ND
TP - 14	Shat Al Arab 1	raw water	28		34	33.0	1,750	7.4	0.02	0.01	0.14	1.0E+02	1.5E+02
		filtlated water	29	0.3	13	15.6	1,780	7.5	0.06	ND	0.02	ND	ND
TP - 15	Shat Al Arab 2	raw water	28		30	36.0	1,800	7.4	0.04	0.01	0.01	1.0E+02	1.6E+02
		-	No treatment action, just pumping raw water to Shat Al Arab 1 plant										
TP - 16	Nashwa 1	raw water	30		24	51.0	2,170	7.6	0.07	0.10	0.06	8.5E+02	1.2E+02
		filtlated water	29	0.1	13	8.4	2,190	7.3	0.18	0.10	0.03	7.0E+01	1.0E+02

Table C.8 (2/2) Result of Water Quality Analysis for Water Treatment Plants

Site No.	Name of plant/ Sampling date	Sampling point	Temp. (℃)	Residual Chlorine (Cl_2: mg/)	Color (TCU)	Turbidity (NTU)	Conductivity (EC: mS/m)	pH	Iron (Fe: mg/l)	Manganese (Mn: mg/l)	Ammonia Nitrogen (NH_3: mg/l)	Escherichia Coli. (MPN/100 ml)	Total Coliforms (MPN/100 ml)
Iraq Standards for Drinking Water			-	0.3 / 1	-	-	-	-	0.5	0.1	-	-	-
WHO guideline (2000)			-	-	15	5	-	-	0.3	0.1	1.5	ND	ND
TP - 17	Nashwa 2	raw water		The plant was being shut down, for Low Lift Pumps overall maintenance.									
		filtrated water											
TP - 18	Abu Al Khaseeb 1	raw water	29		30	19.1	2,210	7.8	0.04	0.01	0.03	3.0E+01	4.3E+01
		filtrated water	29	3.0	16	8.2	2,210	7.2	0.04	ND	0.01	ND	ND
TP - 19	Abu Al Khaseeb 2	raw water	30		28	24.2	2,190	7.6	0.04	0.01	0.05	3.2E+02	4.6E+02
		filtrated water	29	3.0	7	10.5	2,190	7.6	0.01	ND	0.01	ND	ND
TP - 20	Brad'ia1	raw water	31		22	22.1	2,220	7.7	0.07	ND	0.36	4.0E+02	6.5E+02
		filtrated water	31	0.1	20	17.0	2,450	7.4	0.04	ND	0.05	1.0E+01	1.5E+01
TP - 21	Brad'ia 2	raw water	31		21	33.2	2,220	7.7	0.07	ND	0.11	1.0E+02	1.6E+02
		filtrated water	31	3.0	20	10.8	2,230	7.4	0.07	ND	0.03	ND	ND
TP - 22	Brad'ia	raw water	29		32	17.3	1,990	8.1	0.03	ND	0.10	6.0E+01	1.2E+02
		filtrated water	29	2.5	29	12.3	2,000	8.0	0.11	ND	0.07	ND	ND
TP - 23	Al shauaiba 1	raw water	30		48	52.0	810	7.8	0.06	0.10	0.04	1.0E+02	2.1E+02
		filtrated water	29	3.0	16	49.0	816	7.5	0.06	ND	0.02	ND	ND
TP - 24	Al Shauaiba 2	raw water	30		87	181	810	7.9	0.04	0.10	0.03	7.0E+02	1.1E+03
		filtrated water	29	3.0	42	84.0	822	7.8	0.07	ND	0.05	ND	ND
TP - 25	Basrah Muwahad	raw water	28		32	57.3	1,450	7.7	0.02	ND	0.06	1.7E+01	3.0E+01
		filtrated water	29	0.1	26	47.4	1,450	7.7	0.06	ND	0.02	2.5E+01	3.0E+01
TP - 26	Hartha 25	raw water	28		24	25.5	1,980	7.4	0.04	ND	0.06	7.5E+01	1.1E+02
		filtrated water	28	0.1	13	11.3	1,970	7.4	0.05	ND	0.02	3.0E+01	4.2E+01
TP - 27	um Qasir	raw water	30		0	0.0	8,130	6.9	0.04	0.01	0.09	ND	ND
		filtrated water	29	1.5	0	0.0	384	7.1	0.04	ND	0.09	ND	ND
TP - 28	Khur Al Zubair	raw water	30		28	98.4	848	7.7	0.02	0.01	0.03	2.0E+01	3.5E+01
		filtrated water	30	3.0	8	15.3	817	7.6	0.05	ND	0.01	ND	ND
TP - 29	Sihan	raw water	29		32	69.3	1,890	7.9	0.04	0.05	0.34	1.2E+02	2.0E+02
		filtrated water	29	3.0	17	37.4	1,910	7.8	0.05	ND	0.05	ND	ND
TP - 30	Al Ma'aqil 1	raw water	29		20	83.6	789	8.2	0.03	0.10	0.25	7.0E+01	1.1E+02
		filtrated water	29	ND	20	81.4	786	8.1	0.01	ND	0.17	7.6E+01	1.2E+02
TP - 31	Al Kaim	raw water	29		40	96.0	1,300	8.0	0.07	ND	0.03	1.1E+02	1.9E+02
		filtrated water	29	ND	20	80.0	1,320	7.9	0.08	ND	0.03	1.0E+02	1.5E+02
TP - 32	Garma 1	raw water	29		60	22.0	2,110	7.6	0.60	ND	0.01	5.0E+02	7.5E+02
		filtrated water	28	2.5	30	7.5	2,140	7.3	0.05	ND	0.01	ND	ND
TP - 33	Al Ma'aqil 2	raw water	31		55	21.0	2,130	7.6	0.07	ND	0.02	1.2E+02	1.5E+02
		filtrated water	No any treatment activities, it is just a pump station										

Table C.9 Result of Water Quality Analysis for Water Hydrant

sample No.	Place of Tap water Sample	Sampling Date	Residual Chlorine (mg/l)	Bacteriological Test		Remark
				Total Coliforms (MPN/100 ml)	Escherichia Coli. (MPN/100 ml)	
Water Quality Standard / Guideline for Drinking Water			0.3*	ND	ND	
WH - 1	Al Hartha	13-Jun-06	0.1	ND	ND	
WH - 2	Al Medaina Market		ND	2.4E+02	2.4E+02	
WH - 3	Makam Ahmed ben Ali (Al Talha)		ND	2.4E+02	2.4E+02	
WH - 4	Al Mustafa Mosque (Garma)		ND	2.3E+01	2.3E+01	
WH - 5	Health Directory of Al Shafee		0.1	ND	ND	
WH - 6	Al Deer Market		0.1	ND	ND	
WH - 7	Primary Helth Directory (Berad'ia)	15-Jun-06	0.1	ND	ND	
WH - 8	Hyfa School Abu AlKhaseeb		ND	2.4E+03	2.4E+03	
WH - 9	Al Fayha'a Ice Factory (Al Mutayha)		ND	2.4E+03	2.4E+03	
WH - 10	Al Labbani (Abu Al Khaseeb)		ND	2.4E+03	2.4E+03	
WH - 11	Hatem Al Taee School (Abu Al Khaseeb)		ND	2.4E+03	2.4E+03	
WH - 12	A house in Al Shuaiba	18-Jun-06	ND	8.0E+00	8.0E+00	
WH - 13	Tap Water in Al Shuaiba		ND	1.4E+01	1.4E+01	
WH - 14	Al Merbad Petrol Station		0.1	ND	ND	
WH - 15	A house neer Sayd Samee	19-Jun-06	0.1	ND	ND	
WH - 16	A house in Al Ma'aqel		ND	8.0E+00	8.0E+00	
WH - 17	Al Sa'adi Fire Fighting Center		ND	8.0E+00	8.0E+00	
WH - 18	Industerial society in Al Basra	22-Jun-06	ND	2.3E+01	2.3E+01	
WH - 19	Al Kawaz Mosque		0.1	ND	ND	
WH - 20	Um Qasir		0.1	ND	ND	

* Iraqi Water Quality Standard: Accepted upper limit: 0.3 mg/l, Maximum limit: 1 mg/l

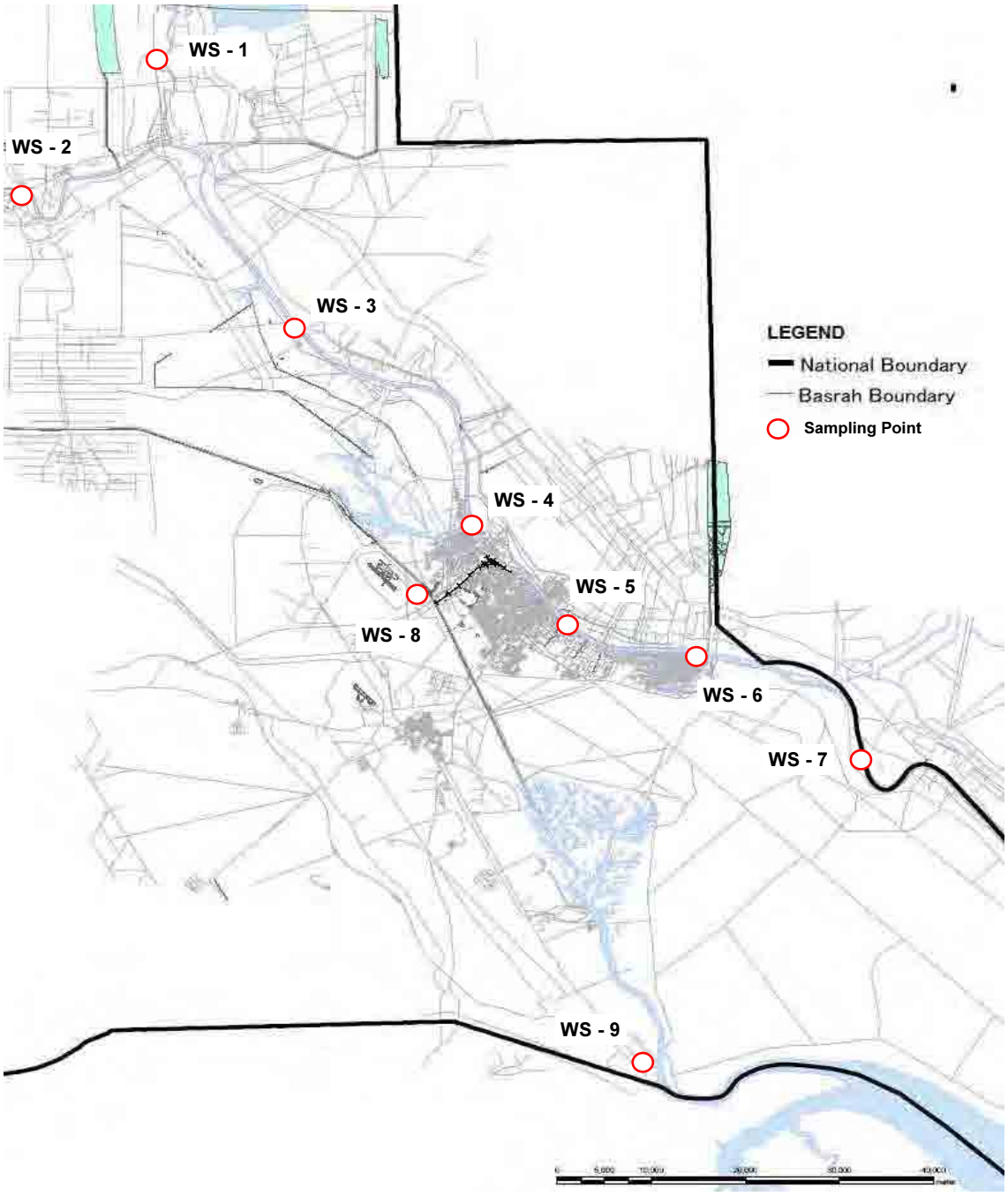


FIGURE C.1 LOCATION OF WATER SAMPLING POINTS (WATER SOURCE SURVEY)

THE DEVELOPMENT STUDY ON AL-BASRAH UNIFIED WATER TREATMENT PLANT AND TRANSMISSION SYSTEM PROJECT IN THE REPUBLIC OF IRAQ	JICA

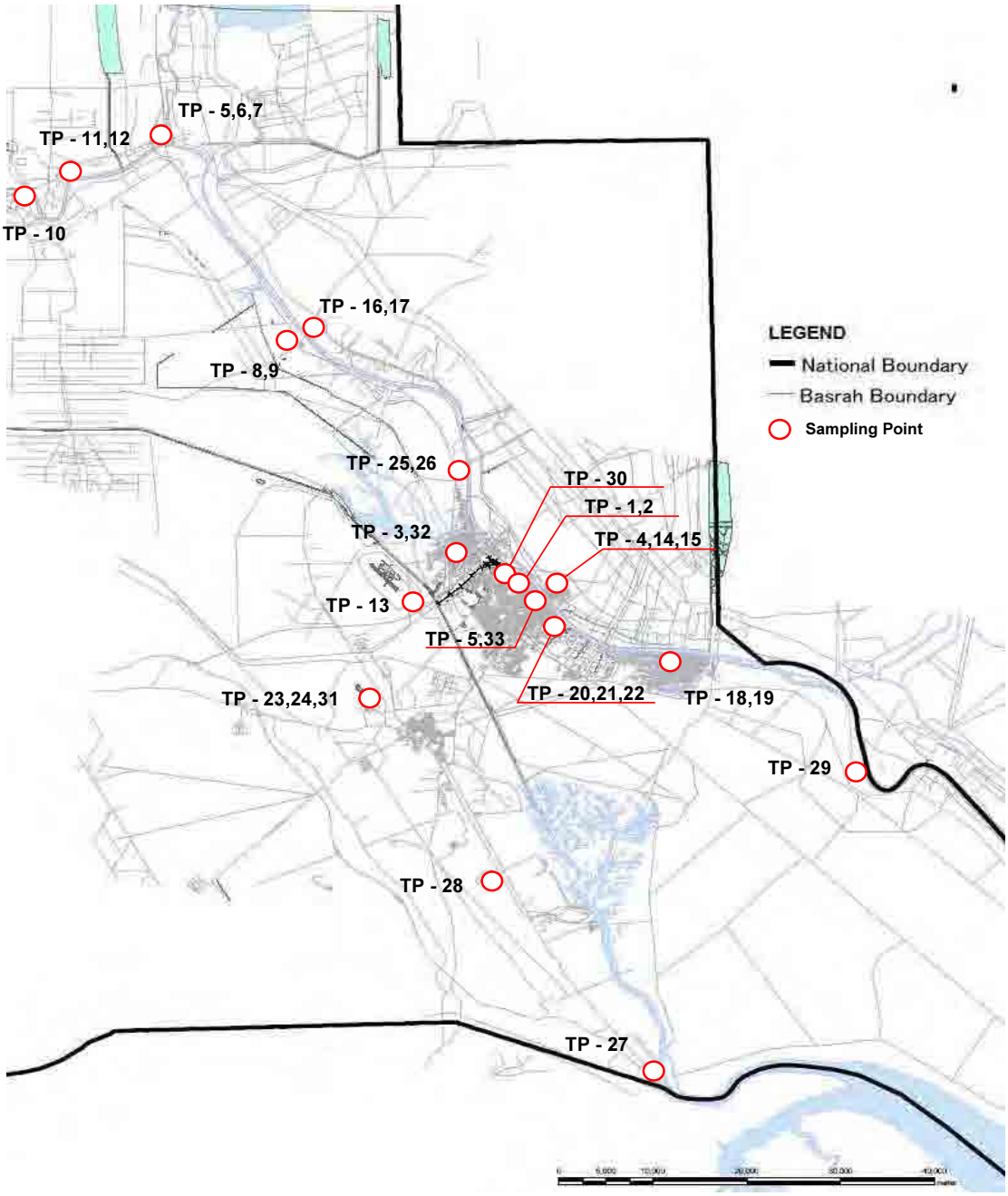


FIGURE C.2 LOCATION OF WATER SAMPLING POINTS (WATER TREATMENT PLANT)

THE DEVELOPMENT STUDY ON AL-BASRAH UNIFIED WATER TREATMENT PLANT AND TRANSMISSION SYSTEM PROJECT IN THE REPUBLIC OF IRAQ	JICA

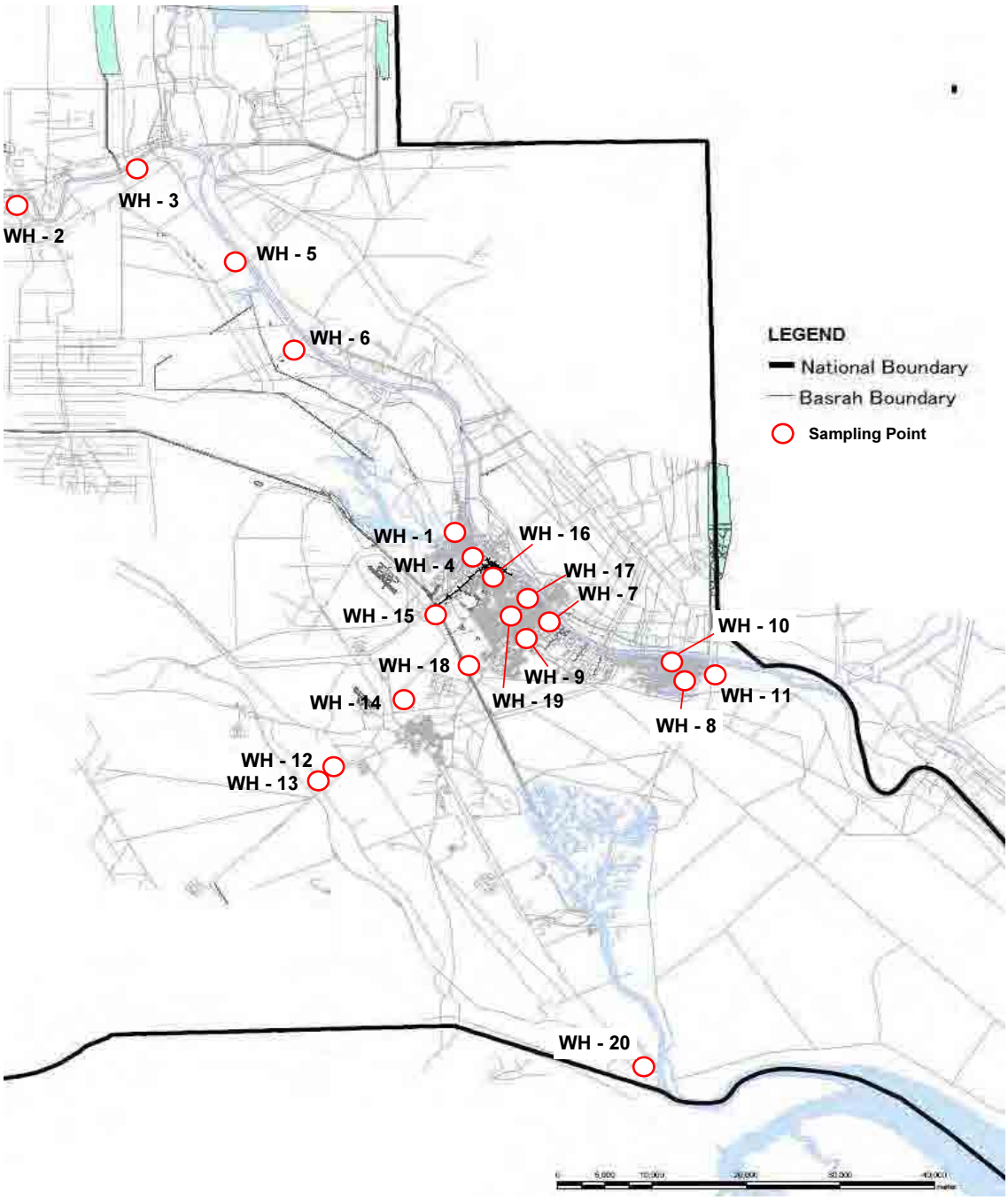


FIGURE C.3 LOCATION OF WATER SAMPLING POINTS (WATER HYDRANT SURVEY)

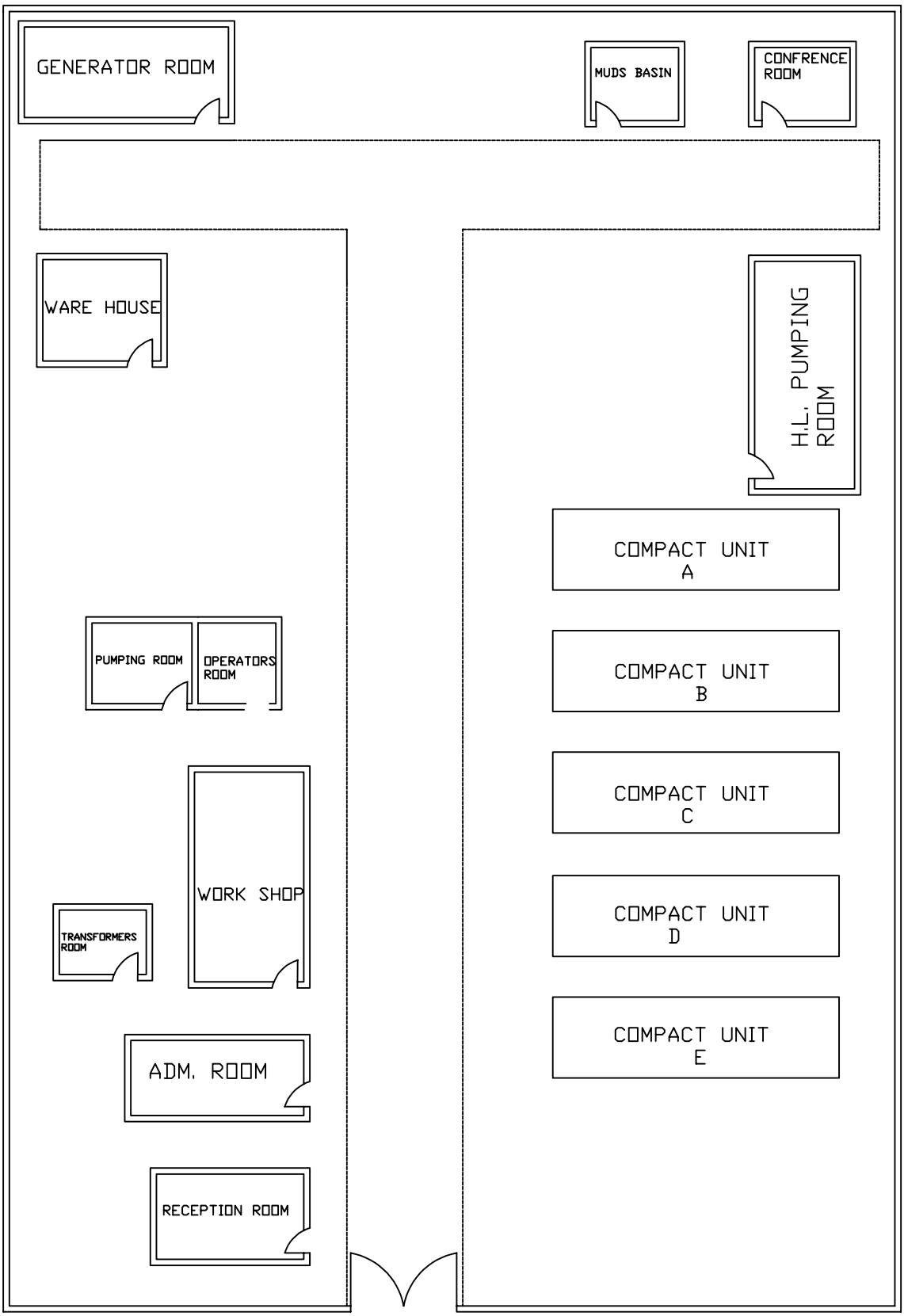
THE DEVELOPMENT STUDY ON AL-BASRAH UNIFIED WATER TREATMENT PLANT AND TRANSMISSION SYSTEM PROJECT IN THE REPUBLIC OF IRAQ	JICA

APPENDIX D

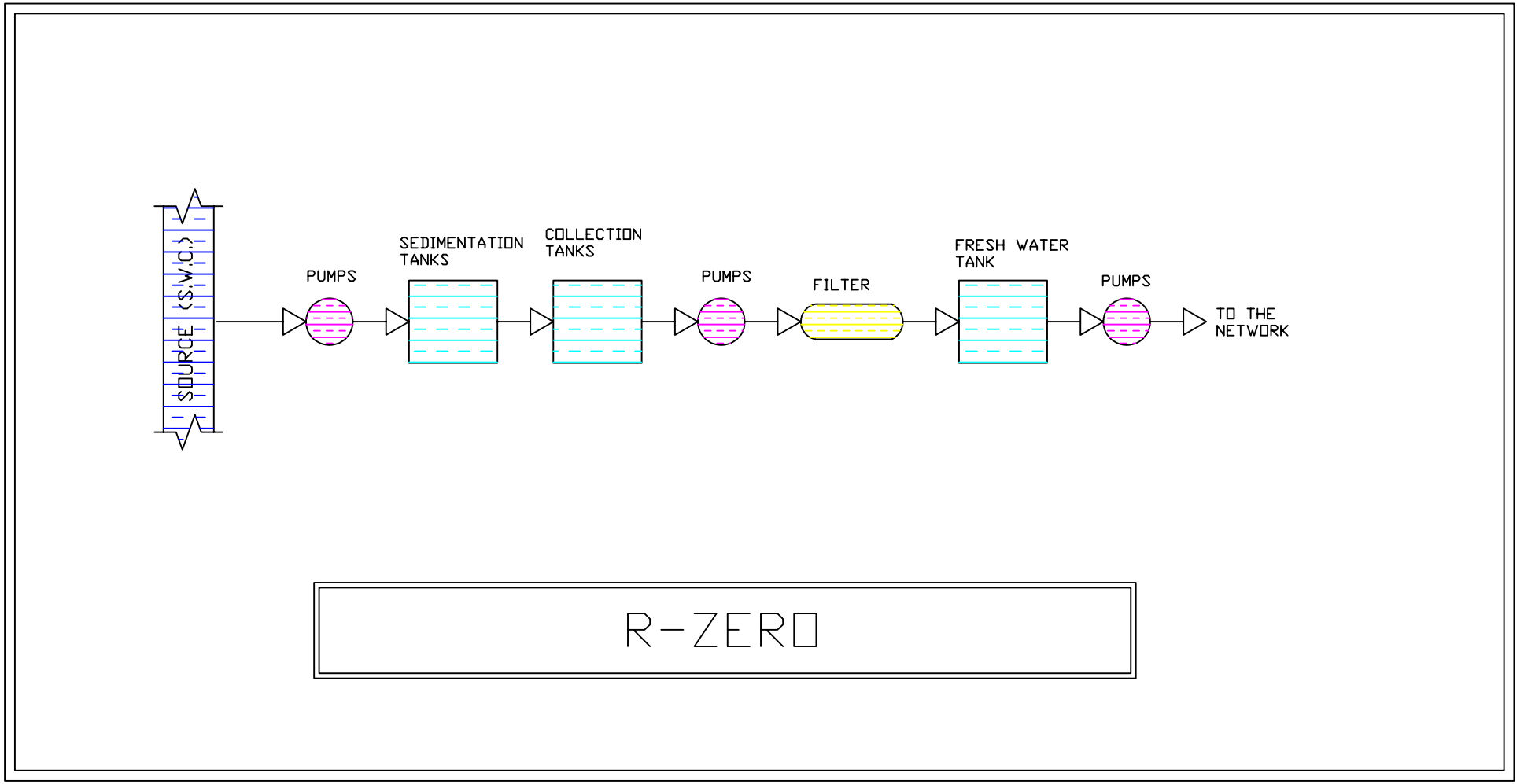
DRAWINGS OF EXISTING WATER SUPPLY FACILITIES

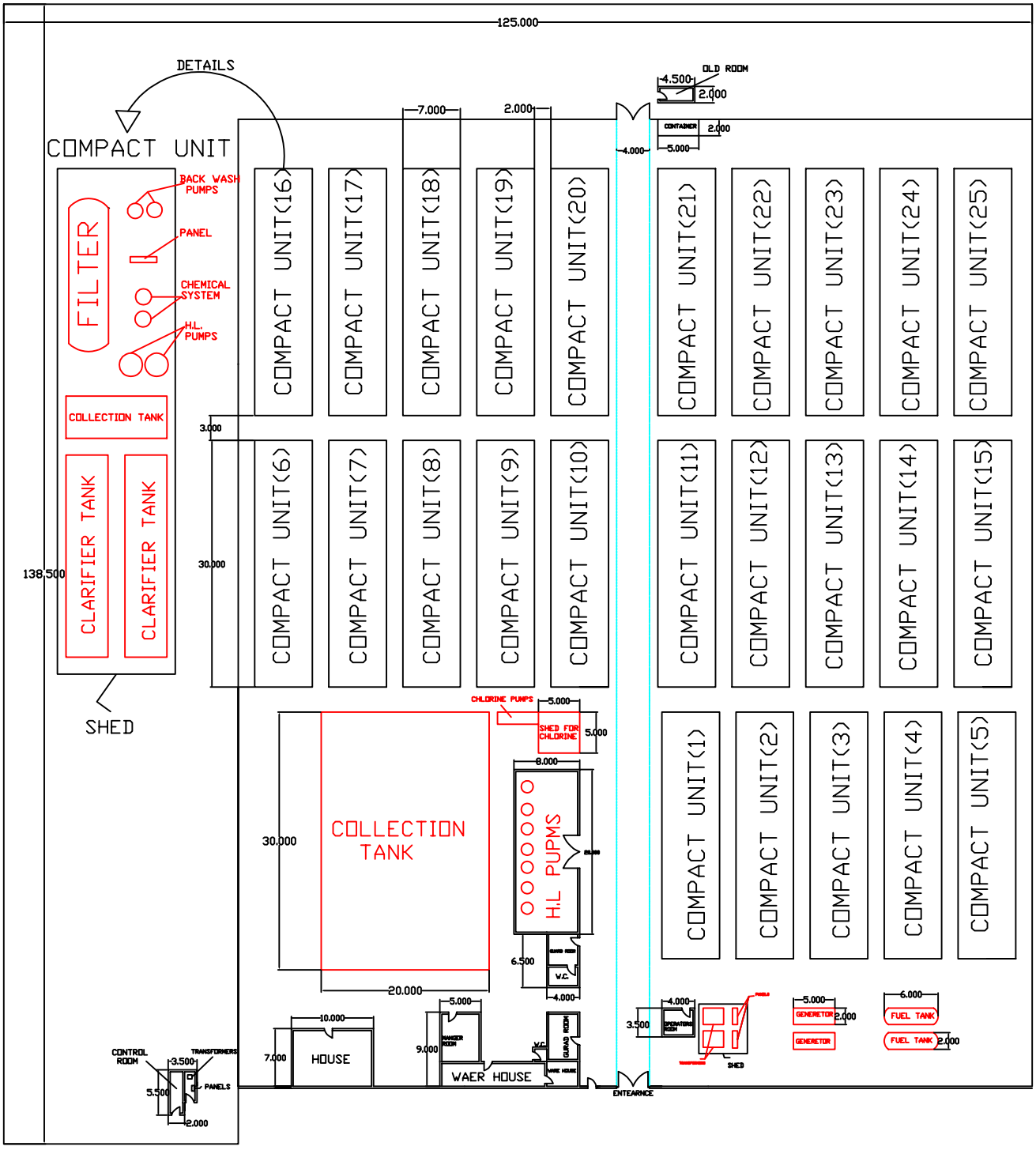
APPENDIX D DRAWINGS OF EXISTING WATER SUPPLY FACILITIES

List of Drawings

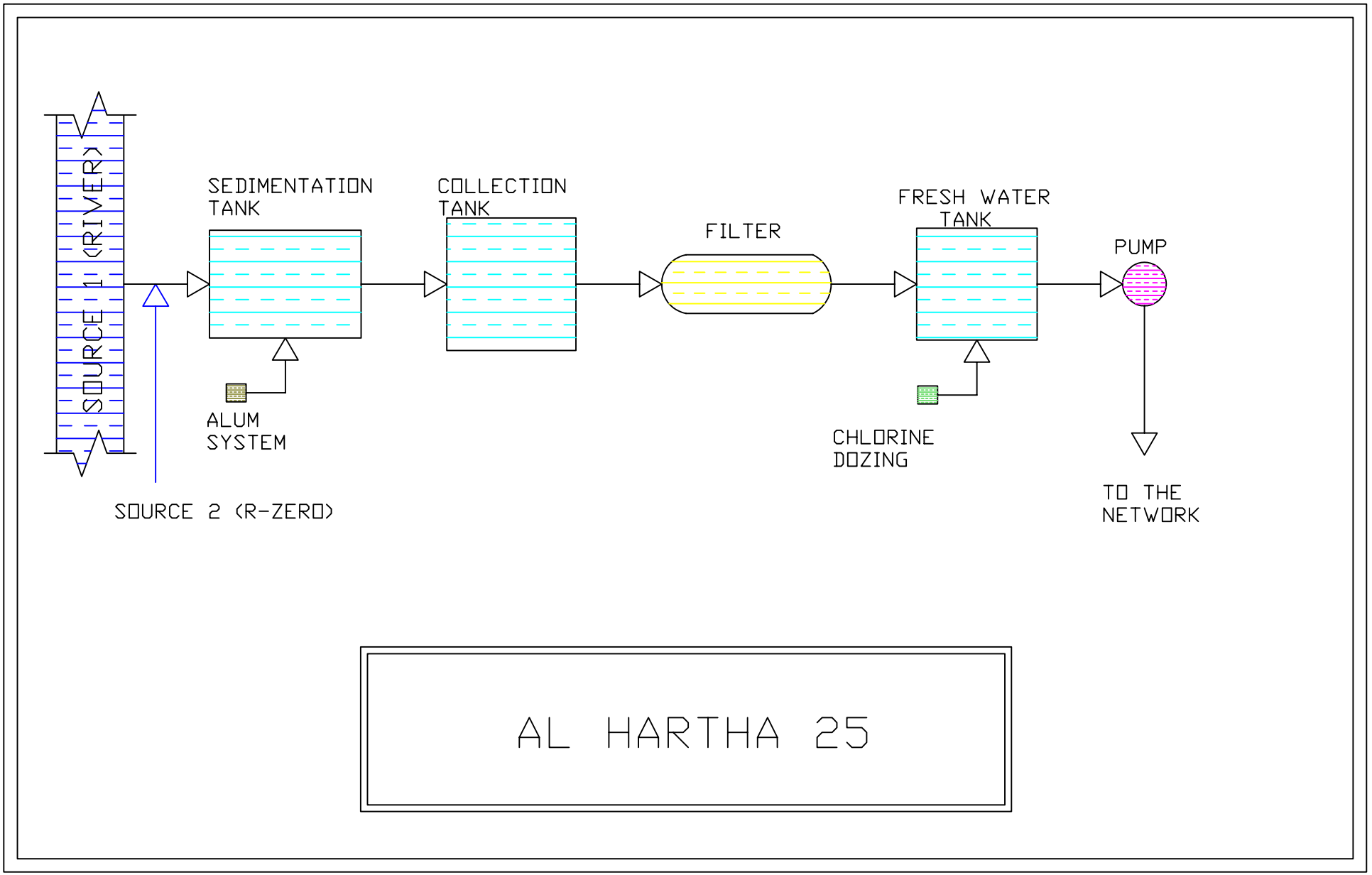

GENERATOR ROOM
MUDS BASIN
CONFRENCE ROOM
WARE HOUSE
H.L. PUMPING ROOM
COMPACT UNIT A
COMPACT UNIT B
COMPACT UNIT C
COMPACT UNIT D
COMPACT UNIT E
PUMPING ROOM
OPERATORS ROOM
WORK SHOP
TRANSFORMERS ROOM
ADM. ROOM
RECEPTION ROOM

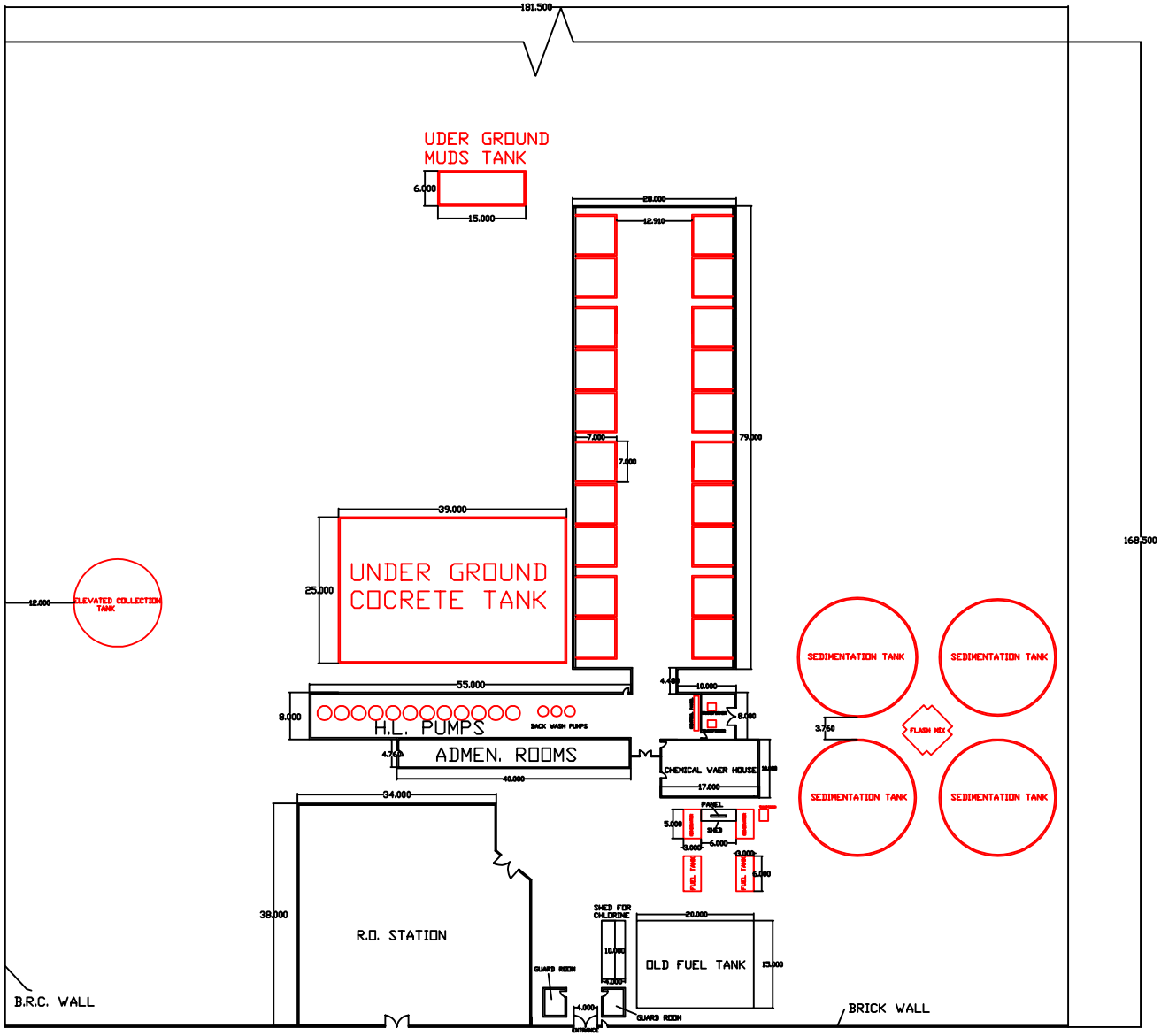
R-ZERO


SOURCE (S.W.C.)
PUMPS
SEDIMENTATION TANKS
COLLECTION TANKS
PUMPS
FILTER
FRESH WATER TANK
PUMPS
TO THE NETWORK
R-ZERO

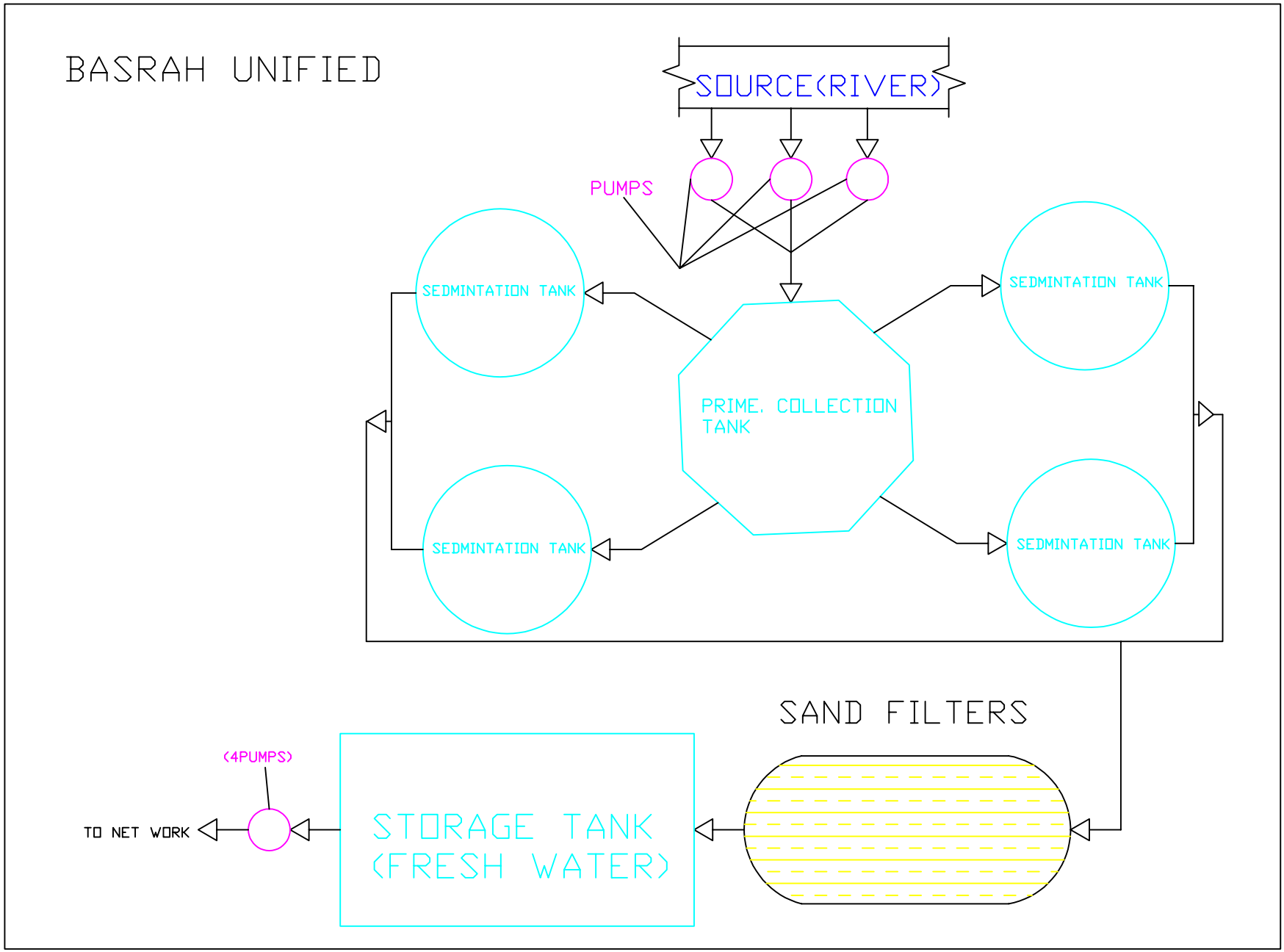

125.000
DETAILS
COMPACT UNIT
BACK WASH PUMPS
PANEL
CHEMICAL SYSTEM
H.L. PUMPS
FILTER
COLLECTION TANK
CLARIFIER TANK
CLARIFIER TANK
SHED
138.500
3.000
30.000
7.000
2.000
4.000
OLD ROOM
4.500
2.000
CONTAINER
2.000
5.000
COMPACT UNIT(16)
COMPACT UNIT(17)
COMPACT UNIT(18)
COMPACT UNIT(19)
COMPACT UNIT(20)
COMPACT UNIT(21)
COMPACT UNIT(22)
COMPACT UNIT(23)
COMPACT UNIT(24)
COMPACT UNIT(25)
COMPACT UNIT(6)
COMPACT UNIT(7)
COMPACT UNIT(8)
COMPACT UNIT(9)
COMPACT UNIT(10)
COMPACT UNIT(11)
COMPACT UNIT(12)
COMPACT UNIT(13)
COMPACT UNIT(14)
COMPACT UNIT(15)
COMPACT UNIT(1)
COMPACT UNIT(2)
COMPACT UNIT(3)
COMPACT UNIT(4)
COMPACT UNIT(5)
CHLORINE PUMPS
5.000
SHED FOR CHLORINE
5.000
8.000
H.L PUPMS
30.000
COLLECTION TANK
20.000
6.500
W.C.
4.000
5.000
10.000
7.000
HOUSE
9.000
MANGER ROOM
WAER HOUSE
GUARD ROOM
W.C.
WARE HOUSE
ENTEARNCE
4.000
3.500
OPERATORS ROOM
SHED
5.000
GENERETOR
2.000
GENERETOR
6.000
FUEL TANK
FUEL TANK
2.000
CONTROL ROOM
3.500
TRANSFORMERS
5.500
PANELS
2.000

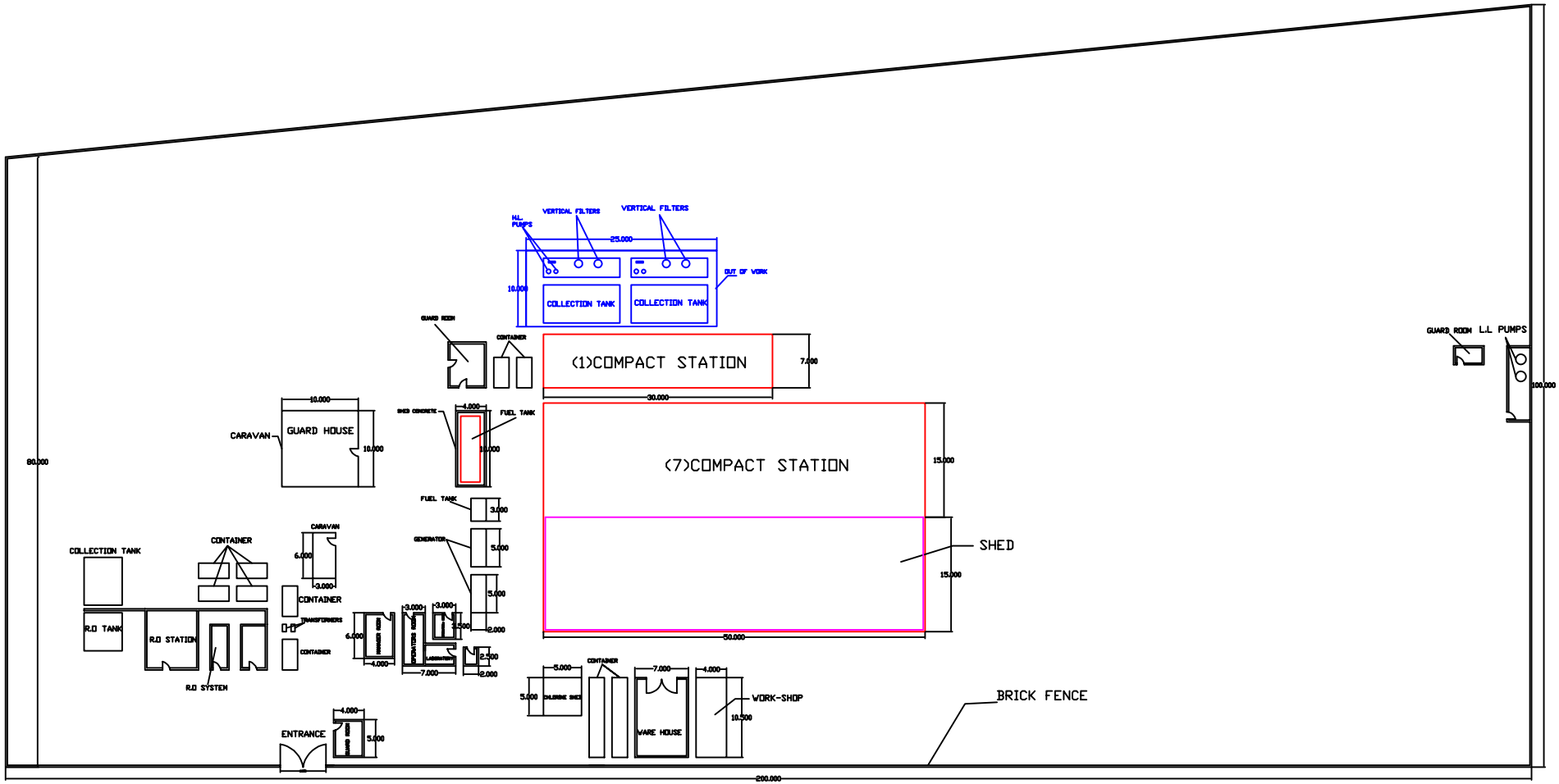
AL HARTHA 25


SOURCE 1 (RIVER)
SEDIMENTATION TANK
COLLECTION TANK
FILTER
FRESH WATER TANK
PUMP
ALUM SYSTEM
CHLORINE DOZING
SOURCE 2 (R-ZERO)
TO THE NETWORK
AL HARTHA 25

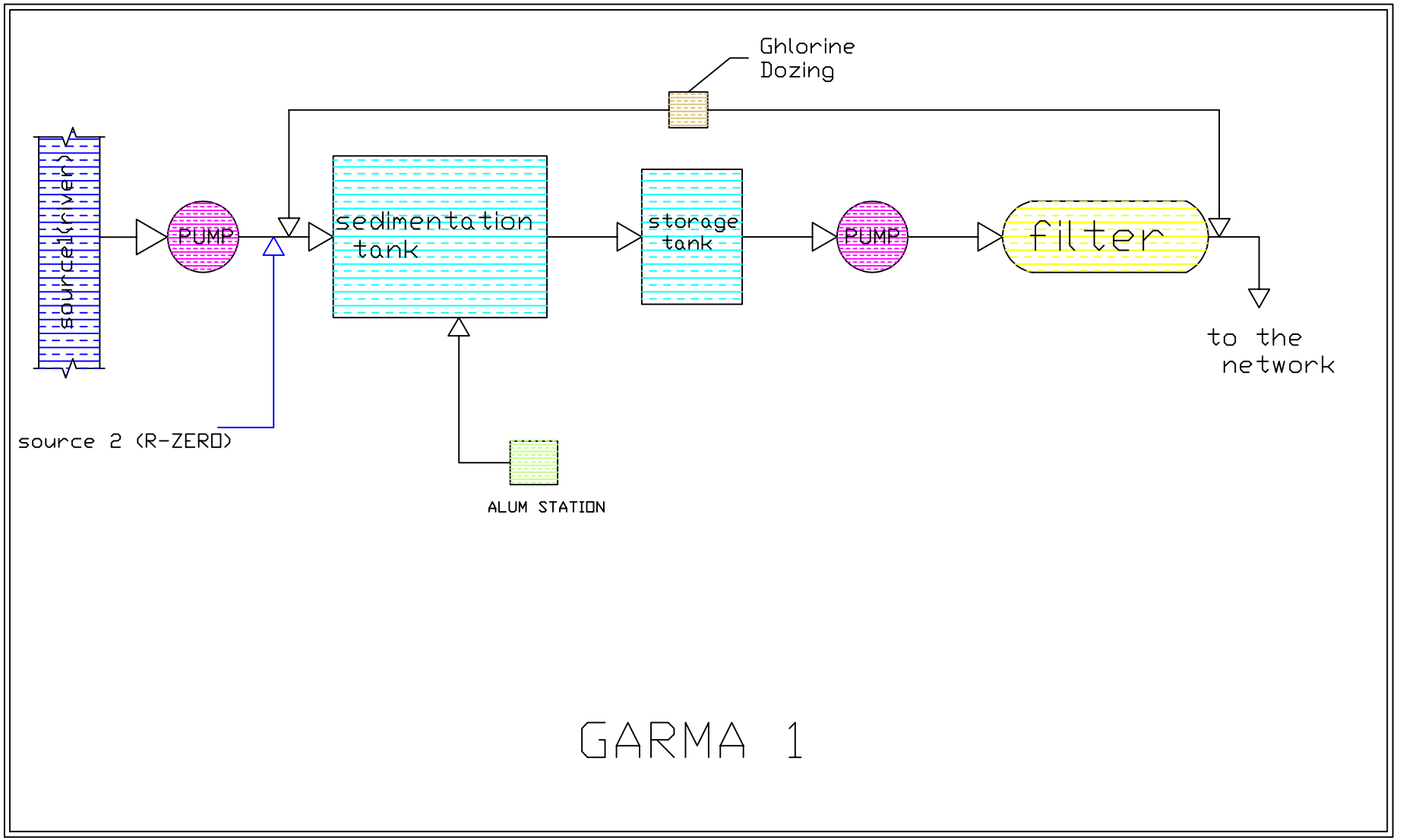


BASRAH UNIFIED

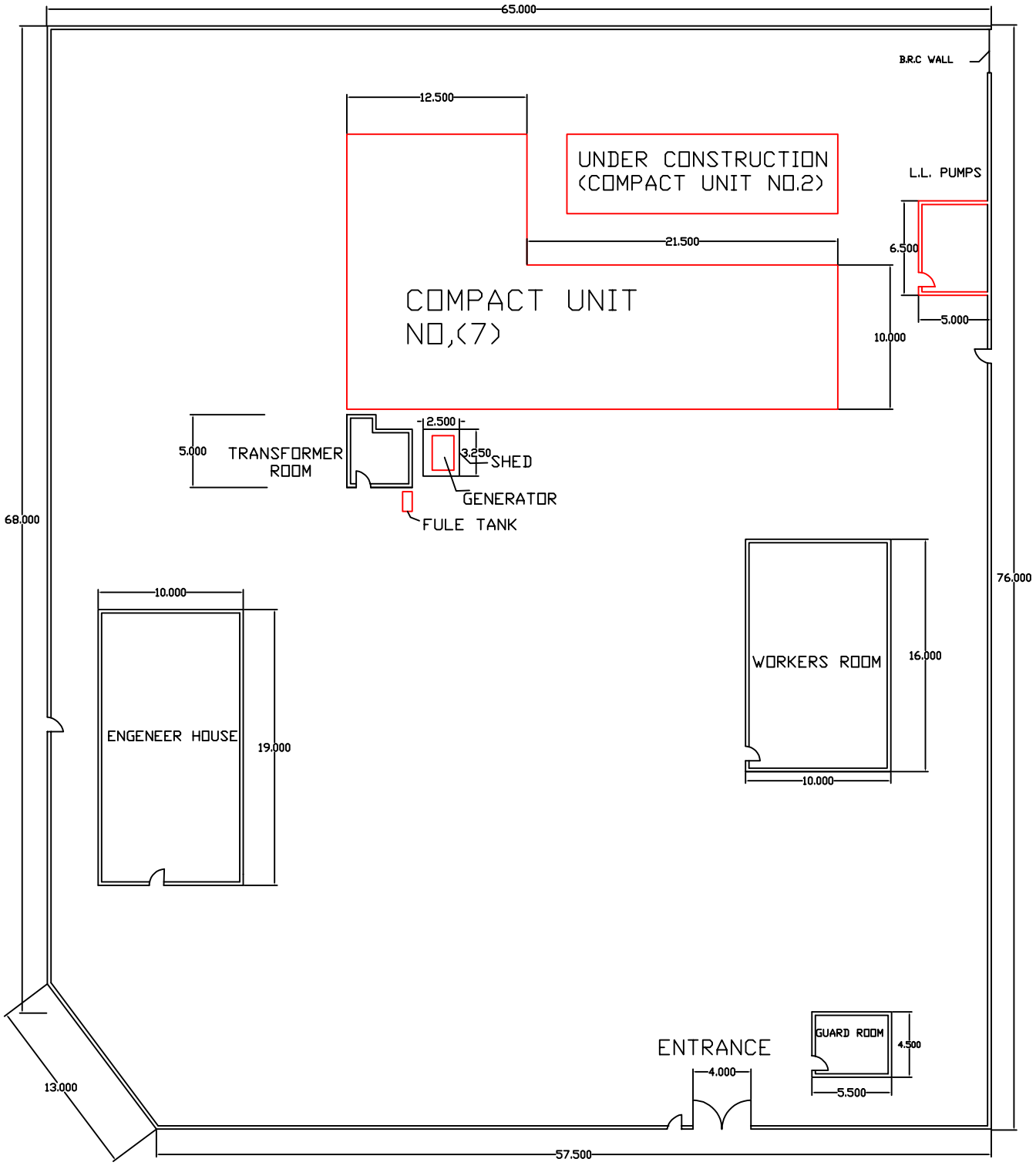

BASRAH UNIFIED
SOURCE(RIVER)
PUMPS
SEDMINTATION TANK
SEDMINTATION TANK
PRIME. COLLECTION TANK
SEDMINTATION TANK
SEDMINTATION TANK
SAND FILTERS
(4PUMPS)
TO NET WORK
STORAGE TANK (FRESH WATER)



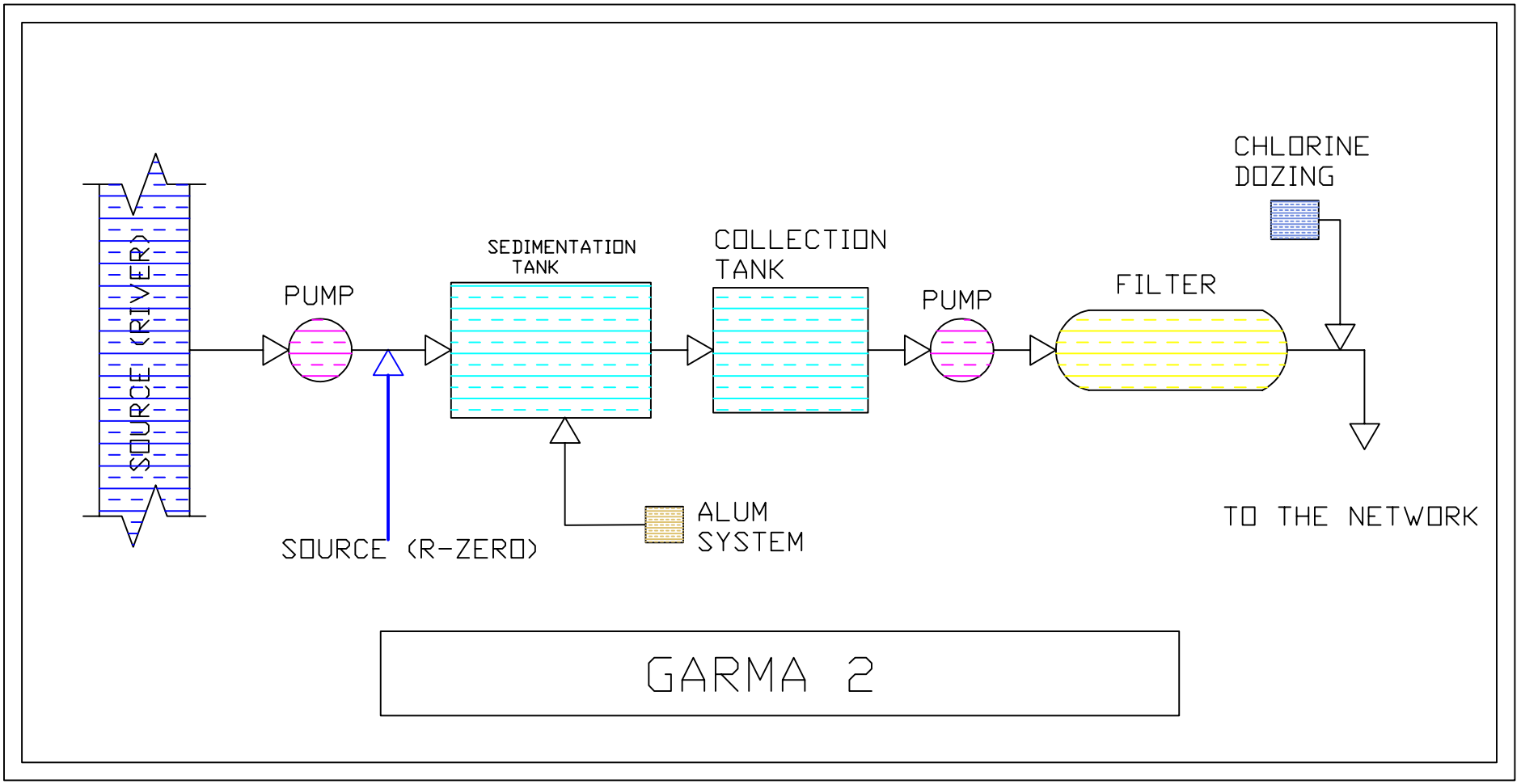
GARMA 1 TREATMENT STATION

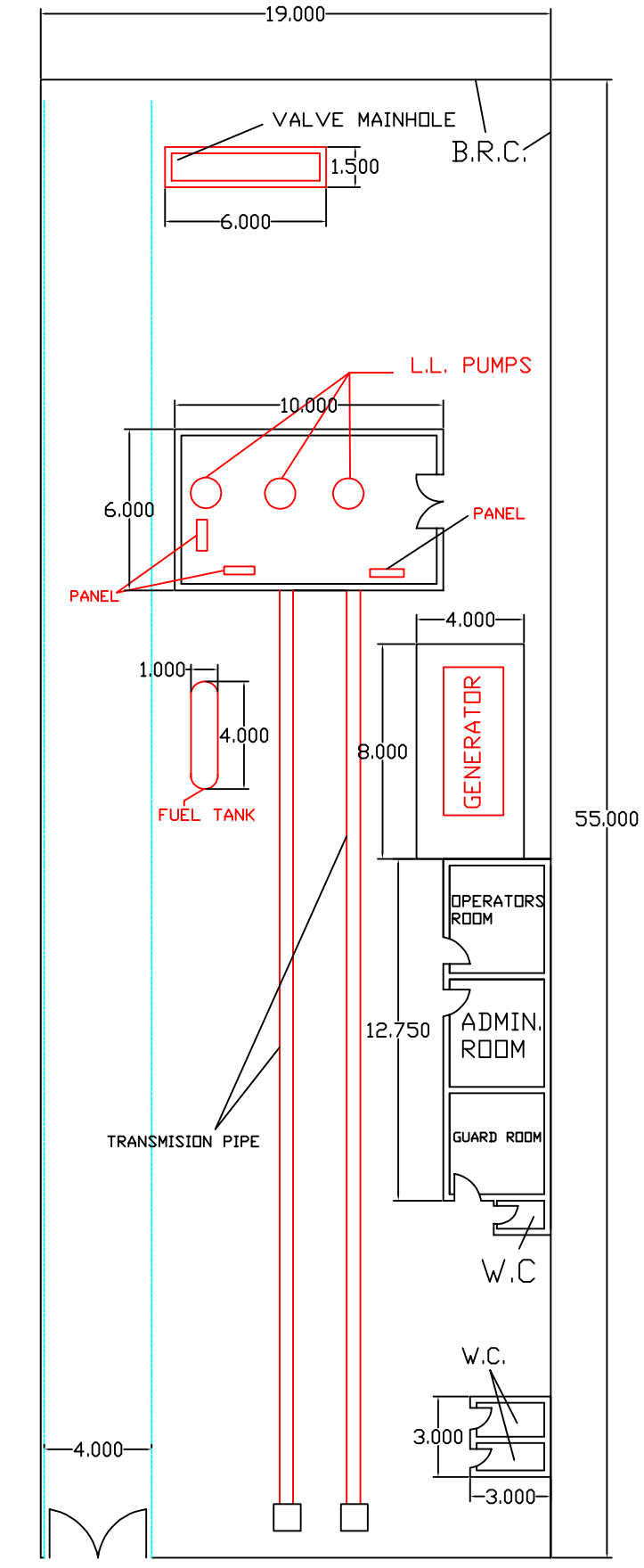

Ghlorine
Dozing
source 1 (river)
PUMP
sedimentation
tank
storage
tank
PUMP
filter
to the
network
source 2 (R-ZERO)
ALUM STATION

GARMA 1

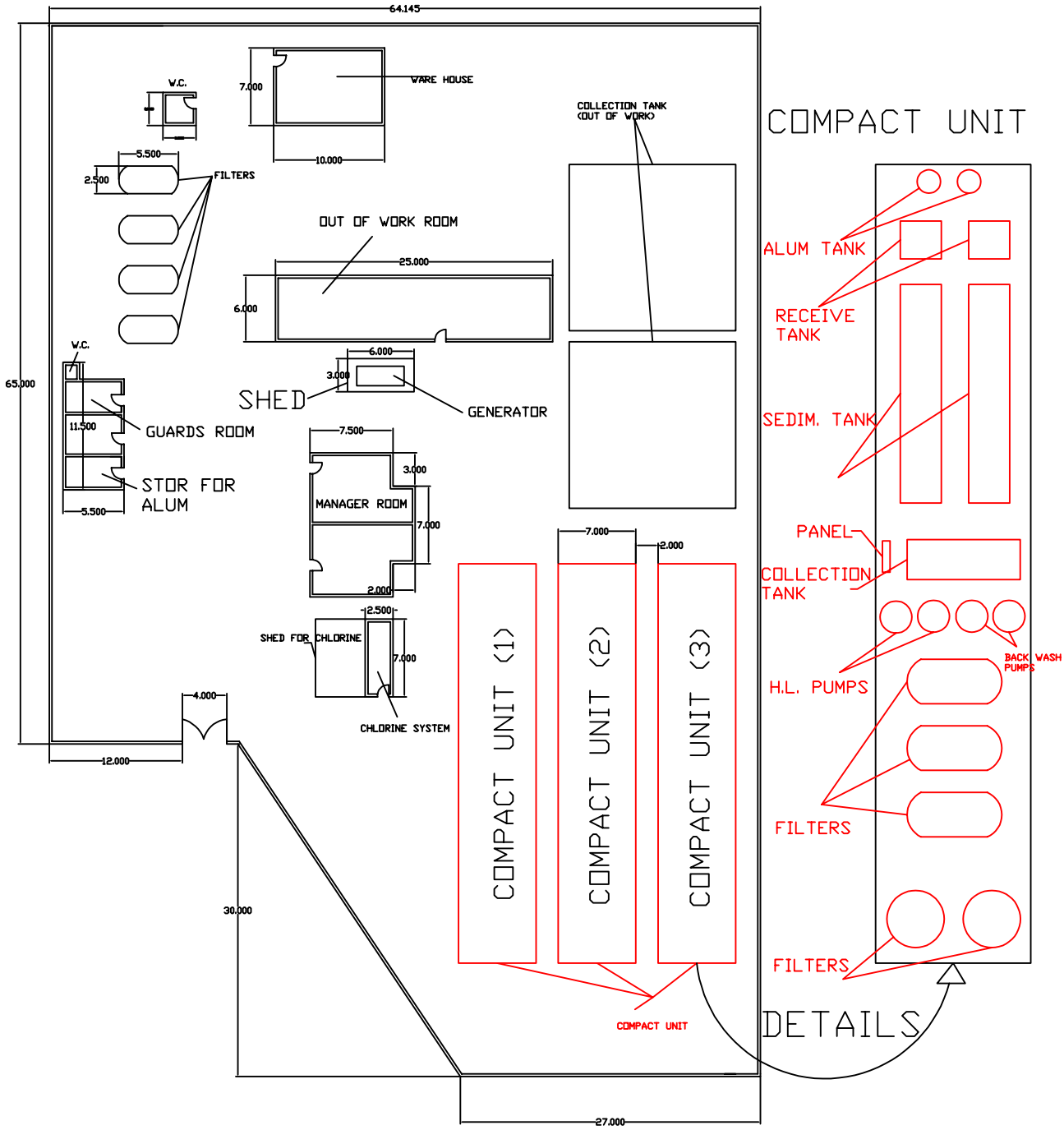

65.000
B.R.C WALL
12.500
UNDER CONSTRUCTION
(COMPACT UNIT NO.2)
L.L. PUMPS
21.500
6.500
5.000
10.000
COMPACT UNIT
NO.(7)
2.500
5.000
TRANSFORMER
ROOM
3.250
SHED
GENERATOR
FULE TANK
68.000
76.000
10.000
ENGENEER HOUSE
19.000
WORKERS ROOM
16.000
10.000
GUARD ROOM
4.500
ENTRANCE
4.000
5.500
13.000
57.500

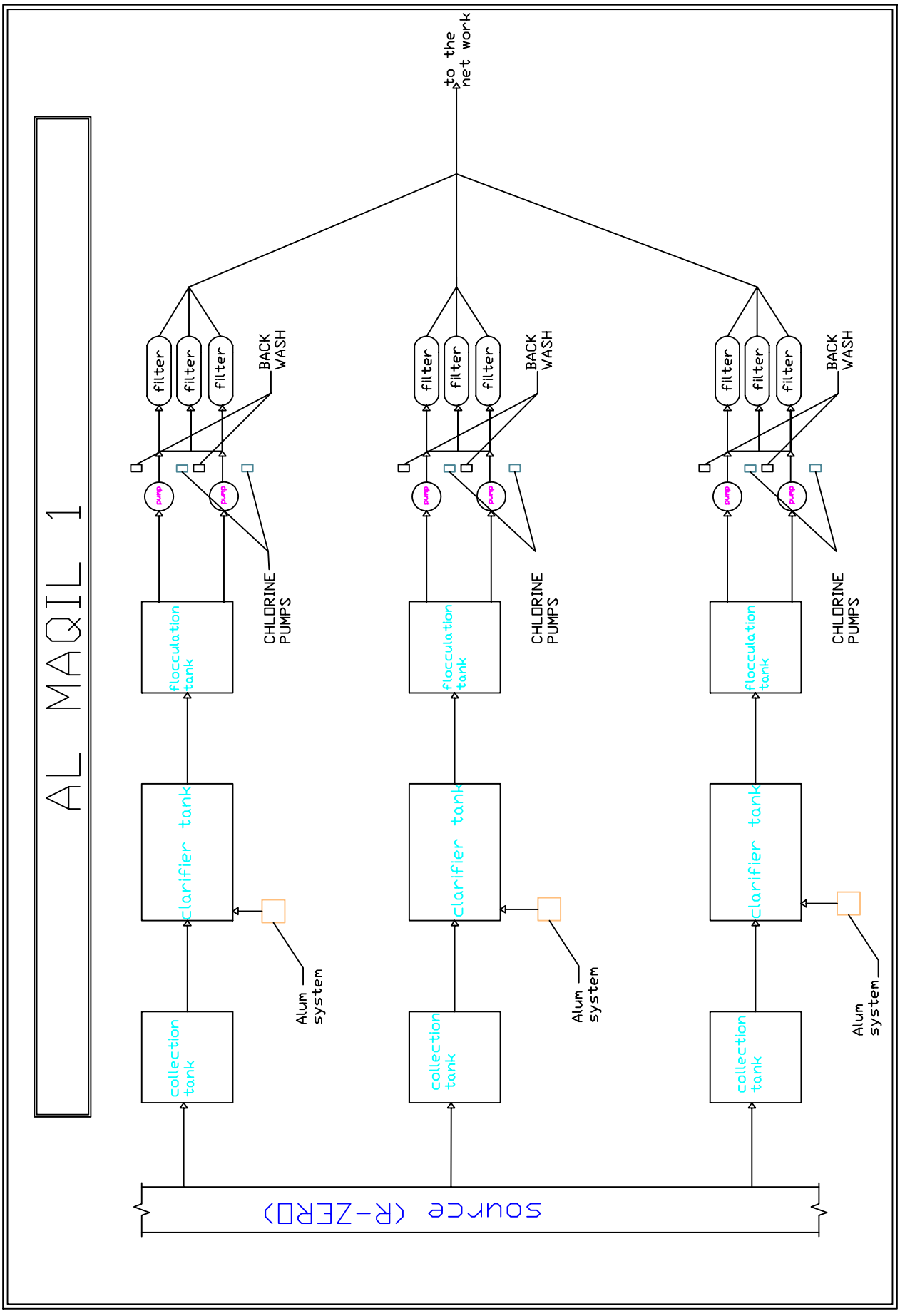
GARMA 2

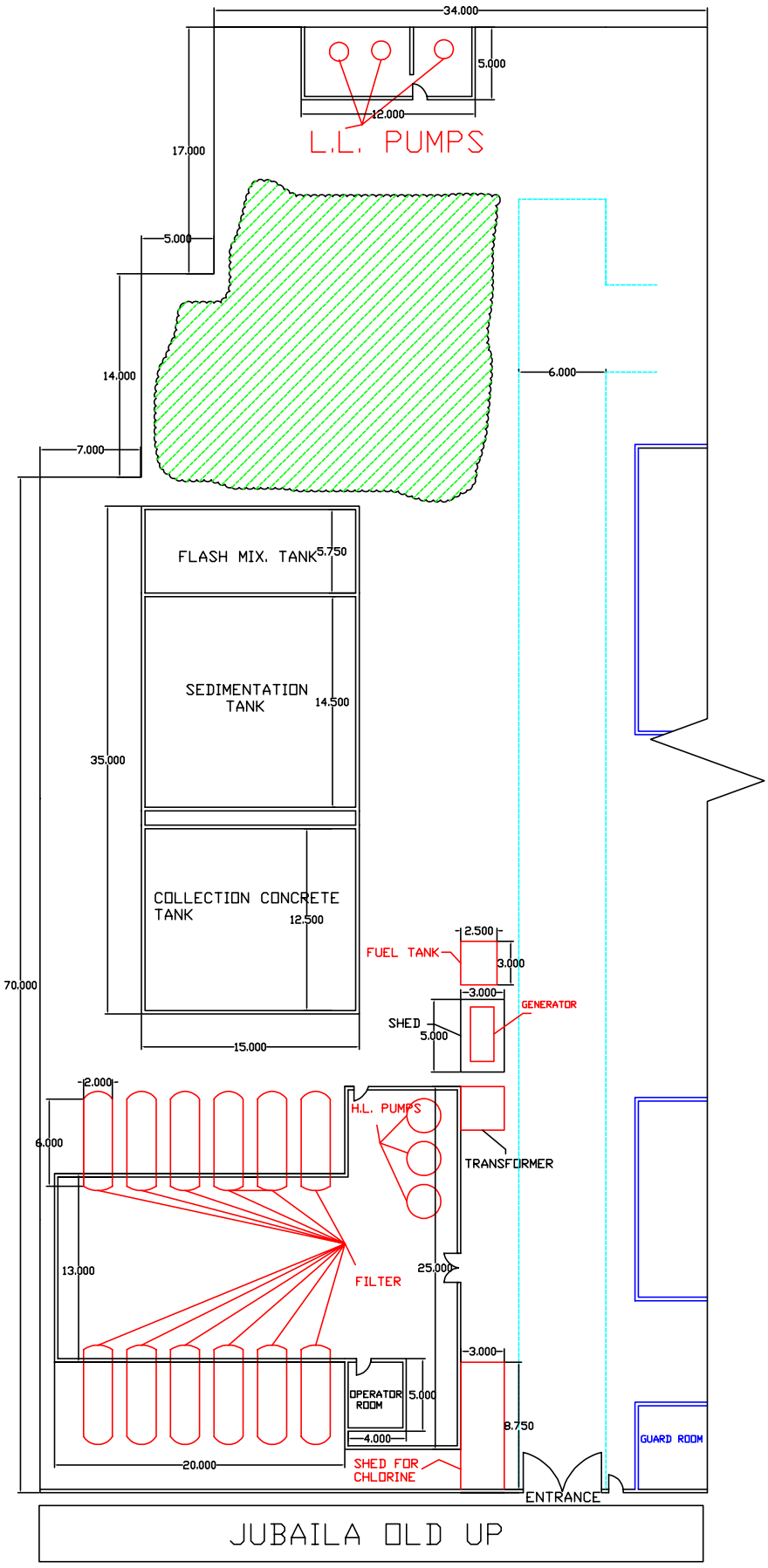

SOURCE (RIVER)
PUMP
SEDIMENTATION TANK
COLLECTION TANK
PUMP
FILTER
CHLORINE DOZING
SOURCE (R-ZERO)
ALUM SYSTEM
TO THE NETWORK
GARMA 2

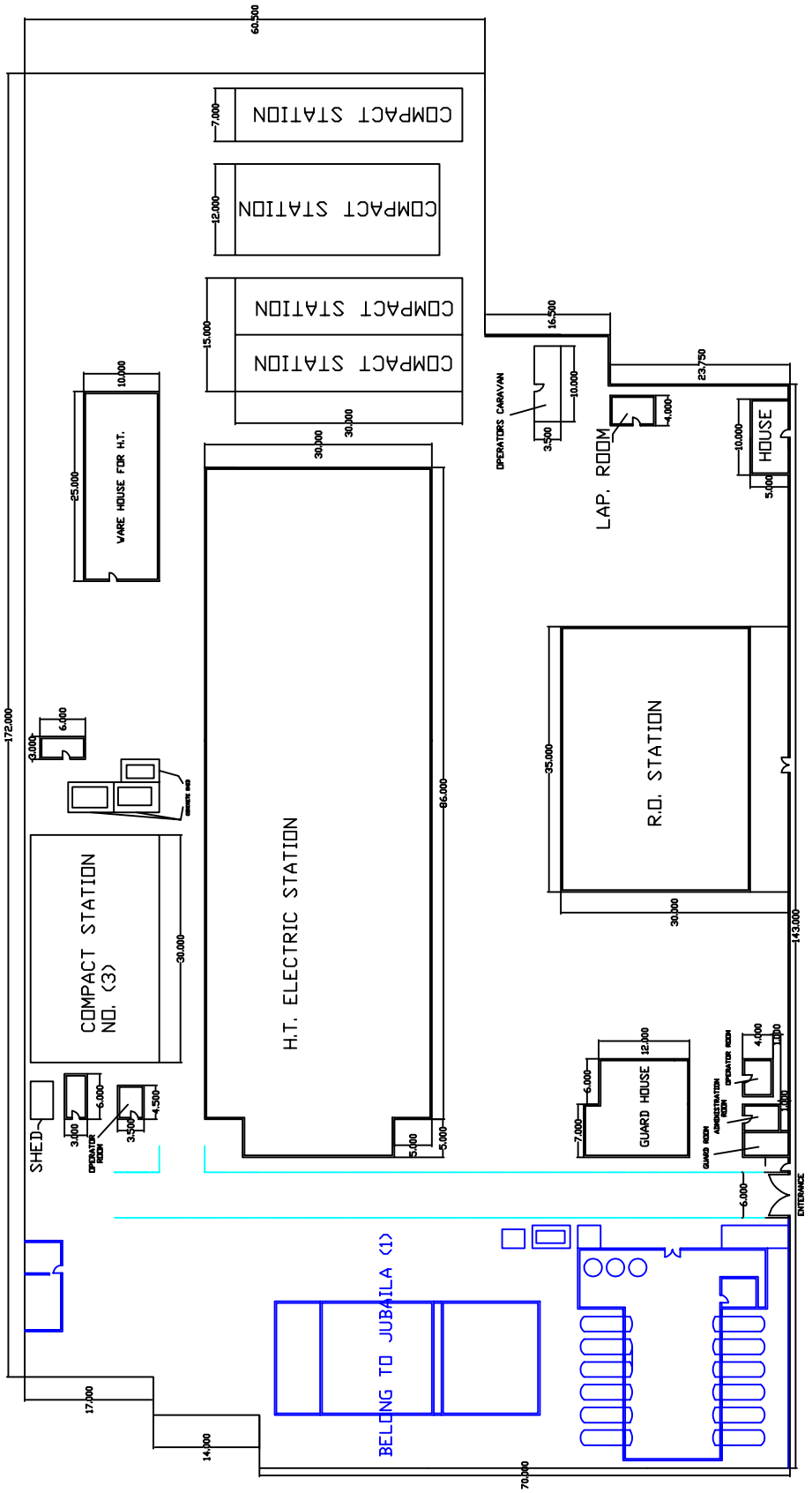


AL MAQIL (BASRAH PORT)

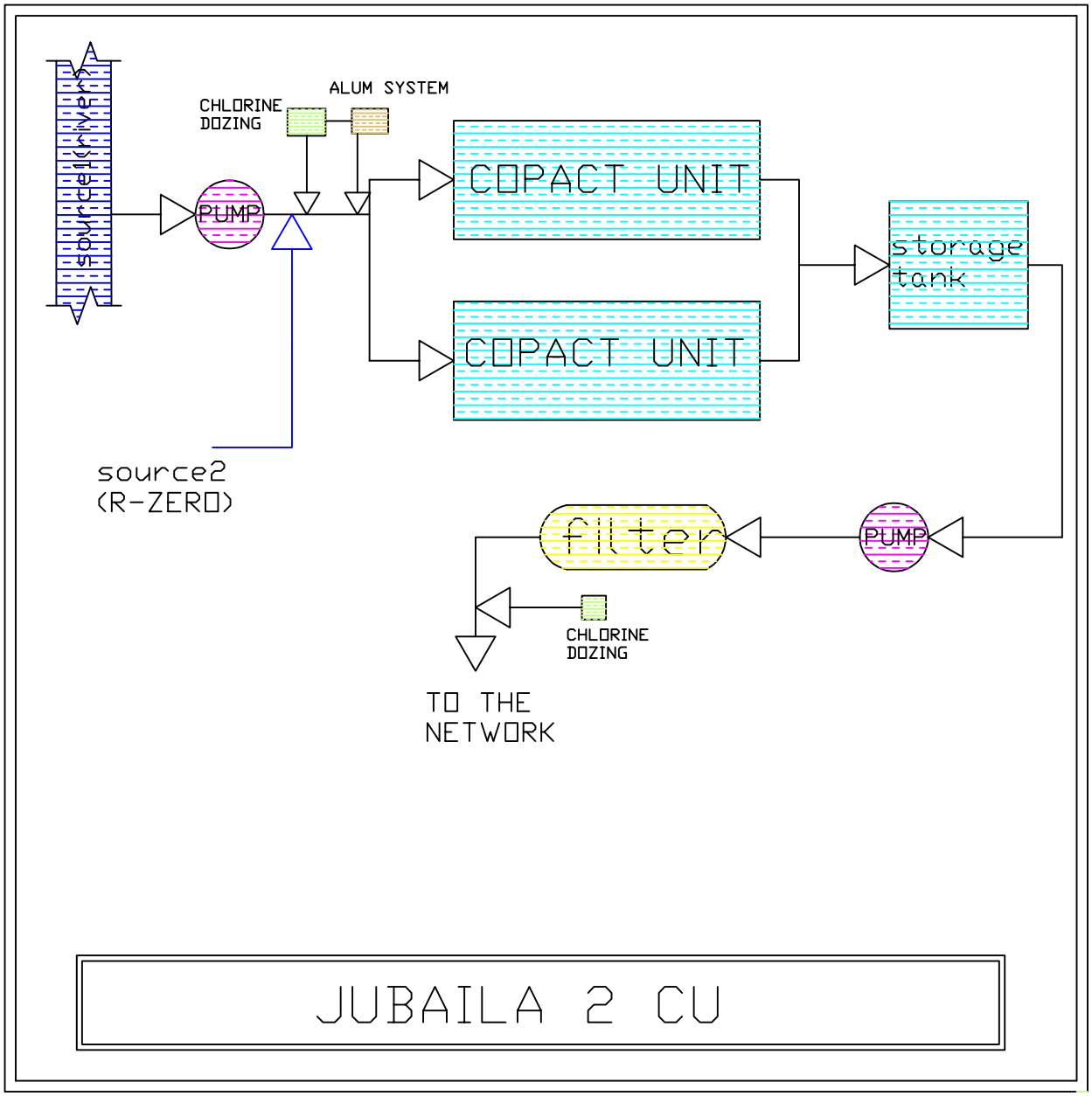

64.145
W.C.
7.000
WARE HOUSE
10.000
COLLECTION TANK
(OUT OF WORK)
COMPACT UNIT
5.500
2.500
FILTERS
OUT OF WORK ROOM
25.000
6.000
ALUM TANK
RECEIVE TANK
W.C.
6.000
3.000
SHED
GENERATOR
65.000
11.500
GUARDS ROOM
SEDIM. TANK
STOR FOR ALUM
5.500
7.500
3.000
MANAGER ROOM
7.000
2.000
PANEL
COLLECTION TANK
7.000
2.000
2.500
SHED FOR CHLORINE
7.000
BACK WASH PUMPS
H.L. PUMPS
4.000
CHLORINE SYSTEM
12.000
COMPACT UNIT (1)
COMPACT UNIT (2)
COMPACT UNIT (3)
FILTERS
30.000
FILTERS
COMPACT UNIT
DETAILS
27.000
AL MAQIL 1

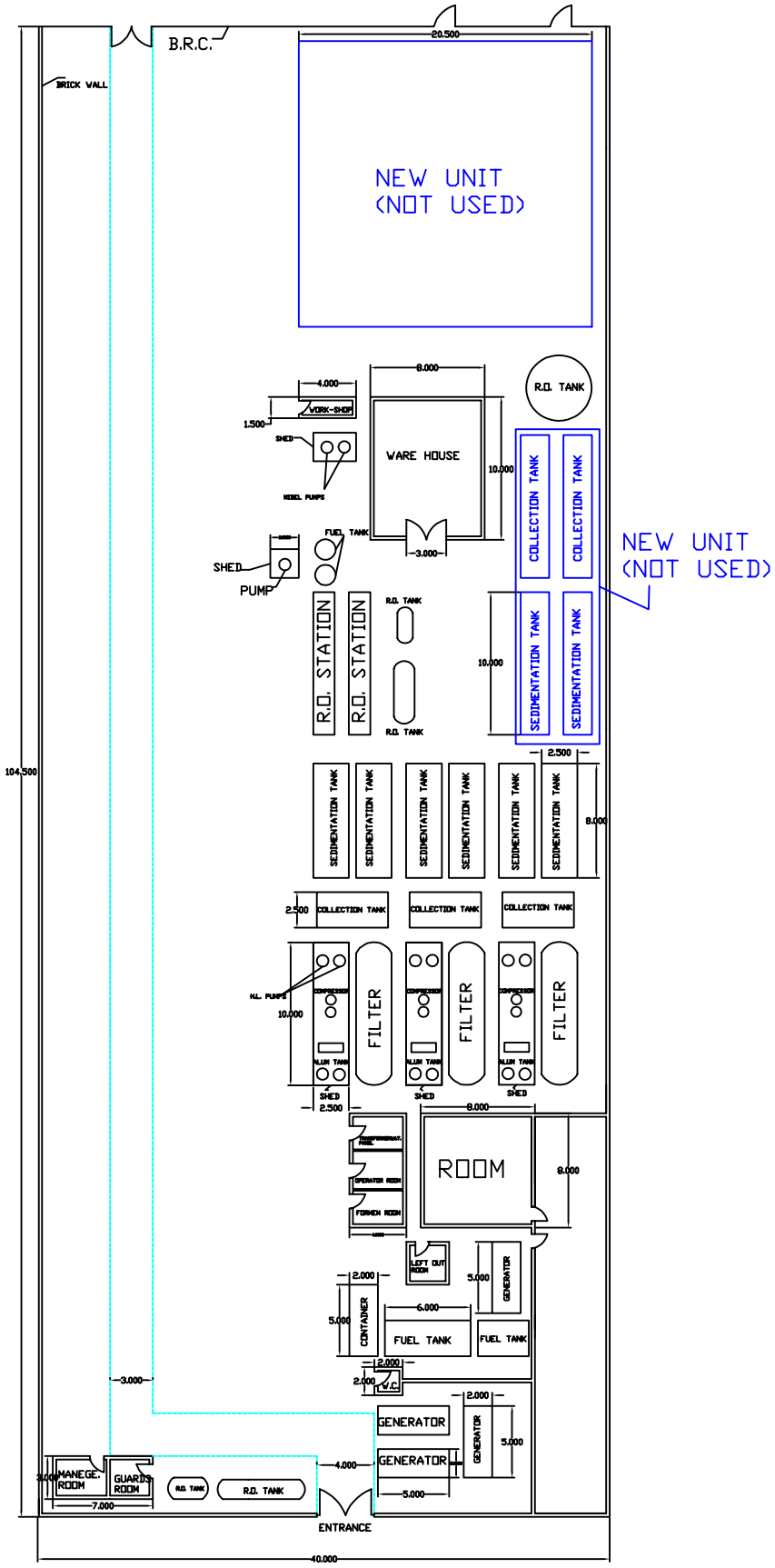

AL MAQIL 1
to the net work
filter
filter
filter
BACK WASH
pump
pump
CHLORINE PUMPS
flocculation tank
clarifier tank
Alum system
collection tank
SOURCE (R-ZERO)


34.000
5.000
12.000
L.L. PUMPS
17.000
5.000
14.000
6.000
7.000
FLASH MIX. TANK
5.750
SEDIMENTATION TANK
14.500
35.000
COLLECTION CONCRETE TANK
12.500
15.000
70.000
2.500
FUEL TANK
3.000
3.000
GENERATOR
SHED
5.000
2.000
H.L. PUMPS
6.000
TRANSFORMER
13.000
FILTER
25.000
3.000
OPERATOR ROOM
5.000
4.000
8.750
GUARD ROOM
20.000
SHED FOR CHLORINE
ENTRANCE
JUBAILA OLD UP

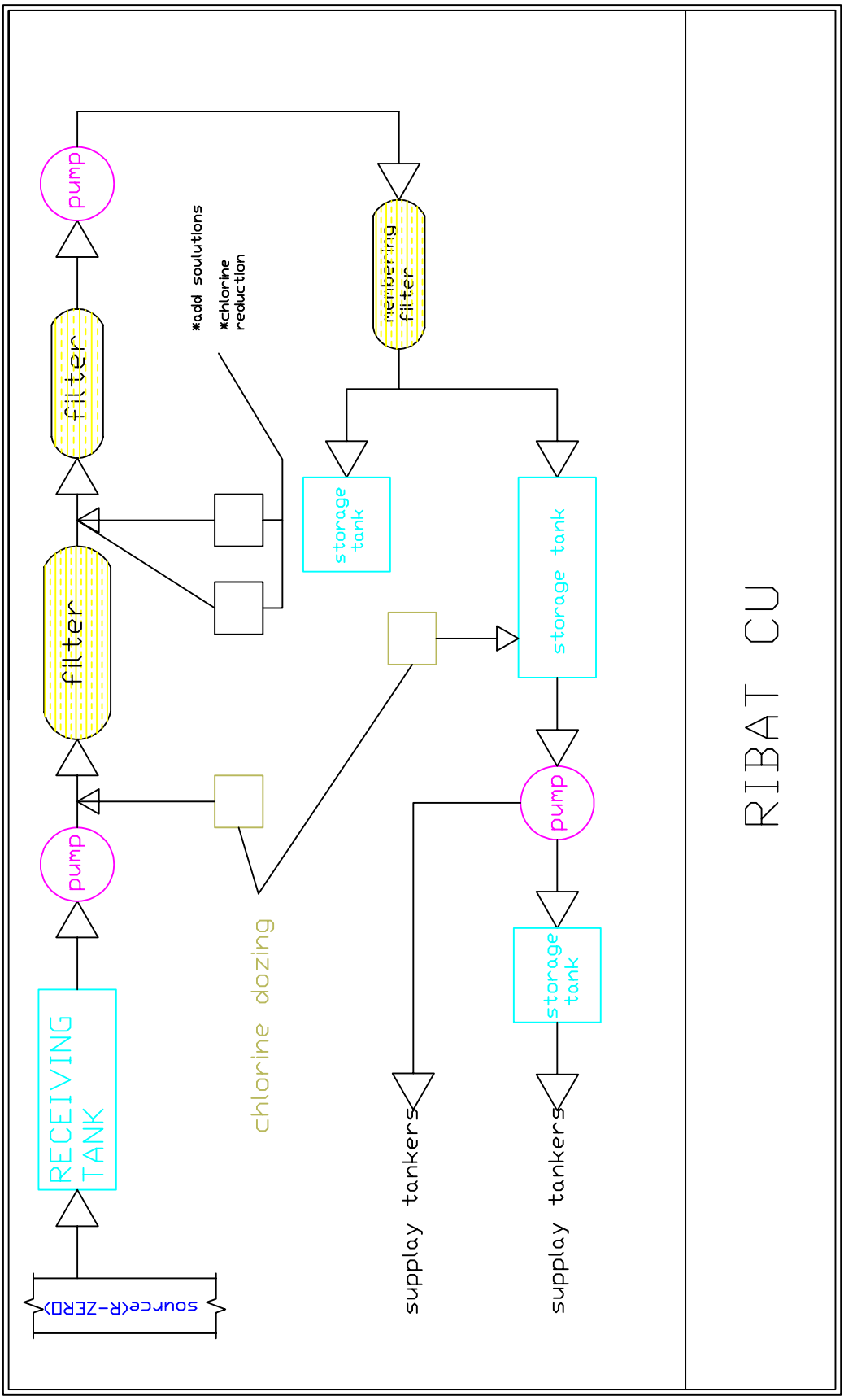

COMPACT STATION
COMPACT STATION
COMPACT STATION
COMPACT STATION
WARE HOUSE FOR H.T.
OPERATORS CARAVAN
LAP. ROOM
HOUSE
H.T. ELECTRIC STATION
R.D. STATION
COMPACT STATION NO. (3)
SHED
GUARD HOUSE
BELONG TO JUBAILA (1)
ENTERANCE

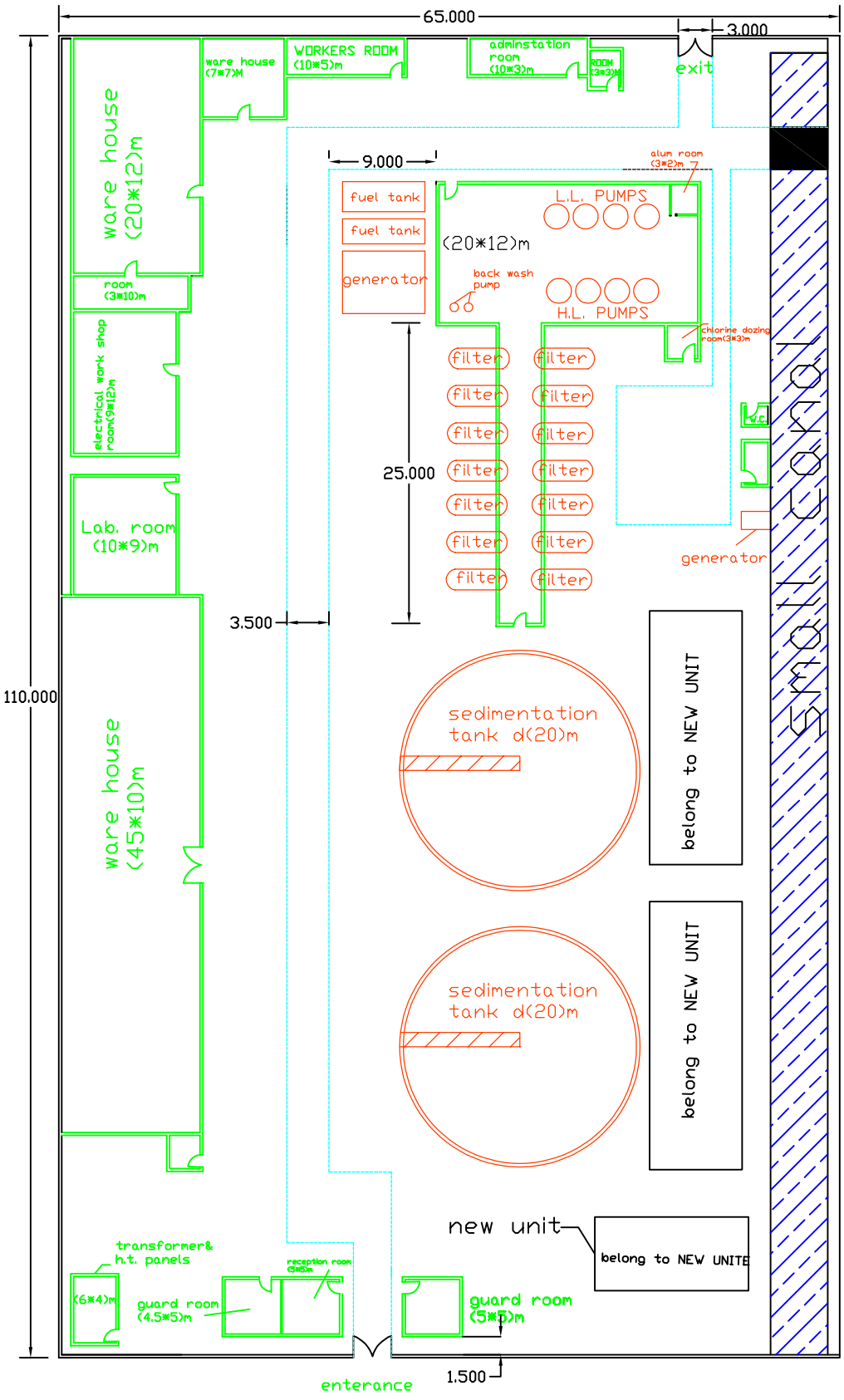
JUBAILA 2 CU


source1(river)
CHLORINE DOZING
ALUM SYSTEM
PUMP
COPACT UNIT
COPACT UNIT
storage tank
source2 (R-ZERO)
filter
PUMP
CHLORINE DOZING
TO THE NETWORK
JUBAILA 2 CU

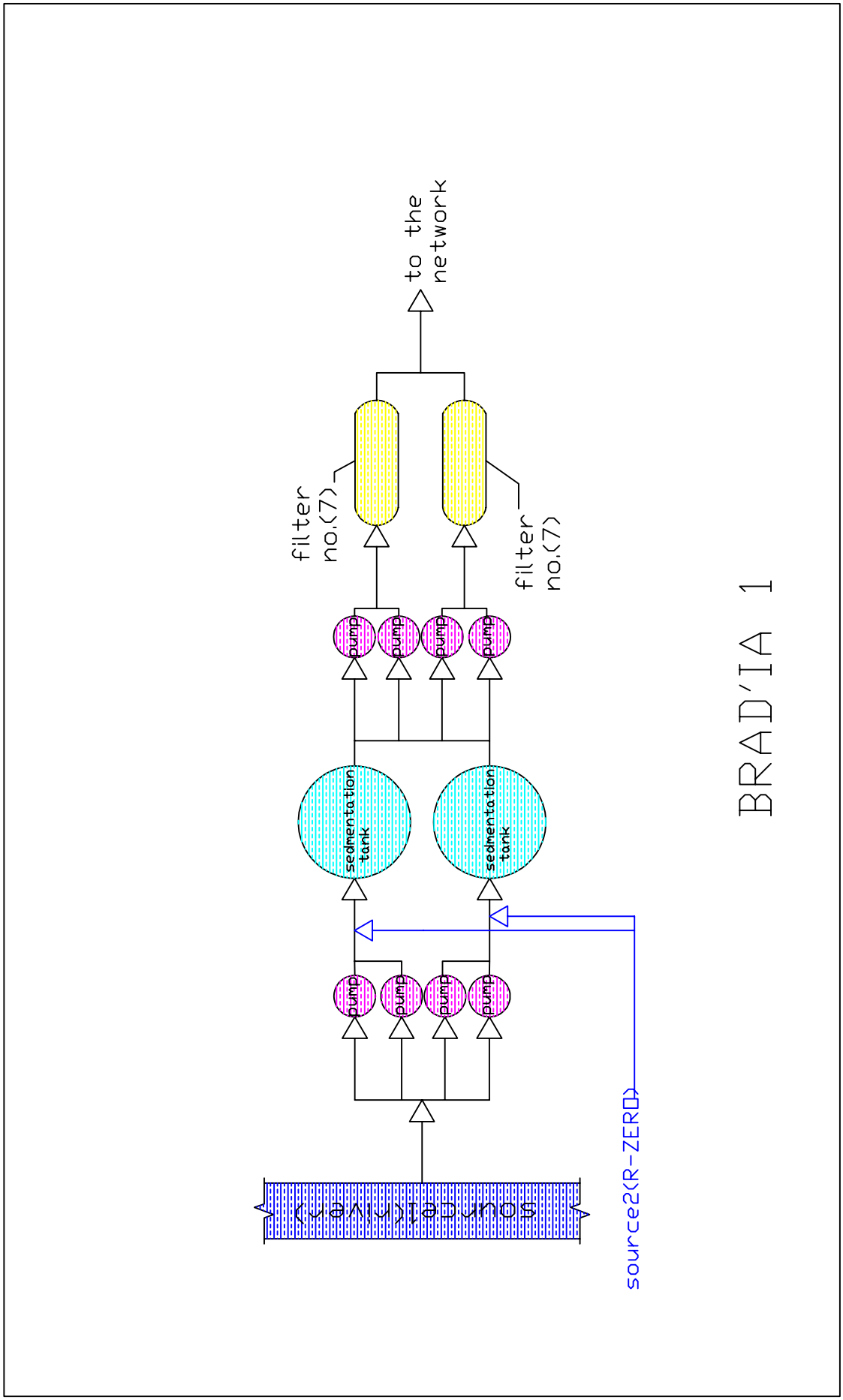

B.R.C.
BRICK WALL
20.500
NEW UNIT
(NOT USED)
4.000
WORK-SHOP
1.500
SHED
DIESEL PUMPS
8.000
WARE HOUSE
10.000
3.000
R.O. TANK
COLLECTION TANK
COLLECTION TANK
SEDIMENTATION TANK
SEDIMENTATION TANK
NEW UNIT
(NOT USED)
FUEL TANK
SHED
PUMP
R.O. STATION
R.O. STATION
R.O. TANK
R.O. TANK
10.000
2.500
104.500
SEDIMENTATION TANK
8.000
2.500
COLLECTION TANK
FILTER
10.000
SHED
8.000
ROOM
8.000
LEFT OUT ROOM
2.000
5.000
GENERATOR
CONTAINER
6.000
FUEL TANK
FUEL TANK
W.C.
GENERATOR
GENERATOR
4.000
5.000
MANEGE. ROOM
GUARDS ROOM
R.O. TANK
R.O. TANK
7.000
ENTRANCE
40.000

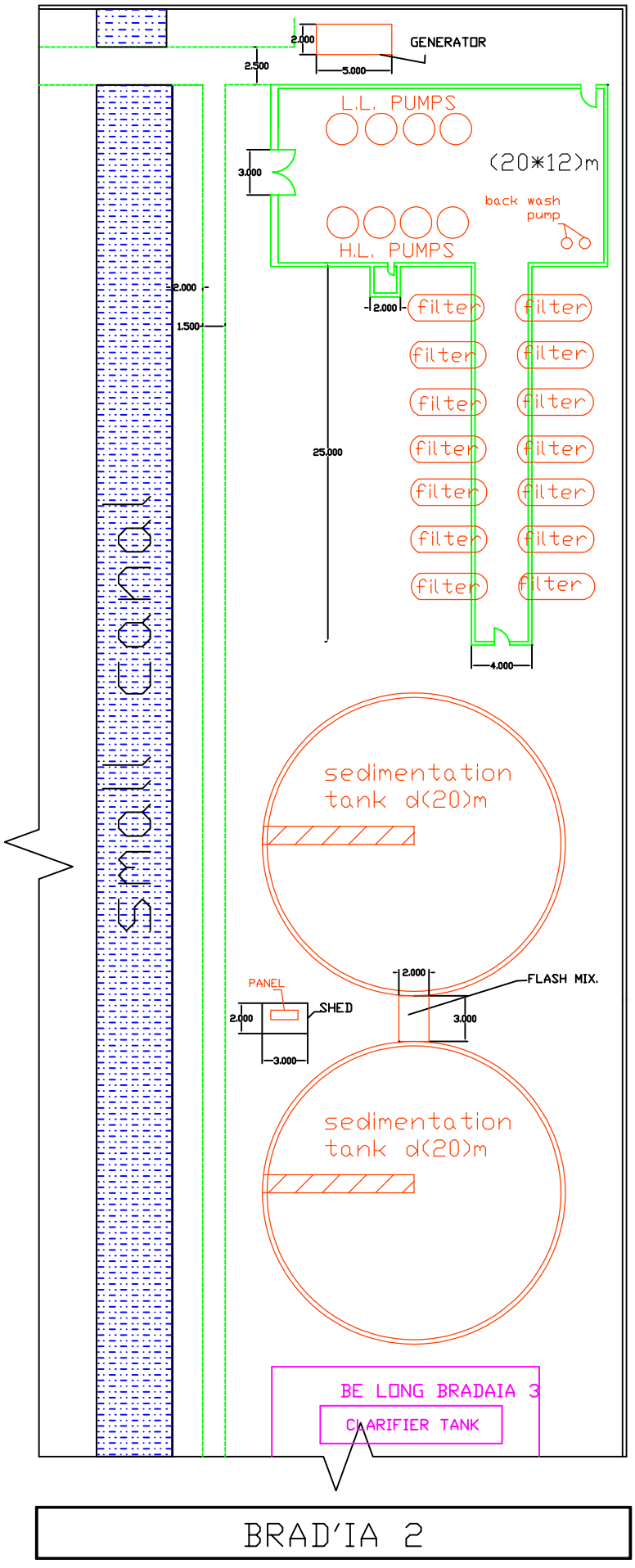
RIBAT CU


RIBAT CU
source(R-ZERO)
RECEIVING TANK
pump
filter
pump
filter
pump
membering filter
*add soulutions
*chlorine reduction
chlorine dozing
storage tank
storage tank
storage tank
pump
supplay tankers
supplay tankers

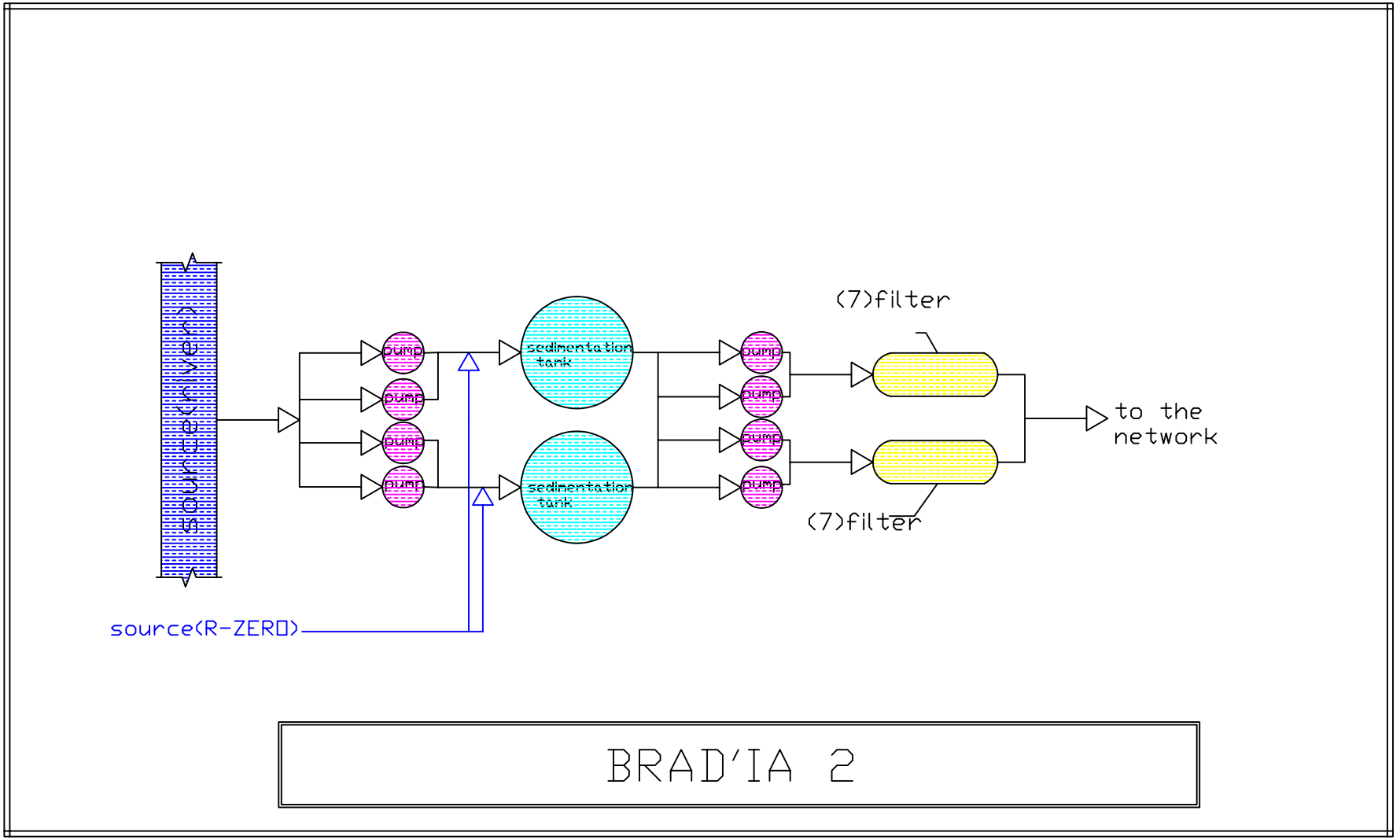

65.000
3.000
exit
ware house (7*7)M
WORKERS ROOM (10*5)m
adminstation room (10*3)m
ROOM (3*3)M
ware house (20*12)m
9.000
alum room (3*2)m
fuel tank
fuel tank
generator
L.L. PUMPS
(20*12)m
back wash pump
H.L. PUMPS
chlorine dozing room(3*3)m
room (3*10)m
electrical work shop room(9*12)m
filter
25.000
W.C
generator
Lab. room (10*9)m
3.500
110.000
sedimentation tank d(20)m
belong to NEW UNIT
ware house (45*10)m
sedimentation tank d(20)m
belong to NEW UNIT
new unit
belong to NEW UNITE
transformer& h.t. panels
(6*4)m
guard room (4.5*5)m
reception room (5*5)m
guard room (5*5)m
enterance
1.500
SWIMMING POOL

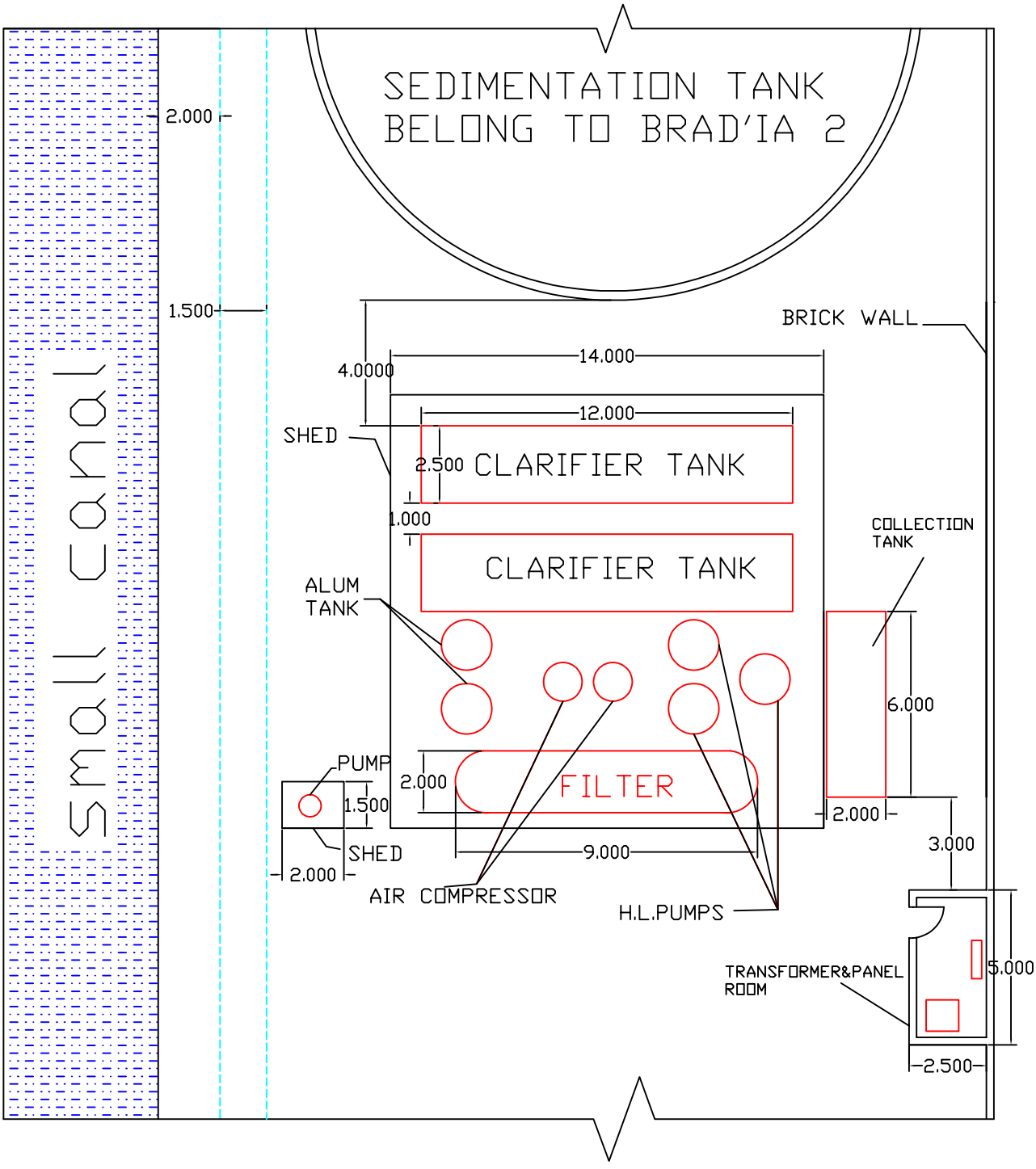
BRAD'IA 1


BRAD'IA 1
to the network
filter no.(7)
filter no.(7)
pump
pump
pump
pump
sedmentation tank
sedmentation tank
pump
pump
pump
pump
source2(R-ZERO)

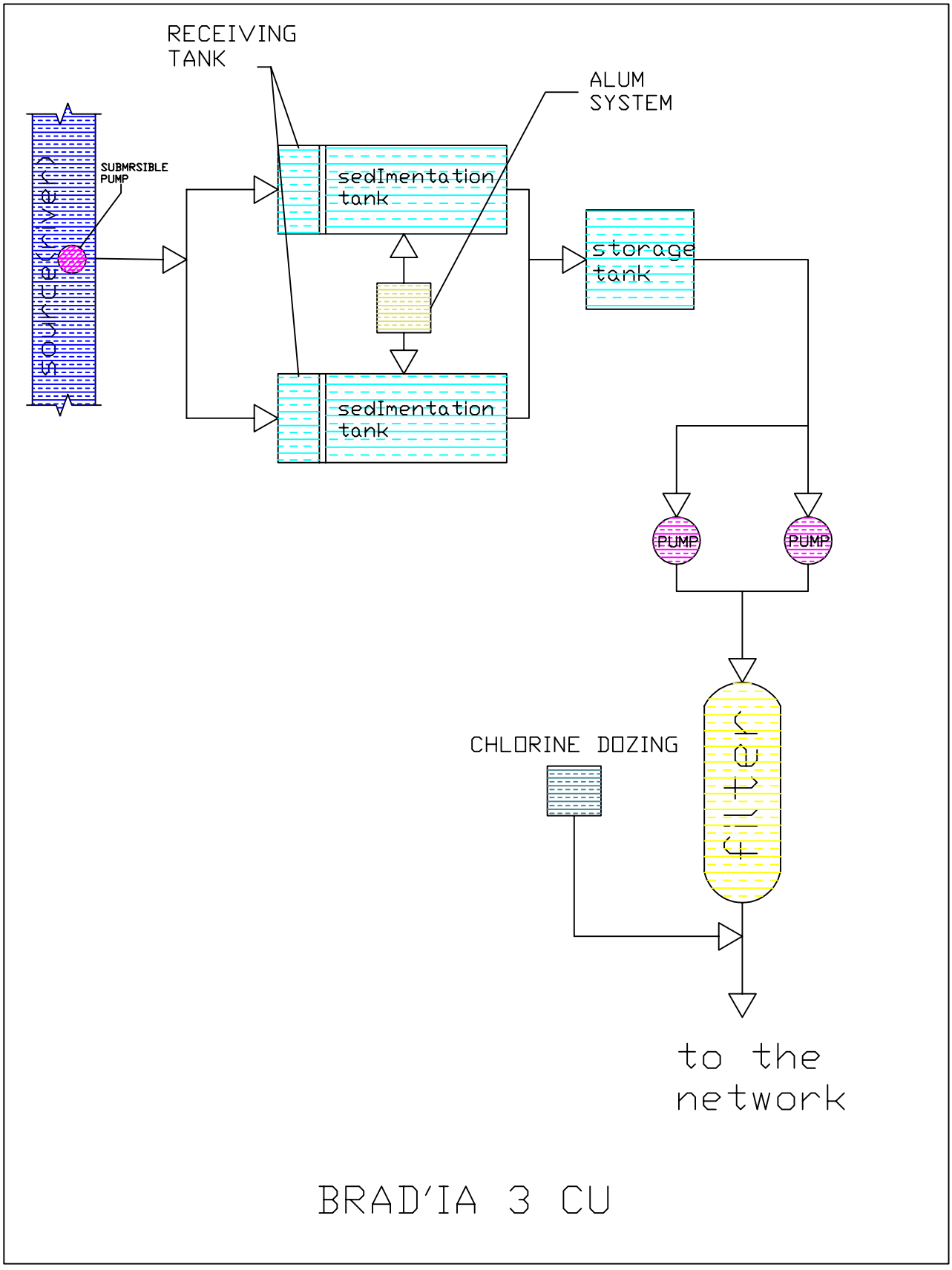

GENERATOR
2.000
5.000
2.500
L.L. PUMPS
(20*12)m
3.000
back wash
pump
H.L. PUMPS
2.000
1.500
2.000
filter
filter
filter
filter
filter
filter
filter
filter
filter
filter
filter
filter
filter
filter
25.000
4.000
sedimentation
tank d(20)m
2.000
FLASH MIX.
PANEL
SHED
2.000
3.000
3.000
sedimentation
tank d(20)m
BE LONG BRADAIA 3
CLARIFIER TANK

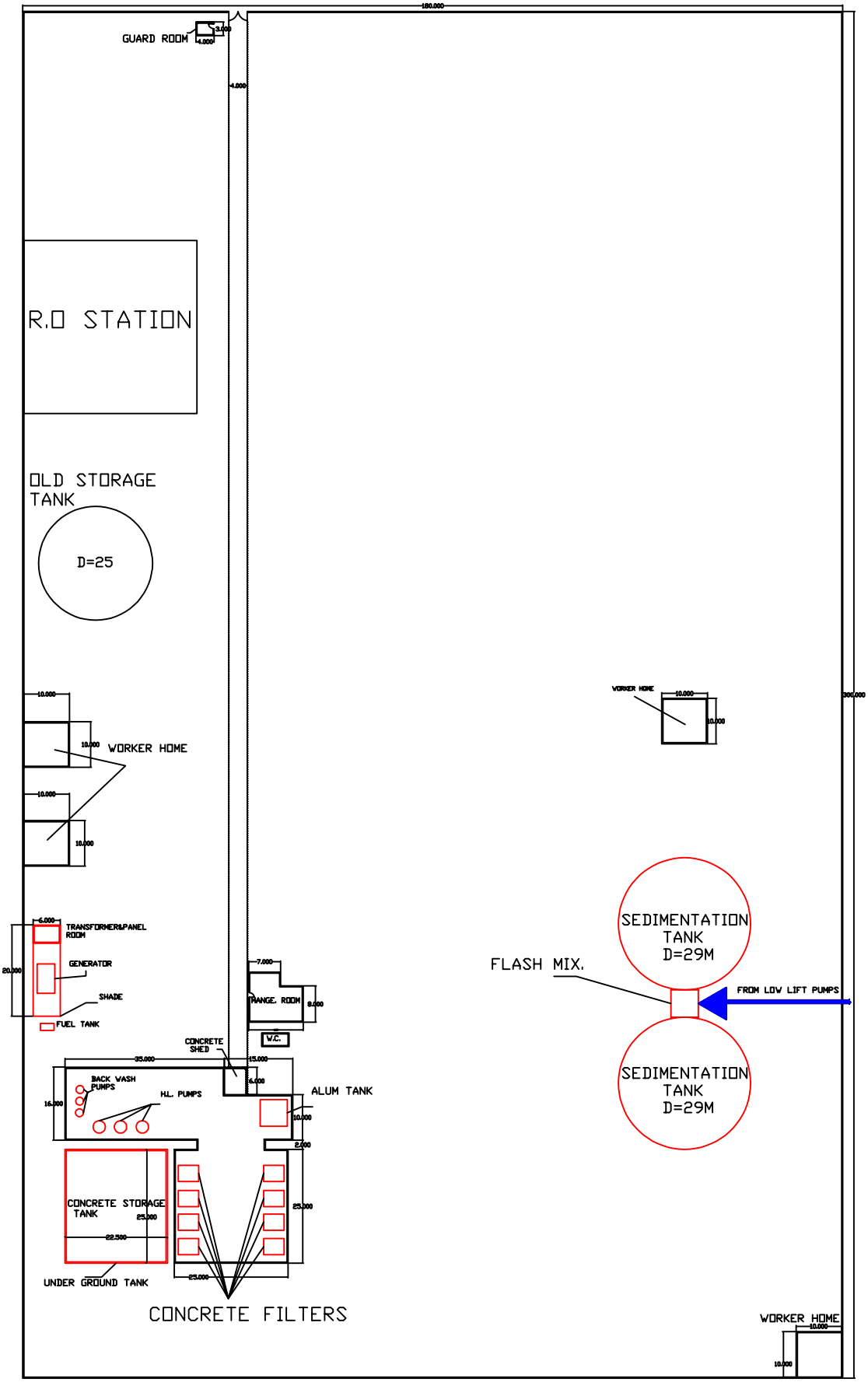
BRAD'IA 2


(7)filter
pump
pump
pump
pump
sedimentation tank
sedimentation tank
pump
pump
pump
pump
(7)filter
to the network
source(R-ZERO)
BRAD'IA 2

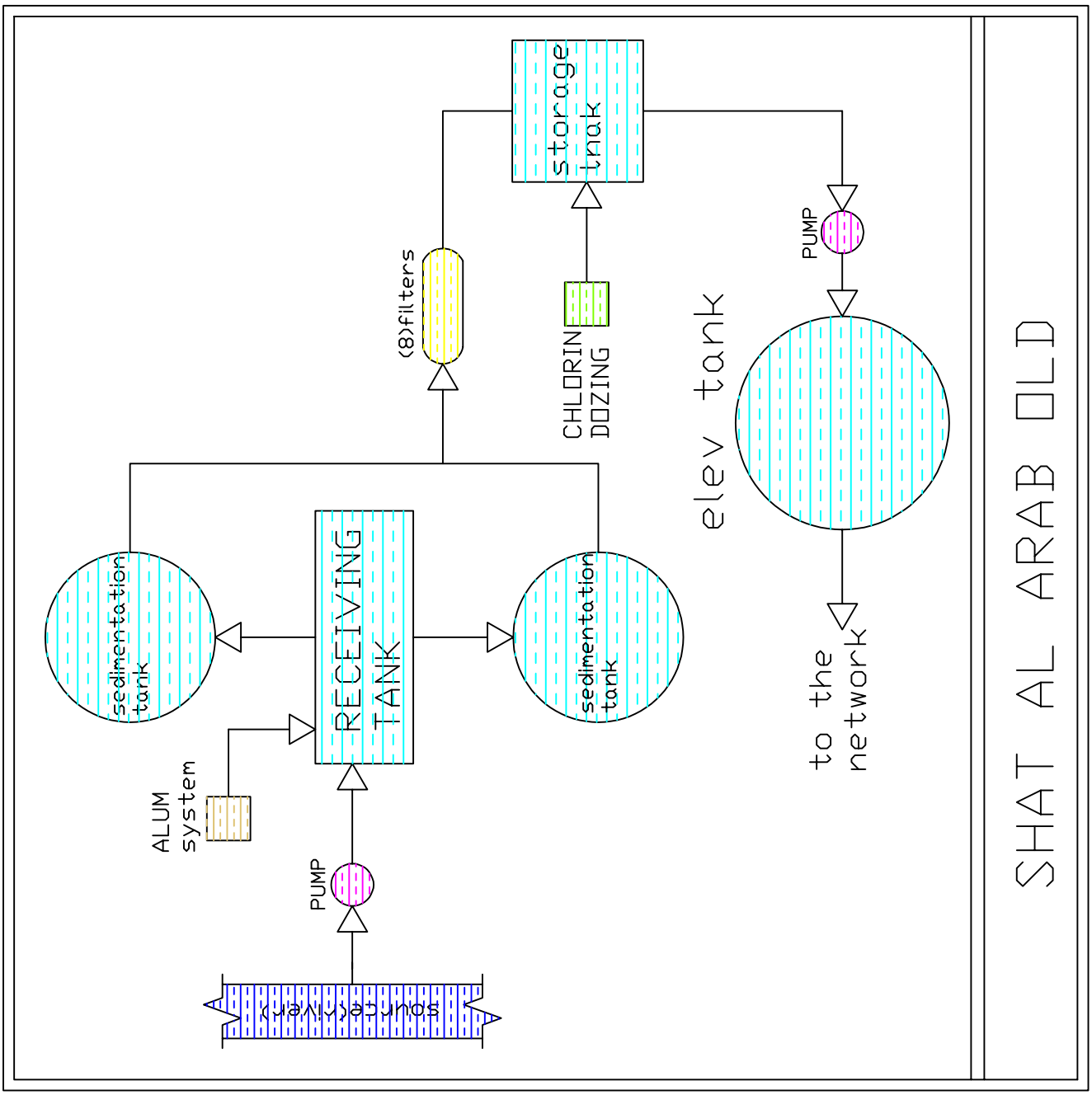

SEDIMENTATION TANK
BELONG TO BRAD'IA 2
2.000
1.500
small canal
BRICK WALL
14.000
4.0000
12.000
SHED
2.500
CLARIFIER TANK
1.000
CLARIFIER TANK
COLLECTION TANK
ALUM TANK
6.000
PUMP
2.000
FILTER
1.500
2.000
SHED
9.000
2.000
3.000
AIR COMPRESSOR
H.L.PUMPS
TRANSFORMER&PANEL ROOM
5.000
2.500

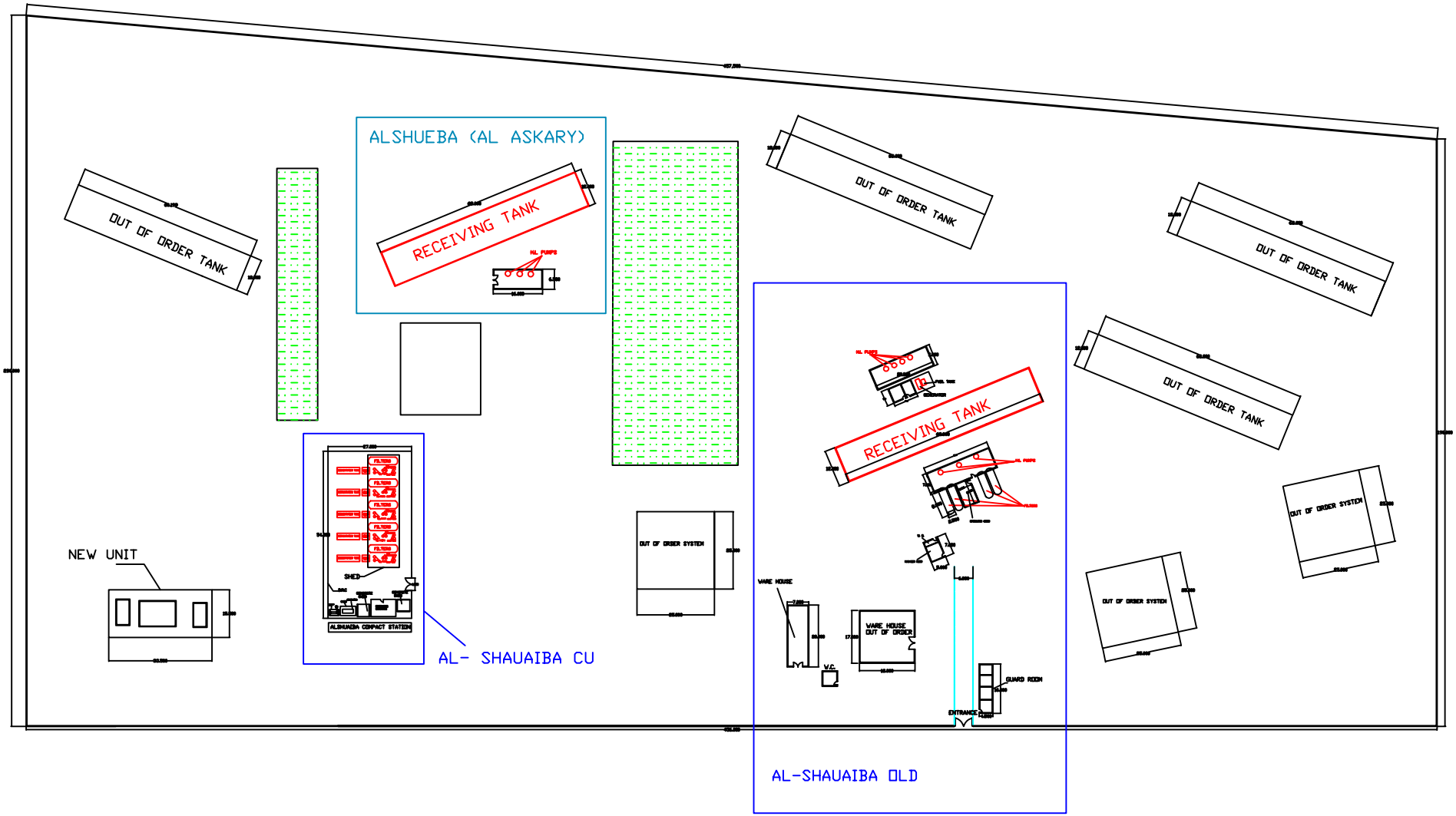
BRAD'IA 3 CU

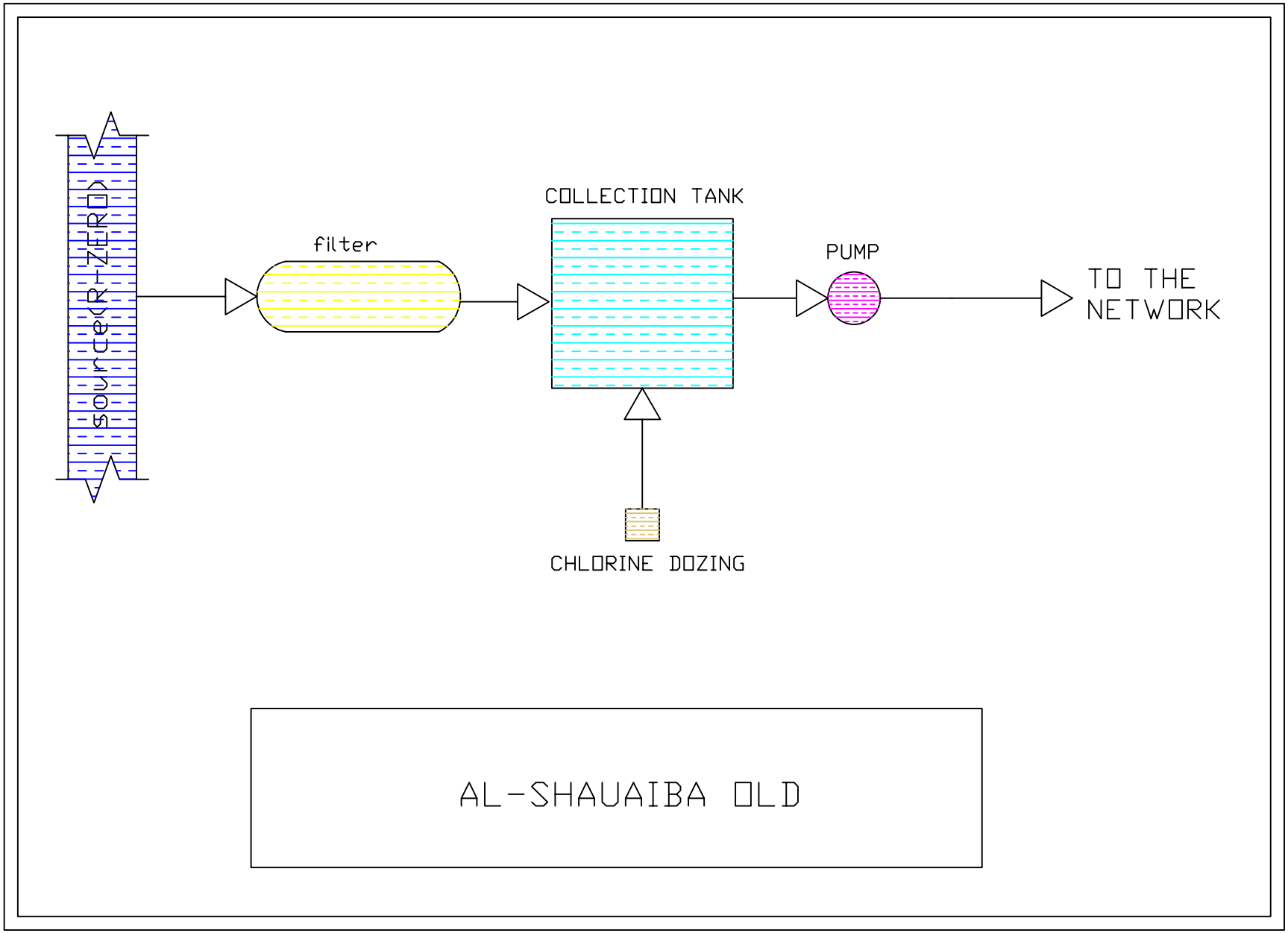

RECEIVING
TANK
ALUM
SYSTEM
SUBMRSIBLE
PUMP
sedImentation
tank
storage
tank
sedImentation
tank
PUMP
PUMP
CHLORINE DOZING
to the
network
BRAD'IA 3 CU

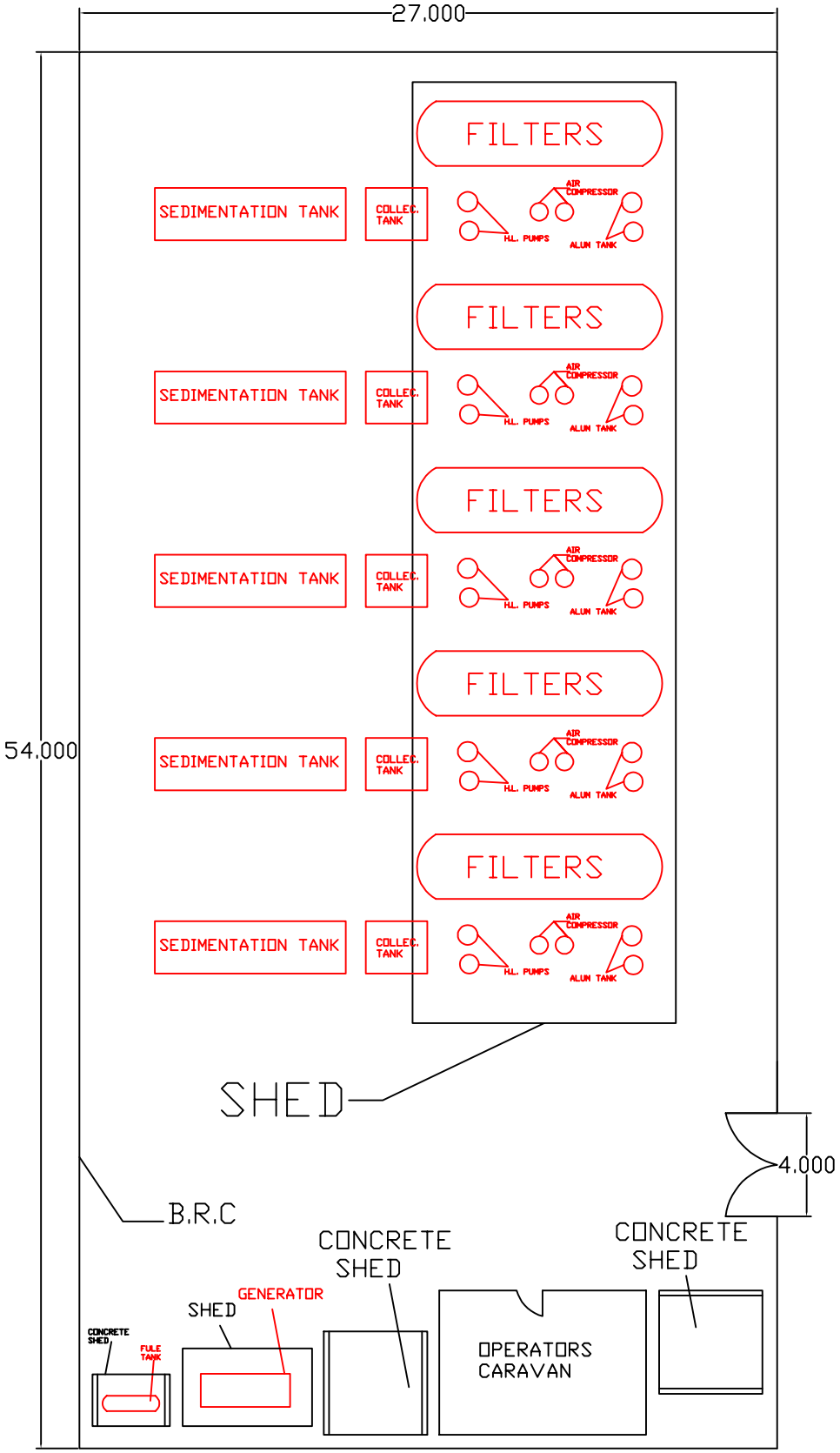


SHAT AL ARAB OLD

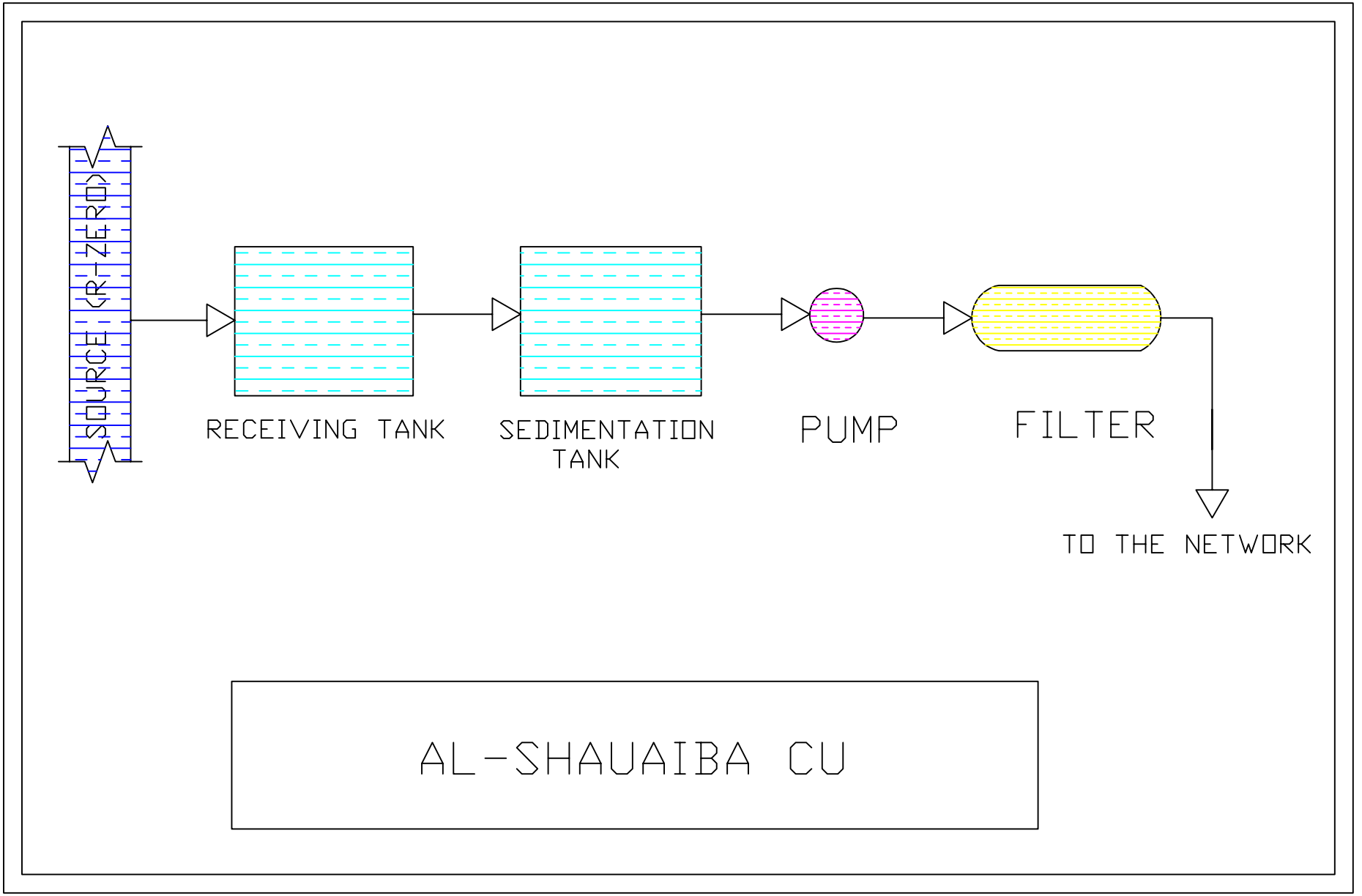

SHAT AL ARAB OLD
storage tnak
(8)filters
CHLORIN DOZING
PUMP
elev tank
to the network
sedimentation tank
RECEIVING TANK
sedimentation tank
ALUM system
PUMP

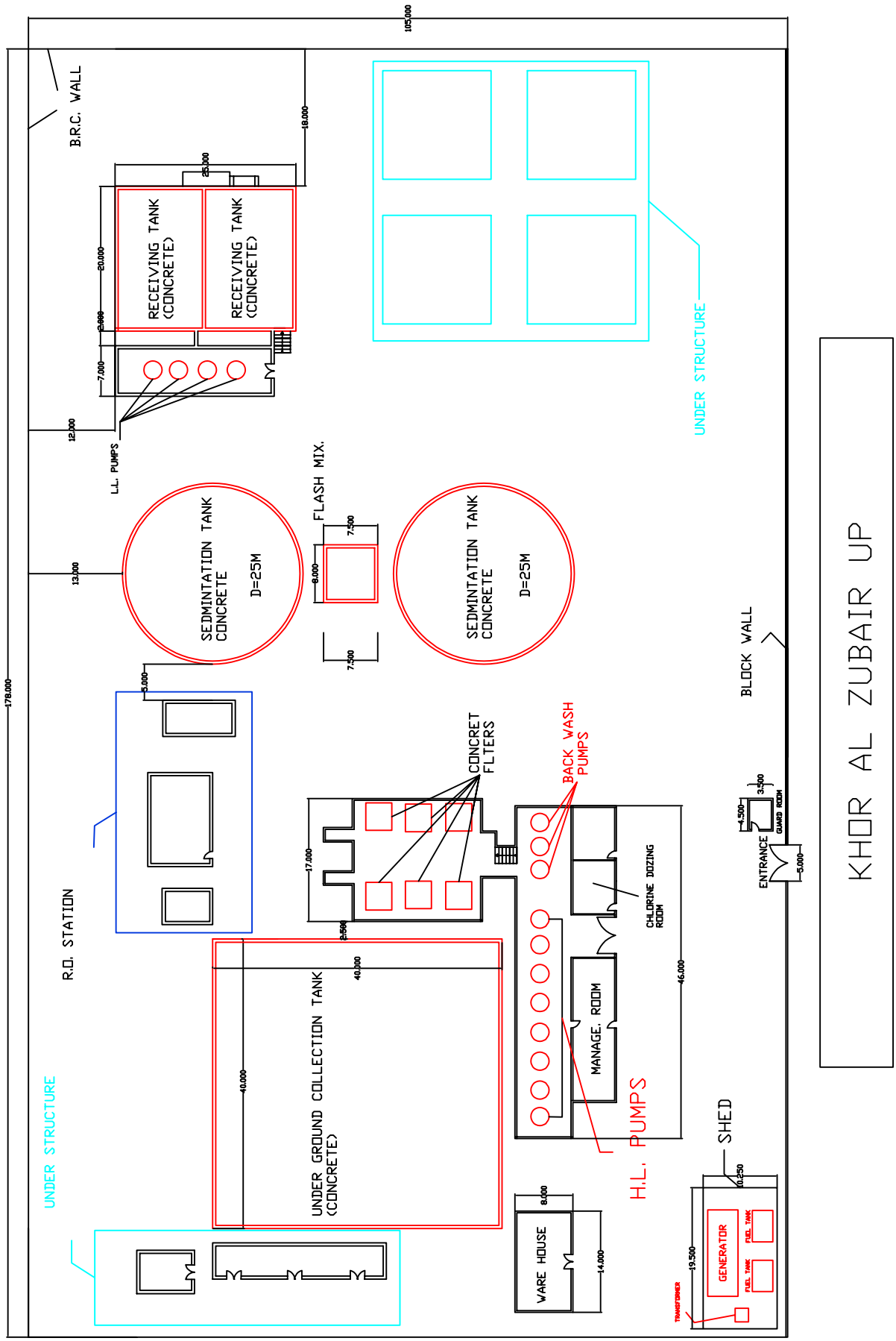

ALSHUEBA (AL ASKARY)
RECEIVING TANK
OUT OF ORDER TANK
OUT OF ORDER TANK
OUT OF ORDER TANK
OUT OF ORDER TANK
NEW UNIT
SHED
ALSHUAIBA CONTACT STATION
AL- SHAUAIBA CU
OUT OF ORDER SYSTEN
RECEIVING TANK
WARE HOUSE
WARE HOUSE OUT OF ORDER
V.C.
GUARD ROOM
ENTRANCE
OUT OF ORDER SYSTEN
OUT OF ORDER SYSTEN
AL-SHAUAIBA OLD

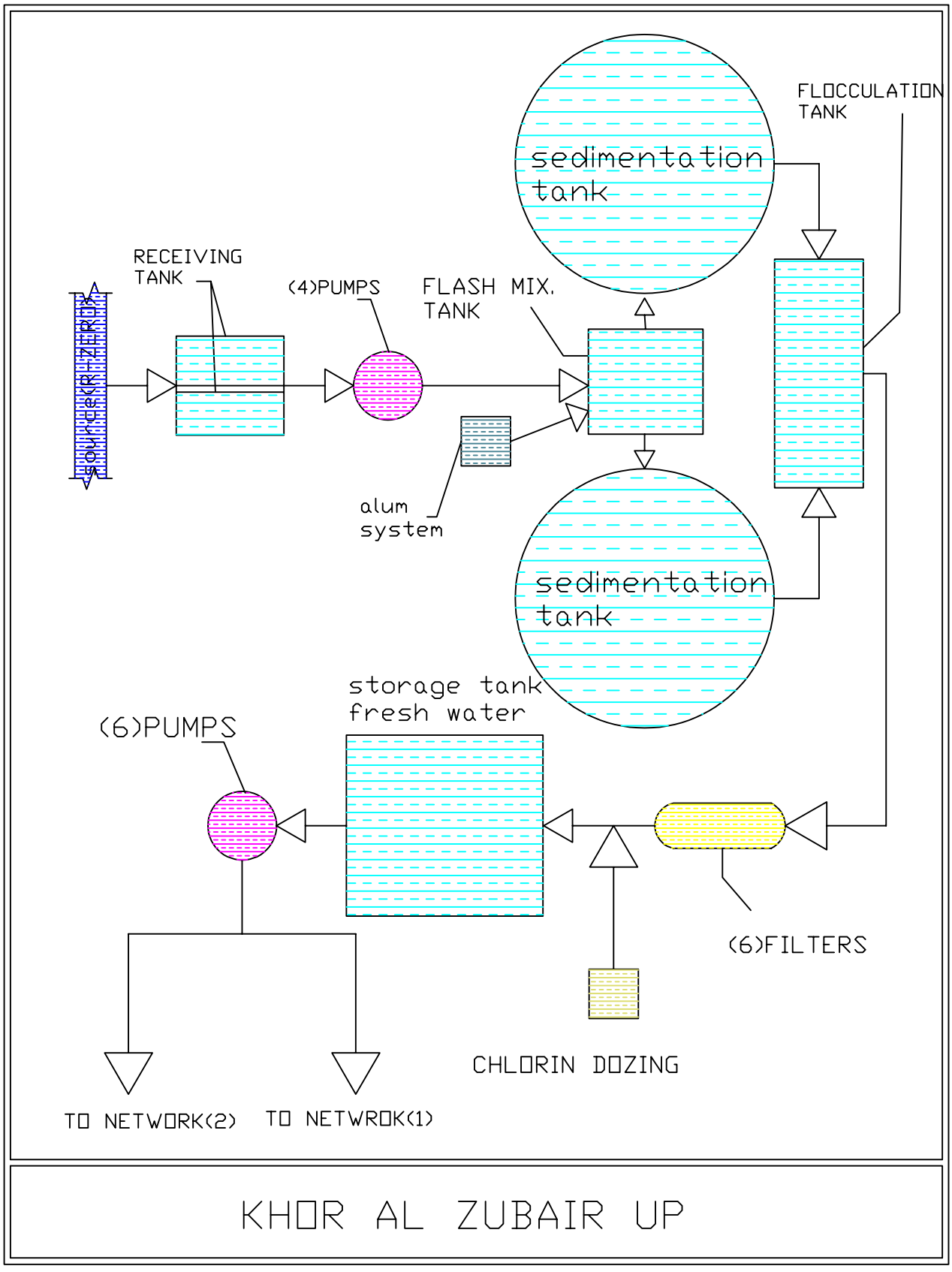

SOURCE(RIZERO)
filter
COLLECTION TANK
PUMP
TO THE NETWORK
CHLORINE DOZING
AL-SHAUAIBA OLD



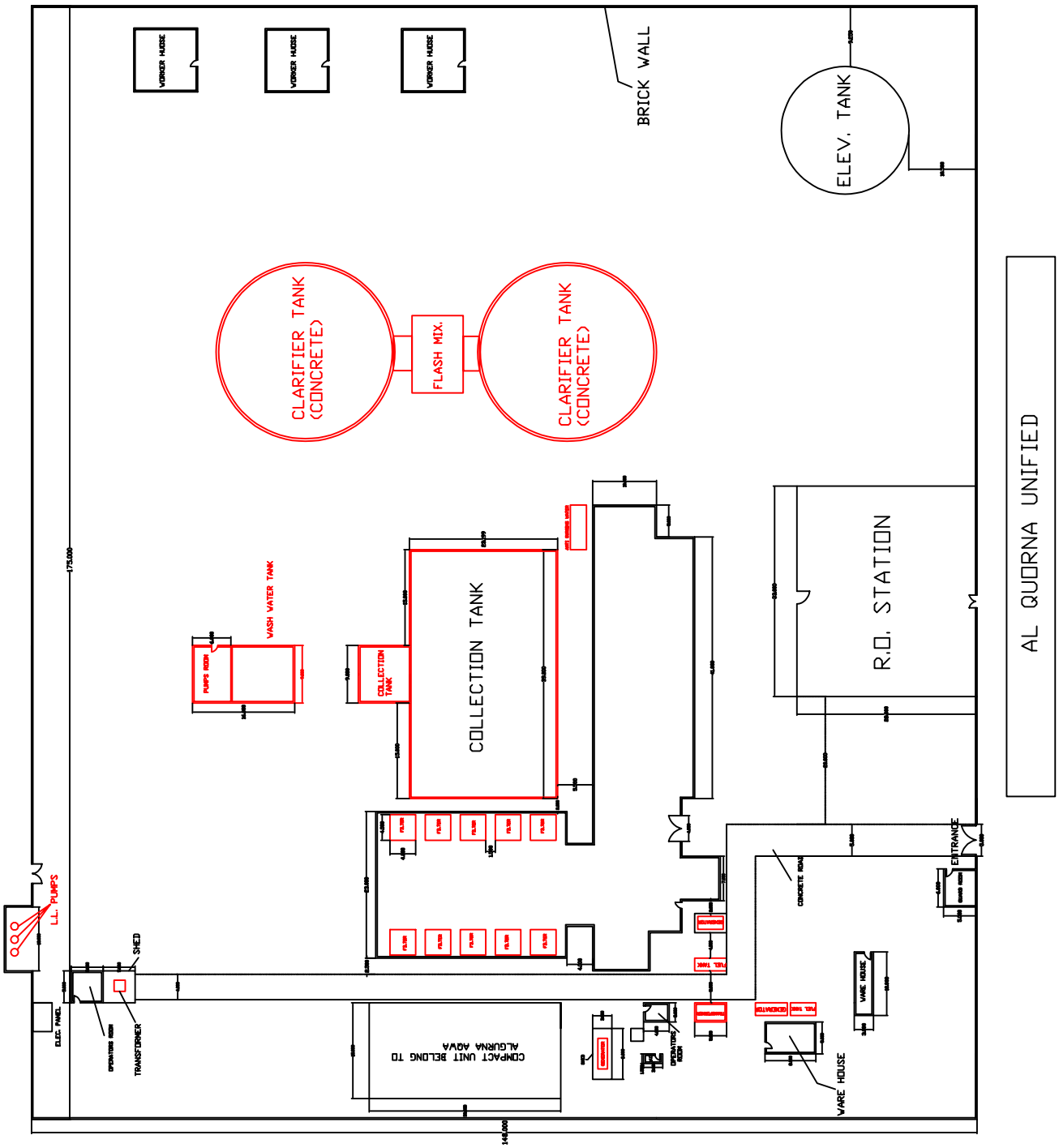
AL-SHAUAIBA CU

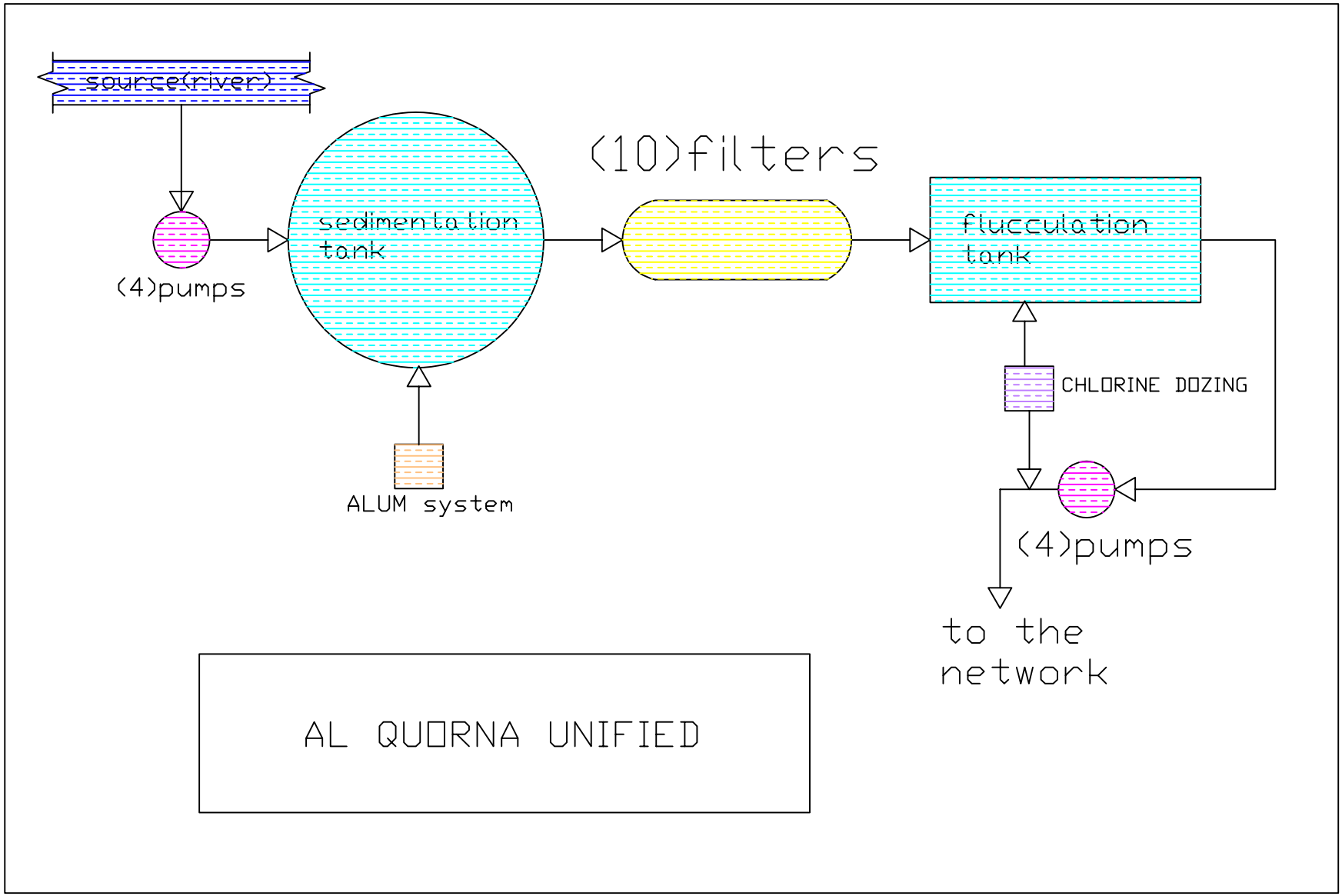

SOURCE (GROUND WATER)
RECEIVING TANK
SEDIMENTATION TANK
PUMP
FILTER
TO THE NETWORK
AL-SHAUAIBA CU

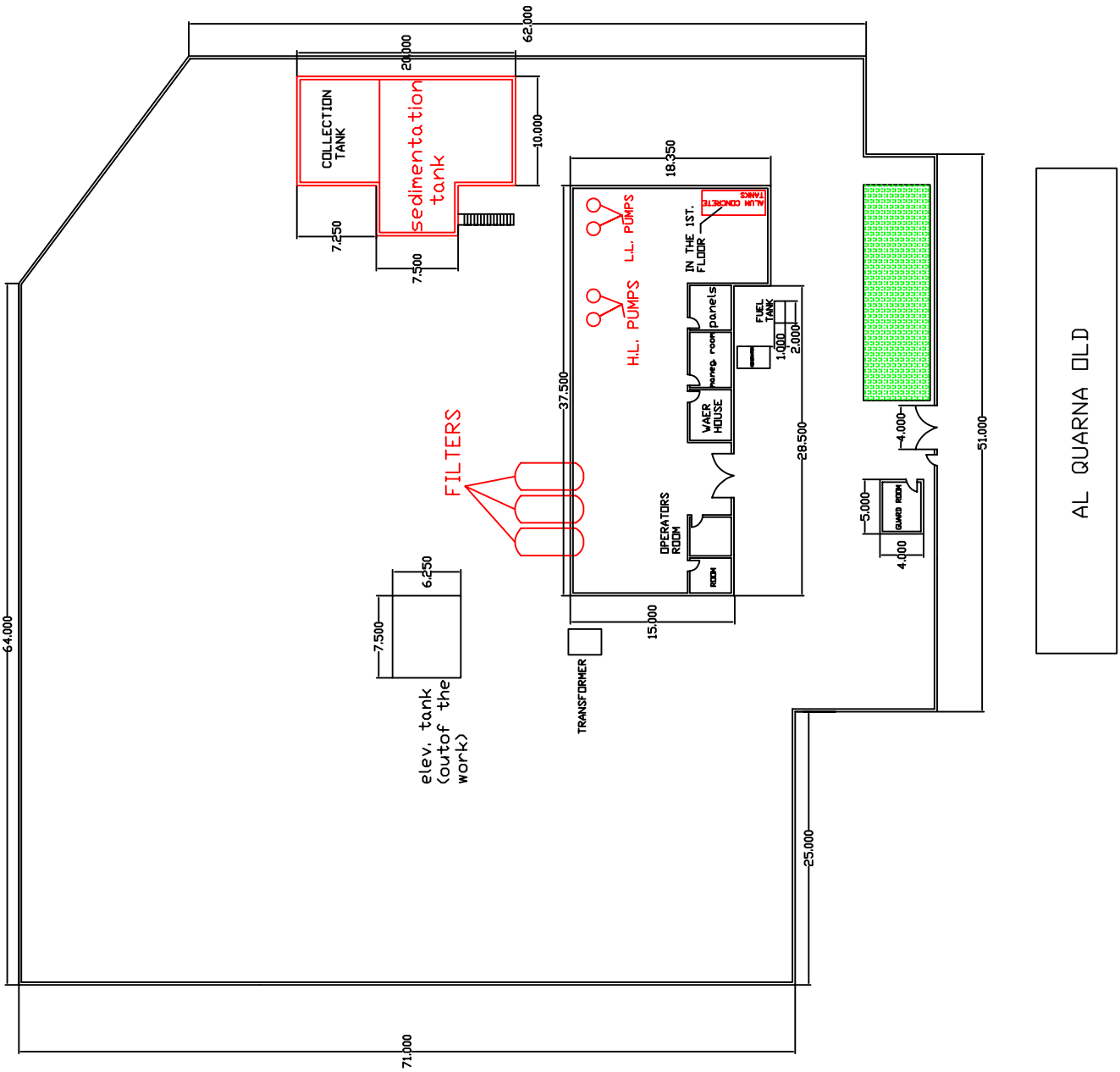

KHOR AL ZUBAIR UP
B.R.C. WALL
RECEIVING TANK (CONCRETE)
RECEIVING TANK (CONCRETE)
UNDER STRUCTURE
L.L. PUMPS
SEDIMINTATION TANK CONCRETE D=25M
FLASH MIX.
SEDIMINTATION TANK CONCRETE D=25M
BLOCK WALL
CONCRET FLTERS
BACK WASH PUMPS
R.O. STATION
ENTRANCE
GUARD ROOM
CHLORINE DOZING ROOM
MANAGE. ROOM
UNDER GROUND COLLECTION TANK (CONCRETE)
H.L. PUMPS
SHED
WARE HOUSE
GENERATOR
FUEL TANK
TRANSFORMER
UNDER STRUCTURE

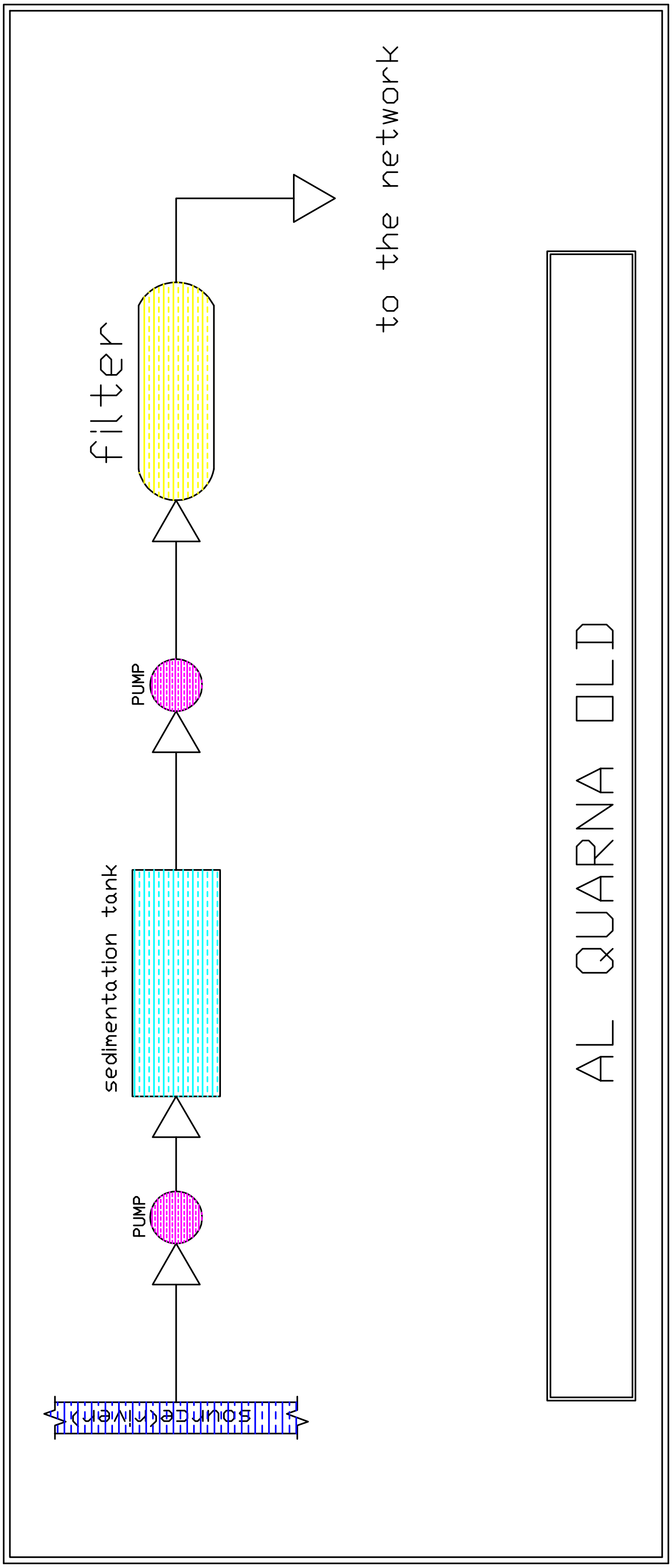


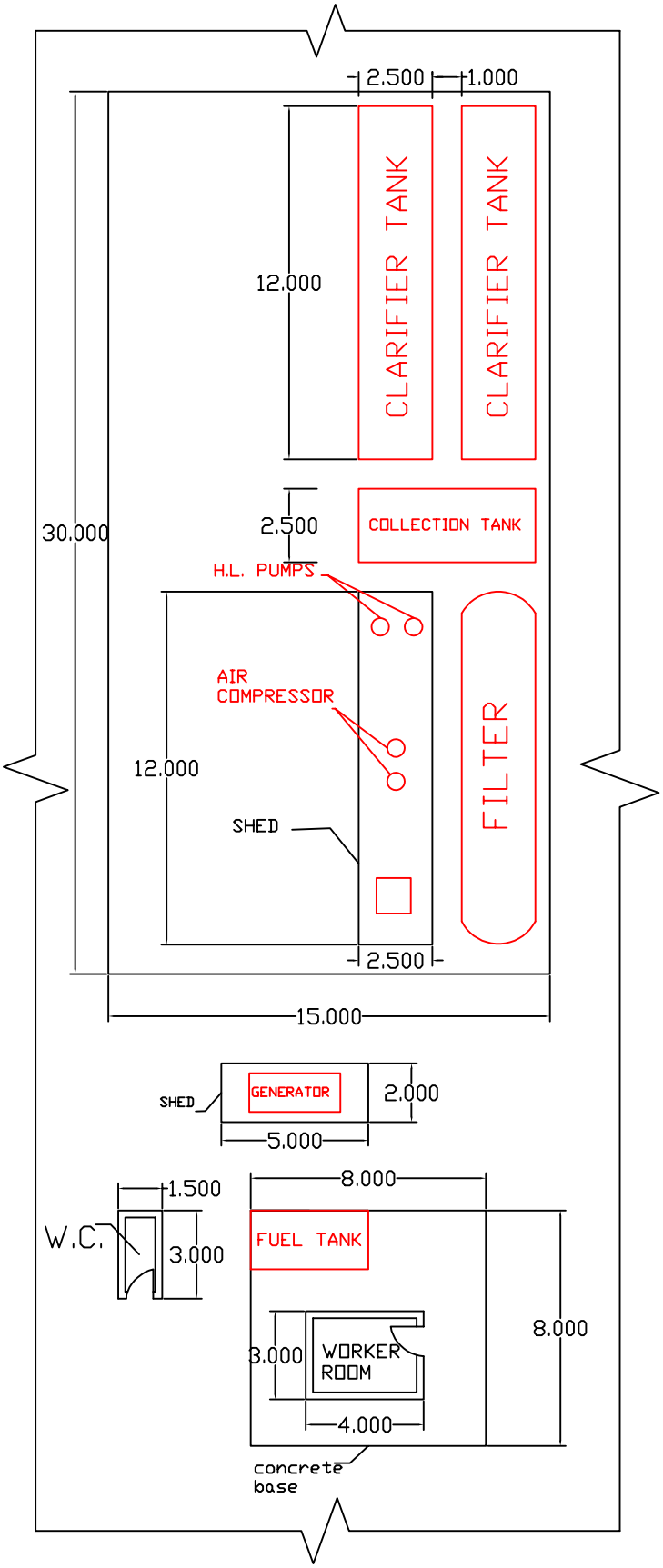
KHOR AL ZUBAIR UP


AL QUORNA UNIFIED
BRICK WALL
ELEV. TANK
CLARIFIER TANK (CONCRETE)
FLASH MIX.
CLARIFIER TANK (CONCRETE)
R.O. STATION
COLLECTION TANK
WASH WATER TANK
L.L. PUMPS
SHED
TRANSFORMER
ENTRANCE
WARE HOUSE

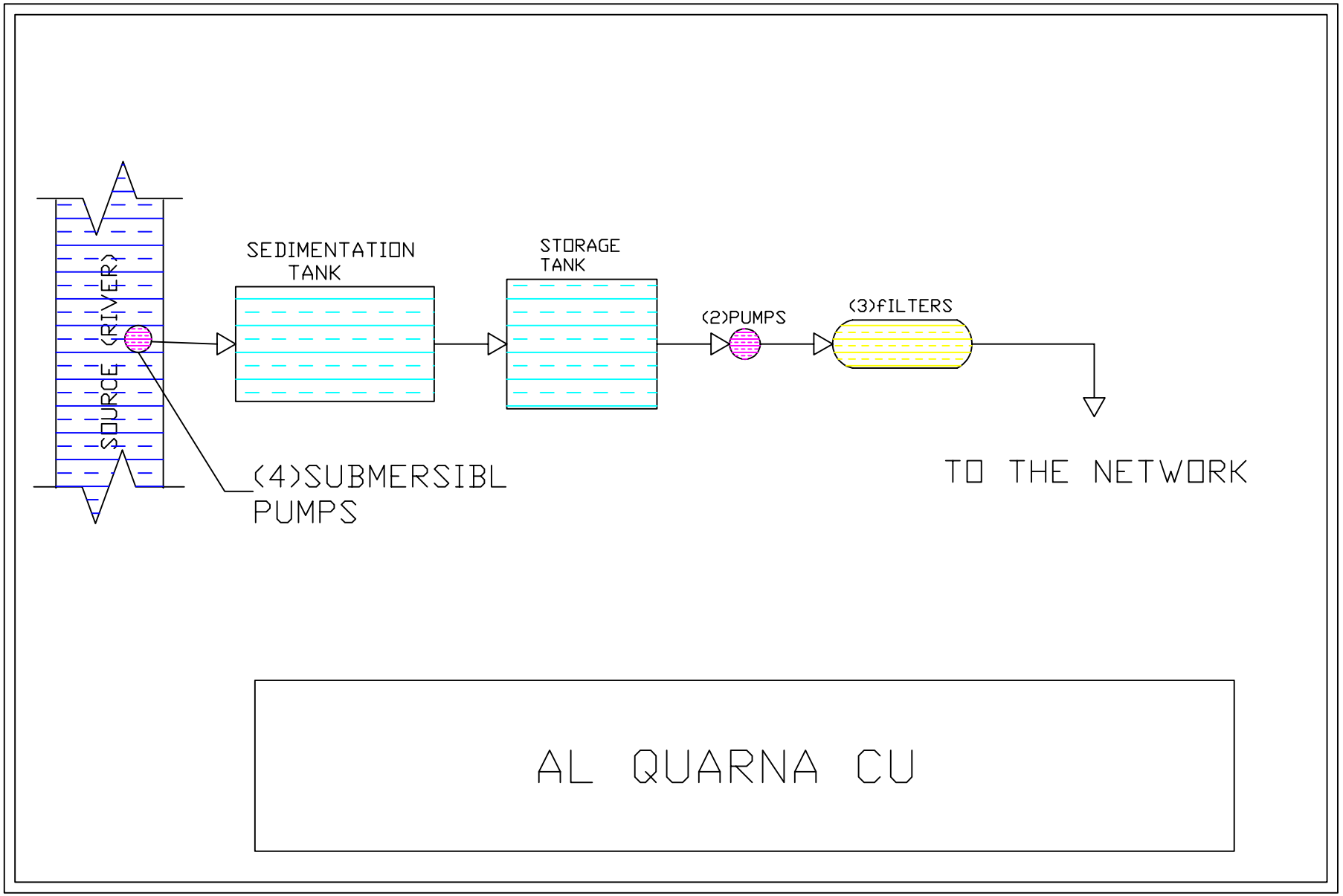

source(river)
(4)pumps
sedimentation tank
(10)filters
flucculation tank
CHLORINE DOZING
ALUM system
(4)pumps
to the network
AL QUORNA UNIFIED

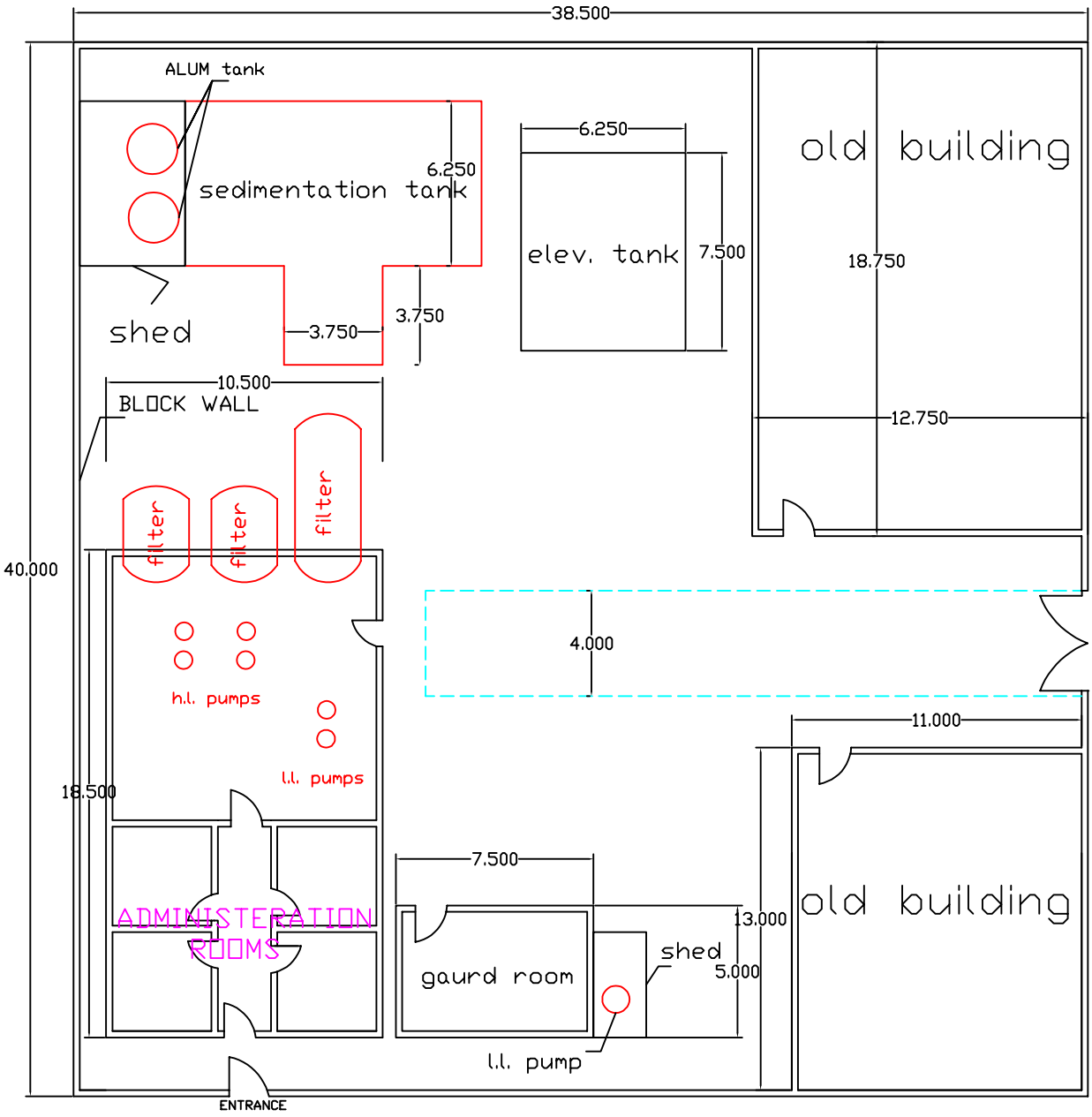

62.000
20.000
COLLECTION TANK
sedimentation tank
10.000
7.250
7.500
18.350
L.L. PUMPS
H.L. PUMPS
IN THE 1ST. FLOOR
ALUM CONCRETE TANKS
panels
FUEL TANK
1.000
2.000
WATER HOUSE
37.500
28.500
FILTERS
OPERATORS ROOM
ROOM
15.000
TRANSFORMER
6.250
7.500
elev. tank (out of the work)
64.000
71.000
25.000
4.000
51.000
5.000
GUARD ROOM
4.000
AL QUARNA OLD


source(river)
PUMP
sedimentation tank
PUMP
filter
to the network
AL QUARNA OLD

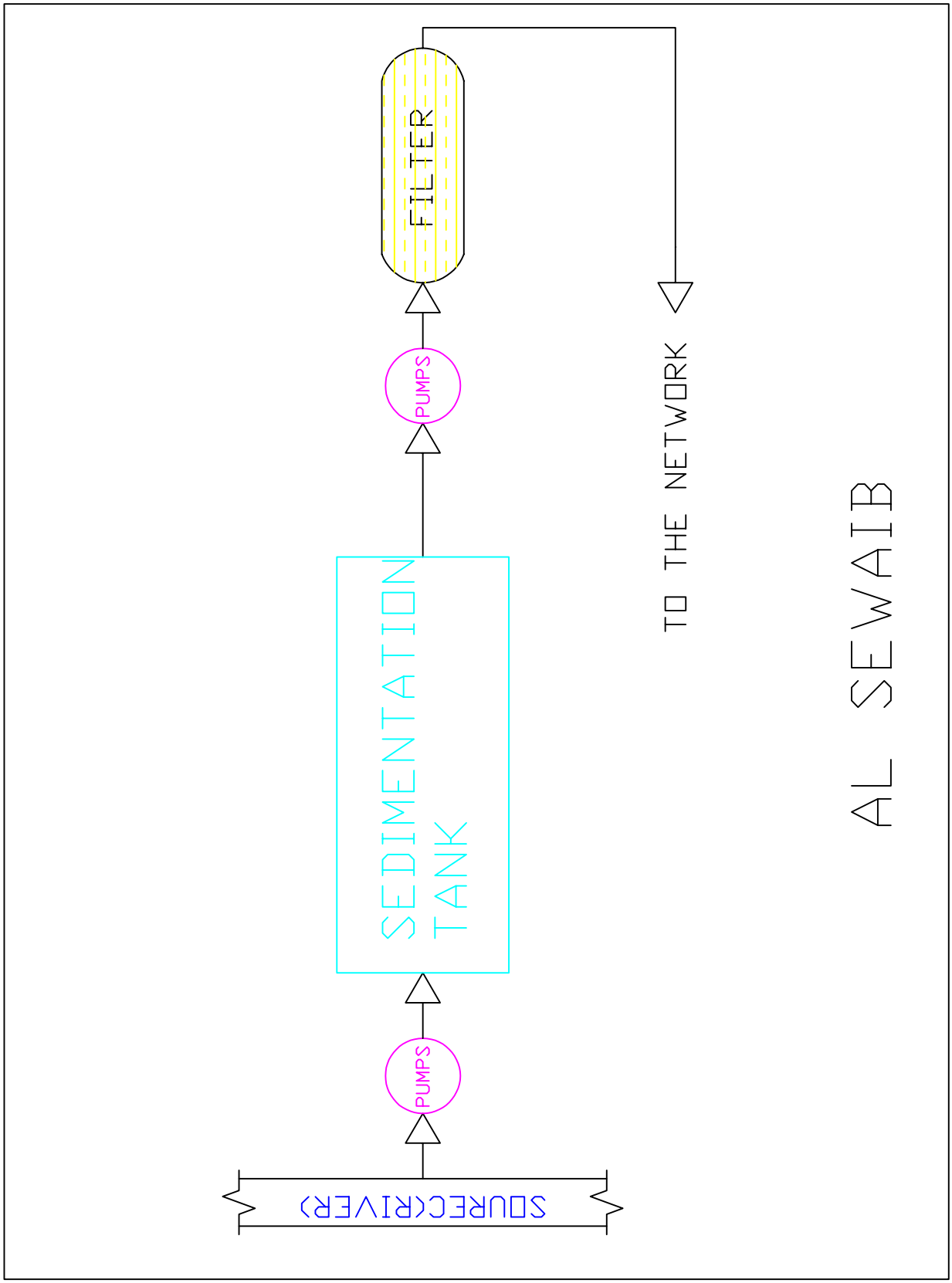

2.500
1.000
CLARIFIER TANK
CLARIFIER TANK
12.000
30.000
2.500
COLLECTION TANK
H.L. PUMPS
AIR
COMPRESSOR
12.000
SHED
FILTER
2.500
15.000
SHED
GENERATOR
2.000
5.000
1.500
8.000
W.C.
3.000
FUEL TANK
8.000
3.000
WORKER
ROOM
4.000
concrete
base

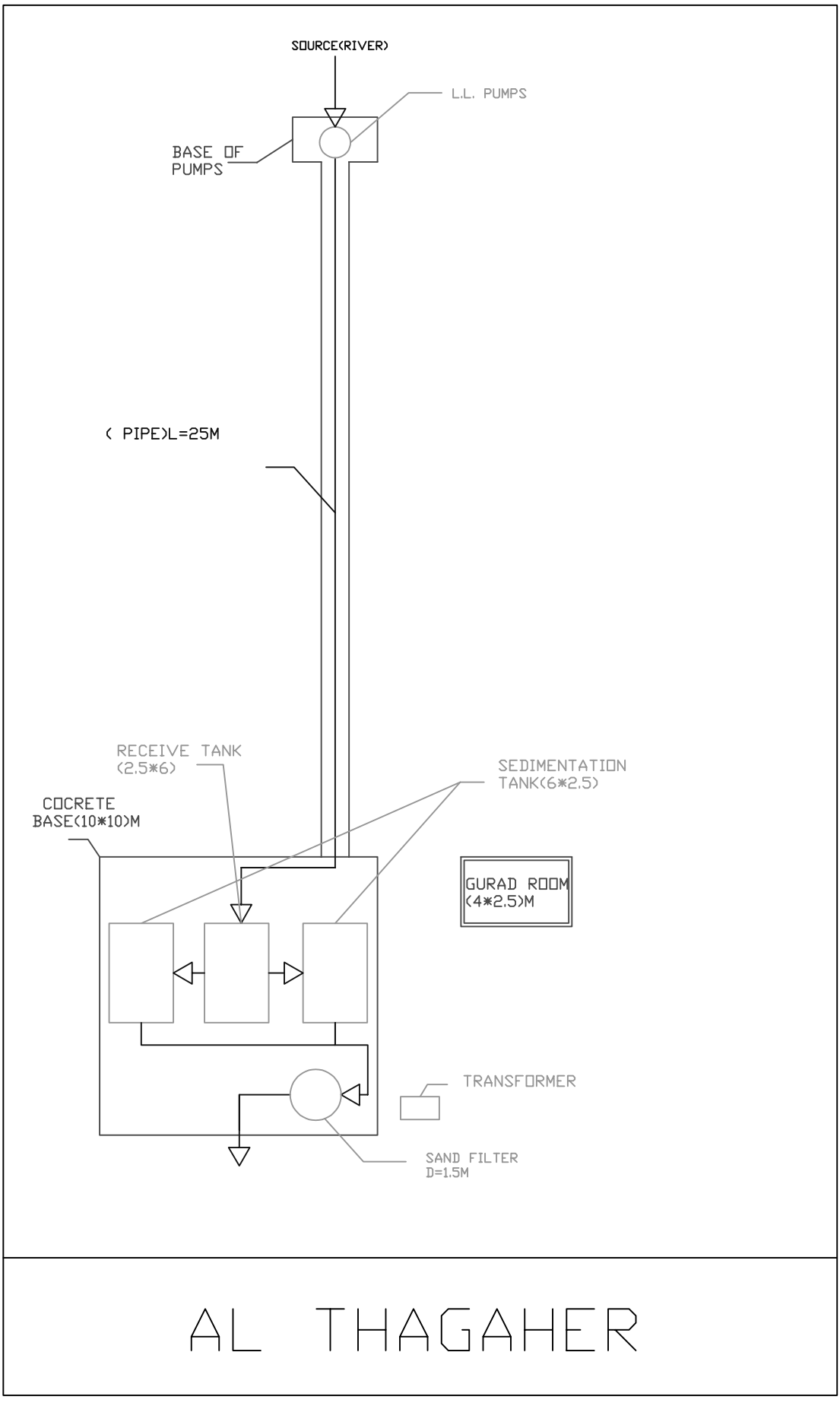
AL QUARNA CU

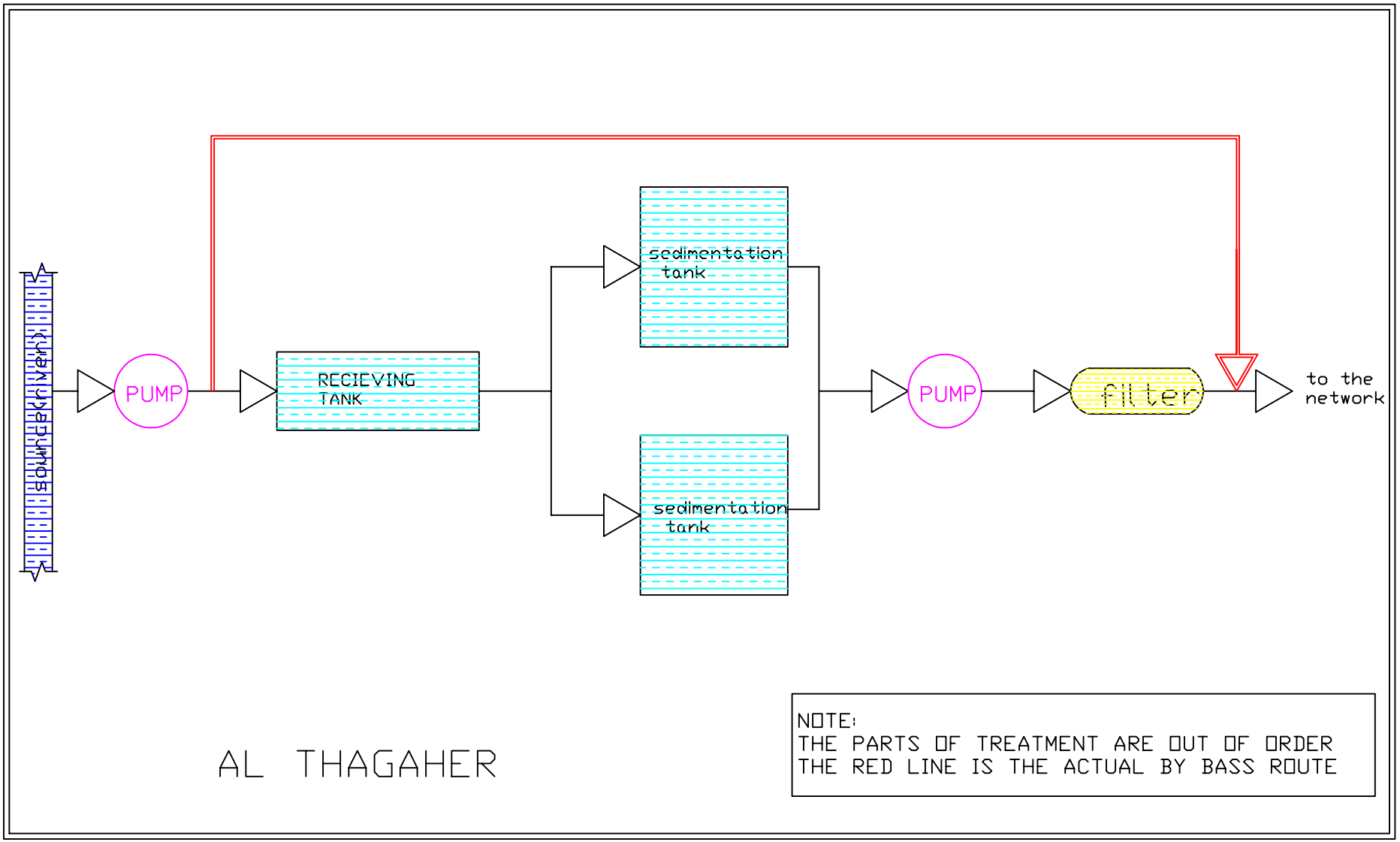

SOURCE (RIVER)
SEDIMENTATION TANK
STORAGE TANK
(2)PUMPS
(3)fILTERS
(4)SUBMERSIBL PUMPS
TO THE NETWORK
AL QUARNA CU

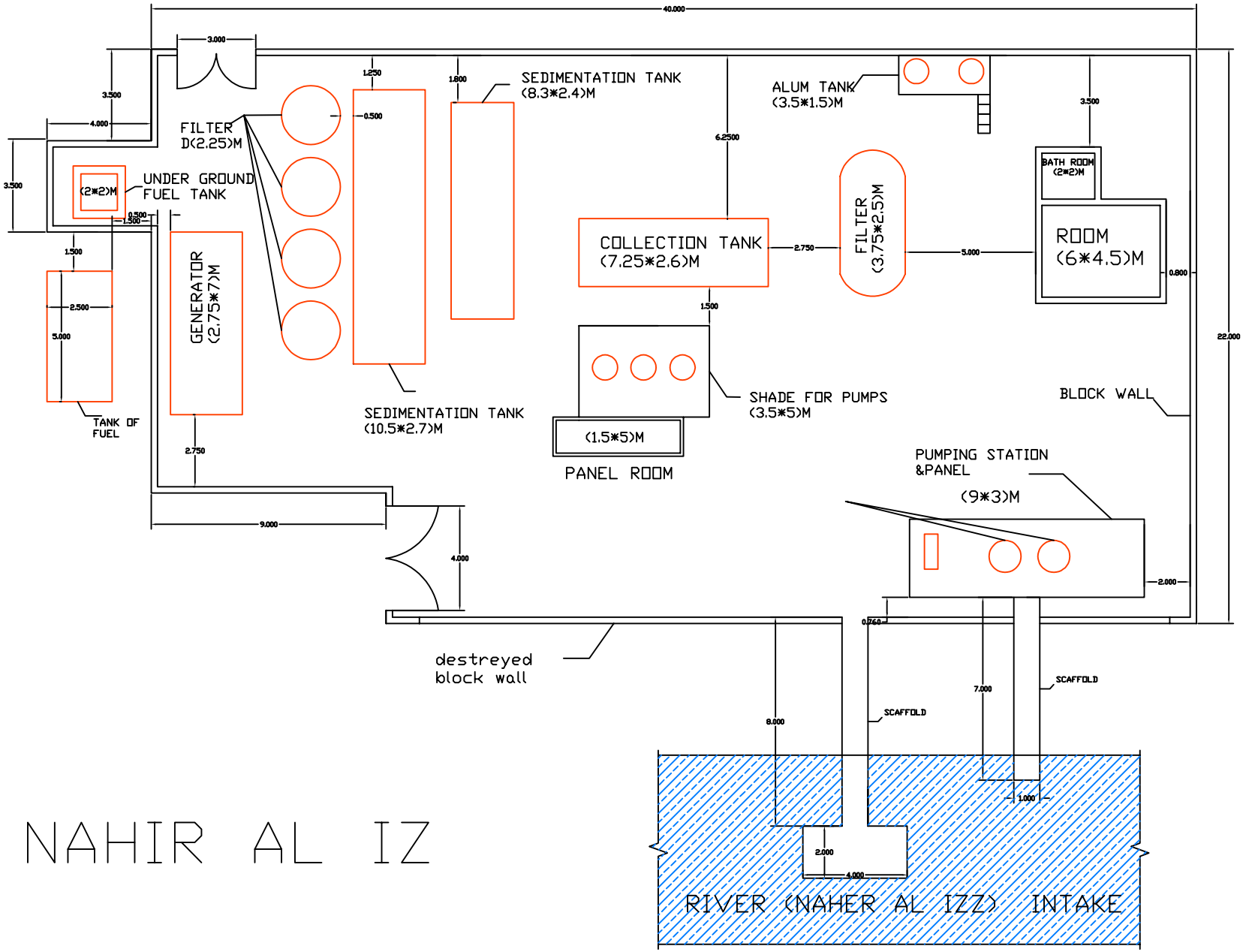

38.500
ALUM tank
sedimentation tank
6.250
6.250
shed
3.750
3.750
6.250
elev. tank
7.500
old building
18.750
12.750
10.500
BLOCK WALL
filter
filter
filter
40.000
h.l. pumps
l.l. pumps
4.000
11.000
18.500
7.500
ADMINISTERATION
ROOMS
gaurd room
shed
5.000
13.000
old building
l.l. pump
ENTRANCE

AL SEWAIB

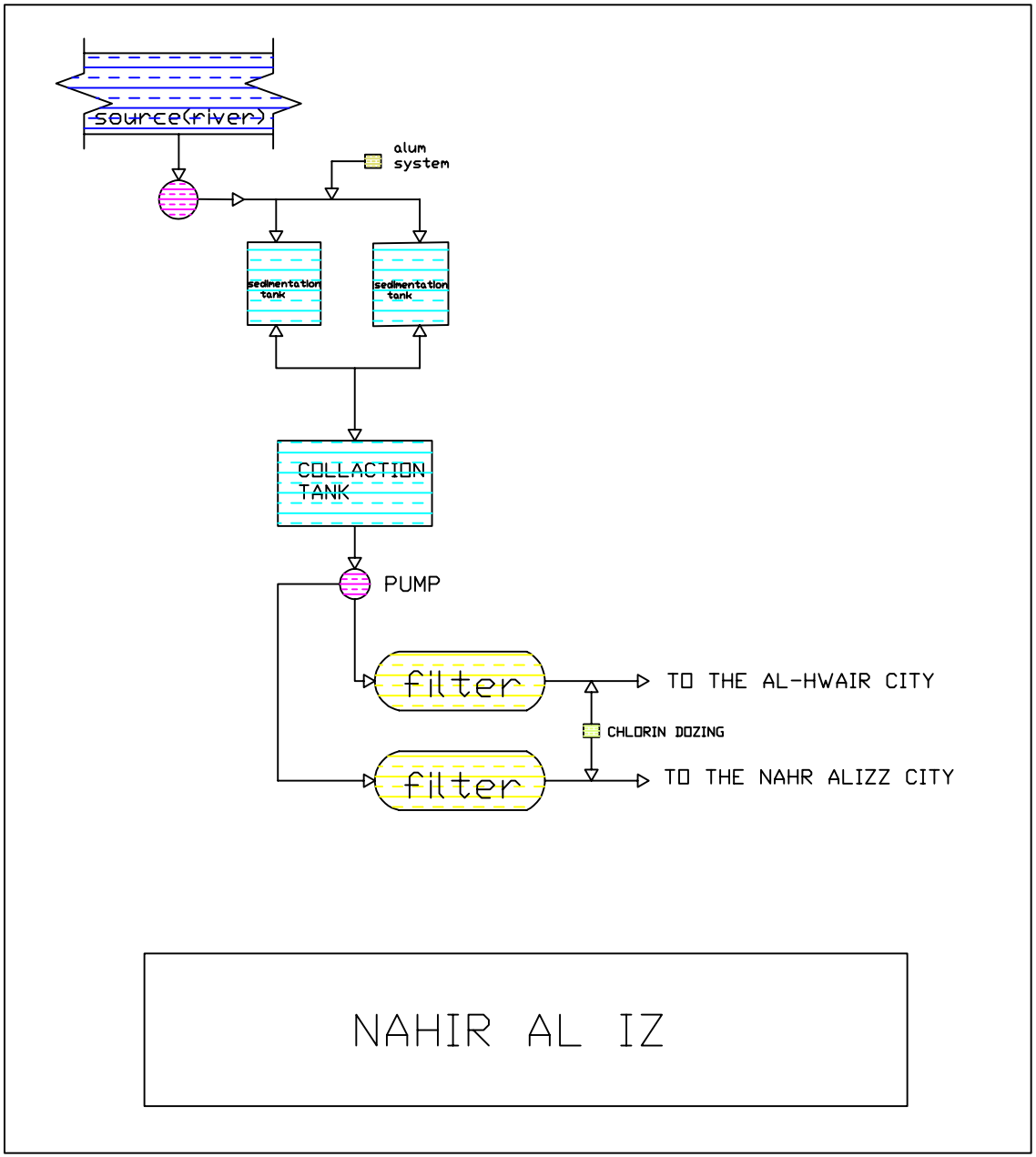

AL SEWAIB
TO THE NETWORK
FILTER
PUMPS
SEDIMENTATION TANK
PUMPS
SOURECRIVER)

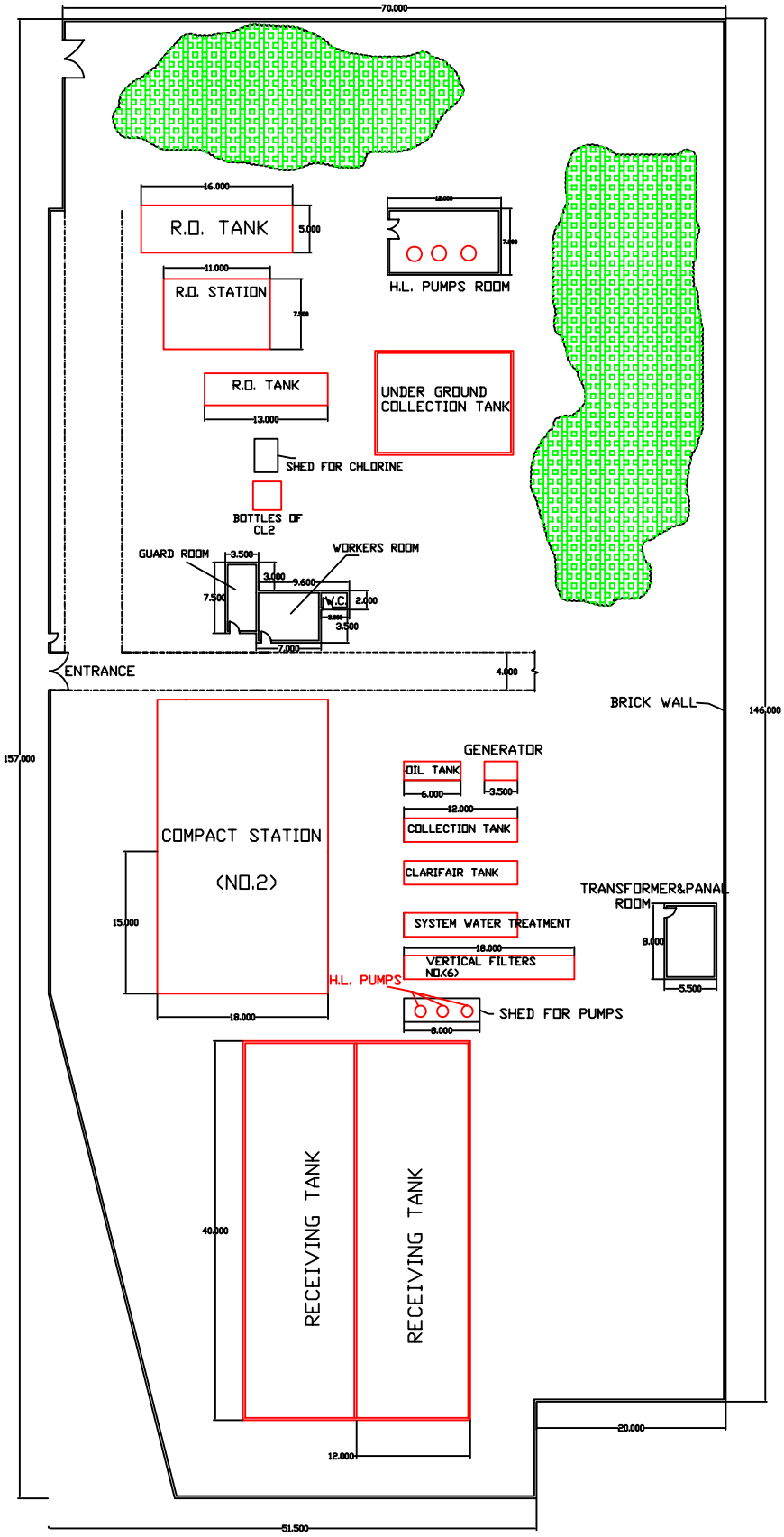

SOURCE(RIVER)
L.L. PUMPS
BASE OF
PUMPS
(PIPE)L=25M
RECEIVE TANK
(2.5*6)
SEDIMENTATION
TANK(6*2.5)
COCRETE
BASE(10*10)M
GURAD ROOM
(4*2.5)M
TRANSFORMER
SAND FILTER
D=1.5M
AL THAGAHER


PUMP
RECIEVING TANK
sedimentation tank
sedimentation tank
PUMP
filter
to the network
AL THAGAHER
NOTE:
THE PARTS OF TREATMENT ARE OUT OF ORDER
THE RED LINE IS THE ACTUAL BY BASS ROUTE

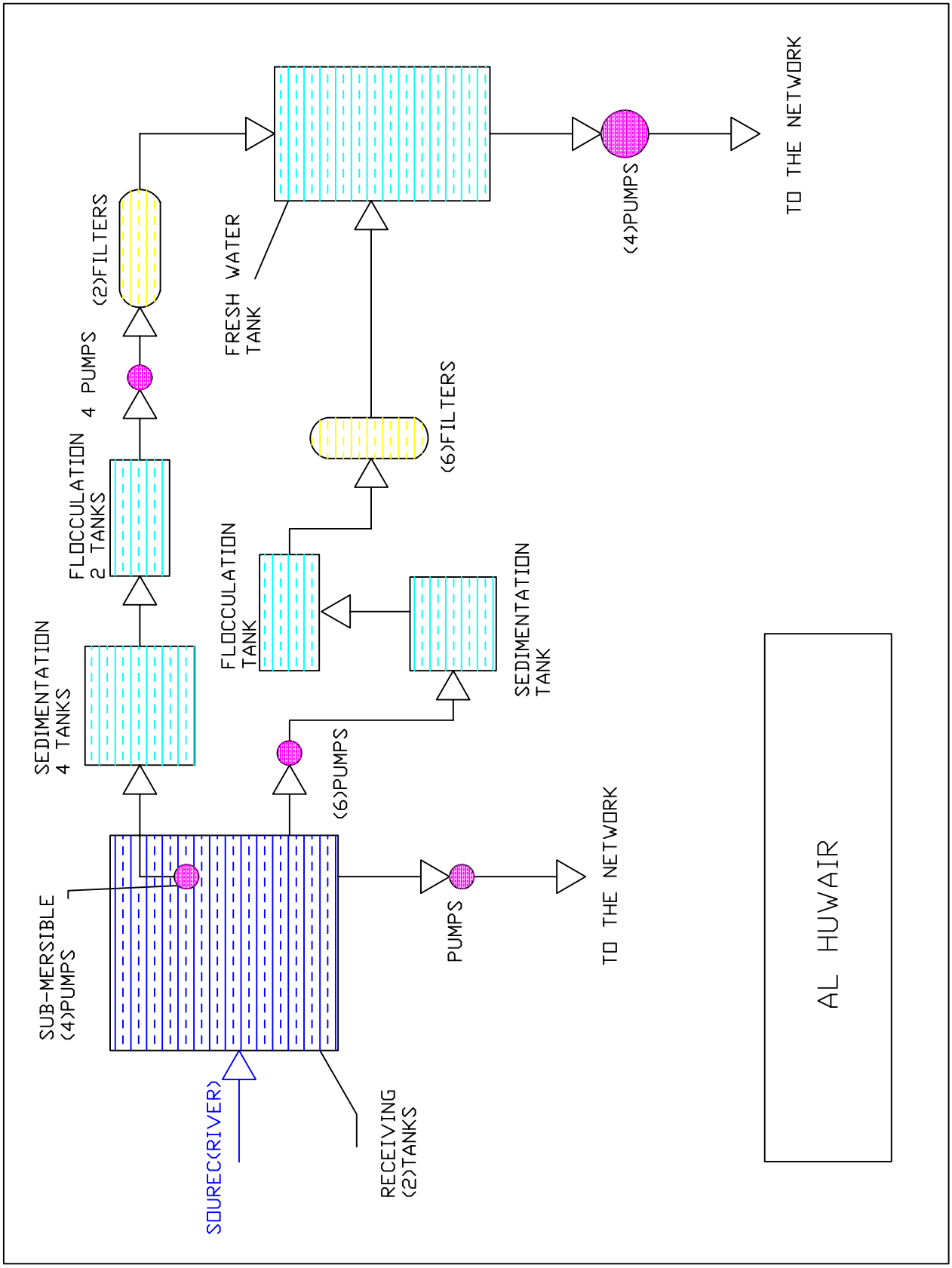

40.000
3.000
3.500
4.000
FILTER
D(2.25)M
1.250
0.500
1.800
SEDIMENTATION TANK
(8.3*2.4)M
ALUM TANK
(3.5*1.5)M
3.500
6.2500
3.500
UNDER GROUND
FUEL TANK
(2*2)M
0.500
1.500
COLLECTION TANK
(7.25*2.6)M
2.750
FILTER
(3.75*2.5)M
5.000
BATH ROOM
(2*2)M
ROOM
(6*4.5)M
0.800
22.000
1.500
2.500
5.000
GENERATOR
(2.75*7)M
1.500
SHADE FOR PUMPS
(3.5*5)M
BLOCK WALL
TANK OF
FUEL
SEDIMENTATION TANK
(10.5*2.7)M
(1.5*5)M
PANEL ROOM
2.750
PUMPING STATION
&PANEL
(9*3)M
9.000
4.000
2.000
0.750
destreyed
block wall
SCAFFOLD
7.000
SCAFFOLD
8.000
1.000
2.000
4.000
RIVER (NAHER AL IZZ) INTAKE

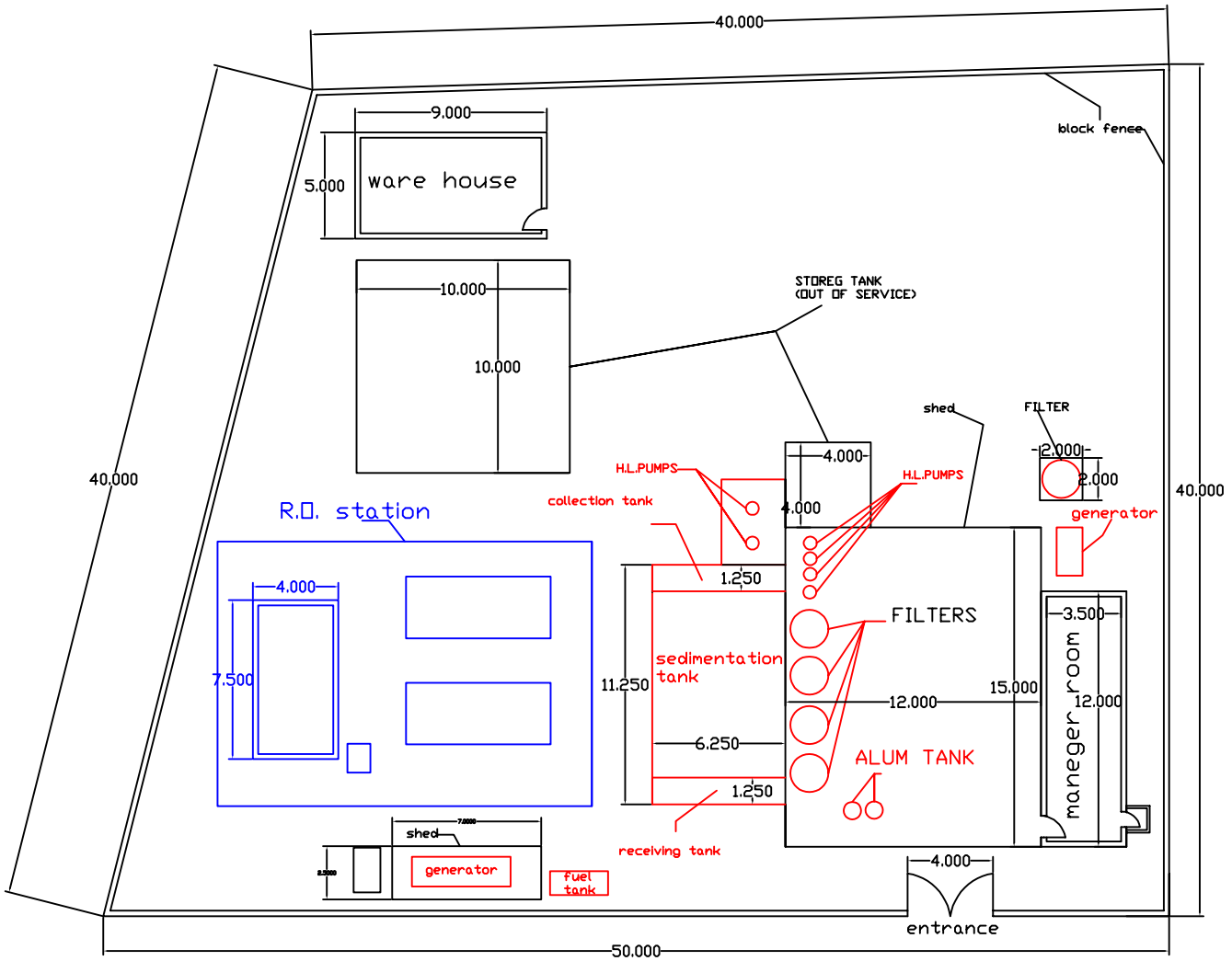
NAHIR AL IZ


source(river)
alum system
sedimentation tank
sedimentation tank
COLLACTION TANK
PUMP
filter
filter
TO THE AL-HWAIR CITY
CHLORIN DOZING
TO THE NAHR ALIZZ CITY
NAHIR AL IZ

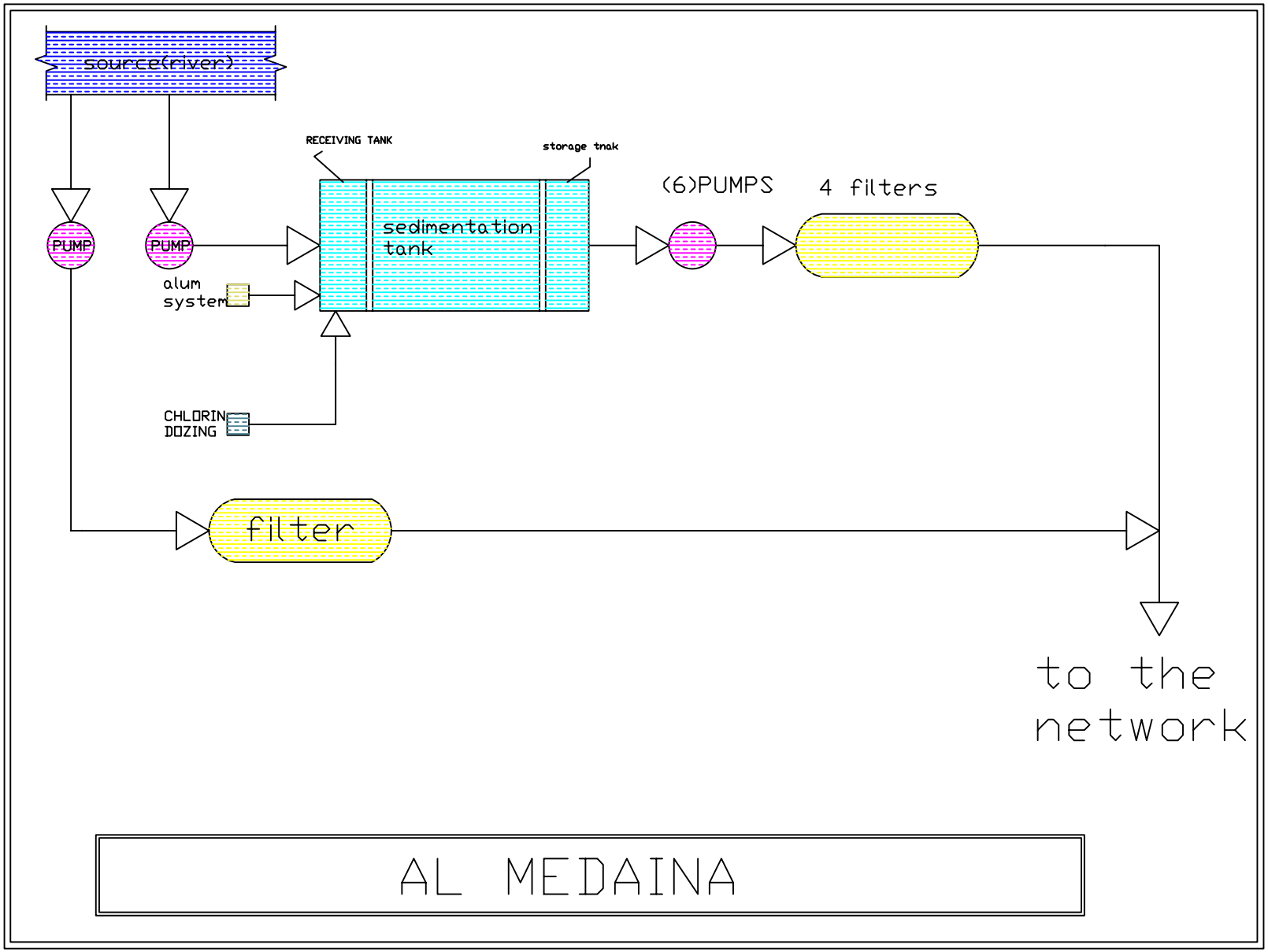

70.000
R.O. TANK
16.000
5.000
R.O. STATION
11.000
H.L. PUMPS ROOM
R.O. TANK
13.000
UNDER GROUND
COLLECTION TANK
SHED FOR CHLORINE
BOTTLES OF
CL2
GUARD ROOM
3.500
WORKERS ROOM
3.000
9.600
7.500
W.C
2.000
3.500
7.000
ENTRANCE
4.000
BRICK WALL
146.000
157.000
GENERATOR
OIL TANK
6.000
3.500
12.000
COLLECTION TANK
CLARIFAIR TANK
COMPACT STATION
(NO.2)
15.000
18.000
SYSTEM WATER TREATMENT
18.000
VERTICAL FILTERS
NO.(6)
TRANSFORMER&PANAL
ROOM
8.000
5.500
H.L. PUMPS
SHED FOR PUMPS
8.000
RECEIVING TANK
RECEIVING TANK
40.000
12.000
20.000
51.500

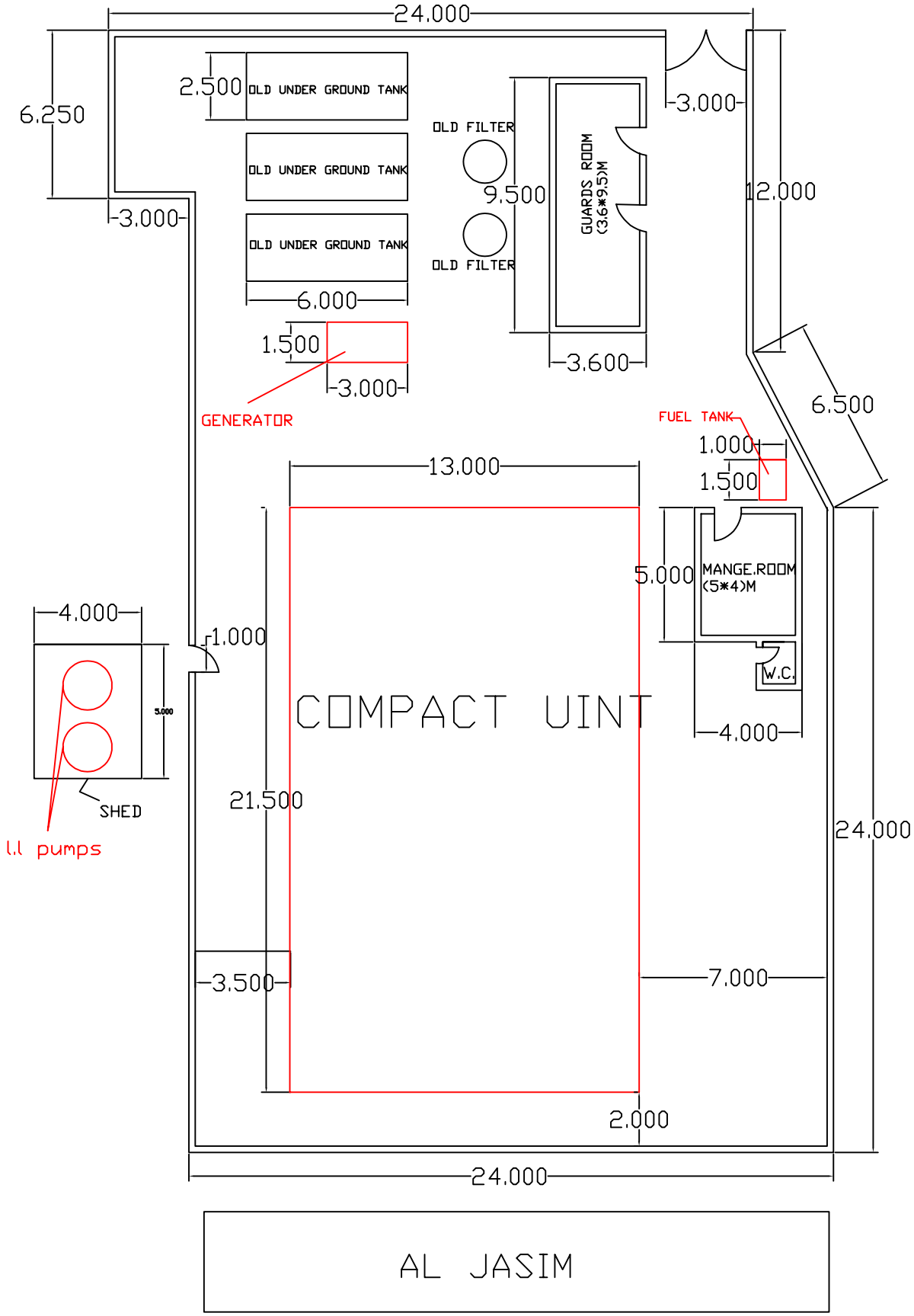
AL HUWAIR

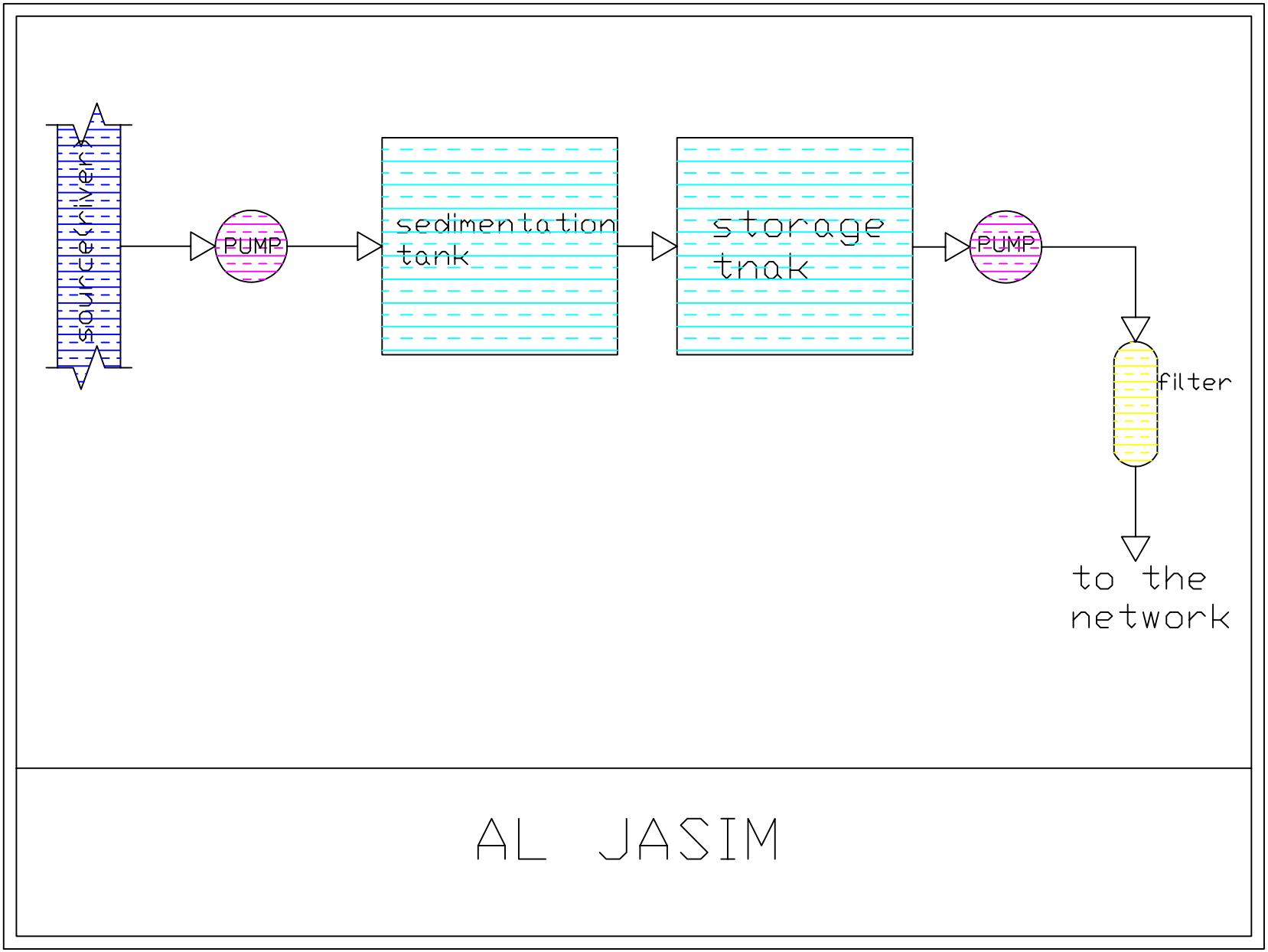

AL HUWAIR
SUB-MERSIBLE
(4)PUMPS
SOURCE(RIVER)
RECEIVING
(2)TANKS
PUMPS
TO THE NETWORK
(6)PUMPS
SEDIMENTATION
4 TANKS
FLOCCULATION
TANK
SEDIMENTATION
TANK
FLOCCULATION
2 TANKS
4 PUMPS
(2)FILTERS
(6)FILTERS
FRESH WATER
TANK
(4)PUMPS
TO THE NETWORK

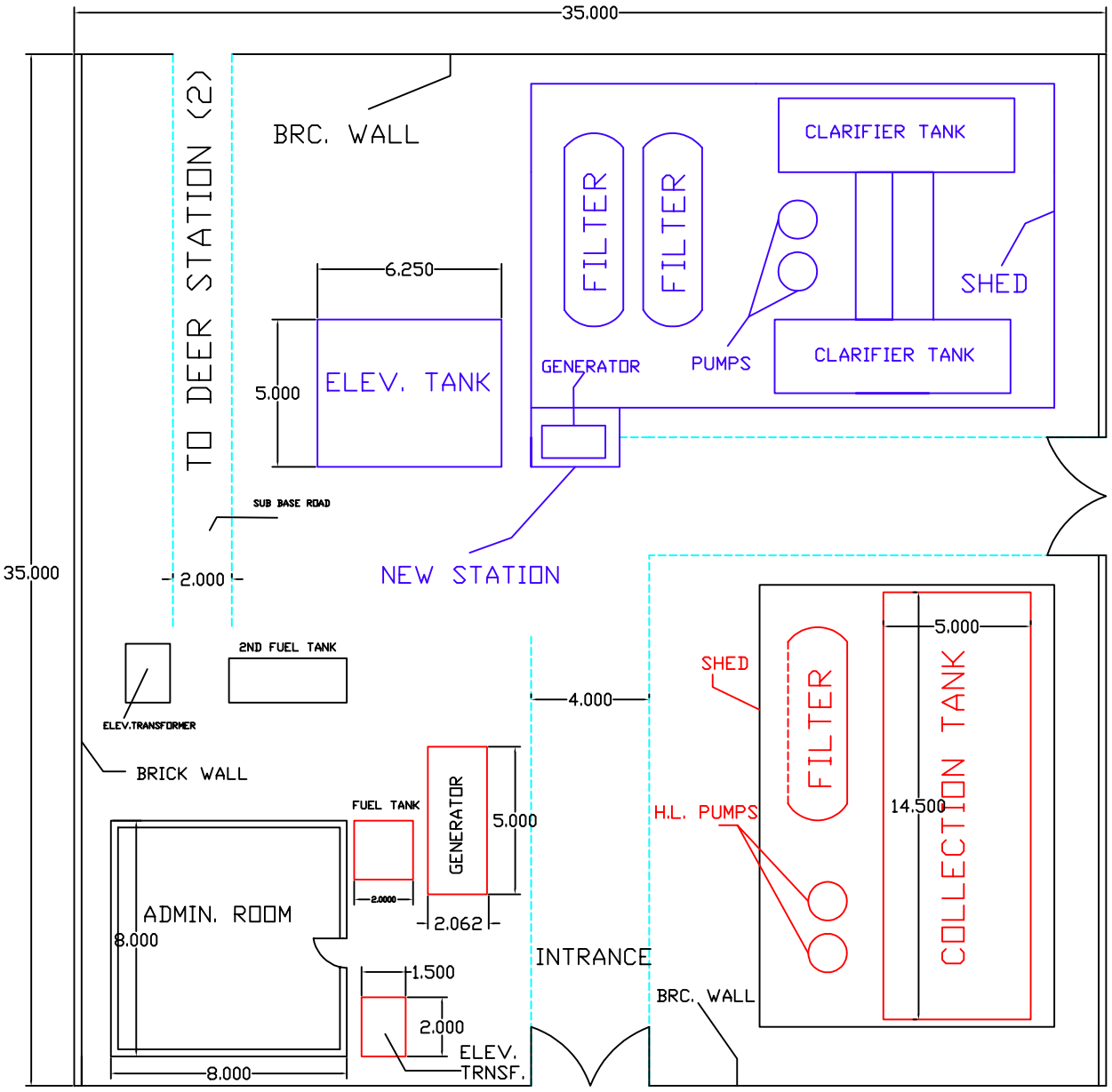

40.000
block fence
9.000
5.000
ware house
10.000
10.000
STOREG TANK
(OUT OF SERVICE)
40.000
shed
FILTER
4.000
2.000
2.000
H.L.PUMPS
H.L.PUMPS
collection tank
4.000
40.000
generator
R.O. station
1.250
4.000
FILTERS
3.500
7.500
sedimentation tank
11.250
12.000
15.000
maneger room
12.000
6.250
ALUM TANK
1.250
receiving tank
shed
generator
fuel tank
4.000
entrance
50.000

AL MEDAINA

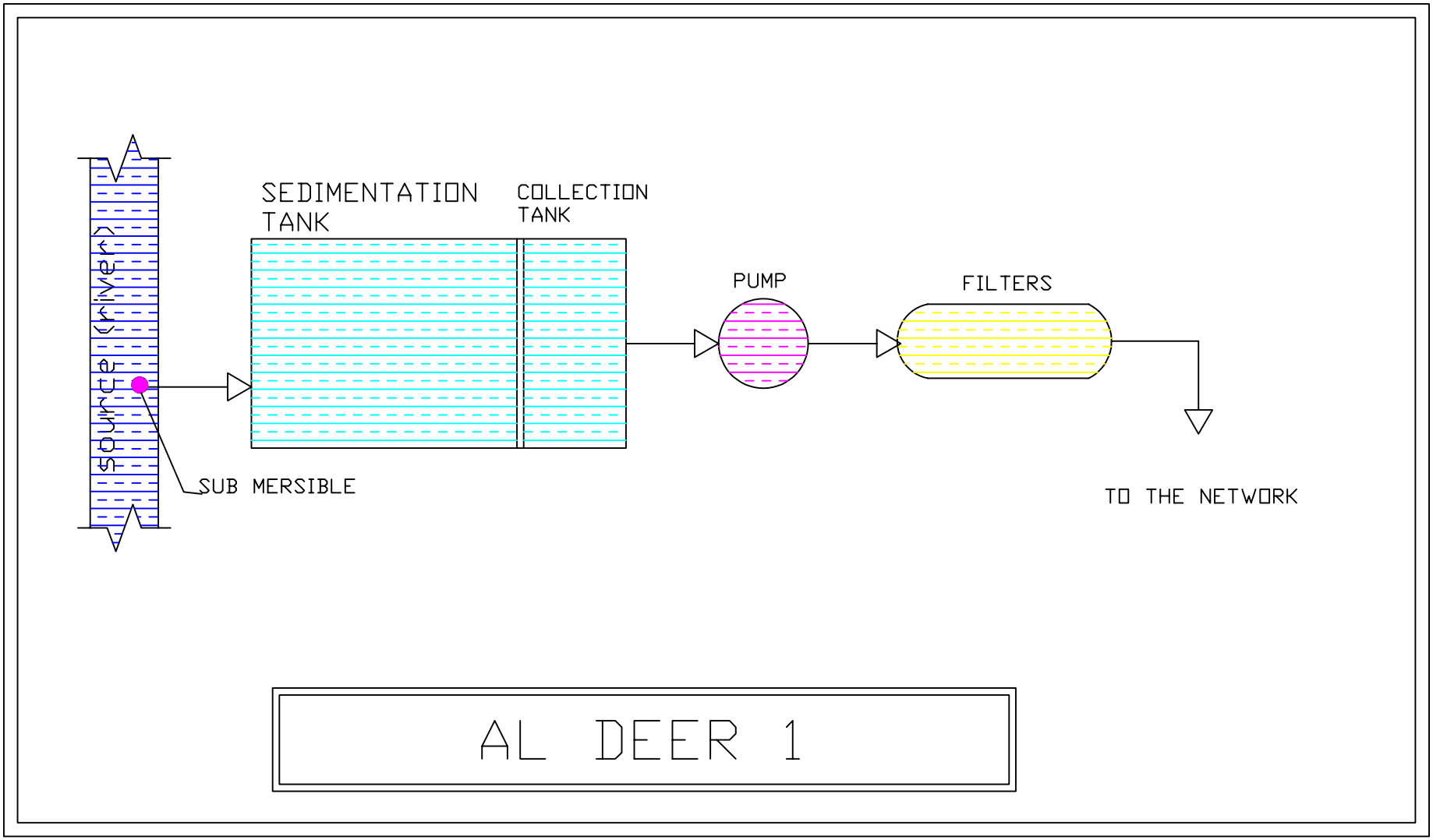

source(river)
RECEIVING TANK
storage tnak
(6)PUMPS
4 filters
PUMP
PUMP
sedimentation tank
alum system
CHLORIN DOZING
filter
to the network
AL MEDAINA

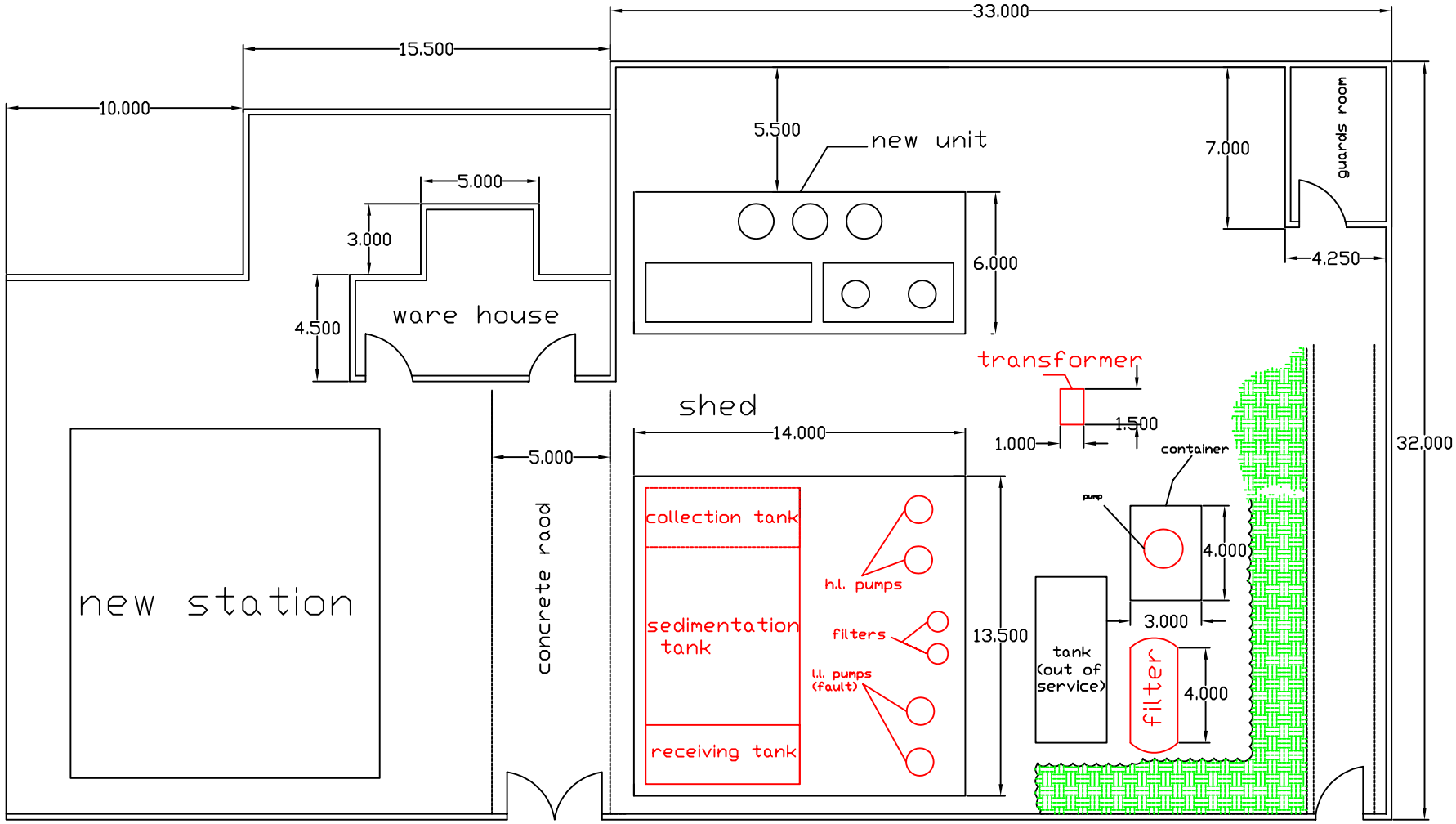

24.000
6.250
2.500
OLD UNDER GROUND TANK
OLD UNDER GROUND TANK
OLD UNDER GROUND TANK
6.000
1.500
3.000
GENERATOR
OLD FILTER
OLD FILTER
9.500
GUARDS ROOM
(3.6*9.5)M
3.600
3.000
12.000
3.000
6.500
FUEL TANK
1.000
1.500
13.000
5.000
MANGE.ROOM
(5*4)M
W.C.
4.000
4.000
1.000
5.000
SHED
l.l pumps
COMPACT UINT
21.500
24.000
3.500
7.000
2.000
24.000
AL JASIM


source (river)
PUMP
sedimentation tank
storage tnak
PUMP
filter
to the network
AL JASIM

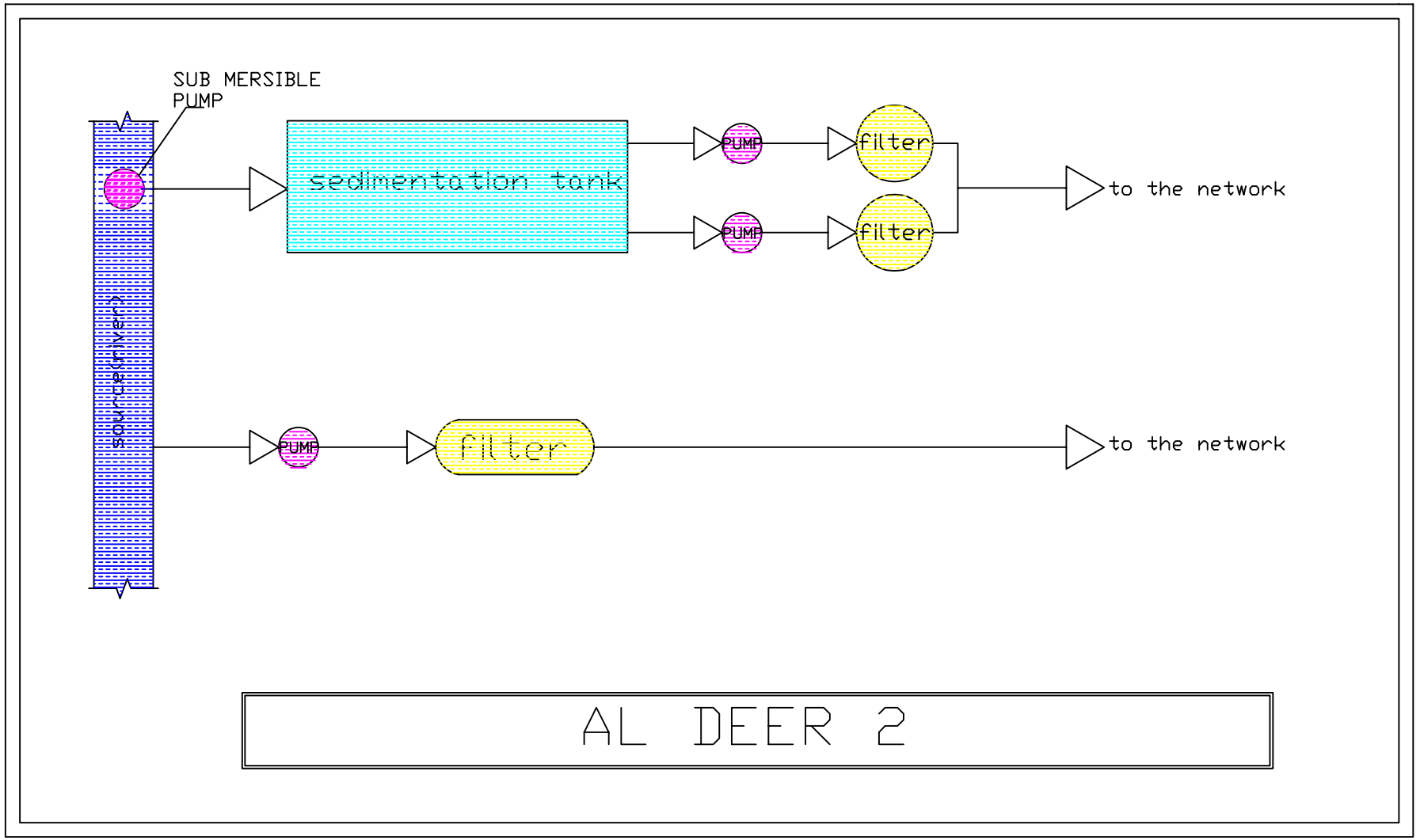

35.000
BRC. WALL
TO DEER STATION (2)
FILTER
FILTER
CLARIFIER TANK
SHED
CLARIFIER TANK
PUMPS
GENERATOR
6.250
5.000
ELEV. TANK
SUB BASE ROAD
NEW STATION
35.000
2.000
2ND FUEL TANK
ELEV.TRANSFORMER
4.000
SHED
FILTER
5.000
COLLECTION TANK
14.500
H.L. PUMPS
BRICK WALL
FUEL TANK
GENERATOR
5.000
2.0000
2.062
ADMIN. ROOM
8.000
INTRANCE
BRC. WALL
1.500
2.000
ELEV.
TRNSF.
8.000

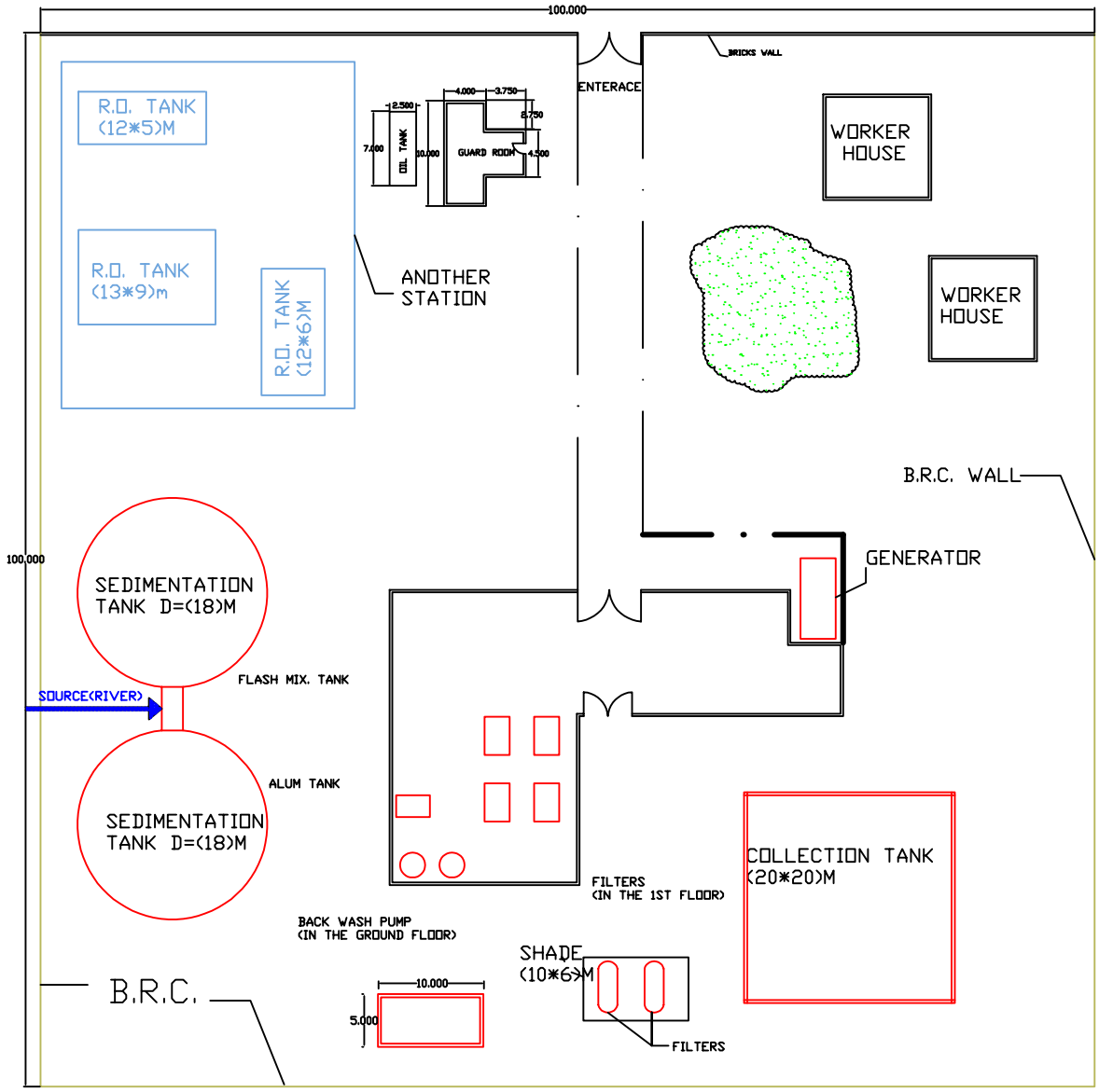
AL DEER 1


SEDIMENTATION TANK
COLLECTION TANK
PUMP
FILTERS
SOURCE (river)
SUB MERSIBLE
TO THE NETWORK
AL DEER 1

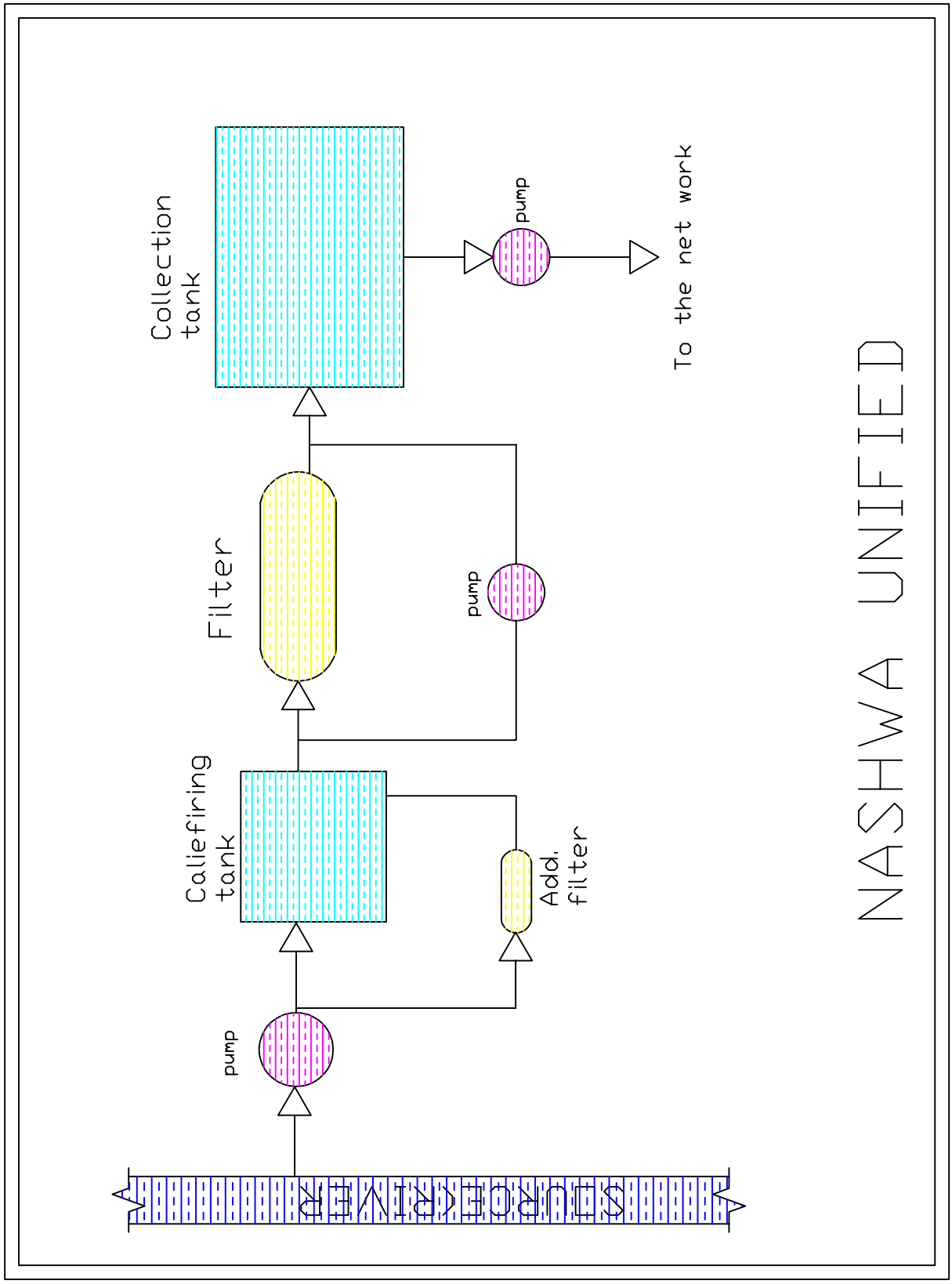

33.000
15.500
10.000
5.500
new unit
7.000
guards room
4.250
5.000
3.000
4.500
ware house
6.000
transformer
1.500
1.000
container
pump
4.000
3.000
4.000
shed
14.000
5.000
concrete raod
collection tank
sedimentation tank
receiving tank
h.l. pumps
filters
l.l. pumps (fault)
13.500
tank (out of service)
filter
32.000
new station

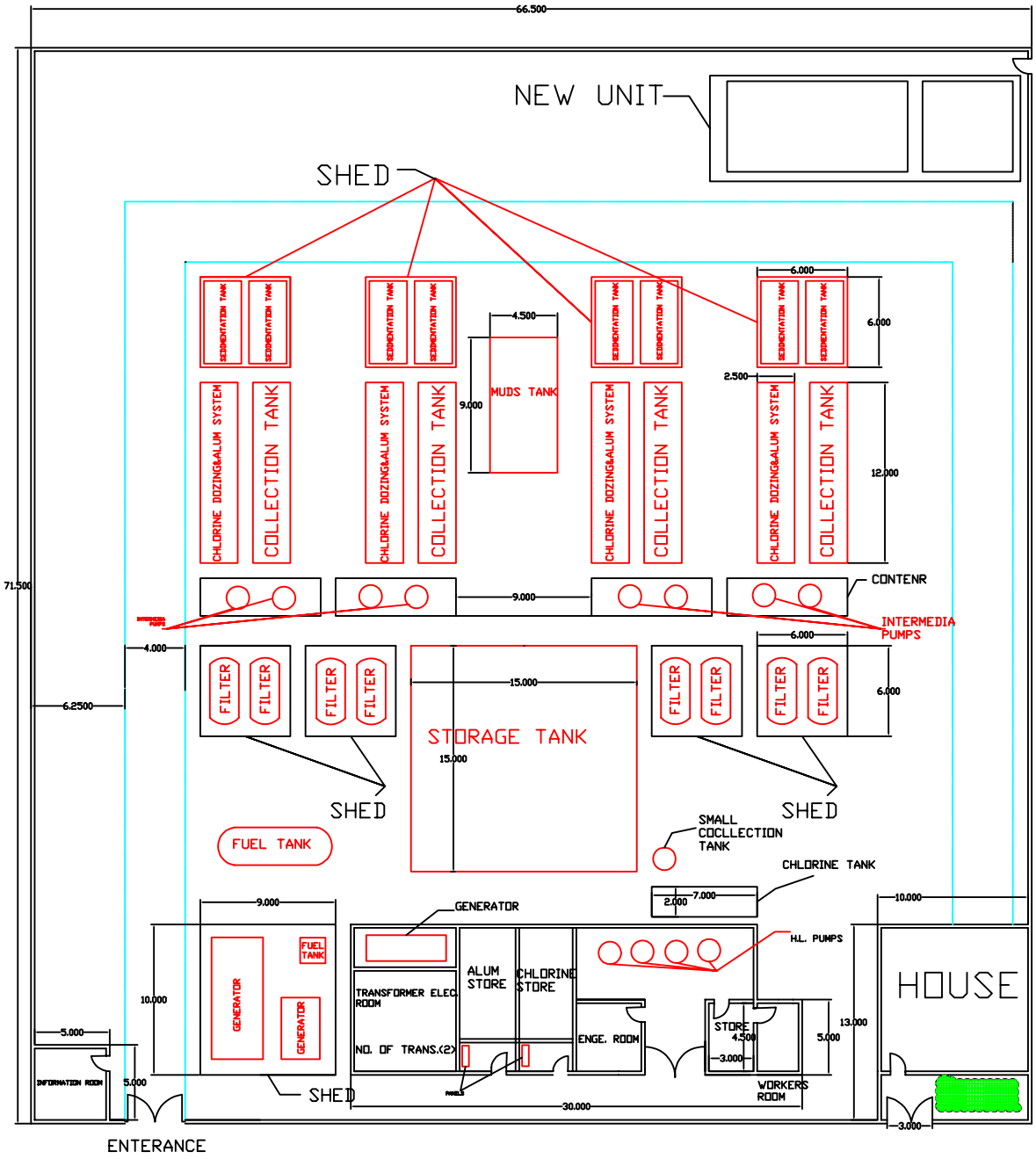
AL DEER 2


SUB MERSIBLE
PUMP
sea water
sedimentation tank
PUMP
PUMP
filter
filter
to the network
PUMP
filter
to the network
AL DEER 2

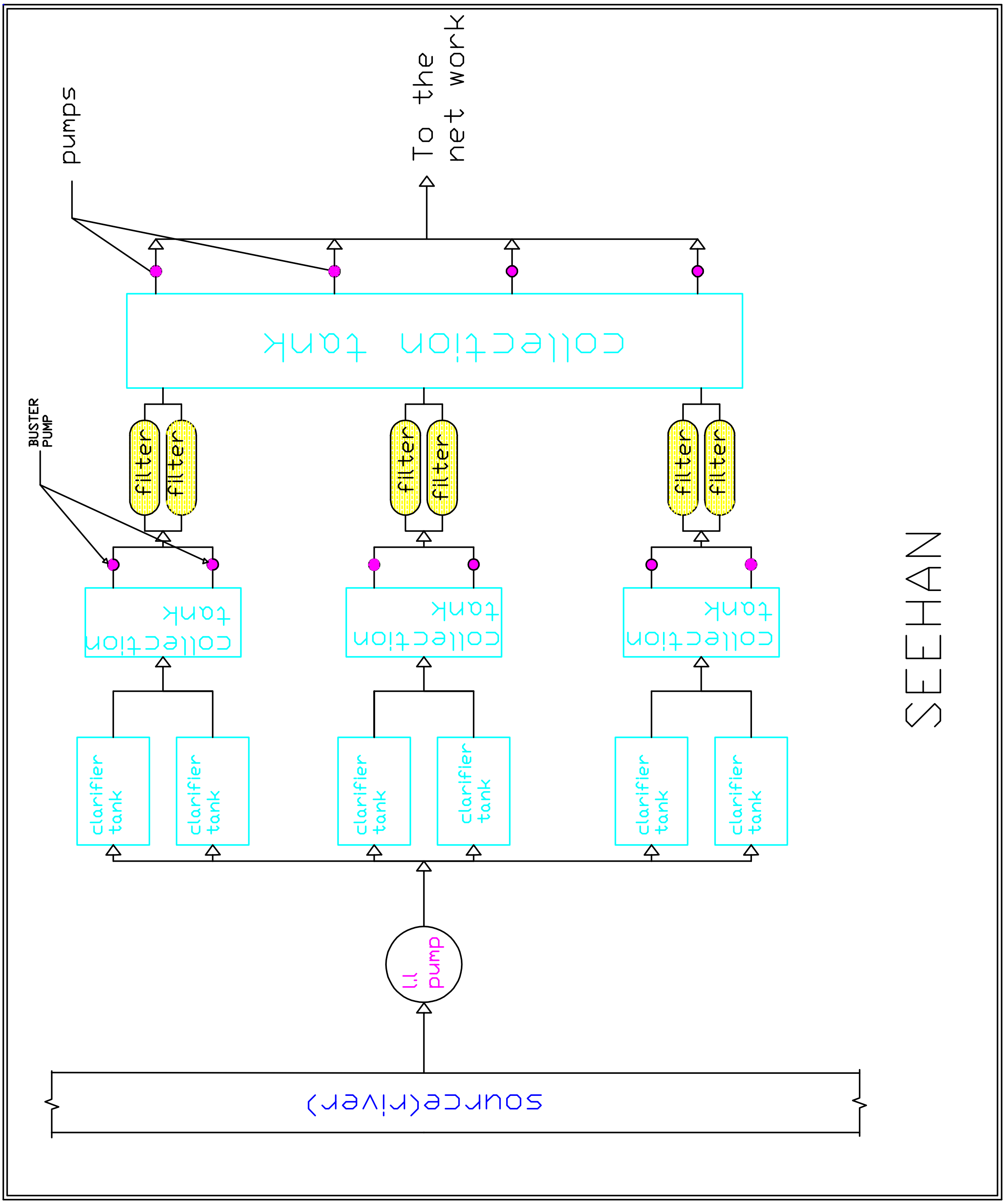


NASHWA UNIFIED

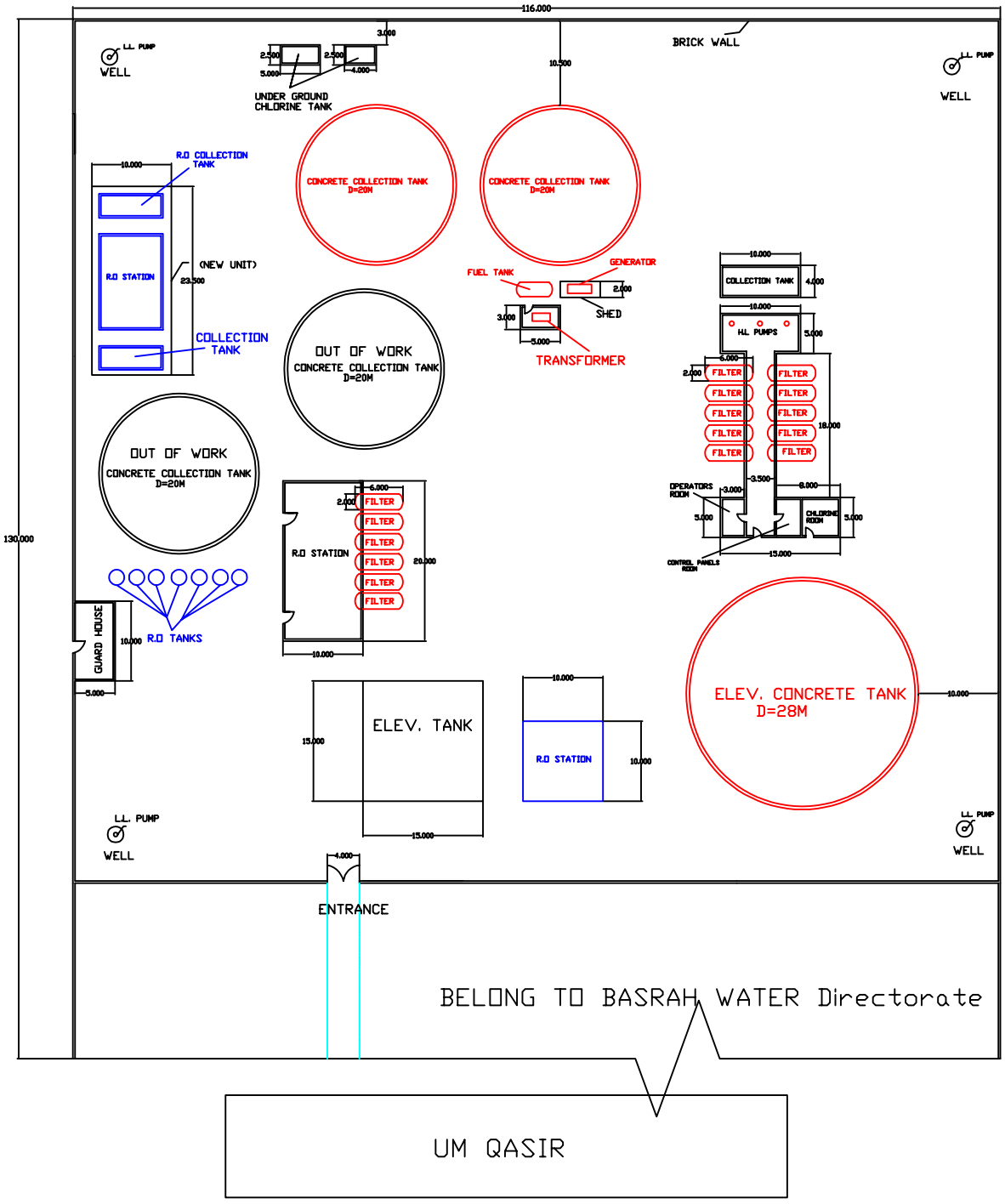

NASHWA UNIFIED
To the net work
pump
Collection tank
Filter
pump
Caliefiring tank
Add. filter
pump

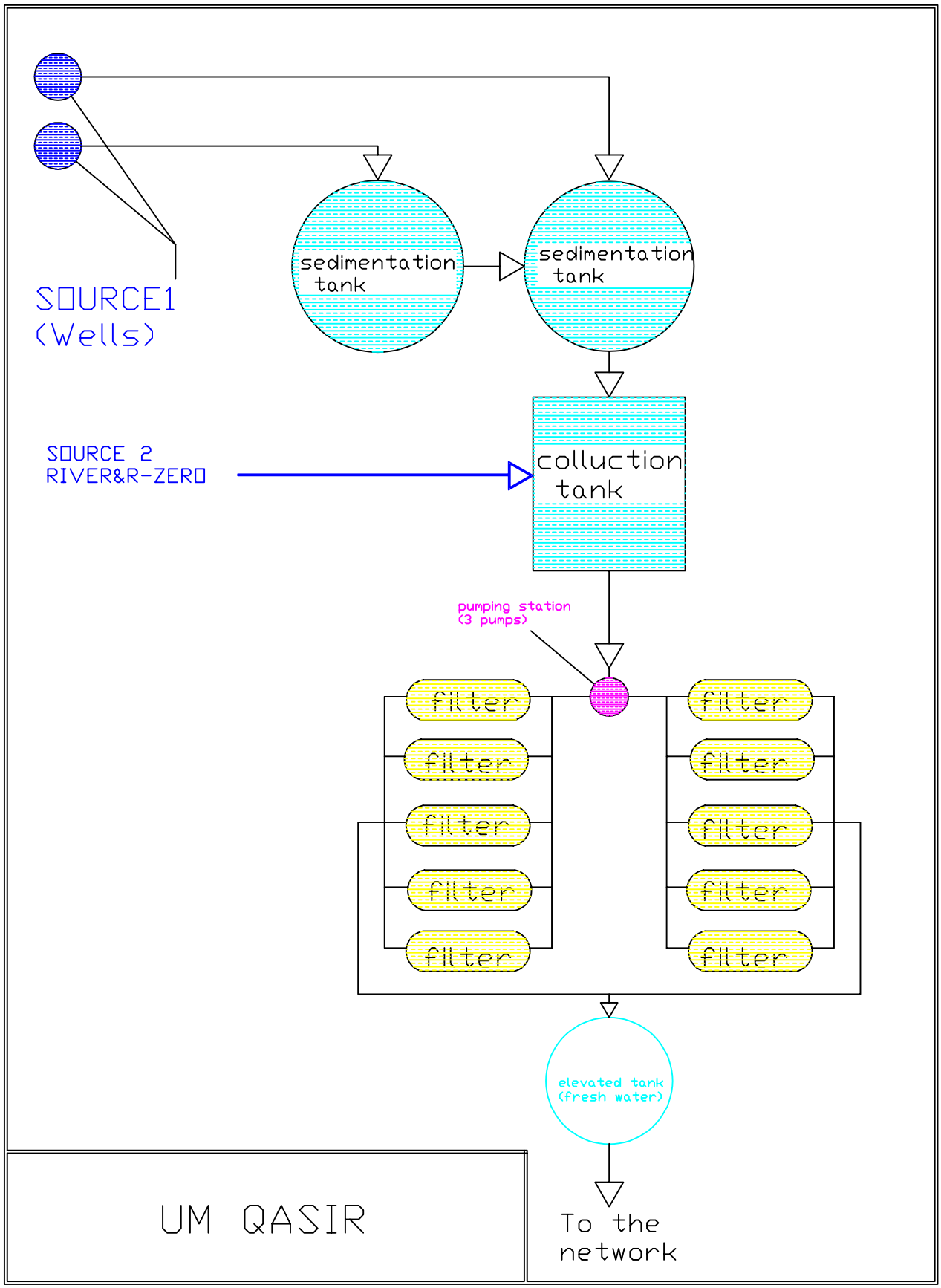

66.500
NEW UNIT
SHED
SEDIMENTATION TANK
CHLORINE DOZING&ALUM SYSTEM
COLLECTION TANK
MUDS TANK
4.500
9.000
6.000
2.500
12.000
71.500
9.000
CONTENR
INTERMEDIA PUMPS
4.000
6.2500
FILTER
15.000
STORAGE TANK
15.000
SHED
SHED
SMALL COCLLECTION TANK
FUEL TANK
CHLORINE TANK
2.000
7.000
10.000
GENERATOR
H.L. PUMPS
HOUSE
FUEL TANK
GENERATOR
TRANSFORMER ELEC. ROOM
NO. OF TRANS.(2)
ALUM STORE
CHLORINE STORE
ENGE. ROOM
STORE
4.500
3.000
5.000
13.000
WORKERS ROOM
30.000
3.000
INFORMATION ROOM
5.000
SHED
ENTERANCE

SEEHAN



pumps
To the
net work
collection tank
BUSTER
PUMP
filter
collection tank
clarifier tank
L.L pump
source(river)
SEEHAN


116.000
130.000
BRICK WALL
L.L. PUMP
WELL
UNDER GROUND
CHLORINE TANK
CONCRETE COLLECTION TANK
D=20M
R.O COLLECTION
TANK
R.O STATION
(NEW UNIT)
COLLECTION
TANK
OUT OF WORK
CONCRETE COLLECTION TANK
D=20M
FUEL TANK
GENERATOR
SHED
TRANSFORMER
COLLECTION TANK
H.L PUMPS
FILTER
OPERATORS
ROOM
CHLORINE
ROOM
CONTROL PANELS
ROOM
GUARD HOUSE
R.O TANKS
ELEV. TANK
ELEV. CONCRETE TANK
D=28M
ENTRANCE
BELONG TO BASRAH WATER Directorate
UM QASIR


SOURCE1
(Wells)
sedimentation tank
sedimentation tank
SOURCE 2
RIVER&R-ZERO
colluction tank
pumping station
(3 pumps)
filter
filter
filter
filter
filter
filter
filter
filter
filter
filter
elevated tank
(fresh water)
UM QASIR
To the network