

**THE FEASIBILITY STUDY
ON
BAGHDAD WATER SUPPLY SYSTEM
IMPROVEMENT PROJECT**

**FINAL REPORT
VOLUME IV
DATA BOOK**

NOVEMBER 2006

**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
GLOBAL ENVIRONMENT DEPARTMENT**

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ABBREVIATIONS

Organization

BWA	Baghdad Water Authority
CERP	Commander's Emergency Response Program
COSIT	Iraqi Central Organization for Statistics and Information Technology
CPA	Coalition Provisional Authority
CSO	Central Statistical Organization
EPID	The Environmental Protection and Improvement Directorate
GRD	Gulf Region Division of the U.S. Army Corps of Engineers
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
ILO	International Labor Organization
MOB	Mayorality of Baghdad
MOCH	Ministry of Construction and Housing
MOE	Ministry of Environment
MOF	Ministry of Finance
MOT	Ministry of Transportation
MPDC	Ministry of Planning & Development Cooperation
MWT	Ministry of Works and Transportation
OPEC	Organization of the Petroleum Exporting Countries
PCO	Project & Contracting Office
UNICEF	United Nations Children's Fund
USACE	U.S. Army Corps of Engineers
USAID	United States Agency for International Development
WB	The World Bank

Others

ACP	Asbestos Cement Pipe
ADF	Average Daily Flow
ATP	Affordability to Pay
BS	Booster Station
CIP	Cast Iron Pipe
CSO	Central Statistical Organization
CU	Compact Unit
DIP	Ductile Iron Pipe
DMA	District Meter Area
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return

FIRR	Financial Internal Rate of Return
GDP	Gross Domestic Product
GIS	Geographical Information System
GSP	Galvanized Steel Pipe
IEE	Initial Environmental Examination
LDPE	Low Density Polyethylene Pipe
MDF	Maximum Daily Flow
MIS	Management Information System
NDS	National Development Strategy
ODA	Official Development Assistance
PEP	Polyethylene Pipe
PHF	Peak Hourly Flow
PMT	Project Management Team
PVC	Polyvinyl Chloride Pipe
RPS	Raw Water Pump Station
RWN	Raw Water Network
SCADA	Supervisory Control and Data Acquisition
SDMA	Sub District Meter Area
SR	Service Reservoir
STP	Steel Pipe
UFW	Unaccounted for Water
WCM	Water Consumption Meter
WSZ	Water Supply Zone
WTP	Water Treatment Plant

Units

Length

mm = millimeter
cm = centimeter
m = meter
km = kilometer

Area

cm² = square centimeter
m² = square meter
km² = square kilometer

Volume

cm³ = cubic centimeter
m³ = cubic meter
l or lit = liter
MCM = million cubic meter

Weight

mg = milligram
g = gram
kg = kilogram

Currency

JPY Japanese Yen
US\$ US Dollar
ID Iraq Dinar

Time as denominator

/s or /sec = per second
/min = per minute
/hr. = per hour
/d = per day
/y = per year

Derived measures

lpcd = Liter per capita per day
m³/s = Cubic meter per second
m³/d = Cubic meter per day
mg/l = milligram per liter

Others

% = percent
°C = Celsius degrees
ppm = parts per million

Transliterations of Arabic Place Names

9 Nisan	٩ نيسان	Jaderiya	الجادرية
Abu Gharib	ابو غريب	Qadessia	القادسية
Abu Nowas	ابو نواس	Rasafa	الرصافة
Adhamiyah	الاعظمية	Rashad	الرشاد
Al Salam	السلام	Rasheed	الرشيد
Amin	الأمين	Rostamia	الرستمية
Army Canal	قناة الجيش	Saba Kosour	سبع قصور
Boaitha	البوعية	Sadr	الصدر
Doura	الدورة	Saidiya	السيدية
Ekhaa	الاخاء	Salam	السلام
Fahama	الفحامة	Salehiya	الصالحية
Hamediya	حميدية	Senak	السنك
Hussian Al Safi	حسن الصافي	Shaab	الشعب
Jomhuriya	الجمهورية	Shark Dijla	شرق دجلة
Kadhemiya	الكاظمية	Shola	الشعلة
Kamaliya	الكمالية	Swaib	صويب
Kanat	القناة	Taji	التاجي
Karada	الكرادة	Tal Aswad	تل أسود
Karama	الكرامة	Tarik	طارق
Karkh North	شمال الكرخ	Um Al Asafier	ام العصافير
Karkh South	جنوب الكرخ	Wahda	الوحدة
Karkh	الكرخ	Wathba	الوثبة
Kasra	الكسرة	Zafaraniya	الزعفرانية
Makaseb	المكاسب	Zaiuna	زيونة
Mansour	المنصور		
Mendly	مندلي		
Montadher	حي المنتظر		
Nasser	النصر		
New Akad	اكاد الجديد		
New Ammari	العماري الجديد		
New Orfally	أورفلي الجديد		
Obaidi	العبيدي		
Obour	العبور		
Old Akad	اكاد القديم		
Old Ammari	العماري القديم		
Old Orfally	أورفلي القديم		
Otaifiya	العطيفية		
Jaderiya Bridge	جسر الجادرية		

DATA BOOK 1

Existing Water Service and Projection

1. Summary of Water Service Tanker Supply in 2005
2. Operation Record of Water Service Tankers
3. Future Population Served at Water Supply Zone (from 2005 up to 2027)
4. Summary of Projected Population and Water Requirement at Water Supply Zone (2005, 2014 and 2027)
5. Annual Water Demand Projection and Water Requirement at Water Supply Zone (2001 to 2027)
6. Balance Sheet between Water Requirement and Proposed Water Production

Summary of Water Service Tanker Supply in 2005

BWA Service Area	May (m3)		June (m3)		July (m3)		Average (m3)	
	Monthly	Daily	Monthly	Daily	Monthly	Daily	Monthly	Daily
Rasafa Side - Resident - Hospital, etc.	29,250	1,125	27,837	1,071	34,464	1,326	30,517	1,174
Karkh Side - Resident - Hospital, etc.	21,221	816	27,516	1,058	5,069	195	17,935	690
Total - Resident - Hospital, etc.	50,471	1,941	55,353	2,129	39,533	1520.5	48,452	1,864

production 2,343,000 m3/d

Study Area	May (m3)		June (m3)		July (m3)		Average (m3)	
	Monthly	Daily	Monthly	Daily	Monthly	Daily	Monthly	Daily
Shaab (R2)	20,347	783	18,899	727	27,577	1,061	22,274	857
Sadr (R3 & R14)	3,549	137	3,501	135	1,687	65	2,912	112
Total	23,896	919	22,400	862	29,264	1,126	25,187	969

BWA Service Area	May (m3)		June (m3)		July (m3)		Average (m3)	
	Monthly	Daily	Monthly	Daily	Monthly	Daily	Monthly	Daily
Rasafa Side	29,250	1,125	27,837	1,071	34,464	1,326	30,517	1,174
Karkh Side	21,221	816	27,516	1,058	5,069	195	17,935	690
Total	50,471	1,941	55,353	2,129	39,533	1,521	48,452	1,864

Operation Record of Water Service Tankers on May 2005

(Unit: l/d)

Date	Al-Reasa	AlSadr	Ibn AlHaitham Hospital	Jurf AlNadaf	AlMahafef	Sabe Qusoor	Al-Rashad	Hay Al-Naser	AlKamaleya	Al-Hamedia	Hay AlBatool	AlKindi Hospital	Abo Ghareeb	Total
2005/5/2		100,000		746,000		745,000	54,000			127,000		56,000	293,000	2,121,000
2005/5/3	39,000	64,000		597,000	66,000	745,000	22,000	22,000	24,000	44,000	50,000	28,000	216,000	1,917,000
2005/5/4	39,000			812,000	144,000		34,000	30,000	26,000		50,000	28,000	283,000	1,446,000
2005/5/5	26,000	72,000		707,000	132,000	752,000	44,000	32,000	26,000	117,000	57,000	56,000	244,000	2,265,000
2005/5/7	52,000	86,000		765,000	128,000	749,000	66,000	30,000		119,000	48,000	84,000	214,000	2,341,000
2005/5/8	39,000	72,000		722,000	132,000	740,000	78,000	20,000	36,000	100,000	60,000	10,000	220,000	2,229,000
2005/5/9	52,000	72,000		390,000	154,000	749,000	44,000	20,000	54,000	100,000	82,000	28,000	172,000	1,917,000
2005/5/10	52,000	72,000		302,000	144,000	752,000	44,000	30,000	50,000	100,000	60,000	28,000	187,000	1,821,000
2005/5/11		36,000		122,000		465,000	32,000	10,000		62,000	50,000	28,000	280,000	1,085,000
2005/5/12	39,000	64,000			147,000	757,000	44,000	40,000	75,000	100,000	50,000	28,000	239,000	1,583,000
2005/5/14	52,000	64,000		572,000	156,000	742,000	20,000	10,000	72,000	48,000	72,000	60,000	245,000	2,113,000
2005/5/15	26,000	40,000		587,000	132,000	726,000	44,000	22,000	84,000	84,000	50,000	50,000	280,000	2,125,000
2005/5/16	52,000	62,000		605,000	143,000	708,000	34,000	32,000	72,000	72,000	37,000	30,000	311,000	2,158,000
2005/5/17	39,000	44,000		623,000	144,000	673,000	52,000	20,000	52,000	72,000	50,000	20,000	325,000	2,114,000
2005/5/18	52,000	72,000		595,000	153,000	641,000	44,000	23,000	60,000	72,000	50,000	66,000	302,000	2,130,000
2005/5/19	52,000	94,000		674,000	155,000	553,000	44,000	12,000	80,000	72,000	62,000	82,000	80,000	1,960,000
2005/5/21	52,000	64,000		671,000	175,000	742,000	42,000	11,000	70,000	107,000	75,000	54,000	348,000	2,411,000
2005/5/22	52,000	62,000		600,000	110,000	724,000	63,000	38,000	70,000	103,000	62,000	54,000	310,000	2,248,000
2005/5/23	39,000	10,000	18,000	254,000	132,000	571,000	66,000	34,000	30,000	63,000	24,000	18,000	126,000	1,385,000
2005/5/24	52,000	30,000	36,000	197,000	155,000		56,000		40,000		47,000	36,000	334,000	983,000
2005/5/25	52,000	8,000	54,000	459,000	143,000	685,000		41,000	40,000	48,000	38,000	54,000	347,000	1,969,000
2005/5/26	52,000		54,000	606,000	177,000	654,000			66,000	103,000	13,000	36,000	291,000	2,052,000
2005/5/28	52,000	40,000	36,000	535,000	177,000	746,000				60,000	13,000	72,000	355,000	2,086,000
2005/5/29		50,000	36,000	53,000	165,000	764,000			50,000	58,000	50,000	18,000	356,000	1,600,000
2005/5/30	62,000	131,000	36,000	329,000	172,000	709,000		12,000	89,000	119,000	49,000	54,000	347,000	2,109,000
2005/5/31	62,000	117,000	36,000	510,000	165,000	754,000	66,000		79,000	73,000	36,000	54,000	351,000	2,303,000
Total Sum	1,086,000	1,526,000	306,000	13,033,000	3,501,000	16,846,000	993,000	489,000	1,245,000	2,023,000	1,235,000	1,132,000	7,056,000	50,471,000

Operation Record of Water Service Tankers on June 2005 (1/2)

Date	Abo Ghareb	AlAbed	Hay ALAmel	AlAmeria	AlBatool	AlBaeia	AlEalam	AlAlawee Hospital	AlKazaleia	AlHabeibia Hospital	AlJewader Hospital	Nervous Hospital	AlKamaleia	Akarama Hospital	AlKarek Hospital	AlKarada	AlKindi Hospital	AlNaser	AlNoamaneia Hospital
2005/6/1	354,000	10,000			50,000								69,000				18,000	44,000	
2005/6/2	141,000	20,000			48,000								72,000				36,000	21,000	
2005/6/4	353,000	13,000			38,000								69,000				40,000	25,000	
2005/6/5	345,000				61,000								72,000					10,000	
2005/6/6	307,000				74,000								69,000				30,000	11,000	
2005/6/7	338,000				38,000								72,000				18,000		
2005/6/8	25,000	13,000			12,000								68,000				76,000		
2005/6/9	286,000	13,000			38,000								72,000				102,000	11,000	
2005/6/11	342,000				50,000												64,000	24,000	
2005/6/12	418,000				26,000												84,000		
2005/6/13	363,000				26,000								76,000				46,000		
2005/6/14	54,000				63,000								96,000				84,000		
2005/6/15	333,000				50,000								116,000				30,000		
2005/6/16	303,000				50,000								113,000				84,000		
2005/6/18	320,000				61,000						40,000		46,000				46,000		
2005/6/19	283,000				50,000						36,000		113,000				54,000		
2005/6/20	115,000				12,000			23,000			90,000		116,000	10,000	10,000		66,000		
2005/6/21	297,000							23,000			123,000	20,000	115,000	10,000	20,000		62,000		
2005/6/22	234,000		34,000	15,000		46,000		37,000	13,000	31,000	101,000	20,000	46,000		10,000	15,000	49,000		
2005/6/23	185,000						21,000	36,000		31,000	95,000	36,000	36,000	10,000	10,000		72,000		39,000
2005/6/25	208,000							23,000			60,000	25,000	50,000		20,000		77,000		36,000
2005/6/26	188,000							36,000		10,000	60,000	37,000	48,000		20,000		46,000		28,000
2005/6/27	269,000							13,000			78,000	18,000	81,000		20,000		59,000		
2005/6/28	336,000										110,000		107,000		20,000		95,000		
2005/6/29	163,000				12,000						60,000		83,000		20,000		46,000		18,000
2005/6/30	202,000				24,000						80,000		116,000				80,000		13,000
Total	6,762,000	69,000	34,000	15,000	783,000	46,000	21,000	191,000	13,000	72,000	933,000	156,000	1,921,000	30,000	150,000	15,000	1,464,000	146,000	134,000

Operation Record of Water Service Tankers on June 2005 (2/2)

Date	AlNoor Hospital	AlRashad	AlRashad Hospital	AlReasa	AlSadr	AlSadr Hospital	AlSaideia		Nuclear Medicine Hospital	Altefel Hospital	AlYarmuk Hospital	Home for old people	AlHameideia	Ibn Alhatham Hospital	Jurf AlNadaf		AlMahafef	Sabe Qessor	Um Alma'alaf	Total Sum
2005/6/1		44,000		52,000	120,000								94,000	36,000	327,000		188,000	716,000		2,122,000
2005/6/2		32,000		52,000	78,000								39,000	36,000	746,000		177,000	654,000		2,152,000
2005/6/4		54,000		52,000	18,000								13,000	40,000	650,000		175,000	292,000		1,832,000
2005/6/5		32,000		52,000											750,000		165,000			1,487,000
2005/6/6		12,000		52,000	92,000									30,000	715,000		188,000	576,000		2,156,000
2005/6/7		24,000		52,000	94,000								79,000	30,000	772,000		188,000	748,000		2,453,000
2005/6/8				52,000	112,000								50,000	54,000	765,000		189,000	410,000		1,826,000
2005/6/9				52,000	152,000								123,000	56,000	663,000		189,000			1,757,000
2005/6/11					76,000								75,000	36,000	540,000			689,000		1,896,000
2005/6/12					70,000								100,000	56,000	452,000			652,000		1,858,000
2005/6/13				65,000	72,000								48,000	56,000	236,000		180,000	800,000		1,968,000
2005/6/14				52,000	72,000								48,000	56,000	143,000		188,000	788,000		1,644,000
2005/6/15				52,000	102,000								48,000	20,000	800,000		189,000	814,000		2,554,000
2005/6/16					134,000								72,000	28,000	798,000		177,000	900,000		2,659,000
2005/6/18				26,000	102,000						28,000		58,000	56,000	897,000		77,000	986,000		2,743,000
2005/6/19			10,000	65,000	78,000						18,000		87,000	36,000	796,000		145,000	655,000		2,426,000
2005/6/20				52,000	10,000					13,000	13,000		39,000	36,000	741,000		78,000	354,000		1,778,000
2005/6/21			13,000	65,000	86,000				24,000	17,000	23,000		86,000	49,000	688,000		64,000			1,785,000
2005/6/22			10,000	39,000	59,000	10,000	12,000		46,000	17,000	13,000	10,000	122,000	49,000	337,000	56,000	66,000	46,000		1,543,000
2005/6/23	18,000			26,000	44,000	31,000	95,000	22,000	68,000	8,000	18,000		95,000		638,000	64,000	12,000			1,710,000
2005/6/25			11,000	52,000		8,000			60,000		18,000			44,000	646,000		160,000	624,000		2,122,000
2005/6/26				26,000		10,000			37,000		18,000		60,000	80,000	743,000		100,000	801,000		2,348,000
2005/6/27				39,000	44,000						18,000		100,000	49,000	663,000		133,000	908,000		2,492,000
2005/6/28				52,000	50,000						18,000		73,000	85,000	701,000		179,000	997,000		2,823,000
2005/6/29				52,000	70,000						18,000		72,000	26,000	903,000		168,000	1,000,000		2,711,000
2005/6/30				52,000	60,000								66,000	54,000	601,000		168,000	992,000		2,508,000
Total	18,000	198,000	44,000	1,131,000	1,795,000	59,000	107,000	22,000	235,000	55,000	203,000	10,000	1,647,000	1,098,000	16,711,000	120,000	3,543,000	15,356,000	46,000	55,353,000

Operation Record of Water Service Tankers on July 2005

Date	Abo Ghareb	Hay Al-Amel	AlBatool	AlEalam	Red crescent Hospital	AlKamalicia	AlKarekh Hospital	AlKindi Hospital	Alno'aman Hospital	AlNoor Hospital	AlRashad Hospital	AlRe'asa	AlResala	AlSadr	AlSaideia	AlSweeb	AlTefel Hospital	AlTorath	AlYarmuk Hospital	AlMahdeia	S.C.E.D.M.H	Sabe Qesoor	Total	
2005/7/2	151,000		12,000	48,000		118,000	20,000	59,000	31,000	18,000		52,000	18,000	40,000			18,000		10,000			999,000	1,594,000	
2005/7/3	129,000	28,000		31,000	18,000	116,000	20,000	49,000	10,000			52,000	25,000	60,000	25,000	13,000	18,000	11,000	18,000	60,000			892,000	1,575,000
2005/7/4	181,000		12,000			116,000	10,000	93,000				50,000		60,000					10,000	72,000			947,000	1,551,000
2005/7/5	239,000					105,000		80,000			24,000	39,000		44,000						60,000			920,000	1,511,000
2005/7/6	275,000					105,000		80,000				39,000		72,000					18,000	127,000			1,002,000	1,718,000
2005/7/7	242,000					104,000		80,000				71,000		88,000						60,000			971,000	1,616,000
2005/7/9	309,000					94,000		36,000				72,000		66,000						112,000			1,083,000	1,772,000
2005/7/10	273,000					92,000		72,000				74,000		56,000						100,000			1,101,000	1,768,000
2005/7/11	429,000		12,000			67,000		64,000				48,000		22,000					18,000	78,000			1,044,000	1,782,000
2005/7/12	378,000		72,000			55,000		72,000				50,000		30,000						114,000			1,022,000	1,793,000
2005/7/13	343,000		12,000			66,000		93,000				48,000		66,000						100,000			979,000	1,707,000
2005/7/14			48,000											68,000						125,000			984,000	1,225,000
2005/7/16	424,000		81,000			81,000		90,000				63,000		62,000						113,000			1,063,000	1,977,000
2005/7/17	260,000		44,000			65,000		93,000				59,000		44,000									1,019,000	1,709,000
2005/7/18			57,000			96,000		93,000				72,000		14,000					18,000	26,000			786,000	1,162,000
2005/7/19	117,000		59,000			105,000		93,000				72,000		110,000						100,000			984,000	1,640,000
2005/7/20	228,000		46,000			96,000		98,000				72,000		94,000					18,000	74,000	13,000		1,094,000	1,833,000
2005/7/21						35,000		75,000				24,000		134,000						128,000			1,095,000	1,491,000
2005/7/23						83,000		83,000				149,000								116,000			967,000	
2005/7/24						59,000		93,000				22,000		134,000						138,000			619,000	446,000
2005/7/25			22,000			59,000		98,000				26,000		64,000					31,000	98,000	13,000		1,106,000	1,517,000
2005/7/26						72,000		93,000				39,000		72,000					13,000	73,000			1,108,000	1,470,000
2005/7/27			24,000			48,000		85,000				22,000		36,000						74,000	13,000		1,103,000	1,405,000
2005/7/28			24,000			74,000		93,000				33,000		48,000						95,000	13,000		1,057,000	1,437,000
2005/7/30			13,000			48,000		93,000				22,000								36,000	84,000		1,083,000	1,379,000
2005/7/31			11,000			39,000		93,000				48,000		54,000						31,000	113,000		1,099,000	1,488,000
Total	3,978,000	28,000	549,000	79,000	18,000	1,915,000	50,000	2,051,000	41,000	18,000	24,000	1,169,000	43,000	1,687,000	25,000	13,000	36,000	11,000	221,000	2,365,000	52,000	25,160,000	39,533,000	

Future Population Served at Water Supply Zones (from 2005 up to 2027)

Water Supply Zone (WSZ)	Administrative Area	WSZ Area (km2)	Benchmark Year: 2004 (Reference 1)					2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	
			WSZ Developed Area (km2)	Projected Population	Developed Population Density (perons/km2)	Build-out Year	Build-out Population	Projected BWA Served Population																							
								Annual Population Growth Rate for the City: Upper, for Suburban: lower (Reference 2)																							
								0.0210										0.0220							0.0225						0.0225
Rasafa Side																															
R1	City	27.39	20.46	270,695	13,230	2014	362,382	276,380	282,184	288,109	294,160	300,337	306,644	313,544	320,598	327,812	362,382	370,536	378,873	387,397	396,114	405,026	414,139	423,458	432,985	442,727	452,689	462,874	473,289	483,938	
R2	City	30.74	22.03	355,962	16,158	2015	496,699	363,437	371,069	378,862	386,818	394,941	403,235	412,308	421,585	431,070	440,769	496,699	507,874	519,302	530,986	542,933	555,149	567,640	580,412	593,471	606,824	620,478	634,438	648,713	
R3	City	18.48	16.54	644,273	38,952	2008	719,841	657,803	671,617	685,721	719,841	734,957	750,391	767,275	784,539	802,191	820,240	838,696	857,566	876,862	896,591	916,764	937,392	958,483	980,049	1,002,100	1,024,647	1,047,702	1,071,275	1,095,379	
R4	City	16.98	10.45	109,898	10,517	2020	178,571	112,206	114,562	116,968	119,424	121,932	124,493	127,294	130,158	133,087	136,081	139,143	142,274	145,475	148,748	152,095	178,571	182,589	186,697	190,898	195,193	199,585	204,076	208,667	
R5	City	20.49	19.15	218,663	11,418	2006	233,964	223,255	233,964	238,877	243,893	249,015	254,244	259,965	265,814	271,795	277,910	284,163	290,557	297,095	303,779	310,614	317,603	324,749	332,056	339,527	347,167	354,978	362,965	371,132	
R6	City	31.87	30.29	320,429	10,579	2006	337,143	327,158	337,143	344,223	351,452	358,833	366,368	374,611	383,400	391,658	400,471	409,481	418,695	428,115	437,748	447,597	457,668	467,966	478,495	489,261	500,269	511,526	523,035	534,803	
R7/R13*	City	34.55	24.65	314,658	12,765	2015	441,032	321,266	328,012	334,901	341,934	349,114	356,446	364,466	372,666	381,051	389,625	441,032	450,955	461,102	471,476	482,085	492,931	504,022	515,363	526,959	538,815	550,938	563,335	576,010	
R8	City	30.09	17.13	133,937	7,819	2023	235,269	136,750	139,621	142,553	145,547	148,604	151,724	155,138	158,629	162,198	165,847	169,579	173,394	177,296	181,285	185,364	189,534	193,799	198,159	202,609	207,153	211,791	216,524	221,352	
R9	City	11.96	9.72	53,638	5,518	2011	65,999	54,764	55,914	57,089	58,288	59,512	60,761	65,999	67,484	69,002	70,555	72,142	73,766	75,425	77,122	78,858	80,632	82,446	84,301	86,198	88,137	90,121	92,148	94,222	
R10**	City/Addman	14.43	11.87	40,923	3,448	2011	49,749	41,823	42,743	43,684	44,645	45,627	46,631	49,749	50,843	51,962	53,105	54,273	55,467	56,688	57,935	59,209	60,512	61,873	63,266	64,689	66,145	67,633	69,155	70,711	
R11	City	8.06	4.77	84,559	17,727	2022	142,882	86,335	88,148	89,999	91,889	93,819	95,789	97,944	100,148	102,401	104,705	107,061	109,470	111,933	114,451	117,026	119,660	122,352	125,097	127,897	130,751	133,659	136,621	139,636	
R12	City	17.09	16.79	867	52	n/a	882	885	904	923	942	962	982	1,004	1,027	1,050	1,074	1,098	1,122	1,148	1,173	1,200	1,227	1,254	1,283	1,312	1,341	1,371	1,402	1,434	
R14	City	16.40	15.49	492,736	31,810	2006	521,683	503,083	521,683	532,638	543,824	555,244	566,904	579,660	592,702	606,038	619,674	633,616	647,873	662,450	677,355	692,595	708,179	724,113	740,405	757,064	774,098	791,516	809,325	827,534	
R45	City	7.65	3.90	171	44	2027	335	175	178	182	186	190	194	198	203	207	212	217	221	226	231	237	242	247	253	259	265	270	277	335	
Sub Total		286.18	223.24	3,041,409	13,624		3,786,431	3,105,320	3,187,743	3,254,729	3,342,842	3,413,086	3,484,806	3,569,154	3,649,435	3,731,522	3,842,650	4,017,735	4,108,107	4,200,512	4,294,995	4,391,604	4,513,439	4,614,992	4,736,606	4,875,831	4,985,537	5,097,712	5,212,410	5,329,742	
Karkh Side																															
K1	City	13.83	11.02	145,237	13,179	2012	182,271	148,287	151,401	154,580	157,827	161,141	164,525	168,227	182,271	186,372	190,566	194,853	199,238	203,720	208,304	212,991	217,783	222,683	227,694	232,817	238,055	243,411	248,888	254,488	
K2	City	21.64	18.78	135,619	7,221	2009	156,272	138,467	141,375	144,344	147,375	150,472	153,634	156,861	160,156	163,514	166,815	170,568	174,406	178,330	182,342	186,445	190,640	194,930	199,316	203,800	208,386	213,074	217,868	222,771	227,783
K3	City	14.64	13.44	134,719	10,024	2007	146,747	137,548	140,437	146,747	149,829	152,976	156,188	159,702	163,296	166,970	170,727	174,568	178,496	182,512	186,618	190,817	195,111	199,501	203,989	208,579	213,272	218,071	222,977	227,994	
K4	City	14.17	3.81	36,870	9,677	2049	137,125	37,644	38,435	39,242	40,066	40,907	41,766	42,706	43,667	44,650	45,654	46,681	47,732	48,806	49,904	51,027	52,175	53,349	54,549	55,776	57,031	58,315	59,627	60,968	
K5	City	8.92	7.19	87,232	12,132	2011	108,221	89,064	90,934	92,844	94,794	96,784	98,817	100,821	110,656	113,146	115,692	118,295	120,956	123,678	126,461	129,306	132,215	135,190	138,232	141,342	144,522	147,774	151,099	154,499	
K6	City	106.46	81.49	720,710	8,844	2013	941,548	735,845	751,298	767,075	783,183	799,630	816,423	834,792	853,575	872,941	892,733	912,985	933,644	954,747	976,241	998,174	1,020,594	1,043,554	1,067,106	1,091,306	1,116,206	1,141,866	1,168,246	1,195,416	
K7	City	127.21	59.41	611,867	10,299	2030	1,310,143	624,716	637,835	651,230	664,906	678,869	693,125	708,720	724,666	740,971	757,643	774,690	792,121	809,943	828,167	846,801	865,854	885,336	905,256	925,624	946,451	967,746	989,520	1,011,784	
K8**	Taji Center	134.7	75.79	130,957	1,728	2024	232,747	133,838	136,782	139,792	142,867	146,010	149,222	152,505	155,860	159,289	162,794	166,375	170,035	173,776	177,599	181,506	185,500	189,673	193,941	198,305	202,747	207,274	211,884	216,574	
K9**	Abu Ghraib	56.67	36.65	136,374	3,721	2019	210,868	139,374	142,440	145,574	148,777	152,050	155,395	158,814	162,308	165,878	169,528	173,257	177,069	180,964	184,946	189,016	193,174	197,421	201,757	206,184	210,701	215,309	220,009	224,801	
K10	City	85.33	39.66	298,868	7,536	2030	643,026	305,144	311,552	318,095	324,775	331,595	338,559	346,176	353,965	361,929	370,073	378,399	386,913	395,619	404,520	413,622	422,929	432,444	442,174	452,123	462,296	472,698	483,334	494,209	
K11	Airport	47.72	47.72	0	0	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Sub Total		631.29	394.96	2,438,453	6,174		4,068,970	2,489,928	2,542,490	2,599,523	2,654,398	2,716,235	2,773,574	2,843,008	2,917,079	3,051,322	3,119,815	3,189,844	3,261,446	3,334,655	3,409,507	3,507,894	3,586,625	3,667,324	3,749,839	3,834,210	3,950,461	4,039,346	4,130,231	4,223,161	
TOTAL		917.47	618.20	5,479,862	8,864		7,855,401	5,595,247	5,730,233	5,854,251	5,997,240	6,129,321	6,258,380	6,412,162	6,566,514	6,782,844	6,962,464	7,207,580	7,369,553	7,535,167	7,704,502	7,899,497	8,100,064	8,282,316	8,486,445	8,710,041	8,935,997	9,137,057	9,342,641	9,552,903	

(Source: BWA and JICA Study Team)

Summary of Projected Population and Water Requirement at Water Supply Zones (2005, 2014 and 2027)

Water Supply Zone (WSZ)	2005						2014						2027					
	Served Population	Water Demand (m3/d) (Unit Water Demand) 244 lpcd	UFW (m3/d) 46.4%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.365	Peak Hourly Flow (m3/h) 2.25	Served Population	Water Demand (m3/d) (Unit Water Demand) 280 lpcd	UFW (m3/d) 38.0%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.292	Peak Hourly Flow (m3/h) 2.25	Served Population	Water Demand (m3/d) (Unit Water Demand) 360 lpcd	UFW (m3/d) 25.0%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.250	Peak Hourly Flow (m3/h) 2.25
Rasafa Side																		
R1	276,380	67,516	58,514	126,029	172,030	11,815	362,382	101,467	62,189	163,656	211,444	15,343	483,938	174,218	58,073	232,290	290,363	21,777
R2	363,437	88,783	76,945	165,727	226,218	15,537	440,769	123,415	75,642	199,057	257,182	18,662	648,713	233,537	77,846	311,382	389,228	29,192
R3	657,803	160,692	139,266	299,958	409,443	28,121	820,240	229,667	140,764	370,431	478,597	34,728	1,095,379	394,336	131,445	525,782	657,227	49,292
R4	112,206	27,410	23,756	51,166	69,841	4,797	136,081	38,103	23,353	61,456	79,401	5,761	208,667	75,120	25,040	100,160	125,200	9,390
R5	223,255	54,538	47,266	101,804	138,963	9,544	277,910	77,815	47,693	125,508	162,156	11,766	371,132	133,607	44,536	178,143	222,679	16,701
R6	327,158	79,920	69,264	149,184	203,636	13,986	400,471	112,132	68,726	180,858	233,668	16,955	534,803	192,529	64,176	256,706	320,882	24,066
R7/R13	321,266	78,481	68,017	146,497	199,969	13,734	389,625	109,095	66,865	175,960	227,340	16,496	576,010	207,363	69,121	276,485	345,606	25,920
R8	136,750	33,406	28,952	62,358	85,118	5,846	165,847	46,437	28,462	74,899	96,769	7,022	257,169	92,581	30,860	123,441	154,301	11,573
R9	54,764	13,378	11,594	24,973	34,088	2,341	70,555	19,755	12,108	31,864	41,168	2,987	94,222	33,920	11,307	45,226	56,533	4,240
R10*	41,823	10,217	8,855	19,071	26,032	1,788	53,105	14,869	9,114	23,983	30,986	2,248	70,711	25,456	8,485	33,941	42,426	3,182
R11	86,335	21,090	18,278	39,369	53,738	3,691	104,705	29,317	17,969	47,286	61,094	4,433	159,696	57,490	19,163	76,654	95,817	7,186
R12	885	216	187	404	551	38	1,074	301	184	485	626	45	1,434	516	172	688	860	65
R14	503,083	122,896	106,510	229,406	313,139	21,507	619,674	173,509	106,344	279,853	361,570	26,236	827,534	297,912	99,304	397,217	496,521	37,239
R45	175	43	37	80	109	7	212	59	36	96	124	9	335	121	40	161	201	15
Sub-total	3,105,320	758,585	657,441	1,416,026	1,932,900	132,752	3,842,650	1,075,942	659,448	1,735,390	2,242,200	162,693	5,329,742	1,918,707	639,569	2,558,276	3,197,900	239,838
Karkh Side																		
K1	148,287	36,224	31,394	67,619	92,300	6,339	190,566	53,358	32,704	86,062	111,192	8,068	254,488	91,616	30,539	122,154	152,693	11,452
K2	138,467	33,826	29,315	63,141	86,187	5,919	174,406	48,834	29,930	78,764	101,763	7,384	232,908	83,847	27,949	111,796	139,745	10,481
K3	137,548	33,601	29,121	62,722	85,615	5,880	170,727	47,803	29,299	77,102	99,616	7,228	227,994	82,078	27,359	109,437	136,797	10,260
K4	37,644	9,196	7,970	17,166	23,431	1,609	45,654	12,783	7,835	20,618	26,638	1,933	60,968	21,949	7,316	29,265	36,581	2,744
K5	89,064	21,757	18,856	40,613	55,437	3,807	115,692	32,394	19,854	52,248	67,504	4,898	154,499	55,620	18,540	74,159	92,699	6,952
K6	735,845	179,756	155,789	335,545	458,019	31,457	962,733	269,565	165,217	434,783	561,739	40,761	1,285,669	462,841	154,280	617,121	771,401	57,855
K7	624,716	152,609	132,261	284,871	388,848	26,707	757,643	212,140	130,021	342,161	442,073	32,078	1,011,784	364,242	121,414	485,656	607,070	45,530
K8 (Taji Center)*	133,838	32,695	28,335	61,030	83,306	5,722	162,794	45,582	27,938	73,520	94,988	6,892	248,814	89,573	29,858	119,431	149,288	11,197
K9 (Abu Ghraib)*	139,374	34,047	29,508	63,555	86,752	5,958	169,528	47,468	29,093	76,561	98,917	7,178	251,829	90,658	30,219	120,878	151,097	11,332
K10	305,144	74,542	64,603	139,146	189,934	13,045	370,073	103,620	63,509	167,130	215,931	15,668	494,209	177,915	59,305	237,220	296,525	22,239
K11 (Airport)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-total	2,489,928	608,254	527,153	1,135,407	1,549,831	106,444	3,119,815	873,548	535,400	1,408,949	1,820,362	132,089	4,223,161	1,520,338	506,779	2,027,117	2,533,897	190,042
Total	5,595,247	1,366,839	1,184,594	2,551,433	3,482,731	239,197	6,962,464	1,949,490	1,194,849	3,144,339	4,062,562	294,782	9,552,903	3,439,045	1,146,348	4,585,394	5,731,797	429,881
Annual Water Requirement (MCM/year)																		

(Source : BWA & JICA Study Team)

Annual Water Demand Projection and Water Requirement at Water Supply Zone (2001 to 2027) (1/9)

Water Supply Zone (WSZ)	2001						2002						2003					
	Served Population	Water Demand (m3/d) (Unit Water Demand) 232.857 lpcd	UFW (m3/d) 49.286%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.393000	Peak Hourly Flow (m3/h) 2.25	Served Population	Water Demand (m3/d) (Unit Water Demand) 236 lpcd	UFW (m3/d) 48.6%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.386	Peak Hourly Flow (m3/h) 2.25	Served Population	Water Demand (m3/d) (Unit Water Demand) 239 lpcd	UFW (m3/d) 47.9%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.379	Peak Hourly Flow (m3/h) 2.25
Rasafa Side																		
R1	254,333.17	59,223	57,555	116,778	162,672	10,948	259,674	61,209	57,808	119,017	164,958	11,158	265,127	63,252	58,053	121,305	167,279	11,372
R2	334,446	77,878	75,684	153,563	213,913	14,397	341,470	80,489	76,018	156,507	216,919	14,673	348,641	83,176	76,339	159,515	219,971	14,955
R3	605,331	140,956	136,985	277,941	387,171	26,057	618,043	145,681	137,588	283,270	392,612	26,557	631,022	150,544	138,170	288,714	398,137	27,067
R4	103,255	24,044	23,366	47,410	66,042	4,445	105,424	24,850	23,469	48,319	66,970	4,530	107,638	25,679	23,569	49,248	67,913	4,617
R5	205,446	47,840	46,492	94,332	131,404	8,844	209,761	49,444	46,697	96,140	133,250	9,013	214,166	51,094	46,894	97,988	135,126	9,186
R6	301,061	70,104	68,129	138,234	192,560	12,959	307,383	72,455	68,429	140,884	195,265	13,208	313,838	74,873	68,719	143,592	198,013	13,462
R7/R13	295,639	68,842	66,902	135,744	189,091	12,726	301,847	71,150	67,197	138,347	191,748	12,970	308,186	73,524	67,481	141,006	194,447	13,219
R8	125,841	29,303	28,478	57,781	80,488	5,417	128,484	30,286	28,603	58,889	81,619	5,521	131,182	31,296	28,724	60,020	82,768	5,627
R9	50,396	11,735	11,404	23,140	32,233	2,169	51,454	12,128	11,455	23,583	32,686	2,211	52,535	12,533	11,503	24,036	33,146	2,253
R10*	38,337	8,927	8,676	17,602	24,520	1,650	39,180	9,235	8,722	17,958	24,889	1,684	40,042	9,553	8,768	18,321	25,264	1,718
R11	79,448	18,500	17,979	36,479	50,815	3,420	81,116	19,120	18,058	37,178	51,529	3,485	82,820	19,758	18,134	37,893	52,254	3,552
R12	815	190	184	374	521	35	832	196	185	381	528	36	849	203	186	389	536	36
R14	462,953	107,802	104,765	212,567	296,106	19,928	472,675	111,416	105,227	216,643	300,267	20,310	482,601	115,135	105,672	220,807	304,492	20,701
R45	161	37	36	74	103	7	164	39	37	75	104	7	167	40	37	77	106	7
Sub-total	2,857,462	665,380	646,637	1,312,018	1,827,700	123,002	2,917,507	687,698	649,493	1,337,191	1,853,400	125,362	2,978,814	710,660	652,249	1,362,909	1,879,500	127,773
Karkh Side																		
K1	136,458	31,775	30,880	62,656	87,279	5,874	139,324	32,841	31,016	63,857	88,506	5,987	142,250	33,937	31,147	65,084	89,751	6,102
K2	127,422	29,671	28,835	58,506	81,499	5,485	130,098	30,666	28,962	59,628	82,644	5,590	132,830	31,689	29,085	60,774	83,807	5,698
K3	126,576	29,474	28,644	58,118	80,958	5,449	129,234	30,462	28,770	59,232	82,096	5,553	131,948	31,479	28,892	60,371	83,251	5,660
K4	34,641	8,067	7,839	15,906	22,157	1,491	35,369	8,337	7,874	16,211	22,468	1,520	36,112	8,615	7,907	16,522	22,784	1,549
K5	81,959	19,085	18,547	37,632	52,421	3,528	83,681	19,725	18,629	38,354	53,158	3,596	85,438	20,383	18,708	39,091	53,906	3,665
K6	677,148	157,679	153,237	310,916	433,105	29,148	691,368	162,965	153,912	316,877	439,191	29,707	705,886	168,404	154,563	322,967	445,372	30,278
K7	574,883	133,866	130,095	263,961	367,697	24,746	586,956	138,354	130,668	269,022	372,864	25,221	599,282	142,972	131,220	274,192	378,111	25,706
K8 (Taji Center)*	122,681	28,567	27,762	56,329	78,467	5,281	125,380	29,554	27,912	57,466	79,647	5,387	128,138	30,570	28,057	58,628	80,847	5,496
K9 (Abu Ghraib)*	127,755	29,749	28,911	58,659	81,713	5,499	130,566	30,776	29,066	59,843	82,942	5,610	133,438	31,835	29,218	61,053	84,192	5,724
K10	280,803	65,387	63,545	128,932	179,603	12,087	286,700	67,579	63,825	131,404	182,126	12,319	292,721	69,835	64,095	133,930	184,689	12,556
K11 (Airport)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-total	2,290,327	533,319	518,296	1,051,615	1,464,900	98,589	2,338,674	551,259	520,633	1,071,892	1,485,643	100,490	2,388,043	569,719	522,893	1,092,611	1,506,711	102,432
Total	5,147,789	1,198,699	1,164,933	2,363,633	3,292,600	221,591	5,256,181	1,238,957	1,170,126	2,409,083	3,339,043	225,852	5,366,856	1,280,379	1,175,142	2,455,521	3,386,211	230,205

(Source : BWA and JICA Study Team)

Annual Water Demand Projection and Water Requirement at Water Supply Zone (2001 to 2027) (2/9)

Water Supply Zone (WSZ)	2004						2005						2006					
	Served Population	Water Demand (m3/d) (Unit Water Demand) 241 lpcd	UFW (m3/d) 47.1%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.372	Peak Hourly Flow (m3/h) 2.25	Served Population	Water Demand (m3/d) (Unit Water Demand) 244 lpcd	UFW (m3/d) 46.4%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.365	Peak Hourly Flow (m3/h) 2.25	Served Population	Water Demand (m3/d) (Unit Water Demand) 247 lpcd	UFW (m3/d) 45.7%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.358	Peak Hourly Flow (m3/h) 2.25
Rasafa Side																		
R1	270,695	65,354	58,288	123,642	169,637	11,591	276,380	67,516	58,514	126,029	172,030	11,815	282,184	69,740	58,728	128,468	174,459	12,044
R2	355,962	85,939	76,649	162,588	223,071	15,243	363,437	88,783	76,945	165,727	226,218	15,537	371,069	91,707	77,227	168,934	229,413	15,838
R3	644,273	155,546	138,730	294,276	403,747	27,588	657,803	160,692	139,266	299,958	409,443	28,121	671,617	165,985	139,777	305,762	415,225	28,665
R4	109,898	26,533	23,664	50,197	68,870	4,706	112,206	27,410	23,756	51,166	69,841	4,797	114,562	28,313	23,843	52,156	70,828	4,890
R5	218,663	52,791	47,084	99,876	137,030	9,363	223,255	54,538	47,266	101,804	138,963	9,544	233,964	57,822	48,693	106,515	144,647	9,986
R6	320,429	77,361	68,997	146,358	200,803	13,721	327,158	79,920	69,264	149,184	203,636	13,986	337,143	83,323	70,166	153,489	208,438	14,390
R7/R13	314,658	75,967	67,755	143,722	197,187	13,474	321,266	78,481	68,017	146,497	199,969	13,734	328,012	81,066	68,266	149,332	202,793	14,000
R8	133,937	32,336	28,840	61,177	83,934	5,735	136,750	33,406	28,952	62,358	85,118	5,846	139,621	34,506	29,058	63,564	86,321	5,959
R9	53,638	12,950	11,550	24,500	33,613	2,297	54,764	13,378	11,594	24,973	34,088	2,341	55,914	13,819	11,637	25,456	34,569	2,386
R10*	40,923	9,880	8,812	18,692	25,645	1,752	41,823	10,217	8,855	19,071	26,032	1,788	42,743	10,564	8,896	19,460	26,426	1,824
R11	84,559	20,415	18,208	38,623	52,991	3,621	86,335	21,090	18,278	39,369	53,738	3,691	88,148	21,785	18,345	40,130	54,497	3,762
R12	867	209	187	396	543	37	885	216	187	404	551	38	904	223	188	411	559	39
R14	492,736	118,961	106,100	225,060	308,783	21,099	503,083	122,896	106,510	229,406	313,139	21,507	521,683	128,930	108,573	237,503	322,529	22,266
R45	171	41	37	78	107	7	175	43	37	80	109	7	178	44	37	81	110	8
Sub-total	3,041,409	734,283	654,901	1,389,184	1,906,000	130,236	3,105,320	758,585	657,441	1,416,026	1,932,900	132,752	3,187,743	787,828	663,434	1,451,262	1,970,900	136,056
Karkh Side																		
K1	145,237	35,064	31,274	66,338	91,016	6,219	148,287	36,224	31,394	67,619	92,300	6,339	151,401	37,418	31,510	68,927	93,603	6,462
K2	135,619	32,742	29,203	61,945	84,988	5,807	138,467	33,826	29,315	63,141	86,187	5,919	141,375	34,940	29,423	64,363	87,405	6,034
K3	134,719	32,525	29,009	61,534	84,424	5,769	137,548	33,601	29,121	62,722	85,615	5,880	140,437	34,708	29,228	63,936	86,825	5,994
K4	36,870	8,901	7,939	16,841	23,105	1,579	37,644	9,196	7,970	17,166	23,431	1,609	38,435	9,499	7,999	17,498	23,762	1,640
K5	87,232	21,060	18,784	39,844	54,666	3,735	89,064	21,757	18,856	40,613	55,437	3,807	90,934	22,474	18,925	41,399	56,220	3,881
K6	720,710	174,000	155,189	329,189	451,648	30,861	735,845	179,756	155,789	335,545	458,019	31,457	751,298	185,678	156,360	342,038	464,488	32,066
K7	611,867	147,722	131,752	279,474	383,439	26,201	624,716	152,609	132,261	284,871	388,848	26,707	637,835	157,636	132,746	290,383	394,340	27,223
K8 (Taji Center)*	130,957	31,617	28,199	59,815	82,067	5,608	133,838	32,695	28,335	61,030	83,306	5,722	136,782	33,805	28,467	62,272	84,565	5,838
K9 (Abu Ghraib)*	136,374	32,925	29,365	62,290	85,462	5,840	139,374	34,047	29,508	63,555	86,752	5,958	142,440	35,203	29,645	64,848	88,063	6,079
K10	298,868	72,155	64,355	136,510	187,292	12,798	305,144	74,542	64,603	139,146	189,934	13,045	311,552	76,998	64,840	141,838	192,616	13,297
K11 (Airport)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-total	2,438,453	588,712	525,068	1,113,780	1,528,106	104,417	2,489,928	608,254	527,153	1,135,407	1,549,831	106,444	2,542,490	628,358	529,144	1,157,502	1,571,887	108,516
Total	5,479,862	1,322,995	1,179,969	2,502,964	3,434,106	234,653	5,595,247	1,366,839	1,184,594	2,551,433	3,482,731	239,197	5,730,233	1,416,186	1,192,578	2,608,764	3,542,787	244,572

(Source : BWA and JICA Study Team)

Annual Water Demand Projection and Water Requirement at Water Supply Zone (2001 to 2027) (3/9)

Water Supply Zone (WSZ)	2007						2008						2009					
	Served Population	Water Demand (m3/d) (Unit Water Demand) 250 lpcd	UFW (m3/d) 45.0%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.350	Peak Hourly Flow (m3/h) 2.25	Served Population	Water Demand (m3/d) (Unit Water Demand) 254 lpcd	UFW (m3/d) 44.0%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.340	Peak Hourly Flow (m3/h) 2.25	Served Population	Water Demand (m3/d) (Unit Water Demand) 258 lpcd	UFW (m3/d) 43.0%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.330	Peak Hourly Flow (m3/h) 2.25
Rasafa Side																		
R1	288,109	72,027	58,931	130,959	176,794	12,277	294,160	74,717	58,706	133,422	178,786	12,508	300,337	77,487	58,455	135,942	180,803	12,745
R2	378,862	94,715	77,494	172,210	232,483	16,145	386,818	98,252	77,198	175,450	235,102	16,448	394,941	101,895	76,868	178,763	237,755	16,759
R3	685,721	171,430	140,261	311,691	420,783	29,221	719,841	182,840	143,660	326,499	437,509	30,609	734,957	189,619	143,046	332,665	442,444	31,187
R4	116,968	29,242	23,925	53,167	71,776	4,984	119,424	30,334	23,834	54,167	72,584	5,078	121,932	31,459	23,732	55,190	73,403	5,174
R5	238,877	59,719	48,861	108,580	146,584	10,179	243,893	61,949	48,674	110,623	148,235	10,371	249,015	64,246	48,466	112,712	149,907	10,567
R6	344,223	86,056	70,409	156,465	211,228	14,669	351,452	89,269	70,140	159,409	213,608	14,945	358,833	92,579	69,840	162,419	216,017	15,227
R7/R13	334,901	83,725	68,502	152,228	205,507	14,271	341,934	86,851	68,240	155,091	207,822	14,540	349,114	90,071	67,949	158,020	210,167	14,814
R8	142,553	35,638	29,159	64,797	87,476	6,075	145,547	36,969	29,047	66,016	88,461	6,189	148,604	38,340	28,923	67,263	89,459	6,306
R9	57,089	14,272	11,677	25,949	35,032	2,433	58,288	14,805	11,633	26,438	35,426	2,479	59,512	15,354	11,583	26,937	35,826	2,525
R10*	43,604	10,921	8,935	19,856	26,806	1,862	44,645	11,340	8,910	20,250	27,134	1,898	45,627	11,772	8,880	20,652	27,467	1,936
R11	89,999	22,500	18,409	40,909	55,227	3,835	91,889	23,340	18,338	41,678	55,849	3,907	93,819	24,205	18,260	42,465	56,479	3,981
R12	923	231	189	419	566	39	942	239	188	427	573	40	962	248	187	435	579	41
R14	532,638	133,160	108,949	242,108	326,846	22,698	543,824	138,131	108,532	246,663	330,528	23,125	555,244	143,253	108,068	251,321	334,257	23,561
R45	182	46	37	83	112	8	186	47	37	84	113	8	190	49	37	86	114	8
Sub-total	3,254,729	813,682	665,740	1,479,422	1,997,300	138,696	3,342,842	849,082	667,136	1,516,217	2,031,800	142,145	3,413,086	880,576	664,294	1,544,871	2,054,700	144,832
Karkh Side																		
K1	154,580	38,645	31,619	70,264	94,856	6,587	157,827	40,088	31,498	71,586	95,925	6,711	161,141	41,574	31,363	72,937	97,007	6,838
K2	144,344	36,086	29,525	65,611	88,575	6,151	147,375	37,433	29,412	66,845	89,572	6,267	156,272	40,318	30,416	70,734	94,076	6,631
K3	146,747	36,687	30,017	66,703	90,050	6,253	149,829	38,057	29,902	67,958	91,064	6,371	152,976	39,468	29,774	69,242	92,091	6,491
K4	39,242	9,810	8,027	17,837	24,080	1,672	40,066	10,177	7,996	18,173	24,352	1,704	40,907	10,554	7,962	18,516	24,626	1,736
K5	92,844	23,211	18,991	42,202	56,972	3,956	94,794	24,078	18,918	42,996	57,614	4,031	96,784	24,970	18,837	43,808	58,264	4,107
K6	767,075	191,769	156,902	348,670	470,705	32,688	783,183	198,929	156,301	355,230	476,008	33,303	799,630	206,305	155,633	361,938	481,377	33,932
K7	651,230	162,807	133,206	296,014	399,618	27,751	664,906	168,886	132,696	301,582	404,120	28,273	678,869	175,148	132,129	307,277	408,679	28,807
K8 (Taji Center)*	139,792	34,948	28,594	63,542	85,781	5,957	142,867	36,288	28,512	64,800	86,833	6,075	146,010	37,671	28,418	66,089	87,898	6,196
K9 (Abu Ghraib)*	145,574	36,394	29,777	66,170	89,330	6,203	148,777	37,789	29,692	67,481	90,424	6,326	152,050	39,229	29,594	68,823	91,534	6,452
K10	318,095	79,524	65,065	144,589	195,195	13,555	324,775	82,493	64,816	147,309	197,394	13,810	331,595	85,552	64,539	150,090	199,620	14,071
K11 (Airport)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-total	2,599,523	649,881	531,721	1,181,601	1,595,162	110,775	2,654,398	674,217	529,742	1,203,959	1,613,305	112,871	2,716,235	700,789	528,665	1,229,454	1,635,173	115,261
Total	5,854,251	1,463,563	1,197,461	2,661,023	3,592,462	249,471	5,997,240	1,523,299	1,196,878	2,720,177	3,645,105	255,017	6,129,321	1,581,365	1,192,959	2,774,324	3,689,873	260,093

(Source : BWA and JICA Study Team)

Annual Water Demand Projection and Water Requirement at Water Supply Zone (2001 to 2027) (4/9)

Water Supply Zone (WSZ)	2010						2011						2012					
	Served Population	Water Demand (m3/d) (Unit Water Demand) 262 lpcd	UFW (m3/d) 42.0%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.320	Peak Hourly Flow (m3/h) 2.25	Served Population	Water Demand (m3/d) (Unit Water Demand) 266 lpcd	UFW (m3/d) 41.0%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.310	Peak Hourly Flow (m3/h) 2.25	Served Population	Water Demand (m3/d) (Unit Water Demand) 270 lpcd	UFW (m3/d) 40.0%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.30	Peak Hourly Flow (m3/h) 2.25
Rasafa Side																		
R1	306,644	80,341	58,178	138,519	182,845	12,986	313,544	83,403	57,958	141,360	185,182	13,253	320,598	86,562	57,708	144,269	187,550	13,525
R2	403,235	105,648	76,503	182,151	240,439	17,077	412,308	109,674	76,214	185,888	243,513	17,427	421,585	113,828	75,885	189,713	246,627	17,786
R3	750,391	196,603	142,367	338,970	447,440	31,778	767,275	204,095	141,829	345,924	453,161	32,430	784,539	211,826	141,217	353,043	458,955	33,098
R4	124,493	32,617	23,619	56,236	74,232	5,272	127,294	33,860	23,530	57,390	75,181	5,380	130,158	35,143	23,428	58,571	76,142	5,491
R5	254,244	66,612	48,236	114,848	151,600	10,767	259,965	69,151	48,054	117,205	153,538	10,988	265,814	71,770	47,847	119,616	155,501	11,214
R6	366,368	95,988	69,509	165,497	218,456	15,515	374,611	99,647	69,246	168,893	221,249	15,834	383,040	103,421	68,947	172,368	224,078	16,160
R7/R13	356,446	93,389	67,626	161,015	212,540	15,095	364,466	96,948	67,371	164,318	215,257	15,405	372,666	100,620	67,080	167,700	218,010	15,722
R8	151,724	39,752	28,786	68,538	90,470	6,425	155,138	41,267	28,677	69,944	91,626	6,557	158,629	42,830	28,553	71,383	92,798	6,692
R9	60,761	15,919	11,528	27,447	36,230	2,573	65,999	17,556	12,200	29,755	38,980	2,790	67,484	18,221	12,147	30,368	39,478	2,847
R10*	46,631	12,217	8,847	21,064	27,805	1,975	49,749	13,233	9,196	22,429	29,382	2,103	50,843	13,728	9,152	22,879	29,743	2,145
R11	95,789	25,097	18,173	43,270	57,116	4,057	97,944	26,053	18,105	44,158	57,847	4,140	100,148	27,040	18,027	45,066	58,586	4,225
R12	982	257	186	444	586	42	1,004	267	186	453	593	42	1,027	277	185	462	601	43
R14	566,904	148,529	107,555	256,084	338,031	24,008	579,660	154,189	107,149	261,338	342,353	24,500	592,702	160,030	106,686	266,716	346,731	25,005
R45	194	51	37	88	116	8	198	53	37	89	117	8	203	55	36	91	118	9
Sub-total	3,484,806	913,019	661,152	1,574,171	2,078,000	147,579	3,569,154	949,395	659,749	1,609,144	2,108,000	150,857	3,649,435	985,347	656,898	1,642,246	2,135,000	153,961
Karkh Side																		
K1	164,525	43,106	31,214	74,320	98,102	6,967	168,227	44,748	31,096	75,845	99,356	7,110	182,271	49,213	32,809	82,022	106,629	7,690
K2	159,554	41,803	30,271	72,074	95,138	6,757	163,144	43,396	30,157	73,553	96,355	6,896	166,815	45,040	30,027	75,067	97,587	7,037
K3	156,188	40,921	29,633	70,554	93,131	6,614	159,702	42,481	29,521	72,001	94,322	6,750	163,296	44,090	29,393	73,483	95,528	6,889
K4	41,766	10,943	7,924	18,867	24,904	1,769	42,706	11,360	7,894	19,254	25,223	1,805	43,667	11,790	7,860	19,650	25,545	1,842
K5	98,817	25,890	18,748	44,638	58,922	4,185	108,221	28,787	20,004	48,791	63,916	4,574	110,656	29,877	19,918	49,795	64,734	4,668
K6	816,423	213,903	154,895	368,798	486,813	34,575	834,792	222,055	154,309	376,364	493,037	35,284	853,575	230,465	153,643	384,109	499,341	36,010
K7	693,125	181,599	131,503	313,101	413,294	29,353	708,720	188,520	131,005	319,525	418,577	29,955	724,666	195,660	130,440	326,100	423,930	30,572
K8 (Taji Center)*	149,222	39,096	28,311	67,407	88,978	6,319	152,505	40,566	28,190	68,757	90,071	6,446	155,860	42,082	28,055	70,137	91,178	6,575
K9 (Abu Ghraib)*	155,395	40,713	29,482	70,196	92,658	6,581	158,814	42,244	29,356	71,601	93,797	6,713	162,308	43,823	29,215	73,038	94,950	6,847
K10	338,559	88,702	64,233	152,935	201,874	14,338	346,176	92,083	63,990	156,073	204,455	14,632	353,965	95,571	63,714	159,284	207,070	14,933
K11 (Airport)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-total	2,773,574	726,676	526,214	1,252,890	1,653,815	117,458	2,843,008	756,240	525,523	1,281,763	1,679,109	120,165	2,917,079	787,611	525,074	1,312,686	1,706,491	123,064
Total	6,258,380	1,639,696	1,152,366	2,827,061	3,731,815	265,037	6,412,162	1,705,635	1,181,247	2,890,907	3,787,109	271,023	6,566,514	1,772,959	1,181,973	2,954,931	3,841,491	277,025

(Source : BWA and JICA Study Team)

Annual Water Demand Projection and Water Requirement at Water Supply Zone (2001 to 2027) (5/9)

Water Supply Zone (WSZ)	2013						2014						2015					
	Served Population	Water Demand (m3/d) (Unit Water Demand) 275 lpcd	UFW (m3/d) 39.0%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.296	Peak Hourly Flow (m3/h) 2.25	Served Population	Water Demand (m3/d) (Unit Water Demand) 280 lpcd	UFW (m3/d) 38.0%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.292	Peak Hourly Flow (m3/h) 2.25	Served Population	Water Demand (m3/d) (Unit Water Demand) 285 lpcd	UFW (m3/d) 37.0%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.288	Peak Hourly Flow (m3/h) 2.25
Rasafa Side																		
R1	327,812	90,148	57,636	147,784	191,528	13,855	362,382	101,467	62,189	163,656	211,444	15,343	370,536	105,603	62,021	167,623	215,899	15,715
R2	431,070	118,544	75,791	194,335	251,858	18,219	440,769	123,415	75,642	199,057	257,182	18,662	496,699	141,559	83,138	224,697	289,410	21,065
R3	802,191	220,603	141,041	361,644	468,690	33,904	820,240	229,667	140,764	370,431	478,597	34,728	838,696	239,028	140,382	379,410	488,680	35,570
R4	133,087	36,599	23,399	59,998	77,757	5,625	136,081	38,103	23,353	61,456	79,401	5,761	139,143	39,656	23,290	62,946	81,074	5,901
R5	271,795	74,744	47,787	122,531	158,800	11,487	277,910	77,815	47,693	125,508	162,156	11,766	284,163	80,987	47,564	128,550	165,573	12,052
R6	391,658	107,706	68,861	176,567	228,831	16,553	400,471	112,132	68,726	180,858	233,668	16,955	409,481	116,702	68,539	185,242	238,591	17,366
R7/R13	381,051	104,789	66,996	171,785	222,634	16,105	389,625	109,095	66,865	175,960	227,340	16,496	441,032	125,694	73,820	199,514	256,975	18,704
R8	162,198	44,604	28,518	73,122	94,766	6,855	165,847	46,437	28,462	74,899	96,769	7,022	169,579	48,330	28,384	76,714	98,808	7,192
R9	69,002	18,976	12,132	31,108	40,315	2,916	70,555	19,755	12,108	31,864	41,168	2,987	72,142	20,561	12,075	32,636	42,035	3,060
R10*	51,962	14,290	9,136	23,425	30,359	2,196	53,105	14,869	9,114	23,983	30,986	2,248	54,273	15,468	9,084	24,552	31,623	2,302
R11	102,401	28,160	18,004	46,164	59,829	4,328	104,705	29,317	17,969	47,286	61,094	4,433	107,061	30,512	17,920	48,432	62,381	4,541
R12	1,050	289	185	473	613	44	1,074	301	184	485	626	45	1,098	313	184	497	640	47
R14	606,038	166,660	106,553	273,214	354,085	25,614	619,674	173,509	106,344	279,853	361,570	26,236	633,616	180,581	106,055	286,636	369,187	26,872
R45	207	57	36	93	121	9	212	59	36	96	124	9	217	62	36	98	126	9
Sub-total	3,731,522	1,026,169	656,075	1,682,244	2,180,200	157,710	3,842,650	1,075,942	659,448	1,735,390	2,242,200	162,693	4,017,735	1,145,055	672,492	1,817,547	2,341,100	170,395
Karkh Side																		
K1	186,372	51,252	32,768	84,020	108,890	7,877	190,566	53,358	32,704	86,062	111,192	8,068	194,853	55,533	32,615	88,148	113,535	8,264
K2	170,568	46,906	29,989	76,895	99,657	7,209	174,406	48,834	29,930	78,764	101,763	7,384	178,330	50,824	29,849	80,673	103,907	7,563
K3	166,970	45,917	29,357	75,273	97,554	7,057	170,727	47,803	29,299	77,102	99,616	7,228	174,568	49,752	29,219	78,971	101,715	7,404
K4	44,650	12,279	7,850	20,129	26,087	1,887	45,654	12,783	7,835	20,618	26,638	1,933	46,681	13,304	7,814	21,118	27,200	1,980
K5	113,146	31,115	19,893	51,008	66,107	4,782	115,692	32,394	19,854	52,248	67,504	4,898	118,295	33,714	19,800	53,514	68,926	5,017
K6	941,548	258,926	165,543	424,469	550,111	39,794	962,733	269,565	165,217	434,783	561,739	40,761	984,395	280,553	164,769	445,321	573,574	41,749
K7	740,971	203,767	130,277	334,044	432,922	31,317	757,643	212,140	130,021	342,161	442,073	32,078	774,690	220,787	129,668	350,455	451,386	32,855
K8 (Taji Center)*	159,289	43,805	28,006	71,811	93,067	6,732	162,794	45,582	27,938	73,520	94,988	6,892	166,375	47,417	27,848	75,265	96,941	7,056
K9 (Abu Ghraib)*	165,878	45,617	29,165	74,781	96,916	7,011	169,528	47,468	29,093	76,561	98,917	7,178	173,257	49,378	29,000	78,378	100,951	7,348
K10	361,929	99,531	63,634	163,165	211,462	15,297	370,073	103,620	63,509	167,130	215,931	15,668	378,399	107,844	63,337	171,181	220,481	16,048
K11 (Airport)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-total	3,051,322	839,114	536,483	1,375,596	1,782,773	128,962	3,119,815	873,548	535,400	1,408,949	1,820,362	132,089	3,189,844	909,106	533,919	1,443,025	1,858,616	135,284
Total	6,782,844	1,865,282	1,192,558	3,057,840	3,962,973	286,672	6,962,464	1,949,490	1,190,800	3,144,339	4,062,562	294,782	7,207,580	2,054,160	1,206,412	3,260,572	4,199,716	305,679

(Source : BWA and JICA Study Team)

Annual Water Demand Projection and Water Requirement at Water Supply Zone (2001 to 2027) (6/9)

Water Supply Zone (WSZ)	2016						2017						2018					
	Served Population	Water Demand (m3/d) (Unit Water Demand) 290 lpcd	UFW (m3/d) 36.0%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.284	Peak Hourly Flow (m3/h) 2.25	Served Population	Water Demand (m3/d) (Unit Water Demand) 295 lpcd	UFW (m3/d) 35.0%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.280	Peak Hourly Flow (m3/h) 2.25	Served Population	Water Demand (m3/d) (Unit Water Demand) 301 lpcd	UFW (m3/d) 34.0%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.276	Peak Hourly Flow (m3/h) 2.25
Rasafa Side																		
R1	378,873	109,873	61,804	171,677	220,433	16,095	387,397	114,282	61,537	175,819	225,048	16,483	396,114	119,230	61,422	180,652	230,512	16,936
R2	507,874	147,284	82,847	230,131	295,488	21,575	519,302	153,194	82,489	235,683	301,674	22,095	530,986	159,827	82,335	242,162	308,998	22,703
R3	857,566	248,694	139,891	388,585	498,943	36,430	876,862	258,674	139,286	397,960	509,389	37,309	896,591	269,874	139,026	408,900	521,756	38,334
R4	142,274	41,259	23,208	64,468	82,777	6,044	145,475	42,915	23,108	66,023	84,510	6,190	148,748	44,773	23,065	67,838	86,561	6,360
R5	290,557	84,262	47,397	131,659	169,050	12,343	297,095	87,643	47,192	134,835	172,589	12,641	303,779	91,438	47,104	138,542	176,779	12,988
R6	418,695	121,421	68,300	189,721	243,602	17,786	428,115	126,294	68,004	194,299	248,702	18,215	437,748	131,762	67,877	199,640	254,740	18,716
R7/R13	450,955	130,777	73,562	204,339	262,371	19,157	461,102	136,025	73,244	209,269	267,865	19,619	471,476	141,914	73,107	215,022	274,368	20,158
R8	173,394	50,284	28,285	78,569	100,883	7,366	177,296	52,302	28,163	80,465	102,995	7,544	181,285	54,567	28,110	82,677	105,496	7,751
R9	73,766	21,392	12,033	33,425	42,918	3,134	75,425	22,250	11,981	34,232	43,816	3,209	77,122	23,214	11,959	35,173	44,880	3,297
R10*	55,467	16,086	9,048	25,134	32,272	2,356	56,688	16,723	9,005	25,727	32,931	2,412	57,935	17,438	8,983	26,422	33,714	2,477
R11	109,470	31,746	17,857	49,603	63,691	4,650	111,933	33,020	17,780	50,800	65,024	4,763	114,451	34,450	17,747	52,197	66,603	4,893
R12	1,122	326	183	509	653	48	1,148	339	182	521	667	49	1,173	353	182	535	683	50
R14	647,873	187,883	105,684	293,567	376,940	27,522	662,450	195,423	105,228	300,650	384,832	28,186	677,355	203,884	105,031	308,915	394,175	28,961
R45	221	64	36	100	129	9	226	67	36	103	131	10	231	70	36	106	135	10
Sub-total	4,108,107	1,191,351	670,135	1,861,486	2,390,200	174,514	4,200,512	1,239,151	667,235	1,906,386	2,440,200	178,724	4,294,995	1,292,794	665,985	1,958,778	2,499,500	183,635
Karkh Side																		
K1	199,238	57,779	32,501	90,280	115,919	8,464	203,720	60,098	32,360	92,458	118,346	8,668	208,304	62,700	32,300	94,999	121,219	8,906
K2	182,342	52,879	29,745	82,624	106,089	7,746	186,445	55,001	29,616	84,617	108,310	7,933	190,640	57,383	29,561	86,943	110,940	8,151
K3	178,496	51,764	29,117	80,881	103,851	7,583	182,512	53,841	28,991	82,832	106,025	7,766	186,618	56,172	28,937	85,109	108,599	7,979
K4	47,732	13,842	7,786	21,628	27,771	2,028	48,806	14,398	7,753	22,150	28,352	2,077	49,904	15,021	7,738	22,759	29,041	2,134
K5	120,956	35,077	19,731	54,808	70,374	5,138	123,678	36,485	19,646	56,131	71,847	5,262	126,461	38,065	19,609	57,674	73,592	5,407
K6	1,006,544	291,898	164,192	456,090	585,620	42,758	1,029,191	303,611	163,483	467,094	597,881	43,790	1,052,348	316,757	163,178	479,934	612,396	44,994
K7	792,121	229,715	129,215	358,930	460,866	33,650	809,943	238,933	128,656	367,590	470,515	34,462	828,167	249,278	128,416	377,694	481,938	35,409
K8 (Taji Center)*	170,035	49,310	27,737	77,047	98,929	7,223	173,776	51,264	27,604	78,868	100,951	7,394	177,599	53,457	27,539	80,996	103,351	7,593
K9 (Abu Ghraib)*	177,069	51,350	28,884	80,234	103,021	7,522	180,964	53,385	28,746	82,130	105,126	7,700	184,946	55,669	28,678	84,346	107,626	7,907
K10	386,913	112,205	63,115	175,320	225,111	16,436	395,619	116,708	62,843	179,550	229,824	16,833	404,520	121,761	62,725	184,486	235,404	17,296
K11 (Airport)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-total	3,261,446	945,819	532,023	1,477,843	1,897,550	138,548	3,334,655	983,723	529,697	1,513,420	1,937,178	141,883	3,409,507	1,026,262	528,680	1,554,942	1,984,106	145,776
Total	7,369,553	2,137,170	1,202,158	3,339,329	4,287,750	313,062	7,535,167	2,222,874	1,196,932	3,419,806	4,377,378	320,607	7,704,502	2,319,055	1,264,663	3,513,720	4,483,606	329,411

(Source : BWA and JICA Study Team)

Annual Water Demand Projection and Water Requirement at Water Supply Zone (2001 to 2027) (7/9)

Water Supply Zone (WSZ)	2019						2020						2021					
	Served Population	Water Demand (m3/d) (Unit Water Demand) 307 lpcd	UFW (m3/d) 33.0%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.272	Peak Hourly Flow (m3/h) 2.25	Served Population	Water Demand (m3/d) (Unit Water Demand) 313 lpcd	UFW (m3/d) 32.0%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.268	Peak Hourly Flow (m3/h) 2.25	Served Population	Water Demand (m3/d) (Unit Water Demand) 319 lpcd	UFW (m3/d) 31.0%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.264	Peak Hourly Flow (m3/h) 2.25
Rasafa Side																		
R1	405,026	124,343	61,244	185,587	236,066	17,399	414,139	129,626	61,000	190,626	241,714	17,871	423,458	135,083	60,689	195,772	247,456	18,354
R2	542,933	166,680	82,096	248,777	316,444	23,323	555,149	173,762	81,770	255,532	324,014	23,956	567,640	181,077	81,353	262,431	331,712	24,603
R3	916,764	281,447	138,623	420,070	534,329	39,382	937,392	293,404	138,072	431,476	547,111	40,451	958,483	305,756	137,369	443,125	560,110	41,543
R4	152,095	46,693	22,998	69,691	88,647	6,534	178,571	55,893	26,302	82,195	104,224	7,706	182,589	58,246	26,168	84,414	106,700	7,914
R5	310,614	95,359	46,968	142,326	181,039	13,343	317,603	99,410	46,781	146,191	185,370	13,705	324,749	103,595	46,543	150,138	189,774	14,075
R6	447,597	137,412	67,681	205,093	260,878	19,227	457,668	143,250	67,412	210,662	267,119	19,750	467,966	149,281	67,068	216,349	273,466	20,283
R7/R13	482,085	148,000	72,895	220,895	280,979	20,709	492,931	154,288	72,606	226,893	287,701	21,271	504,022	160,783	72,236	233,019	294,536	21,846
R8	185,364	56,907	28,029	84,935	108,038	7,963	189,534	59,324	27,917	87,242	110,622	8,179	193,799	61,822	27,775	89,597	113,251	8,400
R9	78,858	24,209	11,924	36,133	45,962	3,387	80,632	25,238	11,877	37,114	47,061	3,479	82,446	26,300	11,816	38,116	48,179	3,573
R10*	59,209	18,177	8,953	27,130	34,510	2,543	60,512	18,940	8,913	27,853	35,318	2,611	61,873	19,738	8,868	28,605	36,157	2,682
R11	117,026	35,927	17,695	53,623	68,208	5,027	119,660	37,453	17,625	55,079	69,840	5,164	122,352	39,030	17,535	56,566	71,499	5,303
R12	1,200	368	181	550	699	52	1,227	384	181	565	716	53	1,254	400	180	580	733	54
R14	692,595	212,627	104,727	317,353	403,673	29,752	708,179	221,660	104,311	325,970	413,331	30,560	724,113	230,992	103,779	334,771	423,150	31,385
R45	237	73	36	108	138	10	242	76	36	111	141	10	247	79	35	114	145	11
Sub-total	4,391,604	1,348,222	664,050	2,012,272	2,559,700	188,651	4,513,439	1,412,706	664,803	2,077,510	2,634,300	194,767	4,614,992	1,472,182	661,415	2,133,598	2,696,900	200,025
Karrah Side																		
K1	212,991	65,388	32,206	97,594	124,140	9,149	217,783	68,166	32,078	100,244	127,110	9,398	222,683	71,036	31,915	102,951	130,130	9,652
K2	194,930	59,843	29,475	89,318	113,613	8,374	199,316	62,386	29,358	91,744	116,331	8,601	203,800	65,012	29,208	94,221	119,095	8,833
K3	190,817	58,581	28,853	87,434	111,216	8,197	195,111	61,070	28,739	89,808	113,877	8,420	199,501	63,641	28,592	92,233	116,582	8,647
K4	51,027	15,665	7,716	23,381	29,740	2,192	52,175	16,331	7,685	24,016	30,452	2,251	53,349	17,018	7,646	24,664	31,175	2,312
K5	129,306	39,697	19,552	59,249	75,365	5,555	132,215	41,383	19,475	60,858	77,168	5,705	135,190	43,126	19,375	62,501	79,001	5,859
K6	1,076,026	330,340	162,705	493,045	627,153	46,223	1,019,878	319,222	150,222	469,444	595,255	44,010	1,124,991	358,872	161,232	520,105	657,412	48,760
K7	846,801	259,968	128,044	388,012	493,551	36,376	865,854	271,012	127,535	398,547	505,358	37,364	885,336	282,422	126,885	409,307	517,365	38,373
K8 (Taji Center)*	181,506	55,722	27,445	83,168	105,790	7,797	185,500	58,061	27,323	85,384	108,267	8,005	189,673	60,506	27,184	87,690	110,840	8,221
K9 (Abu Ghraib)*	210,868	64,736	31,885	96,622	122,903	9,058	215,507	67,454	31,743	99,197	125,781	9,300	220,356	70,294	31,581	101,875	128,770	9,551
K10	413,622	126,982	62,543	189,525	241,076	17,768	422,929	132,377	62,295	194,672	246,844	18,250	432,444	137,950	61,977	199,927	252,708	18,743
K11 (Airport)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-total	3,507,894	1,076,923	530,425	1,607,348	2,044,547	150,689	3,506,267	1,097,461	516,452	1,613,914	2,046,443	151,304	3,667,324	1,169,876	525,597	1,695,473	2,143,078	158,951
Total	7,899,497	2,425,146	1,194,475	3,619,620	4,604,247	339,339	8,019,706	2,510,168	1,132,904	3,691,423	4,680,743	346,071	8,282,316	2,642,059	1,187,012	3,829,071	4,839,978	358,975

(Source : BWA and JICA Study Team)

Annual Water Demand Projection and Water Requirement at Water Supply Zone (2001 to 2027) (8/9)

Water Supply Zone (WSZ)	2022						2023						2024					
	Served Population	Water Demand (m3/d) (Unit Water Demand) 325 lpcd	UFW (m3/d) 30.0%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.260	Peak Hourly Flow (m3/h) 2.25	Served Population	Water Demand (m3/d) (Unit Water Demand) 332 lpcd	UFW (m3/d) 29.0%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.258	Peak Hourly Flow (m3/h) 2.25	Served Population	Water Demand (m3/d) (Unit Water Demand) 339 lpcd	UFW (m3/d) 28.0%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.256	Peak Hourly Flow (m3/h) 2.25
Rasafa Side																		
R1	432,985	140,720	60,309	201,029	253,296	18,846	442,727	146,986	60,036	207,022	260,434	19,408	452,689	153,462	59,679	213,141	267,705	19,982
R2	580,412	188,634	80,843	269,477	339,541	25,263	593,471	197,032	80,478	277,510	349,108	26,017	606,824	205,713	80,000	285,713	358,856	26,786
R3	980,049	318,516	136,507	455,023	573,329	42,658	1,002,100	332,697	135,890	468,588	589,483	43,930	1,024,647	347,355	135,083	482,438	605,942	45,229
R4	186,697	60,677	26,004	86,681	109,218	8,126	190,898	63,378	25,887	89,265	112,295	8,369	195,193	66,170	25,733	91,903	115,431	8,616
R5	332,056	107,918	46,251	154,169	194,253	14,453	339,527	112,723	46,042	158,765	199,726	14,884	347,167	117,689	45,768	163,458	205,303	15,324
R6	478,495	155,511	66,648	222,158	279,920	20,827	489,261	162,435	66,347	228,781	287,807	21,448	500,269	169,591	65,952	235,544	295,843	22,082
R7/R13	515,363	167,493	71,783	239,276	301,487	22,432	526,959	174,950	71,459	246,409	309,982	23,101	538,815	182,658	71,034	253,692	318,637	23,784
R8	198,159	64,402	27,601	92,003	115,923	8,625	235,269	78,109	31,904	110,013	138,397	10,314	240,563	81,551	31,714	113,265	142,261	10,619
R9	84,301	27,398	11,742	39,140	49,316	3,669	86,198	28,618	11,689	40,307	50,706	3,779	88,137	29,879	11,619	41,498	52,122	3,890
R10*	63,266	20,561	8,812	29,373	37,010	2,754	64,689	21,477	8,772	30,249	38,053	2,836	66,145	22,423	8,720	31,143	39,116	2,920
R11	142,882	46,437	19,901	66,338	83,586	6,219	146,097	48,504	19,812	68,316	85,941	6,405	149,384	50,641	19,694	70,335	88,341	6,594
R12	1,283	417	179	596	750	56	1,312	435	178	613	772	57	1,341	455	177	631	793	59
R14	740,405	240,632	103,128	343,760	433,137	32,227	757,064	251,345	102,662	354,008	445,342	33,188	774,098	262,419	102,052	364,471	457,776	34,169
R45	253	82	35	117	148	11	259	86	35	121	152	11	265	90	35	125	156	12
Sub-total	4,736,606	1,539,397	659,742	2,199,138	2,771,000	206,169	4,875,831	1,618,776	661,190	2,279,966	2,868,200	213,747	4,985,537	1,690,097	657,260	2,347,357	2,948,300	220,065
Karkh Side																		
K1	227,694	74,000	31,714	105,715	133,201	9,911	232,817	77,295	31,571	108,866	136,954	10,206	238,055	80,701	31,384	112,084	140,778	10,508
K2	208,386	67,725	29,025	96,750	121,906	9,070	213,074	70,741	28,894	99,635	125,341	9,341	217,868	73,857	28,722	102,580	128,840	9,617
K3	203,989	66,297	28,413	94,709	119,334	8,879	208,579	69,248	28,285	97,533	122,696	9,144	213,272	72,299	28,116	100,416	126,122	9,414
K4	54,549	17,728	7,598	25,326	31,911	2,374	55,776	18,518	7,564	26,081	32,810	2,445	57,031	19,334	7,519	26,852	33,726	2,517
K5	138,232	44,925	19,254	64,179	80,866	6,017	141,342	46,926	19,167	66,092	83,144	6,196	144,522	48,993	19,053	68,046	85,466	6,379
K6	1,150,304	373,849	160,221	534,070	672,928	50,069	1,176,186	390,494	159,497	549,991	691,889	51,562	1,202,650	407,698	158,549	566,248	711,207	53,086
K7	905,256	294,208	126,089	420,297	529,575	39,403	925,624	307,307	125,520	432,827	544,496	40,578	946,451	320,847	124,774	445,620	559,699	41,777
K8 (Taji Center)*	193,941	63,031	27,013	90,044	113,455	8,442	198,305	65,837	26,891	92,728	116,652	8,693	232,747	78,901	30,684	109,585	137,639	10,274
K9 (Abu Ghraib)*	225,314	73,227	31,383	104,610	131,809	9,807	230,384	76,487	31,241	107,729	135,523	10,100	235,567	79,857	31,056	110,913	139,307	10,398
K10	442,174	143,707	61,589	205,295	258,672	19,246	452,123	150,105	61,310	211,415	265,961	19,820	462,296	156,718	60,946	217,664	273,387	20,406
K11 (Airport)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-total	3,749,839	1,218,698	522,299	1,740,997	2,193,656	163,218	3,834,210	1,272,958	519,941	1,792,898	2,255,466	168,084	3,950,461	1,339,206	520,802	1,860,009	2,336,171	174,376
Total	8,486,445	2,758,094	1,182,041	3,940,135	4,964,656	369,388	8,710,041	2,891,734	1,181,131	4,072,864	5,123,666	381,831	8,935,997	3,029,303	1,178,062	4,207,365	5,284,471	394,441

(Source : BWA and JICA Study Team)

Annual Water Demand Projection and Water Requirement at Water Supply Zone (2001 to 2027) (9/9)

Water Supply Zone (WSZ)	2025						2026						2027					
	Served Population	Water Demand (m3/d) (Unit Water Demand) 346 lpcd	UFW (m3/d) 27.0%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.254	Peak Hourly Flow (m3/h) 2.25	Served Population	Water Demand (m3/d) (Unit Water Demand) 353 lpcd	UFW (m3/d) 26.0%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.252	Peak Hourly Flow (m3/h) 2.25	Served Population	Water Demand (m3/d) (Unit Water Demand) 360 lpcd	UFW (m3/d) 25.0%	Average Day Supply (m3/d)	Maximum Day Supply (m3/d) (Peak Day Factor) 1.250	Peak Hourly Flow (m3/h) 2.25
Rasafa Side																		
R1	462,874	160,155	59,235	219,390	275,115	20,568	473,289	167,071	58,701	225,772	282,666	21,166	483,938	174,218	58,073	232,290	290,363	21,777
R2	620,478	214,685	79,404	294,089	368,788	27,571	634,438	223,957	78,688	302,644	378,911	28,373	648,713	233,537	77,846	311,382	389,228	29,192
R3	1,047,702	362,505	134,077	496,582	622,714	46,555	1,071,275	378,160	132,867	511,027	639,806	47,909	1,095,379	394,336	131,445	525,782	657,227	49,292
R4	199,585	69,056	25,541	94,598	118,626	8,869	204,076	72,039	25,311	97,350	121,882	9,127	208,667	75,120	25,040	100,160	125,200	9,390
R5	354,978	122,822	45,427	168,250	210,985	15,773	362,965	128,127	45,017	173,144	216,776	16,232	371,132	133,607	44,536	178,143	222,679	16,701
R6	511,526	176,988	65,461	242,449	304,031	22,730	523,035	184,631	64,870	249,502	312,376	23,391	534,803	192,529	64,176	256,706	320,882	24,066
R7/R13	550,938	190,625	70,505	261,130	327,457	24,481	563,335	198,857	69,869	268,726	336,445	25,193	576,010	207,363	69,121	276,485	345,606	25,920
R8	245,976	85,108	31,478	116,586	146,198	10,930	251,510	88,783	31,194	119,977	150,211	11,248	257,169	92,581	30,860	123,441	154,301	11,573
R9	90,121	31,182	11,533	42,715	53,564	4,005	92,148	32,528	11,429	43,957	55,034	4,121	94,222	33,920	11,307	45,226	56,533	4,240
R10*	67,633	23,401	8,655	32,056	40,198	3,005	69,155	24,412	8,577	32,989	41,302	3,093	70,711	25,456	8,485	33,941	42,426	3,182
R11	152,745	52,850	19,547	72,397	90,786	6,787	156,182	55,132	19,371	74,503	93,278	6,985	159,696	57,490	19,163	76,654	95,817	7,186
R12	1,371	474	175	650	815	61	1,402	495	174	669	837	63	1,434	516	172	688	860	65
R14	791,516	273,864	101,292	375,157	470,446	35,171	809,325	285,692	100,378	386,070	483,359	36,194	827,534	297,912	99,304	397,217	496,521	37,239
R45	270	94	35	128	161	12	277	98	34	132	165	12	335	121	40	161	201	15
Sub-total	5,097,712	1,763,808	652,367	2,416,176	3,029,900	226,516	5,212,410	1,839,981	646,480	2,486,460	3,113,100	233,106	5,329,742	1,918,707	639,569	2,558,276	3,197,900	239,838
Karkh Side																		
K1	243,411	84,220	31,150	115,370	144,674	10,816	248,888	87,858	30,869	118,726	148,645	11,131	254,488	91,616	30,539	122,154	152,693	11,452
K2	222,771	77,079	28,509	105,587	132,406	9,899	227,783	80,407	28,251	108,659	136,041	10,187	232,908	83,847	27,949	111,796	139,745	10,481
K3	218,071	75,453	27,907	103,360	129,613	9,690	222,977	78,711	27,655	106,366	133,171	9,972	227,994	82,078	27,359	109,437	136,797	10,260
K4	58,315	20,177	7,463	27,640	34,660	2,591	59,627	21,048	7,395	28,444	35,611	2,667	60,968	21,949	7,316	29,265	36,581	2,744
K5	147,774	51,130	18,911	70,041	87,831	6,566	151,099	53,338	18,740	72,078	90,242	6,757	154,499	55,620	18,540	74,159	92,699	6,952
K6	1,229,709	425,479	157,369	582,849	730,892	54,642	1,257,378	443,854	155,949	599,803	750,954	56,232	1,285,669	462,841	154,280	617,121	771,401	57,855
K7	967,746	334,840	123,845	458,685	575,191	43,002	989,520	349,301	122,727	472,028	590,979	44,253	1,011,784	364,242	121,414	485,656	607,070	45,530
K9 (Taji Center)*	237,984	82,342	30,455	112,798	141,449	10,575	243,339	85,899	30,181	116,079	145,331	10,882	248,814	89,573	29,858	119,431	149,288	11,197
K9 (Abu Ghraib)*	240,868	83,340	30,824	114,165	143,162	10,703	246,287	86,939	30,546	117,486	147,092	11,014	251,829	90,658	30,219	120,878	151,097	11,332
K10	472,698	163,553	60,492	224,046	280,953	21,004	483,334	170,617	59,946	230,563	288,665	21,615	494,209	177,915	59,305	237,220	296,525	22,239
K11 (Airport)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-total	4,039,346	1,397,614	516,926	1,914,539	2,400,832	179,488	4,130,231	1,457,972	512,260	1,970,232	2,466,730	184,709	4,223,161	1,520,338	506,779	2,027,117	2,533,897	190,042
Total	9,137,057	3,161,422	1,169,293	4,330,715	5,430,732	406,005	9,342,641	3,297,952	1,158,740	4,456,692	5,579,830	417,815	9,552,903	3,439,045	1,146,348	4,585,394	5,731,797	429,881

(Source : BWA and JICA Study Team)

Balance Sheet Between Water Requirement and Proposed Water Production

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
1 Water Requirement																												
1.1 Average Daily Demand	1,160	1,199	1,240	1,283	1,323	1,367	1,415	1,464	1,523	1,581	1,640	1,706	1,773	1,865	1,949	2,054	2,137	2,223	2,319	2,425	2,510	2,642	2,758	2,892	3,029	3,161	3,298	3,439
Rasafa Side	644	665	688	711	734	759	788	814	849	881	913	949	985	1,026	1,076	1,145	1,191	1,239	1,293	1,348	1,413	1,472	1,539	1,619	1,690	1,764	1,840	1,919
Karkh Side	516	534	553	572	589	608	628	650	674	701	727	756	788	839	874	909	946	984	1,026	1,077	1,097	1,170	1,219	1,273	1,339	1,398	1,458	1,520
1.2 Average Daily Requirement	2,319	2,366	2,413	2,462	2,503	2,551	2,607	2,661	2,720	2,774	2,827	2,891	2,955	3,058	3,144	3,261	3,339	3,420	3,514	3,620	3,691	3,829	3,940	4,073	4,207	4,331	4,457	4,585
Rasafa Side	1,287	1,312	1,337	1,363	1,389	1,416	1,451	1,479	1,516	1,545	1,574	1,609	1,642	1,682	1,735	1,818	1,861	1,906	1,959	2,012	2,078	2,134	2,199	2,280	2,347	2,416	2,486	2,558
Karkh Side	1,032	1,054	1,076	1,099	1,114	1,135	1,155	1,182	1,204	1,229	1,253	1,282	1,313	1,376	1,409	1,443	1,478	1,513	1,555	1,607	1,614	1,695	1,741	1,793	1,860	1,915	1,970	2,027
1.3 Maximum Daily Water Requirement	3,247	3,295	3,345	3,395	3,434	3,483	3,540	3,592	3,645	3,690	3,732	3,787	3,841	3,963	4,063	4,200	4,288	4,377	4,484	4,604	4,681	4,840	4,965	5,124	5,284	5,431	5,580	5,732
Rasafa Side	1,802	1,828	1,853	1,880	1,906	1,933	1,971	1,997	2,032	2,055	2,078	2,108	2,135	2,180	2,242	2,341	2,390	2,440	2,500	2,560	2,634	2,697	2,771	2,868	2,948	3,030	3,113	3,198
Karkh Side	1,445	1,467	1,491	1,516	1,528	1,550	1,569	1,595	1,613	1,635	1,654	1,679	1,706	1,783	1,820	1,859	1,897	1,937	1,984	2,044	2,046	2,143	2,194	2,255	2,336	2,401	2,467	2,534
2 Proposed Water Production	2,334	2,334	2,334	2,334	2,341	2,514	2,514	2,582	2,764	3,079	3,079	3,679	3,679	3,679	3,679	4,229	4,229	4,229	4,229	4,743	4,743	4,743	4,743	5,258	5,258	5,258	5,258	5,258
2.1 Rasafa Side	778	778	778	778	785	958	958	1,026	1,199	1,514	1,514	2,114	2,114	2,114	2,114	2,664	2,664	2,664	2,664	3,191	3,191	3,191	3,191	3,719	3,719	3,719	3,719	3,719
Shark Dijla WTP	500	500	500	500	500	635	635	635	635	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950
Wathba WTP	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
Wahda WTP	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58
Rasheed WTP	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Sadr WTP									96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96
Rasafa WTP												600	600	600	600	1200	1200	1200	1200	1800	1800	1800	1800	2400	2400	2400	2400	2400
CUs	100	100	100	100	107	145	145	213	290	290	290	290	290	290	290	290	290	290	290	217	217	217	217	145	145	145	145	145
2.2 Karkh Side	1,556	1,556	1,556	1,556	1,556	1,556	1,556	1,556	1,565	1,565	1,565	1,565	1,565	1,565	1,565	1,565	1,565	1,565	1,565	1,552	1,552	1,552	1,552	1,539	1,539	1,539	1,539	1,539
Karkh WTP	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150
Quadisa WTP	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Karama WTP	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180
Doura WTP	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
CUs	26	26	26	26	26	26	26	26	35	35	35	35	35	35	35	35	35	35	35	22	22	22	22	9	9	9	9	9

DATA BOOK 2

DRAWINGS OF

WATER SUPPLY FACILITIES

DRAWING LIST

DRAWING NO	DRAWING TITLE
DWG - 01	PROJECT AREA (MAHALAHS AND SECTORS)
DWG - 02	MAIN DISTRIBUTION R2 (EXISTING)
DWG - 03	MAIN DISTRIBUTION R3 (EXISTING)
DWG - 04	MAIN DISTRIBUTION R14 (EXISTING)
DWG - 05	TYPICAL PIPE REPLACEMENT WORK AT MAHALAH (333) , R2
DWG - 06	TYPICAL PIPE REPLACEMENT WORK AT MAHALAH (555) , R3
DWG - 07	TYPICAL PIPE REPLACEMENT WORK AT MAHALAH (518) , R14
DWG - 08	TYPICAL ROAD SECTION (LOCATION OF UNDER GROUND UTILITIES)
DWG - 09	PIPE LAYING
DWG - 10	THRUST BLOCK FOR BEND
DWG - 11	THRUST BLOCK FOR VALVE&FLANGE
DWG - 12	THRUST BLOCK FOR TEE
DWG - 13	VALVE CHAMBER DETAILS
DWG - 14	HOUSE CONNECTION AND WASHOUT
DWG - 15	SERVICE RESERVOIR R2
DWG - 16	SERVICE RESERVOIR R3
DWG - 17	SERVICE RESERVOIR R14



Japan International Cooperation Agency

The Feasibility Study on
Baghdad Water Supply System
Improvement Project
in the Republic of Iraq



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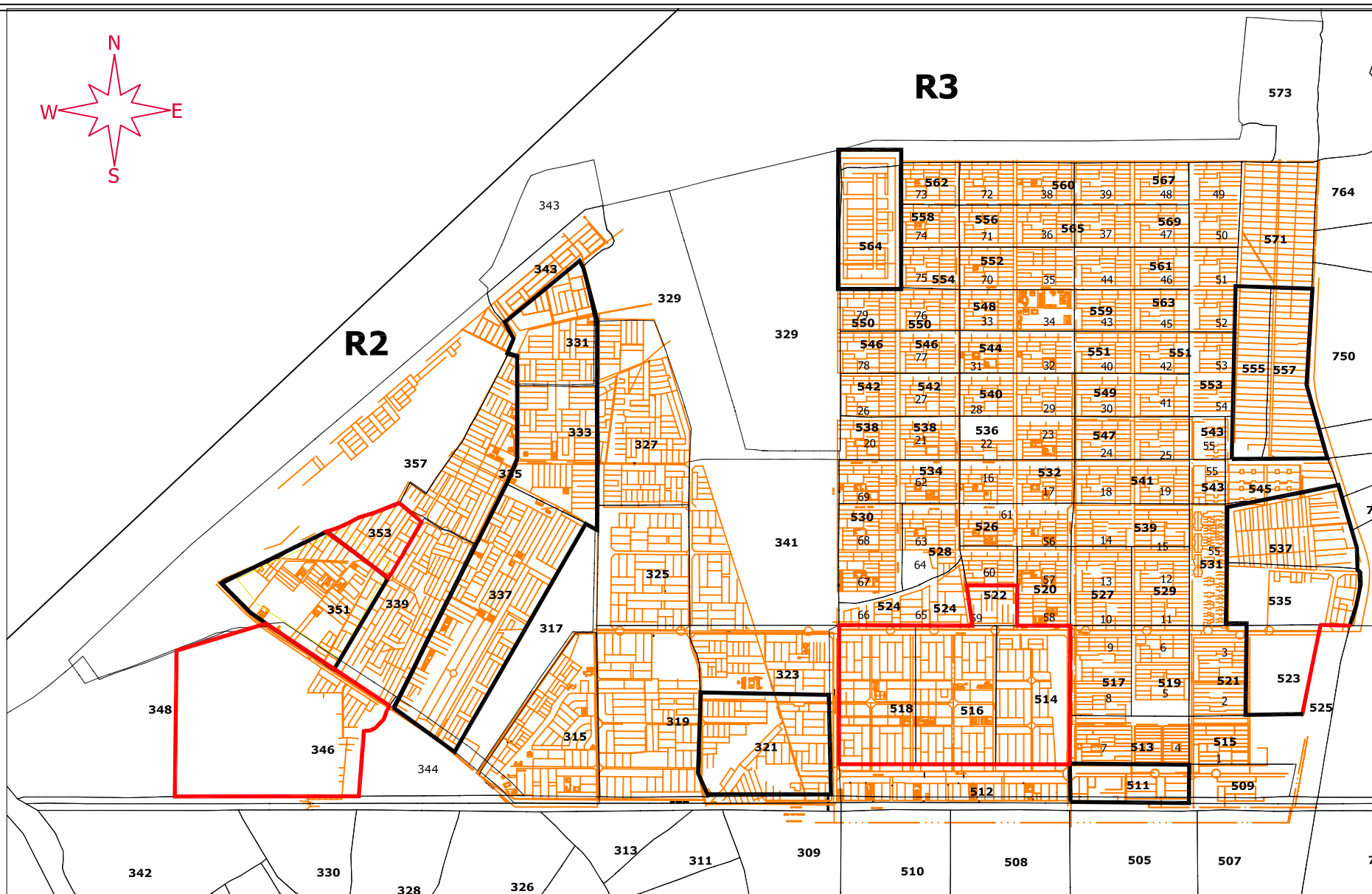
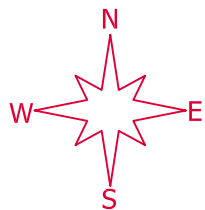
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Title DRAWING LIST

Scale

Date

DWG - NO



LEGEND

- Mahalah Boundary
- Mahalah Number
- Sector Number
- Distribution Main
- Project Area Selected by F/S



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Title

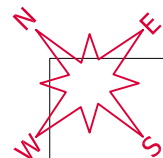
Project Area (Mahalabs and Sectors)

Scale

as shown

Date

DWG - 01



EXISTING WATER SUPPLY PIPES

- 75 mm
- 100 mm
- 110 mm
- 150 mm
- 160 mm
- 200 mm
- 250 mm
- 300 mm
- 375 mm
- 400 mm
- 450 mm
- 500 mm
- 600 mm
- 700 mm
- 750 mm
- 800 mm
- 900 mm
- 1000 mm
- 1200 mm
- 1400 mm
- 1500 mm
- 1600 mm

△ Reservoir
(Planned)

□ Sadr WTP
(planned)

△ R3 reservoir

329

□ Sadr WTP

R2 reservoir

△

357

0 100 200 300 400 500 600

(Original Source: USAID)



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Improvement Project in the
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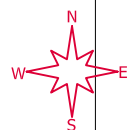
Tokyo Engineering Consultant Co.,Ltd.

Title
Main Distribution R2 (Existing)

Scale
As Shown

Date

DWG - 02



r3 reservoir

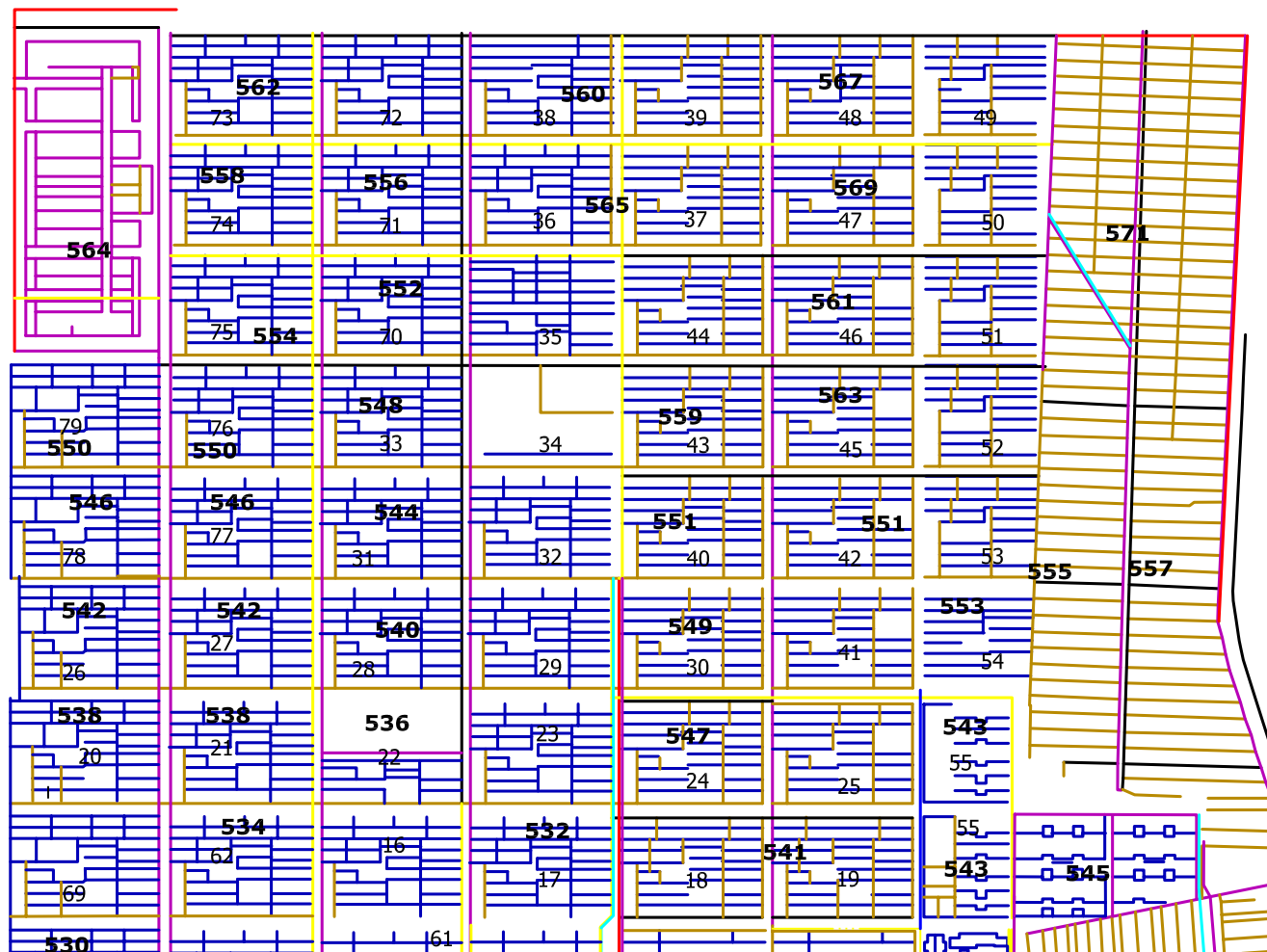


sader WTP

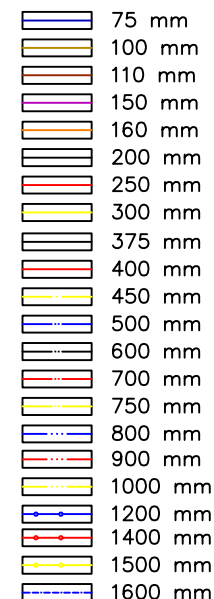
329

R2

R3



EXISTING WATER
SUPPLY PIPES



Reservoir
(Planned)



sader WTP
(Planned)

R14

(Original Source: USAID)



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Title
Main Distribution R3 (Existing)

Scale
As Shown

Date

DWG - 03



0 100 200 300 400 500 600

(Original Source: USAID)



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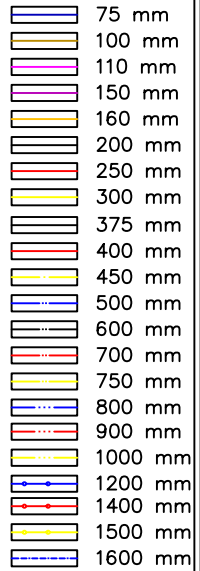
Title
Main Distribution R14 (Existing)

Scale
As Shown

Date

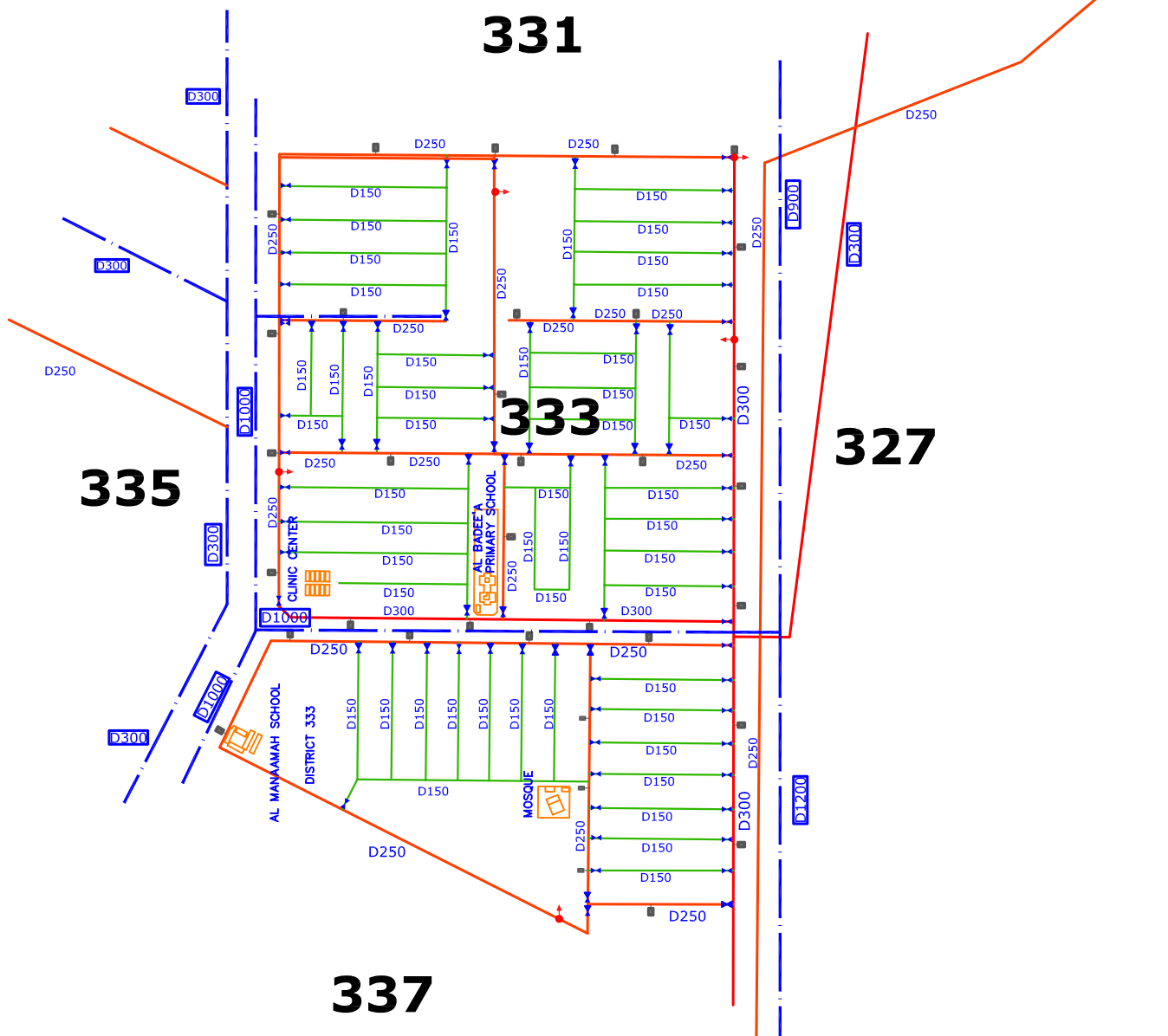
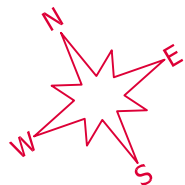
DWG - 04

EXISTING WATER
SUPPLY PIPES



Reservoir
(Planned)





Legend
Distribution main For
Replacement

333 Mahalah No.

Gate valve

Hydrant

Air Valve

D 150 Pipe to be
Replaced

D500 Existing
Distribution
Mains

NOTE:

Ductile Iron Pipe Shall be Protected by
Polyethylene Sleeves -ANSI/AWWAC/05
/A21-5 and ASTM A674.



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Title

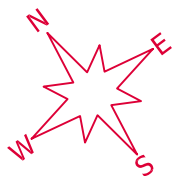
Typical Pipe Replacement Work at Mahalah (333),R2

Scale

As Shown

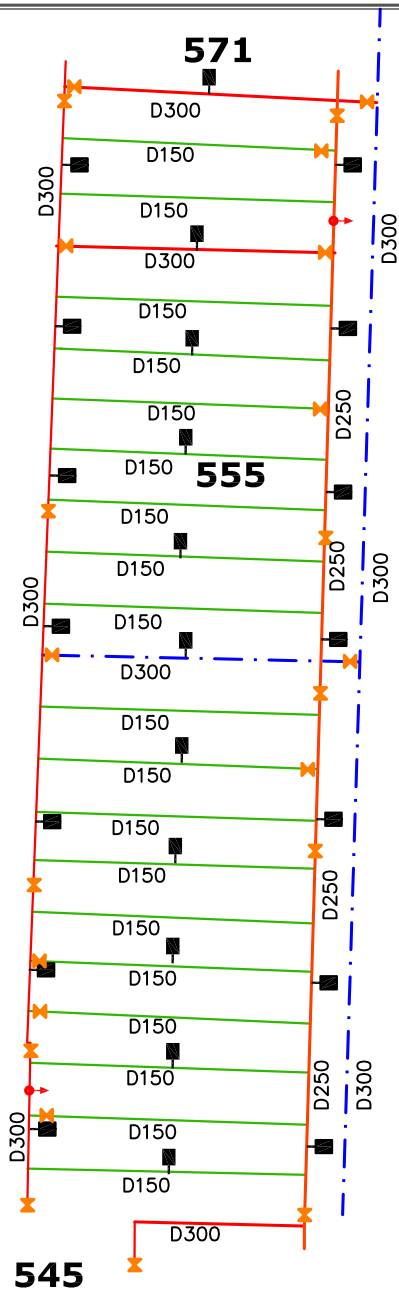
Date

DWG - 05



553

543



557



Legend
Distribution main For
Replacement

333 Mahalah No.

Gate valve

Hydrant

Air Valve

D 150 Pipe to be
Replaced

D500 Existing
Distribution
Mains

NOTE:
Ductile Iron Pipe Shall
be Protected by Polyethylene
Sleeves -ANSI /AWWAC/05
/A21-5 and ASTM A674.



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Tokyo Engineering Consultant Co.,Ltd.

Title

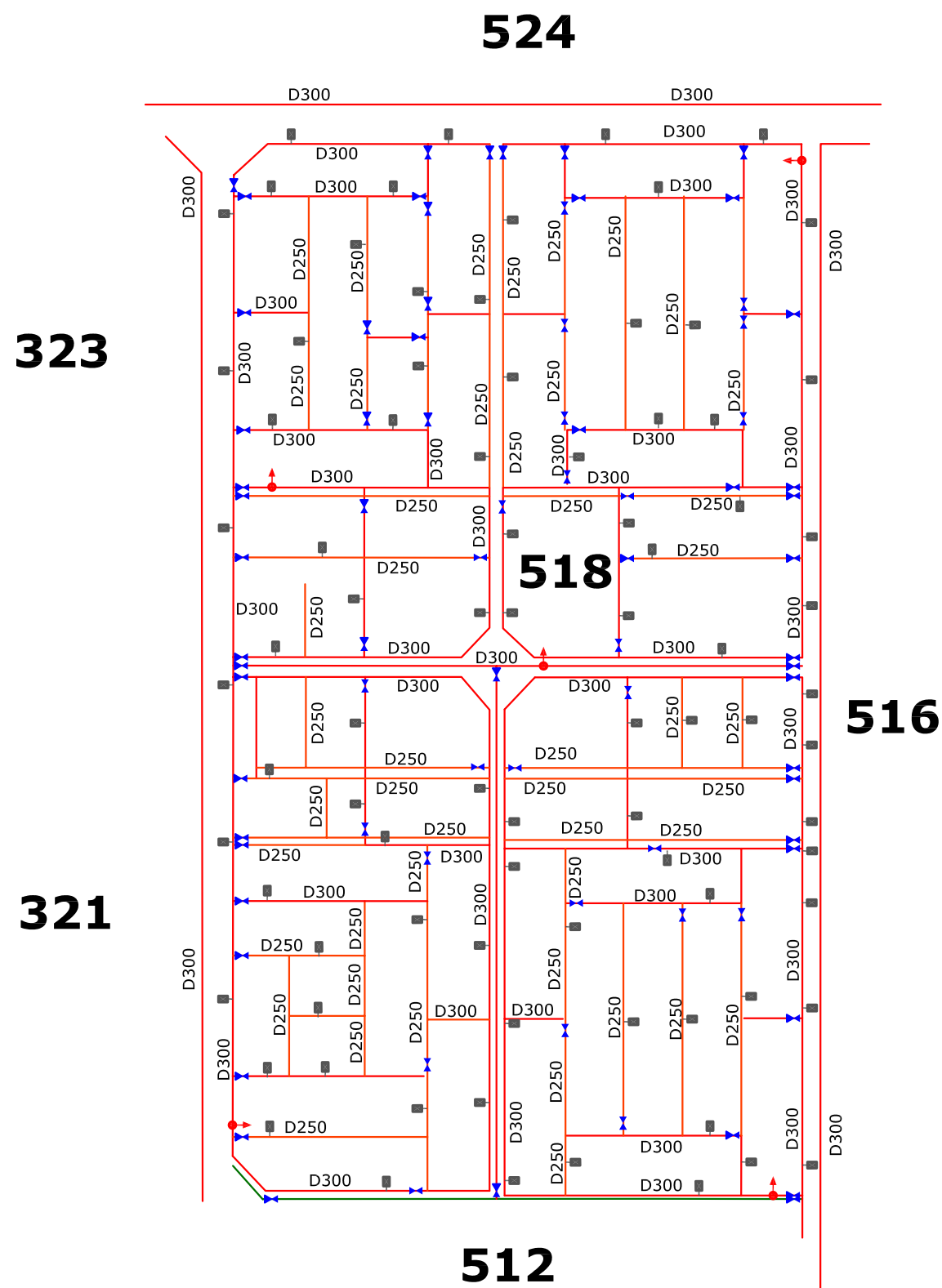
Typical Pipe Replacement Work at Mahalah: (555,R3)

Scale

As Shown

Date

DWG - 06



Legend
Distribution main For
Replacement

333 Mahalah No.

Gate valve

Hydrant

Air Valve

D 150 Pipe to be
Replaced

D500 Existing
Distribution
Mains

NOTE:
Ductile Iron Pipe Shall be Protected by
Polyethylene Sleeves -ANSI/AWWAC/05
/A21-5 and ASTM A674.



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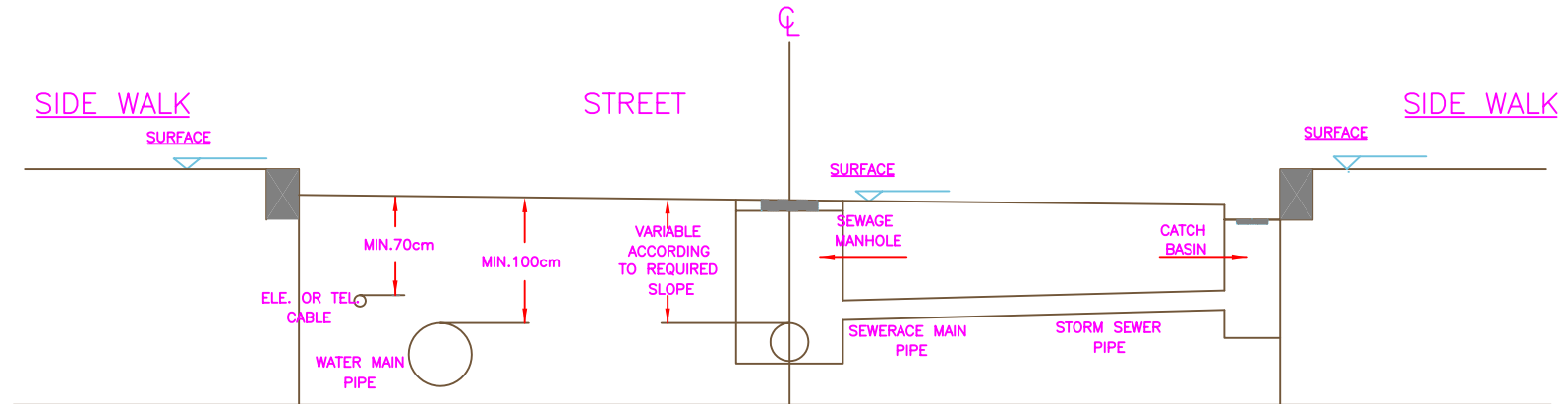
Title
Typical Pipe Replacement Work at Mahalah (518),R14

Scale
As Shown

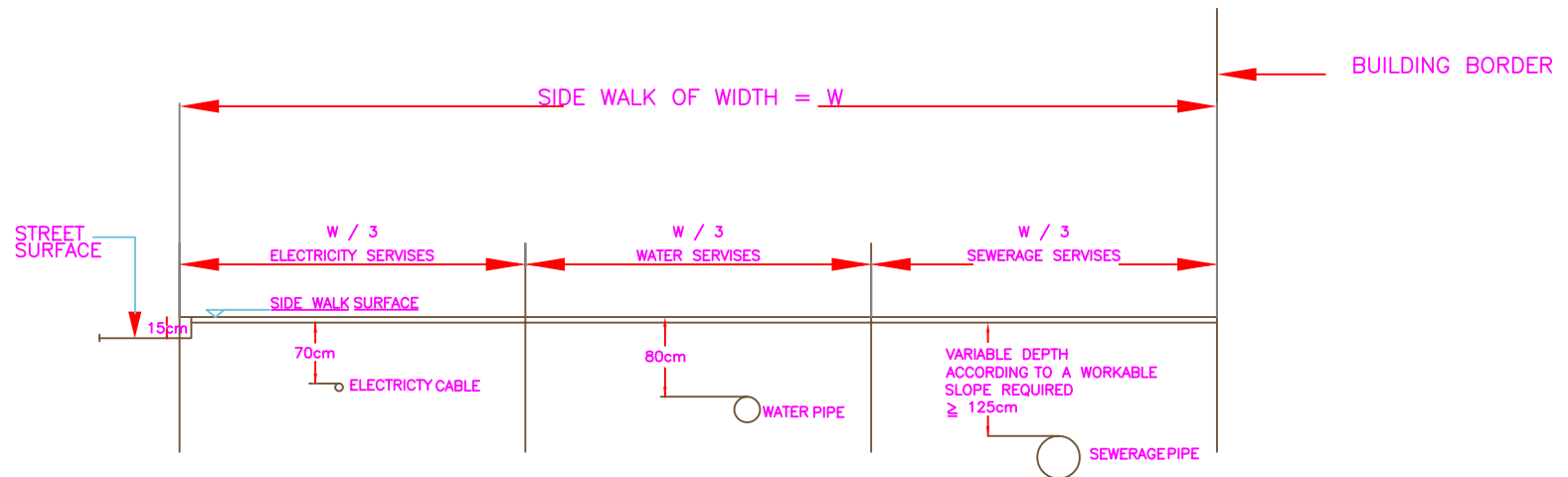
Date

DWG - 07

TYPICAL ROAD SECTION OF STREET (TRAFFIC ROAD)



TYPICAL ROAD SECTION OF SIDE WALK



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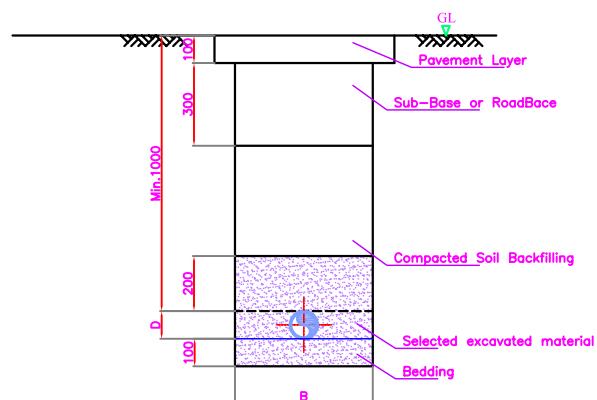
Title TYPICAL ROAD SECTION (LOCATION OF UNDER GROUND UTILITIES)

Scale As Shown

Date

DWG - 08

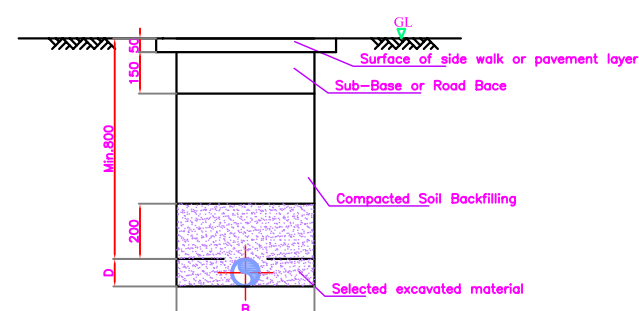
TYPICAL SECTION of TRAFFIC ROAD (DN 400 – 600 mm)



Basic Dimension for Machine Excavation

Pipe DN (mm)	Width: B (m)
400	800
500	900
600	1000

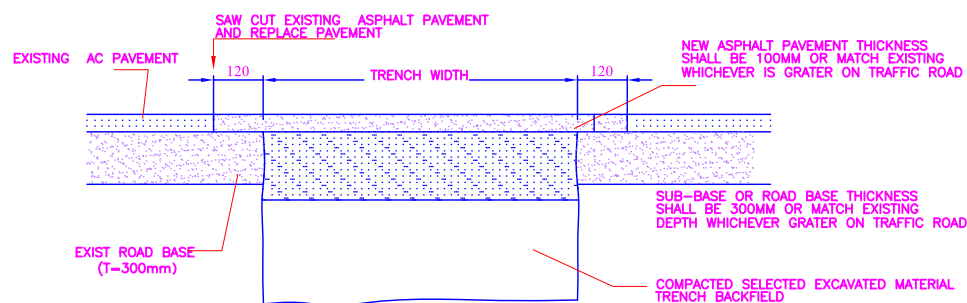
TYPICAL SECTION of SIDE WALK (DN 100 – 300 mm)



Basic Dimension of Manual Excavation

Pipe DN (mm)	Width: B (m)
100	600
150	650
200	700
250	750
300	800

TYPICAL SECTION of MANUAL EXCAVATION



Notes :-

1-The Trench Bottom does not lend itself to direct laying a pipe bed of selected excavated material must be laid over an approximate thickness of 10cm

2-Backfilling shall be placed and compacted by hand in 1 layer, not exceeding 200mm thickness by selected excavated material

3-Backfilling of the sidewalk area shall be compacted at 95% maximum dry density

4-Backfilling of the traffic road area shall be compacted at 97% maximum dry density

5- Basecourse and Sub-basecourse to be carried out by random gravel in two layers each of 15cm thickness Compression of each layer should be not less than 98% of the maximum dry density

6-Prime coat to be separated over for asphalt pavement

7-Surface of side walk area shall be recognized by block inter locking or asphalt pavement

8-Ductile Iron Pipe Shall be Protected by Polyethylene Sleeves -ANSI/AWWAC/05 /A21-5 and ASTM A674.



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Title Pipe Laying

Scale As Shown

Date

DWG - 09